Government of Uganda
Ministry of Water and Environment

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR WATER SUPPLY AND SANITATION PROJECT FOR RUKUNGIRI MUNICIPALITY AND KEBISONI, BUYANJA AND NYAKAGYEME SUB COUNTIES IN RUKUNGIRI DISTRICT

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FINAL REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Prepared by:

SURVESIS	in joint venture with	Savimaxx Limited "...Further linking the environment to economic development."
Agip House, 1st Floor, 9 Kampala Road, P. O. Box 34738, Kampala, Tel: +256 312 294958 Fax: 256 312 371 371394 email: admin@survesis.co.ug Web www.survesis.co.ug		Plot 843, Shelter Road, Naalya Estate, P. O. Box 25250, Kampala, Uganda Tel. 256 712 654651, Email: saviamxxcompanylimited@gmail.com Website: www.savimaxx.co.ug

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AUTHORS OF THIS ESIA REPORT

This ESIA has been prepared by the following Certified Environmental Practitioners:

No.	Name	Signature
1	Dr. Rose Mugidde/Team Leader	
2	Dennis Kamoga/Environmental Practitioner	
3	Samuel Vivian Matagi/ Environmental Practitioner	

Supporting Field Specialists

No.	Name	Specialist
1	Simon Luwemba	Botanist
2	James Kintu	Ornithologistand Herptile Specialist
4	Joshua Mabonga	Mammologists
5	AggreyAgaba	Butterfly Specialists
6	Ester NassonkoKavuma and Edward Jjuko	Sociologists
7	Gustavio Okwir and James Alem	Hydrologists

The review of the draft report was supported by Eng. Simon P. Otoi, Water and Environment Consultant.

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ABBREVIATIONS AND ACRONYMS

Acronym or abbreviation	Meaning
BOD	Biochemical Oxygen Demand
Br	Bromine
CBO	Community Based Organisation
Cl	Chlorine
dBA	Decibel
DEA	Directorate of Environmental Affairs
DEM	Digital Elevation Model
DI	Ductile Iron
DRWM	Directorate of Water Resources Management
DWD	Directorate of Water Development
EIA	Environmental Impact Assessment
ESIA	Environmental and social impact assessment
ESR	Elevated Storage Reservoir
GoU	Government of Uganda
HDPE	High Density Polyethylene
HLR	High Level Reservoir
IUCN	International Union for Conservation of Nature and Natural Resources
$m^3/hr.$	Cubic meters per hour
Masl	Meters above sea level
MBR	Master Balancing Reservoir
MWE	Ministry of Water and Environment
ND	Nominal Diameter
NEMA	Environment Management Authority
NGO	Non-Governmental Organisation
NWSC	Water and Sewerage Corporation
PAPs	Project Affected Persons
PAYE	Pay As You Earn
PIA	Project Impact Areas
PWDs	People with Disabilities
SR	Storage Reservoir
SRTM	Shuttle Radar Topographic Mission
ToR	Terms of Reference
TSS	Total Suspended Solids
ug/L	Micro gram per litre
UGX	Uganda Shillings
uPVC	unPlastised Polyvinyl Chloride
Ushs	Uganda Shillings

Acronym or abbreviation	Meaning
UTM	Universal Transverse Mercator
VIP	Ventilated Improved Pit toilet
WMDP	Water Management and Development Project
WSS	Water Supply System
WTP	Water Treatment Plant

0 EXECUTIVE SUMMARY

0.1 Project background

The Government of Uganda (GoU) is committed to a policy of increased provision of safe water and adequate sanitation facilities to the entire country. Currently the national access to safe water for rural population stands at 64% whereas the access to safe water in urban areas is at 72.8 % (MWE, 2014). The GoU wishes to increase access to safe water and sanitation facilities to 100%. In addition, the Government in its Vision 2040, aims to harness strategic opportunities of vast water resources to strengthen the economy through construction and extension of piped water supply and sanitation systems to all parts of the country to improve health, sanitation, hygiene, promote commercial and low consumption industrial setups.

Therefore, in pursuit of the National Development Plan II and Vision 2040, the Ministry of Water and Environment (GoU) through the Directorate of Water Development (DWD) with financing from the World Bank selected Rukungiri Municiaplity to benefit from the Water and Management Development Project (WMDP) Component two (2). The WMDP Component two (2) aims at improving the water supply infrastructure, faecal sludge management, solid waste management in Rukungiri Municipality, NYakagyeme Sub County and enroute communities in Buyanja and Kebisoni Sub Counties.

This Executive Summary is about the Environmental and Social Impact Assessment of the proposed Rukungiri Water and Sanitation Project.

0.2 Status of Water Supply and Hygiene in Rukungiri

Currently, only three groundwater wells supply Rukungiri Municipality with water. Access to safe water in Rukungiri District is 93%, higher than the national average 77% target set by rural water and sanitation investment plan and strategy, however, the functionality of the water sources are only 81%. NWSC, the operator of the water supply scheme continues to connect more clients despite the reported system limitation. The rapid urbanization and rise in urban population, have only made worse the situation with intermittent water supplies characterizing the supply regime. Some areas receive water only once a week. Further, the existing production wells have had a number of problems associated with the hydrogeological characteristics of the area. Water levels have continuously dropped and this has drastically affected the production of water for town consumption.

The sanitation situation of Rukungiri Municipality is rudimentary and inadequate; there is no sewerage system for faecal sludge treatment and disposal. There are only five (5) public sanitation facilities in Rukungiri Municipality; two flush toilets connected with septic tanks in the market and the park areas and three VIP latrines in the slum area. The majority of town population is served by pit latrines while waterborne toilets with septic tanks are a reserve for mainly the high income population and the hotels. The Municipality operates a dumping site at Kyatoko Ward. However, sludge from exhausted pit latrines and municipal waste is still dumped at uncontrolled places.

0.3 The Rukungiri Municipality Water Supply and Sanitation Project

The proposed Rukungiri Municipality Water Supply and Sanitation Project is located in Rukungiri Municipality in Rukungiri District, a South Western Uganda district that is bordered by Ntungamo District to the East, Kabale to the South, Mitooma to the North and Kanungu to the West. The Project will abstract and treat water from River Kahengye in Kabashaki Village, Kabingo Parish, Kebisoni Sub County (at UTM 36N 0171645N, 9907983E) and supply treated water to Rukungiri Municipality and enroute communities of Kebisoni in Kebisoni Sub County, Buyanja town in Buyanja Sub County and Rwerere town in Nyakagyeme Sub County.

The proposed Rukungiri Water Supply and Sanitation Project will entail constructing; an intake structure on River Kahengye, WTP in Kabashaki Village, Kabingo Parish, Kebisoni Sub County and a 800 m³ capacity Main Balancing Reservoir (MBR) in Mukazi Village, Karuhembe Parish in Kebisoni Sub County. Five storage reservoirs will be constructed including a 1000 m³ capacity reservoir in Rwanyakashesha; 300 m³ capacity reservoir at Bwoma; 150 m³ capacity reservoir in Nyamigonogo; 300 m³ in Town Cell; 150 m³ capacity in Matebe and a 100 m³ capacity reservoir at Rushoroza.

The water supply network will have a total of 5.387 km of pumped transmission pipelines, 32.5 km of gravity flow transmission pipelines and a 39.12 km of distribution network. However, in the first phase, no new distribution pipelines will be constructed but the existing distribution network will be used.

There will be a Feacal Sludge Treatment plant for treating a mixture of faecal sludge and organic waste. Two public waterborne toilets and two shower boxes will be constructed at Greenland and at Ntungamo taxi stage within the Municipality. Each of the toilets will have a separate section for men and women.

The estimated project cost is UGX 40,786,593,768/=.

0.4 Purpose and Scope of the ESIA

The Rukungiri Municipality Water Supply and Sanitation (WSS) Project, which specifically aims at improving the water supply infrastructure and faecal sludge management in Rukungiri Municipality and its environs of Kebisoni, Buyanja and Nyakagyeme Sub Counties. The purpose of this ESIA is to identify and rank potential environmental and social impacts of the proposed project, propose mitigation measures for negative impacts and enhancement measures for positive impacts.

0.5 Description of project activities

The main activities to be carried out at the construction phase will include but not limited to the following: - site hoarding; site clearance which will include vegetation clearance and top soil removal; construction of the water intake on River Kahengye; excavations to prepare for the foundations of buildings to house offices, chemical stores, the laboratory and the water treatment plant; installation of treatment process units like electromechanical and chemical dosing equipment; excavation and laying of water mains; power transfer to the site, landscaping and the construction of access road

s. Additionally there will be construction of the Faecal Sludge Treatment Plant (FSTP) and public toilets.

At the operation and maintenance (O&M) phase, the main activities include the conventional treatment of water using aeration, flocculation, clarification, filtration and disinfection processes. The chemical of choice for flocculation and clarification will be aluminium sulphate and disinfection will be by free active chlorine obtainable from hypochlorite, respectively. The backwash effluent from the WTP will be returned to River Kahengye after treatment to reduce total suspended solids. The water treatment sludge will be dewatered, dried, stored and handed over to a NEMA Registered hazardous waste handler for proper disposal. A cesspool emptier will periodically collect human excreta from the public toilets and take it to the Faecal Sludge Treatment Plant where it will be composted along with municipal organic solid waste. The resultant manure will be sold to farmers, while the effluent from the plant will be treated in a sewage pound before releasing it into a wetland, ending up in a nearby stream.

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, socio-economic 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 Environment and Social Management Plan prepared.

0.7 Description of the project baseline

0.7.1 Climate and water resources

The project area has a bimodal rainfall pattern with light rainfall between March and May every year with the average annual rainfall of 1280 mm. The temperature are generally cool temperature, ranging from 13° C to 26° C with an average temperature of 19° C. June is the coolest month while February is the hottest month.

Rukungiri Municipality has undulating hills with flat planes. In the valleys, there are several streams that are sources of gravity flow water for use by the local communities. These numerous streams and small rivers drain the hills and join one another to form main rivers in the valleys. The main rivers within and in the vicinity of the project area are Biriria, Mitano and Kahengye. Rukungiri District is well endowed with groundwater resources that supply water to over 1,272 protected springs, 86 shallow wells, 68 deep boreholes and 26 gravity flow schemes across the District.

The flows of River Kahengye on which the project is proposed to abstract water was derived by flow time series records observed from River Mitano. The low flows and flood frequency analysis was done on the derived flows of River Kahengye. The low flow analysis shows that a low flow with a 10 years and 50 years return period are respectively 0.788 m^3/s and 0.273 m^3/s while the flood flows with 50 years and 100 years return period are 40.34 m^3/s and 43.16 m^3/s. The ratio between a low flow with a 50 years return period

and planned abstraction rate is 2.45, this is an indication of sufficiency of the river to sustainably support the abstraction during low flow seasons.

Water from River Kahengye was sampled and analyzed in the NWSC Central Laboratory in Bugolobi. The water was found to have higher levels of turbidity (19 NTU) and total suspended solids (34 mg/L) but lower total dissolved solids (37 mg/L) when compared with threshold for untreated water.

0.7.2 Biophysical environment

Vegetation

Vegetation and flora assessments conducted in the 12 sites for the proposed water and sanitation plant facilities recorded a total of 116 plant species from 98 genera and 39 families. Shrubs and herbs dominated the plant life forms with 38 species, while 21 trees species, 15 grasses species and 4 species of Climbers were encountered. Among the plants, the invasive plant species Verbenaceae (*Lantana camara*) was common in most of the sites. However, a general evaluation of all the species encountered shows that none the plan species are of conservation concern as per the IUCN red list categories (IUCN, 2015) nor do they have a restricted habitat range.

Butterflies

A total of 18 species of butterflies, grouped into 12 genera were identified in the project area. These included forested species, migratory and swampy specialists, all, who are neither threatened nor red, listed *by* IUCN.

Herpetiles

Six amphibian species and 76 individuals belonging to three families and three genera were recorded during the survey i.e. *Amietophrynus maculatus, Amietophrynus garmani, Ptychadena mascareniensis, Ptychadena anchietae, Ptychadena oxyrhynchus* and *Amietia angolensis* all of which were of least conservation concern with regard to IUCN Redlist. Three reptilian species and 31 individuals i.e. *Agama agama, Lygodactylus gutturalis* and *Trachylepsis straita*, each belonging to its own family were recorded during the survey. None of the reptilian species found in the project area has been evaluated according to the 2014 IUCN Red List.

Birds

Out of 43 species and 414 individual birds recorded in the project area, only one species (Grey Crested Crane) is Red Listed by IUCN as endangered. The 43 bird species found in the project area is relatively low in comparison with the total of 1,007 bird species found in Uganda. Further comparison with the number of species found in the Albertine Rift, the adjacent Queen Elizabeth National Park and Rwenzori Mountain National Park each had 1061, 600 and 217 bird species respectively. This confirms the project area had relatively low number of species. This is attributed to anthropogenic activities like deforestation,

intensification of agricultural activities (crop and animal husbandry), urbanization and human settlements. Considering the type of habitats of the different sites and their species richness, it's indicative that most of the project sites except the water intake, the proposed sewage treatment plant and alternative sewage treatment plants 1 & 2, are of less conservation concern and the general setting of the project appears to have minimal impacts to the habitat after construction.

Mammals

An ecological survey of all the project sites recorded ten mammal species, i.e. four rodents species, one shrew and four medium to large sized mammal species. The FSTP location in Option 3 recorded the highest species number (eight) while Option 2 recorded the lowest (four). None of the species recorded is listed on the IUCN Red List as threatened.

0.7.3 Socio-economic environment

The project facilities are located in different places and the potential projected affected persons (PAPs) are owners of the land on which facilities such as intake, WTP, storage reservoirs, planned transmission routes and Feacal Sludge Treatment plant will be built. Most of the transmission routes are planned along the road reserves except those segments leading to the Intake, WTP and storage reservoirs which will pass through private land. In total, 5.922 acres of land will be acquired from 25 PAPS and Buyanja Sub County land. The land size required from every PAP is too small in almost all the cases to warrant displacement. The socioeconomic survey of 183 affected households highlight that:

- 86.3% of the PAPs are Banyankole, 11.5% are Bahororo and a small proportion of 2.2% are Bakiga with Runyankole as the most dominant language.
- Of the surveyed PAPs, 57.7% are Protestants, 38.9% are Roman Catholics while Muslims make only 2.3%.
- The majority of the PAPs are married with 78.4% in either monogamous or polygamous marriage, 17.6% widowed and 4% either single or separated.
- Most of the interviewed PAPs are semi-literate having attained equal or less than primary level of education. Only 6% completed secondary level of education while 6% have diploma. 21.6% are illiterate, 27.9% can read and write while 38.5% have completed primary education.
- The household sizes vary greatly. 55% of the respondents have between 1-5 people, 40.5% have between 6-10 people while 4.5% have more than 11 people in their households.
- Sixty five (65) percent of the surveyed households reported having a vulnerable person in the household. In this case, the vulnerable persons are those who are chronically ill, widowed and child headed families.

The PAPs are experiencing poverty characterized by accessibility constraints, low household incomes and unemployment and low levels of literacy. The breakdown of employment are as follows: 62.9% of the surveyed are engaged in small scale farming (peasantry), 10.1% are causal labourers, 9.1% in business, 6.3% civil servants, 5.1% earn a salary, 5.1% are retirees and 1.1% are students.

Almost all the PAPs (98.1%) have access to land and the average number of acres of land owned is 3.35, most of which is held under customary land tenure system (98.7%).

Among the proposed project sites, the environmentally sensitive sites that trigger the World Bank safeguard policies of Environmental Assessment OP/BP 4.0; Natural Habitats OP/BP 4.04 and Involuntary Resettlement OP/BP 4.12. The water intake triggers Forests OP/BP 4.36 because of the small planted forest. No Physical cultural resources are found during ESIA surveys but Physical Cultural Resources OP/BP 4.11 may be triggered if a physical resource is encountered during construction. A chance finds procedure will be implemented during construction, to recover materials that may be of archaeological or paleontological importance.

0.8 Stakeholder consultations and disclosure

0.8.1 Stakeholder consultation

Stakeholder consultations were held with the district and local authorities as well as residents in the proposed project sites. The stakeholders at various levels generally welcomed the project. They perceive the project as a source of employment, an opportunity to improve their welfare, reduce incidences of water borne disease, increase revenues and incomes.

However, the stakeholders expressed a number of concerns including; fear of displacement without adequate compensation, increase in the cost of living, reduction in the volume of River Kahengye because of increased abstraction, traffic accidents especially from truck drivers transporting construction materials, increase in spread of HIV/AIDS and other STIs from construction workers, foul smell from faecal sludge treatment plant which they fear would devalue the land and property in the neighbourhood.

0.8.2 Disclosure

The National Environmental Management Authority (NEMA) will deposit the ESIA statement (report) in public places like the district headquarters, municipality offices and public libraries. The public will be invited to make comments. If the comments are serious NEMA will call for a public hearing. The views from the public will be incorporated into the final ESIA statement.

The World Bank Policy on Disclosure of Information requires that the ESIA report to be put on its website Infoshop for thirty days for the public to make comments. Comments received will be incorporated into the final ESIA, before the project can be cleared for the next implementation phase.

0.9 Potential impacts

The identified positive impacts mainly aim at improvement of the socio-economic status of the beneficiaries through provision of safe water, which in turn will improve the standard of living (significant positive impact +4ve). The project will improve safe water coverage, hence stop the usage of contaminated water sources from unprotected springs, wells, boreholes and streams that are prone to contamination. Coupled with the proper disposal of human excrete from the municipality, this will lead to the improved public health, hygiene and household health status. These impacts are ranked as significant positive impact (with a RIAM scale of +4ve).

Safe water in the house or within 100 m of the House Holds (HH) in informal settlements will liberate women and girls from fetching water from far away sources. The freed time will be used in more meaningful economic activities. This will lead to improvement in household economic status and productive competitiveness. This impact is ranked as a positive impact +2ve.

At the construction phase, the project will employ about 150 people and during operation about 25 people. This impact is ranked as positive impact with a RIAM scale of +2ve. Construction will create market for goods and services in the project area. These products and services will come from the local community and suppliers. At the operational phase suppliers of bulk water treatment chemicals and sundries will be in business. This impact is ranked as positive impact +2ve.

The project will impart skills and transfer technology. An international Contractor will be hired, who will sub contract to local sub-contractors. At the operational level internship/apprenticeship is expected. This will lead to transfer of skills and technology to Ugandans. This impact is ranked as positive impact +2ve.

To reap the most out of the above highlighted benefits, the enhancement measures proposed include ensuring community taps stands are constructed at a radius of 100 m, reduction of water tariffs for people in informal settlements, giving priority to local contractors when sourcing contractors, employing members of the local communities in positions they qualify for, enhancing skills transfer through enforcing a joint venture with local sub-contractors, running internship/apprenticeship, ensuring a sustainable management of the scheme.

The identified negative impacts were categorized into those affecting the physical, biological and human environments. No major (-5ve) negative impacts were identified. The significant (-4ve) negative impacts that are cumulative in nature include pollution from the continuous discharge of backwash water from the WTP into River Kahengye with high suspended solids that cause deoxygenation which may lead to the destabilization of river ecosystem; pollution from water treatment sludge containing hazardous Aluminium, which is toxic to plants and affects the nervous system animals and the discharge of effluent from the Faecal Sludge Treatment Plant that have high organic matter, nutrients and heavy metals which will lead to deoxygenation, eutrophication and bio-accumulation of heavy metals in the receiving aquatic ecosystem.

As a mitigation measure, water treatment sludge containing alum should be dewatered and dried at the water treatment plant. The dried water treatment sludge should be collected, stored and handed over to a NEMA registered hazardous waste handler who will incinerate the waste or dispose it in a controlled environment. Further treatment of effluent/leachate from Feacal Sludge Treatment plant is recommended in a constructed wetland to mitigate impacts of deoxygenation and eutrophication of the receiving water. Backwash water with suspended solids should be filtered before it is released into River Kahengye.

Negative social impacts identified include: - Increase in child abuse and early pregnancy committed by construction workers. This impact was ranked as a significant impact with a RIAM Scale of -4ve; increase in spread of HIV/AIDS and other STIs because of influx of immigrant workers who may indulge in sexual unions with the resident population (negative impact -2ve). This is more significant at construction phase when a large number of workers will come both from near and far without their spouses.

For each of the identified negative impacts, practical and appropriate mitigation measures were proposed. Examples of such mitigation measures include limiting vegetation clearance to project site only, reforestation, implementing a solid waste management plan to reduce solid waste generation and ensure appropriate disposal, having a HIV/AIDS policy, conducting awareness campaigns and Voluntary Counselling and Testing of HIV. Further safe handling of chemicals like hypochlorite and aluminium sulphates, which will be used during the water treatment process, are proposed to mitigate impacts. Employers at all project phases should have a child policy to mitigate against child abuse, child labour and avoidance of early age pregnancies.

0.10 Analysis of alternatives

All project alternatives were analysed. The "do nothing" alternative would have neither positive nor negative impacts but the existing poor water supply and sanitation in the area would continue. In the long term, the no-project scenario would be more disastrous as 78% of the population in Rukungiri District would continue using point water sources which are prone to contamination and put the population at a high risk of contracting waterborne diseases.

The "action alternative" will deliver the project alternatives and improve the living standards of the residents in Rukungiri Municipality. Therefore, the "No project" alternative cannot replace the project it in terms of the overall objective and anticipated benefits. Therefore, the analysis of alternatives was in the context of alternatives project sites and technologies. 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 technology selection criteria used includes environmental and social acceptance, the cost and the skills requirement for operation and maintenance of the technology.

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 time frames, 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, National Water and Sewerage Corporation (NWSC) who will take over management of the project will be responsible for the implementation of the ESMP. The Developer, the Contractor and the Operator should each employ an Environmentalist with relevant academic qualification and work experience to implement the ESMP. At the local level, Rukungiri District Local Government and Rukungiri 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 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 (LCI) 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 find 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 Conclusions and recommendations

The benefits of the project have to be enhanced to ensure project success and sustainability. The Environmental and Social Management plan (ESMP) proposed are the minimum standards that the Contractor, scheme Operator and the Developer have to adhere to ensure the project benefits while mitigating the negative impacts identified at all project phases.

An evaluation of the positive impacts of Rukungiri Municipality Water Supply and Sanitation Project against the identified negative shows that the project is crucial for socio-economic progress of the beneficiaries and national development. This benefit coupled with the fact that all negative impacts have practical mitigation measures drawn in the Environmental and Social Management Plan (ESMP), implies the project is environmentally and economically viable. We therefore, strongly recommend that NEMA approve this ESIA to expedite the project implementation.

1 INTRODUCTION

1.1 The 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, 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. The services should be 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 Rukungiri

The Municipality has a piped water supply system, which was constructed around the year 1996, and managed by WSS Services as the Private Operator until 1st March 2014 when National Water and Sewerage Corporation (NWSC) took over the management of the system. WSS also managed the Buyanja, Kebisoni and Rwerere water supply schemes before the takeover by NWSC.

Currently, there are only three groundwater wells supplying the Municipality with water. From the first borehole, the water is pumped to a 150 m^3 elevated storage tank located at Bwoma hill through a 1300 m long 2" HDPE pipeline. The tank takes about 3 days to fill. The water from the second borehole is pumped to a second 150 m^3 elevated storage tank located at Rwanyakashesha hill through a 400 m long 3" PVC pipeline. This tank takes about 24 hours to fill. The third borehole is within the Municipality and supplies water to two schools and one hospital whereas the fourth borehole is non-functional. The long time these tanks take to fill are evidence to the extreme water shortages in Rukungiri Municipality.

The sanitation situation of Rukungiri Municipality is rudimentary and inadequate; there is no sewerage system for faecal sludge treatment and disposal. There are only five (5) public sanitation facilities in Rukungiri Municipality; two flush toilets connected with septic tanks in the market and the park areas and three VIP latrines in the slum area. Pit latrines serve most of the town population. Flush toilets with septic tanks and soak pits are a reserve for the high income population and the hotels. The Municipality operates a dumping site at Kyatoko Ward (UTM 35M coordinates of 0826098E, 9916569N). However, sludge from exhausted pit latrines and municipal waste is still dumped at open ungezetted places.

1.3 The Feasibility Study

The design review, feasibility study and detailed engineering design of Rukungiri Water Supply and Sanitation has been carried out by SGI Studio Galli Ingegneria S.p.A. of Italy.

From the feasibility study, there are a total of 1,358 connections of which 38 are public stand posts, 1,123 are domestic, 8 are institutional and 189 are Commercial / Industrial connections. NWSC is still connecting more clients despite the reported system limitation. The rapid urbanization and rise in urban population, have only worsened the situation with intermittent supplies characterizing the supply regime. Some areas receive water only once a week.

The existing production wells have had a number of problems associated with the hydrogeological characteristics of the area. Water levels have continuously dropped and this has drastically affected the production of water for town consumption (SGI, 2014) and local stakeholders observe that the system capacity is outstripped and requires a new reliable and adequate surface water source.

1.4 Project Location and Components

The project area is located in Rukungiri Municipality in Rukungiri District, a South Western Uganda district that is bordered by Ntungamo District to the East, Kabale to the South, Mitooma to the North and Kanungu to the West. Rukungiri Municipality hosts the Municipal Council offices and district headquarters of Rukungiri District. It is approx. 394 km from Kampala and approx. 100 km from Mbarara Municipality by road.

The project specifically aims at improving the water supply infrastructure and faecal sludge management in the central business district within the Rukungiri Municipality and its surrounding Kebisoni, Buyanja and Nyakagyeme Sub counties. Figure 1-1 shows the project area. The services are planned for the benefit those in both formal and informal settlements.

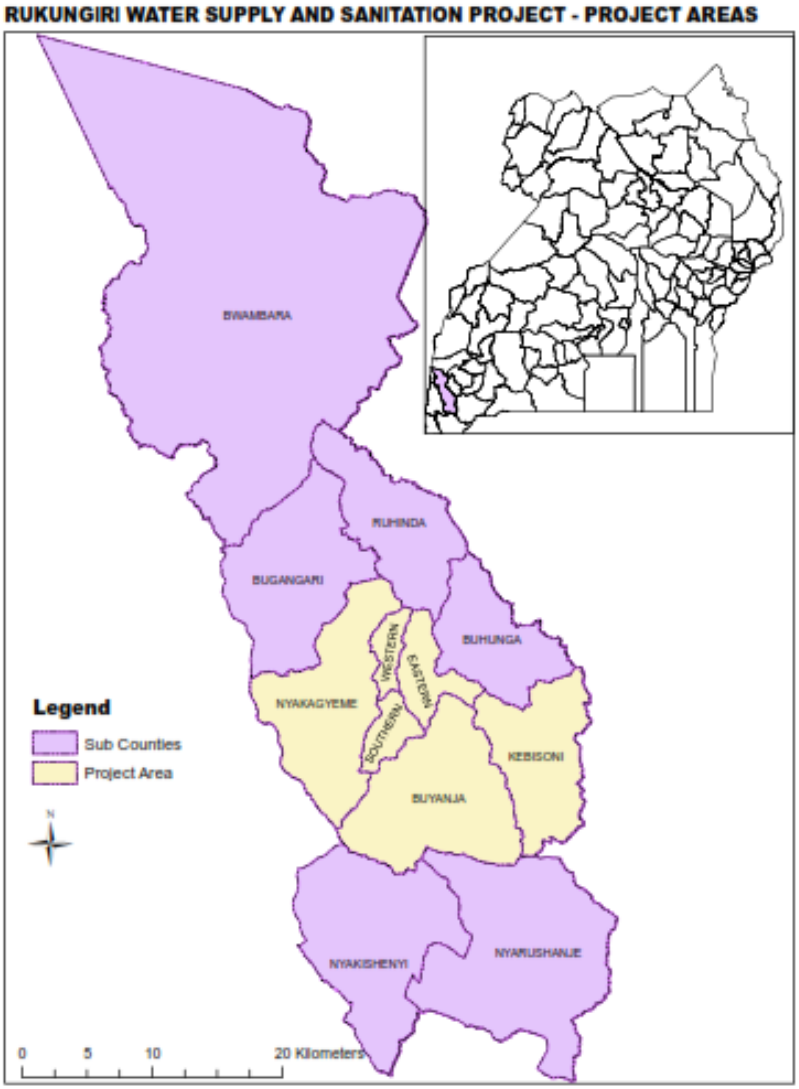

Figure 1-1: Map of Rukungiri District showing the project sub counties.

The proposed Project will abstract and treat water from River Kahengye in Kabashaki Village, Kabingo Parish, Kebisoni Sub County (at UTM 36N 0171645N, 9907983E) and supply treated water to Rukungiri Municipality and enroute communities of Kebisoni in Kebisoni Sub County, Buyanja town in Buyanja Sub County and Rwerere town in Nyakagyeme Sub County.

The Project will entail constructing an intake structure on River Kahengye, a water treatment plant (WTP), main balancing reservoirs (MBR) and five storage reservoirs. There will be raw water transmission mains between intake to WTP and treated water transmission line between the clear water reservoir at WTP and MBR at Mukazi Hill. The transmission line from the MBR to the six proposed service reservoirs will be by gravity flow. The distribution lines serving different demand areas will also be by gravity flow. One Feacal Sludge Treatment plant, two public waterborne toilets and two shower boxes will be constructed at different places within Rukungiri Municipality. The layout of the project components are as shown in Figure 1-2. The construction of a central sewerage system is not considered in this ESIA since it is a proposal that may only become feasible beyond 2040.

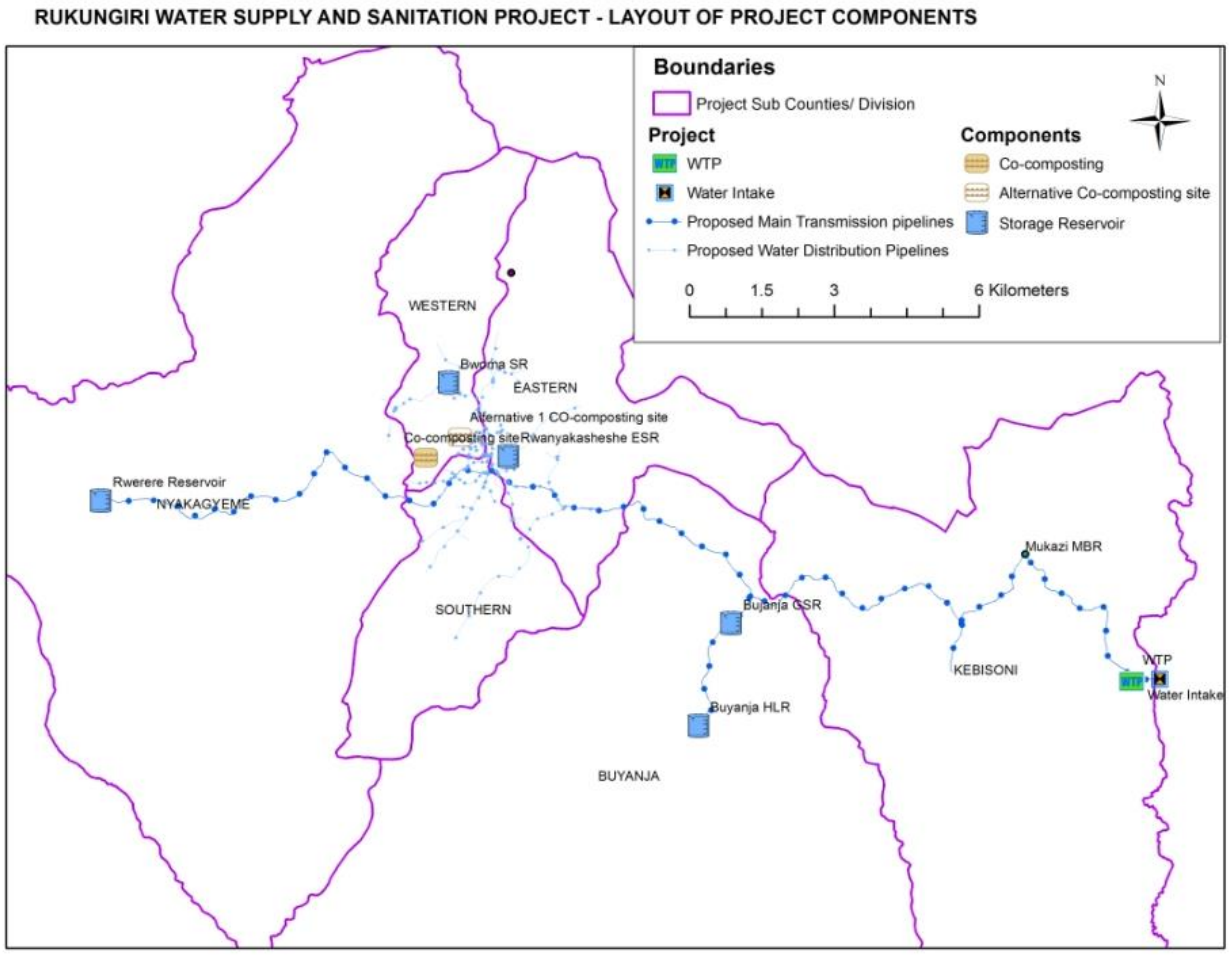

Figure 1-2: Layout of Rukungiri water supply and Saniation Project components

1.5 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 may, 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 in joint venture with Savimaxx Limited in undertaking ESIA and Resettlement Action Plan (RAP). This report covers only the ESIA. The RAP is in a separate report.

1.6 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 (TOR) 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 Rukungiri Water Supply and Sanitation Project.

1.7 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 safeguard policies. In addition, this ESIA report was prepared with in consultation of 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 reviews of existing literature, field visits, ecological surveys within the project area, hydrological and water quality analysis, socio-economic surveys and consultations with relevant stakeholders including potential project affected persons. Below is synopsis of the methods used.

- 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, reptiles, 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;

- Stakeholder consultations were undertaken to seek their views and input on the project. The stakeholders consulted include: the neighbouring local community, Sub county leadership of Kebisoni, Buyanja and Nyakagyeme; Rukungiri Municipality Leadership and Rukungiri District Local Government officials (District Environment Officer, District Water Officer, Physical and Economic Planner) and lead agencies such as The Directorate of Water resources Management (DWRM), Directorate of Environment Affairs (DEA) both of MWE, 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.

1.8 Project Activities

1.8.1 Construction phase

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

Site hoarding

Site hoarding is a pre-requisite for every construction site as it helps in informing the general public of the activities taking place, confining site activities from the public and limits the interaction of site activities with the public. It also reduces construction hazards to the public especially falling or flying debris. Therefore, prior to any other site activities, the proposed sites will be hoarded off with iron sheets or appropriate materials.

Site clearing, excavations and construction of buildings

The sites to be cleared of vegetation and top soil to pave way for construction include sites for water intake, WTP, raw and final water transmission mains, the seven reservoir sites, the Feacal Sludge Treatment plant site, sites for waterborne toilets and shower boxes together with their gravel beds. Excavation works for the foundations of buildings and transmission lines will follow after site clearance. Some of the excavated material will be

used for backfilling the foundations and for levelling the ground and the excess will be taken to waste.

Construction materials source and movement

Some of the required construction materials such as sand, aggregate, gravel, hard core and murram will be sourced from the existing and approved local quarries within or near Rukungiri District. The project proponent (MWE/WMDP) will liaise with the local authorities in the identification of the quarry sites. It is the project proponent's intention that only approved quarries be used.

Other construction materials such as cement, timber, roofing materials, ductile iron DI, uPVC and HDPE pipes, iron bars and pumps will have 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.

Water intake and water treatment works

The proposed water intake structure on River Kahengye at Kabashaki Village, Kabingo Parish will be constructed to abstract 200 m³/hour in the first stage and upgraded to abstract 400 m³/hour in the 2040 stage.

Four lifting pumps and one backwash pump will be installed for the 2040 stage. Only two lifting pumps will be installed immediately for the 2030 phase. The lifting pumps will be installed with a ductile iron suction pipes of ND 250 mm. The suction pipes are fitted with protective suction strainers. The backwashing pump will wash these strainers once clogged.

Vegetation clearance and excavation of pipelines trenches

The water supply scheme will have a total 37.88 km of transmission network categorised as follows:

- 772 m of raw water transmission from intake to WTP,
- 4,615 m of pumped transmission line from the WTP to Main Balancing Reservoir (MBR) at Mukazi and
- 32.5 km of gravity flow transmission lines from MBR to five service reservoirs.

The vegetation along the 37.8 km stretch proposed for transmission mains will be cleared before excavations. Although a 4 metre wide strip of land be acquired for the purpose of transmission pipelines, vegetation clearance will be limited to only areas for trench excavation.

Electromechanical installations

The electromechanical equipment such as lifting and backwashing pumps at intake and WTP, the plumbing fittings will be installed.

Access roads to and within the installations

The proposed raw water intake, WTP, reservoir sites and Feacal Sludge Treatment sites are located in areas with limited or no access roads. In order to access the plant installations, access roads in will be constructed. Full contour surveys of the areas where the roads are to be built have been completed and a preliminary road trace has been prepared.

Public toilets and showers

The project will upgrade two exiting toilet facilities by adding two showers, two washbasins and a septic tank with a pipe leading to a soak pit at the central bus park and the market place. Two new flush toilets facilities will be built at Ntungamo Stage and Greenland (city centre). Each will have six stances (two male, four female), provided also with two showers and a urinal will be located in the male section. One stance in both the male and female sections will be reserved for the disabled. Each of the two new public toilets will have a septic tank with a discharge pipe to a soak pit. Project activities will include site clearance, pit excavation, construction of a gravel bed, masonry work and plumping.

To serve the central business district, two new waterborne latrines with six stances flush toilets, a urinal and two showers will be constructed Fig. 1.3. One will be at Greenland in the city centre (LAT 1) and another at Ntungamo stage (LAT 2); each of the latrines will be partitioned into male and female sections with separate entrances and provision for disabled persons in both male and female sections. The toilets are projected to be able to serve up to 450 persons per day. The effluent from LAT 1 will be drained through a pipe to a gravel bed with a vegetation buffer near LAT 2 where effluent from both latrines will be infiltrated into the soil. The faecal sludge will periodically collected by a cesspool emptier and taken to the faecal sludge treatment plant (FSTP).

Figure 1-3: Map of locations of two new waterborne latrines.

Faecal Sludge Treatment Plant

A faecal sludge treatment plant (FSTP) has been proposed for the treatment of faecal sludge for Rukungiri Municipality Fig. 1.4. In order to facilitate composting process of sludge and to obtain a good compost quality, organic fraction of municipal solid waste will be mixed with faecal sludge and composted together.

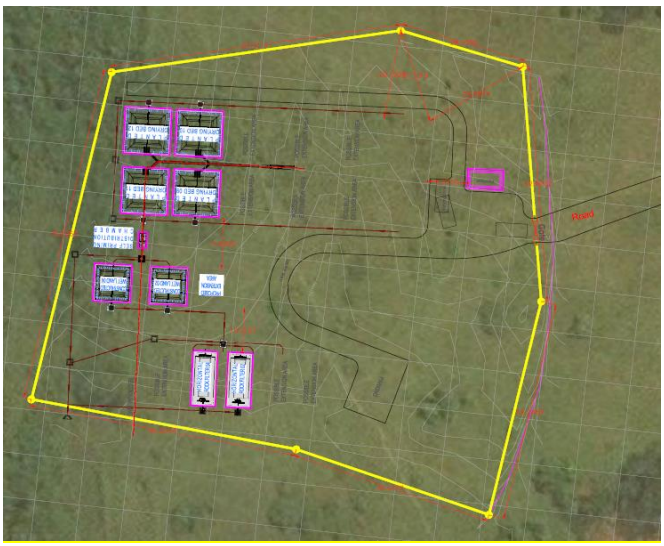

Figure 1-4: General layout of the Feacal Sludge Treatment plant.

Faecal Sludge Treatment Plant will aim at separation of solids and liquids in planted drying beds and retention of solids. The Plant will also pre-treat the liquid portion in constructed wetlands, further treat the liquid through horizontal rock filters and finally the effluent is treated in natural wetlands. The design includes four planted drying beds, two constructed wetlands and two horizontal rock filter. Provision has been made for expansion in future if the demand increases.

Faecal sludge (FS) and municipal solid waste (MSW) is advantageous because the two materials complement each other. The human waste is relatively high in N content and moisture and the MSW is relatively high in organic carbon (OC) content and has good bulking quality. Furthermore, both these waste materials can be converted into a useful product. High temperatures attained in the composting process are effective in inactivating excreted pathogens contained in the FS and will convert both wastes into a hygienically safe soil conditioner-cum-fertilizer.

The FS will have to be biochemically stabilised first for solids and liquids to become separable. Solids-liquid separation of FS, which has undergone considerable biochemical stabilisation (septage), will be achieved through filtration and drying in sludge drying beds. Resulting from this process will be the solids to be mixed with the MSW and taken to the Feacal Sludge Treatment plant and a liquid fraction to be treated before discharge.

The Feacal Sludge Treatment technology to be used will be the open windrows Fig. 1.5. The waste will be piled up in heaps or elongated heaps. The size of the heaps ensures sufficient heat generation and aeration is ensured by passive or active ventilation or regular turning. The leachate control is provided by a sloped and sealed or impervious composting pad (the surface where the heaps are located) with a surrounding drainage system.

The mature compost will be sieved prior to sale and use. Sieves made of a wooden frame and wire mesh are suitable and can be easily made. This will be done manually (commonly by women) who will require PPE (gloves, nose masks, gumboots, and coveralls) as well as vaccination against tetanus.

The total area of Feacal Sludge Treatment plant components will 1.32ha and will have the following main units: -

The Feacal Sludge Treatment plant is designed for the management of the faecal sludge and biodegradable component of the Municipal Solid waste.

Once constructed, faecal sludge from VIP, ECOSAN and water borne toilets will be delivered by cesspool emptier and mixture of the sludge with biodegradable component of solid waste composted within the Feacal Sludge Treatment plant.

1.8.2 Operation and maintenance phase

Water intake structures

In operation, two pumps each with a capacity to discharge 100 m³/h against a head of 95 m will abstract river water through their suction pipes with strainers and pump to the

WTP through ND 225 HDPE pipes. When the strainers are the end of suction pipes get clogged, a third pump for backwashing 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.

Water treatment operations

To meet the required drinking water standards, the raw water will undergo through conventional Water Treatment processes of aeration, fine sieving, coagulation and flocculation, filtration and finally disinfection to ensure pleasant and safe water for human consumption is provided. In the first stage (i.e. 2030 horizon), WTP will treat 200 m^3/h of water to cater for the population of Rukungiri Municipality and enroute towns while in the second stage (ultimate design horizon 2040), both the intake and WTP will be upgraded to a flow capacity of 400 m^3/h to meet demands of both Rukungiri Municipality and Ntungamo District.

The aeration process at WTP 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. After screening, aluminium sulphate (shortened as Alum) will be dosed to facilitate flocculation in sedimentation tanks. The flocculation and clarification processes are to remove dissolved pollutants from the water. The settled sludge from sedimentation tank will be thickened in a tank where about 960 kg of sludge will be collected per day. The thickened sludge will be dried and handed over to a NEMA certified waste disposal contractor for safe disposal. Sludge contains a high amount of aluminium ions and nutrients that would pollute the receiving waters.

After flocculation and clarification processes, water will be filtered 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.

The final stage of treatment will be disinfection of water with Hypochlorite (free active chlorine) which has been proposed as the disinfectant for the project. The clear water from the filtration tanks will be dosed with Free Available Chlorine obtained 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 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 360 m^3 of filtered water from disinfection tank are planned to be used for backwashing. Although the backwashed water will be clarified before releasing to the receiving water, there are chances that dissolved hypochlorite in backwashed water will not be entirely removed.

The FAC will be obtained by reacting a disinfectant in powder, granules or salt tablets with water to generate brine with high free active chlorine concentration (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.

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 extra 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 Treatment plant for co-composting.

Faecal sludge treatment operations

The municipal solid waste will be delivered to the sorting area of Composting Plant in waste skips where biodegradable component of will be sorted. The Non-biodegradable component will be transported and delivered to the existing landfill at Kitoko.

The service will cover 100% of the central business district, 90% of the old Rukungiri TC boundaries but outside the central business district and 60% of the residents outside the old town council boundaries but with Rukungiri Municipality. The estimated 2040 organic waste for the project area is 22 tons per day.

The operation of the Feacal Sludge Treatment plant will entail mixing of faecal sludge in appropriate ration with organic waste. The excess water in the waste mixture will be drained off before composting the waste mixture in windows. The composting process cycle will be completed in about 90 days. This includes the 30 days for decomposition and 60 days for maturation. The total amount of material to be composted in this period is 2,668 tons (or 4,528 m^3 by volume). The composting process is expected to result into 70% reduction in mass of the initial material. Therefore, final compost is expected to be around 800 tons. 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 10,400 m^2 dedicated for composting windrows is 20% larger than the areas required for composting in 90 days. In other words, 10,400 m^2 is adequate to compost for 108 days.

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 wetland and eventually will end up in a nearby stream. 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. 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
- 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 Rukungiri 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
- The 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
- 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 Kahengye. The Water Intake and WTP located in Kabashaki village in Kabingo parish, Kebisoni Sub-county. The water intake will lower the river water level, sediment may build up and pollution of the water source as a result of effluent from the WTP and Feacal Sludge Treatment plant. Since the implementation of the project will affect the River Kahengye, 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.

Law/Regulation/Guideline	Key provisions and Relevancy
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.
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 Rukungiri 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.

Law/Regulation/Guideline	Key provisions and Relevancy
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 Kahengye.
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 Rukungiri WSSP is subject to the control of Physical Planning Authority of Rukungiri Municipality as mandated under S.12 of the Act.

The Water Treatment Plant (WTP) will discharge backwash into River Kahengye. While the water treatment sludge containing hazardous Aluminium will have to be disposed of. These are likely to degrade the receiving environment. 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.

Law/Regulation	**Key provisions and Relevancy**
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. 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.

Law/Regulation	Key provisions and Relevancy
	The Rukungiri District Natural Resource/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 in this case River Kahengye and the pending FSTP site.

The Rukungiri WSSP project has impacts on wildlife. The area has Grey Crested Crane living in the wetlands surrounding River Kahengye. The water project will cause noise, vibrations, lights and fencing which will affect free movement of the birds. The wildlife Act will be triggered.

Law/Regulation	Key provisions and Relevancy
The Wildlife Act Cap 200	The Act provides for sustainable management of wildlife. S.15 of the Act states that any Developer desiring to undertake any project, which may have a significant effect on any wildlife species, or community, shall undertake an environmental impact assessment in accordance with the National Environmental Act. The Grey Crane being protected species will be conserved under the provisions of this Act. Uganda Wildlife Authority (UWA) is the institutional body whose principal function is to ensure sustainable management of wildlife resources in Uganda. It shall monitor the implementation of conservational measures of the wildlife by the water project in Rukungiri.

The Rukungiri WSSP has impact on planted trees. The land to be acquired for the Water Intake has planted trees belonging to the family of the Late William Karigwende in Kabashaki Village. Clearance of the trees will trigger the National Forestry and Tree planting Act 2003.

Law/Regulation	Key provisions and Relevancy
The National Forestry and Tree planting Act 2003	Section 27 provides for Ownership of trees on private land. Government or a local government has no ownership over trees or forest produce situated on private land. A District Forest Officer may issue directions to the owner of trees or forest produce situated on private land, requiring the owner to manage the trees or forest produce in a professional and sustainable manner. As for this project, acquiring such land shall require the guidance and the directions of the Rukungiri District Forest officer as he or she may consider fit for sustainable development.

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. Rukungiri 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.

Law/Regulation	Key provisions and Relevancy
	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 personal protective equipment (PPEs) and there are likely challenges to arise from the treatment of the workers. Accidents such as fire out breaks at the WTP facility at Kabashaki, 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, Rukungiri 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

Law/Regulation	Key provisions and Relevancy
	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 Rukungiri WSSP should adhere to occupational safety and health rules according to the mitigation measures suggested 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

Law/Regulation	Key provisions and Relevancy
	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 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

Law/Regulation	Key provisions and Relevancy
	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. Rukungiri District Labour officers have a key role in monitoring compliance of the contractors.

2.4 Key International Environmental and Social Laws

The whole of Rukungiri District lies within the catchment of Lake Edward basin and all surface waters drain north-west ward into Lake Edward, a water resource shared by Uganda and Democratic Republic of Congo. Hydrological studies show that River Kahengye has adequate flows to sustainably support the planned abstraction rate. Uganda has no agreement with DRC in respect to the lake but has international obligations to observe while using shared water resources.

The Rio Declaration 1992 principle 17 requires that environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority. Principle 4 of the UNEP principles on shared natural resources requires states to undertake EIA for projects or activities that have transboundary impacts.

The EIA has been undertaken and the impacts and mitigation measures identified are reported in this report.

The project is not anticipated to appreciably affect quality or quantity of water in L. Edward, which is shared between DRC and Uganda. However, in accordance with OP 7.50 in December 2011, the Nile Basin Initiative notified all riparian states (except South Sudan) on behalf of GoU. No unfavourable response to the notification was received.

The Water Management and Development Project Appraisal Document (World Bank, 2012), discloses notifications that have been made to the Partner States and the riparian countries.

2.5 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.

2.5.1 Customary land

Much of the land required for the Rukungiri project is under customary tenure. Ownership in the area simply passes down from father to son or from one generation to another. The land has no encumbrances such as mortgages since it's prohibited to be used as collateral for bank loans. Land for the water intake and WTP belonging to William Karigwende (0.66 acres) and John Biretwaho (3.397 acres) respectively in Kabingo Parish is under this tenure. The Mukazi, Kebisono, Buyanja reservoirs (gravity scheme), Bwoma Reservoir and the transmission line land of 19 people are all under customary ownership. 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 of local council 1 chairpersons to verify ownership as well as the respective families.

2.5.2 Freehold land

The land required for Rwerere reservoir (0.089 acres) and part of the transmission line (0.174 acres) is owned by Solomon Bagujuna with a freehold title in Rusoroza 'A', Rwerere Parish, Nyakagyeme S/C. Establishment of such project components on the freehold land will trigger the following laws.

Law/Regulation	Key provisions and Relevancy
The 1995 Constitution of Uganda	Article 237 (3) (b) 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 freehold tenure
The Land Act Cap 227	Section 2 provides for the different tenures of land including freehold. According to S.3 (2), the freehold tenure may involve either a grant of land in perpetuity, or for a lesser specified time period. The Act specifies that the holder freehold land has full power of ownership of it and as such, he may use it for any lawful purpose, dispose of it by will or transact it in any other way as he or she sees fit upon negotiation with the project developer. A search has to be done with Ngora and Kumi District Land Boards to certify title to the above land as stipulated under the Registration of Titles Act Cap 230 Section 101

2.5.3 Leasehold land

Part of the required land for the transmission line is owned under leasehold by Winnie Karanganwa (0.084 acres) in Kifunjo, Eastern Division in Rukungiri Municipality. Establishment of the transmission line 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 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. For the purposes of this project, it shall therefore require direct negotiation by the MWE and Rukungiri Municipality from which Winnie Karanganwa acquired the lease. Winnie Karanganwa

Law/Regulation	Key provisions and Relevancy
	has to be involved and adequately compensated accordingly upon cancellation of her lease by the Municipality.

2.5.4 Public land

The land required for the Nyero reservoir (0.298 acres) is public land held by Nyero S/C. The Ngora – Nyero – Kumi WSS Project is in public interest and use of the above land shall require the involvement into discussions by the MWE, Kumi District Local Government and Nyero S/C. Where a government institution wants land that belongs to another government institution, an application should be made to the Uganda Land Commission for change of use or for shared use.

2.6 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.

Law/Regulation	Key provisions and Relevancy
	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 Rukungiri 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 Rukungiri 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).

2.7 World Bank Safeguard Policies

The Rukungiri WSS Project will be supported by the World Bank, which has environmental and social safeguard policies that are designed to avoid, mitigate, or minimize adverse environmental and social impacts of projects supported by the bank. The operational policies triggered in this project are summarized in the table below.

Summary of Safeguards policies triggered by the Rukungiri WSSP

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/BP 4.04	OP 4.04 is triggered due to potential loss or degradation of natural habitats including, riparian and wetland habitats. Ecologically sensitive areas include River Kahengye and wetlands at the raw water intake and faecal sludge treatment facility.
Forests OP/BP 4.36	This will be triggered since there are potential project impacts on the existence of the planted forest Kaligwende at the water intake in Kabashaki Village.
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 potential for land acquisition for the water intake, Water Treatment Plant, water mains and for the reservoirs except the Buyanja reservoir which is public land.
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, 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 Geography

The Project area is located in Rukungiri District, in the western region of Uganda. Rukungiri District is bordered by Ntungamo District in the East, Kabale in the South, Mitooma in the north and Kanungu in the West. The District has a total area of 1,524.28 km² of which 11% comprises of tropical high forests, 5.5% woodland, 2.6% bush land, 21.3% grassland, 52% farmland and 7.6% open water (Studio Galli Ingegneria (SGI), 2015). Rukungiri District headquarters are situated in Rukungiri Municipal Council.

The Municipality lies on an area of approximately 64.9 km². The municipal council has three divisions: Northern, Southern and Eastern, each with four wards. According to the National Housing and Population Census of 2014, Rukungiri Municipality had a population of 36,509 persons (UBOS, 2014).

3.1.2 Climate

Rukungiri Municipality has a bimodal rainfall pattern with light rainfall between March and May every year as shown in Figure 3-1. The wettest season runs from September to December when the mean monthly rainfall exceeds 120 mm. June and July are the driest months when average monthly rainfall is below 50 mm. The District has a fairly low potential evapotranspiration that varies between 80 to 100 mm/month throughout the year. The average annual rainfall is about 1280 mm per year. The temperatures are generally cool, ranging from 13° C to 26° C with an average temperature of 19° C. The coolest month is June and the hottest is February.

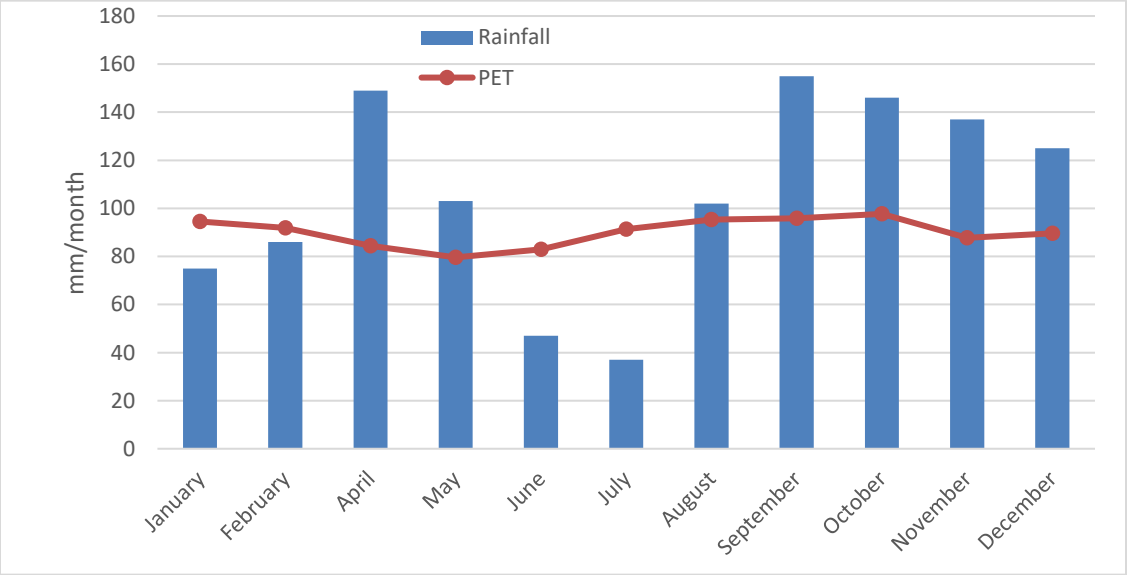

Figure 3-1: Rainfall and Potential Evapotranspiration patterns in Rukungiri District.

(Source: (FAO, 2005)

3.1.3 Geology and Soils

Rukungiri District is underlain by Precambrian rocks of Karagwe – Ankolean system and Toro system. Intrusive granites and undifferentiated acid gneisses derived from rocks of Karagwe – Ankolean age underlain the project areas. Plio - Pleistocene to recent alluvium deposits and black soils occur in the North of the District sloping to Lake Edward.

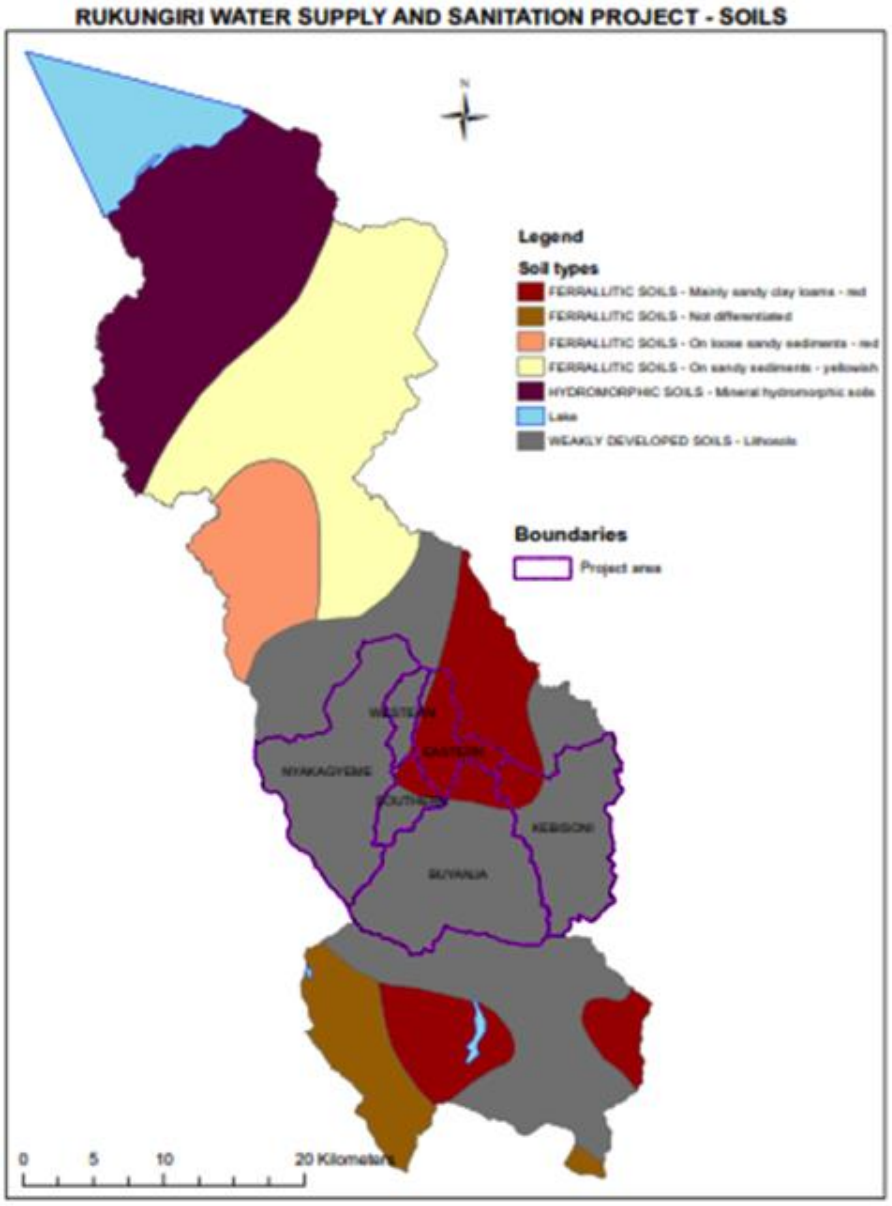

Figure 3-2: Soil types and their distribution in Rukungiri District.

The dominant soils types in Rukungiri are the weakly developed soils (lithosols) and Ferrallitic soils which are mainly sandy clay loams and sandy sediments. Hydromorphic mineral soils lie in the Northern part towards Lake Edward. In the project areas, there are only lithosols with the widest coverage and ferrallitic soils of mainly reddish sandy clay loams. Figure 3-2 shows the different soil types and their distributions in Rukungiri District.

3.1.4 Topography

Rukungiri District is characterized by undulating hills with steep slopes and V-shaped valleys but the Municipality has undulating hills with flat planes. In the valleys, several streams flow originating from near the hilltops. These are the sources of gravity flow water for use by the local communities.

The elevation is as low as 912 m above sea level in Lake Edward in the North and rises up to 2,277 m above sea level in the South. As shown in Figure 3-3 below, the whole of Rukungiri District is in the Basin of Lake Edward, with the terrain sloping to and surface waters draining to Lake Edward. This topography has been utilized in design to drive gravity flow of water along transmission and distribution lines from the service reservoirs to the consumers.

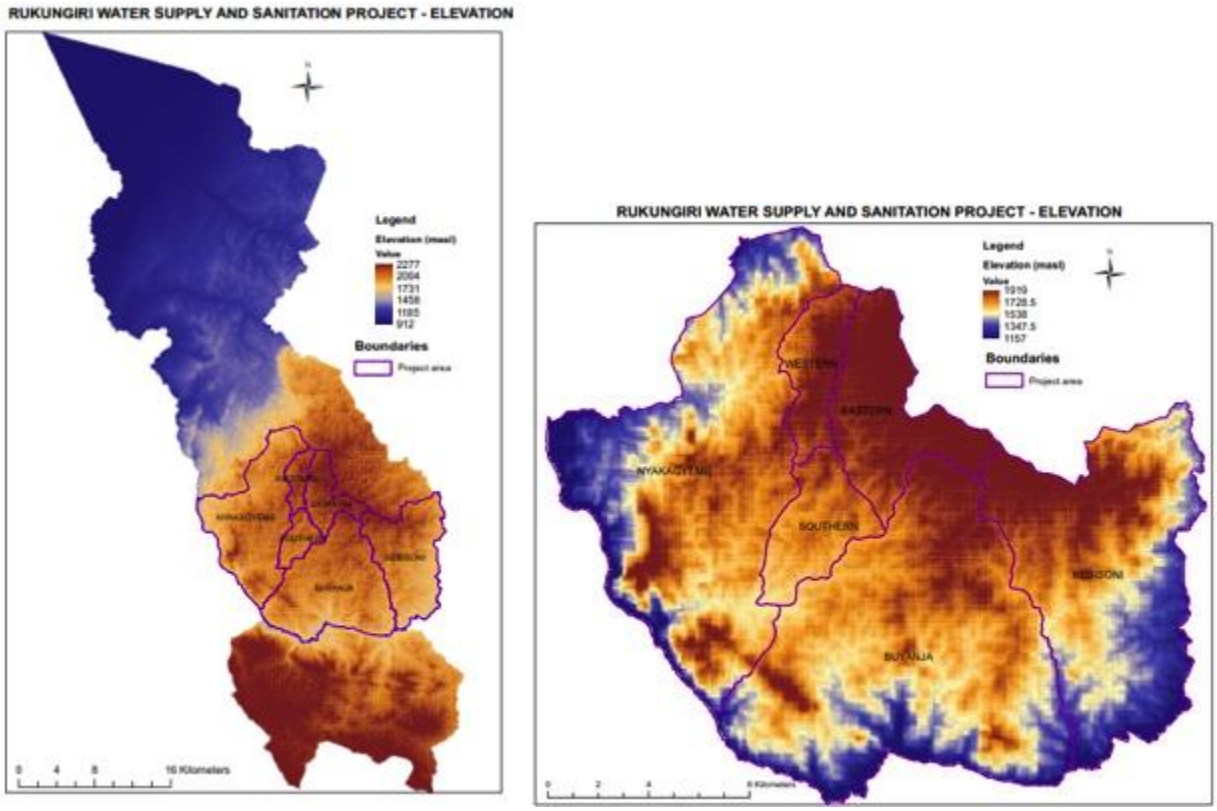

Figure 3-3: Elevation of the project areas.

3.1.5 Water resources

In the many valleys of Rukungiri, there are several streams flow originating from near the hill tops. These are the sources of gravity flow water for use by the local communities. These numerous stream and small rivers drain the hills and join one another to form main rivers in the valleys. The main rivers within and in the vicinity of the project area are Biriria, Mitano and Kahengye. There are also groundwater resources supplying water to over 1,272 protected springs, 86 shallow wells, 68 deep boreholes and 26 gravity flow schemes across the District.

The whole of Rukungiri District lies within the catchment of Lake Edward basin and therefore as shown by topography, all surface waters drain north-westward into Lake Edward. There is a smaller lake within the project area i.e. Lake Nakasanda, in Garubunda Parish (Kebisoni Sub County). The main rivers draining to Lake Edward are River Kaizi and River Nchwera, Rushaya and Ntuugu, which through a wetland system drain to Lake Edward. Figure 3-4 shows the surface water resources in the District and a vast networks of rivers draining the hilly terrains to Lake Edward.

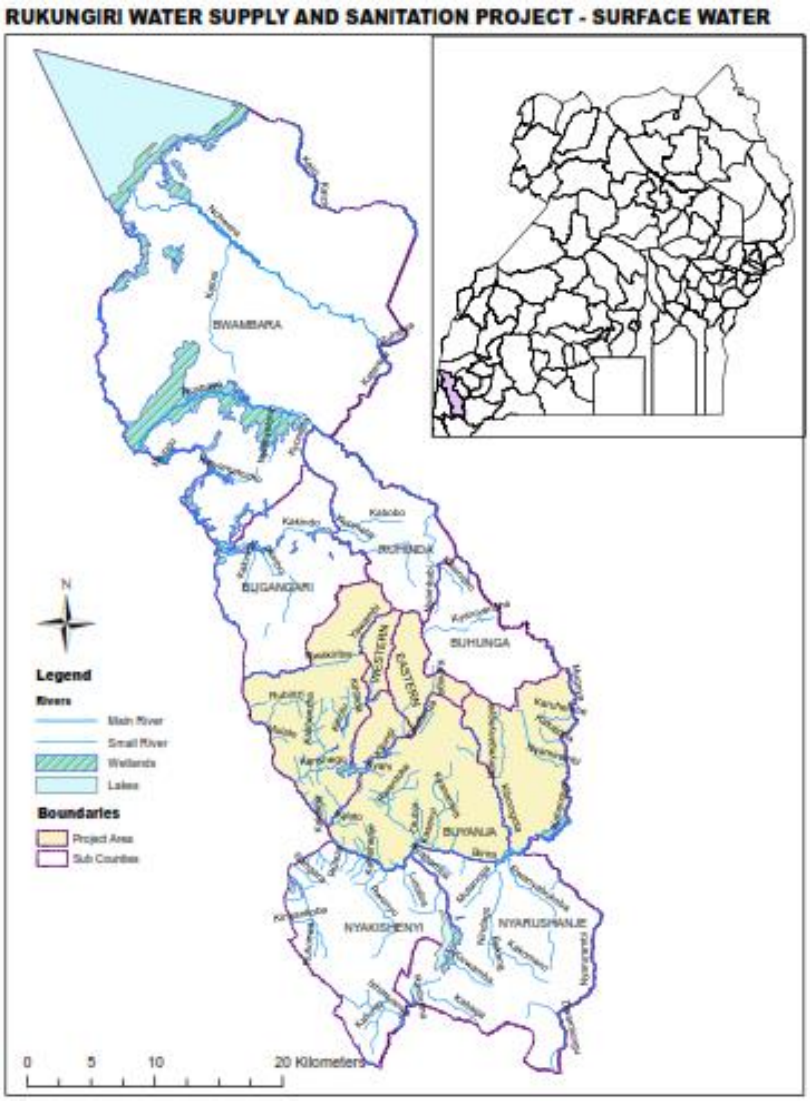

Figure 3-4: The surface water resources of Rukungiri District.

The wetlands resources are very limited in Rukungiri District (see Figure 3-4) The permanently wet areas such as Lake Edward and small lakes form 5.6% of the total land (86 km²) while the seasonal wetlands and wetlands with sedges such as papyrus make up 64 km² i.e. 4.19% of the total land cover of Rukungiri Municipality. The wetlands are increasingly being encroached upon for settlement and cultivation and tree planting is evident around the Municipality. It will be crucial that project activities do not

exacerbate wetlands encroachment but conserve the wetland as much as from possible pollution for wetlands to continue to playing the role of filtering pollutants that would end up in water courses.

Hydrology of River Kahengye

River Kahengye is not gauged but River Mitano to which Kahengye is a tributary is gauged with data spanning the period of 1958 to 2014. However, data for the years 1958, 1996, and 1997 were omitted from analysis because each had missing data for more than three consecutive months.

A trend analysis of the flow records from River Mitano showed the records are homogeneous with no significant trend changes. Only seasonal variations were observed.

Since Kahengye is a tributary of Mitano, flow data from Mitano was used to generate flows of River Kahengye. However, before such derivation s were performed, the two catchments were compared for similarities and the results are summarised in Table 1.

Table 1: Catchment characteristics of River Mitano and River Kahengye basins.

Point ID	Area (km²)	Area – Perimeter ratio	Elevation (masl)			Slope (%)		
			Min	Max	Mean	Min	Max	Mean
River Kahengye water intake point	767.4	5.122	1408	1908	1578	0	100.28	11.17
River Mitano (at UTM 36S 143367E, 9924887N)	2,102.09	6.69	1001	2476	1618	0	127.2	15.8

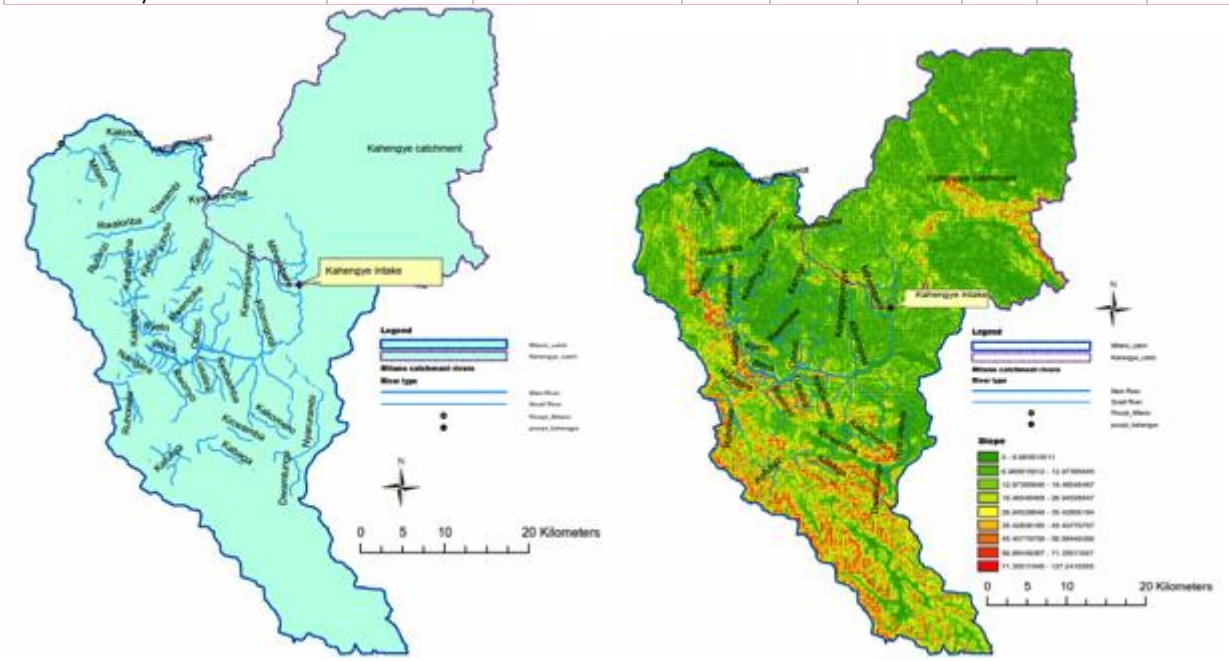

Figure 3-5: Rivers Mitano and Kahengye catchments and slopes.

Considering the similarities between Mitano and Kahengye catchments reinforced by a fact that Kahengye is a tributary of Mitano, a method proposed by McMahon et al. (n.d.) for relating higher discharges between a gauged station and an ungauged one was adopted. The method assumes that the ratio of discharges is equal to the ratio of catchment areas to some power b, given by the following expression. This method assumes that the peaks and the low flows of both rivers occur at the same time but only the flow magnitude are vary.

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

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.

Extreme flow conditions

Using the above equations, the flows of River Kahengye were derived. The annual minimum and maximum flows selected from the derived flows of River Kahengye are as follows.

Table 2: Kahengye Maxima and Minima.

Derived Kahengye Maxima and Minima (m³/hr.)					
Year	**Minima**	**Maxima**	**Year**	**Minima**	**Maxima**
1959	4824	43056	**1986**	13536	107352
1960	2124	31392	**1987**	8424	78336
1961	3528	98064	**1988**	28368	94068
1962	8712	106920	**1989**	6912	78120
1963	14724	110520	**1990**	6372	76860
1964	8964	101340	**1991**	8064	45144
1965	6228	70056	**1992**	3708	79128
1966	5796	53244	**1993**	1692	73404
1967	2196	108792	**1994**	1656	81864
1968	9216	88524	**1995**	864	82152
1969	4464	51984	**1998**	9432	86004
1970	7200	81216	**1999**	6048	64332
1971	7812	97560	**2000**	6120	90216
1972	6876	77616	**2001**	8640	107568
1973	5004	61380	**2002**	9360	87084
1974	8532	97344	**2003**	9972	77040
1975	5760	132084	**2004**	7956	64296
1976	11160	120852	**2005**	6120	57168
1977	11124	125064	**2006**	5580	82008

Derived Kahengye Maxima and Minima (m³/hr.)					
Year	**Minima**	**Maxima**	**Year**	**Minima**	**Maxima**
1978	9288	113544	**2007**	8676	78444
1979	9000	70344	**2008**	7956	81648
1980	6012	117252	**2009**	5076	60516
1981	5904	78876	**2010**	11088	110124
1982	9648	135468	**2011**	16740	123948
1983	9072	126468	**2012**	14292	118800
1984	8784	127512	**2013**	10188	106020
1985	14616	93924	**2014**	6480	87156

Low flows

A further frequency analysis of the annual minima and maxima were performed. The low flow analysis gives a distribution as shown below.

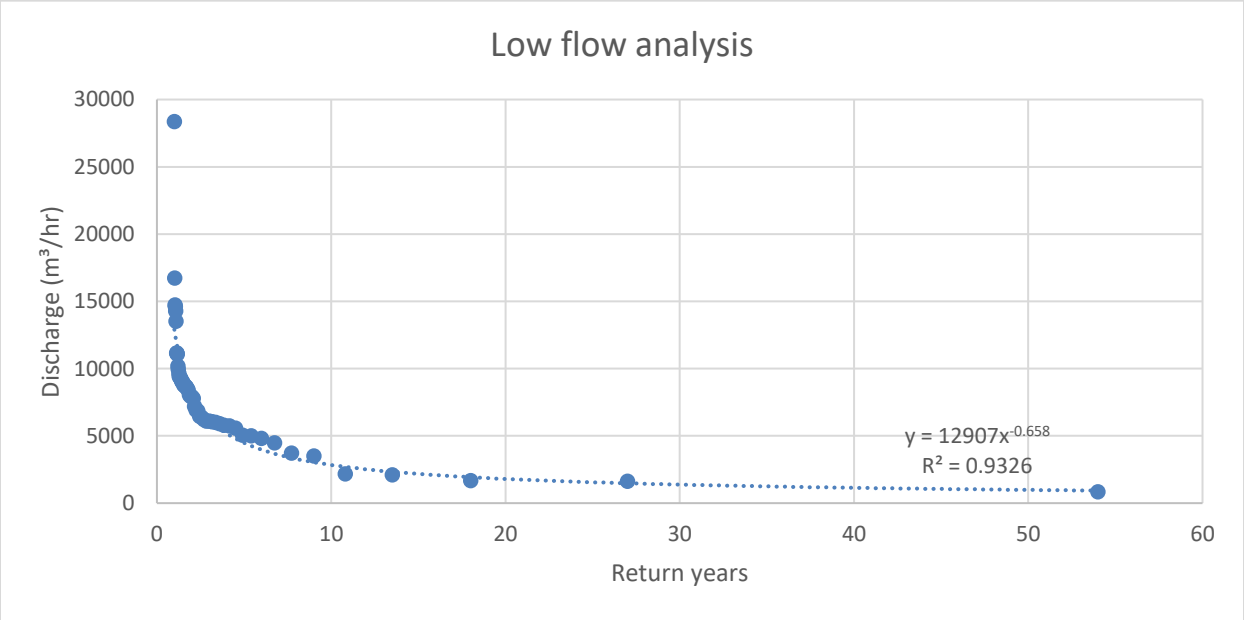

Figure 3-6: Low flow analysis of R. Kahengye.

The distribution was fitted with an exponential equation given as follows:

$$y = 12907x^{-0.658}$$

Where y is the discharge and x is the return period.

A summary of the low flows with their respective flows are given as follows:

Table 3: A summary of low flows of River Kahengye with respective return periods.

No	Return period (years)	Lowest flow of River Kahengye (m³/hr.)
1	50	983.7
2	25	1,552.3
3	10	2,836.8
4	5	4,474.8
5	2	8,179.2

As summarised in Table 3, it's expected that at least once every 50 years, the lowest daily flow of River Kahengye will be 983.7 m³/hr. or lower and it would still be adequate meet the water supply demand.

Flood flow frequency

The food frequency analysis was based 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 Generalised Pareto Distribution of the General Extreme Value Distributions (Patrick Willems, 2005). Using Generalised Pareto 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 3-7.

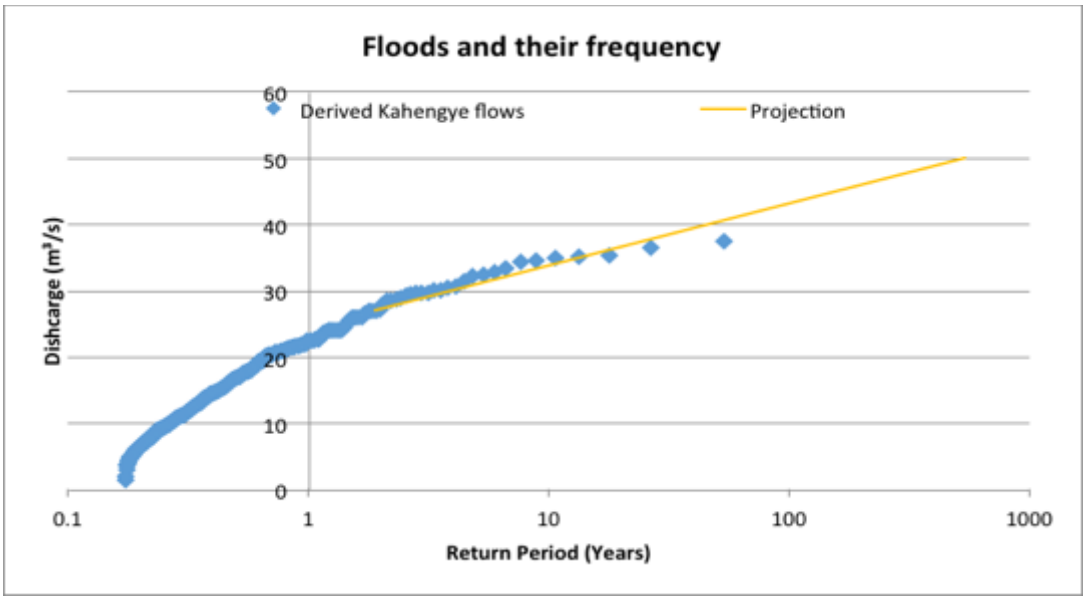

Figure 3-7: The flood frequency of River Kahengye based on derived flow.

By implication, Figure 3-7 shows that River Kahengye can have a flow of more than 30 m³/s once every 10 years. The flood flows with some specific return periods are summarized in Table 4 below.

Table 4: Return periods and maximum discharges of River Kahengye.

No	Return period (years)	Maximum flows of River Kahengye (m^3/s)
1	500	49.71
2	150	44.81
3	100	43.16
4	50	40.34
5	10	33.79

As shown in Table 3, the lowest flow (i.e. 983.7 m^3/hr.) that is expected once in 50 years can still meet the required environmental flow and water supply demand of 400 m^3/h demanded in Rukungiri and Ntungamo by 2040. In short, there is adequate water to meet the demand. Thus far, there are no known competing uses for the river water upstream of the intake site; however, if such a competing use appeared, it would have to be dealt with by the regulator (DWRM) at that stage.

Water Quality of River Kahengye

During the detailed ESIA surveys, the water from River Kahengye was sampled from the proposed intake point and analysed in the NWSC Central Laboratory, Bugoloobi. It's worth noting that sample was done during the dry season. A summary of some quality parameters are presented in the Table 5 whereas the analysis certificate with detailed results are presented in Appendix 2.

Table 5: The baseline water quality of River Kahengye sampled during ESIA surveys.

Parameter	Units	River Kahengye	National standards for potable water (Untreated water)
Turbidity	NTU	19	10
Total Dissolved Solids (TDS)	mg/L	37	1200
Total Suspended Solids (TSS)	mg/L	34	0
Fluoride: F	mg/L	0.29	1.5
PH	-	6.9	6.5 – 8.5
Electrical Conductivity	µS/cm	58	2500
Bio-Chemical Oxygen Demand (BOD)	Mg/L	5.3	Not specified
Total Phosphorus (TP)	Mg/L	0.16	Not specified
Total Nitrogen (TN)	Mg/L	0.2	Not specified
Ortho phosphate	Mg/L	0.12	Not specified

In comparison, the water was found to have a better quality during the ESIA surveys than during the Feasibility Study period. The turbidity, total suspended solids (TDS) and Total Suspended Solids (TSS) loads are lower than was reported during feasibility studies (See Table 32 below.

Table 32 for quality during Feasibility studies). This is probably resulting from seasonal differences because the ESIA survey was done during dry season when water quality is usually good. In contrast, the concentration of fluoride was found to increase from 0 mg/L

during feasibility studies to 0.29 mg/L. Generally, the water quality of the river was suitable as a source for raw water supply. The proposed project will treat the raw water to acceptable water quality needed for portable municipal water supply.

3.2 Biological Environment

3.2.1 Vegetation of project area

Vegetation and flora assessments were conducted on 12 sites, for the proposed water and sanitation plant facilities within Rukungiri District. Fallow lands, bushy vegetation and scrubland that constituted mostly of *Lantana camara* were the major habitat types encountered within the project area. This differed very greatly from the forest/ savanna mosaic that was described by Langdale *et al* (1964) an indication that the vegetation has been subjected to environmental changes over the years, majorly because of human induced activities that have caused vegetation clearances for cultivation, human settlement and excessive harvest of plant resources (deforestation). From the areas proposed for project facilities, 116 plant species were recorded from 98 genera and 39 families. The shrubs and herbs dominated the plant life forms each with 38 species respectively. Trees had 21 species, followed by grasses with 15 species, and climbers had 4 species. Among the plants one record of the invasive, *Lantana camara* (Verbenaceae) was common in most of the sites. However, a general evaluation of all the species records indicated no species of conservation concern, following classifications from the IUCN Red List categories (IUCN, 2015). Furthermore, none of the species recorded has a restricted habitat range. All plant species recorded are widely distributed in the country.

3.2.2 Fauna

Butterflies

A total of 18 species, about 1.4% of the total known number of butterfly species in Uganda, grouped into 12 genera were identified in the project area. These were distributed among the 73 total specimens collected. The butterflies were further grouped into five families: nine were Papilionidae, three Hesperidae, 14 Lycaenidae, 19 Pieridae, and 30 Nymphilidae.

Forested species identified include: *Bobo karka, Junonia sofia infracta, Graphium antheus, J. terea elgiva, Bicyclus vulgaris, Pseudardymni hegemone, J. hertia. J. chorimene. E. desjardinsi, Zizeeria knysana, J. oenone, B. campus, Catopsilia florella oberthi* are the only wide spread in all sites. *Athene hodsoni is* the only open and *Pontia helice johnstoni, Dixeia charina, Eurema hecabe,* are migratory species with no threats. *Mylothris rubricosta* is a swampy specialist that calls for protection of swamps. The project area has very low species richness and abundance due to anthropogenic activities, which have led to over utilisation of the proposed sites for key project facilities for crop gardening or cattle grazing activities. None of the species is on the IUCN red list.

Herptiles

Six amphibian species and 76 individuals belonging to three families and three genera were recorded during the survey i.e. *Amietophrynus maculatus*, *Amietophrynus garmani*,

Ptychadena mascareniensis, *Ptychadena anchietae*, *Ptychadena oxyrhynchus*, *Amietia angolensis* all of which were of least conservation concern with regard to IUCN Red List (see Table 6). Three reptilian species and 31 individuals i.e. *Agama, Lygodactylus gutturalis and Trachylepsis straita*, each belonging to its own family were recorded during the survey. None of the reptilian species found in the project area has been evaluated according to the 2014 IUCN Red List. However, the amphibian and reptilian fauna richness and abundance recorded during the survey are very low compared to Uganda's amphibian estimate of between 98 and 150 reptilian species.

Furthermore, this herpeto fauna diversity could only be a fraction of what the Albertine Rift ecosystem harbours. This was indicated by the comparison to Bwindi and Queen Elizabeth National Parks that lie in the same eco-zone. Records for the former and latter reveal 29 amphibian & 34 reptilian and 10 amphibians and 34 reptiles respectively. The low abundance and biodiversity of this study could be partly attributed to the fact that most of the land within Rukungiri project area is under farmland or any other intense human activity that does not allow high abundance of herpetiles. Therefore, if more time and more sites within pristine habitats were surveyed, relatively high species richness and abundance of amphibians and reptiles could be recorded. General assessment indicates that the herpeto fauna in this area are not of any conservation concern, and are widely distributed in the immediate surroundings of the Albertine rift ecosystem according to previous studies.

Table 6: Amphibian fauna recorded within the project area.

NO	Family name	Scientific name	Class	Site											Total
				WI	WTP	Mukazi SR	P-STP	Alt. STP1	Alt. STP2	Solid Waste	Rwerere SR	Bwoma SR	R. MR	B.HLR	B.GR	
1	Bufonidae	*Amietophrynus maculatus*	**LC**	0	0	0	-	3	2	0	0	0	0	0	0	5
2	Bufonidae	*Amietophrynus garmani*	**LC**	0	0	0	-	4	3	0	0	0	0	0	0	7
3	Ptychadenidea	*Ptychadena mascareniensis*	**LC**	5	0	0	-	9	5	0	0	0	0	0	0	19
4	Ptychadenidea	*Ptychadena anchietae*	**LC**	3	0	0	-	7	4	0	0	0	0	0	0	14
5	Ptychadenidea	*Ptychadena oxyrhynchus*	**LC**	0	0	15	-	0	3	0	0	0	0	0	0	18
6	Ranidae	*Amietia angolensis*	**LC**	4	0	0	-	6	3	0	0	0	0	0	0	13
Total number of individuals				**12**	**0**	**15**	**-**	**29**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**76**

WI- Water Intake; P-STP- Proposed sewage treatment plant; Alt. STP 1- Alternative sewage treatment plant 1; Alt. STP 2- Alternative sewage treatment plant 2; R.MR- Rwanyakashesha Main reserve; B-SR- Buyanja gravity reservoir; B.HLR- Buyanja HLR; LC- Least Concern

Table 7: Reptile species within the project area

NO	Family name	Scientific name	class	Site											Total
				WI	WTP	Mukazi SR	STP1	Alt. STP1	Alt. STP2	Solid Waste	Rwerere SR	Bwoma SR	R. MR	B.HLR	B.GR	
1	Agamidae	*Agama*	**NE**	0	2	0	o	0	0	3	3	2	0	2	0	12
2	Gekkonidae	*Lygodacty lusgutturalis*	**NE**	2	0	0	0	0	0	2	0	3	0	3	2	12
3	Scincidae	*Trachy lepsisstraita*	**NE**	2	3	0	0	0	0	2	0	0	0	1	0	7

WI- Water Intake; P-STP- Proposed sewage treatment plant; Alt. STP 1- Alternative sewage treatment plant 1; Alt. STP 2- Alternative sewage treatment plant 2; R.MR- Rwanyakashesha Main reserve; B-SR- Buyanja gravity reservoir; B.HLR- Buyanja HLR; NE- Not Evaluated.

Avians

An inventory of avian fauna (birds) of the project area was conducted and birds where were recorded in all sites surveyed though the species richness and abundance varied from one site to another Appendix F. Altogether, 43 species and 414 individual birds were recorded. Only one species (Grey Crested Crane) is Red-Listed by IUCN as endangered. The 43 bird species found in the project is relatively low in comparison with the total of 1,007 bird species found in Uganda. Further comparison with the number of species found in the Albertine Rift, the adjacent Queen Elizabeth National Park and Rwenzori Mountain National Park each had 1061, 600 and 217 bird species respectively. This again confirms the project area had relatively low number of species. This is attributed to anthropogenic activities like deforestation, intensification of agricultural activities (crop and animal husbandry), urbanization and human settlements. Considering the type of habitats of the different sites and their species richness, it's indicative that most of the sites except the water intake, proposed sewage treatment plant and alternative sewage treatment plants 1 & 2, are of less conservation concern and the general setting of the project appears to have minimal impacts to the habitat after construction.

Mammals

Ten mammal species were recorded including four rodents, one shrews, one Bat and four medium to large sized mammal species Table 5.4. The Faecal Sludge Treatment Plant option three recorded the highest species number (eight) while Alternative Faecal Sludge Treatment Plant option two recorded the lowest (four), average species number was six at most of the sites. None of the species recorded is listed on the IUCN Red List as threatened.

Table 8: Mammal species at the sites and their IUCN statuses.

English Name	Species Name	IUCN Status	Intake	WTP	Mukazi MBR	FSTP Option 1	FSTP Option 2	FSTP Option 3	Solid Waste Landfill	Rwerere WR	Bwoma WR	Rwanyakasheshe WR	Buyanja WR 1	Buyanja WR 2
Rodents & Shrews														
African Giant Shrew	*Crocidura olivieri*	**LC**	●	●				●					●	
African Grass Rat	*Arvicanthis niloticus*	**LC**	●	●	●	●		●	●	●	●	●	●	●
Natal Multimammate Mouse	*Mastomys natalensis*	**LC**		●	●	●	●		●	●	●	●		●
East African Mole Rat	*Tachyoryctes splendens*	**LC**		●	●	●								●
Striped Grass Mouse	*Lemniscomys striatus*	**LC**	●	●	●	●	●	●	●	●	●	●		●

Bats														
Angolan Free-tailed Bat	*Mops condylurus*	**LC**	•	•	•	•	•	•	•	•	•	•	•	•
Medium to Large Mammals														
Vervet Monkey	*Chlorocebus pygerythrus*	**LC**	•					•					•	
African Savanna Hare	*Lepus microtis*	**LC**			•			•		•			•	•
Marsh Mongoose	*Atilax paludinosus*	**LC**	•					•						
Olive Baboon	*Papio anubis*	**LC**						•						
Total			**6**	**6**	**6**	**5**	**3**	**8**	**4**	**5**	**4**	**4**	**6**	**6**

3.2.3 Proposed water intake site

The proposed water intake site is located at UTM 36 S coordinates of 171694E, 9908156S near the border of Ntungamo – Rukungiri high way bridge. The intake facility is proposed on a 673 m² piece of land owned by the family of the Late William Karigwende of Kabasaki village in Kabingo Parish, Kebisoni Sub-county in Rukungiri District. The landlord has a total of 15 acres and only 0.166 acres will be acquired. The land tenure is customary. The predominant economic activity is subsistence cultivation of food crops, *Ecalyptus* wood lot, grazing of cattle and goats. Cultivated land is alternates with fallow land.

The predominant riverine and wetland vegetation of the area has been replaced with fallow land/ grazing land with common grasses of *Cynodon dactylon, Panicum maximum, Sprobolus spp* and *Paspalum sp* as well as the shrubby *Lantana camara.* Some of the surroundings is under cultivation with *Ipomoea batatas, Phaseolus vulgaris* and *Zea mays,* with some *Ecalyptus grandis* tree stands. It is only along the banks of River Kahengye, where remnants riverine wetland vegetation of *Cyperus papyrifera* and *Typha capensis* still exist culminating into a riverine bushy vegetation. This lavish vegetation is home to the IUCN red listed grey neck crested crane among other bird species. It will need construction of an access road.

Six species of butterflies represented by one specimen each were collected from the site i.e. *Zizeeria knysana Pseudardymni hegemone, Junonia chorimene, Catopsilia florella oberthi, Mylothris rubricosta, Pontia helice johnstoni and Bicyclus vulgaris.* A total of 12 specimen distributed in three species of Amphibians were collected at the site, these include; *Ptychadena mascareniensis* (No. 5), *Ptychadena anchietae* (No. 3) and Amietia *angolensis* (No. 4). A total of four specimen distributed in two species of reptiles were collected at the site, these are *Lygodactylus gutturalis* (No. 2) and *Trachylepsis straita* (No.2). Sixteen bird species were observed, while mammals had six species including a bat i.e. *Crocidura olivieri, Arvicanthis niloticus, Lemniscomys striatus, Chlorocebus pygerythrus*, *Atilax paludinosus* and *Mops condylurus.*

The following Uganda Laws are triggered Land Act Cap 227 and Land Acquisition Act Cap 226. The World Bank Operational Policies OP 4.01: Environment Assessment and OP 4.12 Involuntary Settlement will be triggered.

3.2.4 Water treatment plant site

The water treatment plant will be built on 13,746 m^2 of land, which will be acquired, from John Biretwaho. The landlord has a total of 15 acres. The land tenure is customary. Located on a hilly landscape in Kashaki Village, Kabingo Parish, Kebisoni Sub County (at UTM 36S coordinates 171111E, 9908022S), the ground elevations vary between 1480 masl to 1457 masl. This variation in topography permits gravity flow among the different treatment units of the facility.

A total of 21 plant species were identified at the site. The dormant vegetation was grass species. The site is characterized as a fallow/ grazing with *Paspalum notatum and* some *Hyparrhenia filipendula, Panicum maximum,* with *Lantana camara* and *Tithonia diversifolia,* and sparse trees of *Ecalyptus grandis* and *Markhamia lutea. In the* surroundings are gardens for cultivating mainly *Ipomoea batatas, Arachis hypogaea* and *Zea mays.* The main economic activity in the area is subsistence farming where food crops are grown and livestock particularly cattle and goats reared. The site is accessible by murrum roads on two sides.

Plate 1: The land use of proposed water treatment site.

The site had six species of butterflies represented by one specimen each were collected from the site. These include *Zizeeria knysana, Junonia sofia infracta, Junonia hertia, Junonia chorimene, Eurema hecabe* and *Bicyclus vulgaris.* Because of the dry nature of the site no Amphibian fauna. Five specimens distributed into two species of reptiles presented by *Agama agama* (No. 2) and *Trachylepsis straita* (No. 3) were

collected from the site. Six bird species presented by Yellow-vented bulbul, (No. 2), Pied crow (No. 6), African pied wagtail (No. 2), Arrow-marked babbler (No. 3), Golden pipit (No. 2) and Lemon dove (No. 2) were seen at the site. Six mammal species including a bat i.e. *Crocidura olivieri, Arvicanthis niloticus, Mastomys natalensis, Tachyoryctes splendens, Lemniscomys striatus and Mops condylurus* were seen at the site.

The following Uganda Laws are triggered Land Act Cap 227 and Land Acquisition Act Cap 226. The World Bank Operational Policies OP 4.01: Environment Assessment and OP 4.12 Involuntary Settlement will be triggered.

3.2.5 Main balancing reservoir – at Mukazi hill

The Main Balancing Reservoir (MBR) is proposed Mukazi hilltop in Mukazi Village, Karuhende Parish in Kebisoni Sub County. The Mukazi hill is the highest and was suitably chosen to permit flow of water by gravity to service reservoirs. Located on UTM 36 S coordinates 168900E, 9910742S, the 757 m² piece of land is owned by four persons who will each have the following acreage taken by the project; Silver Kamuhangire (0.110 acres), Grace Turyagumanawe (0.037 acres), Vincent Twinobyesigye (0.001 acres), and Erivaida Kamayangi (0.037 acres). The total acreage own at this site by each Landlord is 5, 2, 0.5 and 0.5 acres respectively. However, due to land fragmentation tenure system in the area, it worth noting that these landlords have other pieces of land elsewhere. All the four landowners are holding the land under customary land tenure. The main economic activity is subsistence farming and rearing of cattle and goats.

As shown in Plate 2, currently the land is cultivated with *Ipomoea batatas, Arachis hypogaea* and *Zea mays* as the food crops grown. A total of 11 plant species were identified at the site. The gravelly landscape supports growth of weeds species such as *Cycodon dactylon, Bidens pilosa, Panicum maximum* and enclaves of the shrubby *Lantana camara, Ocimum gratissimum* and *Tithonia diversifolia*.

At total of seven specimen distributed into five species of butterflies i.e. *Zizeeria knysana* (No. 2), *Junonia oenone* (No. 1), *Junonia terea elgiva* (No. 1), *Junonia chorimene* (No. 1) and *Catopsilia florella oberthi* (No. 2) were collected at the site. Only one amphibian specie (*Ptychadena oxyrhynchus* with 15 individuals) was seen at the site. At the time of the field visit no Reptilian Fauna was found. Five bird species distributed in seven individuals i.e. Lemon dove (No. 1), Mourning dove (No. 2) Red-cheeked cordon-bleu (No. 2), Shining sunbird (No. 1) Yellow-vented bulbul (No. 2) were seen at the site. Five mammal species i.e. *Arvicanthis niloticus, Mastomys natalensis, Tachyoryctes splendens, Lemniscomys striatus and Mops condylurus* (bats) were observed at the site.

Plate 2: Ipomoea batatas, Arachis hypogaea, and Phaseolus vulgaris at Mukazi Hill.

The following Uganda Laws are triggered Land Act Cap 227 and Land Acquisition Act Cap 226. The World Bank Operational Policies OP 4.01: Environment Assessment and OP 4.12 Involuntary Settlement will be triggered.

3.2.6 Service reservoirs

Rwerere reservoir:
The 361 m² piece of land is located on a hill in Rusoroza "A" village, Rwerere Parish in Nyakagyeme Sub County at UTM 35 M coordinates 817619E, 9911843S. It belongs to Solomon Bagujuna who currently uses it for grazing cattle and goats. Site is a modified environment; grazing land with a total of 18 plant species. The common grasses species include *Brachiaria brizantha, Cycodon dactylon, Panicum maximum,* with some *Lantana camara*, and very sparsely distributed trees of *Artocarpus heterophylla, Cupressus lusitanica, Ficus nantalensis* and *Acacia abyssinica.* The woody species of *Acacia spp.* provide shade to cattle. The site already has steel water reservoir that supplies gravity water from another water supply scheme to nearby Rwerere Town board. Therefore, there will be no displacement or resettlement needed. However, the land acquisition with has to follow the Land Act because the land tenure is Free Hold. There is a murrum road passing by the site.

The biodiversity consisted of eight species of butterflies, no amphibians were encountered at the site and reptiles were represented by one specie *Agama*, with three individuals. Eight bird species i.e. African pied wagtail (No. 2), Blue-naped mouse bird (No. 9), Golden pipit (No. 2), little weaver (No. 5), Mourning dove (No. 2), Pied crow (No. 1), White-browed coucal, (No. 1) and Yellow-vented bulbul (No.1) were seen at the site. Five small mammals i.e. *Arvicanthis niloticus, Mastomys natalensis, Lemniscomys striatus, Mops condylurus and Lepus microtis* were seen at the site.

Plate 3: Location of the Rwerere Reservoir site.

The following Uganda Laws are triggered; Land Act Cap 227 and Land Acquisition Act Cap 226. The World Bank Operational Policies OP 4.01: Environment Assessment and OP 4.12 Involuntary Settlement will be triggered.

Bwoma Service Reservoir site

The 374 m² of land required for storage reservoir is located at UTM 35 M coordinates of 824831E, 9914292S belonging to Gershom Byamukama. He has a 3 acres of land near the project site, with customary tenure. The vegetation has only eight species mainly because it is fallow land, predominated with Cycodon dactylon, Panicum maximum, with sparse distribution of Markhamia lutea and Lantana camara. The main economic activity is substance farming of Phaseolus vulgalis, Coffea arabica, Manihot esculenta, Zea mays and Musa paradisiaca. The vicinity has human settlements. There is no need of displacement and resettlement, because it's near an existing water tank, which is part of the existing ground water supply system of Rukungiri Municipality.

The biodiversity had seven species of butterflies i.e. *Zizeeria knysana* (No. 3)*, Junonia oenone* (No. 2), *Pseudardymni hegemone* (No. 1)*, Junonia hertia* (No. 1), *Junonia chorimene* (No. 1), *Graphium antheus* (No. 1) and Catopsilia *florella oberthi* (No. 1). Being with the vicinity of a built up environment with fallow land no amphibians were seen and reptiles were represented by only one specie *Agama agama* with two individuals. Four species of birds i.e. African pied wagtail (No. 2), Black kite (No. 1), Mourning dove (No. 2) and the Yellow-vented bulbul (No. 3) were seen at the site. Four species of small mammals were seen *Arvicanthis niloticus, Mastomys natalensis, Lemniscomys striatus and Mops condylurus.*

Plate 4: Location of the Bwoma Reservoir site.

The following Uganda Laws are triggered Land Act Cap 227 and Land Acquisition Act Cap 226. The World Bank Operational Policies OP 4.01: Environment Assessment and OP 4.12 Involuntary Settlement will be triggered.

Rwanyakasheshe Water reservoir

The site, located in Kifunjo Ward (Police Barracks Zone), Eastern Division in Rukungiri Municipality at UTM 35M coordinates 0826071E, 9912764S. The site is fallow land that transcends into a bushy vegetation. It has 18 plant species characterised by species of *Panicum spp, Hyparrhenia ruffa, Cycodon dactylon i*nterspersed with *Ocimum gratissimum, Vernonia amygdalina* and *Lantana camara.* Site has four telecom masts and an existing water reservoir as shown in Plate 5 below. The 775 m² of land owned by Winnie Karanganwa will be acquired from her total acreage of one acre. The land tenure is leasehold. Although substance farming is the main economic activity the landowner also gets money from leasing land from the four telephone masts.

The site had five species of butterflies represented by one individual each. These species butterfly species are *Zizeeria knysana, Junonia oenone, Junonia terea elgiva, Junonia herti and Pontia helice johnstoni.* There were no herptiles seen. This is probably due to land use of a built up environment. Six bird species were identified at the site. These include Amethyst sunbird (No. 1), Anteater chat (No. 5), Black kite (No. 1), Cinnamon-breasted rock bunting (No. 2), little yellow flycatcher (No. 1) and Yellow-vented bulbul (No. 2). Small mammal species included *Arvicanthis niloticus, Mastomys natalensis, Lemniscomys striatus* and *Mops condylurus.*

An existing water reservoir

Herbaceous vegetation on site

Plate 5: Habitat at Rwanyakashesha Water Reservoir

The following Uganda Laws are triggered Land Act Cap 227 and Land Acquisition Act Cap 226. The World Bank Operational Policies OP 4.01: Environment Assessment and OP 4.12 Involuntary Settlement will be triggered.

Buyanja HL Reservoir

The proposed site will require 409 m² of land take on Buyanja Hilltop located in Town Cell, Buyanja Town Board at UTM 35M coordinates 0830013E, 9907174S. The land is owned by Buyanja Sub County. Sub County has a total of 5 acres on the project site. The current land use is a woodlot of *Eucalyptus* and *Gruveria sp* with a thick undergrowth of *Lantana camara* forming scrubland vegetation. At the slope is cropland of mainly maize as shown in Plate 6. The main economic activity in the area is substance farming with livestock cattle and goats. The wood lot supplements timber and firewood requirements. It's near an existing concrete water tank that supplies Buyanja Town with gravity water. It is anticipated there will be no compensation because the land belongs to government. The land acquisition for the project will be a contribution of the local authorities to the project.

A concrete water reservoir on the site

Open woodland dominated by *Grievellia sp.,* a garden of *Zea mays* (Maize)

Plate 6: Land use of the proposed site for Buyanja HLR.

Since the land tenure is public land, the land take here will be administrative between Rukungiri District Local Government and Buyanja Town Board, after all there is an

existing water reservoir. The World Bank Operational Policies OP 4.01: Environment Assessment will be triggered.

Buyanja Gravity Flow Reservoir

Located in Matebe Ward, Buyanja Town, the 309 m² of land needed by project is owned by Stanley Munabi. He has a total of 15 acres of land at the project site. The land tenure is customary. Eighteen species plants were identified at the site. It is a grazing/ fallow land with vegetation cover largely dominated by grasses of *Brachiaria, Cycodon dactylon, Panicum maximum, Paspulum notatum* species. In the periphery there is shrubby vegetation of *Lantana camara* and *Solanum incanum* grown to a height of about 2m. There are a few trees species of *Artocarpus heterophylla, Cupressus lusitanica, Ficus nantalensis* and *Erythrina abyssinica*. The site is on a gently sloping landscape. There is an existing concrete water reservoir tank. It is part of the Buyanja Gravity Water Scheme. As shown in Plate 7, the open grassland is used for grazing cattle – which is the main economic activity on the site. Located at UTM 35 M coordinates 830686E, 9909300S the site is easily accessible by a murram road.

The biodiversity showed that there were four species of butterflies each represented by one individual. These were *Zizeeria knysana, Junonia oenone, Junonia chorimene and Graphium antheus.* No amphibians were seen and reptiles were represented by one specie *Lygodactylus gutturalis* that had two individuals. Four bird species were identified i.e. African pied wagtail (No. 2), Cattle egret (No. 3), Great white egret (No. 1) and Pied crow (No. 1). Five mammals were seen on the site. These include *Arvicanthis niloticus, Mastomys natalensis, Tachyoryctes splendens, Mops condylurus and Lepus microtis.*

Plate 7: Land use of proposed site for Buyanja HLR reservoir.

The following Uganda Laws are triggered Land Act Cap 227 and Land Acquisition Act Cap 226. The World Bank Operational Policies OP 4.01: Environment Assessment and OP 4.12 Involuntary Settlement will be triggered.

3.2.7 Feacal Sludge Treatment plant

The site is located on a wetland between Kinyasano Ward and Northern Ward at UTM 35M coordinates 825105E, 9913147S. It is a flat landscape composed of wetland vegetation mainly characterized by *cyperus sp*, the site is greatly degraded by human activities such as farming, land filling and dumping of human wastes. Cultivation is mainly concentrated at the centre of the site and crops grown include maize, yams and a lawn of elephant grass. Also eucalyptus plantation was evident at the edge of the wetland (see Plate 8 below).

Plate 8: Proposed alternative site for Feacal Sludge Treatment plant

The site is endowed with high abundance of amphibians (29 were seen). This is so because of the favourable wetland condition. Clearing vegetation and constructing a Feacal Sludge Treatment plant will affect wetland flora and fauna that are known to inhabit wetland environment.

3.3 Socioeconomic environment

The ESIA team conducted a socio-economic survey in order to give a general understanding of the communities affected by the proposed project. The socio-economic studies will be the basis to establish indicators that can be measured at a later stage during monitoring and evaluation. The exercise was also part of consultative process intended to understand the social impacts and mitigation measures from the potentially affected communities themselves. This baseline interviewed 183 affected households and collected data on several issues that will inform the implementation strategies as presented in the sub-sections bellow:

3.3.1 Demographic Conditions

According to the provisional results of the National Population and Housing Census 2014 (UBOS, 2014) the project area (Rukungiri Municipality, Buyanja, Kebisoni and Nyakagyeme sub-counties) had a total population 130,498 people. Of these 62,646 and 67,852 are males and females respectively. The population growth rate for the district was 1.27 lower than the national average 3.03. The majority of the people stay

in rural areas (284,058) against (36,509) in urban areas. The average district household were 4.5.

3.3.2 Ethnic Composition

The survey results suggest that 86.3% of the PAPs are Banyankole, 11.5% are Bahororo and a small proportion of 2.2% are Bakiga. The predominance of one language Runyankole suggests that it should be the major medium of oral communication during the public sensitization meetings.

3.3.3 Religion

A big proportion (57.7%) of the PAPs was Protestants, followed by Roman Catholics (38.9%) and lastly Moslems (2.3%).

3.3.4 Marital Status

The type of marriage can be useful in understanding the potential effect of the project on familial relationship and social cohesion. Survey results suggest that the proposed water supply project will affect mainly married people. This is because of the 183 people that were interviewed, 78.4% were married (both monogamous and polygamous combined). Also important to note is that, a significant proportion (17.6%) is widowed while a small proportion was single (3.4%) and separated (0.6%) as presented in Table 9.

Table 9: Marital status of the PAPs.

Marital status	Percentage
Single	3.4
Married	78.4
Separated	0.6
Widowed	17.6
Total	**100**

3.3.5 Education

Most of the respondents are semi-literate having attained equal or less than primary level of education with only 6% who completed secondary level of education. Only 6% have diploma as illustrated in the Table 10 below:

Table 10: Education level of the survey population sample.

Literacy level	Percentage
Illiterate	21.6
Can read and write	27.9
Completed primary	38.5
Completed secondary	6.0
Diploma	6.0
Total	100

The level of education has an implication on the PAPs knowledge and understanding of the technical compensation issues as well as their absorption capacity to during sensitization.

3.3.6 Household Size

Results from the questionnaire indicate that the people who live in a household on a permanent basis are many. Even when data is arranged by class interval, 55% of the respondents have between 1-5 people, 40.5% have between 6-10 people while 4.5% have more than 11 people in their households. This implies that, the proposed project is going to affect large household size as indicated in Table 11 below.

Table 11: Household sizes of PAPs.

Gender	Household			
	1-5 people	**6-10 people**	**Above 11 people**	**Total**
Males (%)	44.0	25.5	3.2	**72.7**
Female (%)	11.0	15.0	1.3	**27.3**
Total (%)	**55.0**	**40.5**	**4.5**	**100**

3.3.7 Existence of Vulnerable People in a Home

Vulnerable groups usually have very few productive assets, are easily affected by external shocks and risks (resettlement), and have low resilience capabilities. Therefore, the survey included a question aimed at establishing the existence of vulnerable persons in a home. Findings show that, more than a half (65.9%) of the respondents indicated that they have a vulnerable person in the household. Specifically, there are 3 categories of vulnerable groups namely; the chronically ill, widowed and child headed families as presented in the Figure 3-8 below.

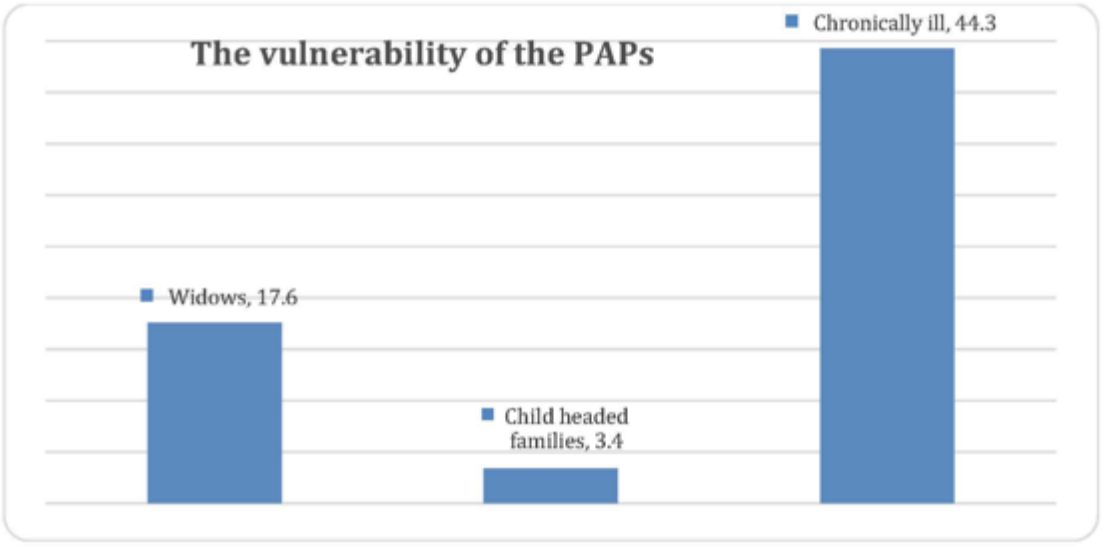

Figure 3-8: Vulnerability of the PAPs.

3.3.8 Gender Division of Labour

Like in all areas of Uganda and most African countries, there are specific cultural roles for men and women in the project area. Based on a set of questions in the qualitative tool, this socio-economic impact survey investigated the current gender division of labour, access to and control over resources. The qualitative findings reveal that, the women and the girl child participate in reproduction activities and play a complimentary role in agricultural-based production activities. Preparing food, bathing children, feeding children and cleaning the house are specific for the women in both urban and rural project areas.

On the other hand, men play a dominant role in production activities and ownership of productive assets and marketing of the agricultural produce. Grazing animals, ploughing, pruning and thinning banana plantation are considered to be men's activities. During harvesting time for beans, maize and picking coffee, most men help their wives. Women tend to play a complementary role in those aspects (light green).

The marketing of produce is primarily the responsibility of a man who also controls the proceeds. With permission from a man, a woman can sometimes sell, but the quantities sold are usually restricted and the woman is required to declare the outcomes of their transactions and account for the money spent. A wife may be entrusted with keeping the money, but has restricted right to spend it. Spouses can occasionally discuss the utilization of family financial resources, more especially spending on basic needs, such as children fees, treatment, farm inputs and so on.

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 husbands. On the other hand, women have more control over reproductive assets such as poultry and household utensils.

By their age-status children play an auxiliary role in all household-based gender division of labour and asset. Except, when it comes to buying basic necessities of life, the girl child is more trusted than the boy child.

3.3.9 House Hold Economy

Production Activities

The following section presents the household economy in terms of sources of livelihood. At a general level, people in the project area are experiencing poverty. The poverty condition is characterized by accessibility constraints, low household incomes, and unemployment and low levels of literacy. The following section presents the socio-economic conditions of the affected communities at the different project facilities and along the transmission lines, obtained from the socio-economic impact study that sampled 183 of the affected households.

Access to sources of Income

As Table 12 below indicates, study respondents mentioned five sources of income, which are mainly informal sectors activities. However, the main income earning activity is farming/ animal rearing. The next are casual labour, business, civil servants and salary employment.

Table 12: Sources of income of surveyed population

Production activities/occupation	Percentage
Farming/animal rearing	62.9
Business	9.1
Civil servant	6.3
Causal labour	10.3
Salaried employee	5.1
Retired	5.1
Student	1.1
Total	**100**

The average monthly income is UGX 3 million, equivalent to USD 894 based on the current exchange rate. The amount of income is exaggerated because of the problem involved in converting weekly, monthly, bi-annual, seasonal and annual income into a single monthly income.

The main commercial and industrial activities are concentrated in the Municipality. Economic activities include farming, with limited livestock rearing of cattle and goats of local breed, service industry (restaurants, bars and lodges) and petty trade. Small scale industries involved in agro-processing of grain and coffee are also found in the area. Other small scale industries are engaged in metal fabrication, wood works and carpentry, milk cooling plants, tailoring, motor garages, bakery and soap industries. The most grown crops are potatoes, bananas, beans, and coffee. Other activities include brick making, small scale trading in produce and merchandise (wholesale and retail shops), cattle market, abattoir, and butcheries.

Results for a separate question on 'who participates in such activity' show that generally all household (except for the children) members participate in the informal sectors economic activity. The only exception is the salary employment whereby men in all cases play dominant role than the rest of the working household members. In other words, loss of the economic activities (land, crops and property) will deprive all household members the source of livelihood.

Household Expenditure

Qualitative findings indicate that household income is spent on 14 expenditure items. In summary, the first seven household expenditure items are: food, school fees, scholastic material, health, telephone, fuel, and transport. That composition of the household expenditure items reflects a consumption-based but not an investment-based local economy. Only a small proportion of residents spend on electricity, water, house and premise rent.

Type of Crops Grown

Whereas the households grow more than 15 crops, the main crops are; bananas, cassava, maize, ground nuts, beans and fruits as shown in Figure 3-9. Coffee is the main cash crop grown in the project area.

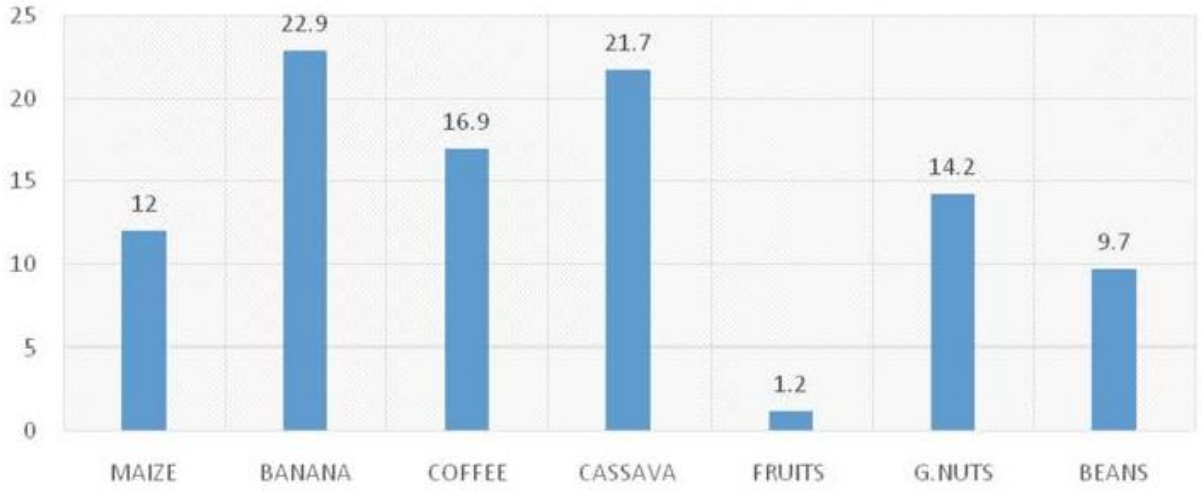

Figure 3-9: Crops grown by PAPs.

Regarding the project impact, with the exception of coffee and bananas, the project will largely affect seasonal crops that can be harvested and replanted within a short period of time.

3.3.10 Asset ownership

Access to and Utilization of Fuel

The main source of fuel is firewood (96%), followed by paraffin (2.3%) and the least ones are charcoal, solar and electricity 0.6% each (see Table 13 below). Other forms of fuel like biogas, natural gas, solar are not used. The basic use for fuel is cooking (especially firewood) and lighting (especially kerosene) and hardly any household uses fuel for production process. The level of fuel usage confirms a rudimentary economy.

Table 13: Distribution of energy sources used by PAPs

Fuel used by the household	Percentage
Firewood	96.0
Paraffin	2.3
Charcoal	0.6
Solar	0.6
Electricity	0.6
Total	100

Communication and Information Technology

The largest proportion of residents have access to radio (97.7%) and mobile phone (85.1%) as presented in Table 14. No one reported to have access to fixed phones. The radio and mobile telephones are the main sources of information in the districts.

Table 14: Ownership of communication and information technology equipment

Do you own the ICT item below	Yes	No
Radio	97.7	2.3
Mobile phone	85.1	14.9

Do you own the ICT item below	Yes	No
Fixed phone	0.0	100.0
Other items owned household members		
At least two sets of clothes	95.4	4.6
Own any transport equipment	**32.0**	**68.0**

3.3.11 Access and Ownership of Land

Almost all (98.1%) indicated that they have access to land. The average number of acres owned is 3.35 acres. The section on impact of the proposed project on the socio-economic condition will show that the project will not affect all the available land owned by the household. The statistical parameters of the land owned by the PAPs are presented in Table 15.

Table 15: Statistical parameters of the land owned by PAPs.

Statistical Parameter	Size
Average	3.3509
Mode	1.00
Minimum	0.25
Maximum	43.00

3.3.12 Land Tenure

The main type of land tenure in this region is customary land, a type of land tenure that is governed by unwritten law. Customary land is a system of land tenure whereby the right over land is regulated by local customs. Ownership simply passes down from father to son or from one generation to another. Here land cannot be used as collateral for bank loan. This system is not subject to annual payment of ground rent and observance of development conditions. The boundaries may be marked by ridges, trenches or trees and grass. Other land regimes in the area include public land (1.3%) which covers areas occupied by civic centres like sub-county headquarters, government schools, hospitals and health centres and leasehold that exists in the municipality.

Table 16: Types of land tenure in the project area.

Type of land tenure	Percentage
Customary	98.7
Public	1.3
Total	100

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 1998 Land Act recognizes four tenure systems, namely: Customary, Mailo, Freehold and Leasehold regulate the management and control of land in Uganda.

3.3.13 Evidence of Land Ownership

Regarding documentation, despite almost all (98.7%) respondents indicated that they had access to land, less than a third (25.7%) of the landowners indicted that they have evidence of land ownership. Majority (74.3%) lacked any evidence of ownership (Table 17).

Table 17: Evidence of land ownership in the project area.

Do you have evidence of land ownership	Percentage
Yes	25.7
No	74.3
Total	100

Three major reasons discourage the process of acquiring the land title for the land the owner is currently occupying and these are: 1) financial constraints, 2) having accustomed to traditional customary land ownership, 3) perceived bureaucracy involved in processing the land title.

3.3.14 Ownership of a house

The condition of the house can be a proxy indicator of wealth or poverty. From the survey findings, nearly all respondents indicated that they own the house they are currently occupying (Table 18).

Table 18: Ownership of the dwelling.

Status of occupancy	Percentage
Land owner	98.7
Licensee	0.6
Co-tenant	0.6
Total	**100**

3.3.15 Access to Water

The socio-economic survey of PAP's identified a number of different water sources available in the project area are presented in Table 19. These include rivers and streams (27.7%), followed by community borehole (25%) piped water/ tap (24.5%), rain water (21.3%) protected spring (1.1%) and lake (0.5%). This further justifies the need for the proposed water supply project in the area.

Table 19: Major source of water for domestic use

Major source of water for domestic use	Percentage
Lake	0.5
River	27.7
Community borehole	25.0
Protected spring	1.1
Rain water	21.3
Ponds/dams	0.0
Tap	24.5
Total	100

The feasibility study showed that Rukungiri was water stressed. The residents were willing to have the project because the existing water supply in the project area was intermittent, unreliable and the water quantity was not sufficient. Some areas in the project get water once a week; hence the residents are forced to use unsafe water from springs, wells and rivers as source of water. The survey showed that the residents were will be pay UGX 227 per 20 litre jerry can. The monthly average price households are willing to pay for a connection from a new water supply system irrespective of service level is UGX 25,156. The monthly average price for those who opted for a House connection are willing to pay for a connection is UGX 35,583; those for Yard tap UGX 15,648; those for a Pubic Standpipe is UGX 19,434. This showed that the project would be financially and economically viable because it will have support from the beneficiaries.

3.3.16 Disruption Access to Land

The socio-economic survey showed that PAPs had an average land size of 3.3509 acres per household. The survey also revealed that the majority of the PAPs (98.1%) did not use the land taken by the proposed project as their principle residence Table below. The majority of the PAP have land elsewhere. Therefore the results suggest that for majority of the households, the affected land is not their principal place of residence.

Table 20: Affected land being the principal residence.

Affected land principal residence	Percentage
Yes	1.9
No	98.1
Total	**100**

This implies that the water supply project will not trigger physical displacement of PAPs since majority of them reside on land elsewhere and not on that which is going to be affected by the project. The project will not result in total land-take at the project sites because the transmission lines cannot take more than three acres. Given that the average land holding is three acres, it is unlikely that the 5-metre corridor required for the transmission lines will result in displacement of people.

3.3.17 Facilities that will be Potentially Affected by the Project

The outcome of the question on "use of the affected land" shows that majority of the PAPs 147 (95%) use their land for agriculture as summarised in Table 21. This implies that, the project shall mainly affect land with crops and a few commercial facilities as well as commercial houses both in equal proportions 4 (2.5%).

Table 21: Use of land affected by the Project

Use of affected land	Frequency	Percentage
Agriculture	147	95.0
Commercial	4	2.5
Rental income	4	2.5
Total	**155**	**100**

The project will not have a significant negative impact on non-agricultural sources of incomes for instance; commercial activities such as small production business, small enterprises, and rental income. This is primary because such facilities are located outside the transmission lines, or they are non-existent in a predominantly rural setting of the project.

3.3.18 Places of Cultural and Religious Significance

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: Catholic Churches (38.9%, 68 PAPs), Protestant Churches (57.7%, 101 PAPs), mosques (2.3%, 4 PAPs) and others / traditional (1.1%, 2 PAPs). On average, these facilities are located within a walking distance of 5 km, used by almost all household members and on a weekly basis.

Based on the socio-economic study findings, this project will not destroy the available places of worship. Only a very insignificant proportion of the study participants 7 (3.8%) reported that, they have graves within the affected plots. However, none of the project facilities is located on any grave. Hence, there will be no need to for grave relocation or compensation.

Table 22: Incidence of graveyards in the project area.

Have you buried any member in the affected plot	Frequency	Percentage
Yes	7	3.8
No	176	96.2
Total	183	100

4 PUBLIC CONSULTATION AND DISCLOSURE

4.1 Rationale

This chapter describes the consultations done with the different stakeholders for the proposed water supply project. This is consistent with the World Bank and National Environment Management Authority guidelines namely OP/BP 4.01 on Environmental Assessment, the National Environmental Act, CAP 153, The EIA regulation 1998, National Environment Certification and Professional Conduct of Environmental Practitioners Regulations 2003 and Guidelines for EIA in Uganda. All these guidelines require that individuals, groups and entities with a stake in any proposed project should not only be informed about the proposed project site but also consulted for their views about the likely impacts and any other concerns about the proposed project.

Therefore, during the ESIA process, consultations were conducted with relevant stakeholders, including potential beneficiaries, affected groups, the local authorities, district and municipal council officials. The consultations focused on the project's environment and social aspects. To this effect, during the field study, the ESIA team was mainly interested in gathering views about community perceptions and fears about the proposed water supply project in a bid to build consensus and to obtain community's support for the project. During the consultation meetings the issues that were discussed included socio-economic impacts that might arise from the project and how to minimize these impacts.

Below we present the findings of our consultations with key stakeholders. Details are recorded in the minutes in Appendix 2.

4.2 Stakeholders Analysis

During the ESIA process, a stakeholder analysis was conducted. Stakeholders in this case constituted the individuals, groups and entities that will be affected by the activities of the project either directly or indirectly or affect the activities of the project. The categories of stakeholders 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: -

- District Water Officer
- District Physical Planer
- District Environment Officer
- District Natural Resources Officer
- Secretary for Production
- Mayor of Rukungiri Municipal Council
- Municipal Water Officer

- NWSC Rukungiri

4.3 Key Issues raised at Municipality and District Level

The ESIA survey team got the opportunity to share project related information with the Chairman, the CAO and a team of councillors and other technical staff who had gathered for another meeting in the district council hall. With the assistance of the DWO, the meeting which was chaired by the CAO allocated 30 minutes to the Team Leader in which he shared fully all the information about the proposed project, its components and activities. During the meeting, he also sought the stakeholder's collaboration, cooperation and participation in the different activities and in the implementation cycle. Key reactions that emerged from this presentation included: -

- *We are not yet clear whether the district shall only engage in securing consent of the affected people to surrender their land to the project or whether we (the Municipality) shall also meet the financial obligations for their lost properties.*

- *If we shall be required to pay for people's assets, then we shall only compensate those whose assets are not within the road reserve.*

- *What will happen if the district does not have the money to pay affected people?*

It should be noted that, the meeting was dominated by expressions of fears related to compensation. The district seemed not to be aware or ready to finance the compensation process, which points to the need for urgent clarification.

At the Municipal Council, the key project stakeholders that were consulted are: the Mayor, the Acting Town Clerk and the Environment Officer. One Senior Assistant Town Clerk for Western Division in Rukungiri Municipality was also consulted.

In addition, public consultations were conducted at different levels, with the attendance right from the sub-county officials to Local Council 1s in most of the affected communities of the project.

Consulting the CAO Rukungiri District

Consulting the Mayor Rukungiri MC

Field Visit at Main Water Reservoir site

Meeting the landlady at the FSTP site

Consulting the local community at intake site

Field consultation with Water Engineer

Figure 4-1: The consultations with stakeholders in Rukungiri MC and District.

4.4 Stakeholders' views and concerns about the project

Public consultations provided enough evidence that most people are aware about the proposed water supply project. Nearly all of them felt that it is a good intervention in their area. Findings from community meetings and focus group discussions established that affected communities have accepted the project although they were scared about losing their land. Even consultations with community members at the proposed site for the sewage plant confirmed that the project benefits are likely to be more than its negative impacts and for that reason, they wholesomely accepted the project.

> *"Yes we need the project to come because we need safe water. The benefits we shall get from the project are more than the anticipated negative impacts. Those whose land shall be taken over by the project should be compensated adequately so that, they can willingly surrender the land."*

> *"We need the project and we have agreed on behalf of all other members of this community to have the sewage plant constructed in the identified location."*

However, it should be noted that the landowner for the proposed site of the sewage plant is not willing to surrender his land to the project. At the time of the ESIA survey, efforts were made to consult the family members and it was clearly evident that they were not in agreement with the proposal. Similarly, when the head of the family was contacted on phone, he also confirmed rejection of the proposal arguing that, he is already in advanced stages to construct a University at the proposed site. Further attempts by the ESIA team to meet him in his office in Kampala were preceded and dominated by expressions of anger about the choice of taking the site without his involvement which points to the need for identifying another alternative site without such encumbrances.

However, the PAPs at the community level perceive the project as a source of safe and clean drinking water, and an opportunity to reduce waterborne diseases.

> *"The first one is that, people in this community shall get access to safe and clean water near their homes."*

> *"Due to easy access to safe water, the health conditions of the people in the area shall improve. People shall no longer get waterborne diseases."*

Nonetheless, District and Municipal Council officials observed that the project is long overdue and wondered whether this time it was going to take off.

> *"We have waited for so long to get this project. All the communities in Rukungiri Municipality want clean water and this is the right time for them to get it when this project starts. The main challenge is that, this project has taken long to take off; almost 10 years now since it was first mentioned to us and all that time people have been anxiously waiting for it."*

Displacement of people highlighted by both the technocrats and local people; they were majorly concerned about the issue of compensation.

> *"This project is likely to take large amounts of land and the land owners in the affected areas where the main pipes shall pass shall be affected because they will be required to surrender large pieces of their land to the project although they shall be compensated."*

> *"The project shall need large pieces of land. This is likely to cause displacement of people."*

Leaders at all levels emphasized the need to compensate people whose land or crops are destroyed by the project fairly and adequately.

> *"Those who shall lose their land, crops and all other assets, should be compensated fairly."*

> *"You need to give affected people their compensation timely and it should be commensurate to the amount of loss they have suffered."*

There was a fear particularly among the district staff that, the project shall require large volumes of water to satisfy the water need of the people in Rukungiri Municipal Council. This was feared to further reduce the amount of water available in the river particularly at the intake.

> *"I also think that, there shall be a significant reduction in the amount of water in the river particularly at the intake and this is likely to affect people on the other side of Ntungamo district."*

The district officials also noted that, due to low water level, the project may not be able to supply all communities in targeted project area with water in sufficient quantities particularly in right of the fact that, water shall be distributed by gravity. Consequently, the project may not be able to solve the existing water shortage and rationing experienced in most of parts of the Municipal council particularly in the hilly areas.

> *"I also think that, there shall be instances when water form this project is unable to reach all areas in municipality particularly those in the hills. Since water is going to be distributed by gravity from the reservoir into the project area, it is very likely that some people in hilly areas shall not get it and this shall be a negative impact. Secondly, this water may not be of good quality like it has always been in other water projects here and elsewhere in the country."*

To this effect, district officials suggested the use of booster pumps to ensure that, all areas in the municipal council are supplied with water all the time in sufficient quantities to satisfy their need.

> *"You have to avail booster pumps to ensure that water reaches all the different parts in the project area including those that are at the top of the hills."*

Increase in cost of living was raised mainly by community members residing around the proposed site of the sewage plant. They noted that, during the construction phase the demand for goods and services is likely to rise up due to an increase in number of

people in the area. This would bring about an increase in the prices of household commodities.

> *"The cost of living in the area shall go up because there will be many people in the area during construction and people shall be competing for the few available goods and services."*

Community members also observed that, the cost of land around the sewage plant is likely to go down because buyers would not want to buy land in an area which is close to the lagoon noting that, the lagoon should be treated regularly to avoid bad smell in the area.

> *"The price of plots around the sewage plant shall go down because people would not want to stay near a lagoon."*

Some of the stakeholders consulted noted that, among their fears and concerns was the potential of the project workers coming from other parts of the country to increase HIV/AIDS in the project area. They noted that, workers on the project would be having money, which they are willing to spend to get sex in exchange. In such cases, the male tend to exploit the women and girls in the community due to high poverty levels in the PIA; hoping to get money from the contractors. This will end up escalating HIV and STDs in the project area. Also community members noted that, they are likely to get diseases coming from wastewater.

> *"The people who will come from outside shall introduce bad behaviours such as prostitution, theft and use of vulgar languages. As a result of prostitution, HIV/AIDS transmission shall increase in the area."*

> *"I think we shall get diseases coming from wastewater."*

The main recommendation given by the PAPs was that, given the potential of project workers to increase spread of HIV/AIDS, the contractor must put in place interventions for prevention of spread of HIV. It was also suggested that, the sewage plant should be constructed far away from people's houses to minimize the hazardous effects of the smell and wastewater that comes from the sewage plant.

> *"You need to construct the sewage plant far away from the road and the houses that are with in that area. The swamp is big and the project can extend it far away from the homes of the people."*

5 IMPACTS IDENTIFICATION, ANALYSIS AND MITIGATIONS

5.1 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 Rukungiri WSS Project were identified and presented. The key infrastructural facilities to be setup comprise: intake works; water treatment plant facility; transmission and distribution mains; reservoirs; public flash toilets and the faecal sludge treatment plant. The impacts (both positive and negative) were identified at all phases of the project i.e. construction, operation and decommissioning and are presented below.

5.2 Impact Areas

The project facilities are located in different parts of the project area and the PAPs are owners of the land on which project infrastructure will be built. These areas will receive primary impacts resulting from project activities. The areas that would receive primary impacts are: Water intake and WTP in Kabashaki 2 Village, Kabingo Parish in Kebisoni Sub County, pipelines from WTP to Mukazi village in Karuhembe parish in Kebisoni through Buyanja Sub County to Rukungiri Municipality and Rwerere in Nyakagyeme Sub County.

Secondary impacts (or indirect impacts) would be felt in areas near the direct impact areas. The indirect impact areas will consist of sensitive ecosystems like wetlands traversed by pipelines, offsite sources of materials for construction activities and stimulated demand for agricultural products during construction among others.

5.3 Key Activities and Potential Impacts

5.3.1 Water intake and water treatment plant (WTP)

The raw water intake will be constructed on River Kahengye in Kabashaki Village, Kabingo Parish, Kebisoni village at UTM 36M coordinates 171694E, 9908156S. A total of 673 m² of land will be cleared to permit construction. The vegetation to be cleared includes eucalyptus trees among other food crops and the papyrus that occupy the river bank. Vegetation along the access routes will be cleared but it will be for a short distance due to its closeness to the main road. Clearance of vegetation is likely to destroy habitat and forage for the IUCN Red Listed Grey Neck Crested Crane and mammals such as rodents and mongoose, but the scale of the impact is low as only 0.166 (673 m²) acres of land will be cleared.

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.

The noise level is anticipated to be low as grid electricity is planned to power the lift pumps. The flow between different water treatment units will be by gravity, so noise and emissions from generators are not predicted.

The WTP will however, release backwash effluent to River Kahengye at a rate of about 15 m³/hr. The backwash water may pollute the receiving water because of its high content of Aluminium sulphate from the coagulation process in the water treatment. The sludge from water treatment process will be thickened and package for safe disposal. The thickened sludge have a high content of nutrients, heavy metals and Aluminium sulphate, which can pollute the watercourses and the soil unless appropriately disposed.

The social impacts at the construction phase of the intake and water treatment plant will result from construction of an access road, which will need land take hence will interfere with current land use of agriculture. This could minimally disrupt the livelihoods of PAP's. There will be noise, dust and vibrations emission during construction. The influx of about 150 workers some of whom will be immigrate workers from different backgrounds and cultural beliefs may change/distort the social networks in the project area.

5.3.2 Storage reservoirs

Social characteristics

The reservoirs will store and distribute clean water to the surrounding communities by gravity. Low noise levels (splashing) are 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 structures are generally small to cause significant obstruction to site and visibility of beautiful scenery.

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. Though exceptionally rare, a tank could collapse and present a flood situation to the low lying areas surrounding it. 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 people should be drafted in to carry out maintenance of the drains and for guard duties.

Environmental characteristics

During the construction phase, there will be disturbances to flora and fauna at reservoir sites mainly due to vegetation clearing and minor excavations, but the plants and animals will thrive again at the operational phase. The reservoirs will ensure continuous supply of water even at peak demand and during periods of intake and WTP maintenance and service works.

5.3.3 Transmission and distribution water mains

The transmission lines are designed to be laid along the road reserves and passes through several sub counties as shown in Figure 5-1. The road reserves on which the transmission lines pass are clear of vegetation except for grass and herbs that will cause little or no encumbrance. But since the storage reservoirs are located on high hills and mostly on private land, the pipelines to the reservoir have inevitable passed through private properties and land of several people. The transmission line will affect nineteen (19) people. The total land area to be taken is 6,207 m² (1.534 acres). The average land take from each of the 19 PAPs is 0.094 acres, while the average total acreage of each PAP is 6.4 acres. Land at Buyanja Sub county HQ below to government, while Winnie Karanganwa and Bagujuna Solomon have Lease and Freehold type of land tenure respectively. The Rest of the PAPs have customary ownership. The pipes will be buried under ground except at crossings of valleys and over obstructions, therefore project affected persons (PAP's) are planned to be compensated for easement and crops. No displacement is expected, hence there is no need of resettlement.

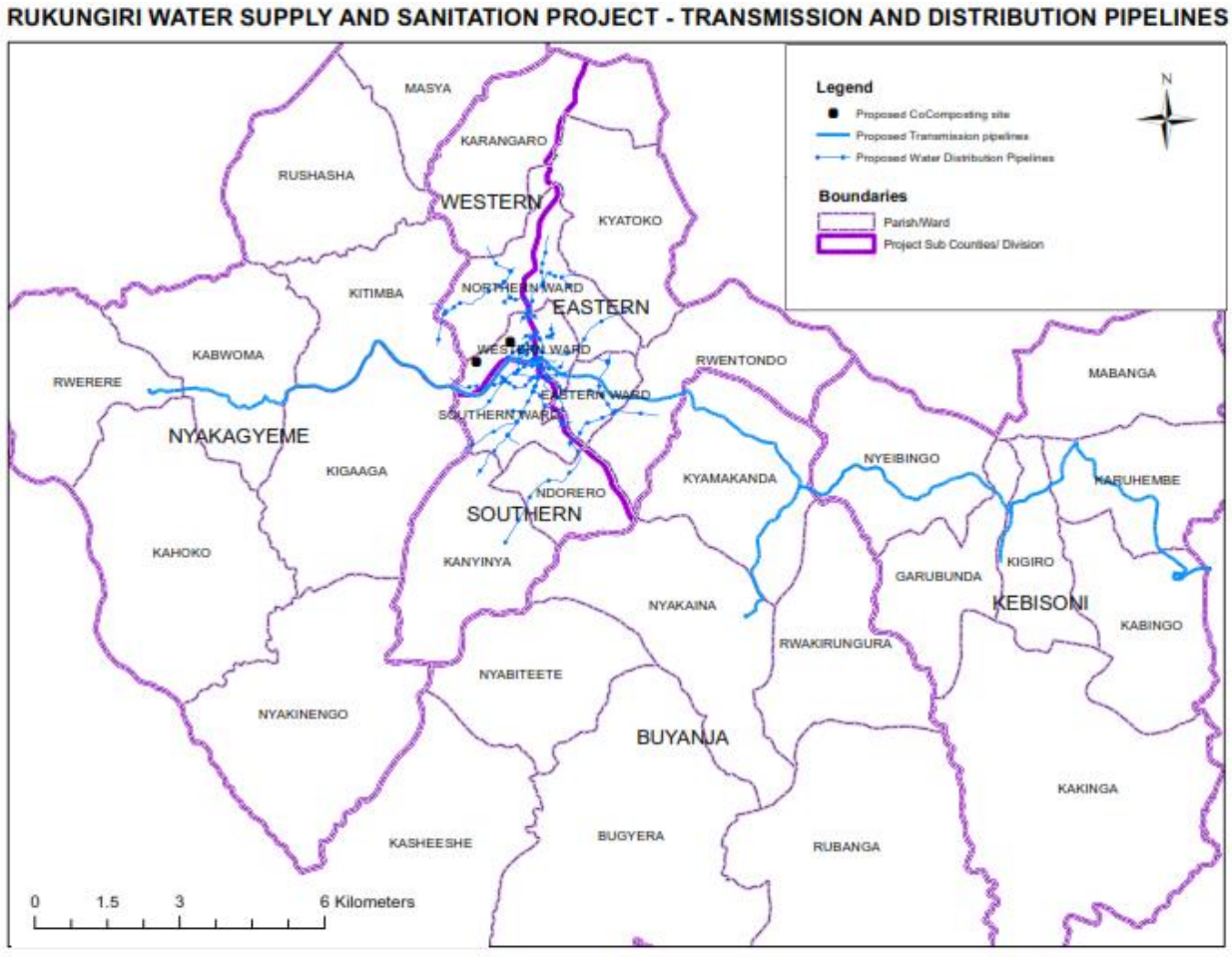

Figure 5-1: Proposed transmission and Distribution pipelines.

The pipeline will be laid underground and landowners will continue to cultivate and graze on the land without any encumbrance except during maintenance where pipelines may have to be excavated and replaced. This encumbrance will be felt

along the entire length of the mains. Land take will be minimal because the mains will be 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 people's private land. Overall, 1.534 acres of land will be acquired by transmission mains.

To enhance the social benefits of the transmission mains, communities along the route will be provided with water supply services at various levels of house connections, yard taps and kiosks. Sensitisation of the community will also be done to ensure that they improve their hygiene and sanitation situation at the household and community level.

5.3.4 Feacal Sludge Treatment Plant

The Feacal Sludge Treatment plant will dewater the mixture of faecal sludge and organic waste in drying beds. The drained leachate will be treated in a shallow treatment plant before discharging into a wetland and finally into the stream. The water treatment pond is designed to be shallow to allow ultraviolet treatment of pathogens and a retention time of 30 days to reduce the organic load. The maximum designed flow is 1 m^3/day.

The treated wastewater will be discharged to the adjacent wetland and will end up in a stream. The effluent is anticipated to cumulatively load the wetland and/or stream with effluent with varying contents of organic load, nutrients and heavy metals depending on the season and waste source. The impacts on the receiving water are discussed in section 5.8. A constructed wetland to provide tertiary treatment is recommended to further polish the effluent before it is released into the natural wetland.

The inorganic matter must be removed from the FSTP once it is deemed safe to handle and disposed of into the 5 ha Municipal Council landfill in eastern ward.

5.3.5 Mobilization of Labour

About 150 workers from within and far from the project area will be recruited to work in the project. The workers will bring increased incomes to the community and their interaction will result into social consequence such as increased sale of products to the workers; social conflicts over any number of issues like sex and intermarriages (which could lead to HIV/AIDS infections, early age pregnancies, etc.); increases in the prices of some items due to the increased purchasing power of the workers and increased opportunities for the locals for self-advancement. Business opportunities like the sale of farm produce in markets, shops, hotels, lodging facilities, restaurants and bars are likely to benefit from project staff who have purchasing power.

5.4 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 (see Table 23).

Table 23: 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 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 in Table 24 to Table 29.

5.5 Potential negative impacts of project construction phase

At construction stage, the following activities are envisaged; vegetation clearing, excavation with machines and manual labour, site hoarding, haulage of materials such as excavated soil and murram, aggregates, cement to and from construction site, civil works, electro – mechanical installation, etc. it will attract a considerable number of workers on site and might necessitate workers camp and equipment camp nearby. The potential impacts of these project activities have been identified and ranked according to RIAM approach (Pastakia, 1998). The impacts of each project sub components are presented in Table 24, Table 25 and Table 26 below.

Table 24: Mitigation measures at the intake and water treatment plant at construction phase.

No.	INTAKE WORKS AND WATER TREATMENT WORKS, MAIN BALANCING RESERVOIRS AND STORAGE RESERVOIR SITES		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 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, MAIN BALANCING RESERVOIRS AND STORAGE RESERVOIR SITES		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	Physical Environment			
	Soils			
		• Continuous inspection & monitoring of equipment to detect any oil leakages at an early stage.		
4	Physical infrastructure like water treatment buildings will seal off the soil in the built area hence denying the ecological benefits of soil	• Limit construction to only project area	-1	Slight negative change/impact
5	Solid waste generation by workers 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 a solid waste management plan.	-2	Negative change/impact
Water Resources				
1	Sediment build up in River Kahengye 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 • Monitor sediment loads and receiving water quality • Install soil erosion checks, scour checks and silt traps to prevent siltation of surface water sources and the drainage channels around the site.	-2	Negative change/impact
2	Pollution by solid waste and chemicals such as spilled oil, lubricants from construction equipment and vehicles	• Contain solid wastes so that no solid waste, fuels or oils should be discharged into surface water bodies. • Hold and store sanitary and cleaning wastes in appropriate containers to be disposed of at approved sites.	-2	Negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, MAIN BALANCING RESERVOIRS AND STORAGE RESERVOIR SITES		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	Physical Environment			
	Soils			
		• 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		
Air Quality				
1	Dust emission from excavation of foundations, access roads and PM, NOx, SOx, VOCs and CO_2 emissions from project equipment and vehicles	• 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	-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;	-1	Slight negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, MAIN BALANCING RESERVOIRS AND STORAGE RESERVOIR SITES		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	Physical Environment			
	Soils			
		• 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 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 the intake and WTP	• Limit clearance of vegetation to only that piece of land that is required for 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 eventual migration and loss of fauna such as IUCN red listed grey neck crested crane that inhabits the wetland /flood plain at the proposed water	• Limit clearance of vegetation to only that piece of land that is required for 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.	-2	Negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, MAIN BALANCING RESERVOIRS AND STORAGE RESERVOIR SITES		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	Physical Environment			
	Soils			
	intake at Kabingo Parish, Kebisoni Sub-county.	• Sensitize workers on importance of nature conservation and dissuade them from harassing animals. • Rescue animals found on site during any project phase. • Development and Implementation of an Integrated Catchment Management for the basin of River Kahengye to protect it from further degradation that jeopardizes the ecological resources.		
3	Interference with terrestrial and aquatic movement of amphibians encountered at the water intake.	• Minimization of wetland loss, restoration of wetlands and other natural sites. • 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
Social Environment				
Socioeconomic aspects				
1	Disruption and interruption to social, cultural and economic activities, possible cultural clash between immigrant workers and local community.	• 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	Displacement, loss of land and livelihood.	• Ensure adequate and prompt compensation for project affected property like land, crops, trees and structures using the agreed and fair compensation in accordance with the Resettlement action plan	-2	Negative change/impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, MAIN BALANCING RESERVOIRS AND STORAGE RESERVOIR SITES		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	Physical Environment			
	Soils			
3	Employment of unskilled labour from the project area by the Contractor may not be gender balanced. It may favour men to the detriment of women.	• Give both men and women equal job opportunity. • A non – discrimination policy must be enforced at recruitment.	-2	Negative change/impact
4	Due to low wages given to children the Contractor may be enticed to use Child Labour	• Sensitize against child labour and Implement child labour act • 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	-2	Negative change/impact
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	-4	Significant negative change/impact
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	Poor human waste management and sanitation	• Contractor to provide sanitation facilities including mobile toilets at all active construction sites and enforce their use. These should be separate for men and women; • Seek guidance from the District Health Officer on any other requirements to meet hygiene and sanitation standards	-2	Negative change /impact

No.	INTAKE WORKS AND WATER TREATMENT WORKS, MAIN BALANCING RESERVOIRS AND STORAGE RESERVOIR SITES		PHASE: CONSTRUCTION	
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
	Physical Environment			
	Soils			
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.	• 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. • Liaising with other agencies to provide free HIV/AIDS testing, counselling and Condom	-3	Moderate negative change/impact
3	Occupational health and safety issues such as working under noisy conditions, lifting heavy objects, handling hazardous materials, poor sanitary conditions for workers, falling off heights, working in confined spaces	• 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 • 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	-2	Negative change /impact
4	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 25: Identified and ranked impacts of Transmission mains at Construction phase.

No.	TRANSMISSION MAINS	PROJECT PHASE: CONSTRUCTION		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Physical Environmental				
Soils				
1	Loss of top soil/Soil erosion along the route. A total length of 37.8 km of transmission pipeline will be excavated.	• Limit excavation to only transmission routes • Removing the top soil prior to dumping any materials and returning later rehabilitation.	-1	Slight negative change /impact
2	Excavation and mixing of horizons or soil layers along pipe route	• Use of excavated soils for backfilling and levelling within the site premises	-1	Slight negative change
3	Contamination by spilled oil, lubricants, fuels, in sections where equipment will be used for excavation	• 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 wet lit area or during day in order to minimize spillage. • Continuous inspection & monitoring of equipment to detect any oil leakages at an early stage.	-1	Slight negative change /impact
4	Solid waste generation by workers and construction materials	• Use of excavated soils for backfilling and levelling within the transmission routes • 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	Sedimentation build up by the eroded soils and excavated materials	• Strict adherence to construction schedule to avoid prolong pollution and impacts on the environment • Install soil erosion checks, scour checks and silt traps to prevent siltation of surface water sources and the drainage channels around the site.	-2	Negative change /impact

No.	TRANSMISSION MAINS	PROJECT PHASE: CONSTRUCTION		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Air Quality				
1	Dust from excavation and CO_2 emissions from project vehicles and equipment	The same as those in Table 24 above	-1	Slight negative change
Noise				
1	Noise emission and vibration from heavy excavation equipment may be a nuisance to neighbours and livestock in the evening when background noise reduces	The same as those in Table 24 above	-1	Slight negative change
Biodiversity				
Flora and fauna				
1	Loss of vegetation. This is very minimal as most transmission line is located on road reserves except those to be laid through private land	• 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	-2	Moderate negative change /impact
2	Restriction to movement of livestock such as cattle and goats	• Where possible backfill excavated soils the same day • Communicate construction schedule and strictly adhere to it to avoid prolong disruption and impacts on the environment	-1	Slight negative change
Social Environment				
Socioeconomic aspects				
1	Disruption and interruption to social, cultural and economic activities through blockage and diversion of roads and traffic	The same as in Table 24	-2	Negative change /impact

No.	TRANSMISSION MAINS	PROJECT PHASE: CONSTRUCTION		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
2	Loss of land and livelihood. Most of the pipelines will pass through road reserves but it will inevitably pass through land of nineteen persons/families. A total of 1.534 acres of land will be affected. Crops such as Eucalyptus trees, bananas, coffee, Gravelia, Avocado, Mango, and Jackfruit will be lost from nineteen (19) PAPs.	• 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	Moderate negative change /impact
3	Employment of unskilled labour from the project area by the Contractor may not be gender balanced. It may favour men to the detriment of women.	The same as in Table 24	- 2	Negative change/impact
4	Due to low wages given to children the Contractor may be enticed to use Child Labour	The same as in Table 24	-1	Slight negative change
5	Child abuse and early age pregnancies	• Implement a strict employment code of conduct. • Sensitization against molestation of children of the workers and the community • Emphasize penal code punishment for concealment or cover up child abuse by employer • Involvement of local leadership in sensitising the community against child abuse and early age pregnancies	-4	Significant negative change/impact
Health and safety				
1	Increased risks of accidents posed by long networks of trenches	• Communicate construction schedule and strictly adhere to it to avoid prolong disruption and impacts on the environment	-2	Slight negative change

No.	TRANSMISSION MAINS	PROJECT PHASE: CONSTRUCTION		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Hoard off work sites and provide proper lights and reflective safety signs and restriction tapes especially at night • Where possible backfill excavated soils the same day • 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. • Provide temporary access in case roads will be temporary blocked • Implement Traffic management plan		
2	Spread of HIV and other STIs as result of influx of workers which may lead to vices such as prostitution.	The same as in Table 24	-2	Slight negative change /impact
3	Occupational health and safety issues such as working under noisy conditions, lifting heavy pipes and objects, fatigue, falling off heights, working in confined spaces	The same as in Table 24	-2	Negative change /impact

Table 26: Potential environmental impacts and mitigation measures of Feacal Sludge Treatment plant at Construction phase

No.	Feacal Sludge Treatment PLANT	PROJECT PHASE: CONSTRUCTION		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
Physical Environmental				
Soils				
1	Loss of top soil/Soil erosion due to use of inappropriate excavation methods which accelerate erosion process.	The same as in Table 24	-2	Negative change /impact
2	Contamination by accidentally spilled oil, lubricants, fuels, from excavation and construction equipment	The same as in Table 24	-2	Negative change /impact
3	Solid waste generated by workers and waste construction materials	The same as in Table 24	-2	Negative change /impact
Water Resources				
1	Sediment build up in the wetland as a result of bank erosion and runoff of construction materials	The same as in Table 24	-2	Negative change/impact
Air Quality				
1	Dust emissions from excavations and CO_2 emissions from vehicles	The same as in Table 24	-1	Slight negative change /impact
Noise				
1	Noise emission and vibration from project vehicles since huge quantities of materials are required to be moved	The same as in Table 24	-2	Negative change /impact
Biodiversity				
Flora and fauna				

No.	Feacal Sludge Treatment PLANT	PROJECT PHASE: CONSTRUCTION		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
1	Loss of vegetation such as wetland vegetation such as papyrus that occupy the wetland. Wetland purification benefit will be lost	• Limit clearance of vegetation to only that piece of land that is required for 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	-2	Negative change /impact
2	Terrestrial habitat loss and biodiversity. The loss of forage and habitat for African Giant Shrew, stripped grass mouse and other bats.	• Limit vegetation clearance to project site only • 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 • Restore / replant the indigenous trees species	-2	Negative change /impact
3	Loss of habitat for amphibians which are abundant at all sites for Feacal Sludge Treatment plant	• Minimization of wetland loss, restoration of wetlands and other natural sites • Sensitize workers on importance of nature conservation and dissuade them from harassing animals • Rescue animals found on site during any project phase	-2	Negative change /impact
Social Environment				
Socioeconomic aspects				
1	Loss of land and livelihood	The same as in Table 24	-2	Negative change
2	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	-4	Significant negative change/impact
Health and safety				

No.	Feacal Sludge Treatment PLANT	PROJECT PHASE: CONSTRUCTION		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
1	Increased risks of accidents as a result of careless driving of project vehicles, flying debris, occupational health hazards	The same as in Table 24	-2	Negative change /impact
2	Spread of HIV and other STIs as result of influx of workers which may lead to vices such as prostitution.	The same as in Table 24	-2	Slight negative change /impact
3	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

5.6 Potential impacts of project operational phase

The impacts of the Project during operation and maintenance phase have been identified and evaluated for each component and are as presented in Table 27; Table 28; Table 29 and Table 30 below.

Table 27: Mitigation measures at the Intake and Water treatment plant at Operation and Maintenance 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 spilled of chemicals such as chlorine and Aluminium Sulphate (Alum) and sludge containing Alum from WTP. Chlorine will 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 caked and handed over to NEMA certified waste handler for safe Disposal	-2	Negative change/impact
Water Resources				
1	Reduction in River Kahengye flow as a result of abstraction	• Limit abstraction to permitted abstraction rate • At no moment should abstraction exceed river flow rate. • Develop and Implement a comprehensive catchment management plan	-2	Negative change/impact
2	Sedimentation build-up of screened coarse particulate at intake sump	• Manual removal of built up screened coarse material from the river	-2	Negative change/impact
3	Pollution by backwash effluent, solid waste and chemicals. Has potential of causing fish kills and depriving other aquatic organisms of oxygen	• 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. • Backwash water should be clarified and the extracted sludge thickened, caked and handed over to NEMA certified waste handler for safe Disposal	-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**
		• Regularly monitor river water quality for contaminants according to NEMA, Uganda standards and advise appropriately • 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		
Health and safety				
1	Exposure to occupational health and safety hazards such as lifting heavy objects, working in confined places, handling hazardous materials and chemicals	• 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
2	Increased accidents within WTP 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 28: Mitigation measures of Transmission and Distribution mains at Operation and Maintenance 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, as well as the execution of excavation works, possibly using heavy equipment. This may induce or accelerate erosion.	• Limit excavation to only transmission routes • Removing the top soil prior to dumping any materials and returning later rehabilitation. • Use excavated soils for backfilling and levelling within the site premises • Timely remove and dispose of excessive quantities of excavated soil	-2	negative change /impact
Biodiversity				
Flora and fauna				
1	Inspection and maintenance works may require the removal of the natural vegetation, leading to potential habitat loss of its associated fauna.	• 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.	-2	Negative change /impact

No.	PIPELINES FOR TRANSMISSION AND DISTRIBUTION: PROJECT PHASE: OPERATION AND MAINTENANCE			
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Minimize temporary interference with private property (e.g. pipeline crossings over private lands) as much as possible • 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 and transportation of materials for maintenance, storage as well as 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 29: Identified and ranked impacts of Main balancing reservoir and storage reservoirs at Operation and Maintenance phase

No.	MAIN BALANCING RESERVOIR AND STORAGE RESERVOIRS: 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 of 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 ways 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 behaviour 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 30: Mitigation at the Feacal Sludge Treatment plant at Operation and maintenance phase.

No	CO COMPOSTING 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 Treatment plant Delivery/illegal dumping of hazardous waste including medical waste to the site.	• Enforcement of 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.	-2	Negative change
Water Resources				
1	Discharged treated wastewater and leachate will contain pathogens, high nutrients and heavy metals that can cause eutrophication (algal blooms) in the receiving water; thereby reducing concentration of dissolved oxygen for aquatic flora and fauna. This will lead to fish kill. Bio-accumulation of heavy metals from the leachate and effluent into aquatic environment can affect the aquatic food web.	• 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 stormwater that would cause the leachate to overflow; • Proper treatment of leachate in the water treatment pond designed as a component of the Feacal Sludge Treatment plant • Further purification/polishing of effluent from the water treatment pond in a constructed wetland • Locate point water sources such as wells and surface water at a minimum distance of 300 m from the discharge point of the Feacal Sludge Treatment plant	-4	Significant negative change /impact
Air Quality				

No	CO COMPOSTING PLANT	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
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. • Appropriate operation and management of the Composting process such as regular turning of windrows • The unsorted solid waste and the sludge has to be neatly arranged in windrows • Fencing 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;	-2	Negative change

No	CO COMPOSTING PLANT	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• Price the compost in a manner to encourage its adoption and use. • Establish demonstration gardens onsite to entice farmers to use compost.		
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.	• 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 Co compost workers to pathogens for infectious diseases such as dysentery, cholera, and typhoid worms. Risk of accidents by waste trucks Injuries to waste sorters Improper sanitation HIV/AIDS due to interaction of staff (sorters, truck drivers, senior staff, neighbours, etc.)	• 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; • Sensitize the workers on HIV/AIDS and provide condoms; • Enforce 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	-2	Negative change/impact

No	CO COMPOSTING PLANT	PROJECT PHASE: OPERATION AND MAINTENANCE		
	Potential impact	**Mitigation measures**	**ES Rank**	**Description of ES**
		• 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		
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

5.7 Analysis of potential positive impacts of the project

5.7.1 Improved standard of living and safe water coverage

Worldwide, water consumption is used as a measure of quality of living standard. The project will provide water supply and sanitation services to both formal and informal settlements in Rukungiri Municipality. It will include providing water to the existing water distribution network within the Municipality and installing water collection points through yard taps in enroute communities of Kebisoni in Kebisoni Sub County, Buyanja and Rwerere Town Boards. Currently, the peri-urban areas are dependent on point water sources that are vulnerable to pollution during rainy season. Eighty seven percent (87%) of persons interviewed during socio- economic survey depend on spring water sources. The increased supply of safe water from the current 343 m^3/d to 7,200 m^3/d in 2030, the immediate year and to 9,600 m^3/d in 2040 will end the water shortage in the project area.

No water and sanitation facilities are planned to be constructed within the informal settlements but instead, water distribution pipelines will be extended to the informal settlements where water kiosks and yard taps will be located at least a radius of 100 m from home steads. This will improve public health and hygiene in these informal settlements. This will reduce reliance on point water sources, which are prone to contamination and often overcrowded with long waiting times. Moreover, the yard taps will be within a short walking distance and will reduce the burden of carrying water over long distances. 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. Women will then have more time to engage in gainful economic activities while children especially girl children will concentrate more on education. In order to enhance these impacts a preferential pro-poor tariff for their yard taps and kiosks selling water and sewerage services should be established. There is no need of land acquisition because the water distribution mains will be strictly in the road reserve. This positive impact is ranked +4 implying a significant positive change or impact.

Enhancement measures

- The operator of the project should supply water to the population without discrimination at affordable rates to realize the benefits of the project, thus ensuring its sustainability. On-time billing and keeping users up to date on the status and functionality of the various project facilities will ensure reliability and guarantee functionality and sustainability.

- The construction supervision team must ensure yard taps are provided at a radius of 100m as recommended in the water supply design manual. Sensitization efforts must be made towards management of the water supply and sanitation system. If a Community Based Management System is 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.

5.7.2 Improved Public Health, Hygiene and Household health Status

Findings from the feasibility socio-economic survey revealed that, in Rukungiri, at present, sanitation systems can be considered very rudimentary. Most of population use pit latrines that are not regularly emptied or properly maintained. No central services are provided for faecal sludge treatment and proper disposal. Sludge is dumped in an uncontrolled site, as well as municipal solid waste. Additionally, the ESIA survey findings indicate that people collect water from open water sources like rivers and streams, which are prone to contamination. The proposed water supply project shall ensure that for the targeted population, health is improved through provision of a system that is able to reduce the risk of water contamination, the spread of pathogens and water borne disease transmission. In the proposed project design, water borne public latrines with six stances shall be constructed which shall also be accessible to the persons with disabilities (PWDs). This will contribute to improvement in the level of hygiene and sanitation in the project area. This impact is ranked a significant positive +4 impact.

Enhancement measures

An awareness campaign on issues of public health, hygiene and sanitation is also very critical. Hence sensitization is important. Hand washing should be encouraged. Body bathing, cleaning of clothes, utensils and dwelling areas particularly toilets will improve the public health of the project area. The sorting of solid waste at source and handling it over to waste collection provider for disposal at the municipality disposal will improve public health.

5.7.3 Improvement in household economic status

There will be reduced expenditure on water since the project activities involve extending the water transmission lines to several underserved areas. The total length of the proposed distribution system is 39,118 m, which is long enough to extend even into poor and informal settlements in the project area. Currently, average expenditure on water stands at UGX 300 to UGX 500 per 20 litre jerry can from water vendors. Improvements in supply will lead to consistent access to nearby and affordable safe piped water. This impact is ranked a positive +2 impact.

Enhancement measures

It is recommended that, rates at which people can access water remain user friendly and should be in line with those established by the MWE Water Supply Design Manual to enable people to access the water from the project.

5.7.4 Improvement in school enrolment and attendance

The implementation of the Rukungiri WSS project will lead to considerably improve the availability and consistent access to safe water in the project area. Consequently, time spent on searching for and waiting for water by women and children will be reduced. This will enable children, especially the girl child to regularly and promptly attend school, while mothers will get more time to prepare their children for school and do other household chores. Assuming other factors are available (such a scholastic materials, teachers) school attendance and performance will improve. This impact is ranked a positive +2 impact.

Enhancement measures

The project should ensure that water points are distributed evenly and in short walking distances from people's homes so that, people particularly the women and girl child are able to access them in a short time to save on time they spend on looking for water and waiting at distant water sources. Complementary initiatives in form of skills training for livelihood improvements should also be conducted to reduce poverty among the PAPs. This will enable affected families to address other barriers hindering children particularly the girls from attending schools such as scholastic materials, sanitary pads and others.

5.7.5 Reduction of domestic violence

In most rural households (HH), 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 at least a yard tap should be within 100m from the homestead.

5.7.6 Increased employment

Employment opportunities will be available for numerous disciplines/professions during the pre-construction, construction, operation and decommissioning phases of the project. At least 150 people will be employed during the construction phase and at least 35 people will be employed during the operational phase. Skilled labour and unskilled labour alike will be required. The predicted benefits attained from increased employment will vary according to project phase.

The benefits will be slight positive impact at operation and maintenance phase as fewer skilled people are employed but during the construction phase, the benefits in terms of job creation will be a moderate positive change (ES +3). This is so because at construction of project components, much skilled labour such as engineers, consultants, foremen, mansions will be drawn all over the region including international technical people while numerous unskilled labourers will be sourced from neighbouring communities and beyond. 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 they expect to get jobs during the project construction phase. 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 residents with skills and training. Where possible, interested communities should be trained in scheme management. The entire unskilled workforce should be provided by the local community.

- Women, youth and persons with disabilities should not be discriminated and all employees should be issued appointment letters that clearly spells out an understandable terms of employment. Prompt payment of workers must be ensured by the contractor and scheme operator.

5.7.7 Market for locally available materials and farm produce

There will be markets for locally available raw materials such as cement, iron bars, timber, wood, aggregates, sand, electro-mechanical equipment and pipes for the construction and operation phases. Since at construction phase 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 other products. This is a +1ve slightly positive change.

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.

5.7.8 Skills training and technology transfer

Skills and technology transfer is foreseen to take place in all phases of the project, though most importantly at the construction phase. The Contractor is expected to incorporate interested members of the local community and other interested persons or run an internship / apprenticeship program with Ugandan undergraduates to facilitate knowledge and technology transfer. If a foreign company will be contracted, it shall be required to have a joint venture with a local company to build capacity of the local company for similar projects. The benefits of skill training and technology transfer are given a RIAM Environmental Score (ES) of +3 implying a moderate positive change.

Enhancement measures

The contract terms for contractor and even construction supervision should emphasize skills transfer. In addition, foreign companies would be required to have a joint venture with local companies to build their capacity. The contractor should have a clearly defined internship program for students.

5.7.9 Economic benefits

Benefits to the Ugandan economy are foreseen to accrue mainly during the construction and operational phases of the project by charging 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), Income Tax, Local Taxes etc. The provision of safe water from the project will help reduce incidences of water borne diseases like cholera, typhoid and dysentery. Hence the workforce will have more productive time rather than spend it in health facilities or bedridden. Funds meant for treating water borne diseases will be available to treat other diseases hence improving the health service sector.

Enhancement measures

The Central Government through the Uganda Revenue Authority should ensure that the contractor and scheme operator make periodic and timely tax returns.

5.8 Analysis of significant potential negative impacts

The identified negative impacts of the Rukungiri WSS Project were ranked using the Rapid Impact Assessment Matrix (RIAM) evaluation criteria. The identified and ranked impacts are presented in Table 24 up to Table 30 in Chapter 5 above. The analysis provided below are focused mostly on impacts, which are anticipated to cause moderate (ES rank -3) and significant (ES Rank -4) negative impacts. No impact was evaluated to cause major (ES Rank -5) negative impact. The impacts are analysed per environmental receptor as categorised below.

5.8.1 Loss of vegetation and forage for animals

Clearance of vegetation at all construction sites will result in loss of forage and terrestrial habitat. This may slightly impact livestock and change the micro-climate of the local area. The loss of vegetation may reduce the micro-habitant of below and above ground organisms. Loss of wetland macrophytes at the intake and the co-compost plant may temporarily reduce the foraging range of the IUCN Red Listed Grey Neck Crested Crane.

This impact is ranked as slightly negative -1 ve impact because the project will be in an already built up environment like the central business district of Rukungiri Municipal Council. The transmission lines and distribution lines will be in the road reserve, which have no conservation value.

Mitigation measures

The cleared construction sites should immediately be landscaped and species matching carried out to plant appropriate trees. Priority should be given to indigenous tree species. Bare ground at construction sites should be planted with grass especially *Paspulum* spp to prevent soil erosion.

5.8.2 Occupational Health and safety

Water supply and sanitation construction and operational employees meet many occupational hazards at the workplace. Examples include repetitive stress injury, cumulative trauma, musculoskeletal disorders, etc. These are generally caused by work conditions that result from using the body in a repetitive way and end up causing injury or traumatizing the body. At times the work environment is poor. For example, low and high illumination; poor ventilation or windy conditions; noisy conditions; high or low humidity; poor working environmental conditions e.g. working under high

temperatures etc. These usually may lead to accidents at the work place and/or low performance. The result is unhealthy workforce.

The impact of occupational hazards, though localized and temporary, can be immense in magnitude, irreversible and cumulative in effect, thus a Moderate negative change at RIAM ES of -3.

Mitigation measures

- Prepare and approve occupational safety and health plan for all sites. The Contractor shall provide safety guidelines to all construction equipment operations prior to start of work; wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats/helmets and safety boots be encouraged.
- Establish emergency entrances, exits and amenities.
- Ensure access to first aid kits.
- Ensure safe working heights through provision of work platforms, scaffolds and adequate supervision by ensuring regular inspection of formwork, false work and temporary supports before loading or pouring concrete.
- Secure site boundaries with fences or hoardings as appropriate.
- 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.

5.8.3 Pollution of water source

During the construction phase, River Kahengye water is likely to be polluted by solid waste generated at the intake. Chemicals such as oil, fuel and lubricants from construction equipment and vehicles are likely to spill into the river. The pollutants are very dangerous and can reduce the ecosystem services of the River Kahengye. Considering the high flows of River Kahengye and the fact that the input of the pollutants will be temporary (only during construction), the impact is anticipated to cause a negative impact (ES rank -2) during construction.

Mitigation measures

- Prepare site waste management plan prior to commencement of work, including appropriate waste storage areas, collection & disposal schedule;
- Wastes must be appropriately segregated into metallic, plastic, glass & biodegradable.
- Waste bins be provided at appropriate points.
- Reusable wastes should be sold or given away to interested parties.
- Excavation material should be used for site levelling/backfilling.
- Wastes must be disposed at only NEMA approved sites.

5.9 Immediate, long-term and cumulative impacts

5.9.1 Backwash discharge

During the operation phase, backwash water from the water treatment plant will be returned to the River Kahengye. The backwash water carries toxic aluminium sludge from aluminium sulphate used as a coagulant and suspended solids.

Alum sludge contains a high moisture content (97 to 99.5%) and a low solids content. It generally settles readily but does not dewater easily. It has been the most difficult sludge to treat because of several peculiar properties. Although alum sludge has high 5-day biochemical oxygen demand (BOD_5) and chemical oxygen demand (COD), it usually does not undergo active decomposition or promote anaerobiasis. It is reported to have a total solids (TS) content of 1000 to 17,000 mg/L (AWWA, 1969a), of which 75 to 95% is total suspended solids (TSS) and 20 to 35% is volatile solids (VS). The pH value ranges between 5 and 7. The BOD_5 of alum sludge ranges from 30 to 150 mg/L. The COD values are high, ranging from 500 to 15,000 mg/L (AWWA, 1969a).

Aluminium ion is toxic to plants and is a nervous inhibitor in animals. Its continuous disposal into the environment will lead to Aluminium poisoning in animals including man and death of plants. This impact is cumulative and is ranked as significant negative -4 ve impact.

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 of backwash effluent into River Kahengye will have a cumulative effect and could be exacerbated by low dilution effect. Nonetheless, the ratio of the planned effluent discharge (of 15 m³/h) against the D7QQ95 flow (i.e. 85732m³/day) of river Kahengye is as high as 1:238, implying the effluent will be highly diluted and the impact of the backwash effluent on the receiving water will be minimal.

Mitigation measures

Backwash water should be filtered and allowed to settle so that suspended matter is removed before discharging it back to River Kahengye. This calls for the design and construction of sedimentation tank. Water treatment sludge containing alum should be dewatered and dried at the water treatment plant. It should be collected, stored and handover to a NEMA registered hazardous waste handler. In its disposal the solid waste should be incinerated in a controlled environment.

5.9.2 Discharge of effluent from 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 shallow aerobic treatment pond, which allows UV treatment of pathogens in leachate before it is released into the receiving wetland. Although the hydraulic residence time in the shallow treatment pond is as long as 30 days to allow reduction of 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. It is anticipated that proposed design will not meet the Uganda sewage effluent discharge standard.

The continuous release of effluent from the co-compost plant will release pathogens, organic load, nutrients and heavy metals into the receiving wetland. The common pathogens include worms, water borne diseases like typhoid, dysentery and cholera. It is anticipated the organic matter will cause de-oxygenation of aquatic environments leading to fish kills, odour and the re-suspension of toxic heavy metals from sediments back into the water column. Sewage effluent has nutrients that will cause excessive fertilisation of water that will lead to algal blooms a condition called eutrophication.

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. 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 or flooding of the FSTP. 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.

The effluent discharge would increase nutrient load i.e. phosphates and nitrates derived from grey water and sewage into the receiving environment in this case Kinyasano wetland and finally into a stream. Excessive plant nutrients in an aquatic environment will cause the fertilization of the water, hence growth of algal blooms

(eutrophication). The continuous release of organic matter from the effluent and the die off of the algal blooms will caused deoxygenation of the water due to decomposition. This will lead to death of aquatic organisms like macro-invertebrates, zooplanktons and phytoplankton. In extreme cases where deoxygenation is less than 2 mg/l of oxygen will lead to fish kills. Eutrophication and deoxygenation of the water will kill off beneficial algae leaving cyanobacteria, which produce toxins, to become dominant. Deoxygenation will also cause anoxic conditions in river sediments. This will lead the release of heavy metals from the sediments back into the water column. The continuous release of heavy metals from co-compost effluent and that, which will be re-suspended from the sediments, will increase heavy metals in the water. This will lead to heavy metal pollution. These heavy metals will find their way into the food chain because this wetland is used as farm and grazing land downstream. This impact is cumulative and is ranked as significant negative -4ve impact.

Mitigation measures

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

5.10 Social analysis of significant negative impacts

5.10.1 Child abuse and early age pregnancies

During construction and operation phase workers will have disposable income earned from being employed on the project. They might engage in sexual acts with under age children particularly the girl child. This may result in early age pregnancies. One of the major consequences arising from this would be 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 many parts of the country and from different cultural and sexual backgrounds, it is possible that some of them introduce foreign sexual behaviours in the project area such as having sex with young boys. This is child molestation. This impact is ranked as -4 ve significant negative impact.

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 emphasise that molestation of children especially the girl child 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.

5.10.2 Child Labour

It is generally anticipated that local labour will be employed especially as casual labourers. This anticipation is very high on the side of community leaders and members in the project areas. However, although this is a good gesture that is likely improve household income due to employment of local labour, if not properly managed and coordinated could potentially result into recruitment of children to provide labour on the project. Child labour is condemned by all international conventional instruments

including those of the International Labour Organization (ILO) and the United Nations (UN) as well as the Ugandan laws.

Mitigation measures
During both construction and 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.

5.10.3 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. Currently, HIV/AIDS prevalence rate in Rukungiri stands at 8%. This is higher than the National prevalence rate of 6.8%.

The impact of increase in HIV/AIDS and STDs, though temporary and reversible, will be regional in context, immense in magnitude and cumulative in effect, thus a negative change at RIAM ES of -2.

Mitigation measures
Sensitize workers on proper social behaviour and conduct with regard to community norms, 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.

5.10.4 Potential disruption to sources of income

Based on the valuation report, the majority (269) of the people to be affected by the project are within the transmission mains. Only 10 people shall be affected by the water reservoir, one by the water intake and similarly the water treatment plant shall affect one person. As has already been indicated, majority of the PAPs (62.9%) are involved in farming (crops and animals combined). This implies that, the proposed water supply project will potentially disrupt farming activities along the transmission lines. However, this disruption is of short term duration and the PAPs will return to use the their land for cultivation when pipe laying is completed. The crop types affected are annual crops; no perennial crops are grown along the road reserves.

Additionally, 98.1% (180) respondents also indicated that, the affected land is not their principal land of residence which implies that, they have alternative economic activities located elsewhere. These results suggest that, whereas the affected people face economic displacement, they can survive on alternative sources of livelihood located elsewhere, on the residual land or that land that is outside the project area.

Mitigation measures
The construction speed much be fast so as minimise disruption of farming activities. Additionally, construction through farmland should restricted to fallow period.

5.10.5 Loss of land and livelihood

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 line through private land for acquisition and compensation of crops that would be affected. When pipe laying is completed, the PAPs will be able to cultivate over the pipe lines, but not to erect permanent structures.

Most of the transmission mains will inevitably pass through 1.534 acres of land belonging to 19 PAPs in order for it to reach the seven storage reservoirs that are all located on hill tops on private land. The water reservoirs will also need 0.825 acres of land to be compulsory acquired from six landowners, while the intake and water treatment plant will need 0.166 and 3.397 acres respectively. Crops such as Eucalyptus trees, bananas, coffee, Gravelia, Avocado, Mango, potatoes and Jackfruit will be lost. According to the RAP UGX 88,064,000 worth of crops will be destroyed while the total land cost will be UGX 148,785,000. In total, 5.922 acres of land will be acquired from 25 PAPS in Buyanja Sub County. The details of the land take and the total land owned by the PAPS are shown in Table 31 below where it is seen that no resettlement actions are triggered since the land take covers only a small portion, for the duration of the construction activities.

Table 31: PAPs affected by Land take for the project

No	Item	Village	Parish	Sub County	Land Take Details		Remarks
					Acreage required	Land owned (acres)	
	Intake Works						
1	Late William Karigwende	Kabashaki	Kabingo	Kebisoni	0.166	15	No resettlement triggered.
1	**Water Treatment Plant**						
1	John Biretwaho	Kabashaki	Kabingo	Kebisoni	3.397	15	No resettlement triggered.
	Feacal Sludge Treatment plant						
	Winnie				3.2		Part of the 3.2 acres will be from a wetland under NEMA stewardship No resettlement triggered.
	Mukazi Reservoir						
1	Silver Kamuhangire	Mukazi	Karuhende	Kebisoni	0.110	5	No resettlement triggered.
2	Grace Turyagumanawe	Mukazi	Karuhende	Kebisoni	0.037	2	No resettlement triggered.
3	Vincent Twinobyesigye	Mukazi	Karuhende	Kebisoni	0.001	0.5	No resettlement triggered.
4	Erivaida Kamayangi	Mukazi	Karuhende	Kebisoni	0.039	0.5	No resettlement triggered.
	Kebisoni Reservoir						
1	Adam Muzoora	Nyamigonogo	Karuhende	Kebisoni	0.087	5	No resettlement triggered.
	Buyanja Reservoir (Gravity Scheme)						
1	Stanley Munabi	Matebe	Buyanja Town	Buyanja	0.076	15	No resettlement triggered.
	Buyanja Reservoir (HLR)						
1	Buyanja Sub County	Town Cell	Buyanja Town	Buyanja	0.101	5	No resettlement triggered.
	Rwanyakashesha Reservoir						
1	Winnie	Kifunjo	Eastern Division	Rukungiri MC	0.192	1	No resettlement triggered.
	Bwoma Reservoir						

No	Item	Village	Parish	Sub County	Land Take Details		Remarks
					Acreage required	Land owned (acres)	
1	Gershom Byamukama	Bwoma	Northern Division	Rukungiri MC	0.092	3	No resettlement triggered.
	Rwerere Reservoir						
1	Solomon Bagujuna	Rusoroza "A"	Rwerere	Nyakagyeme	0.089	4	No resettlement triggered.
	Transmission Line						
1	Late William Karigwende	Kabashaki	Kabingo	Kebisoni	0.057	15	No resettlement triggered.
2	John Biretwaho	Kabashaki	Kabingo	Kebisoni	0.087	15	In total 23.2% (3.484 acres) of his land will be taken for the project No resettlement triggered.
3	Tarabirewe Mahonde	Kigango	Karuhende	Kebisoni	0.088	3	No resettlement triggered.
4	Joram Bahikirira	Kigango	Karuhende	Kebisoni	0.025	5	No resettlement triggered.
5	Eridard Byamuntu	Mukazi	Karuhende	Kebisoni	0.044	4	No resettlement triggered.
6	Mahonde Tarabirewe	Mukazi	Karuhende	Kebisoni	0.042	5	No resettlement triggered.
7	Nasanairi Nkobwa	Mukazi	Karuhende	Kebisoni	0.126	3	No resettlement triggered.
8	Alfred Byamugisha	Mukazi	Karuhende	Kebisoni	0.035	4	No resettlement triggered.
9	Mahonde Tarabirewe	Mukazi	Karuhende	Kebisoni	0.111	3	No resettlement triggered.
10	Vincent Twinobwesigye	Mukazi	Karuhende	Kebisoni	0.047	3	No resettlement triggered.
11	Erivaida Kamayanji	Mukazi	Karuhende	Kebisoni	0.031	4	No resettlement triggered.
12	Andrew Byahangirwe	Mukazi	Karuhende	Kebisoni	0.029	4	No resettlement triggered.
13	James Kamugisha	Mukazi	Karuhende	Kebisoni	0.048	2	No resettlement triggered.
14	Alex Tukwasibwe	Mukazi	Karuhende	Kebisoni	0.048	4	No resettlement triggered.
15	Mary Turamusiima	Mukazi	Karuhende	Kebisoni	0.237	6	No resettlement triggered.
16	Adam Muzoora	Nyamigonogo	Karuhende	Kebisoni	0.001	5	No resettlement triggered.
17	Buyanja Sub County	Town Cell	Buyanja Town	Buyanja	0.220	5	No resettlement triggered.
18	Winnie	Kifunjo	Eastern Division	Rukungiri MC	0.084	1	No resettlement triggered.

No	Item	Village	Parish	Sub County	Land Take Details		Remarks
					Acreage required	Land owned (acres)	
19	Solomon Bagujuna	Rusoroza	Rwerere	Nyakagyeme	0.174	1	No resettlement triggered.

In all sites, there will be no resettlement as no settlement exists at any of the sites proposed for project development nor do any structures exist along the transmission routes. The only structure to be affected is a pit latrine at the site for water treatment but its replacement cost has been adequately catered for in the RAP report. The residual land of the PAPs have been assessed. The land take for the project will neither deprive the PAP of entire livelihood nor cause the PAPS' displacement. Therefore project will only cause slightly negative impact -1 ve.

Mitigation measures

Land take and loss of livelihood will be solved through the Resettlement Action Plan prepared along with this ESIA. It suffices to say here that the PAPs should be adequately compensated in a timely manner. PAPs should be sensitised how to use the money got from the compensation.

6 ANALYSIS OF ALTERNATIVES

6.1 Siting and design alternatives

6.1.1 Water source

Feasibility study considered the following rivers as alternative sources; Yawambi, Mitano, Kahengye and Birira. River Yawambi was discarded because its catchment area is too small to support the daily abstraction throughout the year without disrupting its hydrologic regime and ecological system. Although River Mitano has a reasonably high discharge to satisfy the demand, the river is situated in a very deep gorge that would make accessibility and later project implementation very difficult (Studio Galli Ingegneria (SGI), 2014).

In a study by M&E Associates Consulting Engineers Ltd (Studio Galli Ingegneria (SGI), 2014), Rivers Kahengye and Birira were considered the suitable sources for water supply because their discharge can easily meet the projected demand. However, the option of River Kahengye was found to have the best Internal Rate of Return, Best Investment and Re-Investment Capital Costs, Lowest Operation and Maintenance Costs, Lowest Per Capita Investment & Re-investment Costs, and Best Net Present Value, hence the option of Kahengye River as raw water source for the entire project area was considered (Studio Galli Ingegneria (SGI), 2014)

Two criteria were used to evaluate the potential of a river source in satisfying the demand: - The 7 – day average daily flow that can be exceeded 95% of the time (D7Q95) and a low flow with a return period of 25 years (T25). The selection criteria requires that after allowing a 10 – 30% of daily river flow as environmental flow, the ratio of the D7Q95 and T25 flows should be greater than one. This is to ensure that project abstractions both at high flows and lows conditions, still leaves adequate water to support the life of downstream flora and fauna.

Therefore, the D7Q95 of River Kahengye at the bridge (abstraction point) is 85,732 m³/day, which after allowing 12% as environmental flow, the safe yield would still be 9.8 times larger than the 2040 water demand. The environmental flow is usually allowed between 10 – 30% of the daily flow. The low flow with a 25 years return period was found to be 20,301 m³/day. Thus, the ratio of low flow to 2040 demand after allowing 12% of the daily flow as environment flow is 2.3.

The water from River Kahengye was sampled during rainy season when a bad quality was expected. The results of the quality analysis done at National and Sewerage Corporation Laboratory, Bugoloobi are summarized in Table 32 below.

Table 32: Quality parameters of River Kahengye water.

Parameter	Units	River Kahengye	National standards for potable water (Class I)
Turbidity	NTU	74	5.0
Total Dissolved Solids (TDS)	mg/L	53.5	500
Total Suspended Solids (TSS)	mg/L	64	0.0
Fluoride: F	mg/L	0.0	1.0
Iron: Total	mg/L	2.3	<0.20

Since the ratios of D7Q95 and T25 flows to the water demand are greater than one, it implies the abstraction the River Kahengye water for the project will not affect the life of fauna and flora downstream because adequate flow will be left in the river during both low and high flows.

6.1.2 Water treatment plant site

During feasibility study, the design team considered technical feasibility in choice of sites for the WTP. Among the criteria used were; firm soil conditions at the WTP site, suitability of the site for gravity flow of the treatment process, accessibility to the site, distance to the main consumption area and distance to the next power connection possibility. In their technical judgment, two sites were proposed:

I. Locating WTP with the intake or

II. Locating WTP 700 m away from intake on a hill at Kabingo Parish at UTM 36S coordinates (171080 N, 9908026E, 1432 masl).

Although locating WTP at intake would reduce energy cost and ease management of the whole system, it would require more land than is available at site, higher cost of extending the power required and the clean water transmission line would have very high pressures. The latter has cost implication as pipes with higher pressure ratings would be necessary to deliver water to the main balancing reservoir. Therefore, the WTP site 700m away from the intake was preferred because of lower pressure in the clean/pure water transmission line.

The owners of the land on which the WTP is proposed were consulted and they are willing to negotiate for a land take for the project. Payment and compensation for land uptake for this site will be according to the recommendations of the RAP, which is co-currently being prepared along with this ESIA.

The biodiversity resources at the proposed WTP located at geographical coordinates 36 M 170954/ 9907966 (UTM), is characterized as a fallow/ grazing with *Paspalum notatum* and some *Hyparrhenia filipendula, Panicum maximum,* with *Lantana camara* and *Tithonia diversifolia* and sparse trees of *Eucalyptus grandis* and *Markhamia lutea.* The surroundings were partly cultivation land for mainly *Ipomoea batatas, Arachis hypogaea* and *Zea mays.* No faunal biodiversity was found to be red listed by IUCN. Therefore construction of WTP will not lead to loss of biodiversity.

Figure 6-1: Satellite image and picture (taken) showing site for WTP.

6.1.3 Storage reservoir sites

With the exception of site for Main Balancing reservoir at Mukazi Hill, all the sites chosen for service reservoirs already have reservoirs installed and are owned by Rukungiri Water Authority. Addition of a storage reservoirs at sites of existing reservoirs imply additional but nearby land will be acquired. The choice of sites for storage reservoirs was based 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.

Main balancing reservoir

The following formed the basis of making informed choices of locating the main water reservoir at Mukazi hill in Karuhumbe parish, Kebisoni Sub County; high elevation where water would flow by gravity to other storage reservoirs, firm soil conditions for the construction and accessibility to the site. The 0.11 acres land marked for the reservoir will be acquired from Kamuhangire Sylver, Turyagumanawe Grace, Twinobyesigye Vincent and Kamayangi Erivaida of Mukazi village in Karuhende parish in Kebisoni sub county. The land acreage to be taken is a small fraction of the land owned by each of the PAPs. Therefore, this acquisition will neither result into resettlement nor deprivation of livelihood of any PAP. The land is already agricultural land and there will be no loss of biodiversity. Compensation will be according to the recommendations of RAP.

6.1.4 Feacal Sludge Treatment plant site

The design consultants with the guidance of the beneficiary Rukungiri Municipal Council considered the following criteria in the choice of suitable sites for Feacal Sludge Treatment plant and a sewerage treatment plant; sites with topography that would 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.

Using this criteria with the client's guidance, a large open privately owned land (at UTM 35M 0824362E, 9912733N) in Kinyasano valley westward of the town was identified as suitable for Feacal Sludge Treatment plant and waste water treatment lagoon planned for subsequent project phase: It is accessible through Kanungu Road. The land gently slopes towards a wetland (as shown in Plate 9) with a topography that can permit gravity flow especially for the draining excess liquid from the compost mixture. However, the landowner expressed unwillingness in letting it for the project. He further informed the ESIA team that a University College is planned to be built on the land.

Plate 9: The land cover of the site that was proposed for Feacal Sludge Treatment plant.

(Note the animal water trough in the background).

To avoid any encumbrance, the Municipality authorities identified two alternative sites for Feacal Sludge Treatment plants. The environmental assessment of the alternative sites are presented and discussed below.

The two alternative sites identified for Feacal Sludge Treatment plant were: a wetland (at UTM 35M coordinates, 0825072E, 9913162N) between Northern Ward and Kinyasano Ward and a private land near a wetland at UTM 35M coordinates 0826136E, 9916574N. Table 33 below provides a comparison of the proposed sites in terms of technical feasibility land ownership and willingness to offer the land and environmental resources that could be impacted by the project.

Table 33: Comparison of the three sites for Feacal Sludge Treatment plant

No	Criteria	Co–composting site	Co –composting site Alternative 1	Co –composting site Alternative 2
1	Location	 Located on a private land (farm) in Kinyasano Cell 1B, Kinyasano ward, Western Division at UTM 35M coordinates 0824362E, 9912733N. Slopes towards KInyasano valley and wetland where it drains its runoff	 It is located on a wetland between Northern Ward and Kinyasano Ward in Western Division at UTM 35M coordinates, 0825072E, 9913162N.	 Private land near a wetland at UTM 35M coordinates 0826136E, 9916574N
2	Site description	Assess to the site for detailed Ecological assessments was denied	It's a flat landscape composed of wetland vegetation mainly characterized by *cyperus sp* which is greatly degraded by human activities such as farming, land filling and dumping of human wastes. Cultivation is mainly concentrated at the centre of the site and crops grown include maize, yams and a lawn of elephant grass. Also eucalyptus	In a valley. Mainly a wetland of marshy vegetation at the centre interspersed by scrubland defined by *Lantana camara* as you move towards the edges. Foot trunks of cut eucalyptus and sparsely standing eucalyptus trees are visible. The area is disturbed by brick making and tree harvesting.

No	Criteria	Co–composting site	Co –composting site Alternative 1	Co –composting site Alternative 2
			plantation was evident at the edge of the wetland.	
3	Technical feasibility	The site is suitable for gravity flow/ drainage of leachate from faecal sludge and organic waste mixtures. Designs can be easily adapted to its topography to minimize excavation and filling. it's accessible by tracks and machinery because of nearby roads,	The wetland is flat, may require filling to achieve gravity flow or drainage of leachate from faecal sludge – organic waste mixture. Filling will be required to achieve gravity flow or pumped a system will be necessary. It's accessible by tracks and machinery because of nearby road	Located on a hill that slopes towards a wetland. Gravity flow / drainage of leachate from faecal sludge – organic waste into water treatment pond is possible. The site is accessible through Kanungu road
4	Land ownership and willingness to negotiate for land take	Private. The owner plans to open a university college on the same land. Not willing to negotiate for a land take	Wetland under stewardship of Wetlands Management Department will be consulted on the Wetland	Private land and a wetland under stewardship of NEMA. The owner of the private land is willing. NEMA will be consulted on the Wetland
5	Environmental issues and impact	Assess to the site to undertake Ecological assessments was refused	Has a relatively higher abundance of amphibians (29 specimens were encountered during assessment). This is so because of the favourable wetland condition. This will affect wetland flora and fauna particularly the IUCN red listed grey crested crane.	Have a high abundance of amphibians (20 specimen were encountered during ecological assessments). This will affect wetland flora and fauna particularly the IUCN red listed grey crested crane.

Both alternative sites are near a wetland with a high biodiversity of amphibians thereby posing environment impact of similar magnitude on the fauna. However, Alternative site 1 is entirely on a wetland and implementation of the project on it can result into a complete disappearance of the wetland unlike alternative site 2 where only part of the wetland will be used. The alternative site 2 is anticipated to experience a lesser impact than alternative site, therefore it was recommended for the Feacal Sludge Treatment plant.

6.2 Technology selection alternatives

6.2.1 WTP technology selection alternatives

The type of treatment operation performed at a WTP and treatment chemicals used depend largely on the contaminants present in the source water (EPA, 2011). The treatment process to improve River Kahengye water quality presented Table 5 to meet Uganda Drinking Water Standard 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 dissolved metals such as iron, hydrogen sulfide, 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 oxidation.

The aeration method chosen for this project is air – to – 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 is dependent on oxygen concentration and the pressure used. This method favors 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. There generally 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 34 are comparison of the pros and cons of the available flocculants.

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 coagulant is the choice 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.

Table 34: 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;

	Inorganic coagulants (Aluminium/Ferrous sulphate/chloride)	Polymers (polyelectrolytes)
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 prove to be a more environmental friendly coagulant, it's cost and 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 Kahengye because it is readily available at a relatively lower cost.

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 35* below is a comparison of suitable types of filters for WTP of the scale of Rukungiri 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 very suitable for the situation.

Table 35: 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 underdrain 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 underdrain 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 sand filters have filter rates 40 time those of slow sand filters. (Minesota Rural Water Association, 2009)	

Filter type	Characteristic	Pros/cons	Cons
	rapid filters has larger voids that do not fill as easily.		
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 above.

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 36 compares the different types of disinfectants suitable for this project.

Table 36: 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.
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 presented in Table 36 above, ozone is the most efficient disinfectant but not a persistent disinfectant, thus the water may become unsafe at the consumer premises if contamination occurs along transmission/distribution lines and at reservoirs. And since it is difficult to fulfil the legal limit for the formation of bromate during the process of ozonation, most WTPs tend not to employ ozonation. Chlorine and chloramines are more effective in secondary disinfection in comparison to chlorine dioxide (Less persistent chemical). Lastly, though the combined residual from chloramines lasts longer than chlorine residuals, chloramines are not as effective as other germicidal agents.

Although less persistent, Chlorine dioxide (hypochlorite) has been proposed for treating water in this project because of its high disinfection efficiency and the ease of handling it since the disinfectant will be stored in granules and only prepared from brine 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).

- 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, but 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 is 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 experience to ably handle chlorine is available in NWSC and other service providers.

6.3 Design Alternatives for Wastewater treatment plant

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). Given that this project is targeted to 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 viable option as it can recover manure from waste that would ordinarily be landfilled. Composting is congruent with the new waste management approaches that recommend Reduction, Reuse and Recycling of waste. Feacal Sludge Treatment 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 (see Table 37) such as activated sludge and aerated lagoons may not be sustainable operated. Waste stabilization ponds and constructed wetlands could be opted for given that they are low energy based systems.

Table 37: Technology analysis of applicable for Faecal Sludge Treatment Plant types.

Criteria	Feacal Sludge Treatment	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 High removal of helminth eggs possible (< 1 egg viable egg/g TS)	WSPs are among the most common efficient methods of wastewater treatment around the world. They are appropriate for rural communities that have large, open unused lands, away from homes and public spaces. High reduction in pathogens	Aesthetically pleasing and provides animal habitat High reduction in BOD and solids; moderate pathogen removal Can be built and repaired with locally available materials No electrical energy required

Criteria	Feacal Sludge Treatment	Waste Stabilization ponds (WSPs)	Constructed wetlands
	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	Can be built and repaired with locally available materials Low operating cost No electrical energy required No real problems with flies or odors if designed correctly	No real problems with flies or odors if used correctly
Cons	Long storage times Requires expert design and operation Labor 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. Although, waste stabilization ponds is common and there are vast experience in its operation in Uganda, water borne toilets are not yet well developed in Rukungiri Municipality to optimally utilize the potential of waste stabilization ponds. The Waste Stabilization ponds was recommended for the 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.

6.4 The "No Project" alternative project justification

6.4.1 The No Project Option

This alternative, also known as the do-nothing alternative, means the project is not implemented. This means project site remains in its current state, with neither positive nor negative impacts in the short term. The existing poor water supply and sanitation services in the area would continue to exist. In the long term, the no-project scenario would be more disastrous as 78% of the population in Rukungiri District would continue using point water sources that are prone to contamination and presenting a high risk of spread of waterborne related diseases. This would imply more health burden on the local communities and perpetuate poverty because 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 be futile.

Specifically, the areas of Rukungiri Municipality, Rwerere in Nyakajeme and the enroute communities in Kebisoni and Buyanja sub counties would be denied the following benefits: -

- improved the public health conditions through increased coverage and provision of potable water and sewage collection and treatment facilities,
- stimulate 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,

- Upon completion, the project will lead to a reliable supply of potable water and spur development.

6.4.2 Negative impacts that would be obviated if the project is not implemented

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

i. The water resource potential of the proposed water supply source, River Kahengye, would remain unchanged as water will not be extracted.

ii. Short-term impacts such as noise, dust generation, vibrations, etc., emanating from construction activities would be avoided.

iii. The loss of the relatively small amounts of agricultural land to the construction of water treatment works, faecal sludge treatment works, and storage reservoirs would be avoided.

iv. Temporary inconveniences emanating from construction activities within urban areas such as temporary road closure for pipeline crossings, would be avoided.

v. The limited odour nuisance associated with well managed Faecal Sludge Treatment Plants would be avoided.

vi. The health risks associated with handling of harmful water treatment chemicals would be avoided.

vii. The associated dangers of releasing of wastewater directly into receiving water in case of treatment system failures would be avoided.

6.4.3 The need for improved sanitation facilities

The "no project" alternative poses more risk of water contamination, spread of pathogens and water borne diseases.

The key benefits of the improved sanitation system for the Municipality and the community in general are:

- Reduced incidences of diarrheal and other water borne diseases; this leads directly to lower rates of mortality and morbidity, especially of 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 other matter from homesteads; this leads to improved environmental sanitation and its attendant benefits;
- Cleaner and more conducive environment for urban activities such as sports, markets, public places, etc.;

- Higher quality hotels, restaurants and entertainment places since the developers can erect and maintain high quality toilets;

- Employment opportunities at all stages of the project – from construction, operation and marketing of the services; this leads to increased skills transfers to the community;

- Increased revenue to the local authority and the country in general through the collection of taxes.

6.4.4 Conclusion on the 'No Project' option

Rukungiri Municipality and en-route growth centre residents are in urgent need of a sustainable water supply and sanitation facilities. The existing piped water supply system is operating below demand. The current sanitation systems are unreliable, in sorry state and sub-standard. If this is allowed to continue, not only will the residents be exposed to public health risks but development opportunities will continue to be stifled and curtailed.

In general, the minor benefits of the No-Project option are far outweighed by the benefits to be attained on implementing the Rukungiri Water Supply and Sanitation Project.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The Environmental and Social Management Plan (ESMP) for Rukungiri Water and Sanitation Project has been prepared in accordance with Environmental and Social Assessment Procedures of the World Bank Table 38 and Table 39. 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 ESMP work programs, timing and budget estimates

The proposed ESMP work programs, timing and budget estimates are given in the table below.

Table 38: Environmental and Social Management Plan for the Construction Phase.

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
Water intake and water treatment plant, pipelines, storage reservoirs & Feacal Sludge Treatment plant: Construction Phase								
			A. 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 ➢ Clear internship program for students	At all project phases	➢ Employment Act ➢ Company Act	0	Contractor	Local authorities Gender and Labour Ministry
	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. NEGATIVE IMPACTS					

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
B. Soils	**B:1** Loss of top soil/Soil erosion	**B:1:1** Hoarding off construction site to prevent soil erosion and pollution of surface water sources. **B:1:2** 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	Weekly	➢ The National Environment Regulation (Wetland, River Banks, Land Lake Shore Management Regulation, 2000)	10,000,000	Contractor	Construction supervisor NEMA
		B:1:3 Removing the top soil prior to dumping any materials and returning after excavation. **B:1:4** Use of excavated soils for backfilling and levelling within the site premises	Presence of soil mixed with other materials All depressions filled	Weekly	➢ The National Environment (Minimum Standards For Management of Soil Quality) Regulations	5,000,000	Contractor	Construction supervisor
		B:1:5 Timely remove and dispose of excessive quantities of excavated soil.	No visible stockpiles of excavated materials on site	Weekly		10,000,000	Contractor	Construction supervisor NEMA
		B:1:6 Cover or protect stock piles of loose materials from being eroded by rain water / runoff	➢ Covered stockpiles of loose materials like sand.	Weekly		5,000,0000		Ditto
		B:1:7 Install Soil erosion checks or silt traps where necessary to prevent siltation of surface water sources	➢ Presence of Soil erosion checks	Weekly		10,000,000		Ditto
	B:2 Soil Contamination by spilled oil, lubricants, fuels, and concrete additives	**B:2:1** store in standard recommended packaging materials like oil, fuel, concrete additives and solvents **B:2:2** Install 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.	25,000,000	Contractor, scheme operator during operation phase	Rukungiri District and Municipal Environment officers NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		B:2:3 Oil, fuels & solvents should be handled by trained personnel at a designated workstation to avoid spillage. **B:2:4** 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. **B:2:5** Periodically service project equipment and vehicles to prevent fuel and hydraulic oil spills. **B:2:6** Pre-treat wastewater from maintenance workshops in oil separators before discharging to sewers.	➢ Qualified personnel employed ➢ Records of vehicle and equipment maintenance and inspections ➢ A written down Workshop waste management procedures displayed on a notice board	Monthly	➢ The National Environment Regulation (standards for discharge of effluent into water or on land), 1999.		Contractor, scheme operator during operation phase	Rukungiri District and Municipal Environment officers NEMA
	B:3 Solid waste generation by workers and construction materials	**B:3:1 Use e**xcavated material for site levelling / backfilling within the foundation of facilities and buildings. **B:3:2** Timely remove and dispose **e**xcessive excavated soil in at an approved site or preferably give the soil to brick layers within the project area	➢ No visible stockpiles of excavated materials on site ➢ No. of trips of disposed excavated materials	Monthly	➢ The National Environment (Minimum Standards For Management Of Soil Quality) Regulations	30,000,000		Rukungiri District and Municipal Environment officers NEMA
		B:3:3 Provide different waste bins so enforce waste sorting into categories such as non-hazardous or potentially hazardous, metal, plastics, biodegradable, non-biodegradable waste etc. **B:3:4** Re-usable wastes should be sold or given away to interested parties for recycling **B:3:5** Develop and implement a solid waste management plan	➢ Written down solid waste management plan ➢ Presence of Waste management facilities such as waste bins, ➢ No sight of Indiscriminately disposed waste ➢ Records of waste collection and disposal	Weekly	➢ The National Environment (Waste Management) Regulations, S.I. No 52/1999.		Contractor	Rukungiri District and Municipal Environment officers NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
			➢ Complaints from the local community.					
C. water resources	**C:1** Sedimentation build in river Kahengye as a result of bank erosion and possible deposition of construction wastes	**C:1:1** Strictly adhere to construction schedule to avoid prolong pollution **C:1:2** 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	5,000,000	Contractor	NEMA MWE
	C:2 Pollution by solid waste and chemicals such as spilled oil, lubricants from construction equipment and vehicles	**C:2:1** Contain solid wastes so that no solid waste, fuels or oils should be discharged into surface water bodies. **C:2:2** Hold and store sanitary and cleaning wastes in appropriate containers to be disposed at approved sites.	➢ -Monitoring reports on status of waste management ➢ Designated sanitary, hazardous and special waste bins	Weekly	➢ The National Environment (Waste Management) Regulations, S.I. No 52/1999. ➢ Public Health Act	5,000,000	Contractor	Rukungiri District and Municipal Environment officers
		C:2:3 Store fuel in leak proof containers that periodically monitored, and repaired or replaced when necessary. **C: 2:4** Sites for cleaning, fuelling, parking and maintaining vehicles should be able to prevent leakage (*e.g.* paved). **C:2:5** Qualified staff should fuel vehicles during day or in a well-lit area through appropriate hose pipes	➢ -Monitoring reports on parking of vehicles and status of fuel storages	During construction	➢ The National Environment Regulation (standards for discharge of effluent into water or on land), 1999.	5,000,000 Ugx (lump sum)	Contractor	Ditto
		C:2:6 Test water samples and monitor river water quality for contaminants according to NEMA, Uganda standards and advise appropriately	➢ Water quality analysis results	Bi - annually	➢ Environment Act	1,000,000	Contractor	Ditto
			➢		➢			

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
E. Air	**E:1** Air pollution by dust from excavated soils and unpaved roads	**E:1:1** All construction sites should be hoarded off before excavations. 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.	2,000,000	Contractor	Rukungiri District and Municipal Environment officers
		E:1:2 Timely remove from site excess soil which is not used for construction works and disposed it at an approved site or preferably will be given to brick layers within the project area;	➢ Complaints from the local community			2,000,000	Contractor	
		E:1:3 Cover all vehicles transporting excavated loose soils;	Visible dust emissions		➢ Traffic Act	1,000,000	Contractor	Ditto
		E:1:4 Provide workers 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	➢ Public Health Act	5,000,000	Contractor	Ditto
		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	2,000,000	Contractor	Rukungiri District and Municipal Environment officers
	E:2 Air pollution from Equipment and vehicle emissions.	**E:2:1** Maintain vehicle and equipment according to manufactures' specifications **E:2:2** Use standard fuel and lubricants. **E:2:3** Avoid excessive and an unnecessary vehicle movement	➢ Complaints from the local community; ➢ Visible gaseous emission by project vehicles; ➢ Maintenance records of project vehicles and equipment.	➢ During construction phase	➢ The Public Health Act, Cap 281. ➢ The Constitution of the Republic of Uganda, 1995.	5,000,000	Contractor	Ditto
D. Noise	**D:1** Noise emission and vibrations from construction equipment and materials delivery trucks.	**D:1:1** The site will be hoarded off during construction to limit the noise impacts from the site; **D:1:2** Fit noise and vibration reduction features on motorized equipment and generators	➢ Site hoarding in place; ➢ Type of machinery on site; ➢ Silencers installed in noise emitting machines	Weekly during construction phase.	➢ The National Environment (Noise Standards and Control)	2,000,000	Contractor	Rukungiri District and Municipal Environment officers

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		D:1:3 Provide workers with appropriate PPE such as ear muffs or ear plugs. Provide workers operating equipment that generate noise levels greater than 80 dBA continuously for 8 hours or more with earmuffs while those exposed to prolonged noise of 70 – 80 dBA can be provided with earplugs. Working in shifts is advised to limit the duration of exposure to noise;	➢ Use of PPE by workers on site; ➢		Regulations, 2003	-		
	➢	**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. **D:1:6** Engines should be switched off for all the machines/vehicles which are not in use	➢ Noise levels recorded during construction. ➢ Record of complaints about noise from community and neighbours ➢ Equipment log sheet		➢ The National Environment (Noise Standards and Control) Regulations, 2003	-0	Contractor	Rukungiri District and Municipal Environment officers
		D:1:7 Through a local radio (FM) or Local Council (LC) Leadership, the community must be informed of the work program that must be strictly adhered to	➢ Receipts from radio stations for announcements		➢	2,000,000	Contractor	Ditto
A. Flora and fauna	**A1:** Loss of vegetation cover.	**A1:1:** Limit clearance of vegetation to only that piece of land that is required for development.	Extent of site clearance.	Once monthly	➢ National Forestry and Tree Planting Act ➢ Environment Act	2,000,000	Contractor	Construction supervisor District Forestry Officer
		A1:2 Appropriate and fair compensation for trees, fruits and planted crops that have to be cut down	Evidence of used of approved compensation rates	Twice in a year	➢ Land Act ➢ Land Acquisition Act ➢ World Bank Safe Guard Policy on RAP	See RAP report	RAP Implementer	Chief Government Valuer

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		A1:3 Upon completion of construction works, restore/replant adequate grass cover and indigenous tree species on sloping areas to reduce erosion loss.	Extent of restoration works. Coverage of replanted vegetation or trees	Quarterly	➢ The National Environment Act Cap 153. ➢ The Constitution of the Republic of Uganda, 1995.	5,000,000	Contractor	Rukungiri District and Municipal Environment Officer. NEMA
	A2: Loss of habitat for terrestrial organisms	**A2:1** Limit clearance of vegetation to only that piece of land required for development. **A2:2** Upon construction completion, replant the indigenous trees species	Extent of site clearance. Coverage of replanted vegetation or trees	Quarterly	➢ Environment Act ➢ Wildlife Act	- See A1:3	Contractor	Rukungiri District and Municipal Environment Officer. NEMA
		A2:3 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	Monthly	➢ National Forestry and Tree Planting Act ➢ Environment Act ➢ Wildlife Act	0	Contractor	Construction supervisor
		A2:4 During operation and maintenance phase, carry out regular ecological surveys and monitor to assess ecosystem status	Monitoring reports	Quarterly	➢ Environment Act ➢ Wildlife Act ➢ Water Act ➢ NWSC Act	5,000,000	Operator	NEMA
		A2:5 Sensitize workers on importance of nature conservation and dissuade them from harassing animals **A2:6** Rescue animals found on site during any project phase	Minutes of sensitization meetings Records of rescued animals	Quarterly	➢ National Forestry and Tree Planting Act ➢ Environment Act ➢ Wildlife Act	2,000,000	Contractor	NEMA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
	A3 : Loss of habitat for aquatic organisms	**A3:1** Minimize wetland loss, restore wetlands and other natural sites	Evidence of wetlands restoration	Quarterly	➢ National Forestry and Tree Planting Act ➢ Environment Act ➢ Wildlife Act	15,000,000		Rukungiri District and Municipal Environment officers NEMA
		A3:2 Development and Implementation of an Integrated Catchment Management for the basin of river Kahengye to protect it from further degradation that jeopardizes the ecological resources.	Development & implementation of River Kahengye Catchment management plan	Quarterly	➢ Water Act ➢ Environment Act	See recommendations of consultancy assignment under a separate contract by MWE	Directorate of Water Resources Management, MWE	Directorate of Water Resources Management, MWE
F. Socio - Economic aspects	**F:1** Disruption and interruption to social, cultural and economic activities and arrangement	**F:1:1** Site hoarding should only follow an advance information to the community. **F:1:2** Inform the local communities about the construction program 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	➢ Environment Act	5,000,000	Contractor	Rukungiri District and Municipal Environment officers, District Engineer
		F:1:3 Minimize obstruction of access roads or occupation of roads, footpaths and bridges. Implement a traffic management plans at points of partial or complete closure.	➢ Traffic management plan and evidence of implementation		➢ Environment Act ➢ Traffic Act	5,000,000		District Engineer
		F:1:3 Temporary access ways should be provided with the approval of local authorities where access roads are closed.	➢		➢	0	Contractor	Rukungiri District Engineer
		F:1:4 Minimize temporary interference with private property (e.g. pipeline crossings over private lands) as much as possible	➢		➢ Land Act	10,000,000	Contractor	MWE, Construction supervisor
		F:1:5 Archaeological sites, sacred or sites such as graves and natural features such as trees, rocks with cultural value have to be protected when discovered during works. The opinion leaders and local authorities	➢ Minutes of stakeholders engagement	When deemed necessary	Historical Monument Act, 1967 Cap 46	10,000,000	Contractor	MWE, LC 1 Construction supervisor

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		have to be consulted on best protection method or rituals required if any						
		F:1:6 Workers sensitization on proper social behaviour and conduct with regard to community systems and the acceptable societal norms.	➢ Report of sensitization workshop	At the start of construction	➢ Public Health Act	0	Contractor	MWE Construction supervisor
	F:2 Resettlement, loss of land and livelihood	**F:2:1** Align all pipelines along the road reserves. Where resettlement is inevitable, consult World Bank policy on involuntary settlement for guidance. **F:2:2** Ensure adequate and prompt compensation of project affected persons using the agreed and fair compensation in accordance with the Resettlement action plan	➢ Complaints from community ➢ Records of project affected persons and compensation received		➢ Land Act ➢ World Bank Safe Guard on RAP	See RAP Report	Contractor	MWE, World Bank
	F:3 Gender discrimination in employment	**F:3:1** Give both men and women equal job opportunity **F:3:2** A non – discrimination policy must be enforced at recruitment	Number of women employed		Employment act	0	Contractor	MWE, World Bank, Labour, Gender and Social Development 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 applicant letter with well spelt out terms of engagement	➢ Absence of children at work place ➢ Record of employees		Employment act Child Act	0	Contractor	MWE, World Bank, Labour, Gender and Social Development Ministry
	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		
Occupational Safety	**G:1** Increased risks of accidents such as fire outbreaks, collapse of	**G:1:1** Protect the work sites with clear marking of safety borders and signals.	➢ Site hoarding ➢ Safety signs	During construction	➢ Occupational Safety	3,000,000	Contractor	Construction supervisor, Rukungiri

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
and health aspects	structures, vehicle accidents	**G:1:2** Restrict (or Fence off) all dangerous areas. Access to restricted areas must be with permission **G:1:3** Ensure that work sites especially in the night have proper lights and reflective safety signs and restriction tapes **G:1:4** Inform the local community about the construction program in advance and adhere to it **G:1:5** Develop and implement a comprehensive traffic management plan	➢ Demarcation of restricted access areas ➢ Written down traffic management plan ➢ Record of all accidents		and Health At ➢ Traffic Act			District Health inspector and Environmental health inspector, MWE
		G:1:6 Employ and deploy Reflective signage and flag men to direct traffic to designated areas. **G:1:7** Speed limit signage and speed reduction humps have to be installed at crossing to places such as at school, market, hospital. **G:1:8** Sensitize drivers to observe speed limits.	➢ Visible road signs and humps ➢ Record of all accidents		➢ Traffic Act	1,000,000	Contractor	Rukungiri District Health inspector and Environmental health inspector, MWE
		G:1:9 To reduce risks of fire outbreaks, employ certified electrical undertake all wiring and electrical installations **G:1:9** put in place a comprehensive fire plan to guide the workers in case of fire outbreak. **G:1:10** Displace for all on notice boards the contacts of emergency response teams such as fire brigade, nearest police station and medical centre and ambulances	➢ Electrical wiring certification ➢ Circuit breakers in place ➢ Fire management plan ➢ Fire Assembly area within work area and camps ➢ Fire fighting equipment in place ➢ Fire and smoke detectors in place;		➢ Traffic Act	2,000,000	Contractor	Rukungiri District Health inspector and Environmental health inspector, MWE
	G:2 Collapse of facilities and buildings.	**G:2:1** carry out Geotechnical investigations to determine the bearing capacity of soils to support the proposed developments; **G:2:2** Use of approved site layout plans and the building designs	➢ Geotechnical survey results; ➢ Approved site layout plans and building designs;	During the construction phase.	➢ The Occupational Safety and Health Act, 2006.	5,000,000	Contractor	MWE Construction supervisor Rukungiri District

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
		G:2:3 Thorough supervision should be carried out by qualified engineers at the construction site during project execution.	➢ Expertise of the contractor and supervisor/ structural engineer.		➢ The Workers Compensation Act, Cap 225.			Engineer, 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 to prevent them from contracting HIV/AIDS and other Sexually Transmitted infections (STIs). In addition, workers should be sensitized not to engage in sexual relations with underage girls and married women. **G:3:2** Put in place a HIV/AIDS prevention policy at workplace. **G:3:3** Liase 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	Bi-monthly	➢ Public Health Act	5,000,000	Contractor	Rukungiri District Health inspector and Environmental health inspector, MWE
	G:4 Occupational health and safety hazards to workers and the public.	**G:4:1** Secure site boundaries with fences or hoarding 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 Management Policy, 1994.	2,000,000	Contractor,	Rukungiri District Environmental and Health inspection officers.
		G:4:3 Ensure safe working heights through provision of work platforms, scaffolds and adequate supervision	➢ Written down Health and Safety Management Plan	Daily	➢ The National Environment Act CAP 153.	0	Contractor	Ditto
		G:4:4 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.; **G:4:5** Provide operation and safety guidelines for all operations;	Caution signage in place. ➢ Occupational safety and health measures at the site; ➢ Operation and safety manuals	Weekly	➢ 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	-	Contractor	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement (UGX)	Responsibility	Monitoring institution
					and Health Act			
		G:4:7 Establish emergency entrances, exits and amenities **G:4:9** The workers will have access to a first aid kit which will be used at the construction site	➢ First aid kits ➢ Accident records in accident books recorded by safety officer	Daily	➢ Occupational Safety and Health Act	1,000,000	Contractor	Rukungiri District Environmental and Health inspection officers.
		G:4:9 Appropriate technical personnel should be engaged during the construction;	➢ Qualification of employed workers	Daily	➢ Employment Act	See AG:4.1	Contractor	Ditto
	G:5 Pools of stagnant water that turn into habitats for disease vectors such as mosquitoes	Fill up all depressions to avoid pools of stagnant water that may form in pits, holes and excavated ditches that can create suitable habitats for insect disease vectors such as mosquitoes which cause malaria.	➢ All excavated depressions re-instated, filled and re-vegetated.	Weekly	➢ Public Health Act	8,000,000	Contractor	Ditto
	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 to any designated facility; **G:6:3** Workers should be made aware of the available sanitary facilities and their location; **G:6:4** Undertake regular inspection of the sites to identify sanitation non-conformances and ensure timely re-address; **G:6:5** Construct water borne toilets instead of pit latrines.	➢ Complaints from the local community; ➢ Sanitary facilities in place; ➢ Human waste disposal means.	Daily	➢ The Public Health Act, Cap 281. ➢ The Constitution of the Republic of Uganda, 1995.	2,000,000	Contractor	Rukungiri District Environmental and Health inspection officers.

Table 39: Environmental and Social Monitoring Plan Operation and Maintenance Phase

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
Water intake and water treatment plants, pipelines, storage reservoirs & Feacal Sludge Treatment plant Phase: OPERATION AND MAINTENANCE								
			A. POSITIVE IMPACT					
Socio – economic environments	**Q:1** Employment Creation	**Q:1:1** Give employment preference to skilled and qualified Ugandans, Uganda companies or international companies with more Ugandan employees **Q:1:2** The system operator should give employment priority to local community with skills and training. **Q:1:3** The entire unskilled workforce should be provided by the local community. **Q:1:4** No gender discrimination (of Women, youth and persons with disabilities) at employment **Q:1:5** Issue all employees with appointment letters that clearly spells out terms of employment. **Q:1:6** 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	At all project phase	➢ Employment Act	0	Operator	Local authorities Gender and Labour Ministry
	Q:2 Increase in skilled labour and technology transfer	**Q:2:1** The contract terms for the system operator should emphasize skills transfer. **Q:2:2** Foreign companies should be in joint ventures with local companies to build their capacity. **Q:2:3** The system operator should have a clearly defined internship program for students	➢ Proof of joint venture with local company ➢ Clear internship program for students	At all project phases	➢ Employment Act ➢ Company Act	0	Operator	Local authorities Gender and Labour Ministry
	Q:3 Markets for locally available resources such as pumps, cement, iron bars, aggregates, sand,	**Q:3 1** The sourcing of the project materials should give priority to local suppliers and service providers with capacity. **Q:3:2** Before importing materials, proof of inability of local suppliers to provide the service must be provided	➢ Proforma invoice from local suppliers ➢ Domestic bidding	At all project phases	➢ Company Act	0	Operator	Local authorities PPDA

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	pipes, plumbing fittings							
	Q:4 Improved standard of living because of increased coverage and provision of safe water and sanitation facilities	**Q:4:1** Provision of safe water and sanitation facilities without discrimination at affordable rates **Q:4:2** On-time billing, constant appraisal and updating users on the status and functionality of the various project facilities to ensure reliability and guarantee functionality and sustainability.	➢ Agreed billing rate ➢ Water consumption records ➢ Periodic scheme functionality report		➢	0	Operator	DWO, DWD
		Q:4:3 Constructing yard taps at a radius of at least 100m as recommended in the water supply design manual.	➢ Presence of yard taps		➢	0		
		Q:4:4 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.	➢ Presence of water board with women holding key positions at Community Based Water Management Board		➢	0		
		Q:4:5 Sensitization and awareness creation campaigns to improve sanitation	➢ Minutes and reports of awareness campaigns ➢ Monitoring reports		➢	0		
		Q:4:6 Proper management of compost manure from the Feacal Sludge Treatment plant and sale of compost to farmers at reasonable prices to encourage adoption of composting manure for enhancing soil fertility.	➢ Record of sale of Compost		➢	0		

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
			B. NEGATIVE IMPACTS					
Soils	Loss of top soil/Soil erosion	➢ Hoarding off site during excavation to prevent soil erosion to surface water sources and the nearby drainage channels	Area of the site hoarded off.	During pipeline maintenance	Environment Act	5,000,000 per annum	Operator	NEMA
		➢ Use excavated soils for backfilling and levelling within the site premises ➢ Timely remove and dispose of excessive quantities of excavated soil. Can be disposed in abandoned quarries or given to bricklayers within the project area.	All depressions filled No visible stockpiles of excavated materials on site	During pipeline maintenance		2,000,000	Contractor	Construction supervisor NEMA
	➢ Contamination by spilled chemicals such as lubricants, chlorine and Aluminium Sulphate (Alum), sludge containing Alum	➢ 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 ➢ Water treatment chemicals such has brine and Aluminium sulphate should be handled by trained personnel at a designated workstation to avoid spillage. ➢ Sludge containing Alum should be caked and handed over to NEMA for safe Disposal	➢ Use of standard Packaging materials ➢ Written down spillage protection procedures ➢ Qualified personnel employed	Monthly and during maintenance	➢ The National Environment Regulation (standards for discharge of effluent into water or on land), 1999.	5,000,000	Operator	Rukungiri District and Municipal Environment officers NEMA
Water resources	➢ Reduction of River Kahengye flow	➢ Limit abstraction to permitted abstraction rate ➢ At no moment should abstraction exceed river rate ➢ Develop and Implement a comprehensive catchment management plan;	➢ Surveillance and monitoring report ➢ Records of flow time series data	Data collection on daily or hourly interval	➢ Water Act	2,000,000	Directorate of water resources Management, MWE	MWE NEMA
	➢ Sedimentation build up in the river as a result of screened coarse particulate matter	➢ Removal of built up screened coarse material from the river and safe disposal ➢ Monitoring of downstream flora and fauna to identify potential damage	➢ Water quality tests and monitoring ➢ Records of removed	Quarterly	➢ Water Act ➢ NWSC Act	12,000,000	Operator	NEMA MWE

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	and returned clarified water		particulate matter					
	➢ Pollution by backwash effluent, solid wastes and leakage or spillage of chemicals stored at WTP	➢ 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	➢ Water Act ➢ Environment Act ➢ Public Health Act	1,000,000	Operator	Rukungiri District and Municipal Environment officers
		➢ 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. ➢ Backwash water should be clarified and the extracted sludge thickened, caked and handed over to NEMA certified hazardous waste handler for safe Disposal	➢ Neat storage containers	Weekly	➢ Water Act ➢ Environment Act ➢ Public Health Act ➢ Occupational Safety Health Act ➢ NWSC Act	5,000,000	Operator	
		➢ Test water samples and monitor river water quality for contaminants according to NEMA, Uganda standards and advise appropriately ➢ Test and monitor the quality of effluents from the Feacal Sludge Treatment for compliance with the regulations regarding effluent standards	➢ Water quality analysis results	Monthly	➢ Water Act ➢ Environment Act ➢ Public Health Act ➢ Occupational Safety Health Act ➢ NWSC Act	10,000,000 annually	Operator	Ditto
		➢ Regularly check storage containers for leakage. If any leakage is detected, the chemical should be removed and the container repaired immediately otherwise it should be disposed in compliance with	➢ Inspection report	Quarterly		5,000,000	Operator	Ditto

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
		NEMA regulations for disposal of solid wastes containing hazardous materials						
	Discharged treated wastewater and leachate from Feacal Sludge Treatment plant will contain pathogens, high nutrients and heavy metals that can cause eutrophication	➢ 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 stormwater that would cause the leachate to overflow; ➢ Proper treatment of leachate in the water treatment pond designed as a component of the Feacal Sludge Treatment plant ➢ Further purification/polishing of effluent from the water treatment pond in a constructed wetland ➢ Locate point water sources such as wells and surface water at a minimum distance of 300 m from the discharge point of the Feacal Sludge Treatment plant ➢ The compost leachate should not directly flow into a receiving surface water body neither should it flow directly into a wetland system / flood plain. ➢ A minimum distance of 50m should be provided between a Feacal Sludge Treatment plant discharge point and wetland system to allow for further treatment and purification of leachate before release to the wetland. ➢ Alternatively, a constructed wetland should be put between the Feacal Sludge Treatment plant and the wetland.	➢ Efficiency of the water treatment pond ➢ Minimum distance water source ➢ Monitoring reports on receiving water quality	Quarterly	➢ Water Act ➢ Environment Act ➢ Public Health Act ➢ NWSC Act	0	Operator	Rukungiri 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 & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
Air	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	➢ Monitor the critical parameters of the composting process to ensure they are within the design values ➢ Develop a Composting Operations Manual to provide guidance to staff running the site. ➢ Maintain equipment (skip loader or tractor) to ensure timely turning of windrows; ➢ Sprinkle a slurry of cow dung to the waste to reduce flies ➢ 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. ➢ Operate and manage the Composting process as recommended in the manual to foul smell (odour), flies nuisance and waste accumulation ➢ 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.	➢ .Presence of a thermometer, an oxygen meter and a moisture meter for monitoring purposes; Fenced off area of the Feacal Sludge Treatment plant Complaints from the local community	Quarterly	➢ Water Act ➢ Environment Act ➢ Public Health Act ➢ Environment Act	-	System operator	District and Municipal Environment officers Directorate of water resources management
	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.	➢ Sales and marketing report ➢ Demonstration garden	Quarterly	➢	5,000,000	Operator	District Environment officer,

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
Flora and fauna	Loss of vegetation and crops as a result repair works on transmission and distribution pipelines	Limit clearance of vegetation to only that piece of land that is required for development.	Extent of site clearance.	Bi-annual	➢ The National Forestry and Tree planting Act.	2,000,000	Operator	District and Municipality Environment Officers
		Appropriate and fair compensation for trees, fruits and planted crops that have to be cut down	Evidence of used of approved compensation rates	Bi-annual	➢ Land Act ➢ Compulsory Land Acquisition Act	5,000,000	Operator	Chief Government Valver
		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.	Bi-annual	➢ The National Environment Act Cap 153.	2,000,000	Operator	Rukungiri District and Municipal Environment Officer. NEMA
	➢ Restriction on movement of animals as a result of excavations.	➢ Excavated trenches should be backfilled or reinstated immediately after maintenance on the pipeline so as to allow free movement of animals ➢ Adhere to maintenance schedule and complete work within schedule	➢ No open trenches ➢ Maintenance schedule	Bi-annual	➢ NWSC Act	2,000,000	Operator	Rukungiri District and Municipal Environment Officer. NEMA
		➢ Sensitize workers on importance of nature conservation and dissuade them from harassing animals ➢ Rescue animals encountered on site during maintenance	➢ Minutes of sensitization meetings ➢ Records of rescued animals	Annual	➢ Wildlife Act	2,000,000	Operator	NEMA
	➢ Loss of aquatic habitat as a result of deposition of clarified water containing	➢ Clarify further/ Reduce concentration of total suspended solids to acceptable levels before discharging to the receiving water	Monitoring reports on water quality of receiving water	Bi-annual	➢ Environment Act	2,000,000	Operator	NEMA MWE, Directorate of water resources

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	Aluminium ions which is toxic	➢ Concentration of compounds such as Aluminium ions must be reduced because it can combine/reaction with other chemicals to cause eutrophication	Monitoring reports for aquatic diversity					
Socio - Economic aspects	➢ Disruption and interruption to social, cultural and economic activities and arrangement	➢ 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	➢ Written communication to the community ➢ Copy of radio announcements	Before maintenance begins	➢ Public Health Act	2,000,000 per annum	Operator	Rukungiri District and Municipal Environment officers, District Engineer
		➢ Where access roads are closed, provide temporary access ways with the approval of local authorities ➢ Traffic management plans should be set up at points of partial or complete closure.	➢ Temporary access roads ➢ Traffic management plan and evidence of implementation	During Maintenance	➢ Traffic Act	10,000,000	Operator	District Engineer
		➢ Minimize temporary interference with private property (e.g. pipeline crossings over private lands) as much as possible	➢		➢ Water Act ➢ Environment Act ➢ NWSC Act		Operator	Ditto
Occupational Safety and health aspects	➢ Increased risks of accidents such as fire outbreaks, collapse of structures, Accidental ruptures of pipelines exposing water to the risks of contamination	➢ 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	➢ Environment Act ➢ Public Health Act ➢ Occupational Safety Health Act	5,000,000 per annum	Operator	Rukungiri District Health inspector and Environmental health inspector
		➢ Develop and implement a comprehensive traffic management plan	➢ Written down traffic management plan	During maintenance works	➢ Traffic Act	0	Operator	Construction supervisor,

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
			➢ Record of all accidents					
		➢ Employ and deploy Reflective signage and flag men to direct traffic to designated areas. ➢ Speed limit signage and speed reduction humps have to be installed at crossings of many such as at school, market, hospital. ➢ Sensitize drivers to observe speed limits.	➢ Visible road signs and humps ➢ Record of all accidents	During maintenance	➢ Traffic Act	2,000,000	Contractor	Rukungiri District Health inspector and Environmental health inspector, MWE
		➢ To reduce risks of fire outbreaks, all electrical installations /wiring should be carried out by certified electricians in liaison with the Contractor. ➢ A comprehensive fire plan must be in place to guide the workers in case of fire outbreak. ➢ The contacts of emergency response teams such as fire brigade, nearest police station and medical centre and ambulances have to be displayed for all and on notice boards	➢ Fire management plan ➢ Fire Assembly area within work area and camps ➢ Firefighting equipment ➢ Electrical wiring certification ➢	During maintenance	➢ Occupational Safety Health Act ➢ The Employment Act, 2006 ➢ Workers' Compensation Act (2000)	2,000,000 per annum	Operator	Rukungiri District Health inspector and Environmental health inspector, MWE
	➢ Occupational health and safety issues such as lifting heavy objects, handling hazardous materials	➢ Secure site boundaries with fences or hoardings as appropriate; Fence all dangerous areas especially excavated pits. ➢ Inform communities in advance about the construction schedule	➢ Site hoarding ➢ Receipts of radio announcements ➢	During the maintenance phase.	➢ Occupational Safety Health Act ➢ The Employment Act, 2006 ➢ Workers' Compensation Act (2000) ➢ Traffic Act	15,000,000 per annum	Operator	Rukungiri District Environmental and Health inspection officers.
		➢ Ensure safe working heights through provision of work platforms, scaffolds	➢ Written Health and Safety Management Plan	During maintenance			Operator	

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
		➢ 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.; ➢ The operator shall provide safety guidelines to guide all operations;	Caution signage in place. ➢ Occupational safety and health measures at the site;	During maintenance			Operator	Ditto
		➢ 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 Health Act ➢ The Employment Act, 2006 ➢ Workers' Compensation Act (2000)		Operator	Ditto
	➢	➢ Establish emergency entrances, exits and amenities; ➢ The workers will have access to a first aid kit which will be used at the construction site; ➢ Appropriate technical personnel should be engaged for maintenance;	➢ First aid kits ➢ Accident records in accident books recorded by safety officer ➢ Qualification of employed workers	Monthly			Operator	Rukungiri District Environmental and Health inspection officers.
	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 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.	Daily	➢ Public Health Act	4,000,000 per annum	Operator	Rukungiri District Environmental and Health inspection officers.
	Exposure of Co-compost plant workers to pathogens when mixing sludge and organic waste. It poses the workers to risks of infectious	• 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	Use of PPE Distribution list of PPE Presence of disinfectant and hand washing facility at Feacal	Quarterly	Occupational Safety Health Act Public Health Act	5,000,000	Operator	Rukungiri District Environmental and Health inspection officers.

Environment receptor or issues	Impact to be monitored	Mitigation measures	Monitoring indicators	Time frame/frequency of monitoring	Relevant policies, legislation & regulatory framework	Estimated Cost of Mitigation & enhancement	Responsibility	Monitoring institution
	diseases such as dysentery, cholera, and typhoid		Sludge Treatment plant					
	The compost manure will have pathogens mostly worms if not composted properly. This can contaminate agricultural land where the manure is applied.	• 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;	Records of composting time Testing of compost Farmers training report and attendance list					Rukungiri District Environmental and Health inspection officers.
	Human waste disposal issues.	➢ Put in place water borne toilet at water treatment plant for use by workers during operation and maintenance phase; ➢ Ensure periodic emptying by a licensed cesspool provider to any designated facility; ➢ Workers should be made aware of the available sanitary facilities and their location; ➢ Undertake regular inspection of the sites 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	Rukungiri District Environmental and Health inspection officers.

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. During the operation phase, National Water and Sewerage Corporation (NWSC) who will 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, Rukungiri District Local Government and Rukungiri Municipal Council 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. the National Environment Management Authority (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: -

Ministry of Water and Environment (Project Support Unit)

- Water Engineer
- Sociologist
- Environmental Health Officer

Contractor

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

District

- District Environmental Officer
- District Water Officer

- District Engineer
- District Community Development Officer

Municipal Council
- Municipal Environmental Officer
- Municipal Water Officer
- Municipal Engineer
- Municipal Community Development Officer

NEMA
- Environmental Audit Officer

DOSH
- Occupational Health and Safety Officer

NWSC
- Environmentalist

NGO or CBO
- Representative with skills in environmental management and conflict resolution

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 were 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 of WMDP–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 Consultations on the shared use of water resources and their associated catchments

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 shocks 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 Catchment Management Plan

The Water Management and Development Project is implementing the Investment in Integrated Water Resources Development and Management Component. Under this component a comprehensive integrated catchment management of River Kahengye will be done. According to the Mayor of Rukungiri,

> *"The quantity and quality of River Kahengye has deteriorated over the last 50 years. The volume of water has reduced. The river bed rocks are now above*

the water level. 50 years ago they were completely submerged. We used to see the river bottom because the water was crystal clear. It is now turbid."

These remarks are a hint at perhaps a troubled catchment. Further inquiries revealed that upstream wetlands in the catchment districts of Sheema and Mitooma are under encroachment and deforestation at a high rate. These may be the causes of the turbidity and the receding river water levels and could be compounded by climate change. The Integrated Catchment Management Component of WMDP will address these issues. It is recommended this project component quantifies the drivers of environmental degradation and makes catchment plans with source protection options. But it suffices to say here that it was observed at the intake that cultivation takes place up to the riverbank. All riverine vegetation was removed and replaced with farm or grazing land. During rainfall events surface runoff flushes the soils into the river and floodwater erodes the riverbanks.

As a means of point source protection at the intake the following intervention are recommended:

- Gabions against bank erosion;
- Stop cultivation at the river rank and wetlands. The mandatory 30 m from the riverbank/wetland should be observed;
- Carryout afforestation preferably with indigenous riverine tree species;
- Plant grass on the riverbank; and
- Encourage contour farming on sleep hills to check soil erosion, etc.

7.9 Stakeholder Engagement Plan

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 Rukungiri Municipality, Kebisoni, Buyanja And Nyakagyeme Sub Counties;
- Rukungiri District Local Government;
- Rukungiri Municipal Council
- National Environment Management Authority;
- National Water and Sewerage Corporation and;
- NGO's operating within Rukungiri 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 record.

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 (Table 10.1) has been developed 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 complaints	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 (ISRs), and Implementation Completion Reports (ICRs) 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 an 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 Grievance Redress 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 Proposed Terms of Reference for Grievance Management Coordinator

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 Rukungiri Municipality Water Supply and Sanitation Project. The project specifically aims at improving the water supply infrastructure and faecal sludge management in the central business district within the Rukungiri Municipality and its surrounding Kebisoni, Buyanja and Nyakagyeme Sub counties.

The expected project benefits are numerous and include among others; improvement in coverage of safe water supply, improved public health, sanitation and hygiene, increment in school enrolment, creation of employment opportunities, provision of market for locally available materials. Additionally, the project will bring water closer to homes thereby spuring economic growth by reducing walking distances, reduced risks of community violence at water points and reduced sexual offences that may result when women and the girl child walk long distances to collect water. In entirety, these benefits are cumulative in nature and will improve social – economic status of the residents of Rukungiri Municipality, Nyakagyeme Sub County and enroute communities in Kebisoni and Buyanja sub counties.

Just like many projects, Rukungiri Municipality WSS Project too has a list of negative impacts to the environment and society that have been identified and ranked according to RIAM Matrix Environmental Score (Pastakia, 1998). These include increased spread of HIV/AIDS, vegetation loss, increased risks to health and safety such as occupational hazards, risks of accidents at project site, water contamination by backwash effluent and spilled water treatment chemicals, air quality, and loss of land among others. No major negative impact (with ES Rank -5ve) is anticipated both at construction and operation and maintenance phase.

An evaluation of the positive impacts of Rukungiri Municipality WSS Project against the identified negative shows that the project is crucial for socio-economic progress of the beneficiary and national development at large. This benefit coupled with the fact that all negative impacts have practical mitigation measures drawn in the Environmental and Social Management Plan (ESMP), implies the project is environmentally and economically viable. The ESIA Team therefore, strongly recommends that NEMA approves this ESIA to expedite the project implementation.

10.2 Recommendations

The benefits of the project have to be enhanced to ensure project success and sustainability. The Environmental and Social Management Plan (ESMP) proposed should be adhered to ensure that the project benefits are enhanced while mitigating the negative impacts identified at all project phases.

In case any other subprojects or structures/ future expansions not described in this report take 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 addition, there may be a number of permits and approvals from other Lead Agencies that have to be secured in order to implement the project. These will have to be secured in a timely manner to avoid delays.

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 proposed in the Resettlement Action Plan (RAP) should be implemented to allay the fears of the PAPs 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 is indispensable in order to meet the Project Objectives of providing 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.

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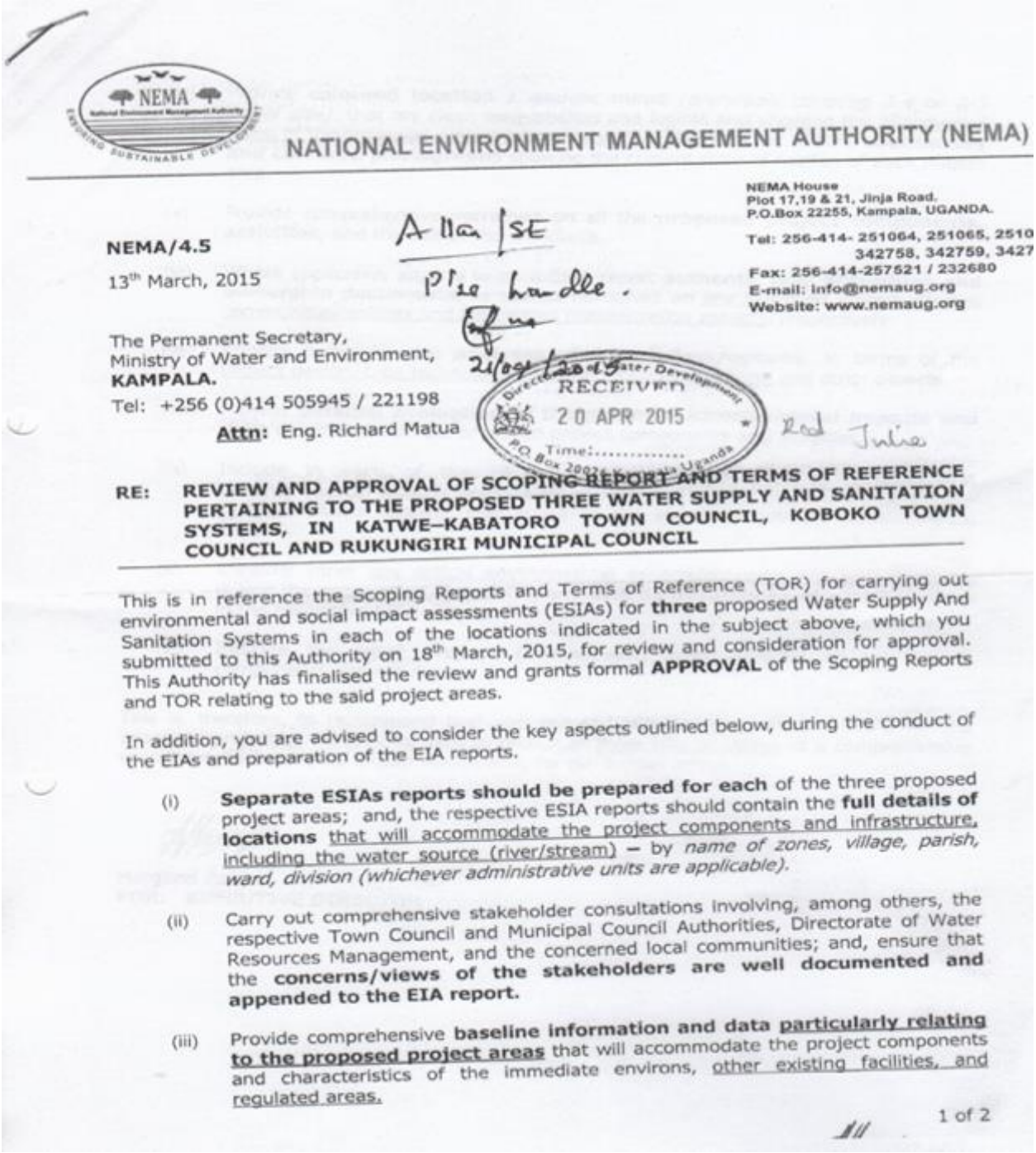
APPENDIX 1: NEMA APPROVAL OF TOR



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

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

2 of 2

APPENDIX 2 MINUTES OF STAKEHOLDER MEETINGS

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR RUKUNGIRI WATER SUPPLY PROJECT

Minutes Of Meeting With Leaders And Community Members Of Kagyera / Kakyeka Villages, Northern Ward, Western Division In Rukungiri District-Sewage Treatment Plant

Agenda

1. Introductions
2. Discussion
3. Closing remarks

Location: Kakyeka village

Attendees

Find the attendance list attached

Table 41: Minutes Of Meeting With Leaders And Community Members Of Kagyera / Kakyeka Villages.

Min. No	Description / Item	Action by	Date
1	**Introductions:** The meeting was officially started by the Chairman LC1 who welcomed the visitors in their community and thanked them for coming to talk to them about the upcoming water project. He also welcomed the community members and asked them to listen carefully to the consultants so that they can understand all issues concerning the project. The chairman's speech was followed by self-introductions by all members present and a short prayer said by one of the community members. At this point Edward Jjuuko the sociologist explained the purpose of the meeting. He mentioned that, one of the key activities to be undertaken prior to project implementation is the ESIA which entails talking to affected communities particularly about their concerns related to the project. He noted that, as a sociologist, he wants to listen to their perceived social and environmental impacts and what they think can be done to mitigate them. He encouraged members to give their views openly and to ask questions where they need clarifications from the consultants.	Sociologist	
2	**Discussions** The discussion was facilitated by the sociologist following a socio-economic survey guide which included a set of questions intended to make consultations on key issues and the following were the responses provided by the community members.	Community	

Min. No	Description / Item	Action by	Date
	Main sources of Income: • Most of us are into farming. • Other people keep animals while others grow trees. • We have two farming seasons; May-August, and September to May. • There are also a few people particularly teachers who teach in schools like Kinyansaano girls and Makobore high school who earn salaries. **Expenditure patterns:** • Being a peri-urban area, most people earn above 500,000/ and money is spent mainly on food, school fees, medical bills and transport. • The women spend their monies on buying food, clothes for themselves and the children and payment of medical bills. • Men spend on bigger bills like school fees and household investments. • The youth spend mainly on clothes, some of them contribute towards paying their school fees, and others spend the money on alcohol and gambling. **Gender roles and responsibilities:** • Producing children and Cooking is specifically for women while men are responsible for cutting firewood, building houses and grazing animals. **Water:** • The main sources of water include; protected and unprotected springs, rain water, shallow wells and others use running water. • **Schools:** • Schools include Kinyansano primary school, Kinyansano girls, makobole high school, Makerere business institute and Mirembe memorial secondary school. **Health centre:** • We do not have any health center in this area. Diseases: • Malaria is the most common disease, followed by typhoid, flue and lastly HIV/AIDS. **Cultural Sites:** • We do not have any cultural site in this area. • **Negative impacts of the project:**		

Min. No	Description / Item	Action by	Date
	• I think we shall get diseases coming from waste water. • The runoff water can spoil people's crops and also cause soil erosion if water is not well directed by the channels. • The project shall need large pieces of land. This is likely to cause displacement of people. • The cost of living in the area shall go up because there will be many people in the area during construction and people shall be competing for the few available goods and services. • The lagoon in the sewage plant might be dangerous to the people particularly the children because if they fall in they can even lose their lives. • The people who will come from outside shall introduce bad behaviours such as prostitution, theft and use of vulgar languages. • As a result of prostitution, HIV/AIDS transmission shall increase in the area. • The project activities shall require that, the vegetation shall be destroyed as they construct the project facilities and this likely to affect cattle raring. • The price of plots around the sewage plant shall go down because people would not want to stay near a lagoon. • Some people get materials from the swamp to make baskets. These may not be able to continue with their activities when they construct the sewage plant in that area. **Social and Economic benefits of the project:** • Community will access safe and clean water near their homes. • Improvement in the health condition of the community members especially the water borne diseases. • The project shall attract development in the area because people shall start up small industries which use large amounts of water. • It will also improve agriculture because people shall also get enough water for irrigation and for watering their animals. **Mitigation Measures:** • You need to give affected people their compensation timely and it should be commensurate to the amount of loss they have suffered. • The lagoon should be treated regularly to avoid smell • The manure that comes from the lagoon should be sold cheaply or given to the people of the area free of charge.		

Min. No	Description / Item	Action by	Date
	• You must provide security to the sewage plant. • You need to construct the sewage plant far away from the road and the houses that are with in that area. The swamp is big and the project can extend it far away from the homes of the people. • Please also try to acquire the land which is about three hectares away from the current location earmarked for the sewage plant. There is a wet land that can also serve the same purpose as the one you identified and it belongs to the church not to an individual. The owners of the land that you need may not be willing to sell. • You also need to sensitize the people about the project in bigger gatherings than this and you talk about the benefits of this project. **Concerns and fears/issues to be given ample consideration:** • You must compensate the community members whose land will be taken by the project. **Corporate social responsibility:** • Construct for us a health facility in the community. • Provide water in the schools • Train the orphans in plumbing • Employ our own people to do casual work. Don't bring people from outside to do manual labour.		
3	**Closing remarks** The meeting was closed by the community member with a word of prayer.		

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

Date 30/05/2015 **Time** 9:00pm **Town** Rukungiri

Sub County Kebisoni **Parish** Kibingo **Village** Kabashaki **LC 1**

No	Name	Designation	Email	Phone No.	Signature
1	Oworinawe Victor	V/C/P Kakunga LC I		0785013751	
2.	TIBAYUNGWA ABDALLAH	C/man LC II Kabashaki		0788990067	
3.	Ahereise Stines S.	V./C.man	Kabashaki	0753249669	
4	TINKAMANYIRE JAMES	Chairperson LC III Bwongyera S/C	tinkamanyirej@gmail.com	0772314976	
5.	Samuel Vivian Matagi	Project manager	savimaxx company limited @ gmail	0772657651	

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR RUKUNGIRI WATER SUPPLY PROJECT
Minutes of Meeting with Rukungiri District Officials, 20th/May 2015 at Rukungiri District

Agenda
1. Presentation by the Environment/MWE
2. Presentation by the project Manager
3. Question and answer session/Discussion
4. Closing Remarks

SITE: Rukungiri District Headquarters.

ATTENDEES:
Find attached the attendance list.

Table 42: Minutes of Meeting with Rukungiri District Officials, 20th/May 2015 at Rukungiri District.

Min No	Description / Item	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 town 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. **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 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,		

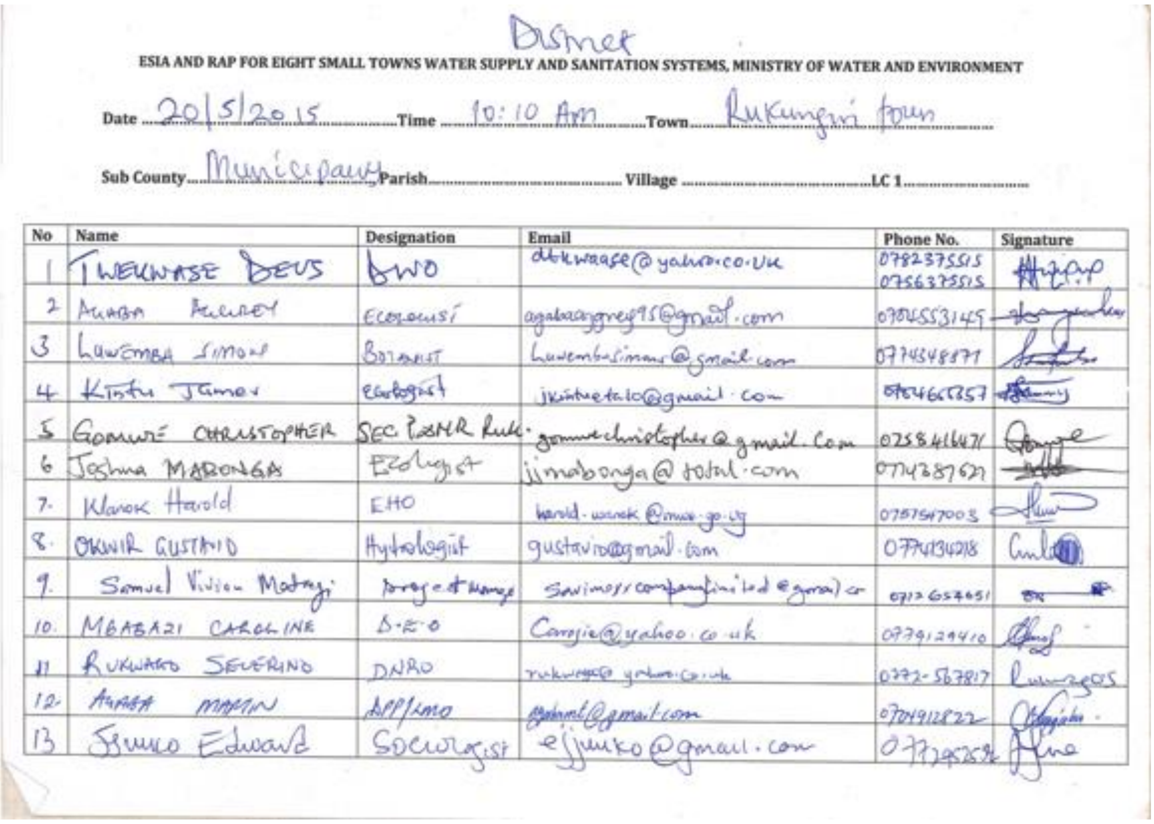
Min No	Description / Item	Action By	Date
	and butterflies and also doing water quality analysis. He informed them that, the ESIA is aimed at looking at the different impacts particularly those that are likely to arise from project activities and based on that, to design appropriate mitigation mechanisms. At this point, he introduced the sociologist and asked him to engage the district staff.		
2	**Question and Answer Session.** Before Mr. Jjuuko started asking the questions, he thanked the district staff for being able to attend the meeting 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 following were the outcome of the discussion;	Mr. Jjuuko Edward / Sociologist	
3	**Discussions:** **Opinion about the project:** • People are anxiously waiting to see the commencement of the project because there is a very big water crisis in Rukungiri Town council. We have a piped water facility in the municipality but the demand for water in the area is more than the amount of water that can be supplied by the water scheme. Water is rationed and many people have taps in their house holds but they can take even a full month without getting water because sometimes they are not at home during their scheduled days for getting it, yet they continue getting water bills. • People also have very high expectations to get compensation for their land and crops that shall be destroyed by the transmission lines (pipes). • As a district, we really need the water, not only for household consumption but also for production. Most parts of the municipality are very far away from their water sources. They cannot get enough water from the piped water facility for their own domestic consumption and for watering their animals. Our worry is that, there are many activities being undertaken on the proposed water source which have consequently reduced the water level in that river. We are not sure whether the water project shall be sustainable with the little water that is currently available in the proposed water source.		

Min No	Description / Item	Action By	Date
	Negative Impacts: • There could be some negative impacts which might be theoretical in nature but generally the positive impacts are more compared to the negative ones. I think things like increase in the prevalence of malaria, flooding and involuntary land acquisition are likely to increase but with proper planning, these can easily be mitigated. I also think that, there shall be a significant reduction in the amount of water in the river particularly at the intake and this is likely to affect people on the other side of Ntungamo district. • For all development projects, inevitably there are negative impacts that come along with them but what is important is to sensitize people early enough about these impacts that are likely to occur which might disrupt their normal day to day activities. This should also be done on this project before implementation so that people are able to appreciate the benefits of the project amidst a few negative impacts. • I also think that, there shall be instances when water form this project is unable to reach all areas in municipality particularly those in the hills. Since water is going to be distributed by gravity from the reservoir into the project area, it is very likely that some people in hilly areas shall not get it and this shall be a negative impact. Secondly, this water may not be of good quality like it has always been in other water projects here and elsewhere in the country. **People who will be affected most:** • There has been a lot of degradation of the water catchment area particularly at the water source and our advice is that, you must do whatever is necessary to secure the catchment area and the source. Otherwise I do not see any gender specific impacts arising from the project. Actually, women and children are likely to benefit more from this project since they the ones who do most of the work that requires use of large amounts of water. • This project is likely to take large amounts of land and the land owners in the affected areas where the main pipes shall pass shall be affected because they will be required to surrender large pieces of their land to the project although they shall be compensated. • We know that all these impacts shall come up but we also need the development as long as it shall be sustainable.		

Min No	Description / Item	Action By	Date
	• We are looking more at the bigger benefit and less at the small negative impacts from the project because even the institutions like schools shall get when the project is completed. **Mitigation measures:** • The most important mitigation measure should be undertaking community sensitization to raise people's awareness about the benefits that are likely to come with the project. Sensitization activities should also involve both the technical and the political leaders of the district. The project staff should at all times provide updates to the technical staff at the district detailing the progress made on implementation. You need to use the current technology that can contain or minimize noise pollution. In order to attract support of the people towards the implementation of this project, it will be very important to use locally available labour. Give first priority to local people for employment, that way, people will find reason to support the project other than when you bring in people from outside. • Regarding the destruction of the vegetation, the project together with the district staff should emphasize, support and enforce tree planting activities. Tree planting should aim at also focus on planting grass destroyed during excavation and along the pipe lines. • You have to avail booster pumps to ensure that water reaches all the different parts in the project area including those that are at the top of the hills. Those who shall lose their land, crops and all other assets, should be compensated fairly. • I think it shall be important to have an inbuilt mitigation plan within the project which will ensure continuous mitigation activities whenever a problem arises. Funds should be committed to mitigation activities so that, the project is able to mitigate negative impacts that may arise which we are not able to fore see at the moment. • You must make sure that all excavations and other manual labour in the project is done by local people. Make sure that, all the jobs that require unskilled labour are given to local people otherwise people might resist the project and start interfering with the project programs. • The challenge I see in local labour is that, very few people are willing to do work to the satisfaction of the contractor. Local people need the jobs but their problem is that,		

Min No	Description / Item	Action By	Date
	sometimes they are not willing to work up to the task and to the satisfaction of the contractor. **Cultural sites or features of cultural significance:** • Not really, apart from graves. We don't have shrines or homes for small gods in the area but a few graves could be relocated and this shall require compensating them using the approved district rates recommended for grave relocation. **Specific concerns / fears:** • My concern is that, you should have started by sensitizing members of the district council because we as the technical staff, we are answerable to that council. • Technically, the design engineers came to the municipal council and presented the proposed designs to the executive committee but during this presentation, there were only 2 people who represented the district. This being a very big project, we need to engage the district leadership because the project has different components and some of them are going to be constructed in sub-counties outside the municipal council. We are aware that the ministry of water and environment is going to bring a water project here but we do not have detailed information about it particularly on issues of compensation. You need to share this information both in the municipal and in the district councils. Similar presentations as the one that was done in the municipal council should be done in all the sub-counties where some project components shall be constructed particularly in Buyanja because it is a sub-county where very rich people stay. If you bring a project of this nature and the sub-county council is not aware, people might reject that project. • You also need to ensure that the rates for paying for water from this project are user friendly otherwise people might resort back to the traditional water sources. Currently, people do not know that they shall pay for water services at different rates from the ones they are used to. People in the municipality are getting used to paying for improved water services but those in the sub-counties are not.		
4	**Closing Remarks** Mr. Jjuuko thanked the district officials for availing themselves to provide their opinions about the proposed project which shall inform the development		

Min No	Description / Item	Action By	Date
	of the ESIA report and consequently be integrated into project implementation strategy.		



District

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

Date 20/5/2015 Time 10:10 Am Town Rukungiri town

Sub County Municipality Parish .... Village .... LC 1 ....

No	Name	Designation	Email	Phone No.	Signature
1	TWEKWASE DEUS	DWO	dtukwaase@yahoo.co.uk	0782375515 0756375515	
2	AGABA AUDREY	ECOLOGIST	agabaaudrey95@gmail.com	0704553149	
3	LUWEMBA SIMON	BOTANIST	Luwembasimon@gmail.com	0774348871	
4	Kitutu James	Ecologist	jkitutetalo@gmail.com	0754665357	
5	GOMUTE CHRISTOPHER	SEC. PSNR Ruk.	gomutechristopher@gmail.Com	025841647	
6	Joshua MABONGA	Ecologist	jjmabonga@total.com	0774387627	
7.	Waniok Harold	EHO	harold.waniok@mwe.go.ug	0757547003	
8.	OKWIR GUSTAVO	Hydrologist	gustavio@gmail.com	0774134218	
9.	Samuel Vivian Matovu	Project Manager	savimaxxcompanylimited@gmail.com	0712654651	
10.	MBABAZI CAROLINE	D.E.O	Carojie@yahoo.co.uk	0779129410	
11	RUKWAGO SEVERINO	DNRO	rukwago@yahoo.co.uk	0772-567817	
12.	AGABA MARTIN	APP/LMO	[illegible]@gmail.com	0704912822	
13	SSEJJUKO Edward	Sociologist	essjjuko@gmail.com	0772952596	

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

Date 21/05/2015 Time 2:00 P.M Town Rukungiri Municipality

Sub County Western Division Parish Nyakibale Award Village Kagyera/ Kakyeka LC 1

No	Name	Designation	Email	Phone No.	Signature
14	Behimbisa Topher		Kagyera cell	0782835705	SA
15	Loy Murinzi		Kagyera Cell	0775952665	Lmurinzi
16	Twesigye Richard		KACEEKA CELL	0782723593	T R
17	Miriam Kagurusi		Kagyera Cell	0783123591	Kagurusi
18	Wanok Harold	MWE/DWD	[illegible]@gmail.com	0757547003	[signature]
19	OKWIR GUSTAVIO	Hydrologist/Sanitation	gustavio@gmail.com	0774934218	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR RUKUNGIRI WATER SUPPLY PROJECT

Minutes of the Meeting with Staff of Rukungiri Municipality.

Agenda

Location: Rukungiri Municipality Offices.

Attendees
Find the attendance list attached

Consortium

1. Samuel Vivian Matagi — Environmentalist
2. Edward Jjuuko — Sociologist
3. Wanok Harold — MWE/DWD
4. Okwir Gustavio — Hydrologist

Table 43: Minutes of the Meeting with Staff of Rukungiri Municipality.

Min No	Description / Item	Action by	Date
1	**Introductions** **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 Rukungiri town 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 municipal council staff. **Presentation by Project Manager:** Mr. Matagi Samuel the project manager and an Environmentalist introduced himself and the other team members as consultants who were contracted by the MWE to develop the ESIA and RAP reports for the proposed water project in Rukungiri Municipality. He informed them that, the project is implemented in phases. Earlier activities included development and production of technical	Mr. Wanak Harold / Environmentalist / MWE Mr. Matagi Samuel / Environmentalist	

Min No	Description / Item	Action by	Date
	designs for the project which were also shared with officials at the municipal council. Within this phase, we are interested in capturing information on social and environment so that we are able to understand the negative impacts that are likely to emerge as a result of the project. At this point he asked the sociologist to facilitate the discussion.		
2	**Discussions:** **Opinions about the proposed water project:** • We have waited for soo long to get this project. All the communities in Rukungiri municipality want clean water and this is the right time for them to get it when this project starts. The main challenge is that, this project has taken long to take off; almost 10 years now since it was first mentioned to us and all that time people have been anxiously waiting for it. On a good note however, we have finally received a message that the World Bank has donated money to the government of Uganda for its implementation. • We really need water in the municipal council. Currently, the water scheme we have does not have the capacity to provide enough water required by the people. Consequently, water is rationed and people receive it on scheduled days but sometimes people do not get the water even on days they are scheduled to get it. The municipal council demolished all the pit latrines because we now want to shift away from that technology and retain only the water born toilets. This further increased our demand for water as a municipality. Therefore, people are great need for water but many years have passed when we do not have water in the municipality. • We have been told that people on the other side of the river in Ntungamo district shall also get water from this project at the same water source. If this is true, then the river is likely to get affected in the long run because large amounts of water shall be pumped out there by affected its environmental nature. Remember that, there are currently many activities that are being done on the same river upstream which if coupled to this project shall significantly reduce its water level. My other concern is that, this project shall require big chunks of land but I am not sure whether people are willing to surrender their land or whether the project is willing to compensate them.	Mr. Jjuuko Edward / Sociologist. Municipal Council staff.	

Min No	Description / Item	Action by	Date
	• I don't think we shall have any problem with compensation because we already have a water piped network in the municipality. This upcoming project should not create a different network but build on the existing one for expansion. The main challenge however is that, the river has been encroached on by the people who have planted there tress, uprooted the vegetation and this have greatly reduced its water level. We brought this issue to the attention of the minister and she promised to do something. Now that this project has come up, we need to protect the catchment of this river to prevent it from further encroachment. • This project shall also have a sewage treatment plant. The challenge with this is that, we may not easily find a place for the plat. The design engineers had proposed a site which is owned by an affluent family and we may not succeed in securing that land from that family. I think we need to reconsider this and look for and alternative location most preferably on government land because when we visited the land proposed by the engineers, we found out that people's attitude particularly the owners of the land was very negative because they raised a lot of fears related to the smell from the treatment plant. They think the plant shall produce bad smell and eventually cause diseases. Whether that is true or not, we need to find an alternative location with few settlements where we can locate the plant and where we shall find less resistance but in all cases, we need to do a lot of community sensitization. **Mitigation measures:** • I would propose that, you encourage construction of trees along the banks of the trenches. • I also believe that, people's trees and crops shall be destroyed during the excavations; do we have a plan with in the design to replant these trees and crops after the excavation and what other plans are there in the plan to avoid any more activities that shall further reduce the water level? MWE: The ministry of water and environment shall hire services of a consultant to come up with a catchment protection and water source protection plan.	Mr. Harold Wanok / MWE	

Min No	Description / Item	Action by	Date
	Social and Economic effects on people's livelihoods: • Not really but may be in some locations along the river where people take their cows to drink water and a few who use the river to irrigate their crops. **Negative and Positive impacts regarding butterflies, herpitiles, mammals and plants:** • I think that shall happen mainly at the treatment plant because microorganisms in the soils and the general hydrosphere of the place shall change in terms of temperature. Secondly, during the process of digging trenches for the pipe lines, some fences and other compound flowers may be destroyed because sometimes it may be difficult to divert the line. **Mitigation measures:** • For plants, I would propose that people should be advised to remove their crops early enough before the project activities start. Don't remove their crops forcefully. Those whose fences are destroyed, we could replant for them. The contractor should have that provision to replace people's damaged fences back as well as trees. This shall require establishing seedlings beds. **Specific concerns / fears:** • The most important one is source protection. If we do not protect the source, we shall further affect the water level. We must also ensure that, the project provides sufficient amounts of water required by the people in the project area. • The politicians sometimes encourage activities that affect the catchment like planting of trees. These need to be sensitized and helped to understand the dangers involved in this. We also need to buy the land early enough form the owners otherwise if we wait for the last minutes, people shall ask for too much money. Let the ministry give us the money and we buy the land now because if we wait, we shall eventually procure it very expensively.		

Min No	Description / Item	Action by	Date
3	**Closure:** The meeting was officially closed by the Mayor for Rukungiri Municipal council. He asked the official from the MWE to speed up the process so that people can start getting water in the municipality.		

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

Date 20/05/2015 Time 10:00am Town Rukungiri Municipal Council HQ

Sub County.................. Parish.................. Village.................. LC 1..................

No	Name	Designation	Email	Phone No.	Signature
01	Akol Samuel	Eng MWE	akolsmc4@gmail.com	0701844607	
02	Makuru Charles	Mayor RMC	chamakuru@yahoo.com	0772733300	
03	S.V. Matagi	Project manager	Savimaxx company limited@gmail.com	0712 65965	
04	Dews Tweumwase	DWO	dtumwase@yahoo.co.uk	0782375515	
05	OKWIR GUSTAVIO	Hydrologist	gustavio@gmail.com	0774134218	
06	Ijjuuko Edward	Sociologist	ejjuuko@gmail.com	0772952552	
07	James Kintu	Ecologist	jkintuetala@gmail.com	0704655767	
08	Wanok Harold	EHO	harold.wanok@mwe.go.ug	0757547003	
09	Byamukama Vincent	W.O - RMC	byavince@gmail.com	0702416863	
10	Agaba Prosper	Ag Town Clerk	[illegible]@gmail.com	0772950038	
11	Kushaba Laban Kitanda	Municipal Environment Officer	labankushaba@gmail.com	0703612658	

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR RUKUNGIRI WATER SUPPLY PROJECT

Minutes of Meeting with Mr. Muheirwe Laban, Senior Assistant Town Clerk, Western Division in Rukungiri Municipal Council.
TELEPHONE: 0772661469

AGENDA
1. Introductions
2. Discussion

Table 44: Minutes of Meeting with the Senior Assistant Town Clerk, Western Division in Rukungiri Municipal Council.

Min No	Description / Item	Action By	Date
1	**Introductions:** Mr. Wanok Harold the Environmentalist from the MWE introduced himself to the Town Clerk. He also introduced Mr. Jjuuko Edwards a sociologist and working as a consultant on the water project. He Informed the Town Clerk that, the MWE is planning to implement a water project in Rukungiri Municipal council and that, as a Ministry, they have already hired consultants to do the work. He informed him that, the technical designs are already in place which provided details on the sites for the different components of the project. He observed that, the work of the Sociologist on the team is to collect social issues which are likely to affect the project and use them to design appropriate mitigation measures. At this point he asked the sociologist to start facilitating the discussion. Mr. Jjuuko first thanked the town clerk for giving them time to talk to him. He informed him that, as a sociologist, his main interest is to understand general and specific social impacts that are likely to be introduced by the project in the area and ways of how to mitigate them.	**Environmentalist / MWE** **Sociologist / Consultant**	

Min No	Description / Item	Action By	Date
2	**Discussions:** **Main sources of Community Livelihoods:** • This is a peri-urban area where people are engaged in a wide range of activities including crop production, livestock and small scale businesses. Majority of the people are into farming and mainly grow crops such as matooke, coffee and perennial crops. Those doing business are mainly petty traders and a few own retail shops. There are a number of tertiary institutions in this area such as Makerere business institute; there are schools like Kinyansaano girls and Makobore high school. So there are people who work in these institutions who earn monthly incomes. People also are into forestry; mainly growing eucalyptus trees and a few of them plant pine. **Opinion about the project:** • This project is very good for the municipality because there has been an inherent shortage of water in the area. The existing underground water sources are not reliable; they always dry up in the dry seasons. Therefore, the demand for water in the municipal council is higher than the supply. This project is going to alleviate this problem because water consumption at the household level is increasing on a daily basis. This piped water will be safe and it is going to avoid use of stagnant water which is not safe and subsequently reduce on the prevalence of water borne diseases. **Specific concerns and fears about the project:** • My biggest fear is that, even this project may not provide enough water to all areas in the municipal council. We have heard rumours that the water source shall not have enough water to satisfy the existing demand which is ever increasing in the municipal council. With the current water scheme, very many people have applied for the piped water but they have not been connected because the current source cannot give them enough water. That is my biggest fear and I hope it is not true. • Additionally, some people also think that like it is in the current water scheme, some areas particularly those on the hills which are higher in altitude than the one where the water reservoirs are shall not get water. **Negative Impacts:**	**Town Clerk**	

Min No	Description / Item	Action By	Date
	• People have small pieces of land because the area is densely populated. Based on this, some people might resist the project if their land is taken and they are not given sufficient compensation. • People also fear to construct a lagoon in their area because they think it will be storing feces and if this perception continues, many of them may not accept the sewage treatment plant to come to their area if they are not sensitized. You can even take the local leaders to area elsewhere and see how these lagoons are constructed. The other fear is related to the tariffs. People will not be willing to spend more money on water than they do on the current water scheme.		

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR RUKUNGIRI WATER SUPPLY PROJECT

Minutes of Community Meeting Held At Kabashaki Village, Kabingo Parish, Kebisoni Sub-County in Rukungiri District at the proposed site for the Intake.

AGENDA:

1. Introduction
2. Discussion
3. closure

Location: KABASHAKI VILLAGE

ATTENDEES

Find the attendance list attached

Table 45: Minutes of Community Meeting Held At Kabashaki Village, Kabingo Parish, Kebisoni Sub-County in Rukungiri District at the proposed site for the Intake.

Min. No	Item / Description	Action By	Date
1	**Introduction:** The meeting was opened with the word of prayer from the community member. This was followed by self-introductions for both consultants and the community members. Subsequently, the Project manager Mr. Matagi introduced the project and explained the importance of the project to the community. He also informed them about the source of funding for the project and how much it would cost. He talked about the different components of the project and issues related to land take for the intake, water treatment plant, sewage plant and the Reservoir. He also mentioned that, there were other people working on the project but specifically focusing on Resettlement and Compensation issues who he said shall be coming to your homes to collect detailed information from you. He asked the community members to cooperate with them because they are also part of the project. At this point he asked the sociologist to come and facilitate the discussion. Before Mr. Jjuuko conducted the discussion, he talked about the importance of public consultations and how this feeds into the development of the ESIA report. He indicated that, community members in the affected communities are very critical stake holders because they are the ones who are going to be directly affected by the project. For this reason, we have to consult you extensively to get your opinions, fears, perceptions, anticipated negative impacts and your proposals on how can be done to mitigate them. He indicated that, this was the main reason why we are here to talk to you and encouraged the community members to openly give their views so that, they can be used to inform project implementation and to design appropriate mitigation measures.	Consultants and community members	

Min. No	Item / Description	Action By	Date
2	**Discussions:** **Community opinions about the project generally:** • We need the project to come to our area, we like it very much because it will solve the water scarcity problem that we have both in the trading center and in the rural areas of the sub-county. • We need this project to come because we shall get clean and safe water nearby. Partly, this will put to an end the challenges related to walking long distances in search of water and the time taken to get to the water sources. We might even get water for irrigation which shall improve on our livelihoods. • We welcome the project into our area. In this sub-county, we do not have water sources from which we can get clean and safe water. The shallow well that was constructed by the district dried up because the water table is low. Once this project comes, we shall get clean water in our area and consequently reduce on the prevalence of water borne diseases. This area has never got clean water sources with support from the government yet we have the river in close proximity. • At the sub-county level, we have even already formed a WASH committee and among many things, this committee is expected to sensitize our people on good water, hygiene and sanitation practices. We were told to identify suitable places where they will construct the water treatment plant and the reservoir. We have already secured these places because we have land in this sub-county that belongs to government. • The main challenge is that, our sub-county is very big but there are only a few areas that were surveyed and earmarked to benefit from this project. The areas along the pipe lines are the only ones that shall benefit which is not good. **Perceived Negative Impacts of the project:** • We were told that the water from this project shall be provided at a cost which means that, our people shall have to pay for water services. People in this area are not used to pay for water services but I believe this attitude shall change when we sensitize the people about the importance of getting safe water and how to maintain the project in general. Once people appreciate the importance of paying little money in exchange for safe and clean water, they will be willing to support the project. • The design of the project seems to indicate that, people shall have to surrender their part of their land towards the construction of the water treatment plant, the reservoir and	Community members.	

Min. No	Item / Description	Action By	Date
	the sewage plant. Although we do not expect any problem to this, people are most likely going to resist if the project does not give them adequate compensation for their assets including their land, crops and trees. **Social and Economic benefits of the project:** • Due to the availability of clean water, hygiene and sanitation shall greatly improve in our area • People shall no longer have to move very long distances in search for clean water. However, the project has to protect the catchment to ensure that people don't continue encroaching on the river banks like they did in Isunduri wetland. • When the officials from the ministry came to introduce the project and the consultants, they did not tell us that, they will compensate people for their land and the crops. We also don't talk about it when we are in communities when we are sensitizing people about the project but even without compensation, people are anxiously waiting for the project and they like it because it will introduce safe water. They know that, even when they put pipes in their land, that cannot stop them from continuing to use their land. • We also think that people shall get jobs as casual labourers from the project. We do not expect the project to get people from outside to come and do these jobs when there are people here who can do them. Once this is done, the sense of community ownership for the project shall increase. **Cultural sites and features of culture significance that may be affected:** All of them: No we do not have any in our community. **Concerns and fears/issues to be given ample consideration:** • In your introduction, you talked more about Rukungiri district and less about areas on this side of Ntungamo district. Is that to imply that, our areas shall not benefit from this project? For us we believe that both sides are going to benefit. Our people have already started filling in application forms for water in all the Local Councils namely; Kahanje cell, Iteriro, Rugarama, Rwisande, and Kamukuringwa cells in Rwashamire town council. Resp: Before responding to the question, Mr. Matagi Samuel first contacted the project surveyor for clarity on this issue. The surveyor noted that, some areas in Rwashamire town council were surveyed but that they shall get the water in the second phase when the project is rolled out to that side of the river.		
3	**Closure:**		

Min. No	Item / Description	Action By	Date
	The meeting was closed by the chairman LC111 who thanked the consultants for taking their time to talk to the people. He asked them to work expeditiously and complete the first phase and then start on the second one in which they expect to get water for their area.		

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

Date 20/05/2015 Time 9:00pm Town Rukungiri

Sub County Kebisoni Parish Kibingo Village Kabashaki LC 1

No	Name	Designation	Email	Phone No.	Signature
1	Oworinawe Victor	V/C/P Kahunge L-C I		07850157[illegible]	
2.	Tibayungwa Abdalla	C/man L.C I Kabashaki		0788998067	
3.	Aheebwa Stines S.	V./C/man Kabashaki		07532496[illegible]	
4	Tinkamanyire James	Chairperson LCIII Bwongyera S/C	tinkamanyirej@gmail.com	0772319976	
5.	Samuel Vivian Matagi	Project manager	savimaxxcompany limited @ gmail	0772657651	

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

Date 20/5/2015 Time 3:10 P.m Town

Sub County Kalasoni Parish KARUHEMBE PARISH Village MUKAZI 2 LC 1

No	Name	Designation	Email	Phone No.	Signature
	BYAMUNGU ERIDADI	C. PERSON L.C I		0757971156	

APPENDIX 3: WATER QUALITY TEST RESULTS FOR R. KAHENGYE

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 Rahenge	*National Standards for potable water. (un-treated water)*
WS Sample Nr	--	**K2180/2015/C/B**	
pH	--	6.90	*6.5 – 8.5*
Electrical Conductivity (EC)	µS/cm	58	*2500*
Total Dissolved Solids (TDS)	mg/L	37	*1200*
Total Suspended Solids (TSS)	mg/L	**34**	*0*
Colour: Apparent	PtCo	**80**	*15*
Turbidity	NTU	**19**	*10.0*
Alkalinity: total as $CaCO_3$	mg/L	32	*500*
Hardness:Total	mg/L	24	*500*
Magnesium: as Mg^{2+}	mg/L	0.96	*50*
Flouride: F	mg/L	0.29	1.5

Table of Analytical Results

Chloride- Cl^-	mg/L	1.0	500
Nitrate – N	mg/L	0.02	5.0
Sulphate: SO_4^{2-}	mg/L	7	200
Calcium: Ca^{2+}	mg/L	8	75
Ammonia-N	mg/L	0.42	1.0
Bio-Chemical Oxygen Demand (BOD)	mg/L	5.3	Not specified
Chemical Oxygen Demand (COD)	mg/L	15.5	Not specified
Total Phosphorus (TP)	mg/L	0.16	Not specified
Total Nitrogen (TN)	mg/L	0.2	Not specified
Ortho Phosphate	mg/L	0.12	5.0
Fat oil and Grease	mg/L	0.76	Not specified
Bacteriological: Faecal Coliforms	CFU/100mL	60	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
Tel: +256 414 315 111/107
Email: external.services@nwsc.co.ug