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Ministry of Water and Environment

Irrigation for Climate Resilience Project - P163836

KABUYANDA IRRIGATION SCHEME

Environmental and Social Impact Assessment

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ACRONYMS

AES	Audio Encounter Survey
BMP	Biodiversity Management Plan
BOD	Biological Oxygen Demand
CAO	Chief Administrative Officer
CBD	Convention on Biological Diversity
CDM	Climate Development Mechanism
CFR	Central Forest Reserve
CFRD	Concrete-Faced Rock-Fill Dam
CIA	Cumulative Impact Assessment
CIWA	Cooperation in International Waters in Africa
CMC	Catchment Management Committee
CMO	Catchment Management Organization
CMP	Catchment Management Plan
CNDPF	Comprehensive National Development Planning Framework policy
COD	Chemical Oxygen Demand
DGSM	Directorate of Geological Surveys and Mines
DLB	District Land Boards
DO	Dissolved Oxygen
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
EC	Electrical Conductivity
ERPA	Emission Reductions Payment Agreement
ESIA	Environmental and Social Impact Assessment
ESMF	Environment and Social Management Framework
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GFS	Gravity Flow Schemes
GoU	Government of Uganda
GPS	Global Positioning System
HEFD	Homogeneous Earth Fill Dam
HIV/AIDS	Human Immuno-deficiency Virus/ Acquired Immuno-deficiency Syndrome
ICRP	Irrigation for Climate Resilience Project
IDKWRMC	Isingiro District Kabuyanda Water Resources Management Committee
IDKWRTSC	Isingiro District Kabuyanda Water Resources Technical Sub Committee
IDPC	Isingiro District Planning Committee
IPMP	Integrated Pest Management Plan
IUCN	International Union for the Conservation of Nature
KCMC	Kigarama Commodity Marketing Cooperative
LC	Local Council
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MCM	Million Cubic Metres

MDGs	Millennium Development Goals
MEMD	Ministry of Energy and Mineral Development
MGLSD	Ministry of Gender, Labour and Social Development
MLHUD	Ministry of Lands, Housing and Urban Development
MOH	Ministry of Health
MOJCA	Ministry of Justice and Constitutional Affairs
MOLG	Ministry of Local Government
MOWT	Ministry of Works and Transport
MTTI	Ministry of Tourism, Trade and Industry
MWE	Ministry of Water and Environment
NBI	Nile Basin Initiative
NCORE	Nile Cooperation for Results
NDP	National Development Plans
NELMSIOA	Nile Equatorial Lakes & Multi-Sector Investment Opportunity Analysis
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NEMA	National Environment Management Authority
NFA	National Forest Authority
NWSC	National Water and Sewerage Corporation
O&M	Operation and Maintenance
ODS	Ozone-Depleting Substances
OL	Opinion Leaders (Village)
PAPs	Project Affected Persons
PCBs	Polychlorobiphenyls
PCDD	Polychlorinated dibenzo-p-dioxin
PCDF	Polychlorinated dibenzofurans
PCR	Physical Cultural Resources
PM	Particulate matter
PMA	Plan for the Modernisation of Agriculture
POPs	Persistent Organic Pollutants
RAP	Resettlement Action Plan
RDC	Resident District Commissioner
SACCO	Savings and Credit Cooperative Society Limited
SDA	Seventh Day Adventists
SEAP	Social and Environmental Action Plan
SIPs	Sector Investment Plans
TCMP	Traditional and Complementary Medicine Practitioners
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UBOS	Uganda Bureau of Statistics
UEDCL	Uganda Electricity Distribution Company Limited
UEGCL	Uganda Electricity Generation Company Limited
UETCL	Uganda Electricity Transmission Company Limited
ULC	Uganda Land Commission
UNBS	Uganda National Bureau of Standards
UNDP	United Nations Development Programme

UNEP	United Nations Environment Program
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNFCCC	United Nations' Framework Convention on Climate Change
URTI	Upper Respiratory Tract Infections
VHT	Village Heath Team
WHO	World Health Organization

EXECUTIVE SUMMARY

Introduction

The Government of Uganda (GoU) through the Ministry of Water and Environment (MWE) with support from the World Bank is preparing the Irrigation for Climate Resilience Project (ICRP). The project development objectives are to provide farmers in the project areas with access to irrigation and other agricultural services, and to establish management arrangements for irrigation service delivery. Specifically, the project will contribute to improvement of farm incomes, rural livelihoods, food security, climate resilience, sustainable natural resources management in the proposed areas of Kabuyanda in Isingiro District.

Components. The project has three components: Component 1. Irrigation Services; Component 2. Support services for agricultural production and value-chain development; and Component 3. Institutional Strengthening and Implementation Support.

Component 1. Irrigation Services (US$120 million)

Access to irrigation is critical to allowing farmers cope with climate variability, to increase yield and intensification, and diversify towards higher value crops. Component 1 aims at providing farmers with irrigation water across various irrigation models, classified around the size of irrigation development [1] as per the National Irrigation Policy, spanning across the country.

Component 1 comprises three sub-components.

Sub-component 1.1 on Large and Medium-scale Irrigation. Large (>1,000 ha) and Medium (100 to 1,000 ha) scale irrigation schemes are established when an important water source is available in conjunction with a sizable irrigable area, offering the chance of developing economies of scale for marketing and value addition. As water might be not directly accessible across the whole irrigable area, and/or as the water source might be at a certain distance from the irrigable area and/or variable over the year, off-farm infrastructures (i.e. dams, diversions weirs, transmission pipes or canals, distribution networks) are required. The project will construct new irrigation schemes (Kabuyanda and Matanda); support the development and strengthening of management model of new (Kabuyanda and Matanda) and existing (Olweny and Agoro) irrigation schemes; and develop studies for future irrigation schemes (Nyimur, Enengo and Amagoro). Activities will include: (i) dam construction and associated head works; (ii) construction of irrigation networks (pipes, canals, hydro-mechanical equipment) up to the farm gate; (iii) construction of drainage networks; (iv) construction of access and scheme roads; (v) construction of scheme offices, sanitation facilities, and storage facilities; (vi) construction of weather stations; (vii) consultancy services to prepare feasibility studies, detailed designs and safeguard instruments for irrigation schemes; (viii) consultancy services to monitor and control civil works; (ix) consultancy services in support of management of irrigation schemes; (x) consultancy services for environmental assessments and audits and implementation of the Environmental and Social Management Plan (ESMP); (xi) consultancy services for the roll out of Certificates of Costumery Ownership; and (xii) startup fund for O&M.

Sub-component 1.2 on Small and Micro-scale Irrigation. Small (5 to 100 ha) and Micro (<5 ha) scale irrigation schemes are smaller in size, relying on a nearby water source mobilized with simple and relatively low-cost infrastructure, making it possible for farmers (individually or collectively) to take charge of irrigation development and management. The project will pilot public support for the construction of farmer-led small and micro scale irrigation schemes around the two new irrigation schemes (Isingiro

District around Kabuyanda and Kanungu District around Matanda) and in areas close to Kampala characterized by high marketing potential (Mukono, Wakiso and Mpigi Districts), adopting a value chain approach. Activities will include: (i) construction of small water retention facilities and associated head works; (ii) drilling of wells and boreholes; (iii) construction of small irrigation networks (pipes, canals, hydro-mechanical equipment); and (vi) consultancy services to prepare designs, safeguard instruments and for monitoring and control of works.

Sub-component 1.3 on Integrated Catchment management. It will develop and implement integrated catchment management interventions for the two new irrigation schemes (Kabuyanda and Matanda), to improve the sustainability of the schemes, including the restoration/reforestation activity in Rwoho CFR (Kabuyanda). Activities will include: (i) consultancy services to prepare integrated micro-catchment management plans; (ii) implementation of identified watershed management measures from the micro-catchment management plans; and (iii) restoration/reforestation activities.

Component 2. Support services for agricultural production and value-chain development (US$32.6 million)

Component 2 aims to support farmers carrying out on-farm irrigation, accessing production and value addition knowledge and skills, and developing sustainable market access. The project will support farmers in increasing their knowledge using a Farmer Field School (FFS) approach, increased access to inputs (improved seeds, fertilizers), on-farm irrigation technologies, machineries and postharvest and agro-processing infrastructures through the use of smart subsidies and consultancy services.

Component 2 will comprise of two sub-components.

Sub-component 2.1 on On-farm Production and Productivity. It will provide support to farmers and farmers' groups for production and productivity improvement at the farm level in the new irrigation schemes (Kabuyanda and Matanda), in existing irrigation schemes (Olweny and Agoro), in small and micro irrigation schemes (Isingiro, Kanungu, Mukono, Wakiso and Mpigi Districts) as well as in the area of the proposed future irrigation scheme (Nyimur). Activities will include: (i) consultancy services to create and strengthen farmer groups, provide extension services, facilitate access to inputs, promote good agricultural practices, sustainable land management practices, and integrated pests and disease management; (ii) matching grants to facilitate access to inputs (seeds, agro-chemicals); (iii) matching grants to facilitate access to on-farm irrigation technology; and (iv) consultancy services to monitor and control civil works.

Sub-component 2.2 on Value Addition and Market Linkages. It will provide support to farmers' groups for value-chain development and strengthening and establishment of market linkages. Activities will include: (i) consultancy services to create and strengthen linkage with value chain actors in improved post-harvest handling, agro-processing, access to financing services, access to markets and market information; (ii) matching grants to facilitate access to equipment; and (iii) purchase of small goods.

Component 3. Institutional Strengthening and Implementation Support (US$10 million)

Component 3 will comprise of two sub-components.

Sub-component 3.1 on Institutional Strengthening. Activities will include: (i) short-term studies on management models in irrigation, tariff structures, and prerequisites for financial sustainability; and (ii) capacity building, training and study tours.

Sub-component 3.2 on Implementation Support. Activities will include: (i) hiring of individual consultants for the Project Support Team (PST); (ii) purchase of project implementation goods and services (ICT Equipment, softwares, vehicles); (iii) travel costs and allowances; and (iv) Monitoring and Evaluation (M&E) costs.

Kabuyanda Irrigation scheme

Kabuyanda is one of the irrigation schemes that was designed under the previous Nile Equatorial Lakes Subsidiary Action Plan (NELSAP) as Kabuyanda Water Resources Development project. Feasibility and detailed design, Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for Kabuyanda irrigation scheme were undertaken under NELSAP in 2017. The project design has been revised to simplify management and reduce the project costs and this has necessitated the revision and update of the ESIA and RAP respectively, including all the additional required documents (Integrated Pest Management Plan, IPMP; and Dam Safety Management Plans, DSMP). Given the above, it was therefore necessary to update the ESIA and RAP of Kabuyanda irrigation scheme to ensure its consistency with World Bank environmental and Social Safeguards requirements. The RAP, including the census, was updated, approved by the World Bank and disclosed in February 2019.

Project Description

The Kabuyanda irrigation scheme under the Irrigation for Climate Resilience Project (ICRP) is located in Isingiro and Ntungamo Districts in south-western Uganda and falls within the broad zone known as Uganda's "cattle corridor", which stretches from the south-west to the north-east of the country. Characterized by fluctuating rainfall and with up to four months of little to no rainfall, it is dominated by pastoral rangelands and resource variability. The proposed project consists of a dam and an irrigation scheme. Kabuyanda Dam (33 m high earth-fill dam with reservoir with a storage capacity of 8.8 MCM, draining an area of about 90 km^2) will be located approximately 5 km north-west of Kabuyanda Town, and will submerge an area of 100 ha (1.1% of total forest area) within the Rwoho Central Forest Reserve (CFR) under the the management of National Forestry Authority (NFA). Rwoho CFR is a 9,000-ha plantation development forest, largely degraded and partially restored with non-indigenous species (*Pinus caribaea, Pinus ocarpa* and *Eucalyptus sp.*). As Rwoho CFR contains a large proportion of plant species of non-native origin, and as human activity has substantially modified the area's primary ecological functions and species composition, Rwoho CFR is classified as a modified[1] (not as natural)[2] habitat. Considering that Rwoho CFR has no high biodiversity value, it is classified as a non-critical habitat.[3] In part of the area to be submerged (15.1 ha), plantations were established under the Climate Development Mechanism (CDM), as a strategy to mitigate against extremes of weather and climate but also to benefit from the CDM financing mechanisms aimed at sustaining the developments and for resilience to climate (the ERPA terminates on December 31, 2019, thus ahead of the commencement of works for the Kabuyanda

[1] Modified habitats are areas that may contain a large proportion of plant and/or animal species of nonnative origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include, for example, areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

[2] Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

[3] Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

irrigation project). The irrigation area served by the dam is expected to cover 3,300 ha and extends southwards from the dam bordering the banks of the Mishumba River, outside the forest reserve. The area suffers from low access to water, with occasional border conflicts arising when pastoralists cross into Tanzania, and vice versa, in search of water and pasture during the dry seasons. To manage the pastoralists immigration, the Governments of Uganda and Tanzania agreed to construct valley tanks at strategic locations.

Project alternatives

Two project alternatives were considered. Alternative 1 with a dam being located about 2 km upstream in a forest reserve area, whilst Alternative 2 with a dam laying downstream in an area with settlements and which is heavily utilized for agriculture. Parameters used for analysis of the two alternatives included potential environmental and social impact (costs and benefits); the feasibility of mitigating these impacts (costs, benefits, and cost-effectiveness); their capital and recurrent costs; their suitability under local conditions; their institutional, training, and monitoring requirements and their technical parameters. Alternative 1 with a dam within the forest reserve was deemed to have the lower impact and therefore has been selected as the preferred alternative. Similarly, the type of dam structure was analyzed and a Homogeneous Earth Fill Dam (HEFD) was deemed preferable rather than a Concrete Faced Rock Fill Dam (CFRD). Dam utilization options were also analyzed and the option of irrigation purpose alone, which excludes hydropower, domestic uses and livestock uses, was recommended and selected for implementation.

Policy, Legal and Institutional Framework

Under the project the following policies are applicable:

a. The National Environment Management Policy 1994 (NEMP);
b. The National Development Plan 2015-2020;
c. The Uganda Vision 2040;
d. Agricultural Sector Strategy Plan 2015/16-2019/20;
e. The 2003 National Agricultural Research Policy;
f. Draft Uganda Organic Agriculture Policy, July 2009;
g. Water Resources Policy, 1995;
h. Plan for Modernization of Agriculture (PMA);
i. The National Land Use Policy;
j. The National Gender Policy, 1997;
k. The National HIV/AIDS Policy, 2004;
l. The National Irrigation Master Plan for Uganda (2010-2035); and
m. The National Policy for the Conservation and Management of Wetland Resources, 1995

The Legal Framework

The following are some of the pertinent legal and regulatory instruments relating to the project:

a. *The Constitution of the Republic of Uganda, 1995:* The Constitution provides for *inter alia*, matters pertaining to land, natural resources such as rivers and lakes and the environment. It obliges citizens to maintain a clean and healthy environment. This ESIA is to ensure the project maintains a clean and healthy environment in its setting and the environs.
b. *The National Environment Act, 2019 (Amended):* This Act established principles for sound environmental management and provides an Institutional Framework for environmental management as well as ESIA process for projects listed in its Fourth and Fifth Schedules (such as

National Water Resources Management Programs - NWRMP ESIA process, contained in EIA guidelines for Water Resources Related Projects in Uganda, Sept. 2011, MWE).

c. *The Water Act, Cap 152:* The objective of the Act is to enable equitable and sustainable management, use, and protection of water resources of Uganda through supervision and coordination of public and private activities that may impact water quantity and quality.
d. *Uganda Wildlife Act Cap 2000:* The purpose of this Act is to promote the conservation and sustainable utilization of wildlife throughout Uganda so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use. Amongst others, Act requires an ESIA to be carried out for projects that may have a significant impact on protected areas.
e. *The Land Act, Cap 227:* Section 44 implores land owners to use land in compliance with a number of laws governing environmental, forestry amongst others.
f. Land Acquisition Act, 1965: the key consideration regarding this Act in the project is to ensure land owners affected by the project are adequately and timely compensated.
g. *The Workman's Compensation Act, 2000:* The Act provides for the compensation to be paid to a worker who has been injured or acquired an occupational disease or harmed in any way in the course of his work.
h. *The Occupational Health and Safety, Act 2006:* In all this law is to ensure for protection of workers while in work environment.
i. *The Employment Act, 2006:* Is a framework Act which provides for matters governing individual employment relationships in terms of circumstances of provision of labor. Also, the Employment Act provides for matters of grievance settlement and issues of payment of wages and salaries.
j. *The EIA Regulations, 1998:* These Regulations serve to guide the ESIA process and this study is being undertaken in line with the provisions the Regulations.

The World Bank Safeguard Policies triggered by the project include:

a. OP 4.01 *Environmental Assessment* is triggered because the infrastructures will be of large scale, with inundation of 100 ha (1.1%) of the Rwoho CFR area, a reservoir storage capacity of 8.8 MCM, with the inundation area including 15 ha of part of Clean Development Mechanism (CDM) areas and sections of areas of forested land being managed under Collaborative Forest Management scheme hence, a need for conducting this Environmental and Social Impact Assessment. All these qualify the project to be placed under Environmental Assessment (EA) Category A type;
b. OP 4.04 *Natural Habitats* is triggered because the irrigation infrastructure development will involve uptake of parts of forested areas currently being managed under Collaborative Forest Management with the communities as well as parts Rwoho CFR and the dam reservoir being hosted in a river body;
c. OP 4.36 *Forests:* The project activities will take up 100 ha (1.1%) of Rwoho CFR which therefore triggers this safeguards policy instrument. Forest impacts and management shall be mitigated by restoring/reforesting 500 ha in Rwoho CFR and shall be undertaken under the project as part of the Catchment Management activity (sub-component 1.3). Area for reforestation has been identified within Rwoho CFR.
d. OP 4.09 *Pest Management* is triggered because the project is aimed at boosting agricultural production and income at household level amidst climatic variability which is one of the factors leading to proliferation of crop and livestock pests and diseases whose control will likely require use of pesticides and agro-chemicals. As such, a Pest Management Plan has been prepared as part of this ESIA;

e. OP 4.12 *Involuntary Resettlement* is triggered because the works will necessitate land take triggering compensation and resettlement of project affected persons (PAPs). Accordingly, a RAP has been prepared alongside this ESIA report;
f. OP 4.11 *Physical Cultural Resources* is triggered because project will involve extensive excavations. The project will avoid affecting any known PCR and a Chance Finds Procedure has been provided in the ESIA to guide handling and management of chance finds;
g. OP 4.37 *Safety of dams* is triggered by construction of large dams whose design and management plans have been reviewed by an independent panel of experts. Dam Safety Management and Emergency Plans have been prepared for Kabuyanda scheme alongside the ESIA to provide guidance on management of any dam failure that could result in loss of lives in the event of a failure. GoU has a dam safety panel in place, established under the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) and NCORE funded by the Bank; and
h. OP 7.50 *Projects on International Waters* is triggered because the project is hosted by R. Mishumba which in turn drains into R. Kagera which is a transboundary river. Riparian notification has been undertaken by GoU through the Nile Basin Initiative on November 13, 2018. Only Tanzania responded to give a no objection, while the rest of the countries did not respond. The following Riparian States were notified: Burundi, DR-Congo, Egypt, Ethiopia, Kenya, Rwanda,South Sudan, Sudan, and Tanzania.

Assessment Methods

A number of methods were applied including literature reviews and field investigations for the identification of sensitive receptors, baseline data collection and analysis including biodiversity assessment, hydrology and water resources assessment, pests and diseases assessment, public health survey, archaeology and cultural heritage assessment, noise assessment, air quality, and water quality assessment, as well as stakeholder consultations and direct observations. Both NEMA and World Bank Guidelines were followed while carrying out the assessments.

Description of Biophysical Baseline Conditions in the Project Area

a. *Climate:* The project area receives 1,120 mm of rainfall annually spread over two rainy seasons from March until May and from September until December, the second of which receives more rainfall but is more variable. Temperatures average 19^{o}C with a range of between 13^{o}C and 26^{o}C, whilst evaporation rates average around 1,350 mm per annum, but may be a factor of 3-4 times the rainfall levels during the dry season.
b. *Catchment Area:* The catchment is characterized by hilly to mountainous terrain with steep fluted slopes and high hilltops. Catchment elevations vary from 1,347 m.asl at the proposed dam site to over 1,843 m.asl at the upper reaches with steep slopes. The annual run-off averages about 177 mm. The mean annual flow of the Mishumba River is 0.51 m^3/s with a range of 0.37–0.74 m^3/s. Peak maximum flood is calculated to 382.1 m^3/s. River Mishumba modelled flow indicate 10 years out of 46 years have zero flow. The catchment is dominated by Rwoho Central Forest Reserve (CFR), a 90 km^2 plantation development forest, mostly degraded with bare hilltops with sparse woody plant cover, and partially replanted with non-indigenous species (*Pinus caribaea, Pinus ocarpa and Eucalyptus sp.*). As Rwoho CFR contains a large proportion of plant species of non-native origin, and as human activity has substantially modified the area's primary ecological functions and species composition, Rwoho CFR is classified as a modified habitat. Considering that Rwoho CFR has no high biodiversity value, it is classified as a non-critical habitat.

c. *Proposed command area:* The area to be irrigated has elevations vary over a lower range of 1272-1350 m.a.s.l with milder slopes, classified as flat to undulating with some areas having rolling terrain. Land is widely crop with banana.
d. *Geology:* The project area is underlain by the Karagwe-Ankolean system belonging to the Cambrian age, predominantly composed of arenites and argillites. Instances of metacalcareous rocks (including shales, slates and sandstones) and undifferentiated gneisses are also occasionally encountered. The dominant soils within the reservoir catchment are Lithic Leptosols varying from very shallow soil over hard rock or highly calcareous material to deeper gravelly soils.
e. *Water quality:* Water quality at sampled sites is generally acceptable, with pH results being almost neutral with a few exceptions which were lower, and nitrogen, iron concentration and total suspended solids all within acceptable limits. Coliforms were not recorded within the project area with phosphorus concentrations exceeded acceptable limits indicating possible application of fertilizers in the catchment areas of the project. The average result for electrical conductivity (EC) was 1,140 µS/which is higher than 1,000 µS/cm, implying that water quality in some areas is not good for sustaining life of organisms that cannot live in water with high EC. Whilst total dissolved solids exceeded 500ml/l at three sample points. This suggests that water quality is overall good but has already been degraded to some extent, and that, measures should be put in place for sustainable land management to avoid use and application of fertilizers.
f. *Fish:* Seven fish species were recorded at the sampled sites, belonging to three families. Six fish species were caught during experimental fishing and one was reported during interviews. The site at R. Katenseni, which is 6 km downstream of the dam, recorded the highest number of fish species with a total of four encountered during the sampling and a fifth being the one which was reported anecdotally to exist in the area. Fish monitoring, as recommended by NAFRRI, will be included in the contractor's ESMP to monitor and mitigate impacts on the fisheries. None of the recorded fish species is of special conservation interest, measured againt the IUCN conservation list.
g. *Fauna:* It was ascertained that no large mammals occur in the area, although several species of medium sized mammals (Hyrax, Olive Baboon, Side-stripped Jackals, and Leopard) were stated to have previously existed in the area. A total of 53 species of birds were recorded in six general areas where surveys were conducted. The Ring-Necked Dove was recorded in all survey areas visited, whilst the African Harrier Hawk was an opportunistic record observed between survey areas. A total of 21 transects were established and surveyed for herpetofauna in the project area, recording eight reptile species, constituting 4.6% of Uganda's total reptiles. The species included two skinks, one lizard, one gecko, one chameleon and three snakes. Additionally, the Forest Cobra *Naja melanoleuca* and the Nile Monitor *Varanus niloticus* were reported by local residents as occurring. None of the mammal, fish, anphibian and reptile species recorded in the project area is of ecological concern according to the IUCN red list 2017.

Description of Socio-economic Baseline Conditions

a. *Population:* The population and housing census of 2014, the total population of Isingiro District was 486,360 people (250,739 females and 235,621 males). The district has 101,623 households with an average size of 4.8 persons. Kikagate Sub-County has the highest population followed by Nyakitunga and Mbaare Sub-Counties. The average age of the household heads in the project area is 42 years with the youngest being 18 years and the oldest being 90 years. The results show that the majority of the household heads are still in their productive years and therefore commendable for employment opportunities on the project.
b. *Religion:* Five major religious affiliations exist within the Project area, including Protestants, Catholics, Muslims, Seventh Day Adventists (SDA) and Pentecostal (Pentecostal Christians) with the majority being

protestants at 55.8% and Catholics at 30.5%. Socio-economic survey findings showed that the resident population in the project area is mainly comprised of the Bakiga (60.8%), Banyankole (26.3%) and Bafumbira (12.1%), with the remaining 0.9% being Baganda, Batooro and Rwandese.

c. *Literacy:* Although 20.1% of household heads have received no education, just over half of household heads have attained primary education (53.5%), followed by secondary education (23%), and tertiary (3.4%). Further analysis of the socio-economic data showed that 35.6% of the household heads can read and write in both local languages and English while 46.9% of the households only know to how to read and write in local languages.
d. *Vulnerable groups:* Identification of vulnerable project-affected persons revealed that 25.2% of households' heads are female, 5.1% of household heads are 65 years or older, and 1.5% of households were reported to have a head suffering from chronic disease or disability. 14.4% of households surveyed had at least one member who is an orphan and 2% of households reported to have at least one disabled member other than the head.
e. *Energy:* Household fuel consumption and natural resource use are interlinked, with analysis showing that 70% of households use firewood for cooking whilst 23.7% use charcoal. During field visits, the project-affected persons were observed to be mainly using eucalyptus wood which is cut and piled or sorted into bundles for sale along roads/paths and in some market places. 53.4% and 36% of households use electricity and solar for lighting respectively.
f. *Water supply and Drought vulnerability:* Owing to variable rainfall, Isingiro District is prone to drought, resulting in a lack of adequate water supply for both human consumption and production. The average safe water coverage for the entire district is recorded at 35% which is far below the national standard of 66%. According to the National Population and Housing Census 2014 – Isingiro District Profile, 12.3% of the households in the district have access to piped water while 6.1% access water through boreholes. Kabuyanda Sub-County has two Gravity Flow Schemes and four boreholes. Other sources of water for households in the sub-county include springs and swampy water, although the quality of the water from these two sources is poor in terms of taste, colour, smell and hardness. Kabuyanda Town Council depends primarily on two streams flowing from Oruhenda from Kabuyanda Sub-County and a Gravity Flow Scheme from Rutemba and Kisyoro supplying the town council and other villages in the vicinity. These gravity flow schemes provide water to the communities at no cost. Initially, these gravity flow schemes were owned by associations, organized in small groups through which money was collected for maintenance purpose. These associations later collapsed due to poor management.
g. *Health:* Prevalent diseases at district level include Malaria, upper respiratory tract infections, diarrhea (especially among children), dysentery, TB, Yellow Fever, Cholera, skin and eye infections, AIDS, asthma and parasitic infestations among children. The health programmes related to the project need to address and reduce these diseases, in particular, HIV/AIDS and STDs which will be of concern due to a large influx of Project employees and other economic migrants. Health programmes will need to be implemented to prevent escalation of rates of disease prevalence, and to manage risk factors. The existing health care sector within the project area aims to provide curative, preventive, rehabilitative services and includes outpatient services, laboratory services, immunization, family planning, antenatal, maternity, and maternal child health services. However, funding is inadequate and health care services are therefore lacking and would not be able to support an influx of project employees.
h. *Archaeology:* Archaeological sites identified in the area have been considerably disturbed by agricultural practices, and none have remained in their original context. Seventeen sites were identified and documented, although it should be acknowledged that due to the high in-migration of community residents, knowledge of cultural and historic elements may have already been lost. None of the identified sites falls within the reservoir/dam area. Care shall be taken by the project implementers to identify and report any accidental archaeological finds.

i. *Land tenure system:* Land tenure systems in the area include customary, leasehold and freehold. The socio-economic survey indicated that most of the land (77.3%) in the project area is customary, 10% is leasehold, 9.4% is freehold and 3.4% is communal land. Some of the institutions that own freehold land include; National Forestry Authority (NFA) and it is on this land where the dam access and water reservoir will be located; Kigarama Commodity Marketing Cooperative Society Limited, Kaiho Farm School Leavers Cooperative Society - this cooperative own approximately 75 ha of land and Tukundane Fish Farm Limited among others. Some farmers acquired their agricultural land through purchase while others rent land for cultivation on an annual basis. The socio-economic survey revealed that all the household heads interviewed own a piece of land in the project area. The average size of land owned is 2.4 acres. The survey further revealed that all the household heads owned land elsewhere besides where the households reside.

j. *Agriculture:* Mixed cropping is the predominant cropping system, with only a few crops (including passion fruit, sweet potato, sorghum and cabbage) observed to be mostly grown in monoculture. Farmers reported that they also grow tomatoes, green pepper, eggplants, onions, cocoyam, pineapples, and sunflower and soya bean, with most in plots smaller than 5-acres. A few farmers were reported to have banana plantations exceeding 10-acres, and two passion fruit farmers were visited who each had 1-acre crops. The five most common staple crops were reported to be banana, beans, maize, potatoes and sorghum, which are cultivated by most farmers for both domestic consumption and sale.

k. *Pests and Diseases:* A total of 22 pest and disease problems were observed, the most frequent of which was fall armyworm on maize and sorghum, bean aphids and maize aphids. Crop diseases were generally rare (less than 5% of crops per garden), with the exception of cassava mosaic which occurred on nearly all cassava plants observed. An algal leaf spot infection on Avocado, especially on lower leaves in dense canopies, and leaf anthracnose on mangoes were prevalent. In a few isolated cases, there was a severe case of bacterial wilt infection on *Eucalyptus grandis*, mole rat damage on sweet potato, soft spots on passion fruit attributed to fruit flies, and a millipede species was reported by a farmer to be the cause of hollowing damage observed on potato tubers in one garden.

Public Consultation

A two-stage public consultation and disclosure was done during the compilation of the ESIA report and after drafting of the ESIA report. The consultations were through pre-arranged meetings with different stakeholders. A number of stakeholders were consulted including National Stakeholders (Government Institutions / Departments) officials and these included Ministry of Water and Environment (MWE), Ministry of Energy and Mineral Development (MEMD), National Forestry Authority, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Ministry of Lands, Housing and Urban Development (MLHUD), National Environment Management Authority, Ministry of Gender, Labour and Social Development, National Fisheries Resources Research Institute (NaFFFiRI) under the National Agricultural Research Organization (NARO), Uganda National Bureau of Standards (UNBS) and Isingiro and Ntungamo District Local Governments. Consultations were also held with the women and other vulnerable groups, large scale farmers in the area and cooperative societies. These included Kaiho Farm School Leavers Cooperative Society, Kigarama Commodity Marketing Cooperative Society Limited, Kabuyanda Dairy Cooperative Society Limited and Tukundane Fish Farm Limited. These were consulted on aspects such as livelihood, health, gender specific concerns etc. Other stakeholders consulted included African Panther Limited. Finally, consultations were undertaken with Biodiversity Experts with specific focus on the impact of the project's reservoir on the 100 ha (1.1%) of Rwoho CFR and included: World Conservation Union (IUCN) Uganda Country Office, Environmental Conservation Trustee NGO (ECOTRUST) and Department of Environment and Natural Resources Management in the College of Agriculture, Forestry and Nature Conservation of Makerere University.

Some of the issues raised during Public Consultation included:

An operator is expected to be contracted to operate and maintain the scheme. There is need for an economic plan or analysis for sustainability management of the project. Government needs to understand what people are willing to pay for the irrigation, because appropriate pricing is an important tool to improve sector performance and the establishment of achievable targets and effective monitoring systems are useful instruments for enhancing efforts, public/community awareness and engagement is crucial, hence the community should be involved in meeting the objectives of the project. There is a dire need to compensate the affected PAPs and support reforestation under NFA to mitigate project's impact on the inundated forest; MWE should draw lessons learnt from other projects for sustainable management.

DGSM is ready and willing to provide technical assistance in the identification of good quality rock for construction. Products must be based on the Ugandan standards and should be tested. In case the products that are not available on the local market then, UNBS advises that international standards be used. Products approved by UNBS should be used and they must be used in the right quantities. NFA recommended that MWE restricts itself to constructing a dam and reservoir in Rwoho CFR, otherwise construction of other infrastructure such as the camps and project office would require degazettement as per the National Forestry and Tree Planting Act, 2003 (section 7, 8 and 13). MAAIF recommended the need to consider how cattle keepers are to share the water with the farmers because there is a likelihood of using the irrigation water for other purposes. MAAIF also recommended developing a plan to take care of the residual water and soil and water conservation plan, since it is a hilly area. There is also a need to put in place an HIV/AIDS management plan. NEMA raised concern on the economic aspects and advised that the consultant captures clearly issues of cost sharing, social acceptability, linkages with the existing farming practices and the beneficiary components. They suggested that livelihood option analysis be made and indicate properly the interface between livestock herders and crop farmers. They as well indicated that since the project area is within a cattle corridor, the consultant needs to cite who needs the water more. MGLSD advised on occupational, health and safety measures to be undertaken during the project and Gender sensitivity aspects with regard to the project.

Disclosure

This ESIA will be disclosed in compliance with relevant Ugandan regulations and the World Bank Operational Policies. At the national level, once the ESIA is finalized, MWE will submit it to the NEMA for their review and approval. Once NEMA receives the ESIA reports, it will forward copies to key project stakeholders for their comments to be received with 21 days of their receipt of reports. Other copies of the ESIA will be deposited in NEMA library, Makerere University especially in the library at Makerere University Institute of Environment and Natural Resources as well in the Resource Centre in Isingiro District and in the office of the DEO Isingiro. It is also important to note that, NEMA will also disclose the Summary of ESIA on public media such as newspapers, television and radio and invite comments from the public on the project. Once NEMA receives comments on the ESIA, the Executive Director will take a decision to approve/disapprove the ESIA taking into account comments from the stakeholders as well the Agency's judgement on the likely impacts of the project. MWE will upload the ESIA and other safeguards for the project onto its website https://www.MoWE.go.ug/ and invite the public to access and review the documents. The Ministry will also provide copies of the ESIA and RAP documents in the project to the public in its public library and Departments for the public to give their comments on the project.

On its part, the World Bank will review, clear and disclose the ESIA and the RAP alongside other safeguards documents in its website and made available to any interested persons for public access and for public information and comments/feedback as will be necessary.

Impacts and Mitigation/Enhancement Measures

The Kabuyanda project area in Isingiro District suffers from regular annual water scarcity, which causes severe droughts. From community consultations, it was found out that farmers face the problem of drought and most times, they lose their crops and animals. Irrigation in this area will therefore have huge potential positive impacts for the communities. The positive impacts identified over weigh the negative impacts as shown below. Besides, all the negative impacts can be managed and mitigated using the scenarios shown below. The overall conclusion is that the economic benefits of setting up the Kabuyanda irrigation scheme are significant and will help ameliorate poverty and hunger in the communities, including providing climate resilience coping mechanism to the populace in the project area.

MAIN ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROJECT

Positive Impacts

The project has many positive impacts, as given below.

1. ***Transformation of agriculture practice in the areas:*** The proposed Kabuyanda Irrigation Scheme is consistent with GoU strategic development enshrined in its Vision 2040 in which, the country strives to transform its economy from largely peasantry and subsistence agriculture to modern economy. In this Vision, Uganda aspires to transform the Agriculture sector from subsistence to commercial agriculture through mechanization and introduction of modern irrigation systems which is what is being planned under this project.
2. ***Sustainable and optimal use of irrigation water resources:*** The project provides opportunity to promote agricultural development strategies through sustainable use of the country's fresh water resources through measures such as irrigation coupled with catchment management interventions. Available information indicates that, with even full exploitation of irrigation potential only 14.1% of Internal Renewable Water Resources will be utilized. To mitigate rampant country wide seasonal local scale water shortages, GoU plans to put in place large and medium water reservoirs as planned under this project[4].
3. ***Serve to address food security in the areas of the project:*** The planned irrigation project, is a timely intervention by GoU to address water scarcity which has chronically affected crop production in Isingiro District. The New Vision newspaper of January 25th 2018 reported that**…."** Isingiro is one of the leading producers of matooke in Uganda but that exalted position is now threatened by the rampant and persistent droughts since 2015"…Therefore, the planned irrigation intervention is timely in addressing water needs for crop production and addressing food security a situation which is worsening by over-reliance on traditional rain-fed crop production.
4. ***Provide employment opportunities:*** According to UBOS Abstract for Isingiro District, is reported that about 6,039 (6.3%) youth are unemployed. Therefore, the planned irrigation will likely provide opportunities to work in construction and related engagements thereby contributing to youth empowerment.
5. ***Improved household acreages:*** In most rural areas, crop production systems using rudimentary cottage labor and equipment have for long typified agricultural production in the proposed project areas which in a way has kept it plunged in food insecurity, limited production and productivity, limited household acreages summing to poor household incomes. In addition, the irrigation technology to be introduced will likely be one which is more adaptable can be customized to

[4] *Uganda Vision 2040 NPA/MoFPED-Kampala*

household levels. The project is envisaged to assist farmers clear their lands alongside a host of farming husbandry support services which will bring about improved production at household levels.

6. ***Improved access to social services:*** There will be improved accessibility, trade and commercial opportunities after the planned rehabilitation of community access roads which will enhance commercial opportunities as well as delivery of social services in the beneficiary areas.
7. ***Gender empowerment:*** Aware of eminent gender disparities in the project areas, the project has measures aimed at empowering the women who are participating in the project through training and skilling on income generation, record keeping and savings which will be some stride towards women empowerment.
8. ***Crop diversification and intensification:*** Available information indicates that, the local population in the areas of Kabuyanda are largely engaged in banana production despite the climatic limitations affecting the crop. Once the irrigation scheme is operational, it is expected that, the famers will take up horticultural production thereby diversifying their income base. This diversification implies diverse sources of income at household and improved livelihoods as well.
9. ***Tourism Potential:*** Water projects can facilitate the development of recreation facilities in the form of picnic resorts, holiday resorts etc. which are having much commercial viability nowadays. Therefore, the proposed development of a water reservoir and a dam in Kabuyanda may act as a tourist attraction, thereby generating income for the local people, the government and the proprietors of recreational centers and tourism facilities. In addition, the irrigation scheme will attract the students from different schools for study tours. The impact will be long-term and it will be at national/ international scales. It will moderately benefit the communities and those outside the project area, and the likelihood of the impact occurring is probable. The significance of this impact is therefore expected to be **moderate to high positive.**
10. ***Increased Trading and Services:*** On-site facilities tend to be minimal during the Planning Phase such as clearing and citing for material lay down grounds, so reliance on the local community for products and services tends to be quite high, even if by limited numbers of personnel and for short periods. A positive impact would be increased business for shops and services, particularly those in linear market developments along main roads accessing the proposed Project area. This would also apply to guest houses or other places offering local accommodation. The impact will be short term for those with existing small businesses which are easily accessible. However, relatively few businesses will benefit, influxes of personnel will be limited to relatively small numbers, and influxes will be sporadic, depending on the field activities. The likelihood of this impact occurring is certain, and the significance is considered **low positive**.

<u>Potential Negative Impacts</u>

The proposed project has many negative impacts, during the planning, construction and operational phases. However, the identified impacts shall be mitigated according to the mitigation hierarchy. These have been placed according to the phases of the project as follows:

Planning Phase negative impacts

1. **Anxiety and speculation by the communities:** This is likely to arise through sessions of surveying the routes and material sources whereby the communities will be subject to speculation interms of compensation and employment opportunities from the project. This will be managed through a structured and sustained community mobilization and sensitization by the project using available avenues such radio, mass/public meetings, places of worship and council meetings.
2. **Setting up camps and access to the site:** These will likely generate anxiety and in some cases, thefts of project equipment/equipment parts by sections of the community especially where there is

inadequate sensitization hence, a need for the project to have its launch process held in the area of implementation. This process ought to be well publicized.

3. **Vegetation loss:** The proposed project envisages to inundate 100 ha (1.1%) of Rwoho CFR, a 9,000 ha plantation development forest, largely degraded and partially restored with non-indigenous species (*Pinus caribaea, Pinus ocarpa and Eucalyptus sp.*). Rwoho CFR is a modified non-critical habitat. Of the inundated area, 15.1 ha are under the Clean Development Mechanism programme (CDM and for which the ERPA terminates on December 31, 2019, thus ahead of the commencement of works for the Kabuyanda irrigation project, while it would not be possible to take advantage of the option of a 20 year renewable crediting period until 2029), and the rest under private developers through concessionary agreements with NFA, or kept unplanted under NFA unplanted (Natural Belt & Nursery). Once the project is implemented there will be estimated loss of 4,292 m^3 of wood plantation, about 112 m^3 standing natural trees and other aspects all valued at UGX 2,995,520,800.[5]

   Mitigation measures

   - NFA will issue a license to MWE to use part of CFR for the dam and reservoir, which will include the restoration/reforestation of an area of 500 ha in Rwoho CFR using indigenous trees as a condition; there will be no degazettement of Forest, thus land will remain for and NFA's management, in accordance with the National Forestry and Tree Planting Act, 2003;
   - The private tree owners in the inundated area will be compensated for loss of trees as per RAP; and
   - The project under its sub-component 1.3 Catchment Management Plans will prepare and implement catchment management plans within the project catchment area including some forest reserve areas, to be implemented in collaboration with local communities and NGOs.

Construction Phase negative impacts

These will include:

1. **Air quality:** The project initial works of site clearance and excavations will likely cause loose soils which in the end can be blown by wind causing dust nuisance a process that will likely compromise visibility and air quality. However, this is assessed as short-term and a negative impact which can be mitigated through sprinkling water on loose/exposed surfaces and restricting excavations to those sites needed for the works.

   Mitigation measures

   a. The areas of such works be routinely sprinkled with water to suppress dust during works.
   b. Restricting excavations to those sites needed for the works.
   c. For the safety of the workers on such areas, the workers supplied with appropriate PPEs to protect them dust nuisance.

2. ***Noise nuisance:*** It is envisaged that, short-term noise exceedances during construction operations causing nuisance, issues of vibration, and noise from associated project facilities. This will be short-term negative impact.

   Mitigation measure: The impact is to be mitigated through ensuring working hours in the project will be between 8:00am-5:00 pm and having project construction equipment routinely maintained.

3. ***Impact on faunal groups***

[5] In December 2018, NFA carried out an inventory and economic assessment of project affected portion in Rwoho CFR, which at the time corresponded to 302 ha. The assessment estimated that once the project is implemented there will be loss of 12,876 m3 of wood plantation, about 338.09 m3 standing natural trees and other aspects all valued at UGX 8,986,562,400. As the affected area is now reduced to 100 ha, the impact is reduced to a third.

These have been considered as follows:

a. ***Mammals:*** From interviews with the local community and the ESIA surveys, no large mammals were reported to occur in the area. However, several species of medium sized mammals such as Olive Baboon, Savanna Hare and monkeys were reported to be in the area. Through transect walks, evidence of the presence of Marsh Mongoose was recorded. The majority of small mammal species recorded are of wide either spread occurrence (W) or open habitats (O). These can still range into agricultural landscapes and will very likely be present in several parts of the project area in different levels of abundance. None of the mammals are reported to be in the IUCN Red Data List.
b. ***Birds:*** A total of 53 species of birds were recorded in six general areas where the surveys were conducted. By and large, the species that were recorded occur more widely in the project area. The earlier reports of the Grey Crowned Crane *Balearica regulorum* were later confirmed to be pet-like animals in one home in Kabuyanda Town Council hence, no direct project impact expected to have on the Crested Crane. In addition, there were no roosting or breeding nests encountered in the areas of the project confirming further no impact on the Cranes.
c. ***Herpetofauna:*** The project area is comprised of different types of habitat features which may govern the occurrence and distribution of herpetofauna, including tree plantations, farmland, built environment and wetlands, ponds, rivers and streams. Based on the IUCN 2014 Red List none of the species recorded is of conservation concern, all are listed as of Least Concern.

Eight reptile species were recorded in Kabuyanda Project Area. The species included two skinks, One Lizard, One gecko, One Chameleon and three snakes. The Forest Cobra *Naja melanoleuca*, and the Nile Monitor *Varanus niloticus* were reported by the local residents as occurring in the project area. According to the IUCN Red List 2014 and the National Red List for Uganda 2016, none of the reptile species recorded during the survey is of conservation concern.

Mitigation measures: A biodiversity action plan has been developed for the project and shall be implemented. There were no special faunal groups of key concern as such, good construction practices coupled with implementation of the ESMP will go along to addressing any concerns relating to fauna conservation in the project. The project activities, including vegetation clearance in the reservoir area shall be restricted to 100 ha and any faunal encounter shall be evacuated in consultation with NFA and Uganda Wildlife Authority (UWA). The Code of Conduct for workers shall prohibit workers from engaging in hunting activities within the project area.

4. *Concerns regarding labor influx to the area*

Once the project works are launched, there are risks relating to labor influx in which, those seeking employment or enterprises opportunities begin to come into the area hoping to sell goods and services to the temporary project workforce, as well as "associates" who often follow the first two groups to exploit opportunities for criminal or illicit behavior (e.g. prostitution and crime).

More typically, labor influx is associated with negative impacts such as:

a. ***Environmental:*** population pressure due to labor influx may lead to expanded use of natural resources, such as forests and aquatic resources. Influx may induce increased vegetation degradation through collection of fuel-wood and housing needs. There may also be impacts on biodiversity and wildlife from hunting since this is one of the local people activities in the areas of the project.
b. ***Economic and livelihood strategies:*** influx, when significant in relation to local community size, can result in increased pressures on the demand for food, fuel, housing and land. Pressures on land and water systems may also have economic impacts for those with resource-based livelihoods (e.g., agriculture, hunting etc.).
c. ***Pressure on infrastructure, services and utilities:*** population influx can stretch the capacities of social infrastructure especially housing and water supply leading to additional pressures on waste management and sanitation. Labor influx can also create direct demands on social, health and

emergency services. Lack of adequate housing may also lead to unplanned and controlled development of squatter settlements in the project area.

d. ***Health:*** labor influx can provoke higher rates of violence, injury, alcohol and drug consumption/abuse and sexually transmitted diseases in the local population. Over-crowded or camp-based living conditions can significantly alter existing levels of communicable diseases including respiratory problems, diarrheal and vector-borne diseases and tuberculosis, which also increases the risks of disease being introduced and spreading through host communities.
e. ***Social and Community well-being:*** labor influx, can have effects on community cohesion which can be particularly acute in smaller communities hosting a largely male workforce, and/or a workforce from other regions which may result in conflicts between locals and non-locals concerning employment opportunities, wages, and natural resources. While crime rates may increase generally, increases in crime and violence against women and girls may be particularly acute in socio-economic settings where there is an existing gender differentiation in terms of power and norms, coupled with limited governance capacity. In locations with pre-existing sexual and gender-based violence (SGBV) issues such as in the project area, labor influx can exacerbate SGBV risks.

   Mitigation measures: First and foremost, the Contractor/s shall be required to develop and implement a Labour Management Plan that shall guide hiring of workers to ensure proper identification, avoidance of forced and child labour, issuance of work contracts including code of conduct, formation and operationalization of workers' Grievance Redress Committee, Workers' Union, induction and continuous workers' training, provision of workers' accommodation/camp to isolate work-force from communities, development and implementation of an HIV/AIDS and Gender management plans and hiring a service provider to undertake implementation of HIV/AIDS and Community Health and Saefty activites in the project area/ host community.

5. ***Loss of structures:*** The RAP (February 2019) established that the project will take up a total of 185 structures of mainly 62 commercial buildings, 69 auxiliary structures (kitchen, toilets and bathrooms), 13 animal houses and 20 hedge fencings.

   Mitigation measure: The RAP has provided for compensation for these assets and that process should be fair, timely and adequate in keeping GoU land acquisition laws and procedures.

6. ***Impacts on physical cultural resources:*** Based on analysis of the location of the reservoir villages and its coordinates, none of the 17 PCR sites presented under baseline are located within the reservoir/dam area. This implies that the project will not likely have significant impact on the known PCRs in the reservoir area. However, the project's implementation in the command area where most of the PCRs occur will necessitate;

a. Clearly marking out the identified PCRs locations before implementation of the project
b. Realignment of the water transmission canals to bypass any PCRs in the alignments. Where it becomes inevitable to avoid PCRs especially the graves, the developer will pay compensation for relocation of human remains in accordance with RAP provisions.
c. Archaeological watching briefs to be undertaken during ground breaking and site clearance/construction phase by a professional archaeologist(s).
d. Training of construction workers in basic skills of identification, handling and reporting of any new archaeological sites and artefacts during site clearance and construction.
e. Providing a copy of chance finds procedure to construction workers to guide them in management of archaeological sites and materials.
f. Prohibiting Project workers to remove archaeological material from the site unless authorized to do so.
g. Professional rescue excavations on site. Where there could be accidental encounters of PCRs, a ***Chance Finds Procedures*** is provided to guide salvage such materials.

7. ***Impacts on current water supply facilities:*** There are two valley tanks of 10,000 M^3 capacity each, in Kikagati sub-county (within the irrigation command area) and Ruborogota sub-county (10 km outside the command area) which could be influenced by the project. The project may affect access to these facilities.
   Mitigation measure: Project implementation should be planned in a way to allow users of these valley tanks continued access. This is to be adhered to, bearing in mind that the project area is prone to water scarcity and long droughts.
8. ***Physical displacements:*** According to the RAP (February 2019), the main pipeline and the secondary pipes will pass through five freehold land holdings, 1,778 customary lands and two licensees. It is estimated that, a total of 1,785 PAPs will be affected by the project through construction of both the main pipe line and its secondary lines. It is proposed that adequate time and fair compensation be paid out to the PAPs to enable them settle to normal livelihoods before construction. Above all, the project as per its RAP has a livelihoods restoration program which should assist the PAPs to resettle fully after the project.
9. ***Traffic related impacts:*** Movement of construction traffic fleet through trading centers and in the community areas (leading to the project site), will likely pose a risk to the safety of the public in terms of motor accidents and interference with public traffic and deteriorate safety (especially the school children and elderly people). The contractor will put in place, a traffic management plan and work with the traffic police to guide and control traffic during construction works across public places. Project drivers shall be requied to sign specific Code of Conduct for Machine Operators, requiring among others observance of speed limits and ensuring regular servicing and maintenance of vehicles. The project shall ensure installation of appropriate safety signage, speed control structures, and sensitization of the public on safety measures by a nominated service provider.
10. ***Impact on faith-based establishments:*** The project will impact on two places of worship i.e. Kabugu Catholic Church and St. Jude Catholic Church whose lands and trees (not church structures) will be taken up the project main water lines. This will be a direct negative impact to be mitigated through compensation for the lost properties and adequate and full restoration of the sites, as already taken up in the RAP. In addition, impacts relating to disturbance of worship programs in the two churches are to be mitigated through ensuring that, project works are undertaken outside days of church worship and in full and close consultations with laity in such areas
11. ***Impacts on education establishments:*** The project will have direct negative impacts on schools established to be on its infrastructures alignments i.e. Kabesekye Primary School (land and crops), Bakurungu P/S (land), Kitezo Primary School (land), Kigarama International School (crops and land), Nyamichi P/S (land and trees), Kabuyanda P/S (land), Kabugu P/S (land and trees) and St. Mary's P/S (toilet, teachers' houses $2N^o$; and water tank. These will be impacted through construction of water main line an activity that is likely to cause inference with teaching programs due to noise and general construction disturbances. These will be mitigated through screen out schools from direct interaction with construction activities, providing safety structures near schools such as speed control, humps, dust screens, hoarding off excavations, limiting noisy activities to non-school hours, sensitization of school children and teachers on project impacts, and so on. There will also be compensation for lost land and trees.
12. ***Impacts of sourcing soils, sand and clay material, mining, borrow pits and transportation***: Stockpiles of rock and earth materials will be a source of pollution. Excavation will also have visual impacts resulting from landscape degradation and may expose some cultural artefacts as well as soil erosion. It is also envisaged that extraction construction materials will likely result into accidents on people and cattle as well as causing air pollution through release of dust. Animals will lose their habitat and some killed in the process. The overall impact resulting from material mining and transportation is

likely to be of **medium magnitude negative** because most impacts will be localized in one area and mitigable. The land will be for temporary use and will revert to the owners after restoration. Survey of material sites were carried out and candidate sites have been identified considering environmental and social criteria. Environmental audit of existing sites and ESIA/RAP of new sites will be conducted during implementation following the project ESMF.

Mitigation measures

a. Restoration of the land through grassing and tree planting;
b. Non-active areas of the borrow pits will be landscaped and re-vegetated as soon as possible to avoid erosion and stagnant water;
c. The extraction of materials will be planned so that overburden and top soil is used in re-development and restoration works; and
d. Agreements between the contractor and borrow pit owners will clearly indicate the Contractor's obligations of sound environment management.

13. ***Impact on wetlands:*** Baseline information shows that the project area valleys consist of some wetland relics with a mix of vegetation lagerly of *Typha sp, Cyperus sp* and *Vossia sp*., a factor due to cultivation amongst others. The project is expected to inundate 5.6 ha of wetlands.

Mitigation measures

a. The project will restore 10 ha of wetlands along the River Mishumba, upstream of the reservoir location and within the Rwoho CFR and specifically within the 500 ha targeted by the restoration/reforestation activities;
b. Maintain the 30 m buffer zone around the river lines and wetlands in line with provisions of the National Environment (Wetlands, River Banks and Lake Shores Management Regulations, S.I. No.3/2000). This would conserve the wetland ecology by avoiding degradation activities such as cultivation (soil erosion and siltation), and pollution from agricultural chemicals.
c. In case of any construction to be done on the wetland shore-lines outside the Rwoho CFR, an Independent Environmental Assessment will be done and a User Permit will be issued in line above Regulations.
d. After construction, all degraded wetland vegetation cover will be restored along the buffer zone downstream following the Catchment Management Plan (CMP).

14. HIV/AIDS risks: According to UPHIA 2016-2017[6] HIV/AIDS prevalence among adults aged 15-64 years in Isingiro District (South-West Uganda) has a prevalence of HIV reported to be 7.9% which is second to central region areas with a rate of 8.0%. This spells a challenge for the project and it is proposed that, there will be measures to address the scourge.

Mitigation measures

The project will put in place, measures to mitigate the risks in terms of sensitization and awareness campaigns as well as distribution of condoms, voluntary counselling and testing (VCT) and distribution of ARVs to the workers who test positive and such services will also be extended to the communities in the vicinity of the project areas.

15. ***Impacts due to creation and widening of access roads:*** The project will construct 2 km of access roads, including access to the dam site, and including the roads running from the dam site to the north on the left bank of the river (about 190 m). The 25km gravel road will be rehabilitated from the branch out from the main road Mbarara-Kikagati to the dam and irrigation appurtenances structures. The access road will be enlarged and stabilized in order to transport heavy construction materials and machineries. This impact resulting from creation of and widening of access roads will occur but it will

[6]*Uganda Population-based HIV Impact Assessment: Summary Sheet: Preliminary Findings August, 2017*

be short term as will occur mainly during construction phases and therefore the impact is rated as medium negative and will require mitigation measures

Mitigation measures

a. It is recommended that construction be undertaken during the dry conditions to minimize erosion;
b. Map out areas to be used for access and only clear vegetation in such areas without necessarily clearing other sites anyhow;
c. Suppress dust by sprinkling water on dusty surfaces and loose soils;
d. Safety signage and speed control structures shall be installed at points of high human activity, deployment of traffic guides; and
e. Project workers will use appropriate PPE while at work.

16. ***Impacts of the quarrying activity:*** It is expected that there will be stone blasting at the quarry sites during the construction phase of the project. Accidents may arise as a result of the flying stones that may cause damage to the neighboring structures, banana plantations or to any passer-by close to the quarry. This impact is expected to be medium negative as most homesteads are not very close for the quarry site.

Mitigation measures

a. A separate ESIA for the proposed quarry and other auxiliary facilities will be carried out as required and has to be approved by NEMA before quarrying activities start;
b. Relevant due diligence should be undertaken during acquisition or procurement of quarry materials especially where quarries exist;
c. Areas that will be identified for quarrying will be clearly zoned with clear safe zone demarcated to keep the public;
d. The land owners where the stone quarry is located will be compensated on willing seller willing buyer basis;
e. Demobilize work equipment and staff, taking care to prevent adverse impact on the environment.
f. Restoration of the land after quarrying will be done to acceptance of NEMA and DEO of the area.

17. ***Impacts relating to laying of water pipes:*** The laying of water pipes for water transmission and distribution with respect to water supply and for irrigation will likely have the following impacts:

a. land take a process which will be mitigated through compensation for land areas taken up by the infrastructures;
b. Warning signs will be posted in strategic sections before and after such works sites to warn the public about such works;
c. Disruption of traffic especially where pipes cross roads. It is proposed that, such work areas are sealed off with barricades to keep off the public and livestock; and
d. Restoration of the sites after works are completed.

18. ***Impacts due to creation of camp sites, offices, parking and storage of project equipment/ materials:*** The project office/yard, the workers camp and the management camp will be constructed outside Rwoho CFR. The workers camp will be accommodating about 120 workers, while the management camp will be accommodating about 42 workers and some support facilities whose details are not now established. Likely impacts from these activities will be mitigated through ensuring that:

a. The contractor will develop and implement a waste management plan and dispose of waste in accordance with the National Environment (Waste Management) Regulation 1999;
b. Put in place proper sanitation facilities at the campsite and offices and such facilities should be separate for male and female and should be clearly labeled so;
c. Put in place a designated and labeled areas on the camp site for temporary storage of waste and the storage bins should be accordingly coded and well labeled;

d. Overburden or spoil material will be used for rehabilitation of affected areas around the project site; and
e. Work sites will be adequately equipped with portable toilets.

19. Impacts to hydrology and sedimentation

It is noted that, works relating to river diversion and its subsequent interception and dam construction activities have a potential to generate a number of impacts on hydrology and sedimendation, including:

a. Management of cut-to spoil materials arising from excavations. Some of the cut to spoil materials can be used as field materials with approval of the project engineer while excess will be disposed into approved sites by the District Environmental Officer;
b. During construction stage, river diversion, dam construction and other construction activities will alter river flow regime. Altering the river flow regime will increase the likelihood of soil erosion and sedimentation. This will be mitigated through following good construction practice, such as: carrying out construction during dry season to the extent possible; installation of soil trap onsite; and appropriate management of excavated soils.
c. Contractor's environmental and social management plan will based on detailed deisgn include detailed construction schedule and implementation plan to mitigate such impacts properly.

20. Impacts on fish and fishing

During construction, river diversion, interception and dam construction will have potential imapcts on river flow regime, water quality, riverine and riparian ecosystem, resulting negative impacts on fish, its habiats and fishing activities. It is expected that the impacts will be limited as fish surveys and livelihood assesement conducted during the ESIA preparation indicated limited fish stocks, small-size fish individuals and minimal fishing activities in the project river. Fish impact assesement also indicated the identified fish species in the river belonging to the *Barbus, Clarias, Haplochromus* and tilapiine families. These fish species are mostly categorized as Least Cocern according to IUCN Red List, the remaining one is not included in the Red List but all are common species in the region, and are found upstream and downstream of the Mishmba river, streams and ponds in the project irrigation command area. Thus, it is expected the construction impacts on fish and fishing activities will be temporary and limited.

Mitigation measures

- Measures mitigating impacts on hydrology, sedimentation, water quality and habitats (see relevant sections) will be duly implemented to protect fish and fish habitats;
- Sebsitization of contractors including awareness raising and training will be conducted during construction to prohibit workers from fishing and damaging fish habitats;
- Additonal fish survey and monitoring and RAP monitoring will be carried out during the project implementation.

Impacts on Water quality

Water quality in the water courses may be affected by in the following ways:

- Site clearing and the disruption of the natural drainage patterns,
- There will also be potential water contamination from hydrocarbons mainly from the contractor's machines,
- Vegetation and humic soils leading to elevated organic pollutant levels.

- A high nutrient level is essential for productive agriculture. However, the use of both natural and chemical fertilizers may result in an excess of nutrients which can cause problems in water bodies and to health.
- Increase in contaminate concentration as a result of decrease in river flow volume.

Mitigation measures

- It is recommended that construction be undertaken during the dry conditions to minimize erosion when the soil is loosened. The top soil removed will be required to be moved to an alternative site where storm water cannot carry the soil to the streams.
- A water pan (silt trap) may be established downstream of the dam which will act as a soil trap to hold the excessive silt during construction.
- The steep slopes surrounding the dam construction will be stabilized, and compacted to reduce on erosion and potential landslides as a result of deep cutting,
- Drainage channels shall be installed where necessary,
- Undertake re-afforestation and improved farming systems upstream of the dam as part of the catchment management plan (CMP),
- There shall be an integrated catchment management plan (CMP) targeting R. Mishumba and other rivers affected by the project. In this regard, involvement of the communities, landowners and relevant authorities will be undertaken,
- Develop a deliberate initiative for monitoring water quality both upstream and downstream in order to inform cathment management strategies and management in compliance with the water abstraction permit that shall be obtained from Directorate of Water Resources Management.
- Installing gauging stations for monitoring the immediate trends in the upper zones of the river basin
- Provide mandatory buffer area for conservation of the riverine and dam ecosystem through the review of riparian land ownership and control of wetland/floodplain encroachment, as part of the catchment management measures.
- Monitor the relationship of the dam to the downstream flooding trends. Periodically make corrective improvements to sustain/enhance environmental sustainability.

21. ***Impacts on existing NFA roads*****:** Dam and reservoir construction will result in the inundation of sections of roads within the Rwoho CFR.

Mitigation measures

The project will finance the construction of new roads within the NFA reserve to account for those which will be inundated. These roads will be designed by the supervision consultant for Kabuyanda Dam under Component 1, in consultation with NFA. Construction of the roads will be undertaken by the Kabuyanda Dam Contractor.

23. Accidents and health impacts: This relates to poor worker safety management and general safety risks to the workers and the community as well as poor health management. There is also concern on working hours the laborers can be exposed to.

Mitigation measures

a. Have Occupational health and safety procedures enforced at site by both the engineer and contractor i.e. develop and implement appropriate occupational health safety measures during project construction;
b. The workers shall be given trainings and briefings on code of conduct while on the project in a manner consistent with provisions in Occupational Health and Safety Act 2006 requirements;
c. The contractors will be required to prepare, obtain approval of, and implement an occupational health and safety (OHS) plan which has to be approved by the supervising engineer;

d. Provide workers with appropriate personal protective equipment and ensure that they are used as intended;
e. Maintain qualified first aid staff and first facility on site;
f. Ensure that construction equipment is kept maintained and regularly checked for defect;
g. Ensure that all open trenches are marked and appropriately barricaded where possible and where trenches cross pedestrian access, suitable walkways should be established to permit pedestrian access; and
h. Control access to working site and implement appropriate traffic management system including use of appropriate signage, flag men, mandatory site speed limit, etc.
i. The Contractor shall report all accidents and incidents in a timely manner to the Supervision Consultant. All severe (fatalities) and serious accidents shall be reported to the Supervision Consultant immediately and to MWE and the Bank within 24 hours of occurance.

24. ***Pressure on public health and sanitation facilities*****:** Safe water coverage in Isingiro District stands at 35% as compared to the national average of 66%. The risk of inadequate sanitary facilities may result in open defecation or bathing in or next to open water bodies which may contribute to an outbreak of hygiene related diseases like diarrhea and cholera among others, although the poor community sanitation is not a result of the project. The impact of the project will be short term as limited to the construction phase The significance of this impact is thus assessed as **medium negative.**

Mitigation measures

a. Provision of adequate water supply facilities for the project workers.
b. The project will provide additional sanitation facilities to its workers.
c. Public health-based waste especially from wash-rooms will be disposed into soak-away pits. While pit latrines will be dug, and such pits will be located at least 100 yards (90 meters) downwind (prevailing wind) and down gradient from the food service facility such as kitchen/dining) and at least 100 feet (30m) from any unit ground water source;
d. The pit latrines should be for separate sexes i.e. male and female;
e. On the other hand, all domestic waste like polythene papers, food wrappings, plastic bottles, torch batteries, will be collected and disposed in the existing dump site for Kabuyanda Town Council; and
f. Food remains from the canteens will be disposed in the rubbish pits to be dug in the vicinities of the kitchen (at least 30m downwind direction) or composted.

25. ***Risks of disease incidences:*** During construction, diarrhea, malaria and HIV/AIDS prevalence as well as other sexually transmitted infections are cited as some of the likely ailments that can affect the project especially resulting from population influx amongst others. The likelihood of the impact occurring is probable. The significance of this impact is thus assessed as **high negative.**

Mitigation measures

a. Strategies to control malaria and HIV/AIDS e.g. sensitization of communities. This can be done through health centers and NGOs operating in the area.
b. Partner with Kabuyanda Health Centre IV to carry out HIV/AIDS voluntary testing and counselling.
c. The Contractor will have an HIV/AIDS prevention plan for his workers so as to reduce the risk of spreading the disease. For instance, condoms should be made available to workers by having a constant supply in in discreet places.

26. ***Insecurity risks:*** Influx of people in a project area in search of jobs is likely to come with a host of vises such as thefts, crime and general deterioration of area security. Materials prone to theft include cement, fuel and equipment. Theft of materials will lead to an increase in the project cost and project delays. Besides theft of the project materials, the community property and assets could also be

stolen. The impact will be short term and may go up to district level. The impact will moderately affect the communities and the project in general. The significance of this impact is thus assessed as **medium negative.**

Mitigation Measures

a. Collaborate with the local security set ups in areas of labor recruitment such that, priority is given to locals in the areas in terms of casual and non-skilled jobs;
b. Those seeking jobs are to present their details accompanied with recommendations from their area LCs as well as next of kin for purposes of traceability in case of engagement in any misconduct or otherwise;
c. Employ private security guards at the construction site.
d. The contractor should work closely with the area police out-posts, local defense secretaries and general community policing.
e. Contractor will put in place an internal control system to curb cases of theft of materials.

27. ***Community Health and Safety:*** Like any development project brought in an area, it is likely that a considerable number of people will be attracted to the construction site. These will include both the job seekers from outside the project area and the local residents in the neighboring villages and towns. The construction of the project facilities will introduce machinery and other equipment such as vibrators, trucks, ramming machines etc. There will be increased traffic and population influx and its associated effects. The likely community health and safety hazards include: dust; noise and vibration from construction vehicles, risks of communicable diseases associated with the influx of temporary construction labor; and accidents and injuries;

The significance of the impact is therefore considered to be **medium negative.**

Mitigation Measures

a. Instituting speed limits on project vehicles,
b. Use of signs and barriers to show the dangerous areas;
c. Identify and clearly mark all areas with restricted accessibility to the public;
d. Enforce restrictions on unnecessary entry into the project site or any protected zone
e. Follow the mitigation measures prescribed to reduce any dust or noise impacts.

28. ***Risks of sexual exploitation and abuse:*** The project will not only increase social diseases and in particular sexually transmitted diseases (such as HIV/AIDS) but will also affect social dynamics as a result of increased human social activities in the project area. In addition to this, some project workers may have to be living away from home and families which exposes them to risks of unprotected sex. The influx of workers and followers could also lead to social effects such as Sexual Exploitation and Abuse. Furthermore, in rural settings, the risk of sexual harassment for local women can be common. The magnitude of the impact is thus assessed as **medium negative.**

Mitigation Measures

a. Key will be sensitization of the Project Staff on the risks associted with gender voilence and discrimation of person while working on the project;
b. The project will not employ persons below ages of 18 in the site and the Ministry of Gender, Labour and Social Development will be in forefront to monitor the possibilities of such occurences.
c. The local Police together with the local authorities will monitor and look out for any possible cases related to child abuse and sexual abuse.
d. The contractor will implements robust measures to address the risk of gender-based violence and sexual exploitation and abuse in the project.
    - ***Impact on vulnerable groups:*** The. Results from the socio-economic survey further showed that;.. Such social concerns could be mitigated through.

29. ***Impact on vulnerable groups:*** In the project area, analysis of socio-economic data reveals that, some of the PAPs qualify to be categorized as vulnerable and they include people with physical disabilities and impairments, the elderly and widows and families headed by childrenFrom the socio-economic surveys, 12.4% of the household heads were 65+years while 9.7% were widowed. 12.4% of interviewed household did not own land, 23.3% had an orphan in their home while 12.7% had a person with disability in their home. An estimated fifty-one households (18%) were living with members aged 70 years and above and in such households. Construction of the dam will lead to a reduction in farmland and loss of livelihoods for some of these households, thereby making their already vulnerable situation worse. Though these vulnerable groups will not be physically displaced by the project, they will be indirectly affected in that, their bread winners could likely move to work in the project leaving them without attention in the households. The women (including widows) could face segregation in terms of employment and sexual harassment. The impact on the vulnerable groups will be long term, affecting these groups of people, the severity of the impact will be moderate because the nature of the project especially where the water pipelines will be located will require acquisition of a strip of land. The significance of the impact is thus assessed as **medium negative.**

Mitigation Measures

a. Livelihood restoration strategies will be extended to the vulnerable groups and their income levels monitored closely during and after the implementation process.
b. Vulnerable households should be provided with assistance by the project as part of its corporate social responsibility (CSR) considered for employment opportunities.
c. providing vulnerable groups with employment opportunities in unskilled areas depending on their ability.

Operational phase impacts

1. ***Water quality impacts:*** With the exception of Dissolved Oxygen (DO), *in-situ* measurements showed that the water quality in respect to pH, temperature, Electrical Conductivity (EC) and salinity were within the acceptable limits according to the UNBS standards for Natural water**.** However, during project implementation, water quality issues could arise through erosion and sedimentation from storm water.

   Mitigation measures

   These concerns are to be addressed by putting in place measures for soil erosion control as well as restricting clearance of vegetation to areas only needed for project works alongside full restoration of the sites. Water quality tests shall be undertaken on a regular basis (quarterly) in order to detect and rectify if any anomalies occur during operation phase, by Directorate of Water Resources Management at MWE.
2. ***Impact on water demand and usage:*** The ESIA established that there are other on-going and planned water interventions in Kabuyanda by GoU to improve water supply in the areas. These include an on-going Kabuyanda Gravity Flow Scheme whose water source is under ground water, a planned bulk water supply system from River Kagera financed by AFD, borehole repairs, sinking of a number of shallow wells in rural areas to address water supply constraints in the areas. Therefore, the project impact will be mitigated through the above-mentioned interventions.

   Mitigation measures

   The project will provide information on sustainable water management practices, and carry out sensitization campaigns and distribution of learning material.
3. ***Gender and vulnerable groups:*** Based on ESIA surveys for the project, identification of vulnerable project-affected persons revealed that 25.2% of households heads are female, 5.1% of household heads are 65 years or older, and 1.5% of households were reported to have a head suffering from

chronic disease or disability. I addition, about 14.4% of households surveyed had at least one member who is an orphan and 2% of households reported to have at least one disabled member other than the head.

Mitigation measures

The project will provide deliberate initiatives to enhance women participation in the project through ensuring 30% of work opportunities are provided for the women to amongst others, improve on household income. Furthermore, the project is to support women and youth in empowerment drives such as skilling in savings and start of enterprises such as value addition to agriculture based commodities.

4. ***Risks of water and vector-borne diseases:*** The water in the reservoir will be stagnant and will act as a breeding ground for mosquitoes and this will have consequence in terms of incidence of mosquitoes and malaria at large in the area. The water in the reservoir may also be unsafe for human consumption as such, contaminated by human activities in the vicinity of the dam, thereby leading to water borne diseases like typhoid. The impact will be medium negative.

   Mitigation measures

   a. The project will work closely with some of the on-going water and sanitation programs in the district especially on hygiene and water to reduce mosquito breeding areas and bushes around households;
   b. The reservoir is located in Rwoho CFR with controlled access, but in addition the communities will be sensitized to sleep under treated mosquito nets distributed under the Ministry of Health Malaria Control Program; and
   c. Have primary health care programs in place to create awareness on the risks of diseases from dam waters to discourage farmers from using the irrigation water for domestic purposes.

5. ***Water System leaks and loss of pressure:*** Water system leaks does not only reduce the pressure of the water, it also compromises the quality of the water by allowing contaminated water to leak into the system.

   Mitigation measures

   It is important that, the construction of water supply system meets Best Industry Standards (BIS), and include BIS in Technical design specifications in Tender documents alongside conducting regular inspection and maintenance including a leak detection and repair program during the operations of the facility.

6. ***Impacts on water supply and flood control:*** The project will impound up to 8.8 million m^3 to supply water for irrigation of 3,300 ha. If the dam is not well constructed, dam failure risks can be high and such could cause flooding, damage to property to even loss of lives. The impacts are therefore rated as medium negative.

   Enhancement Measures

   a. There will be dam safety plan in place which guides on aspects of dam risks including its possible failures;
   b. There will be stand-by emergency response measures for the safe operations of the investment;
   c. Regular maintenance programs should be put in place for the dam facility;

7. ***Impacts on climate change:*** Once the dam/reservoir is in place i.e. after construction, its process of inundation will submerge vegetation and such a process is likely to generate methane gas which ozone depleting gas. In addition, cleared vegetation needs to be disposed and such a process will likely generate carbon emissions that are of climate change concerns.

Mitigation measures

a. There should be salvage harvesting of vegetation in the area to be inundated for use in the project and by the communities and such a process will reduce the amount of vegetation to be submerged;
b. No open burning of cleared vegetation during project preparation works;
c. 500 ha in Rwoho CFR are to be planted with indigenous trees which will augment vegetation growth and enhance carbon gas absorption thereby checking climate change risks;
d. The project will put in place, measures to address soil erosion thereby checking climate change risks as well;
e. Enforce the NEMA 30m protection buffer zone regulation on the river where there will be no cultivation allowed; and
f. Sensitization of Communities about climate change and grass burning.

8. ***Introduction of invasive species:*** The invasive species may include pests and noxious weeds. Accumulation of sediments and high concentration of nutrients in the water can lead to proliferation of aquatic weeds like water hyacinth, *Pistia* and water cabbage. The impact is likely to occur in the dam reservoir and its shores. The likelihood of the impacts occurring is small negative.

Mitigation measures

a. Ensure construction equipment come on site while clean and leave site after being cleaned to avoid spread of noxious weeds or invasive plant species; and
b. Sensitize communities about the need to control the spread of water hyacinth and encourage them to physically remove and destroy water hyacinth found floating on the river and other water courses. In addition, mechanical removal will be considered.

9. ***Impacts on fish and fishing:*** Dams generally have signifacant impacts on fish and fish habitats. They affect fish populations by disrupting their upstream/downstream movements and by replacing riverine ecosystem with lacustrine ecosystem. Two rounds of fish suveys including interviews with communities were conducted during the ESIA preparation. The surveys find that the fish identified include several species belonging to Cyprinedae, Clariidae and Cichlidae families. The conservation status of the identified fish species are listed as 'Least Concern' according to the IUCN Red List (2017-1), except Clarias casonii (catfish) which is not included the Red List. However, this remaining fish species is a common Cat Fish species found in most of the lakes and rivers in Uganda. Based on available information, the fish species and ecological habitats downstream the reservoir are likely not significant (see Annex 9 for additional information). Completion of the lifecycle of these fish species is not dependent on migratory behavior. The suveys also indicate that the population abundance is low. *C. casonii* was the most dominant fish species encountered during the suvey, further analysis of the length and weight indicate small individuals. It is also noted that fishing activity in the Kabuyanda area is minimal and only at subsistence level and mainly targeting *Clarias carsonii*. The main fishing gear was the baited basket traps. According to the project resettlement action plan (RAP), among activities that generate household income from fishing, one 1% will be potentially affected directly, and 4% indirectly, compared to poultry that is 43% and 56% respectively. The surveys on fish and fishing activities during ESIA and RAP preparation indicate that the fish abundance, diversity / conservation status, as well as fishing activities are not significant in the area.However, it is also recognized that the historical records of fishery resources in the river is very limited. Fish surveys conducted during the ESIA development were also constrained by a number of factors such as drought. Continued fish monitoring and surevey will be carried out during implementation.

Mitigation measures

a. Environmental flow. River Mishumba is not a permanent river, often drying up February, July to September (zero flow identified 10 out of 46 years). The project will ensure a minimum flow in the stream equaling 10% in the dry season, and 20% in the wet season. Tributaries contribute to the river flow, at 1km and 5km, downstream the dam. The environmental flow will be beneficial for fish and fish habitats during dry seasons. During wet season the water flow downstream of the dam will be reduced with less variation, in particular 1km immediately downstream the dam. Some natural hydrological variation will be kept by allowing the passing of a yearly natural flood event which will mitigate dam impact to downstream fish and fish habitats.

b. The surrounding catchment areas are degraded as a result of poor land management practices, such as poor agricultural practices and deforestation. This has inevitably affected riverine and riparian habitats. The project will support the development and implementation of catchment management plans (CMPs), in collaboration with local communities, NGOs, NFA and District local government. The CMPs will be beneficial to fish habitats;

c. Similarly, save natural vegetation cover within a 30-meter band along the river, to conserve fish habitats. This is best done by enforcing the NEMA River Banks and Lake Shore Regulation by the District Environment Officer;

d. As the baseline of fishery resource based on rapid surveys that were endorsed by National Fisheries Resources Research Institute, the limitations of data availability, resources, scope and timeframe of the surveys have been recognized. It has been agreed that additional riverine ecological baseline assessment, including additional fish surveys, will be conducted covering both upstream and downstream of the dam.

e. In terms of mitigation for the impacts on fishing activities. Though the household income from fishing activities (according to survey during RAP development), the scale and impact of fishing activities is very limited. The additional surveys will determine if there are any additional impacts on livelihoods in the area. Compensation for livelihoods of fishermen will be addressed in the RAP, which if needed will be updated following the surveys.

f. A fish monitoring plan will be developed, as proposed by NAFiRRI, as part of the Biodiversity Action Plan (BAP).

10. ***Impact on vulnerable groups:*** In the project area, there are several categories of vulnerable people including female heads of households, widows, the elderly, and people with disabilities. From the socio-economic surveys, 12.4% of the household heads were 65+years while 9.7% were widowed. 12.4% of interviewed household did not own land, 23.3% had an orphan in their home while 12.7% had a person with disability in their home. Construction of the dam will lead to a reduction in farmland and loss of livelihoods for some of these households, thereby making their already vulnerable situation worse. The impact on the vulnerable groups will be long term, affecting these groups of people, the severity of the impact will be moderate because the nature of the project especially where the water pipelines will be located will require acquisition of a strip of land. The significance of the impact is thus assessed as **medium negative.**

Mitigation Measures

a. Livelihood restoration strategies will be extended to the vulnerable groups and their income levels monitored closely during and after the implementation process.

b. Vulnerable households should be provided with assistance by the project as part of its corporate social responsibility (CSR) considered for employment opportunities.

11. ***Impacts on the hydrology of the river:*** Impoundment of the Mishumba River means there will be a consequential reduction in water flow in the river that will likely affect the water availability

downstream, for both surface sources and recharging of ground water. The presence of the reservoir will further alter the groundwater table in the near vicinity of the reservoir. It has previously been observed that reservoir construction is associated with the raising of the groundwater table in near upstream vicinity of the reservoir and altered groundwater flow downstream of the reservoir. The clay soils in the area indicate low permeability and the presence of the reservoir may increase infiltration as this is dependent on residence time. The project impact on groundwater in the area will be further assessed in the ongoing Integrated Water Management Development Project (P163782) which will carry out a compressive National groundwater assessment. Tributaries downstream may be impacted primarily at the confluence where reduced flow will be noticeable, however the any impact on the estuary downstream will be limited. Upstream the impoundment area there are no significant tributaries that will be impacted. The dam has the potential for downstream flood moderation during heavy rains and hence flood plain protection, reduction in property and crop loss and enhanced/better usage. This has been taken into account in the operation planning for the dam. There will be changes in the river hydrology which has the potential to have an effect on the aquatic habitats such as fish breeding and migration hence habitat loss. The downstream river flow will be altered to follow an environmental flow regime as the minimum discharge in the river. Rapid biodiversity surveys conducted of the downstream areas indicated that fish biodiversity, breeding and migration areas are not significant in the area. The conservation status of the encountered flora, fish, reptile, and amphibian species are listed as 'Least Concern' by the IUCN. Based on available information, the fish species and ecological habitats downstream the reservoir are likely not significant (see Annex for additional information). However, considering the limitation in the information available, additional biodiversity surveys, sedimentation, and cumulative impact assessments as well as an updated environmental flows assessment will be continued during project implementation and prior to dam construction to confirm the adequacy of the mitigation measures. If needed, appropriate adjustments to dam design and/or operation will be introduced prior to dam construction in a manner satisfactory to the World Bank. The impact is **high negative.**

Mitigation Measures

a. The river flow regime influences the water quality, energy cycles, biotic interactions, and habitat and any modification of the flow regime has implications on these and organisms/species that depend on them for their livelihoods. The environmental flow will ensure the sustainability of the downstream environment through the provision of the water to satisfy the needs of downstream communities and ecological environment. Altering the flow of a river may impact the water chemistry and quality, the physical habitats for species, the biological composition and interactions in the stream as well as floodplains. Based on the needs of the downstream environment and community needs, the Environmental Flow is determined to be optimally set at 10% of the mean annual flow during the dry season and 20% of the mean annual flow during the wet season. The environmental flow is deemed adequate to sustain the significantly modified environment downstream the Kabuyanda dam. The environmental flow requirement was determined by a low-resolution hydrological methodology, the use and results of which were verified by surveys and assessments of the modified downstream environment. Measurements of water flow, water quality as well as ecosystem variables downstream the dam will be regularly monitored by MWE to ensure compliance with agreed scheduling and compliance with environmental flow requirements. The monitoring data collected by MWE will feed into management decisions of the operator to ensure appropriate action is taken.
b. The environmental flow regime scheduling will include one peak flood per year during the wet season for downstream sediments replenishment and mitigate sediment starvation downstream the dam. The flood pulse release shall be timed with a high flow event to coincide with the higher

sediment load of the water flow as well as allow for the flooding of the downstream floodplains. The flood releases will also have potential impacts on downstream river bank stability, community safety, aquatic and riparian habitats which will be mitigated by i) the gradual changes in volume of flow releases during flood event to minimize rapid variation in downstream water level; and ii) community announcements and advertisements, as well as in the dam Emergency Preparedness Plan (EPP) which is periodically updated.

c. Natural vegetation cover within a 30meter band along the river will be saved to reduce any project impact on river bank erosion and stability. This is best done by enforcing the NEMA River Banks and Lake Shore Regulation.

12. **Impacts on the sediment loading and management of the river:** The sediments generated depend on the upstream catchment characteristics i.e. soils, topography and vegetation cover. The ecological environment of river flood plains is dependent on deposition of silt from the catchments upstream that brings with it nutrients and minerals. Retention of silt in Kabuyanda Dam over duration of time will effectively reduce the overall silt loading as well as the overall flood areas. Construction of the dam will result in high retention and storage capacity and ability compared to the transportation speed. From the hydrology studies of the project catchment area, the sedimentation rate estimated that 290 Ton/km^2/year equivalent to 26,100 tons/year of sediments will be moved per year into the dam from the catchment. The implication of this is that with a lifespan of 50 years, the dam requires 0.9Mm3 for dead storage. This storage will trap sediment in the reservoir, thereby reduce the sediment loading to the downstream flood plains, limiting the opportunity for production on ecological and social terms. The impact is **low-medium negative**.

    1. Sediments to the downstream areas will be limited by the project. However, this impact will decrease further downstream as sediments are naturally deposited, and tributaries add flow and sediments (1km downstream).

    2. The environmental flow regime scheduling will include one natural peak flood event per year during the wet season to mitigate the sediment starvation downstream the dam. This entails that the dam operator will, during the occurance of a natural flood, open the spillway to allow the natural flow to pass the impounding reservoir. This will occur at least once (1) per year. Although sediments will still pass the dam throughout the year, the high flow events are necessary for the sediments to reach the floodplains of the downstream river stretch. The flood pulse release shall be timed with a natural high flow event to coincide with the higher sediment load of the water flow. The dam design and/or operation do not include the use of sediment flushing practices of deposited sediments in the dam, instead all water and sediment release will be done through the spillway. This operation will be included in detail in the reservoir operation, maintenance and surveilance manual (OMS) for the dam, which is reviewed and updated continuously during dam operation. This practice will have potential impacts on downstream river bank stability, community safety, aquatic and riparian habitats. The scale and scope of the potential impacts are subject to the status of these components and the hydraulic process.

    3. The project will support further efforts to limit the land degradation of the downstream sub-catchments through sustainable land management (SLM) practices. This will include developing catchment management plans (CMPs) for R. Mishumba and other rivers in the areas of the project.

13. ***Water loss impacts:*** Water storage and irrigation systems are subject to water losses from reservoirs through evaporation, infiltration, losses in transmission and distribution systems, and illegal/unregulated abstractions. In hydrological terms, open water surfaces have potential evaporation rates of over 1,200 mm per year or 3.3 mm per day causing a water loss of about 870,000

cubic meters per year. If the ground was always wet, the equilibrium will be achieved between open surface water evaporation and ground evaporation of the same area (ground evaporation before reservoir created and open water surface evaporation after reservoir created). The other likely water loss from the reservoir is likely to be through seepage. During operation of the project there may be potential water loss in water transmission systems and appurtenances, at consumer points through wastage, leakage in distribution pipes, irrigation ditches and overuse through irrigation. Other avenues of water loss are at the consumption points and include burst pipes, unmaintained irrigation drains, leaking taps and illegal connections. The impacts are therefore rated **medium negative** and will require mitigation.

Mitigation Measures

a. Ensure appropriate compaction of the dam floor embankment walls to minimize leakages and infiltration upon commissioning of the dam;
b. Institute surveillance around the dam and along all water transmission pipeline corridors to control illegal water abstractions;
c. Ensure optimum maintenance of the water transmission, storage and distribution system components including pipelines, valves, irrigation system and consumer taps;
d. Enhance buffer zones with appropriate tree species around the dam may assist in checking on the rate of evaporation; and
e. Educate and create awareness to the water users in the service areas of Kabuyanda Town.

14. ***Problems of crop pests and diseases in the project areas:*** Pests impact on agriculture in a number of ways, including lost production, diminished quality, increased production costs, and decreased flexibility in production or management decisions. In Kabuyanda areas, a number of crop pests and diseases were reported and the problem seems to be growing due to climatic variability which farmers attribute to frequent outbreaks of pests and diseases. To address issues of disease and pest on crops, a Pest Management Plan has been include into this ESIA and it advocates for use of a number of options in the controls of pests and diseases not only use of pesticides.
15. ***Community Health and Safety*****:** During the operational phase, there is likely to be risk of drowning by both children and adults in the reservoir. The children or adults may be enticed to swim in the reservoir and may end up drowning or may drown accidentally while passing by. Furthermore, domestic animals may also drown in the reservoir while trying to drink from it. The risk of drowning can be long-term and irreversible when it involves death/loss of life**.** Dam release operation may lead to unexpected high flows downstream and potential impacts on community safety and downstream activities.

Mitigation measures

a. Sensitization of the community on the risks/dangers of swimming in the reservoirs especially for the children;
b. Provide watering points for livestock outside the reservoir; and
c. There should be Project Management Committee which should address issues of operations of the reservoir.
d. Impacts on community safety and downstream activities will be mitigated by i) the gradual increases changes in volume of flow releases during flood event to minimize rapid variation in downstream water level; and ii) community announcements and advertisements, as well as in the dam Emergency Preparedness Plan (EPP) which is periodically updated.

Cumulative Impacts:

In summary, the main cumulative environmental and socioeconomic impacts resulting from the proposed development of Kabuyanda Project will be related to the damming and abstraction of water and the

resulting reduction in downstream flows in the river. The increased agricultural production arising from all year-round water supply may also change the social dynamics on landuse, including the possibility of increased land-demand, which may exert more stress on Rwoho CFR.

The following are mitigation proposed measures;

i) There shall be appropriate mechanisms for continuous assessments of the required downstream reserve flows including both environmental flows and also compensation flows for sustaining the base flow through the dam to the extent possible,
ii) Prepare a programme for cumulative impact audits for project which should include the following primary considerations; (a) flow trends downstream, (b) emerging water demand against the available flows to be shared, (c) level of flow moderation downstream without compromising on the desired off-takes; (d) NFA to closely monitor community impacts on the forest and be involved in the catchment management planning and implementation in order to avert any likely increased encroachment from the communities.
iii) Undertake capacity building on Cumulative Impact Assessment (CIA) for the Government Agencies involved, Consultant/s and Contractor/s to ensure adequate attention and managenment of any CIAs that may arise during project implementation.

Environmental and Social Management Plan

An environmental and social management plan to ensure implementation and check on the efficiency of the proposed mitigation measures was prepared. In the plan, monitoring roles are assigned to the Developer and/or his contractors, Ministry of Water and Environment. The total cost for implementation of the ESMP has been estimated at USD 4,924,240. This cost includes capacity building which is geared to enhancing the capacity of stakeholder entities in the implementation of safeguards compliance as well as Dam Safety, Compensation of Forest PAPs, establishment and operationalization of the GRM, and overall ESMP construction and operations phase activities.

Commitments in the ESMP Implementation

In view of the above, the project management is expected to commit itself on the following aspects:

- The client at its different levels, shall fully supervise the project implementation in all phases and shall ensure that the proposed environmental and social mitigation measures stipulated in the ESIA as a whole are to the extent possible, fully integrated in the project;
- The Contractor(s) shall engage services of environmental and social experts to provide quality control and oversight in the implementation of the ESMP;
- MWE through the project puts in place and operationalizes a Grievance Redress Mechanism (GRM) aimed at providing an avenue for PAPs to express their concerns regarding the project;
- The operator contracted for the management of the scheme shall operate the dam in accordance with the operating rules specified in the ESIA, including with reference to the Environmental Flow Requirement. MWE will ensure monitoring;
- MWE has been implementing Catchment Based Integrated Water Resources Management since 2011 with the aim of facilitating sustainable development and management of water and related resources. As a result, catchment management plans (CMPs) have been prepared for various catchments in the Country. The project will prepare a micro-catchment plan for the river Mishumaba sub catchment to address challenges of water or natural resources degradation. The plan will be prepared through a participatory approach and micro-catchment management structures will be established to oversee the implementation of the micro-catchment management interventions in the plan and to ensure sustainability of the measures. The Directorate of Water

Resources Management (DWRM) under MWE shall be responsbe for the preparation and implementation of the CMPs in consultation with other National Stakeholders namely: communities, NGOs, NFA, NEMA, MAAIF, Directorate of Environmental Affairs and Isingiro District Local Government. The micro-CMPs will be reviewed and approved by Catchment Management Committee (CMC). The CMC is constituted of Civil Society, Private Sector, Technical Officers, Political Leaders and is chaired by an elected Political Head from the catchment area; and

- MWE shall implement and continuously review this Plan to ensure its acceptability by the stakeholders.

Dam safety Plan

In this project a Dam Safety Emergency Plans is required for purposes of managing any dam failure emergency that could result in loss of lives in the event of a dam failure. In this regard, documenting the dam safety emergency responses and procedures, a dam safety emergency plan are all being developed and once developed, they will be implemented by the proponent in the event of a dam incident. The Dam Safety Plan will provide general information about the dam, its location and also outlines the potential inundation area in the event of a catastrophic dam failure. The Plan is to provide the relevant contact details for people to be contacted in an emergency situation and provides the emergency evacuation procedures and processes. For now, the Dam Safety Plan for the project is under preparation and awaits details of the dam which are yet to be completed especially its design details.

Proposed Management Structure of the Project

The Project's Implementing Entity is MWE under arrangements for execution of similar projects/programmes, headed to the Permanent Secretary. The Water for Production Department, an integral part of the Executing Agency under the direction and supervision of the MWE, will coordinate implementation of activities of the programme with the addition of the necessary skill mix including a Project Accountant, Monitoring and Evaluation (M&E) Specialist, Procurement Specialist, and Safeguard specialists. The liaison and coordination of project implementation will be supported by the technical staff in the Ministries involved in the implementation to complement its work. The Water for Production Department will ensure that Project activities are initiated and are adequately budgeted for, consolidate project records, submit all procurement documents to the Bank for review and approval; compile and submit all disbursement applications and quarterly progress reports; coordinate annual audits of all Project accounts and facilitate submission of audit reports to the Bank.

A multi-sectoral Steering Committee established under the project/programme will provide policy oversight of the project, review and approve annual work plans and budgets, and ensure adherence to relevant strategies established by Government during project implementation. The Permanent Secretary, MWE, will chair the Steering Committee. The membership of this committee will comprise Permanent Secretaries (or their representatives at high technical level) of the Ministries of Agriculture, Animal Industry and Fisheries (MAAIF); Gender, Labor and Social Development (MoGLSD); Finance, Planning and Economic Development (MoFPED), Trade, Industry and Cooperatives (MoTIC); Local Government (MoLG); and the Executive Director, NEMA; Executive Director of NFA; and Executive Secretary of the National Farmers' Federation; Chief Administrator of Isingiro district where irrigation infrastructure activities will be implemented will also be a member of the Steering Committee.

Conclusions and recommendations

From this study, we conclude that there is no environmental or social obstacle to the implementation of the Kabuyanda project, and we recommend that the proposed mitigation/enhancement measures to the identified impacts be implemented.

The project is well placed to address persistent water scarcity which very much affect agricultural production in Kabuyanda and Isingiro District at large because of its reliance on rainfalls only. The construction of the irrigation scheme will guarantee all year crop production thus ensuring household income for the local population in keeping with aspiration of Agriculture Sector Strategic Plan 2015/16-2019/2020. The project can likely have a number of environmental, social and economic benefits that are geared towards improving the livelihoods of the households in terms of infrastructure development, stimulating economic development, creation of employment opportunities, enhanced service delivery.

The project area is prone to effect of weather and climatic variability i.e. drought and flooding as such, the planned intervention will help augment agricultural productivity in the area through instituting sustainable means of water management through water harvesting and irrigation. Such measures will guarantee food security at household levels and improved incomes.

Despite these benefits, the project will likely have some negative environmental and social impacts and the ESIA has identified some mitigation measures which, when implemented, are expected to address such concerns. The anticipated impacts can be mitigated and are associated with construction and operations of the dams. Through proactive monitoring, such impacts will be addressed while keeping the project on a sustainable path in line with NEMA Approval Conditions and the requirements in its financing agreements.

Notably, the project will result in the inundation of 100 ha (1.1%) of Rwoho CFR, a plantation development forest, largely degraded and partially restored with non-indigenous species (*Pinus caribaea, Pinus ocarpa* and *Eucalyptus sp*.), and classified as a modified non-critical habitat. This area includes 15.1 ha under the CDM programme (for which the ERPA terminates on December 31, 2019, thus ahead of the commencement of works for the Kabuyanda irrigation project), as well as private developers through concessionary agreements with NFA, and unplanted area under NFA (Natural Belt & Nursery). As such, inundation of this CFR will have a negative and socio-economic dimension. Therefore, the project will: (i) compensate the private tree planters on Rwoho CFR as per RAP; (ii) mitigate for the loss of trees by financing restoration/reforestation of 500 ha with indigenous tree species within the Rwoho CFR, in collaboration with NFA; and (iii) support the preparation and implementation of Catchment Management Plans (CMP), in collaboration with- among others - communities, NGOs and NFA.

The project proponent has agreed that biodiversity surveys (with more focus on fish), sedimentation, and cumulative impact assessments as well as an updated environmental flows assessment will continue during project implementation and prior to dam construction to confirm the initial findings described in this ESIA. If needed, appropriate adjustments to dam design and/or operation will be introduced prior to dam construction in a manner satisfactory to the World Bank.

Some elements of the project are not yet fully clear at this stage, i.e. the final selection of the locations to be used for sources of material for the construction of the dam. It is therefore proposed that, specific ESIAs for these given details should be prepared once such details are established and confirmed upon completion of the project design.

1 INTRODUCTION

1.1 Background

The Government of Uganda (GoU) through the Ministry of Water and Environment (MWE) with support from the World Bank is preparing the Irrigation for Climate Resilience Project (ICRP). The project objectives are to provide farmers in the project areas with access to irrigation and other agricultural services, and to establish management arrangements for irrigation service delivery. Specifically, the project will contribute to improvement of farm incomes, rural livelihoods, food security, climate resilience, sustainable natural resources management in the proposed areas of Kabuyanda in Isingiro District.

Project Components

The project comprises three components here listed: Component 1 - Irrigation Services; Component 2 - Support services for agricultural production and value-chain development; Component 3 - Institutional Strengthening and Implementation Support.

Component 1. Irrigation Services (US$120 million)

Access to irrigation is critical to allowing farmers cope with climate variability, to increase yield and intensification, and diversify towards higher value crops. Component 1 aims at providing farmers with irrigation water across various irrigation models, classified around the size of irrigation development [1] as per the National Irrigation Policy, spanning across the country.

Component 1 comprises three sub-components.

Sub-component 1.1 on Large and Medium-scale Irrigation. Large (>1,000 ha) and Medium (100 to 1,000 ha) scale irrigation schemes are established when an important water source is available in conjunction with a sizable irrigable area, offering the chance of developing economies of scale for marketing and value addition. As water might be not directly accessible across the whole irrigable area, and/or as the water source might be at a certain distance from the irrigable area and/or variable over the year, off-farm infrastructures (i.e. dams, diversions weirs, transmission pipes or canals, distribution networks) are required. The project will construct new irrigation schemes (Kabuyanda and Matanda); support the development and strengthening of management model of new (Kabuyanda and Matanda) and existing (Olweny and Agoro) irrigation schemes; and develop studies for future irrigation schemes (Nyimur, Enengo and Amagoro). Activities will include: (i) dam construction and associated head works; (ii) construction of irrigation networks (pipes, canals, hydro-mechanical equipment) up to the farm gate; (iii) construction of drainage networks; (iv) construction of access and scheme roads; (v) construction of scheme offices, sanitation facilities, and storage facilities; (vi) construction of weather stations; (vii) consultancy services to prepare feasibility studies, detailed designs and safeguard instruments for irrigation schemes; (viii) consultancy services to monitor and control civil works; (ix) consultancy services in support of management of irrigation schemes; (x) consultancy services for environmental assessments and audits and implementation of the Environmental and Social Management Plan (ESMP); (xi) consultancy services for the roll out of Certificates of Costumery Ownership; and (xii) startup fund for O&M.

Sub-component 1.2 on Small and Micro-scale Irrigation. Small (5 to 100 ha) and Micro (<5 ha) scale irrigation schemes are smaller in size, relying on a nearby water source mobilized with simple and relatively low-cost infrastructure, making it possible for farmers (individually or collectively) to take charge of irrigation development and management. The project will pilot public support for the construction of farmer-led small and micro scale irrigation schemes around the two new irrigation schemes (Isingiro District around Kabuyanda and Kanungu District around Matanda) and in areas close to Kampala

characterized by high marketing potential (Mukono, Wakiso and Mpigi Districts), adopting a value chain approach. Activities will include: (i) construction of small water retention facilities and associated head works; (ii) drilling of wells and boreholes; (iii) construction of small irrigation networks (pipes, canals, hydro-mechanical equipment); and (vi) consultancy services to prepare designs, safeguard instruments and for monitoring and control of works.

Sub-component 1.3 on Integrated Catchment management. It will develop and implement integrated catchment management interventions for the two new irrigation schemes (Kabuyanda and Matanda), to improve the sustainability of the schemes, including the restoration/reforestation activity in Rwoho CFR (Kabuyanda). Activities will include: (i) consultancy services to prepare integrated micro-catchment management plans; (ii) implementation of identified watershed management measures from the micro-catchment management plans; and (iii) restoration/reforestation activities.

Component 2. Support services for agricultural production and value-chain development (US$32.6 million)

Component 2 aims to support farmers carrying out on-farm irrigation, accessing production and value addition knowledge and skills, and developing sustainable market access. The project will support farmers in increasing their knowledge using a Farmer Field School (FFS) approach, increased access to inputs (improved seeds, fertilizers), on-farm irrigation technologies, machineries and postharvest and agro-processing infrastructures through the use of smart subsidies and consultancy services.

Component 2 will comprise of two sub-components.

Sub-component 2.1 on On-farm Production and Productivity. It will provide support to farmers and farmers' groups for production and productivity improvement at the farm level in the new irrigation schemes (Kabuyanda and Matanda), in existing irrigation schemes (Olweny and Agoro), in small and micro irrigation schemes (Isingiro, Kanungu, Mukono, Wakiso and Mpigi Districts) as well as in the area of the proposed future irrigation scheme (Nyimur). Activities will include: (i) consultancy services to create and strengthen farmer groups, provide extension services, facilitate access to inputs, promote good agricultural practices, sustainable land management practices, and integrated pests and disease management; (ii) matching grants to facilitate access to inputs (seeds, agro-chemicals); (iii) matching grants to facilitate access to on-farm irrigation technology; and (iv) consultancy services to monitor and control civil works.

Sub-component 2.2 on Value Addition and Market Linkages. It will provide support to farmers' groups for value-chain development and strengthening and establishment of market linkages. Activities will include: (i) consultancy services to create and strengthen linkage with value chain actors in improved post-harvest handling, agro-processing, access to financing services, access to markets and market information; (ii) matching grants to facilitate access to equipment; and (iii) purchase of small goods.

Component 3. Institutional Strengthening and Implementation Support (US$10 million)

Component 3 will comprise of two sub-components.

Sub-component 3.1 on Institutional Strengthening. Activities will include: (i) short-term studies on management models in irrigation, tariff structures, and prerequisites for financial sustainability; and (ii) capacity building, training and study tours.

Sub-component 3.2 on Implementation Support. Activities will include: (i) hiring of individual consultants for the Project Support Team (PST); (ii) purchase of project implementation goods and services (ICT

Equipment, softwares, vehicles); (iii) travel costs and allowances; and (iv) Monitoring and Evaluation (M&E) costs.

Kabuyanda is one of the irrigation schemes that was designed under the previous NELSAP as Kabuyanda Water Resources Development project. Feasibility and detailed design, Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for Kabuyanda Irrigation scheme were undertaken under NELSAP in 2017. The project design has been revised to reduce the project cost and this has necessitated the revision and update of the ESIA and RAP respectively, including all the additional required documents (Integrated Pest Management Plan (IPMP), and Dam Safety Management Plans (DSMP). More so, a number of comments were raised by the World Bank in the original ESIA report which requires to be addressed accordingly. Given the above aspects, it is therefore necessary to update the ESIA and RAP of Kabuyanda Irrigation scheme to incorporate the Bank's comments and any new design review changes, before its implementation under ICRP. This is aimed at undertaking site specific assessment and development of appropriate environmental and social mitigation measures to guide implementation. Findings from the RAP report have also been incorporated into this report accordingly.

1.2 Purpose and Requirement of the ESIA

The dam, reservoir and irrigation command will be located in an area comprising hilly to mountainous terrain with steep fluted slopes and hill tops. Part of the project area (dam and reservoir) is within Rwoho Central Forest Reserve (CFR), a modified non-critical habitat. Various streams and wetlands could be negatively affected by project implementation. The purpose of the ESIA study was, therefore, to ensure that if the project is undertaken, it is undertaken in such a way that there is minimal or no adverse impact on the physical, biological, cultural and socio-economic environment of the proposed project area and vicinity. The National Environmental Act CAP 153 requires an EIA to be undertaken for all projects that are listed under the third schedule of the Act with a view of sustainable development. The proposed project is one of the projects listed under Section 4 of the schedule which includes dams, rivers and water resources.

1.3 Overview and scope of the Proposed Project to be assessed

The project will support Irrigation Services (Component 1), choosing irrigation models responding to local needs and opportunities. The Project has as core focus on the development of two new irrigation schemes (Kabuyanda and Matanda, both in the Western Region) and develop a pipeline for future investments (Enengo in the Western Region, Amagoro in the Eastern Region, and Nyimur in the Northern Region). In order to contribute to the institutional development of the irrigation sector in the country, the project will also support O&M of existing irrigation schemes (Agoro and Olweny). Finally, the Project will pilot support to small and micro-scale irrigation, building up on the more successful experience of farmer-led irrigation model in the country, with an eye to leveraging private financing. Irrigation services will be developed hand in hand with Support Services for Agricultural Production and Value Chain Development (Component 2), cognizant of the need to expand use of other production inputs (improved seeds, fertilizers, machineries) to increase yield, enhance diversification, and intensification; and of the opportunity of irrigation to become the anchor for the development of value chains and strong producer organizations. The Project will keep a focus on sustainability, through Institutional Strengthening and Implementation Support (Component 3).

The ESIA was conducted for the Kabuyanda Irrigation Scheme under the infrastructure development sub component of the ICRP. The ESIA study scope includes the following areas which will benefit from the Project, or which may be affected negatively:

a. The reservoir area, dam and auxiliary structures, irrigation command area and adjacent areas to the proposed irrigation command area;

b. The land resources and the people who may be affected by construction activities related to the irrigation infrastructure, access roads and other ancillary works like the quarries; and
c. Natural ecosystems, farmlands, infrastructure, and other water users downstream of the irrigation scheme intake which could be affected by the change in the river flow regime or/and by abstractions from the river.

1.4 Objectives of the ESIA

The general objective of the ESIA is to identify and assess the potential environmental and social impacts (both positive and negative) of the proposed Kabuyanda Irrigation Scheme prior to, during and after infrastructure construction, and to eliminate/ minimize negative impacts, while enhancing the positive impacts.

The specific objectives of the ESIA are:

a. To examine the existing environmental and social baseline conditions of the proposed Project area.
b. To obtain stakeholders' views on the proposed Project for consideration during Project design.
c. To identify and assess the potential significant environmental and social impacts of the proposed project.
d. To recommend measures that can be taken to avoid, offset or reduce the potential adverse environmental and social impacts of the proposed project.
e. To recommend measures that can be undertaken to enhance the positive potential environmental and social impacts of the proposed project.
f. To describe and analyze any project alternatives that were being considered and recommend the best alternative with most benefits and least costs in terms of financial, social and environmental considerations.
g. To develop an Integrated Pest Management Plan (IPMP) with an adequate level of detail to allow related activities to be adequately priced and integrated into successful bidder's works contract.
h. To develop Environmental and Social Management Plans (ESMP)

1.5 ESIA Methodology

The scope of the ESIA was guided by provisions in the first schedule of the EIA regulations for Uganda and the approved terms of reference for the study attached in Appendix A. A number of methods were applied including literature reviews and field investigations for the identification of sensitive receptors, baseline data collection and analysis, biodiversity assessment, hydrology and water resources assessment, pests and diseases assessment, public health survey, archaeology and cultural heritage assessment, noise assessment, air quality, noise, and water quality assessment, as well as stakeholder consultations and direct observations.

1.5.1 Literature Review

Existing literature related to the project and project area, documents provided by the Client on the proposed project, guidelines for Environment Impact Assessment in Uganda as well as World Bank and other relevant international operating policies/safeguards, guidelines, standards, and legislation were reviewed in relation to the project.

Documents reviewed included the following:

i. Request for Proposals for consultancy services for finalization of preparation of Environmental and Social Impact Assessment (ESIA) and Development of the Resettlement Action Plan (RAP) for the Kabuyanda Water Resources Development project;
ii. Final feasibility study report for the Project;

iii. Draft Detailed Design Report for Project;
iv. Draft interim report for the ESIA and RAP Scoping report for the ESIA;
v. Letter of approval of scoping report and Terms of Reference for ESIA;
vi. Isingiro District Five Year Development Plan II 2015/2016 – 2019/2020;
vii. Relevant national and international laws and policies
viii. MWE ICRP Draft PIM
ix. MWE ICRP Environmental and Social Management Framework

1.5.2 Field Baseline Surveys

In order to enable the comprehensive evaluation of impact significance, biophysical, socio-economic and cultural baseline field surveys were undertaken between November 2017 and February 2018. Including identification of sensitive receptors, baseline data collection and analysis, biodiversity assessment, hydrology and water resources assessment, pests and diseases assessment, public health survey, archaeology and cultural heritage assessment, noise assessment, air quality, noise, and water quality assessment. The methods employed for each survey are presented below:

1.5.2.1 *Hydrology and Water Resources Assessment*

This study concentrates on assessing aspects of the project that are crucial for evaluating its impact on water resources in the area. The assessment included extraction of data from the feasibility study and design reports which is relevant for estimation of environmental flows and other related assessments. In addition, it involved a literature review and collection of historical data, determination of key drivers and trends in water resources of the area, assessment of impacts and prescription of mitigation measures on water resources, and estimation of environmental flows to ensure ecosystem health.

1.5.2.1.1 Document Review/ Historical Data Collection

Documents which were reviewed andwhich informed the contents of the hydrology and water resources assessment included:

i. Existing designs, proposed scheme, data and reports;
ii. Design parameters including population to be served, water abstraction volumes, likely stresses on the system including urban centres, large scale water users, pollution sources etc.;
iii. Regulations, legal frameworks especially national (NEMA) statutes for water abstraction, use and pollution control. Regional/ trans-boundary water use protocols;
iv. Earlier water resources and hydrology studies related to the project and all information collected so far.
v. Climate and hydrological datasets available at NBI/NELSAP and within the relevant agencies of the Uganda Government;
vi. Catchment data including land-use and land cover, soils and geology, terrain;
vii. Water use for various purposes including amounts and spatial and temporal distribution;
viii. Other datasets that may be available as guided by the above document review.

1.5.2.1.2 Field Inspections

The inspections were aimed at creating an appreciation of the water resource situation on the ground and enhancing the data collected above. In particular, field inspections were useful for crosschecking and updating of the database for catchment characteristics, drivers of water use (locations and characteristics) and improvement in understanding the inter-linkage between water availability and water use.

1.5.2.1.3 Runoff Modelling Approach

No long-term runoff data exists for Mishumba River except a 2years record from the gauging station that was established for the purpose of this study. The river flow was therefore estimated using a rainfall-runoff model (HEC-HMS software) whose inputs included rainfall, temperature and catchment specifics

like land cover, soil etc. The Model calibration was based on the similar R. Rwizi catchment parameters which has long term flow measurement records (1950-1995).

1.5.2.1.4 Projections of Water Demands

These were based on assessed unit water demands for irrigation. Analysis was carried out at monthly intervals.

1.5.2.1.5 Environmental Flow Estimation

The assessment involved estimation and justification of the environmental flows for the proposed Kabuyanda Project. The following approach has been adopted for estimating environmental flows in the area:

a) Review of existing reports,
b) Review and characterization of various ecosystems in the vicinity of the project area,
c) Review and update of the hydrology data for the site as shown above,
d) Application of the selected environmental flow assessment (EFA) methodology to the study area,
e) Recommendations for project operations to meet environmental flow requirements.

The analysis was carried out on monthly data and the choices made were based on the findings of the biological and ecological studies.

1.5.2.2 *Fish and Fisheries Data Collection*

Fisheries data was collected using the following methods;

a. Experimental fishing by use of scoop nets and baited minnow traps.
b. Expert analysis/observation of fish presence along the river banks.
c. Interviewing and conducting group discussions with local people within the vicinity was carried out to obtain further information using local knowledge.

The fish checklist album guide was used for respondents to identify which fish species they usually encounter in those rivers and streams along project area.

1.5.2.3 *Water Quality, Plankton and Benthos*

Sampling sites were selected based on unique land uses and habitat structure. At the same time, sampling sites were set at the inlet, outlet and in the middle of the Mishumba stream. One more sampling station was set at the entry of Kasharira stream into the Mishumba stream. Water samples were collected and analysis done at the Makerere University Laboratory. The following parameters were sampled over a period of three days and the average readings collected. *In-situ* measurements of temperature, electronic conductivity (EC) and pH were done using a Hannar combo meter Model H198128, whilst dissolved oxygen (DO) (mg/L) was measured by the Winkler method. Water transparency was not measured due to the fact that the water was very shallow at all the sampling sites at the time. Fishing was also done within the vicinity of the selected sites.

1.5.2.3.1 Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)

This was measured to indicate the amount of biologically degradable organic matter present in each water sample. Hence it is a measure of the amount of organic pollution of the rivers. It is an indirect indicator of how pristine an aquatic environment is. COD was measured to indicate susceptibility to oxidation of organic and inorganic matter present in a water body. Hence, it is a direct indicator of pollution.

1.5.2.3.2 Dissolved Oxygen (DO)

DO is the most important parameter in aquatic ecosystems and was therefore measured. It is a prerequisite for aerobic respiration and is responsible for self-purification processes in natural waters. Its abundance and saturation often directly reflects high biodiversity in aquatic ecosystems. Conditions below 4mg/l cannot support fish species, and fish kills are observed at below 2mg/l for most fish. It is also

a direct measure of organic pollution. The oxygen content of natural water varies with temperature, salinity, turbulence, atmospheric pressure and photosynthetic activity.

1.5.2.3.3 Electrical Conductivity (EC),

EC measured as it indicates the ability of water to conduct an electric current and is related to concentrations of Total Dissolved Solids (TDS). Its continuous monitoring in rivers is useful in the management of temporal variations in TDS and major ions. TDS is directly proportional to electrical conductivity and influences salinity.

1.5.2.3.4 Hardness, Bicarbonate, Carbonate, Carbon Dioxide

This was assessed; hardness is an important parameter to measure and water can be classified into soft or hard water. Hard water has the economic implications of causing scales in boilers and poor lather formation in laundry. It is an indirect determination of Ca^{2+} and Mg^{2+} - its major cation constituents. The main anions that contribute to hardness are CO_3^{2+} and HCO_3^-. These also influence alkalinity. CO_2 and HCO_3^- are important sources of carbon for algal photosynthesis. These parameters provide general information above the water ionic content and buffering capacity.

1.5.2.3.5 Coliform Bacteria

It was investigated as their presence is a confirmation of human and animal waste contamination. Since the catchments have water-borne epidemics like cholera, typhoid and dysentery, the measurement of these tests enables the provision of information on the linkage between water contamination and outbreaks of epidemics.

1.5.2.3.6 Nitrogen, Phosphorous and Sulphates

These are the major algal nutrients. Nitrogen occurs as nitrogen gas (N_2), ammonia (NH_4^+), nitrite (NO_2^-) and nitrate (NO_3^-), while phosphorous occurs as phosphate (PO_4^{2-}). These were measured in order to evaluate the extent of anthropogenic activities on aquatic environments. They are direct indicators of agricultural, industrial and domestic sewage runoff from the catchments. Their measurements enable the establishment of the trophic status of an aquatic ecosystem. Sulphates are nutrients needed in the synthesis of proteins. Their absence or low values in river water needs further investigation, in order to understand the nutrient dynamics in the tropical aquatic environments.

1.5.2.3.7 pH, Acidity and Alkalinity

These influence many biological and chemical processes in water bodies and were therefore measured. pH is a measure of the acid balance of a solution and is defined as the negative of the logarithm to the base 10 of the hydrogen ion (H^+) concentration. The pH scale runs from 0 and 14 (i.e. very acidic to very alkaline), with pH 7 representing a neutral condition. At a given temperature, pH (or the hydrogen ion activity) indicates the intensity of the acidic or basic character of a solution and is controlled by the dissolved chemical compounds and biochemical processes in the solution. Acidity and alkalinity are the base and acid- neutralizing capacities (ANC) of water and are usually expressed as $mmol^{-1}$. The acidity of water is controlled by strong mineral acids, weak acids such as carbonic, humic and fulvic and hydrolyzing salts of metal (e.g. iron, aluminum), as well strong acids. The alkalinity of water is controlled by the sum of the carbonate (CO_3^{2-}), bicarbonate (HCO_3^-) and hydroxide (OH^-), but may include contributions from borate (BO_4^2), phosphates (PO_4^{2-}), silicates (SiO_4^2), and other basic compounds.

1.5.2.3.8 Temperature

Is a prerequisite for biological activities, especially enzymatic and biochemical reactions that are temperature dependent. It affects physical, chemical and biological processes in water bodies which influence the concentration of parameters which, in turn determines the chemical composition of water. Increase of temperature increases the rate of chemical reactions and evaporation. It also influences the solubility of gases in a water body.

1.5.2.3.9 Total Suspended Solids (TSS)

TSS of a water sample corresponds to non-filterable and filterable residues. TSS was measured as it is directly proportional to turbidity, colour transparency and secchi depth. TSS is also a direct measure of siltation in rivers which drain heavily cultivated catchments.

1.5.2.3.10 Phytoplankton Sample Preparation and Identification

Water samples for phytoplankton species identification were collected using a water sampler. Twenty (20) ml samples were separated and preserved using Lugol's solution in brown glass bottles for further analysis in the laboratory. Identification was done up to species level for the algae, diatoms and flagellates under an inverted microscope using standard techniques (APHA, 1998).

1.5.2.3.11 Zooplankton Sample Preparation and Identification

Water samples were collected using a water sampler. Water samples were immediately filtered using cellulose acetate membrane filters (pore size 0.45µm) and preserved in labeled sample bottles with ethanol (50 %). Laboratory analysis was conducted immediately after delivery to the laboratory. Total counts (all individuals in the sample) of zooplankton were made for each sample using a Sedgwick rafter cell and a stereo microscope. Identification was done up to species level for rotifers and for micro crustaceans using standard identification keys.

1.5.2.3.12 Benthic/ Macro Invertebrate Fauna Sample Preparation and Identification

The Ekman-Birge-grab 15x15x15cm was used to get samples for the benthic fauna. The samples were sieved using a benthic net of 0.5 mm mesh in order to remove fine sediments and other extraneous materials. The samples were preserved in 15% ethanol for later analysis in the laboratory. Benthic invertebrates play an important role in transitional ecosystems by filtering phytoplankton and then acting as a food source for larger organisms such as fish, thereby linking primary production with higher trophic levels. They also structure and oxygenate the bottom by reworking sediments and play a fundamental role in breaking down organic materials before bacterial re-mineralisation. In addition, benthic organisms are used as fishing bait and are often used as biological indicators because they are relatively immobile within the ecosystem and do not migrate, respond to a wide range of pollutants, are present throughout the year and are therefore a reliable indicator of water quality.

1.5.2.4 *Flora Survey*

The accuracy of results on data obtained in a flora survey depends on the sampling method used in the study design. Inventories of demarcated plots have been widely used in floristic sampling and ecological studies in recent years. However, the results of species richness depend on the size, shape and number of the plots being used, and the choices of the parameters depend on the scope of the study. Sampling with quadrats (plots of a standard size) can be used for most plant communities. Transects were established along the different facility locations including the canals, dam axis, reservoir and within the entire irrigation zone. Sample plots were established along the established transects. For every location to be sampled, rectangular plots of 25m by 50m were used to study the vegetation. Data on trees, shrubs, climbers, lianas and herbaceous plants were recorded in each plot. The coordinates of each plot as well as the vegetation type were recorded. Trees and shrubs of less than 10 cm diameter at breast height (dbh) were recorded from each nested plot of (10m by 20m) in the bigger plot. Lianas were recorded by the presence-absence mechanism in the nested plots of 10m by 20m. Herbs were also recorded by their presence or absence in a nested plot of 2m by 4m. Flora Species identification for species that were not be readily identified in the field were identified at the Makerere University Herbarium. Data collected was used to determine the distribution of flora species by life form (habit) and the frequency of occurrence of species. Species of conservation importance encountered as per IUCN Red list were noted.

1.5.2.5 *Fauna Survey*

Literature Reviews were undertaken to collate information on species likely to exist in the project area.

Local Consultations with local community members established the existence of particular species. Information provided by the community was cross-examined by reviewing distribution literature and publication to confirm their existence.

Red Data/ Protected Species Analysis was consulted to assess the Red List and/ or protected status of species recorded or potentially occurring in the study area, the following sources were consulted:

- International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (2014.2), and;
- The National Red List for Uganda January 2016, published by Wildlife Conservation Society (WCS).

1.5.2.5.1 Mammals

For this study, general and some directed surveys were conducted. The surveys were aimed at:

a. Conducting some general medium to large sized mammal species occurrence recordings in the survey areas.
b. Surveying bats and small mammals in the project area to gain an idea on the community composition of these two groups in the area.
c. Because of the diversity of interest in the mammal surveys, different standard mammal survey methods.

To conduct the surveys, the project area was traversed and transects were established at the different main areas of establishment of the project components. Along the transects, timed species counts were conducted to document the mammals observed. Mammal signs looked for and counted included spoors and prints, skeletal material, fecal material, tracks and other animal parts. To improve the information obtained from the surveys, time-constrained interviews with members of the local community were conducted. The strategy for the surveys was to search for and conduct the observations in selected areas that still carried some natural vegetation cover. All such areas that were visited had semi-natural land-cover remaining along the valleys which also had flowing rivers.

1.5.2.5.2 Birds

Counting birds is best done by standard methods (for example, Bibby et al, 2000, Pomeroy 1992 and many others). Transects were established at the different main areas designated for construction of the Project components. Along the transects, timed species counts were conducted to document the bird species heard or seen. The strategy for the surveys was to search for and conduct the observations in selected areas that still carried some natural vegetation cover. All such areas that were visited had semi-natural land-cover remaining along the valleys which also had rivers flowing in the valley. All species were recorded, whether detected by sight or sound, and at any distance within the sampled habitat. Observations were mainly made between 07.00am and 12.00pm when bird activity is high. Analyses included assessment of likely impacts on various categories of birds, especially those of conservation concern, and thus contribute to mitigation proposals.

1.5.2.5.3 Herpetofauna

A combination of methods was used to collect information during the survey of herpetofauna of the project area. At each sampling area, sampling/ observations were conducted for a period of two (2) hours in and around a radius of 200m. The methods include:

a. Visual Encounter Surveys (VES) / Opportunistic surveys: Visual encounter surveys were conducted in the established sampling areas. Visual searches included examining hiding places such as under logs, leaf litter, in vegetation, and crevices. Species encountered were recorded.
b. Audio Encounter Surveys (AES): This method uses the species specific calls made by breeding males. The identity of the amphibian species heard calling and their numbers were recorded. The counts were then used to estimate or determine: 1) relative abundance of calling males, and 2) species composition.

c. Dip Netting: Some herpeto-fauna are more aquatic than others, spending most of their time in water. Using dip net ponds, pools, streams and other water collection points were dip netted. Adult amphibians and tadpoles encountered were recorded.
d. Specimen Collection and Preservation: Apart from individuals heard calling, species encountered were handpicked, identified, were photographed if possible, and released at the point of capture. Only individuals whose identity was not known were retained as specimens and preserved in 10% alcohol to be taken to Zoology Museum Makerere University Kampala.

1.5.2.6 *Crops, Pests and Diseases Assessment*

Data was collected using two approaches: (i) field observations, and (ii) discussions with local agricultural officials and farmers. A reconnaissance was first done in the project area in order to focus the areas for field observations and farmer discussion. Field observations were made through visits to areas upstream and downstream of the proposed dam site and data collected on the species, cropping system, pests and diseases of crops and trees encountered. Pest and disease identification was based on spot diagnosis of systematic crops and trees. The number of gardens or woodlots examined for pests and diseases varied among crop and tree species depending on the availability of the crop or tree species during the visit.

One-to-one discussions were held with an agricultural extension agent in Kabuyanda (Mr. Bright Muhumuza) and the Isingiro district Agricultural Officer (Mr. Patrick Tumwesigye). The discussions focused on farmers' land ownership in the project area, farmer organization, crops and trees cultivated, occurrence and management of crop and tree pests and diseases. Two group discussions were held with farmers, one in Kanyamaizi parish (upstream) and the other in Iryango parish for downstream farmer. The meetings focused on crops and trees cultivated by the farmers, occurrence and management practices of crop and tree pests and diseases. Discussions were also held with individual farmers, who were found in the gardens, on their experiences with crop and/or tree pests on their crops. A local field assistant was recruited to guide field movements and discussions with farmers. Extensive reviews of previously documented reports and publications were as well conducted to obtain information on various aspects, including potential pests in Uganda, Integrated pest management, legal and instructional framework for pest management. Relevant national plans, policies and acts in Uganda were reviewed.

1.5.2.7 *Noise and Air Quality Measurements*

In order to establish a benchmark of the current noise level conditions in the project area, a noise survey was undertaken during day time in November 2017 at 28 locations. The measurements were undertaken using a pre-calibrated AWA5661 sound level meter to obtain a baseline against which future monitoring of noise levels will be based. Measurements were taken for a 10-minute period during day time at each location. Baseline information regarding the existing air quality at the site has been gathered via field surveys. Air quality measurements were conducted using a CEM DT-9881M particulate meter to get values for PM10, PM2.5, Ambient Temperature (AT) and Relative Humidity (RH), with the intention of establishing a baseline for future monitoring purposes.

1.5.2.8 *Socio-Economic Survey*

The human environment forms an important part of an impact assessment. Humans have significant impacts on the surrounding natural environment and an ESIA must examine these interactions in order to determine the extent of Project impacts and mitigation measures concerning socio-economic, cultural and health issues. This section of the report presents the findings on the socio-economic conditions of households that will be directly and indirectly affected by the project and the general socio-economic conditions of the area and provides a baseline for any future monitoring of the households. The Consultant used both qualitative and quantitative methods to capture up-to date socio-economic information on both directly and indirectly affected households in the project area, however, the methodology was

largely quantitative involving questionnaire interviews enriched by qualitative methods like Key Informant Interviews. The quantitative methodology was favoured because of the need for statistical information to inform planning and future monitoring and evaluation of the Project Affected Households (PAH). The description of the approach and methodology applied to collect relevant information in the project area is described overleaf.

1.5.2.8.1 Review of Relevant Documentation

The Consultant reviewed a number of reports that contained vital information including:

a. Feasibility Reports
b. Uganda National Population and Housing Census 2017
c. Isingiro District Five Year Development Plan II 2015/2016 – 2019/2020
d. Kabuyanda Town Council Five Year Development Plan 2015/2016 – 2019/2020
e. Health Management Information Systems (HMIS), Isingiro District, Annual Analysis Report (July 2016 – 2017)
f. Draft Interim Report and Scoping Report (November, 2016)
g. Terms of Reference for the Project.

1.5.2.8.2 Stakeholder Consultations

The Consultant consulted a number of stakeholders to obtain relevant socio-economic information. Among the stakeholders consulted were the Ministry of Water and Environment officials, Ministry of Energy and Mineral Development, National Forest Authority, Isingiro District officials, Kabuyanda Town Council officials, Kabuyanda Sub-County officials, and members of the Community in both the direct and indirect impact area of the project. The consultation process will continue throughout the different phases of the project.

1.5.2.8.3 Socio-Economic Household Surveys

The questionnaire was the primary tool used to collect data. This method was selected because it edges other methods in eliciting quantifiable data. The Consultant purposively selected the sub-counties and villages included in the survey. However, the households were randomly selected. A total of 651 households were included in the survey.

a. *In-depth interviews:* Selection was based on the subject's profession or status within the villages in relation to the information needed by the study for instance the topics to be discussed. This information helps to contextualise some of the information obtained from the questionnaire.
b. *Informal discussions:* In order to get another view of how daily life is like in the selected area, informal discussions on the streets, in hotels, in shops and outside homes were carried out.
c. *Observations:* For a vivid description of the social services and health services catering for the selected area, observation was carried out of the standard of medical facilities, population activities, food and feeding amenities, hotels and bars, surrounding environment and homes of the inhabitants.The Consultant made observations for purposes of understanding responses provided in the household interviews and for picking additional information not picked up through other methods.
d. *Public Health Assessment*: In order to get information on health issues/matters in the project area, several methods of data collection were used for verification and clarification purposes. The data collection methods included observation from walk-through, questionnaires, in-depth interviews, informal discussions, observation, and a medical sensitivity test of prevalent diseases using urine, stool and sputum. All obtained data was compared with the Health Management Information System (HMIS), Form 105, in the District facilities.

1.5.2.9 *Archaeology and Cultural Heritage*

In this project, the systematic survey technique was applied in the gardens where crops were not too tall and unsystematic surveying was undertaken in gardens with dense crop cover. Data collection methods included observations, recording, photographing, and documenting all identified cultural materials, and other environmental features likely to be impacted on either positively or negatively by the project.

1.5.3 Analysis of Project Alternatives

The principle used in the selection of sounder project alternatives was to minimize environmental and social impacts and the cost of project implementation inclusive of environmental management principles. The parameters used in the assessment of the project alternatives included, where applicable, their potential environmental and social impacts (costs and benefits); the feasibility of mitigating these impacts (costs, benefits, and cost-effectiveness); their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements and their technical parameters. The parameters used in recommending the best alternatives were assigned scores ranging from ranging from 1-4 which scores are defined differently depending on category of options and parameter. An alternative with very many high to medium positive impacts with minimal negative impacts scored 1. An alternative with balance number of positive and negative impacts scored 2. An alternative with more negative impacts than positive impacts scored 3. In addition, an alternative with very many high to medium negative impacts with minimal positive impacts scored 4. The scores were then summed up and the alternative with the lowest score recommended as the best alternative.

Table 1: Scores for Alternative Options

Parameters	Scores for the Project Alternatives		
	Option A	Option B	Option… (as many options as provided)
Potential Environment and Social Impacts	4	2	3
Feasibility of Mitigating Impacts	1	1	1
Capital and Recurrent Costs, etc.	3	1	2
Total scores	**8**	**4**	**6**

1.5.4 Impact Assessment Methodology

Four factors were considered when assessing the significance of all the social impacts, namely:

Relationship of the impact to temporal scales (relating to measured time). The temporary scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

Relationship of the impact to spatial scales (relating to space). The spatial scale defines the physical extent of the impact.

The severity/beneficial scale (state or extent of badness or benefit). The severity of the impact is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it.

The likelihood (degree of probability) of the impact occurring. The likelihood of impacts taking place as a result of project actions differs between potential impacts. There is often no doubt that some impacts will occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle

accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion is ranked with scores assigned as presented below to determine the overall significance of an activity. The criterion is then considered in two categories - effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in the table in next page to determine the overall significance of the impact. The overall significance is either negative or positive.

Table 2: Ranking of Evaluation Criteria

Effect	**Temporal scale**			**Score**
	Short-term	Less than 5 years		1
	Medium-term	Between 5 and 20 years		2
	Long-term	Between 20 and 40 years		3
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there		4
	Spatial Scale			**Score**
	Localised	At a localised Scale and a few hectares in extent		1
	Study Area	Proposed Site and its immediate environment		2
	Regional	District and Provincial level		3
	National	Country level		4
	International	Internationally		5
	*	**Severity**	**Benefit**	**Score**
	Slight /Slight Beneficial	Slight impact(s) on the affected system(s) or party(ies)	Slight beneficial to the affected system(s) or party(ies)	1
	Moderate/Moderate Beneficial	Moderate impact(s) on the affected system(s)or party(ies)	Moderate beneficial to the affected system(s) or party(ies)	2
	Severe/Beneficial	Severe impact(s) on the affected system(s) or party(ies)	Substantially beneficial to the affected system(s) or party(ies)	3
	Very Severe/Very Beneficial	Very Severe impact(s) on the affected system(s)or party(ies)	Very beneficial to the affected system(s) or party(ies)	4
Likelihood	**Likelihood**			**Score**
	Unlikely	The likelihood of these impacts occurring is slight		1
	May Occur	The likelihood of these impacts occurring is possible		2
	Probable	The likelihood of these impacts occurring is probable		3
	Certain	The likelihood is that this impact will definitely occur		4

The score is inserted in the significance matrix for the magnitude calculation of the impacts based on likelihood and effect. It has to be mentioned that under the effect category of all scores are summed to come up with a total effect of the identified project.

Table 3: Significance Matrix of the Impacts based on Likelihood and Effect

LIKELIHOOD		EFFECTS													
		4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	4	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The **impact significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

Table 4: Description of Significance Ratings

Significance Rating	Description	Score Range
Low	An acceptable impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment.	**4 - 7**
Moderate	An important impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment.	**8 - 11**
High	A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually a long-term change to the (natural &/or social) environment and result in severe effects or beneficial effects.	**12 - 15**
Very High	A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are un-mitigatable and usually result in very severe effects, or very beneficial effects.	**16 - 20**

The evaluation of the impacts, as described above is used to prioritize which impacts require mitigation measures. Negative impacts that are ranked as being of "**VERY HIGH**" and "**HIGH**" significance should be investigated further to determine how the impact can be minimised or what alternative activities or mitigation measures can be implemented. These impacts may also assist decision makers i.e. lots of **HIGH** negative impacts may bring about a negative decision. For impacts identified as having a negative impact of "**MODERATE**" significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed. Impacts ranked as "**LOW**" significance, will have no or minor mitigation measures and slight alternatives could be considered. Such measures will ensure that the impacts remain of low significance.

1.6 Report Structure

This Environmental and Social Impact Assessment report is divided into 8 Chapters as indicated below:

- **Chapter 1. Introduction** provides a description of the background of the project, the need for an Environmental and Social Impact Assessment and the methodology used in the assessment.
- **Chapter 2. Project Description** describes the project location, the area of influence, the project components, and project technical designs.
- **Chapter 3. Policy, Legal and Institutional Framework** presents an overview of the legal and institutional framework under which this ESIA has been conducted including national and international EIA study requirements.
- **Chapter 4. Environment and Social Baseline** describes the existing physical, biological and socio-economic baseline conditions.
- **Chapter 5. Analysis of Alternatives** provides an analysis of project alternatives.
- **Chapter 6. Public Consultations** provides an overview of public disclosure and consultation activities undertaken in connection with the ESIA process.
- **Chapter 7**. **Potential Environmental and Socio-Economic Impacts, Mitigation and Enhancement Measures** describes the potential positive and negative environmental and social impacts according to their magnitude and presents the anticipated overall impacts of the Project. It also highlights the mitigation and enhancement measures.
- **Chapter 8**. **Environment and Social Management Plan**
- **Chapter 9. Conclusions and Recommendations** gives concluding remarks and recommendations on project implementation

2 PROJECT DESCRIPTION

2.1 Location

The Kabuyanda Irrigation Scheme (formerly Kabuyanda Water Resources Development Project) area is located within the Isingiro and Ntungamo districts of South-Western Uganda. Known as Uganda's "Cattle Corridor", this climatic region is part of a broad zone stretching diagonally from the south-west to the north-east of the country, and is characterized by high rainfall variability and dominated by pastoral rangelands. The Project will be located in three sub-counties in Isingiro District (Kabuyanda, Kikagati and Nyakitunda) and one sub-county in Ntungamo District (Rukoni East Sub-County), and in one Town Council (Kabuyanda) in Isingiro District.

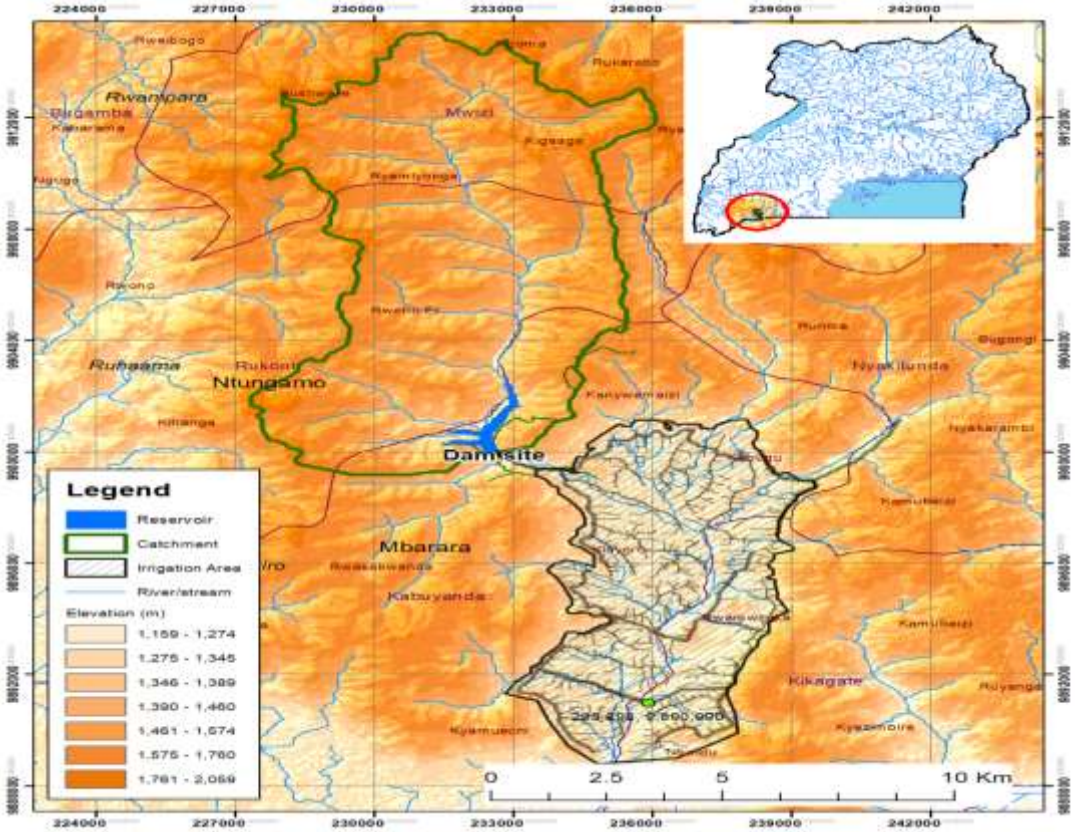
By constructing a dam on the Mishumba River 5 km to the north-west of Kabuyanda Town, the project is envisaged to develop 3,300 ha of irrigated agriculture extending southwards from the dam along the river banks, in addition to contribute towards restoration/reforestation of sub-catchments upstream. Mishumba River is a tributary of the Kagera River and drains part of the Rwoho Central Forest Reserve (CFR) before later joining the Kagera River at a confluence along the Uganda-Tanzania border. The dam site is located on the exit of Rwoho CFR as it flows towards the Kikagate area. Rwoho CFR is a 9,000 ha plantation development forest, largely degraded and partially restored with non-indigenous species (*Pinus caribaea, Pinus ocarpa* and *Eucalyptus sp.*), classified as modified non-critical habitat. The mid-altitude forest is on the fringes of the bare Mbarara hill tops and Oruchinga Valley to the south-east which drain to the Kagera River.

2.2 Justification and Objectives

South-Western Uganda and specifically the project Districts are characterized by up to four months each year of little or no rainfall. The districts have low access to water, with occasional border conflicts arising when pastoralists cross into Tanzania, and vice versa, in search of water and pastures during the dry seasons. The area currently has low productive subsistence agriculture despite having extensive arable land and, therefore, the Kabuyanda Irrigation Scheme Project intends to improve the situation by:

a. Creation of a dam to increase water availability for irrigation of 3,300 ha of agricultural land;
b. Restoring degraded sub-catchments; and
c. Regulating flows for drought and flood control functions.

Figure 1: Map Showing Catchment, Reservoir, Dam site and Irrigation Command Area



2.3 Catchment Characteristics

The catchment has distinct characteristics largely due to geographical location, topography, climate and varying land uses. The basin has a relatively elongated shape with a length of 15 km and an average width of around 6 km, for a total area of 90 km^2. The river has its headwaters in the Parishes of Ngoma, Rukarabo and Bushwere of Mwizi Sub-County in Mbarara District. The river then flows in a general southerly-direction through Rwoho Central Forest Reserve (CFR) and is fed by numerous streams that flow in from the east and west. Land-uses in the catchment area include tree plantation, subsistence farming and livestock rearing.

2.4 Extent of Affected Area

The dam will create a reservoir that will inundate 100 ha of land within the Rwoho CFR, to serve an irrigation command area of 3,300 ha. The dam will create a storage of 8.8 MCM with a live volume of approximately 7.289 MCM. The Google Earth Map (Figure 2) shows the project area. Around the dam area, North and upstream of the dam is Rwoho CFR, a plantation development forest, degraded and partially replanted with non-indigenous species (*Pinus caribaea, Pinus ocarpa* and *Eucalyptus sp*.), and classified as modified non-critical habitat. Along the rivers, some wetlands are present, mostly degraded due to human activity.

Figure 2: Upstream of project area, dam and Auxiliary facilities, Reservoir, Irrigation Command Area and Downstream of Project Area

2.5 Project Components

The project will include construction of a dam and its auxiliary works; and an irrigation network and associated structures, which will comprise a low-pressure pipe system. The project is composed of the following main works:

a. A zoned earth-fill dam with 33 m maximum height and a crest length of approximately 314 m;
b. A spillway designed to discharge a flood of 57 m^3/s, with a return period of 10,000y;
c. A Control Building;
d. An irrigation network consisting of:
   - ❖ main and secondary distribution lines reaching the different zones in the command area,
   - ❖ tertiary lines distributing water directly to the irrigation units and relevant hydrants,
   - ❖ hydrants, each serving one irrigation unit;

2.5.1 Dam

The dam is to be located in Katooma I and Kagoto II Villages in Kanyamizi Parish, Kabuyanda Sub-County in Isingiro District. The dam main features and the coordinates of the dam site area are (UTM, WGS84): E 233602 and N 9899313. The dam envisaged for the Kabuyanda Project is a zoned earth-fill dam type. All the materials foreseen for the construction of the dam body are available on site or in close proximity.

Table 5: Main Features of the Dam

Maximum dam height (H)	33 m
Maximum crest length (m)	314 m
Crest Elevation (Cel)	1359 m.a.s.l
Maximum Base Width (upstream to downstream toe) (BW)	160.5 m
Upstream slope (S_{US})	2.25:1+2.5:1+2.5:1 (h/v)
Downstream slope (S_{DS})	2.25:1+2.5:1 (h/v)
Crest road width (CW)	7 m

A drainage pipe around 220m long, has been designed along the dam axis at a depth of about 10m from the original ground elevation. The drainage pipe is a corrugated steel pipe and is accessible from the intake gallery. The main function is to collect the water from the drainage system and to monitor the eventual presence of seepage problems.

Table 6: Drainage Dimensions

Type	Corrugated steel pipe 3''x 1''
Diameter (D)	2.4 m
Thickness (tk)	4.5 mm
Length (L)	220 m

The project does not have a component for electricity generation much as this was anticipated before. The dam complex will access electricity through existing grid as Kabuyanda Town Council and Kabuyanda Sub-County are connected to the national power distribution grid. Several villages in Kabuyanda Town Council and Kabuyanda Sub-County are connected to the 33kV lines and the power supplier is UMEME).

The reservoir starts from the dam area in Katooma I and Kagoto II villages in Kanyamizi Parish, Kabuyanda Sub-County in Isingiro District. It has a small section stretching into Mukazianyara Village, Kirungu Parish, Rukoni East Subcounty in Ntungamo District. The reservoir ends at coordinates 232805E, 9903108 N (WGS 84), where Isingiro district (Kabuyanda Subcounty) borders both Mbarara District (Rwampara Sub-county)

and Ntungamo District (Rukoni East). The tip end of the reservoir is inbetween Kagala Village, Kanyamizi Parish, Kabuyanda Sub-county in Isingiro District and Nyakatojo Village, Kirungu Parish, Rukoni East Sub-county in Isingiro District.

The characteristic elevations of the reservoir are listed below.

Table 7: Reservoir Levels

Reservoir Elevations M a.s.l.			Reservoir Volume Mm^3
Minimum Operating Level	Min OL	1347.0	1.5
Maximum Operating Level	Max OL	1359.0	8.8
Flood Level @ 10,000 yrs	FL	1359.8	9.5
Extreme Flood Level	Ex FL	1361.2	10.9

2.5.2 Control Building

The control building will serve for the management of irrigation water. From the control building it will be possible to divert the reservoir water into the:

a. pressurized irrigation system;
b. natural river for the ecological flow.

2.5.3 Irrigation System

2.5.3.1 *Distribution System and Irrigation Method*

Distribution will consist of a piped network under pressure. In fact, an open-canal distribution system would prove much more difficult to conceive and expensive in terms of both construction and–most importantly–maintenance costs.

2.5.3.2 *Irrigation Network*

The irrigation system is composed of the following items:

a. the main and sub-main or secondary distribution lines reaching the different zones in the command area,
b. the tertiary lines distributing water directly to the irrigation units and relevant hydrants,
c. the hydrants, each serving one irrigation unit.

The irrigation network is not open canal. It will convey water through underground pipelines and delivered at the hydrant under pressure for basin or furrow irrigation whenever the farmers prefer.

a. ***Main Distribution Line:*** The main distribution line is conveying the flow of the system under optimized hydraulic conditions of flow velocity and friction losses. It takes water from the source to distribute it to the sub main (secondary or tertiary) distribution lines.
b. ***Secondary Distribution Lines:*** These are pipelines which, if necessary, extend from the main lines to reach significant irrigation areas laying far away from the main pipeline. Secondary lines branch into tertiary lines to serve the single irrigation unit. In some cases, tertiary lines can take straight from the main pipeline and in this case the secondary lines are not required.
c. ***Tertiary Distribution Lines:*** These are pipelines which extend from the main or sub main (secondary) lines and have hydrants mounted on them, each serving one irrigation unit.
d. ***Hydrants:*** These are fitted on the tertiary lines and equipped with a shut-off valve. They deliver water to the irrigation unit. In the case of a pressurized irrigation system, they feed the manifolds (feeder lines).

2.6 Construction Materials

The materials required for the construction of the dam will mainly include;

1.Murrum from borrow pits or another source

2. Clay core in layers to Provide Casing embankment over homogeneous soils on Dam's side.

3. Graded sand in Inclined/Horizontal filter/sand blanket

4. Rock fill for graded filter media and rip-rap

5. Cement for concrete works

Some of the materials are expected to be sourced from quarries to be developed in the vicinity of the Kabuyanda site while others will be outsourced from local and international suppliers. Water for construction will be abstracted from R. Mishumba. The dam will be built with the same soil material as the foundation (lean clay or clay with low plasticity or silt or silt with low plasticity CL/ML), suitably selected and compacted. 300 mm thick rip rap will be constructed over graded filter media on embankment; such material will be taken from quarries in the vicinity of the dam site.

The estimated required quantities of the construction materials can be summarized below.

Table 8: Estimated materials for dam construction

Material	Amount required	Remarks
Clay	76,695.00 m^3	Cut-off trench/dam body embankment
Murrum	225,472.00m^3	Casing embankment over homogenous souild in downstream side
Graded sand	25,593.00m^3	Inclined/Horizontal filter/sand blanket
Rock fill	24752.00 m^3	Riprap on upstream side of embankment
Cement concrete	448.28 m^3	Longitudinal drain/chute drain/profile walls, solid arapet wall, guard stones

An investigation was conducted by MWE to identify potential sources for Dam construction materials in the vicinity of the project as well as investigate the materials quality and quantity. The investigations included identification of Sources of natural granular, clay and sand materials for Dam construction. The investigation showed that there is sufficient quantity of the materials within the vicinity and these are of good quality.

2.6.1 Auxiliary Facilities

These are componets a project system that are not deemed part of the main pipeline project infrastructures but are key in supporting the operations and functions of project. For this project, auxillary facilities includes stone quarries, borrow pits, access roads.

2.6.1.1 *Stone Quarries*

There are possible sources of construction materials especially crushed stone aggregate could be from two existing stone quarries close to Kabuyanda i.e. from Kitwe and Kikagate which are 30km and 20km respecitively from the dam site.

It is suggested that, the ideal quarry site(s) will be zeroed on by the contractor taking into account the following considerations:

a. Where the stone quarries are existing and operational, Environment Due-Diligence shall be conducted to establish their operational compliance with applicable EIA requirements;

b. Its distance away from ecologically sensitive ecosystems such as wetlands, rivers, forests and national parks, CFRs i.e. how far a way is a quarry is from these ecosystems? Quarries which are closer to ecologically sensitive ecosystems (minimum distance away should be atleast 2km) will not be taken up by the project because quarry dust and associated operations will have large negative impacts on the protected areas;
c. Distance from settlements, schools and health centres taking into account risks of quarry operations to such establishments for fears of risks from flying stones on the safety of the inhabitants in such areas;
d. Existence of access route to and from the quarry without necessarily requiring construction of access route across rivers and swamps; and
e. Distance from the quarry to the dam with the objective of keeping the haulage distance shorter by comparison.

Table 9: Proposed Sources of rock materials (quarries)

Location	Sub-county	District	GPS Coordinates		Distance to Kabuyanda Dam, km	Proximity to, within a radius of 2.5km		Ecosystems within 5km		
			Northings	Eastings		Settlements	Schools & Health centers	Rivers	Swamps	National Park
Kitwe	Ruhaama	Ntungamo	-105729	220493	29.5	7	2	4	1	0
Kinyara	Kabuyanda TC	Isingiro	-107442	232232	11.2	1812	3	4	1	0
Mbarara Rutare	Kikagate	Isingiro	-110091	238485	13.3	1814	2	2	2	0
Nyamiyaga	Nyakitunda	Isingiro	-102541	240051	10.6	1953	8	5	0	0
Rwamwijuka	Kikagate	Isingiro	-104511	238259	9.1	2265	7	2	1	0
Kikagate	Kikagate	Isingiro	-115279	240301	20.3	1014	5	2	1	0

For the existing rock material sources, the Contractor will be required to undertake due diligence to establish operational compliance status of these sites before procuring the rock material. For any new stone quarry sites, it is a statutory obligation for the Contractors to undertake ESIA for facilities that will be under their direct control and accordingly be held responsible for their operations. However, MWE will undertake due diligence to supervise the assessment process (review TORs, review ESIAs, RAPs for completeness and accuracy) and monitor implementation of the ESMPs/ RAPs.

Figure 3: Proposed stone quarry sites

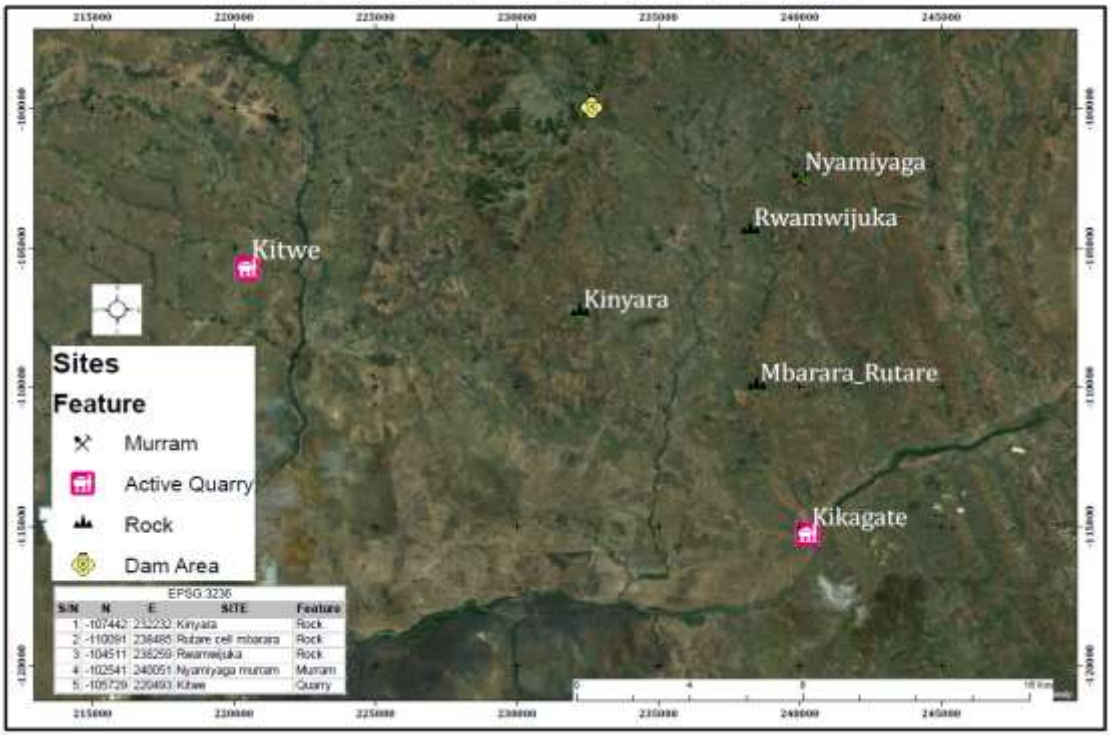


Figure 4: Stone quarries proximity to ecosystems

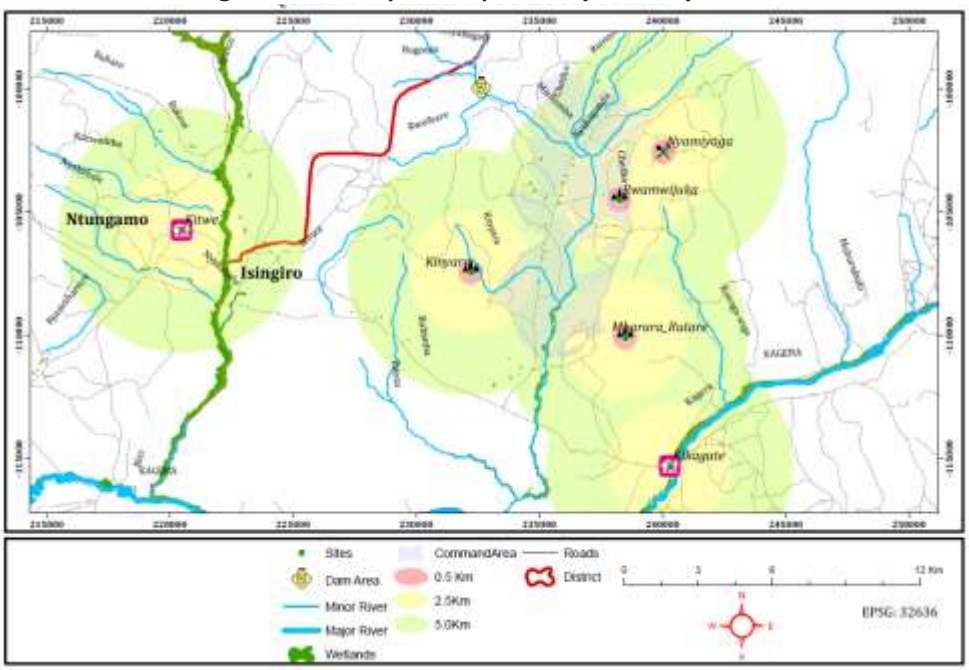


Figure 5: Stone quarries proximity to buildings

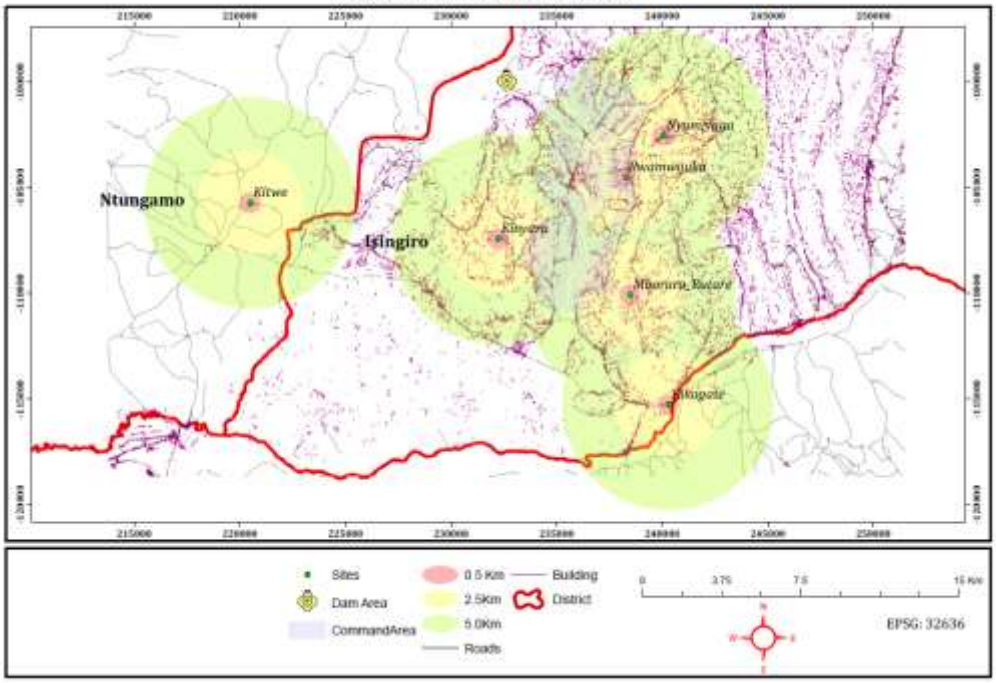
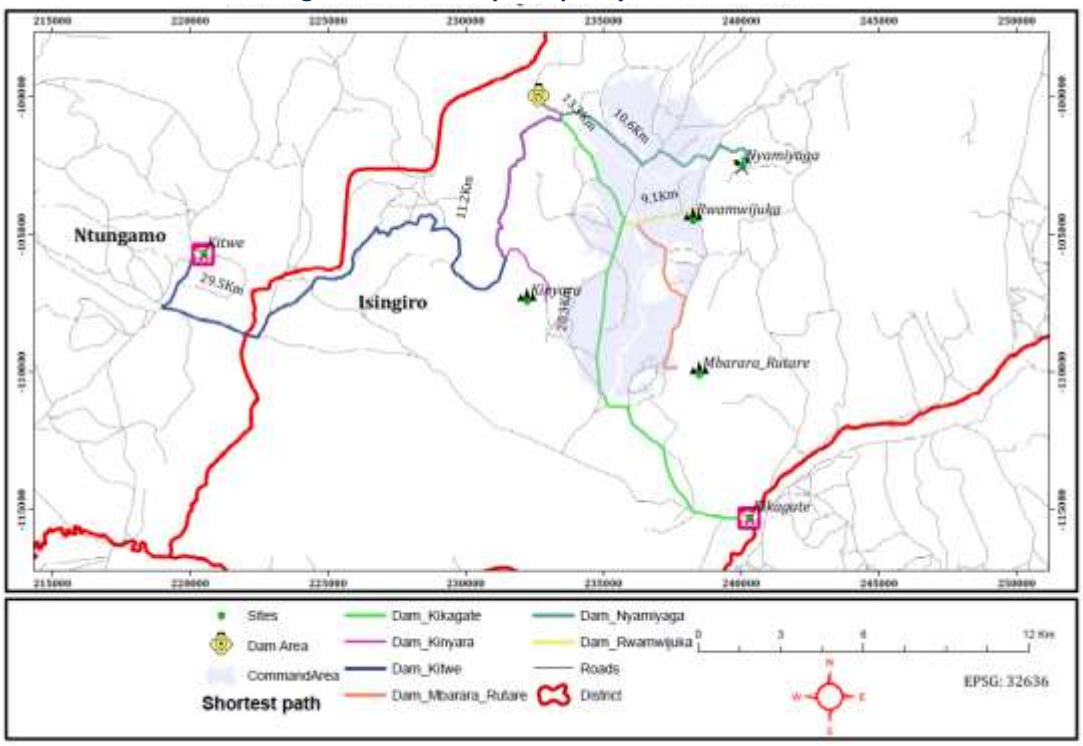


Figure 6: Shortest path quarry to the dam site



2.6.1.2 *Murram, Sand and clay sources*

Existing sand and clay sources

Considering a number of aspects such as proximity to wetlands, streams and settlements as well as operational status, all the existing sources appear to be very close to settlements and these will pose labour influx, health and safety issues to the community. . Therefore, the existing sources of clay and sand listed under Table 10 will not be used by the project. The project will consider utilization of 2 new clay and 2 new sand sites, and one existing sand source listed under Table 11. MWE will undertake due diligence to supervise the acquisition of land and required statutory apporvals (review TORs, review ESIAs, RAPs for completeness and accuracy) and monitor implementation of the ESMPs/ RAPs.

Table 10: Existing sources for sand and clay

Material Sources												
							Distance (Km)					
Site	Status	X	Y	Contact No.	Material	Road Access	Swamp	Stream	Settlement	School	Health Facility	Dam
Mabona	Active	252570	–94622	0755482233	Sand	Yes	within	4	0.05	2.5	16	45
Nyakayoyo	Active	239144	-116316	0750394973	Sand	Yes	0.5	0.6	0.01	1.6	21	20.5
Rwembera	Inactive	235503	-104805	N/A	Clay	Yes	within	0.3	0.045	0.18	0.5	6.8
Kagoto 1	Inactive	234372	-101146	N/A	Clay	No	within	0.15	0.2	0.5	3	2.5

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New murram, clay and sand sources

Table 11: Murram, clay and sand sources

MURRUM					Ecosystems within 5km			
Burrow area no.	**Area**	**Location**	**Description of the surrounding environment**	**Estimated Volume (m3)**	**Rivers (distance away)**	**Forests**	**National Park**	**Recommendation**
BA 1	Ndani cell, Kabuyanda TOWn COUNCIL	mE 233546.71 mN 9889177.93	The site is located 2km from River Rwamango down stream the dam site. It is about 100m from the trading centre. The site location has about 50 households withinin a radius of 300m, with the nearest located in about 30m. Most of the settlements are located in the trading centre.	36,000	1 (2km)	0	0	BA 1 is is a feasible site and therefore recommended for extraction of murrum. However, this being a new site an ESIA is highly recommended to be done to ensure mitigation of any likely impacts.
BA 2	Ndani cell, Kabuyanda town council	mE234327.56 mN9893509.55	There are about 20 scattered settlements within 500m radius from the site location, with the nearest settlement located within 50m. The site is located 300m away from the road and about 2km from the river Chezho downstream the dam site.	30,000	1 (2km)	0	0	BA 2 is a feasible site and therefore recommended for extraction of murrum. However, an ESIA and RAP are recommended to be done prior project commencement, to ensure mitigation of any likely social and environmental impacts.
BA 3	Ndani cell, Kabuyanda town council	mE234272.37 mN9893601.44	The site is located about 100m from site BA 2, hence characteristics are similar	45,000	1 (2km)	0	0	Similar to site BA 2, an ESIA and RAP are recommended to be done prior commencement of the project.
BA 4	Kigabagaba, Kabuyanda sub-county	mE235415.56 mN9895851.93	The site is located in an area with about 20 settlements in a radius of 300m, with the nearest being 150m away. All the settlements are established in a linear pattern along the road. The site is located 200m from the road and about 2km from the river Chehzo down stream.	36,000	1 (2km)	0	0	The site is very feasible but will require an ESIA done prior project commencement.
BA 5	Kakoni, Mwizi sub-county	mE234848.27 mN9893339.99	The site located about 1km away from the river Rwamango and Kabuyanda. It is located about 200m away from the road. There are 10 settlements within a radius of 300m from the site, with the nearest being 50m. The surrounding land use is mainly agriculture	36,000	1 (1km)	0	0	The site is very feasible but will require an ESIA done prior project commencement, given that it is a new site.
BA 6	Kakoni, Mwizi sub-county	mE234752.39 mE9893655.65	The site is located about 1.5km from river Chezho and about 100m away from the road. There are an estimated 12No settlements within a radius of 300m, with the nearest being 100m, and the land use is mainly agriculture.	120,000	1 (1.5km)	0	0	The site is feasible but will require an ESIA done prior project commencement, given that it is a new site.

BA 7	Kakoni II, Mwizi	mE234145.92 mN9892739.79	This site is located about 120m from the road and is surrounded by 15 scattered settlements with the nearest settlement located within 150m, The site is located 2km from the river Chezho.	120,000	1 (2km)	0	0	The site is very feasible but will require an ESIA done prior project commencement, given that it is a new site.
BA 8	Rwemihoji cell, Kikagati sub-county	mE240452.68 mN9899247.03	The site is located about 200m from the road about 10km away from the river Chehzo. There are about 8 settlements within a radius of 300m, the nearest settlement located within 150m. There is no water body within a radius of 3km.	60,000	0	0	0	The site is very feasible but will require an ESIA done prior project commencement, given that it is a new site.
BA 11	Kabumba Ruborogota sub-county	mE234738.22 mN9888858.54	There are about 70 settlements located within a radius of 300m, of which most are located within a trading centre. The site is located about half a kilometer from the river Chehzo down stream.	90,000	1 (0.5km)	0	0	The site is too close to highly populated settlements, hence farther investigation is recommended.
BA 12	Kashosha Kabuyanda sub-county	mE235772.89 mN9895875.41	The site is located about 150m from the major road and the trading centre. The settlements are of linear pattern along the road. The are about 100 settlements within 300m radius, The site is located about 1.5km away from the river Chehzo down stream,	120,000	1 (1.5km)	0	0	This site is also too close to highly populated settlements, hence farther investigation is recommended.
BA 13	Kigatama, Kabuyanda sub-county	mE233801.36 mN9892923.96	The site is located about 2.5km from the river Chezho down stream and 200m from the road. There are about 15 settlements with the nearest settlement in about 50m from the site.	60,000	1 (2.5km)	0	0	The site is feasible for murrum extraction, an ESIA is recommended prior project commencement.
BA 14	Rwebwera cell, Kabuyanda town council	mE233777.41 mN9895335.62	The site is located about 300m away from the road. There are about 5 households with the nearest located within 100m. It is located about 3km away from the river Chehzo down stream the dam.	90,000	1 (3km)	0	0	The site is very feasible for murrum extraction. However, an ESIA is also recommended prior project commencement..
BA 15	Nyamiyanga cell, Nyakitunda sub-county	mE240066.56 mN9897468.40	The site is located about 15 meters from the nearest settlement and 100m from the road. The site is located up on the ridge; it is not neighboring any water body.	90,000	0	0	0	The site is very feasible for murrum extraction. However, an ESIA is also recommended prior project commencement..
BA 16	Nyamiyanga cell, Nyakitunda sub-county	mE240033.88 mN9897884.21	There are about 3 settlements within 300m radius from this site. The site is located about 100m away from the road. It is located up on the ridge and not neighboring any water body.	120,000	0	0	0	The site is feasible for murrum extraction. However, an ESIA is also recommended prior project commencement.
CLAY SOURCES								
CS 2	Kigabagaba cell II, Kabuyanda town council	mE235986.48 mN9892480.34	The site is about 250m from the river Chehzo. There are about 10 settlements within a radius of 300m, with the nearest settlement located	360,000	1 (0.25km)	0	0	The site is feasible for clay extraction. However, an ESIA is also recommended prior project commencement.

			within 70m. The site is located about 150m from the road.					
CS 3	Rwembwera, Kabuyanda town council	mE235338.71 mN9894581.56	The site is located about 150m from the road. It is about 100m away from the nearest settlement, with about 5 settlements within a radius of 300m.	180,000	0	0	0	The site is feasible for clay extraction. However, an ESIA is also recommended prior project commencement.
SAND SOURCES								
SA 1	Kasigate Kikagati town council	mE239097.40 mN9883668.4 7	The site is an exiting burrow pit and is located about 250m from the road, 800m from river Kagera. The nearest household to the site is about 150m away.	600,000	1 (0.8km)	0	0	The site is very feasible for sand extraction. However this being an existing site, an environmental audit is recommended prior project commencement.
SA 2	Lorongo, Isingiro south Nsunjezi	mE249964.81 mN9893328.81	The site is located 400m away rom the river Oruchinga, and 300m from the road. The site is in the neighborhood of an estimated 300m from the nearest settlement. The houses are located along the road.	180,000	1 (0.4km)	0	0	The site is feasible for sand extraction. However, an ESIA is recommended prior project commencement.
SA 3		mE238127.25 mN9884047.18	The site is located about 800m from the road. There are about 50 settlements within a radius of 300m, all in a linear pattern along the main Kikagati road. The is no any water body within a radius of 3km	720,000	0	0	0	The site is very feasible for sand extraction. However, an ESIA is also recommended prior project commencement.

From their location and surrounding environment as presented in Table 11, all the new potential murram, clay and sand sources are outside ecologically sensitive and gazetted areas. For the new sources, it is a statutory obligation for the Contractor to undertake ESIA for facilities that will be under their direct control and accordingly be held responsible for their operations. However, MWE will undertake due diligence to supervise the assessment process (review TORs, review ESIAs, RAPs for completeness and accuracy) and monitor implementation of the ESMPs/ RAPs.

2.6.1.2.1 Other considerations in locating auxiliary facilities

It is also important to note that, in instances where the project will have to establish new auxiliary facilities (especially new quarries sites), the contractor/s will take into consideration the following:

a. ***Location:*** Auxiliary facilities shall be located outside ecologically sensitive areas (forests, wetlands, PCRs, settlements-observe minimum distance of 2 km from public establishments such as schools, health centers, trading centers, and markets). All auxiliary facilities shall be subject to environmental and social screening using the screening form contained in the project ESMF Annex 3 ESMF Screening form. This will help to guide on the level of Environmental Assessment that will be required before the onset of such quuary operations;
b. ***Access:*** While siting any new stone quarries, the contractor shall closely consult with: the client (MWE and MAAIF), Isingiro District Local Government Administration, Kabuyanda Town Council, host LC-1 Chairperson/s, host communities, and land-owners with whom the Contractor has to obtain a lease agreement to access and use the sites;
c. ***Statutory approvals:*** The stone quarries fall in the Third Schedule of The National Environment Act CAP 153 hence, they require mandatory EIA to be conducted and approved by NEMA;
d. ***Clearance:*** Once ESIAs on these facilities are completed, they will be subjected to clearance processes by the Bank; and
e. ***Operation:*** Compliance with the General Environmental Management Conditions for Construction Contracts as summarized under Annex 4 of the project ESMF.

2.6.1.3 *Access Roads*

The project area can be accessed from Mbarara District through the Mbarara-Isingiro-Kikagati highway to the Tanzania border, an asphalted road of about 65 km. The access to the dam area is from a secondary, non-asphalted road that branches out from the main Mbarara-Kikagati road about 20 km from Kikagati, where the main road ends. The 20 km long secondary road reaches both the right and left side of the dam site. It goes through the command area before reaching the dam area after about 30-45 minutes from Kikagati. The existing access road runs adjacent to the proposed dam-site (approximately 50 m). As such the T-off access to the dam-site will be within the area that will be acquired by the project for dam-site operations and the existing access road will thus be the boundary with the dam.

2.6.1.4 *Project Office/s*

The project office will be located outside the Rwoho CFR. The project office can also serve the purpose of parking and storage of Project equipment/ materials. Location of the project office has not been identified. The office will be located outside the Rwoho CFR.

2.6.1.5 *Management's Camp and Workers' Camp*

A permanent camp will be built to be used by the Contractor, the Employer and the Engineer during construction of the works. Location of the camps has not been identified. The campsite will be located outside the Rwoho CFR. Camp/s ESIAs shall be done by the contractors as part of Contractor's ESMP before commencement of civil works. At the end of Construction phase, all project structures not required during the operation phase of the Project, including workshop structures and workers' camps, will be demolished and the debris disposed of in a legally acceptable manner. The management camp shall accommodate about 42 workers and workers' camp to accommodate 120 workers. A total of 162 workers will be accommodated. Some of the workers especially the local labour (138), shall commute from their homes.

There will be construction of two different camps:

The Management's Camp will consist of the following:

a. 6N°. two-bedroom family and guest houses

b. 6 N^{o}. one-bedroom family houses
c. 24N^{o}. single-person accommodation
d. 1N^{o}. clinic
e. 1N^{o}. mess/catering area.
f. 1N^{o}. laundry

The Workers' Camp consists of the following housing:
a. 120 N^{o}. 120 single-person accommodation
b. 1N^{o}. mess/catering area
c. 1N^{o}. laundry

2.7 Project labour

During the Construction Phase, the Project will employ approximately 300 employees, of whom 138 will be unskilled, 120 semiskilled and 42 skilled. During labor recruitment, the locals should be prioritized.

2.8 Dumping sites

Sanitary wastewater from toilets, drains and wash sinks will drain directly into a septic tank. A dumping site for solid wastes will be located close to the quarry site area. Use of excavated material and spoil will be necessary for the restoration of the quarry site and other degraded areas. The other solid wastes generated and stored at the dumping site will be collected and disposed by a licensed solid waste management company.

2.9 Project cost estimate

The construction costs include mobilization and installation works, construction costs, supply and installation of equipment etc. The other costs include environmental mitigation measures, resettlement costs, land acquisition, insurances, administration, supervision of construction etc. The total investment for the Kabuyanda Irrigation Scheme is estimated to be USD 52.4 million dollars.

2.10 Project activities

2.10.1 Pre-construction activities

Activities to be undertaken during the pre-construction phase of the project will basically include land surveys, land acquisition, acquisition of construction equipment and materials, site clearance, construction of access roads, improvement of existing roads, construction of management's camp, workers' camp and offices and transportation of construction material and equipment to the project sites.

2.10.2 Construction phase

During the construction phase, the dam, spillway, intake and bottom outlet, irrigation networks, drainage networks and other structures will be put in place. This will include activities such as further site clearance, excavation, blasting and surfacing of cleared areas. This is projected to take a period of two years.

River diversion during dam construction will take the following steps;
a. Step 1. Excavating a diversion channel large enough to convey a flood of a desired return period, the excavated material is placed on the river bank, during this process the river continues flowing through the natural course.
b. Step 2. Import the excavated material and place it as a coffer dam/ dyke so that the river-flows through the diversion channel downstream.

2.10.2.1 *Steps to construction of the dam in the scheme*

These can be a summary of the activities to be undertaken in an irrigation dam facility construction much as they may not really be sequential *per se*. They include:

a. ***Site investigations:*** Before construction of the dam commences the site will be subjected to a host of thorough engineering investigations to establish the nature of the foundation, and to locate sufficient suitable clay material to use in the embankment. Test pits will be excavated and soils subjected to through geotechnical tests. Investigation of the foundation of the dam will equally be done to ensure that it will not fail and cause the embankment to fail.

b. ***Engineering:*** During dam construction, specialized engineering supervision will be required. The level of specialized engineering supervision required is generally proportional to the size and anticipated hazard category of the dam. Appropriately qualified and experienced engineer services will be required during dam construction to ensure the infrastructure under construction is being done to the required and applicable standards and specification as in the design provisions. Engineering expertise can be used during the planning, and construction of the dam, as well as throughout the life of the dam.

c. ***Clearing:*** The area to be covered by the embankment should be pegged out prior to commencement of any works. The embankment and the area to be excavated should be cleared and grubbed. Topsoil should be stock-piled in areas outside of the area to be covered by the embankment and all trees, scrub and roots removed. Topsoil should be stock-piled in layers not exceeding 200mm and planted with grass if it is to be left for a considerable time (more than 6 months). This will conserve the integrity of the topsoil. All loose and unusable material in the embankment area has to be removed clear of the site and must not be used in the embankment construction.

d. ***Borrow pits***: The full excavation for embankment material, will be kept as much as possible below the full supply level of the storage area. Excavating suitable materials within the wetted perimeter of the storage will maximize the total storage potential. Otherwise suitable material to construct the dam will be sourced outside the wetted perimeter from borrow pits. Great care will be taken when obtaining borrow materials from steep bank areas that may be prone to instability. A person should never enter an excavation that is deeper than chest level unless the excavation has been made safe from collapse.

e. ***Foundation:*** The base of the embankment is to be stripped of all topsoil, silt, loose material, vegetable matter, and then scarified over its whole area.

f. ***Embankment compaction:*** Leaks in earth-filled dams that lead to dam failures are often the result of inadequate compaction levels as such, it is important that, effective compaction is achieved and this can be by applying the required compaction effort to high clay content materials. Compaction should be undertaken by using a tamper foot roller, commonly referred to as a sheep foot roller.

g. ***Settlement of the embankment:*** Settlement of soil banks is common and an allowance must be made for settlement of the dam embankment. The embankment may settle to a level where it is overtopped by water and failure will result. Or overtime settlement may result in the height of the embankment becoming lower than the spillway. Clay soil can settle in excess of 10% of the dam's height, but well-constructed and compacted clay dam embankments are not likely to settle more than about 5%. An allowance of 5% of the height of the embankment (along its length) to cater for settlement is necessary.

h. ***Planting of vegetation:*** Topsoil should be spread over the exposed surfaces of the embankment to a depth of at least 150mm and sown with pasture grass to establish a good cover as soon as possible. Always, it is important to ensure that, vegetation should not be higher than knee-height on or near the embankment. Tree roots, can cause the core to crack resulting in the failure of the dam as such, no trees should not be allowed to establish on the embankment as such, trees and shrubs should be

kept to a minimum distance of 1½ times the height of the tree away from the embankment of the dam.

i. ***Cut-off trench or keyway:*** Dams lose water through evaporation and seepage. Little can be done for evaporation losses, but with good construction methods seepage losses can be reduced. One critical aspect is the construction of the cut-off trench. This keyway will minimize seepage under the embankment and increase the stability of the dam. It should be taken down to a minimum of 600mm into impervious soil and rock and backfilled with the appropriate quality clay that is thoroughly compacted. It should extend for the length of the embankment including the hillside flanks, but should not need to be extended under the spillway where the spillway is cut into rock.
j. ***Outlet pipe:*** An outlet pipe will be installed in the base of the dam. It is also required to allow water in the stream, upstream of the construction work to be bypassed during construction. The minimum size outlet pipe is to be specified in the project design. However, if need for a specific size pipe to suit the pump/irrigation plant it is recommended that dedicated pipe work also be installed for that purpose. Every precaution is to be taken with the installation of the pipe, given the fact that a large percentage of dam failures are associated with poor installation of outlet pipes.
k. ***Protection from wave action:*** where the dimensions of the surface of the stored water are such that the prevailing winds will cause wave action on the embankment, protection of the upstream face of the dam is to be provided in the form of stone pitching or rip-rap and this will depend on the design.
l. ***Filling of the dam:*** Once construction of the dam is complete, the dam will be inspected thoroughly ahead of filling of the dam commencement. The dam should be filled as slowly as possible, preferably not more than 0.3metres depth per day to let the new embankment adjust to the increasing water loads. The need for caution cannot be overstated because breaching of the dam and the resulting wave of water may cause considerable damage to the facility.
m. ***Maintenance and inspections:*** Regular maintenance and inspections are required to ensure it remains in a good operating condition.

2.10.3 Post Construction Activities

During the operation phase, water from R. Mishumba and associated tributaries will be used for irrigation. The dam, control building, pipelines and other structures will require maintenance.

2.10.4 Decommissioning

All project structures not required during the operation phase of the project, including workshop structures and workers' camps, will be demolished and the debris disposed of in a legally acceptable manner. Any waste on the project site at the end of the construction period will be properly disposed of. The project site will be reinstated to as near as possible its original state. Landscaping and grassing of degraded areas will be done.

2.10.5 Project power supply

It is noted that, Kabuyanda Town Council and its environs, is connected to the national 33Kv electricity grid (about 1 km a way from proposed dam site). During project implementation, the project can apply to Rural Electrification Agency (REA) for electricity to be extended to the project. Electricity extension infrastructure will be erected along the existing road reserves which minimises levels of environmental and social impacts. The road reserves are routinely maintained by cutting of vegetaion by Ministry of Works and Transport, and used as utilities corridor (water supply infrastructure, electricity distribution, telecommunication cabling). Such a process starts with route surveying in which attempts are made to see that the project will have minimum negative impacts on vegetation and other social aspects. However, to address the challenge of power outage, it is proposed that solar power facilities be set up as alternate energy source for the project

2.11 Project duration

Table 12: Duration of the project phases

Project Phase/activity	Tentative timelines
Obtaining all necessary approvals	2019-2020
Construction of project facilities including the dam and installation of pipes*	2020-2022
Operation phase	2023

* *In stream construction notably the dam will take about 2 years to be completed*

3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Uganda Policy Framework

3.1.1 The National Environment Management Policy 1994 (NEMP)

The key policy objectives include the enhancement of the health and quality of life of Ugandans and promotion of long-term, sustainable socio-economic development through sound environmental and natural resource management and use; and optimizing resource use and achieving a sustainable level of resource consumption. ***Regarding the planned Kabuyanda Irrigation Project, aspects of Environmental Assessment have been integrated into the project in with the objective of ensuring sustainability in the project.***

3.1.2 The National Development Plan 2015-2020

It underscores the country's medium-term strategic direction, development priorities and implementation strategies. According to the NDP, the share of agriculture in GDP has been declining which represents significant structural transformation in the economy. ***In that case, a number of interventions to be pursued under the project are aimed at addressing some of the pillars in NDP II which are all geared towards socio-economic transformation and improvement in the livelihoods at household levels.***

3.1.3 The Uganda Vision 2040

Uganda Vision 2040 is anchored on the national shared vision which is attaining **"A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years"**. However, it is clear, agriculture is the main stay of the Ugandan economy employing 65.6% cent (UBOS, 2017) of the labor force and contributing 21% to the GDP. Despite these, agricultural contribution to the GDP has been declining but remains very important to provide a basis for growth in other sectors. ***For Uganda to shift from its current largely peasantry economy in most of the households to an industrialized and urban society, it must be propelled by multi-sectoral development interventions such as the project seeks to address electricity, water supply and agricultural production which therefore makes the project consistent with the GoU Vision 2040.***

3.1.4 The Uganda Agriculture Policy, September 2013

The policy outlines six principles to guide the sector, which entail pursuance of a private sector led and market-oriented economy; zoning to promote the most suitable commodities per area and provision of government support for such commodities to enhance commercialization, development of value chains for these commodities and food security. ***The policy principles are important aspects of the planned irrigation project which focuses on increasing production and commercial agriculture, development of value chains for the produce of the irrigation scheme and capacity development of farmers of all categories with the support of government.***

3.1.5 National Water Policy, 1999

The policy objective of this instrument is to sustainably manage and develop the water resources of Uganda in a coordinated and integrated manner so as to secure/provide water of an acceptable quality for all social and economic needs. ***Therefore, allocation of water to meet irrigation demand in the project will be done considering the economic, social and environmental values and uses of water by its various users especially downstream communities.***

3.1.6 The National Agriculture Policy (2013)

Uganda's agricultural sector policy highlights the country's high potential in agriculture which it seeks to exploit in order for it to realize its overall development and poverty reduction objectives. Uganda expects to attain middle-income country status by 2020 and to reduce its poverty levels to 5% by 2040. The National Agricultural Policy provides the framework within which the sector expects to contribute towards

achieving these targets. **To have a sustained positive impact on overall economic growth, poverty reduction and food security, the agricultural sector must grow at a rate of 5.6%**.

3.1.7 The National Land Use Policy

The overall policy goal is to achieve sustainable and equitable socio-economic development through optimal land management and utilization in Uganda. ***In the planned project, women are key beneficiaries in its agricultural activities and therefore, where land is to be taken up for project infrastructures, opinion of women have to be factored in compensation as well as during allocation of resources of irrigations interventions.***

3.1.8 The Occupational Health and Safety Policy

This policy will be especially relevant for Occupational Health and Safety (OHS) of the Project and associated transmission line construction crews and subsequently, maintenance personnel. ***The policy will also have relevance in mitigation measures that protect the public from adverse health and safety impacts as a result of project construction and subsequent operation and maintenance activities***.

3.1.9 The National Gender Policy, 1997

The GoU adopted a National Gender Policy of 1997, a tool to guide mainstreaming gender interventions into the development process and planning in sectors of economy. The gender policy is to facilitate Uganda's gender mainstreaming programs in all sectors of the economy. Kabuyanda Project will ***mainstream gender dimensions into its activities, plans and policies with objective of seeking economically empower the women in particular at household level.***

3.1.10 National Irrigation Master Plan for Uganda (2010-2035)

The Overall Objective of irrigation development in Uganda is: *"Poverty Alleviation and Economic Growth as a result of the sustainable realization of the country's irrigation potential mitigating the effects of climate change and contributing to the transformation of Uganda society from a peasant to a modern and prosperous country*"***.*** Therefore, ***these objectives of the Irrigation Master Plan are in line with the aspirations of Kabuyanda Irrigation Project especially, its irrigation component.***

3.1.11 The National HIV/AIDS Policy, 2004

The policy provides the principles and a framework for a multi-sectoral response to HIV/AIDS in Ugandan's world of work. ***The requirements of this policy are expected to be fulfilled by the Project in that, its contractors are to have an in-house HIV Policy, workers sensitization, conducting VCT, provision of free condoms as well as other supportive measures for prevention and management of HIV, including its gender dimensions.***

3.1.12 Resettlement/Land Acquisition Policy Framework, 2002

With regard to compensation and resettlement issues, the main pieces of legislation are the Constitution of Republic of Uganda/and the Land Act both of which require that, compensation should aim at minimizing social disruption and assist those who have lost assets as a result of the Irrigation Project to maintain their livelihoods in status not worse off than before the project. ***Where land-uptake has been envisaged, a Resettlement Action Plan has been prepared to effectively ensure the PAPs are timely, adequately and compensated.***

3.1.13 The National Fisheries Policy, 2004

The aim of the new policy is to provide an overall national vision for the development of the fisheries subsector and bolster it by prescribing institutional arrangements for management of the subsector. The overall goal of the fisheries subsector is to ensure increased and sustainable fish production and utilization. ***The policy strategy is important for Kabuyanda Project since it calls for sustainable management and development of fisheries: social, economic and environmentally sustainable use and development of the resource. The planned irrigation project is to be implemented in a manner which***

allows the rivers to sustainingly meet its other uses and values including fisheries as well as water supply.

3.1.14 Operation Wealth Creation

The GoU acknowledge that agriculture has, for a long time, been a core sector of the economy providing the basis for growth in other sectors and significantly contributing to GDP and employment. Under Operation Wealth Creation (OWC), it is the objective of GoU that national policies, interventions and programmes aim at transforming agriculture from subsistence to commercial agriculture with a target of raising household incomes to a minimum UGX20 million per household per year. ***This project will, at the grassroots be implemented in close alignment with the OWC especially on aspects of working with the farmers.***

3.2 Uganda Legal Framework

3.2.1 Constitution of the Republic of Uganda, 1995

The right to a clean and healthy environment is enshrined in Article 39 of the Constitution of Uganda, 1995. ***To ensure that the implementation of Kabuyanda Irrigation Project complies with the Constitutional obligations on environmental sustainability, this ESIA has been prepared which amongst others, outlines anticipated environmental and social negative impacts of the project and outlines measures for addressing such concerns through its ESMP.***

3.2.2 The National Environment Act, Cap 153

Section 20 of the Act makes it a legal requirement for every developer to undertake an environmental assessment for projects listed in the Third Schedule of the Act. ***In this case, major changes in land use such as construction of dams (including; storage dams, barrages and weirs) envisaged under the project require ESIA to be conducted before project implementation.***

3.2.3 The Occupational Safety and Health Act, 2006

The Act provides for the prevention and protection of persons at all workplaces from injuries, diseases, death and damage to property. ***The ESIA provides for the project to avail its workers Personal Protective Equipment (PPEs) for purposes of their safety and protection while working on the project activities.***

3.2.4 The Employment Act, 2006

This Act spells out general principles regarding elimination of forced labor, discrimination in employment, sexual harassment and provisions to settle grievances. It further provides that, a child under the age of twelve years shall not be employed in any business, undertaking or workplace. ***No doubt, this law will oblige the project to ensure no employment of children below the age of 18 years in the project activities.***

3.2.5 The Public Health Act, 1964

Section 7 of the Act provides local authorities with administrative powers to take all lawful, necessary and reasonable practical 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 public health; and to exercise the powers and perform the duties in respect of public health conferred or imposed by this Act or other relevant laws. ***Public health and hygiene are key in the project implementation with regard to handling of waste arising from the project as well as agro-chemicals use, including use of pesticides***.

3.2.6 National Forestry and Tree Planting Act, 2003

The National Forestry and Tree Planting Act 2003 is the main law that regulates and controls forest management in Uganda. Section 38 of this Act provides for an environment impact assessment to be undertaken for an activity that may have significant impact on a forest. ***For this project, part of Rwoho***

CFRs will likely be taken up by the project as such, an ESIA is deemed necessary as shall also apply to alternate exchange land for the area to be taken up by the project.

3.2.7 The Local Governments Act (Cap 243)

The Act creates a decentralized system of government based on the district as the main unit of administration. The Act allocates responsibility for service delivery of a number of functions to local government councils (districts, cities, municipalities or town councils) and to lower local government councils (sub-counties / divisions). ***The design of Kabuyanda Project is geared towards uplifting the livelihoods of the households as such, its implementation is consistent with Isingiro District Development Plans is to be undertaken with technical guidance of the District technical staff supported by the political wing of the district.***

3.2.8 The Land Act, Cap 227

The Land Act vests land ownership in Uganda in the hands of Ugandans and that, whoever owns or occupies land shall manage and utilize the land in accordance with the Forest Act, Mining Act, National Environment Act, the Water Act, the Uganda Wildlife Act and any other law [section 43, Land Act]. ***The planned Kabuyanda Irrigation Project has integrated Environmental Assessments into its feasibility study to ensure that, its implementation will be in compliance with the Act provisions.***

3.2.9 The Traffic Act

The Act is relevant to the project in ensuring the project transport will not pose a safety risk to the public during transportation of project in-put to the area. ***Ultimately, the Act obliges project transport to take measures that guarantee safety of road users and the wider public during project implementation. These will include alternate routing for traffic, diversions, and safety signalling during implementation of the project for the safety of the public and road users at large.***

3.2.10 Water Act, 1995

This Act seeks to promote provision of a clean, safe and sufficient supply of water for domestic purposes to all persons. The basic foundation of the Act's provision is the reconciliation between protecting the environment and ensuring the availability to the population of water of sufficient quality and quantity. The project will largely use waters from the river system whose usage has a transboundary perspective. ***Therefore, to guarantee both equitable and optimal usage of the water, feasibility studies are being undertaken to establish permissible abstraction levels which will ensure the project will be compliant with the relevant provisions in the Act.***

3.2.11 The Water Abstraction Regulations, 1998

The Water Abstraction Regulation in Section 18 provides for the establishment of a controlled mechanism through issuance of permits to regulate the amount of water abstracted by users. The Regulation requires that a water abstraction permit either for ground or surface water abstraction are pre-requisites for motorized and/or abstracting of quantities above $400m^3$/day for persons involved in construction (damming, diverting surface water). ***Irrigation, hydropower and associated considerations may require abstraction permits from DWRM after detailed feasibility is conducted.***

3.2.12 The Public Health Act, 1964

Section 7 of the Act provides local authorities with administrative powers to take all lawful, necessary and reasonable practical 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 public health; and to exercise the powers and perform the duties in respect of public health conferred or imposed by this Act or other relevant laws. ***Public health and hygiene are key in the project with regard to management of a range of waste including agro-chemicals based types and the general health of the project and the communities in the vicinity.***

3.2.13 The Workers Compensation Act, Cap 225

According to the Act, an employee is entitled to compensation for any personal injury from an accident or disease arising out of and in the course of his or her employment even if the injury or disease resulted from the negligence of the employee. ***Under this Act, compensation is automatic with respect to injury and the compensation is to be paid by the employer whether the worker was injured as a result of his or her own negligence, mistake, omission or commission.***

3.2.14 Environmental Impacts Assessment Regulations, 1998

The EIA Regulations gives outline in the conduct of an EIA study, thus paving the way for an enabling environment for it to use as a tool for environmental protection. ***The Regulation provides for three levels of EIA which in this case, a full ESIA has been prepared based on the nature and magnitude of the project.***

3.2.15 The National Environment (Audit) Regulations, 2006

The Regulations reinforce the requirement to undertake Self-Environmental Audits as contained in the EIA Regulations. Normally, under approval conditions of NEMA, it is a requirement to undertake Audits for projects which comply with the EIA requirement as part of the conditions of EIA approval. ***With respect to this project will be the need for an Environmental Audit after 12 months of the project implementation in line with the Audit regulations.***

3.2.16 The National Environment (Waste Management) Regulations, 1999

The National Environment (Waste Management) Regulations, 1999 apply to all categories of hazardous and non-hazardous waste and to the storage and disposal of hazardous waste and its movement into and out of Uganda. The regulations promote cleaner production methods and require a facility to minimize waste generation by eliminating use of toxic raw materials; reducing toxic emissions and wastes; and recovering and reuse of waste wherever possible. ***The Regulations oblige the Developer to put in place measures for proper management of waste.***

3.2.17 National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, No. 3/2000

The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, No. 3/2000 section 34 requires a developer to conduct Environmental impact assessment to a project which may have a significant impact on a wetland, river bank or lake shore. ***The project is aimed at protecting the environment and hence observe the protection zone. In case the design and construction of project facilities will be within the protected zone then the permission will be requested from the authorities.***

3.3 Uganda Institutional Framework

3.3.1 Ministry of Water and Environment, (MWE)

The Ministry has the national mandate to ensure provision of quality water and environmental protection services in the country and is equally charged with the management and sustainable utilization of water and environment resources for the betterment of the population of Uganda. ***With respect to this project, MWE has dedicated a Project Coordination Office (PCO) headed by a National Project Coordinator (NPC), for the overall coordination of this project. The NPC is to be guided by a National Project Steering Committee (NPSC) chaired by the Permanent Secretary MWE.***

3.3.2 MWE Victoria Water Zone in South Western Region Mbarara

The Ministry has set up in its structure, four zonal regional water management zones which are charged with the sustainable use of its water resources and catchment areas, improving the catchment areas and setting up catchment management organizations, supporting sensitization of communities on sustainable management of water resources in the zones. The Zone Supports sustainable management of water

resources, with a focus on benefiting the people within the catchment, economically and socially. The zone plays a role in catchment based integrated water resources management i.e. supporting the preparation of Catchment Management Plans (CMPs) and establishment of Catchment Management Organizations (CMOs) to promote coordination and collaboration among the various stakeholders. ***The Management Zone will be key in Sustainable Land Management (SLM) aspects in the project so that, the catchment is protected from degradation thus ensuring proper use and management of the river water.***

3.3.3 Ministry of Lands, Housing and Urban Development

The Chief Government Valuer in the Valuation Division in this Ministry is responsible for approving the Valuation report on matters of land acquisition for the project. ***The Chief Government Valuer's office is also involved in resolving public complaints that arise from valuation for land during land acquisition and compensation processes.***

3.3.4 Ministry of Works and Transport-MoWT

The Ministry of Works and Transport is a lead sector agency on matters of transport and roads especially setting standards on roads. ***The MoWT will be key on roads especially standards and specifications to be adopted in planning and construction of roads in the irrigation project.***

3.3.5 Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)

Is mandated amongst others and specific relevance to this project, to support the development of infrastructure and use of water for agricultural production and to develop and promote collaborative mechanisms nationally, regionally and internationally on issues pertaining to the sector. ***With respect to irrigation aspects in Kabuyanda Irrigation, project issues of on-farm works will be the responsibility of the Ministry especially provision of technical assistance in the design and construction of on-farm irrigation systems. MAAIF will further be responsible for the provision of extension services and advice to farmers on irrigation systems and promotion of efficient water use. In addition, the Ministry will provide support in the supervision and monitoring of water use and management.***

3.3.6 Ministry of Energy and Mineral Development (Uganda)

The Ministry of Energy and Mineral Development, also known as Ministry of Energy, Oil and Mineral Development has the function of developing and implementing energy policy, investments in mining, and the establishment of new power generating infrastructure using hydro power, thermal power, solar power, wind power and nuclear power. ***With respect to the planned Kabuyanda Irrigation project, the Ministry of Energy and Mineral Development will be involved in the provision of power supply services to the project.***

3.3.7 Statutory Agencies

3.3.7.1 *The National Environment Management Authority (NEMA)*

The National Environmental Management Authority (NEMA) is the principal agency for the management of the environment and coordinates, monitors and supervises all activities in the field of the environment. Its Environmental Monitoring and Compliance division is responsible for the review and approval of EIAs, post-implementation audits and monitoring of approved projects. ***NEMA will be responsible for reviewing the ESIA report and subsequent decision making in addition to monitoring of environmental compliance during project implementation and operation through the designated regional or district offices.***

3.3.7.2 *The Uganda Land Commission*

The Uganda Land Commission (ULC), is an autonomous body that holds and manages any land in Uganda vested in or acquired by the Government of Uganda. The Uganda Land Commission holds and manages land in Uganda vested in or acquired by Government of Uganda. ***Once the land for common infrastructure***

facilities (dams, reservoirs, roads and offices amongst others) in the project is acquired, it will be vested with the ULC.

3.3.7.3 *Isingiro Local Government*

Through its bottom-up participatory planning process, the District prepares a Five-Year District Development Plan as a framework for its delivery of mandated services to its population. The District Development Plan is the single reference point for all development interventions and initiatives in the district. ***In view of this, to the extent possible, Kabuyanda irrigation scheme interventions are to be linked to the districts DDP in Uganda.***

3.3.7.4 *District Land Board*

The District Land Board sets compensation rates for crop and semi-permanent structures as such, RAP implementation involves participation of district land boards. In this regard, Isingiro district land board will have roles of overseeing appropriation of district land; facilitating registration and transfer of interests in land.

3.4 Related International Conventions and Agreements

3.4.1 Convention on Protection and Use of Transboundary Watercourses and International Lakes 1992

Under Article 1, The Parties shall take all appropriate measures to prevent, control and reduce any transboundary impact on the watercourses and the Parties are obliged to: prevent, control and reduce pollution of waters causing or likely to cause transboundary impact; ensure that transboundary waters are used with the aim of ecologically sound and rational water management, conservation of water resources and environmental protection; ensure that transboundary waters are used in a reasonable and equitable way, taking into particular account their transboundary character, in the case of activities which cause or are likely to cause transboundary impact; ensure conservation and, where necessary, restoration of ecosystems; and Measures for the prevention, control and reduction of water pollution shall be taken, where possible, at source. ***In the implementation of the project, modalities for amicable involvement of the two States in the implementation of the project has been part of the ESIA process through joint workshops to discuss the deliverables as well as issues of design as in the feasibility study which ensured that, there is equitable availability of water for various users both up and downstream of the river.***

3.4.2 Guidelines of the World Commission of Dams (WCD)

WCD was created by World Bank and IUCN in May 1998 in response to growing opposition to large dams. International Commission on Large Dams (ICOLD) defines a large dam as one with a height of 15 m or more from the foundation. If dams are between 5-15 m high and have a reservoir of more than 3 million cubic meters, they are also classified as large dams. ***It is noted that, Kabuyanda Irrigation Scheme is a category A type as such, it will have a large dam as such facilities link the development to WCD, the WCD recommendations will be applicable in its implementation.***

3.4.3 Convention of Biological Diversity

The Convention on Biological Diversity (CBD), known informally as the Biodiversity Convention, is a multilateral treaty. The Convention has three main goals namely conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources. In other words, its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development. ***Uganda is a signatory to this convention and when the ESIA is being undertaken for this project, there should be recommendations that the proponent will abide by the convention requirements to carry out assessments for all projects likely to have significant adverse effects on biodiversity. This project is in line with the spirit of the convention, there is need to integrate biodiversity***

in water resource planning as the environment has been considered a legitimate user of water thus the project shall consider the volume of water abstracted leaves enough water for the existent ecosystems.

3.4.4 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Uganda is a signatory to this treaty, which outlines the role of all parties to protect endangered plants and animals. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants. ***No animals will be traded in the course of the planned project implementation and all its phases. The workers will be briefed on risks of engaging in animal hunting and trade.***

3.4.5 United Nations Convention to Combat Desertification (UNCCD)

Convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements. ***The Kabuyanda irrigation project has direct impacts on the Rwoho CFR as such, as provided by law, the CFR area taken up by the project will be subject to equivalent compensation which will address lost forest as well as lost climate change mitigation that would arise from the project.***

3.4.6 Convention on the Conservation of Migratory Species of Wild Animals

The convention aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. ***The project will in its implementation be cognizant of migratory aspects of wildlife some through its areas of implementation and such wildlife will not be hunted.***

3.4.7 Ramsar Convention on Wetlands

Is an international treaty for the conservation and sustainable utilization of wetlands, to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. ***The implementation of the proposed project is to take into account, the need for sustainable ensure that the wetland areas within the project area are conserved.***

3.4.8 Strategic Approach to International Chemicals Management (SAICM)

Uganda UNEP/UNDP Partnership initiative for the implementation of SAICM is intended to assist the Government, through the National Environmental Management Authority (NEMA), to take up the strategic priorities of SAICM Quick Start Program (SQSP), namely: develop and strength national chemicals management institutions, plans, programs and activities to implement the Strategic Approach, building upon work conducted to implement international chemicals-related initiatives; and undertake analysis, interagency coordination, and public participation activities directed at enabling the implementation of Strategic Approach by integrating the sound management of chemicals in national development priorities and strategies. ***Provisions of SAICM will be considered in the project by developing PMP for the project to ensure information, capacity building and general safe handling of agrochemicals.***

3.4.9 World Bank Safeguard Policies

Details of the safeguards relating to the project are summarized below.

Table 13: World Bank safeguard policies triggered

Safeguard Policies	Triggered?		Remarks
	Yes	No	
OP 4.01 Environmental Assessment	√		The project is about constructing *Irrigation Infrastructure Development* which are structures above 10m high which are major works necessitating detailed ESIA and ESMP to be developed as such, the project is categorized a category A type. In addition, the project will have other auxiliary components which will equally necessitate to be subject to independent ESIAs. This ESIA has therefore assessed likely environmental and social impacts, including development of ESMP for addressing negative impacts during project implementation.
OP 4.04 Natural Habitats	√		The project implementation will involve use of some ecosystem areas such wetlands and forests (parts of Rwoho CFR) thereby triggering this safeguards policy instrument. The reservoir for Kabuyanda irrigation scheme will occupy 100 ha (1.1%) of Rwoho CFR, which is considered a modified non-critical habitat, largely degraded and under production using exotic tree species of eucalyptus and pine. The project will mitigate this impact by undertaking restoration/reforestation on 500 ha in Rwoho CFR, under the technical leadership of National Forestry Authority (NFA). In addition, a Biodiversity Action Plan has been developed (Appendix 12).
OP 4.09 Pest Management	√		The Kabuyanda Irrigation project is aimed at increasing agricultural production amidst evidently variable climatic conditions as such, there will likely be problems of pests and diseases which will necessitate use of agro-chemicals which triggers this safeguards policy and has necessitated inclusion of a Pest Management Plan alongside this ESIA.
OP 4.10 Indigenous People	√		This safeguard is triggered because some activities in Matanda (but not in Kabuyanda) might impact Batwa communities;
OP 4.11 Physical Cultural Resources	√		This safeguard is triggered because project activities will involve excavations which is likely to occasion accidental discoveries of PCRs. Therefore, a Chance Finds Procedure has been prepared as part of this ESIA.
OP 4.12 Involuntary Resettlement	√		The project works involving construction of common project infrastructures such as roads, dam sites, irrigation channels irrigation infrastructures which will likely cause land-take thereby triggering this safeguards policy. A separate Resettlement Action Plan has been prepared as part of safeguards study in this project.
OP 7.50 Projects on International waters	√		The Kabuyanda Scheme located on parts of the broader R. Kagera system is a transboundary river feeding to the Lake Victoria and the R. Nile system which triggers this safeguards policy.
OP 4.36 Forests	√		The project activities will likely take up some areas of Rwoho CFR which therefore triggers this safeguards policy instrument. Forest impacts and management shall be included in the site-specific ESIAs

			and/or ESMPs developed during implementation, in close collaboration with NFA. The reservoir for Kabuyanda irrigation scheme will occupy 100 ha (1.1%) of Rwoho CFR, which is considered a modified non-critical habitat, largely degraded and under production using exotic tree species of eucalyptus and pine. The project will mitigate this impact by undertaking restoration/reforestation activities on 500 ha in Rwoho CFR, under the technical leadership of National Forestry Authority (NFA).
OP 4.37 Safety of Dams	√		The project envisages to put in place, large dams which triggers dam safety since its envisaged dams will be more than 10m high which triggers this policy and also the project being a category A type. In addition, the project will include excavation activities for its construction materials which will be accompanied with major topographical and land-cover changes making safety considerations essential triggering the policy. In all, there will be a host of OHS hazards that can occur during the operational phase of construction materials extraction projects.
OP/BP 7.60 Projects in Disputed Areas		X	The planned Kabuyanda Irrigation project will not be implemented in disputed areas; hence this safeguards policy is not triggered.

3.4.10 World Bank Group Environmental, Health, and Safety General Guidelines

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). Effective management of environmental, health, and safety (EHS) issues entails the inclusion of EHS considerations into corporate and facility-level business processes in an organized, hierarchical approach that includes mechanisms for identifying EHS project hazards and associated risks as early as possible in the facility development or project cycle, including the incorporation of EHS considerations into the site selection process, product design process, engineering planning process for capital requests, engineering work orders, facility modification authorizations, or layout and process change plans.

3.4.11 Environmental, Health, and Safety Guidelines for Construction Materials Extraction

This document includes information relevant to construction materials extraction activities such as aggregates, limestone, sand, gravel, and clay amongst others. It addresses stand-alone projects and extraction activities supporting construction, civil works, and cement projects. Although the construction materials extraction guidelines emphasize major and complex extraction schemes, the concepts are also applicable to small operations.

Some of the key concepts covered under these Guidelines include:

a. *Environment:* Environmental issues during the operational, construction, and decommissioning phases of construction materials extraction primarily include aspects such as air emissions, noise and vibrations, water, waste and land conversion;
b. *Occupational Health and Safety* hazards likely to occur during the operational phase of construction materials extraction projects which primarily include; respiratory hazards, noise and physical hazards; and
c. *Community Health and Safety* issues relating to construction, operation, and decommissioning mainly focus on land instability, water and explosives safety and aspects of decommissioning at the end of the project.

These have been considered during the preparation of the ESIA with the objective of ensuring project compliance with these provisions. Accordingly, an ESMP has been prepared to address anticipated negative environmental and social impacts during project implementation phase.

3.5 Acquisition of project Permits and Licenses

Prior to the commencement of the project activities, a number of permits and approvals will have to be secured to ensure legal compliance and, foster cooperation and harmony among the different stake holders.

According to the National Forestry and Tree planting Act, a forest reserve shall not be put under any use other than in accordance with its management plan. In line with this and with section 32 b (v) of the National Forestry and tree planting Act, the developer (MWE) will obtain a license from NFA to put up the dam and reservoir facilities with the forest reserve (Appendix 2), pay all the license associated fees and /or compensation fees and meet other license obligations before implementation of the project within the reserve. Prerequisites for the issuing of the license by NFA are: (i) revision of the Forest Management Plan for Rwoho CFR by NFA to provide for existence of the dam; and (ii) approval of the ESIA by NEMA (Appendix 15). Other components of the project other than the dam and reservoir will be located outside the Forest Res erve, as advised by NFA (Appendix 2). The CFR area affected by the reservoir and dam will remain a forest reserve.

Key of these permits and approvals are summarized below.

Table 14: Permits and Licenses required for the Project

Nº.	Permit/Approvals	Responsible /Issuing Agency
01.	License for construction of dam and reservoir within Rwoho CFR	National Forestry Autority (NFA)
02.	Construction Permit	Directorate of Water Resources Management (DWRM) in Ministry of Water and Environment
03.	Surface Water Abstraction (Legal basis: *Uganda water act (Cap. 152), The Water Resources Regulations, 1998.* Application Fees: UGX 450,000 while license fee: UGX 450,000 for a New permit	Directorate of Water Resources Management (DWRM).
04.	Wastewater discharge permit. Its legal basis: *The Water Act Cap 152, The Water Resources Regulations, 1998*	Directorate of Water Resources Management (DWRM). License Fee: UGX 650,000
05.	EIA Approvals	National Environment Management Authority (NEMA)
06.	Registration of Construction Site/Workplace. Its Legal Basis are provision in Occupational Safety and Health Act 2006	Occupational Health & Safety Department of Ministry of Gender, Labor and Social Development-MoGLSD
07.	Storage license (operation of petroleum depot for storage of petroleum products)	Ministry of Energy and Mineral Development
08.	Hoarding permit	District Local Government (Engineering Department)
09.	License to own or operate a waste treatment plant or waste disposal site **Legal Basis:** *National Environment (Waste Management) Regulations SI 153-2*	NEMA upon payment of Application Fees: UGX 50,000. License Fee: UGX 300,000

4 ENVIRONMENTAL AND SOCIAL BASELINE

This chapter presents the environmental and social baseline conditions of the project area, covering the physical, biological and socio-economic environment.

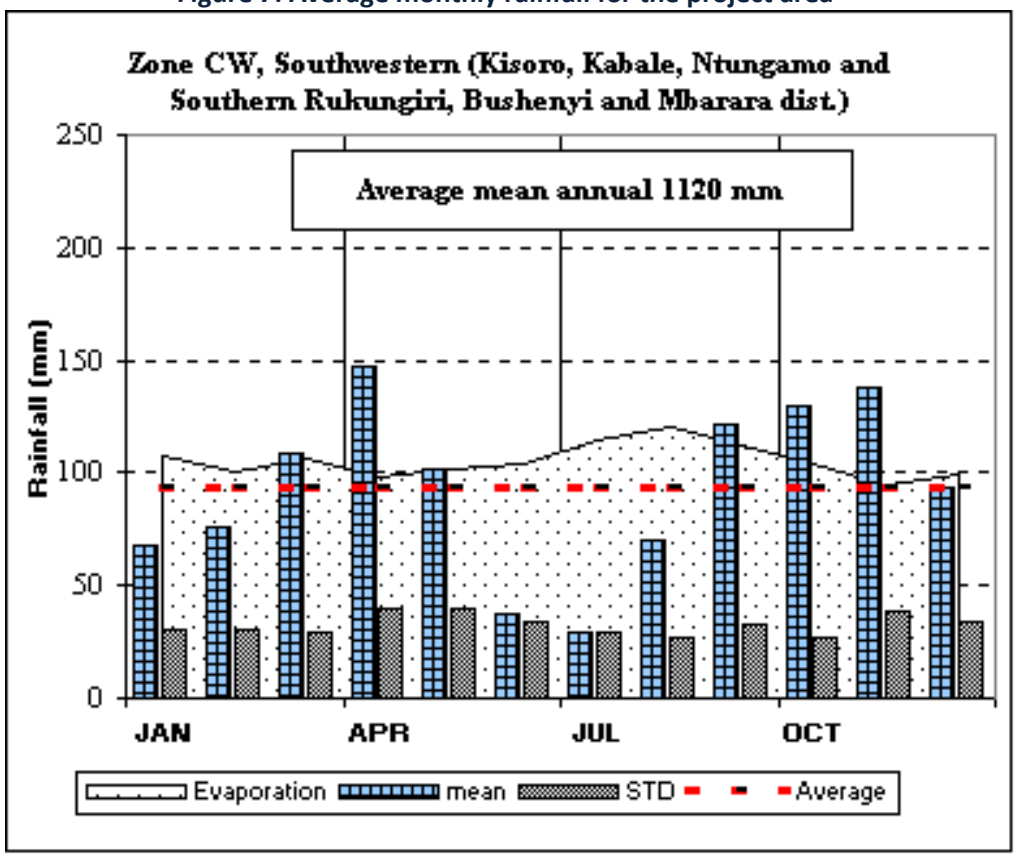
4.1 Physical Environment

The catchment area has distinct characteristics largely due to geographical location, topography, geology, climate and varying land uses. The basin has a relatively elongated shape with a length of 15 km and an average width of about 6 km. The river has its headwaters in the Parishes of Ngoma, Rukarabo and Bushwere in Mwizi Sub-county in Mbarara District. The river then flows in a generally southern direction through Rwoho CFR and is fed by numerous streams that flow in from the east and west towards the river.

4.1.1 Climate

The project is located in Climatic Zone which receives average of 1,120 mm of rainfall annually with about 330 mm of rainfall is received during the first long rainy season which lasts from March-May, whilst the second rainy season receives more rainfall on average, i.e. 450 mm but it is more variable, starting as early as September or even August and sometimes continuing until December. Temperatures average 19°C but ranges between 13°C and 26°C. Evaporation averages around 1,350 mm per annum but may be a factor of 3-4 times the rainfall amount during the dry season.

Figure 7: Average monthly rainfall for the project area[7]



[7]*Source: Studio Ing. G. Pietrangeli S.r.l, Kabuyanda Final Feasibility Report, 2017*

4.1.2 Topography

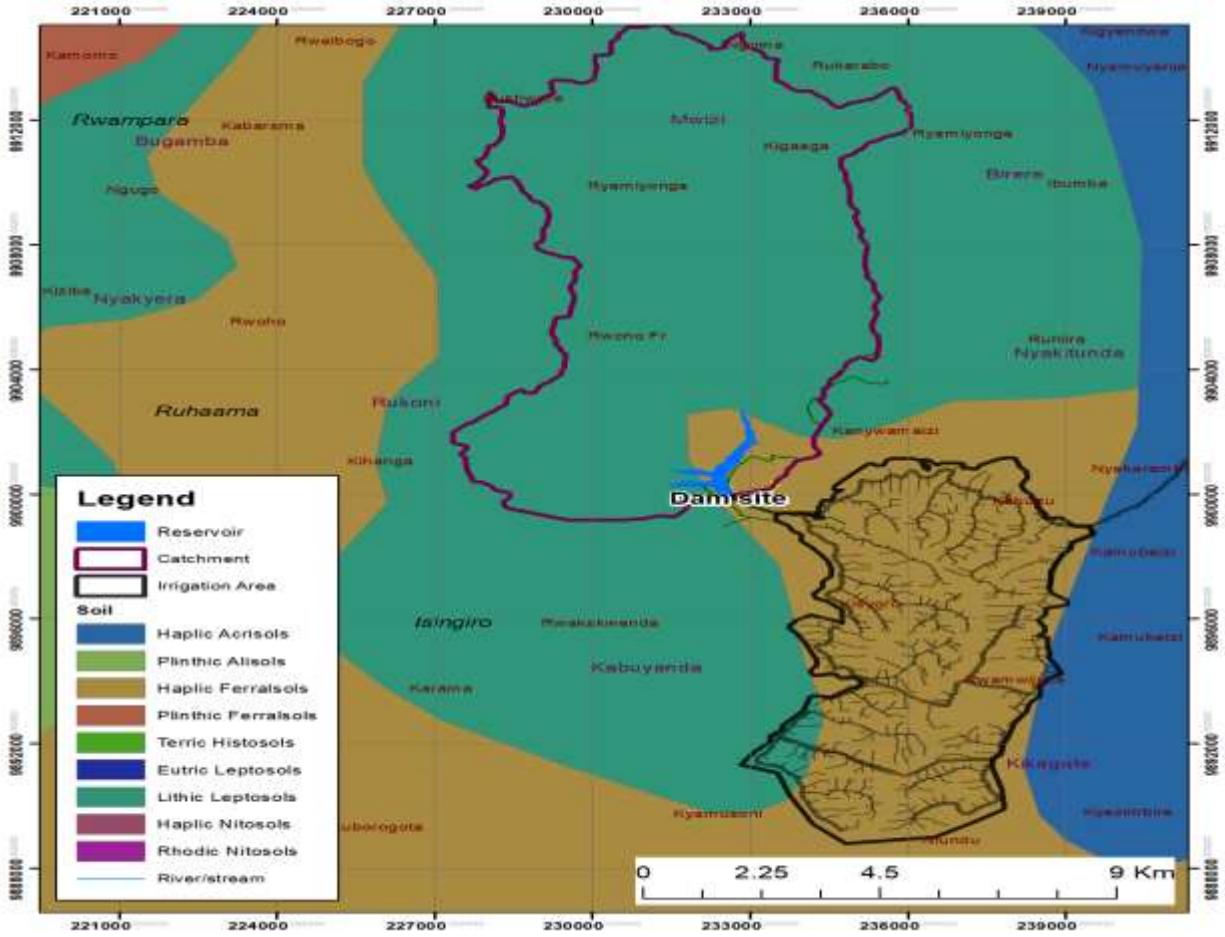
The catchment is characterised by hilly to mountainous terrain with steep fluted slopes and high hilltops. Catchment elevations vary from 1,347 m at the dam site to over 1,843 m at the upper reaches. The hillsides are steep with average slopes of more than 30%, but which can be as high as 80%. The valley bottoms have milder slopes of less than 5%. As a result, fast flowing slope-side stream flows are significantly attenuated in the valleys and flow in the mean river is expected to show a significantly lower degree of peakedness. Elevations in the irrigation area vary over a lower range of 1,272-1,350 m. Slopes are mild and average 7% but rarely reach 20%. Over 80% of the area has slopes less than 10%. Therefore, the terrain in the irrigation area can be classified as flat to undulating with a few areas having rolling terrain.

4.1.3 Soils and Geology

The catchment area is underlain by the Karagwe-Ankolean system which is of Cambrian origin. The dominant rocks include Arenites and Argillites which are mainly sedimentary rocks composed of indurated clay particles and varying sizes of silt particles. Instances of metacalcareous rocks (including shales, slates and sandstones), and undifferentiated gneisses are occasionally encountered. Therefore, all the three major divisions of rocks i.e. Sedimentary, igneous and metamorphic are represented in the area.

The dominant soils within the catchment area are Lithic Leptosols which include very shallow soil over hard rock or highly calcareous material, or deeper soils that is extremely gravelly and/or stony. Leptosols are unattractive soils for rain fed agriculture because of their inability to hold water, but they may sometimes have potential for tree crops or extensive grazing. Leptosols are best kept under forest. The dominant soils within the irrigation area are Haplic Ferralsols which cover extensive areas on the flat, generally well drained area. They are strongly weathered, and tend to be associated with old geomorphic surfaces. The texture may vary from a sandy loam to a clay loam. Many Ferralsols have stable micro-aggregates which explain the excellent porosity, good permeability and favourable infiltration rates.

Figure 8: Soil Classification[8]



4.1.4 Water Resources

Isingiro is located within the dry belt known as the cattle corridor. Droughts frequently occur and can last 4-6 months causing stress on water resources and failure of crop yields resulting in famine. Given that most of the population is dependent on agriculture, with matooke as the main crop grown, frequent droughts and famine exacerbate poverty in the District. Most of the population depends on ground water sources and water from the many (seasonal) streams. Depending on location, however, some of the streams have hard water which cannot be used for domestic purposes. According to the Uganda Water Supply Atlas, Isingiro has a population of 543,379 with an average rate of access to safe water sources of only 40%. Areas around the vicinity of the proposed project of Kabuyanda and Kikagate have access of 69% and 37% respectively. Access to safe water in Kabuyanda Town stands at 54%.

4.1.4.1 *Surface Water*

Surface water resources include rainwater, stream and river flows, and some wetlands. Figure below shows the rainfall over the catchment, runoff (as direct runoff and base flow) and the "losses" which represents the amount of water that evaporates and the amount that infiltrates. On average 82% of

[8]*Source: Studio Ing. G. Pietrangeli S.r.l, Kabuyanda Final Feasibility Report, 2017*

the rainfall either evaporates or infiltrates into deep aquifers. This means that there are opportunities for increasing water security through, for example, water harvesting.

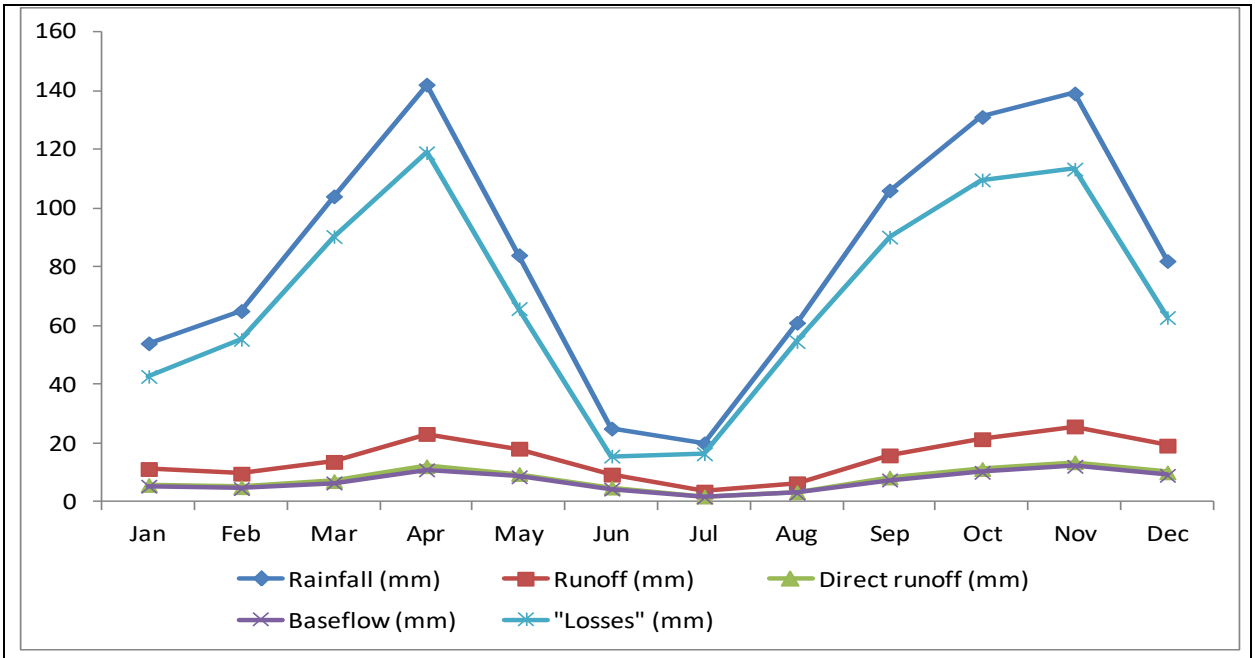


Figure 9: Surface Water Sources

The proposed Kabuyanda Dam is located at a point where there is limited human activity upstream apart from agriculture. This implies that pollution of water resources is currently not a major problem. However, the situation may change when the project is implemented and additional people migrate to the area to take advantage of the project benefits. The dam is designed for storage of stream flow that will then release progressively downstream during the dry conditions. The gradual release will act as a balancing phenomenon for the river flows downstream. This will also regularize water quality downstream. The tributaries of R. Mishumba downstream include R. Rweibara (Kasharira) which joins Mishumba about 1 km downstream of the dam; R. Rwamango and Kyabayanda join R. Mishumba about 5 km downstream of the dam. Further details on the tributaries are covered under the water resources assessment in Annex 9.

The figure below shows the confluence and flow of the tributaries of river Mishumba below the dam. River Rweibara (also known as Kasharira) joins Mishumba about 1 Km downstream of the dam. From this point onwards, the tributaries contribute to the flow of Mishumba. River Rwamango and Kyabayanda join river Mishumba about 5 km downstream of the dam site. The flows available downstream of the dam from the free catchments are presented in table below.

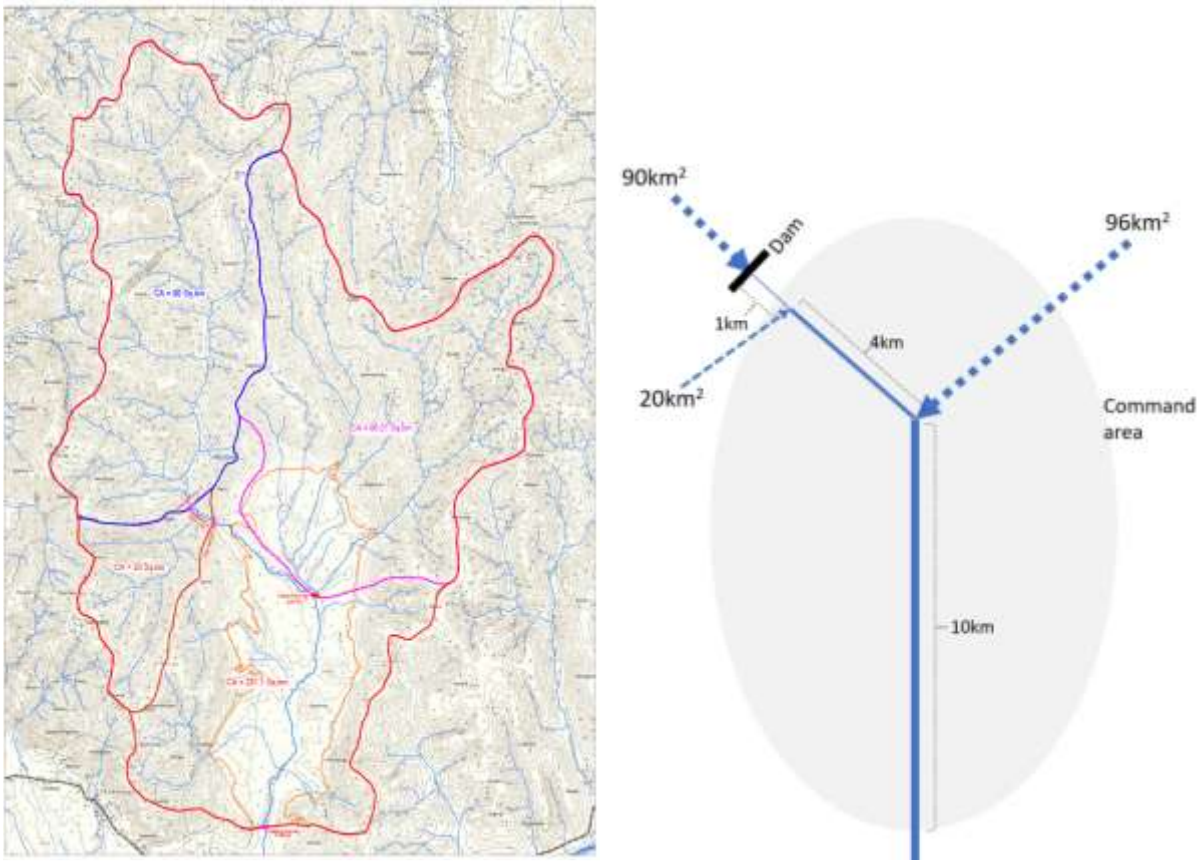


Figure 10: Confluence and flow of the tributaries of river Mishumba below the dam.

Table 15: Flows from the free catchments downstream of the dam

Sl.no	Location	Free Catchment Area (Sqkm)	Annual Average flows (cumec)	Distance from Dam site (km)
1	Dam site	90	0.5	
2	Rweibara confluence	20	0.11	1
3	Rwamango and Kyabayanda confluence	96	0.53	5
4	Tail of command	191	1.06	15

4.1.4.2 *Groundwater*

According to the Uganda Water Atlas, the majority of the population in Isingiro currently depends on groundwater sources for their water supply. The percentage of population served by groundwater is up to 65%. The different technologies for water supply include protected springs that serve 7% of the population, shallow wells that serve 34% of the population and deep boreholes that serve 24% of the

population. As such groundwater is a major source of water, a situation that is likely to persist even after implementation of the project.

Groundwater sources are susceptible to contamination and depletion due to overexploitation. Groundwater quality is influenced by potential infiltrating agrochemical residuals, nutrients from cattle pens and application of animal manure on farms as well as discharge into the ground of human wastes from pit latrines. Measures should be put in place to protect groundwater sources during the project operation. Proposed mitigation measures are detailed in Chapter 7 of this report.

Kagera Basin

With a length of 690 km and drainage basin of 59,800 km^2, the Kagera River is the largest tributary flowing into Lake Victoria. The Kagera River is formed by the confluence of the Ruvubu and Nyabarongo Rivers, which are fed by streams originating in the highlands of Burundi and Rwanda. The Kagera River forms the border between Rwanda and Tanzania as well as Tanzania and Uganda before flowing into the western edge of Lake Victoria. The Kagera River Basin traverses six districts of Uganda (Kabaale, Ntungamo, Isingiro, Kiruhura and Rakai). The Kagera Basin is home to nearly 14 million people in Burundi, Rwanda, Tanzania, and Uganda. Extending from the highlands of Burundi and Rwanda to Lake Victoria, the basin ranges in elevation from 4,500 m to about 1,200 m a.s.l. The basin includes many types of ecosystems, including lakes and papyrus swamps, dense forest, and wooded savannah. The most significant part of the basin is cultivated agricultural lands (48%), followed by natural vegetation (26%), of which 2% is covered by closed forest vegetation. The drainage density in the catchment areas of Nyabarongo, Akanyaru and Ruvubu is very high, particularly on the eastern part of the Congo-Nile Crest. The basin is an important source for hydropower especially at Rusumo Waterfall. There is persistent land degradation in the Kagera River Basin, accompanied by serious loss of biodiversity and impacts on the agro-ecosystems that are affecting the livelihoods of local people who largely depend upon natural resources for their living. While only 10% of the Kagera Basin is located in Uganda, impacts of activities in Uganda may have significant impact because the Uganda part of the basin is located on the lower reach of the river.

Table 16: Kagera Area Proportion in the Riparian countries

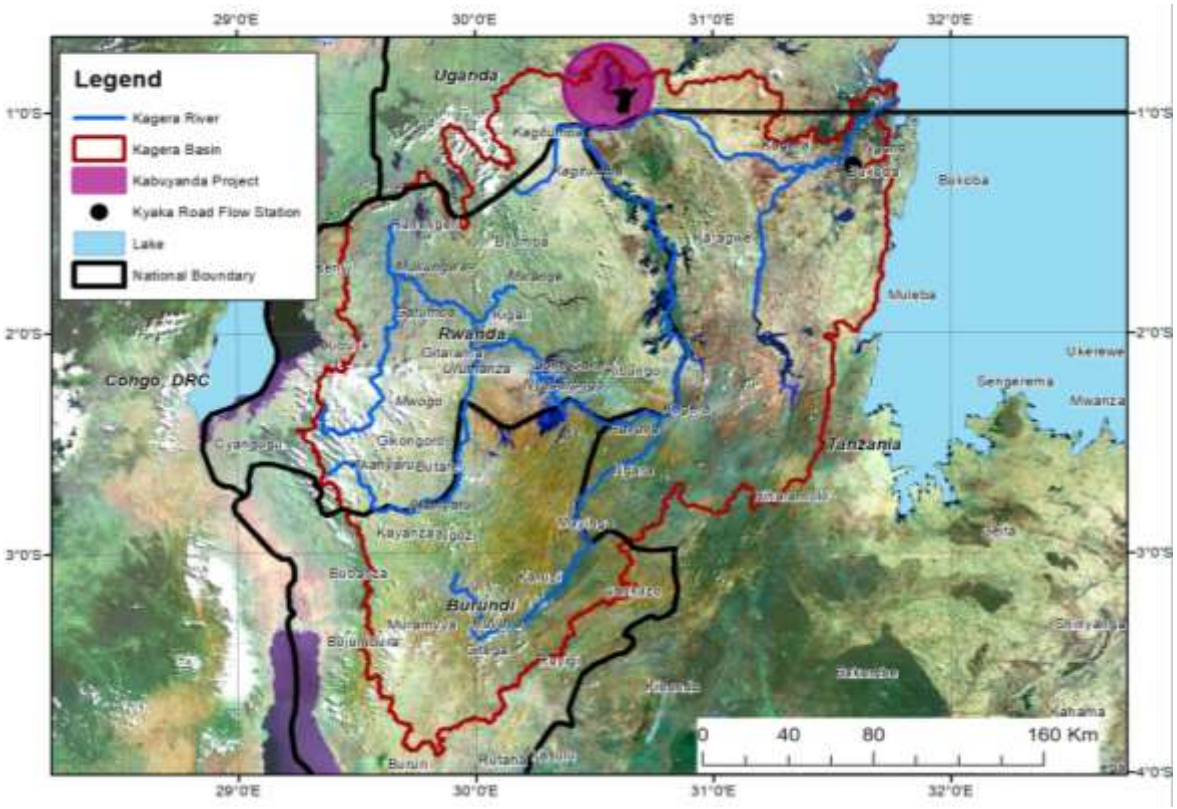
Country	Country surface area (km^2)	Area in Kagera Basin (km^2)	Area in Kagera Basin (%)
Burundi	27,834	13,300	22%
Rwanda	26,340	19,900	33%
Tanzania	945,100	20,800	35%
Uganda	241,000	5,800	10%
Total	1,240,274	59,800	100.00%

Regional Significance of the Kabuyanda Project

A comparison of key catchment characteristics for R. Mishumba and R. Kagera. In terms of catchment area, the watershed of R. Mishumba upstream of the dam site of 90 km^2 covers only 0.15% of the Kagera River basin watershed. The entire project area, including the irrigation command area of 42

km^2, covers only 0.22% of the Kagera area. The mean flows of R. Mishumba vary between 0.12 m^3/s in July and 0.89 m^3/s in November with an average of 0.51 m^3/s. The mean flows of R. Kagera at the outlet into Lake Victoria vary between 200 m^3/s in January and 273 m^3/s in July with an annual average of 230.3 m^3/s. Consequently, the R. Mishumba mean annual flow is only 0.2% of the Kagera flow while the percent contribution of varies between 0.05% in July and 0.42% in October. The entire Mishumba River catchment and irrigation command area are located within the boundaries of Uganda. The river meets the Kagera near Kikagate at the border between Uganda and Tanzania when the Kagera has achieved most of its flow and it is commencing its final journey into L. Victoria. The Project impacts downstream of the proposed dam will mainly be restricted to a 20 km stretch located within Isingiro District to the confluence with R. Kagera at the Uganda-Tanzania border where most of the beneficiary population lives. Therefore, the Project will not likely to pose major water resources threats that are of transboundary nature. On the other hand, the project would be beneficial by encouraging regional trade in agriculture products as a result of the increased productivity due to the project.

Figure 11: Kagera basin with location of Mishumba River



4.1.5 Hydrology

Hydrological analysis forms a key part of any water resources development and management project. A detailed hydrological analysis was carried out as part of the Feasibility Study and Detailed Design of the project by Studio Ing. G. Pietrangeli S.r.l., the Design Consultant. Sections below presents the hydrology of the project area and is further elaborated in Annex 9.

4.1.5.1 *Estimated River Runoff*

River Mishumba does not have a long-term gauging station so there are no measured runoff records. A gauging station was established on the river following a decision to carry out detailed assessment of the project but it has only about 2 years of record. The river runoff was therefore estimated using a rainfall-runoff model using HEC-HMS software. The model inputs included rainfall, temperature and other relevant catchment data like land cover, soils, etc. Model calibration was carried out using parameters generated for the nearby R. Ruizi catchment which has long term flow records. The estimated monthly runoff for R. Mishumba for the period 1950-1995 at the proposed dam location is shown in figure below while the flow statistics are shown in table below. The monthly records exhibit a bimodal variation with two peak flows in April and October of 0.8m3/s and 0.89 m3/s, respectively.

The mean annual flow is 0.51 m3/s. The month with the lowest flow is July with a flow of 0.12 m3/s. June, July and August record flows representing 24% of the mean annual flow. Based on the data series, the river sometimes dries up in the dry months of July and August, and February and September. Flow in the months of September-November is more variable than during the other months. The maximum flows, that lead to flooding, are most likely to occur during the months of September - December.

Table 17: Monthly flows of the River Mishumba

Month	Mean	Median	Standard Deviation	Min	Max	Range (max-min)
Jan	0.39	0.34	0.27	0.06	1.63	1.56
Feb	0.34	0.32	0.23	0.00	1.09	1.09
Mar	0.48	0.50	0.20	0.10	0.90	0.80
Apr	0.81	0.76	0.27	0.35	1.65	1.30
May	0.63	0.60	0.31	0.21	1.58	1.37
Jun	0.33	0.25	0.27	0.04	1.20	1.16
Jul	0.12	0.08	0.14	0.00	0.65	0.65
Aug	0.22	0.16	0.22	0.00	0.78	0.78
Sep	0.55	0.50	0.37	0.00	2.32	2.31
Oct	0.74	0.70	0.30	0.17	1.62	1.44
Nov	0.89	0.91	0.32	0.26	1.61	1.35
Dec	0.67	0.66	0.27	0.12	1.51	1.39
Annual	0.51	0.50	0.10	0.37	0.74	0.37

The annual maximum average flow for River Mishumba is 0.74 m^3/s with peak flows occurring in the month of September with 2.32 m^3/s. Figure below shows the average monthly flows for the Kabuyanda project.

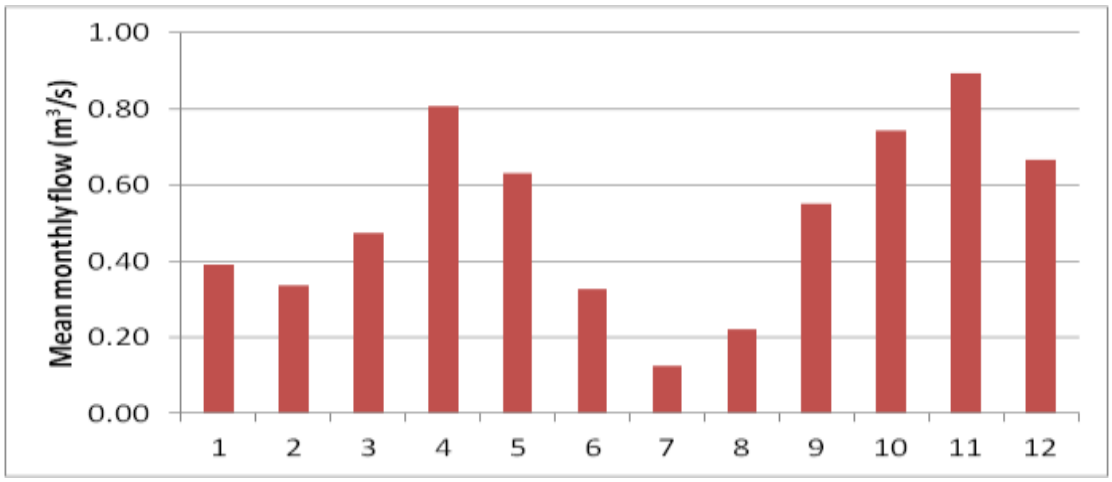


Figure 12: Mean Monthly flows of the River Mishumba

4.1.5.2 *Low Flows Analysis*

Low flow assessment was aimed at determining the historically lowest flows, which is key to determine the scale of the required environmental flows for supporting basic ecological functions. Data used for the analysis was the annual minimum flow data generated as the lowest monthly runoff in each calendar year of record. The low flows of 0 m^3/s (instances when the river completely dried up) were registered in at least 10 years of the 46 years for which runoff was modelled. The years with no zero flows, the amounts varied between 0.003 m^3/s and 0.255 m^3/s with a mean of 0.079 m^3/s.

4.1.5.3 *Peak Flood Assessment*

The peak floods were derived for two rainfall-runoff based methods namely SCS peak flood assessment and Snyder's UH method for the 20, 100, 1,000 and 10,000 year return periods. The probable maximum flood (PMF) was also estimated.

Table 18: Peak flood calculations

Tr {yrs}	P(X)	SCS peak floods {m3/s}	Snyder's UH peak flood {m3/s}
20	0.950	4.6	3.6
100	0.990	16.5	13.0
1000	0.999	42.8	33.7
10000	1.000	76.9	60.9
PMF	-	382.1	316.1

4.1.5.4 *Water Demand for irrigation*

According to the design report, the major water demand for the reservoir is irrigation water demands for the project beneficiaries within the command area. The monthly distribution of water released for irrigation was estimated.

Table 19: Monthly Distribution of Water Demand for irrigation

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Monthly irrigation water requirement (Mm3)	2.40	1.43	0.30	0.27	0.87	1.99	1.6	1.16	0.61	0.37	0.4	1.88	13.27

4.1.5.5 *Sediment analysis*

The watershed sediment yield is one of the main issues in evaluating the lifetime of the dam. There are no consistent reliable sediment transport data for the catchment. The RUSLE (acronym for Revised Universal Soil Loss Equation) erosion model was applied to estimate sediment yield. The method combines the effects of the environmental factors mainly governing soil erosion on a single parametric equation. According to RUSLE, annual soil loss is expressed as:

$$A = R \times K \times L \times S \times C \times P$$

where A= specific mean annual soil loss; R= index expressing the erosivity power of the rain; K= pedologic factor expressing soil erodibility; L= topographic factor related to slopes length; S= topographic factor related to slope steepness; C= correction coefficient accounting for land cover; and P= correction coefficient accounting for control practices. A is expressed in terms of mass per unit area of soil loss in the unit time (tons/km2/year or tons/hectare/year).

Based on the RUSLE model, the frequency distribution is determined and the median erosion rate of the Kabuyanda catchment is seen to be 2.9 Ton/ha/year which is equivalent to 290 Ton/km2/year. Considering the expected residence time (reservoir volume / inflow) of the reservoir, the ratio of deposited sediment to the total sediment inflow (trap efficiency) is expected to be approximately 50 percent (%).

4.1.5.6 *ENVIRONMENTAL FLOWS*

There has been strong recognition internationally over the past decades that, while implementation of projects of water for human development, use and diversion are important, ensuring the health and vitality of the river and ecosystems it supports are also as important (World Commission on Dams, 2001). Rivers and other aquatic ecosystems need water and other inputs like debris and sediment to stay healthy and continue providing benefits to people and the price of not providing environmental flows cannot be underestimated. The river flow regime influences the water quality, energy cycles, biotic interactions, and habitat and any modification of the flow regime has implications on these and organisms/species that depend on them for their livelihoods. For the Kabuyanda Project the major impacts prior to implementation of mitigation measures will potentially be on water quality, riverbank vegetation, birds, fish populations and other aquatic life.

Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems (Brisbane Declaration). Environmental Flow Assessments (EFAs) consists of determining how much of the flow regime of a river should be preserved to maintain specified, valued features of the ecosystem hydrological regimes for the river (Tharme, 2003). There is a wide literature concerning the methodologies to use for the EFA in a specific situation (Water Resources and Environment, Technical Note C.1 of the World Bank, 2003).

In the case of Kabuyanda, an initial assessment of the Environmental Flow was carried out using the Tennant method (1976), the most widely known across the low-resolution historic flow methods, which rely solely on the (recorded or estimated) flow regime of the river. The Tennant method assumes that some percentage of the mean annual flow is needed to maintain a healthy stream environment. Based on literature data from the project area (Okori, 2010), the environmental flow requirement at Kabuyanda was initially determined as 10% and 20% of Average Annual Flow (AAF) in the dry and wet seasons, respectively.

Noting there is a potential for impacts on the downstream environment on the water quality, riverbank vegetation, birds and aquatic life, additional surveys and assessments of the downstream environment were conducted to confirm/amend the proposed environmental flow requirement. The surveys and consultation were conducted in the primary area affected by the project, i.e. the 1 km immediately downstream the dam before additional tributaries complement the rivers water, in regards to the biodiversity of the area and water needs. The flows from the tributaries contribute significantly to satisfy the downstream water demands. One km downstream, Rweibara River contributes about 18% of the 0.61 m3/s Average Annual Flow (AAF) of Mishumba River at the confluence and 5 km downstream the combined flow of Rweibara and Rwanago Rivers is about 56% of the total flow at the confluence.

Within the 1km stretch downstream of the dam and the confluence of river Rweibara (also known as Kasharira) and Mishumba, there are no tributaries. The river valley is covered with patches of papyrus vegetation and slow moving clear water. The surrounding land is under crop cultivation and forest plantation.

Downstream water use

The first major domestic water abstraction point is about 1km downstream of the dam site at river Rweibara (also known as Kasharira) and Mishumba confluence. There is also some limited fishing activity using traditional fishing gear as mentioned under Section 4.4.4.3. It further states that fishing activities in Isingiro District are carried out on L. Nakivale, Rwamurunga and Rivers Kagera and Rwizi. The major types of fish caught include; tilapia, miller caps, lung fish and claris. In the project command area, commercial fish farming is practiced using fish ponds. Fish farming is mainly practiced in the downstream area (irrigation command area). The major fish farmer in the project area is Tukundane Fish Farm Limited, approximately 10Km from the reservoir area. The fish farm abstracts water from three tributaries downstream of the reservoir and these include Rusharira, Kasharira and Kasworo. The main water use is downstream of the Rweibara and Mishumba confluence up to River Rwamango, Kyabayanda and Mishumba confluence, and it includes the following;

domestic supply, alcohol distillation, vehicle and motorcycle washing and fishing. This section is not used for livestock watering. The domestic water supply points are found at Kagoto I, Kagoto II, Karo I-IV villages. The number of people depending on river Mishumba and Rweibara confluence is estimated to be about 300-500. This population is the same expected to benefit from the development of a water supply project by MWE, from groundwater, which would thus not depend anymore from the river.

Figure 13: *Domestic water supply points (upper left) Rweibara and Mishumba conluence (upper right) Kagoto I village (lower left) Kagoto II village (lower right) Karo IV village (e) Karo I village.*

Downstream herpetofauna rapid survey and assessment

Three main sampling methods were employed during a survey in May 2019, as described by Heyer et al, 1994; Fellers and Freel, 1995; Halliday, 1996; and Olson, et al, 1997. The methods include:

- Visual Encounter Surveys (VES): Visual encounter surveys were conducted along the transect from the dam location down the Mishumba River. The method involved moving through the area in and around the river, watching out for and recording surface-active species. VES were complimented by visual searches, by examining under logs, leaf litter, and in vegetation.
- Audio Encounter Surveys (AES): This method uses the species specific calls made by breeding males. The identity of the amphibian species heard calling and their numbers were recorded.

- Opportunistic Encounters: Herpetofauna species encountered outside the sampling points but within the project area / surrounding were recorded. The opportunistic encounters complemented the amphibians and reptiles recorded for the river section.

Apart from individuals heard calling, species encountered were handpicked, identified, and where possible photographed and released at the point of capture. Identification followed field guides by Spawls, S. et al. (2002), and Bill Branch (2005).

To assess the Red List and / or protected status of species recorded or potentially occurring in the study area, two sources were consulted: a) The latest Red List of Threatened Species of the International Union for the Conservation of Nature (IUCN); and/or b) The National Red List for Uganda, published by Wildlife Conservation Society (WCS) January 2016.

Sampled Areas

The survey was conducted along one transect established along the river from the dam location, down the river for the length of 1 km. In total the sampling was carried out in 11 points. Eight of the points were within the stretch of 1 km from the Dam access (white, yellow and light blue Markers).

Figure 14: *Location of sampling points along the river (White mark is the Alternative 1 dam location. Yellow marks are the sampling points. Light blue mark is the Confluence of Rivers Mishumba and Rusharira. Red marks are additional points down the river).*

Survey Results

The rapid survey and assessment covered: i) amphibians; ii) reptiles; iii) fish; and iv) other aquatic species.

i. Amphibians

Eight Amphibian species were recorded in the stretch of 1 kilometer of River Mishumba from the dam site area down the river in table below. All are classified as frogs. Six of the species are categorized as water specialists and these are found in and around water sources. Two of the species encountered are non water specialists (still require water for spawning and normal life functions), the species can resist desiccation and can be encountered distances away from water sources. Thenone water specialists include the Mascarene Rocket Frog Ptychadena mascareniensis and Anchieta's Rocket Frog Ptychadena anchietae.

Table 20: *Amphibian Species encountered in the 1 kilometre stretch of River Mishumba from the Dam site area down stream*

Family Name	Scientific Name	Common Name	IUCN Red List Status	National Red List Status	Numbers found
Pyxicephalidae	Amietia angolensis	Angola River Frog	LC	DD	17
Phrynobatrachidae	Phrynobatrachus natalensis	Natal Puddle Frog	LC		2
	Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC		5
Ptychadenidae	Ptychadena mascareniensis	Mascarene Rocket Frog	LC	DD	19
	Ptychadena anchietae	Anchieta's Rocket Frog	LC		4
Hyperoliidae	Hyperolius kivuensis	Kivu Reed Frog	LC		5
	Hyperolius cinnamomeoventris	Cinnamon-bellied Reed Frog	LC		28
	Hyperolius viridiflavus	Common Reed Frog	LC	DD	6

Limitations: It should be noted that the numbers found do not translate into estimated population density, which could be done through a capture/recapture methodology or to compare it to densities in other locations.

ii. Reptiles

One specie (Striped Skink Trachylepis striata) of reptile was recorded in the stretch. The reptile belongs to the group of Skinks. Abundance of the identified biota within the 1 km stretch. Hyperolius cinnamomeoventris was the most abundant specie with twenty-eight individuals recorded. This was followed by Ptychadena mascareniensis and Amieta angolensis with nineteen and seventeen individuals recorded respectively. Phrynobatrachus natalensis was the least abundant with only two

individuals encountered. Ptychadena anchietae was second least abundant with only four individuals recorded. Only one individual of the reptile (Striped skink Trachylepis striata) was recorded.

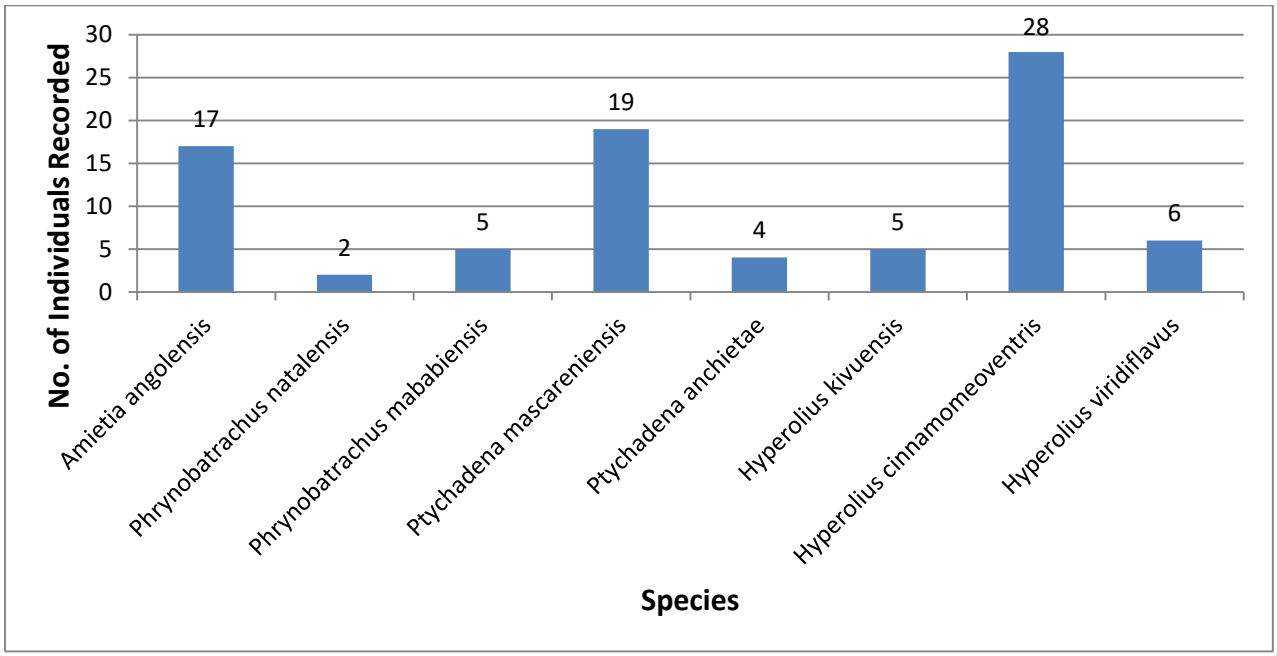


Figure 15: *Abundance of reptile species encountered.*

Conservation status of identified species: Based on the IUCN 2014 Red List none of the species recorded is of conservation concern, all are listed as of Least Concern. Three of the amphibian species however, are listed as Data Deficient according to the National Red List for Uganda 2016. The three species include Common Reed Frog Hyperolius viridiflavus, Mascarene Rocket Frog Ptychadena mascareniensis, and Angola River Frog Amietia angolensis. Striped skink Trachylepis striata is listed as being Least Concern by the IUCN Red List 2014.

Estimate of the water demand of the identified biota: The Amphibian species require moisture for survival so as not to desiccate due to hot weather. Water is required during breeding periods. Two of the species encountered are not water species (still require water for spawning and normal life functions) and can be encountered away from water sources. The two (Mascarene Rocket Frog Ptychadena mascareniensis and Anchieta's Rocket Frog Ptychadena anchietae) can utilize ephemeral water pools for breeding that form during rainy seasons, while the rest of the species require water sources.

iii. Fish

Methods of fish data collection: Due to the fact that this area is covered with patches of papyrus vegetation, and therefore no big expanses of open water, fishing was mainly done by use of baited fish traps, plus scooping using basins. When the fish catches of the only fisher group which was got there was observed, the fish species they had were similar to our experimental catches and mainly comprised of the small sized fish species that is Clarias casonii, Barbus apleurogramma and Barbus

jacksonii. When these fishermen were interviewed at the four selected sites within one kilometer stretch from the dam axis to River Kasharira, they reported that there are some fish species which they catch sometimes but were not among the catches for that time. Such species include Oreochromis leucostictus (IUCN lists as least concern) and some Haplochrimine species (primary habitat in Lake Victoria). Based on field survey and interviews with fishermen, fishing activities exist in the area although very limited.

Fishing was carried out at four selected sites within the one kilometer stretch from the dam axis to River Kasharira, plus one point downstream. The experimental catch comprised of mainly 3 fish species belonging to two families; Cyprinidae and Clariidae.

Table 21: The coordinates and description of sampled points, species composition, numbers and conservation status according to IUCN red list

Data point	Coordinates	comments	Fish Family	Fish species	numbers	The IUCN Red list 2017-1
Pt1	36M 0232601 9899879	Area with papyrus vegetation	Clariidae	*Clarias casonii*	12	Benthonic Cat fish sp. not covered/identified in the IUCN Red list. This species is also not reported in the GBIS. It is also possible that this fish species name was either wrongly reported/identified/ changed – However, it is a common Cat Fish species found in most of the lakes and rivers in Uganda and air breathing
			Cyprinidae	*Barbus apleurogramma*	7	Least Concern
Pt 2	36M 0232623 9899808	Area patches of papyrus vegetation	Clariidae	*Clarias casonii*	15	Least Concern
			Cyprinidae	*Barbus apleurogramma*	49	Least Concern
			Cyprinidae	*Enteromius jacksoni*	1	Least Concern
Pt 3	36M 0232720 9899691	Area Covered by papyrus	Clariidae	*Clarias casonii*	1	See description above.
			Cyprinidae	*Barbus apleurogramma*	4	Least Concern
Pt 4	36M 0232874 9899579	Open water	Cyprinidae	*Enteromius jacksoni*	20	Least Concern

Limitations: It should be noted that the numbers found do not translate into estimated population density, which could be done through a capture/recapture methodology or to compare it to densities in other locations.

Catfish (Clarias)

More than 100 different species of the Genus Clarias were first described in Africa. However, following a systematic revision based on morphological, anatomical and biographical studies was conducted by Teugels (1982), this was reduced to recognizing 32 valid species. All the large African Catfish species now belong to the subgenus Clarias. Clarias species are the amongst the commonest fish species in rivers, lagoons and estuaries. IUCN lists Clarias species as 'least concern' (or has not been assessed) in the Lake Victoria basin.

East African Red Finned Barb (Enteromius apleurogramma)

The East African Red Finned Barb is known to inhabit temporary and permanent streams, as well as in marginal water-lily swamps (Greenwood 1962), pools near papyrus vegetation (Okedi 1971), in smaller bodies of water or near the margins of rivers between the vegetation (Seegers 1996) and in fast-flowing water. It feeds on insect larvae (Greenwood 1966), but also aquatic vegetation, molluscs and fishes are taken (Welcomme 1969). Spawning occurs in temporary streams when they are flooded during the rainy season (Greenwood 1962). Seegers (1996) reports spawning activities all year round with a maximum at the beginning of the rainy season. The maximum size is 5.4 cm Standard Length (SL) (De Vos and Thys van den Audenaerde 1990).

Jacksons Barb (Enteromius jacksoni)

The Jacksons Barb is found in lakes and in streams, both permanent and temporary (Greenwood 1966). It feeds on insect larvae and bottom debris (Greenwood 1966). Upstream spawning migrations have been reported for individuals in the Lake Rukwa drainage (Seegers 1996). The maximum size is 11.6 cm SL (Greenwood 1962).

Conservation status of identified species: The International Union for Conservation of Nature (IUCN) holds a worldwide-recognized database of species with special status called the IUCN Red List. Searches on IUCN Red List were carried out in September 2019 to identify potential fish species with special status. Search results indicated that the fish species present in the basin are common in the Lake Victoria basin. The IUCN red list rates all the encountered fish species as least conservation concern. The fish species are which means that as regards fish biota in the area, there is no such fear that the project activities will cause critical damage to the species if handled carefully.

Estimate of the water demand of the identified fish: The encountered fish species are accustomed to temporary streams and require a seasonal variation in flow for spawning activities.

iv. Other aquatic species

Phytoplankton data collection: Water samples for phytoplankton species identification were collected using a water sampler. Twenty (20) ml samples were separated and preserved using Lugol's solution in brown glass bottles for further analysis in the laboratory (Not yet analyzed in the laboratory)

Zooplankton data collection: Water samples were collected using a water sampler and were immediately filtered using cellulose acetate membrane filters (pore size 0.45µm) and preserved in labeled sample bottles with ethanol (50 %). (Not yet analyzed in the laboratory)

Macro-invertebrate (benthic) fauna data collection: The Ekman-Birge-grab 15x15x15cm was used to get samples for the benthic fauna. The samples were sieved using benthic net of 0.5 mm mesh in order to remove fine sediments and other extraneous materials and were preserved in 50 % ethanol for later analysis in the laboratory. (Not yet analyzed in the laboratory)

Downstream ecological and other water demand

The main water demand downstream of the dam is irrigation, domestic, livestock, ecological and other uses. The project has been designed for supply of water for irrigation for the sub county of Kabuyanda as discussed in section on water demand above. The main concern for the environmental flow remains the ecological aspect especially the 1km section downstream of the dam where reduced flow is expected after the dam construction.

Recommendation of Environmental Flows

A critical element in the determination of the environmental flow in the case of Kabuyanda is the minimum flow. As reported in the low flow assessment, the river dried up over at least 10 years out of the 46 years for which runoff was modelled. The years with no zero flows, the amounts varied between 0.003m3/s and 0.255m3/s with a mean of 0.079m3/s. With the construction of the dam, the dry-season low-flows are expected to increase, while the seasonal variability is expected to reduce. As the river will no longer register zero flow, downstream conditions will improve for some plant species, as well as for the small community relying on the river for domestic uses.

However, the ecological habitat is not only dependent on the minimum discharge. Though a minimum discharge is required, it is not sufficient for establishing a sustainable aquatic environment downstream the dam. Species are accustomed to the apparent hydrological variability in the area and the lifecycle triggers and behaviors are often tied to the seasonal flows (high-low). Floods trigger migration while also moving sediments and contributing to the ecosystems of the littoral zones. For some animals, with the construction of the dam, hydraulic and thermal conditions can become mismatched with life-cycle requirements, thus the need to ensure that operating rules of the dam allow for sufficient variability in flow to avoid decrease in numbers and abundance of some species. A natural flood event will be allowed to pass the dam, mitigating the impact of the dam on the hydrological variability. The natural flood hydrographs carry a significant amount of sediments, allowing for the replenishment of the downstream environment and floodplains with the sediments and nutrient.

Using a low-resolution hydrological methodology, the environmental flow was initially determined as 10% and 20% of Average Annual Flow (AAF) in the dry and wet seasons, respectively. The initially proposed environmental flow requirement was confirmed following additional rapid surveys and assessment to be adequate to maintain the ecological environment immediately downstream the project dam site. The surveyed environment was determined to be fair-degraded, justifying the use of the low-resolution methodology and the proposed AAF percentages. The environmental flow during the dry season is 0.05m3/s and during the rainy season is 0.1 m3/s.

This environmental flow is adequate to satisfy the fish species that are accustomed to temporary streams and reduced water volumes in the area. The flow is also adequate for the amphibian species

which require moisture for survival so as not to desiccate due to hot weather and those that require water can get it from the environmental flow and move either up or downstream if necessary.

The flows from the tributaries contribute significantly to satisfy the downstream water demands. One km downstream, Rweibara River contributes about 18% of the 0.61 m3/s Average Annual Flow (AAF) of Mishumba River at the confluence and 5 km downstream the combined flow of Rweibara and Rwanago Rivers is about 56% of the total flow at the confluence. The recommended 10% EFR for the dry season and 20% (Tennant method) for the rainy season of the AAF (0.5m3/s) will increase these flows to 26% and 65% respectively. Given the biota and water demand in this section as described below, these flows are expected to be adequate. The use of the low-resolution hydrological model was thereby confirmed by the observations and assessments of the downstream environment based on the conducted rapid surveys and expert opinions.

Table 22: *Monthly distribution of environmental flows*

Month	Inflow (m3/s)		Q_{eco} (m3/s)
January	0.32	10% of AAF (0.50 m3/s)	0.05
February	0.31	10% of AAF (0.50 m3/s)	0.05
March	0.51	10% of AAF (0.50 m3/s)	0.05
April	0.88	20% of AAF (0.50 m3/s)	0.10
May	0.55	20% of AAF (0.50 m3/s)	0.10
June	0.23	10% of AAF (0.50 m3/s)	0.05
July	0.09	10% of AAF (0.50 m3/s)	0.05
August	0.18	10% of AAF (0.50 m3/s)	0.05
September	0.55	10% of AAF (0.50 m3/s)	0.05
October	0.75	20% of AAF (0.50 m3/s)	0.10
November	0.89	20% of AAF (0.50 m3/s)	0.10
December	0.68	20% of AAF (0.50 m3/s)	0.10

4.1.5.7 *Monitoring*

Since the Ministry of Water and Environment (MWE) is mandated to monitor the quality and flow of rivers in Uganda, the Ministry should be responsible for monitoring and ensuring the environmental flow. The district water officer and the regional management zone staff should take this responsibility. For monitoring purposes, the downstream flow and quality should be measured at a number of points:

- immediately after the dam;

- at the pour points of all major drains from the irrigated area;
- the final out flow from the irrigated area.

Monitoring of the water flow and quality should be carried out on a continuous basis. Additional measurements should be done at the beginning and middle of the two rainy seasons or the beginning and middle of the cropping seasons when we expect minimum and maximum use of agricultural chemicals and soil erosion. The water quality monitoring during the dry season is critical to ensure adequate management.

4.1.6 Water Quality

Sampling sites were selected based on unique land uses and habitat structure. At the same time, sampling sites were set at the inlet, outlet and in the middle of the Mishumba stream. One more sampling station was set at the entry of Kasharira stream into the Mishumba stream. Water samples were collected in duplicates and treated accordingly for later analysis in the laboratory. A detailed analysis of the physical-chemical and biological parameters was done to determine:

a. Physical- chemical parameters including nutrients, trace minerals and metals
b. Biological parameters including fecal coliforms, chlorophyll **a**, phytoplankton zooplankton and benthic/macro invertebrate composition and abundance.

Table 23: Water Analysis

Parameter	Upstream	Dam Axis	Kasharira	Katenseni	Lower command area	Nombe bridge	National portable water quality standards
Temperature(^{0}C)	19.4	19.4	22	21.3	22.4	22	Not specified
Dissolved Oxygen (mg/l)	3.4	2.01	2.5	2.1	0.95	3.25	Not specified
EC µS/cm	524	496	1235	620	2470	1500	2500
Salinity	217	208	521	262	1015	623	Not specified
pH	7.05	6.94	6.78	7.08	6.05	6.14	5.5-9.5
TDS (mg/l)	262	286	618	308	1236	748	1500
Total Phosphorus (mg/l)	6.16	21.64	10.95	9.24	10.50	5.45	2.2
Total Nitrogen (mg/l)	1.06	1.14	1.32	1.18	2.26	1.82	45
TSS (mg/l)	10	12	14	12	8	6	Not detectable
COD (mg/l)	26	28	38	24	42	36	Not specified
BOD (mg/l)	8	7	12	4	12	10	Not specified-
Iron (mg/l)	0.15	0.12	0.20	0.18	0.26	0.24	0.3
Manganese(mg/l)	0.11	0.14	0.15	0.13	0.14	0.15	0.1
Lead (mg/l)	Nd	Nd	0.01	nd	0.01	0.01	0.01
Copper (mg/l)	0.08	0.12	0.30	0.18	0.42	0.36	1.0
Zinc (mg/l)	0.14	0.12	0.30	0.18	0.42	0.36	5
Chlorophyl **a** (mg/l)	2	4	6	2	6	4	Not specified

Total coliforms (CFU/100 ml)	Nil	Nil	Nil	nil	Nil	Nil	0.0

4.1.6.1 *Temperature*

Temperature is a prerequisite for biological activities especially enzymatic and biochemical reactions that are temperature dependent. Temperature affects the physical, chemical and biological processes in water bodies. Water temperature varies with season, elevation, geographic location, and climatic conditions and is influenced by stream flow, streamside vegetation, groundwater inputs, and water effluent from industrial activities.

The results show an average of 21.1^{0}C, the highest temperature recorded was in sampling station 5 in the lower command area and the lowest was 19.4 in sampling station 1 and 2 upstream of dam and at dam axis respectively. The temperatures recorded are good for survival of fish. The metabolic rate of aquatic organisms such as fish increases with temperature, thus increasing their demand for oxygen; while on the hand, an increase in stream temperature reduces the capacity of water to hold dissolved oxygen. Such conditions stress the fish and make them vulnerable to attack by disease causing organisms, which may have flourished in such conditions. Therefore, increasing temperatures can threaten fish survival. Removal of streamside vegetation and discharging warm water from industries are the main causes of increased stream temperatures (Watershed Protection Plan Development Guidebook).

4.1.6.2 *Dissolved Oxygen (DO)*

It is a prerequisite for aerobic respiration and is responsible for self-purification processes in natural waters. Its abundance and saturation often directly reflects high biodiversity in aquatic ecosystems. The amount of dissolved oxygen in streams is dependent on several factors, such as the water temperature, the quantity of sediment in the stream, the amount of oxygen taken out of the system by respiring and decaying organisms, and the amount of oxygen put back into the system by photosynthesizing plants, stream flow, and aeration. The ability of water to hold dissolved oxygen is inversely proportional to temperature whereby the amount of DO reduces as temperature increases. Fish species requirements for the dissolved oxygen differ (Watershed Protection Plan Development Guidebook) e.g. Trout need DO levels in excess of 8 mg/liter, striped bass prefer DO levels above 5 mg/l, and warmest water fish need DO in excess of 2 mg/l (Watershed Protection Plan Development Guidebook). Conditions of low levels of DO mostly support life of small sized, hardy fish species and this explains the dominance of *Clarias casonii* in the fish catches given the low records of dissolved oxygen at all the sampling (3.4 at P1 to 0.95 and P5). Accordingly, the level of DO of 0.95 is below the level that can sustain fish growth, although the people in that area told us there were some *Barbus species*[9].

4.1.6.3 *Electrical Conductivity (EC)*

ECwas measured as it indicates the ability of water to conduct an electric current and is correlated with concentrations of Total Dissolved Solids (TDS). Its continuous monitoring in rivers is useful in the management of temporal variations in TDS and major ions. TDS is directly proportional to electrical conductivity and influences salinity. Results show that the average EC was 1,140 µS/cm. 50% of the samples had EC below 800µS/cm. The lowest EC was 496µS/cm (dam axis) and the highest was 2470µS/cm (lower command area).

If EC is between 800-2500 µS/cm, it shows that water can be consumed by humans, although most would prefer water in the lower half of this range if available, used for irrigation, requires special management

[9] *https://extension.psu.edu/interpreting-water-tests-for-ponds-and-lakes*

including suitable soils, good drainage and consideration of salt tolerance of plants and suitable for all livestock. According to the results, the water quality within the project area fits within this scenario. If EC is below 800 µS/cm then the water is good for drinking water for humans (provided there is no organic pollution and not too much suspended clay material), generally good for irrigation though some care must be taken, particularly with overhead sprinklers, which may cause leaf, scorch on some salt sensitive plants and suitable for all livestock and 50% of the areas sampled meets the second scenario.
Conductivity is the ability of a substance to conduct electricity. The conductivity of water is a more-or-less linear function of the concentration of dissolved ions and like TDS, it is a general indicator of ion concentrations and affects taste. All natural waters contain some dissolved solids due to the dissolution and weathering of rock and soil. Some but not the entire dissolved solids act as conductors and contribute to conductance. Waters with high total dissolved solids (TDS) are unpalatable (Watershed Protection Plan Development Guidebook). Single measurements of EC above 1,000 µS/cm could be indicative of an existing water quality problem[10]. The results of this study showed conductivity levels higher than 1000 µS/cm at P3 (1235), P5 (2470) and P6 (1500) implying that water quality in those areas is not good for sustaining life. According to federal drinking water standards, 500mg/l is the TDS standard but in the project area studies showed higher levels at P3 (618), P5 (1236) and P6 (748) implying that state of the water quality in some areas is already compromised.

4.1.6.4 *pH*

Acidity and Alkalinity influence many biological and chemical processes in water bodies and were measured. pH is a measure of the acid balance of a solution and is defined as the negative of the logarithm to the base 10 of the hydrogen ion (H^+) concentration. The pH scale runs from 0 and 14 (i.e. very acidic to very alkaline), with pH 7 representing a neutral condition. At a given temperature pH (or the hydrogen ion activity) indicates the intensity of the acidic or basic character of a solution and is controlled by the dissolved chemical compounds and biochemical processes in the solution. Acidity and alkalinity are the base and acid- neutralizing capacities (ANC) of water and are usually expressed as $mmol^{-1}$. The pH of water affects the solubility of many toxic and nutritive chemicals; therefore, the availability of these substances to aquatic organisms is affected. As acidity increases, most metals become more water soluble and more toxic. Toxicity of cyanides and sulfides also increases with a decrease in pH (increase in acidity). Ammonia, however, becomes more toxic with only a slight increase in pH.

The acidity of irrigation water is expressed as pH (< 7.0 acidic; > 7.0 basic). The normal pH range for irrigation water is from 6.5 to 8.4. The pH results for this study were almost neutral. However, records for P5 (6.05) and P6 (6.14) were out of range. Abnormally low pH's may cause accelerated irrigation system corrosion where they occur. High pH's above 8.5 are often caused by high bicarbonate ($HCO3^-$) and carbonate ($CO3^{2-}$) concentrations, known as alkalinity (Bauder, Waskom, Sutherland and Davis). The pH tending towards neutral favors fish growth while pH less than 6.5 may result in stunted, reduced or even absent fish populations[11].

4.1.6.5 *Total Suspended Solids (TSS)*

TSS of a water sample corresponds to non-filterable and filterable residues. TSS was measured as it is directly proportional to turbidity, colour transparency and secchi depth. TSS is also a direct measure of siltation in rivers which drain heavy cultivated catchments. Sediment are usually measured as a

[10] https://extension.psu.edu/interpreting-water-tests-for-ponds-and-lakes
[11] https://extension.psu.edu/interpreting-water-tests-for-ponds-and-lakes

concentration of total suspended solids (TSS). Sediment is a natural component of streams, but excessive sediment can be carried into streams and rivers from erosion of unstable stream banks, construction sites, agricultural activities, and urban runoff. Turbidity and or TSS can reduce light penetration, decreasing algal growth, and low algal productivity can reduce the productivity of aquatic invertebrates, a food source of many fish. Average TSS concentrations of 25 mg/l has been suggested as an indicator of unimpaired stream water quality (Holbeck-Pelham and Rasmussen, 1997), however, results of the study showed TSS below 25 mg/l which implies that TSS is not a problem in the project area.

4.1.6.6 *Phosphorus and Nitrogen*

These are macro-nutrient which determine aquatic productivity and trophic state. Total phosphorous and total nitrogen are essential nutrients necessary for the growth of algae and other plants upon which other aquatic life is dependent. These nutrients usually occur in low levels in surface water. Excessive concentrations of the nutrients, however, can over-stimulate aquatic plant and algae growth (*eutrophication*). Dense algal blooms or rapid plant growth can occur in waters rich in phosphorus because phosphorus is always the limiting nutrient for eutrophication since it is typically in shortest supply. Algal blooms can cause an increase in BOD by way of respiration and decomposition after death, thus depriving fish and invertebrates of available dissolved oxygen in the water (Watershed Protection Plan Development Guidebook). Typical sources of excess nutrients are human and animal wastes and fertilizers. Therefore, care should be taken to avoid over fertilization in the project area. Nitrate-nitrogen concentrations above 3 mg/l and any detectable amounts of total phosphorus (above 0.025 mg/l) may be indicative of pollution from fertilizers, manures or other nutrient-rich wastes[12]. The results of this study show that nitrogen is below dangerous levels however, phosphorus is too far above that standard. This signifies over fertilization and means should be devised to reduce the nutrient levels in order to control nuisance growth of aquatic plants and algae. This can be accomplished by reducing the use of fertilizers near the water.

4.1.6.7 *Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)*

BOD and COD were measured to indicate a measure of the amount of biologically degradable organic matter present in a water sample. Hence, it is a measure of the amount of organic pollution in the rivers. It is an indirect indicator of the pristine of an aquatic environment. COD was measured to indicate susceptibility to oxidation of organic and in organic matter present in a water body. Hence, it is a direct indicator of pollution.

Biochemical oxygen demand (BOD) is a measure of the amount of oxygen that bacteria will consume while decomposing organic matter under aerobic conditions while chemical oxygen demand (COD) is a measure of the total quantity of oxygen required to oxidize all organic material into carbon dioxide and water regardless of whether biologically available or inert organic matter, and Bacteria decompose these organic materials using dissolved oxygen, thus reducing the DO present for fish.

4.1.6.8 *Metals*

Metals can accumulate in aquatic environments and cause toxic effects on aquatic life and increase health risks of drinking water. These chemicals are at very low concentrations in the natural environment, and they are typically introduced to surface waters as waste from human activities. Lead, zinc, manganese and copper are some of the metals of concern for human and aquatic life and affect fish in some ways and when fish are exposed to either of these at certain concentrations, gill tissues are damaged and death by

[12] https://extension.psu.edu/interpreting-water-tests-for-ponds-and-lakes

asphyxiation can occur. (Watershed Protection Plan Development Guidebook). Lead also prevents the uptake of iron leading to anemia, inhibits brain cell development in children and can cause a variety of neurological disorders while copper is also toxic to juvenile fish. (Watershed Protection Plan Development Guidebook).

i. Iron and Manganese

These metals are needed by aquatic biota but when their concentrations are too high, they may become harmful and adversely affect pond aesthetics by precipitating as an orange-brown coating on the pond bottom, docks, and vegetation. These precipitates may also smother aquatic life and they may cause injury to plants that are irrigated with such water. Iron concentrations above 0.3 mg/L and manganese concentrations above 0.05 mg/l are problematic and may affect the reproduction and feeding habits of fish and other animals. High concentrations of iron sometimes result in increased acidity of water—killing or hurting aquatic life[13]. The results of this study show that the iron concentration is safe as its below 0.3 mg/l at all sampled points, however, manganese was far above the standard of 0.05 mg/l at all the sampled points. During sampling, there were signs of red deposits at the bottom surface, which was suspected as excess iron concentration, but the laboratory results have proved otherwise that it is probably due to manganese.

4.1.6.9 *Faecal Coliform*

Coliform bacteria was investigated. Their presence is a confirmation test of the presence of human and animal waste contamination. Since the catchments have water borne epidemics like cholera, typhoid and dysentery, the measurement of these tests enables the provision of information on the linkage between water contamination and out breaks of epidemics.

Fecal coliform, found in the intestines of warm-blooded animals, is the bacteria for which surface water quality standards are measured. Fecal coliform bacteria are used as an indicator of disease causing pathogens in the aquatic environment. Typical sources of bacteria are sewage from septic system failure and storm water overflows, poor pasture management and animal-keeping practices, pet waste, and urban runoff. High bacteria levels can limit the uses of water for swimming or contaminate drinking water in groundwater wells. The presence of excessive bacteria also may indicate other problems, such as low DO. The results of this study did not record any coliforms in the project area thus care should be taken during project implementation to avoid contamination.

4.1.7 Noise

Undertaken in November 2017 noise-monitoring measurements were conducted at 28 locations and results showed that 50% of the sampling points had average noise levels slightly above the permissible limits with a few exceptions. Exceeds at the time of the measurement were associated with daily activities in the Project Area (e.g. human conversations, vehicles, welding etc.) as well as from fauna, particularly birds and goats, as well as the effect of occasional wind on vegetation.

4.1.8 Air Quality

Air quality measurements were undertaken and the results are listed in table below which show that, the concentration of $PM_{2.5}$ and PM_{10} were generally well below the national limits (60 and 100 µg/m^3, respectively) at all the sampled points, and the WHO standards which are 25 and 50 µg/m^3, respectively. In conclusion, the existing air quality in the project area is not affected by any forms of pollution except by dust associated with vehicular movements.

[13] https://extension.psu.edu/interpreting-water-tests-for-ponds-and-lakes

Table 24: Noise Measurements

No	Monitoring station	Coordinates (WGS 1984) and Time	Noise level/dB(A)				Background noise sources
			Max	Min	Average (Leq)	Permissible noise level	
1.	Proposed Dam site in Kyamazinga village, Kagaara parish, Kabuyanda Sub-county, Isingiro district.	S00.90493 E030.59731 10:55am	69.0	31.4	45.1	50	Wind, Birds' sound and crickets
2.	Proposed reservoir site, in Kyamazinga village, Kagaara parish, Kabuyanda Sub-county, Isingiro district.	S00.89801 E030.59751 11:36am	60.3	33.9	48.1	50	Wind, Birds' sound and crickets
3.	Proposed in take point in Luwenda village, Kabuyanda Sub-County, Isingiro district.	S00.89370 E030.59745 12:20pm	56.7	36.8	43.5	50	Wind, Birds' sound and crickets
4.	Converging point of Mishumba stream and Kasharira stream.	S00.90855 E030.60024 1:04pm	66.8	41.3	49.5	50	Water flow, Birds' sound and crickets.
5.	Residential house in Kagoto village, Kabuyanda Sub-County, Isingiro district.	S00.90687 E030.60028 1:04pm	79.3	39.7	55.2	50	Noise from the people around the area.
Irrigation command area							
6.	Residential area	S00.95845 E030.63110 4:26 pm	68.4	39.1	55.1	50	Goats bleating and Birds' sound.
7.	Residential area	S00.95780 E030.63093 4:42 pm	56.3	32.0	44.5	50	Goats bleating, crickets and Birds' sound
8.	Residential house	S00.95588 E030.63051 4:59 pm	56.1	33.5	56.1	50	Crickets and Birds' sound.
9.	Kabuyanda Town Council Head quarters	S00.95030 E030.62696 5:15 pm	76.0	31.8	49.8	50	Birds' sound and noise from people around the area.
10.	Kabuyanda Health Centre IV	S00.94783 E030.62551 5:27 pm	86.1	28.7	59.0	50	Wind and Bird sound.
11.	Residential area	S00.95764 E030.62306 6:04pm	80	39.3	62.0	50	Noise from the people around the area.

No	Monitoring station	Coordinates (WGS 1984) and Time	Noise level/dB(A)				Background noise sources
			Max	Min	Average (Leq)	Permissible noise level	
12.	Residential area	S00.95764 E030.62284 6:17pm	78.0	33.3	58.4	50	Goats bleating and Birds' sound.
13.	Tukundane fish farm office	S00.99285 E030.61751 10:28am	65.5	33.4	45.9	50	Noise from the people around the fish farm office.
14.	Residential area in Kashaka village, Kabuyanda Town Council, Isingiro district.	S00.00051 E030.61763 11:17am	86.4	40.8	69.6	50	Noise from the people around the area.
15.	Kabuyanda Trading Centre	S00.94510 E030.62549 11:41am	95.7	50.2	66.6	55	Noise from people in the Centre, Welding activities, motorcycle movement and soft music.
16.	Omani Junior Nursery and Primary school in Kabuyanda Town Council, Isingiro District.	S00.96070 E030.62078 12:08 pm	93.0	45.3	68.0	55	Vehicle movement, Pupils at school and Birds' sound.
17.	Omukalere Trading Centre in Nyampiche 1 village, Elyango Parish, Kabuyanda Town Council.	S00.98044 E030.61827 12:22 pm	76.8	43.3	54.0	55	Motorcycle movement
18.	Residential area in Kasha´ka cell, Iryango Ward, Kabuyanda Town Council.	S00.99131 E030.61131 12:46 pm	65.2	29.2	48.7	50	Birds' sound
19.	Iryango Primary School	S00.98701 E030.60863 12:46 pm	82.4	33.0	66.2	55	Birds' sound and noise from pupils at school.
20.	Kabegaramire Trading Centre, Kigalama Zone, Kabuyanda Town Council.	S00.97668 E030.60754 1:33pm	78.5	42.5	58.5	55	Noise from people in the trading Centre.
21.	St Moses Nursery and Primary School.	S00.97011 E030.60985 12:46 pm	88.0	44.9	68.8	50	Noise from people in the trading Centre.
22.	Kabuyanda Model Primary School.	S00.94750 E030.62183 3:33 pm	75.0	38.0	52.9	50	Noise from pupils at school.

No	Monitoring station	Coordinates (WGS 1984) and Time	Noise level/dB(A)				Background noise sources
			Max	Min	Average (Leq)	Permissible noise level	
23.	Kisyoro Trading Centre	S00.94278 E030.60849 3:45pm	71.0	35.2	49.6	55	Goats bleating, Birds' sound, and motor cycles movement.
24.	Kinangi Trading Centre, Kisyoro ward, Kabuyanda Town Council.	S00.93074 E030.61758 4:02pm	70.0	33.7	55.0	55	Soft music from the nearby shop.
25.	Kagoto Trading Centre	S00.92593 E030.636207 4:20pm	66.8	32.4	54.3	55	People conversing in the background.
26.	No1 Trading Centre, Kigabagaba II cell, Kabuyanda Sub-County.	S00.91434 E030.64267 4:35pm	62.2	32.4	69.3	55	Noise from the people around the area, Thunder and birds' sound.
27.	Kabugu Heath Center II	S00.91400 E030.64449 4:44pm	58.9	28.0	45.9	55	Birds' sound and wind.
28.	Kigabagaba Trading Centre, Kabugu village, Kabuyanda Sub-County.	S00.90048 E030.64776 5:03pm	83.0	43.1	67.8	55	Noise from the people around the area, motorcycle movement and birds' sound.

Table 25: Air Quality Measurements

No.	Sampling Locations	Coordinates (WGS 1984) and Time	$PM_{2.5}$ ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	RH (%)	AT (^oC)
1.	Proposed Dam site in Kyamazinga village, Kagaara parish, Kabuyanda Sub-county, Isingiro district.	S00.90493 E030.59731 10:55am	1	8	60.1	27.3
2.	Proposed reservoir site, in Kyamazinga village, Kagaara parish, Kabuyanda Sub-county, Isingiro District.	S00.89801 E030.59751 11:36am	2	11	50.6	30.2
3.	Proposed in take point in Luwenda village, Kabuynda Sub County, Isingiro District.	S00.89370 E030.59745 12:20pm	3	21	52.6	31.2
4.	Converging point of Mishumba stream and Kasharira stream.	S00.90855 E030.60024 1:04pm	3	22	50.2	31.1
5.	Residential house in Kagoto village, Kabuyanda Sub-County, Isingiro District.	S00.90687 E030.60028 1:04pm	1	6	45.0	34.8
Irrigation Command Area						
6.	Residential area	S00.95845 E030.63110 4:26 pm	2	23	48.6	30.8
7.	Residential area	S00.95780 E030.63093 4:42 pm	1	7	51.3	29.2
8.	Residential house	S00.95588 E030.63051 4:59 pm	1	5	54.5	27.7
9.	Kabuyanda Town Council Head quarters	S00.95030 E030.62696 5:15 pm	1	4	50.7	28.6
10.	Kabuyanda Health Centre IV	S00.94783 E030.62551 5:27 pm	1	5	52.1	28.2
11.	Residential area	S00.95764 E030.62306 6:04pm	2	9	56.9	28.8
12.	Residential area	S00.95764 E030.62284 6:17pm	3	8	62.8	25.5
13.	Tukundane fish farm office	S00.99285 E030.61751 10:28am	3	10	53.7	30.4
14.	Residential area in Kashaka village, Kabuyanda Town Council, Isingiro district.	S00.00051 E030.61763 11:17am	1	5	52.4	31.7
15.	Kabuyanda Trading Centre	S00.94510 E030.62549 11:41am	7	49	50.8	31.7
16.	Omani Junior Nursery and Primary school in Kabuyanda Town Council, Isingiro District.	S00.96070 E030.62078 12:08 pm	3	22	54.7	27.2

No.	Sampling Locations	Coordinates (WGS 1984) and Time	$PM_{2.5}$ ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	RH (%)	AT (^oC)
17.	Omukalere Trading Centre in Nyampiche 1 village, Elyango Parish, Kabuyanda Town Council.	S00.98044 E030.61827 12:22 pm	1	4	54.1	29.8
18.	Residential area in Kasha´ka cell, Iryango Ward, Kabuyanda Town Council.	S00.99131 E030.61131 12:46 pm	0	2	49.5	30.3
19.	Iryango Primary School	S00.98701 E030.60863 12:46 pm	1	5	49.8	31.5
20.	Kabegaramire Trading Centre, Kigalama Zone, Kabuyanda Town Council.	S00.97668 E030.60754 1:33pm	4	15	48.7	32.8
21.	St Moses Nursery and Primary School.	S00.97011 E030.60985 12:46 pm	7	55	49.1	32.8
22.	Kabuyanda Model Primary School.	S00.94750 E030.62183 3:33 pm	1	11	49.9	30.4
23.	Kisyoro Trading Centre	S00.94278 E030.60849 3:45pm	2	14	47.0	30.1
24.	Kinangi Trading Centre, Kisyoro ward, Kabuyanda Town Council.	S00.93074 E030.61758 4:02pm	1	9	47.2	30.1
25.	Kagoto Trading Centre	S00.92593 E030.636207 4:20pm	2	10	48.0	31.0
26.	No1 Trading Centre, Kigabagaba II cell, Kabuyanda Sub-County.	S00.91434 E030.64267 4:35pm	4	15	57.1	29.4
27.	Kabugu Heath Center II	S00.91400 E030.64449 4:44pm	2	6	57.4	29.1
28.	Kigabagaba Trading Centre, Kabugu village, Kabuyanda Sub-County.	S00.90048 E030.64776 5:03pm	5	15	58.1	28.4

4.2 Biological Environment: Flora

The project area is a combination of modified vegetation with farmlands (including tree farming), grasslands and pasturelands**.** Rwoho Central Forest Reserve (CFR) dominates the centre and lower part of the catchment, where a combination of forest, mix forest-shrub-grass, and savanna can be observed. Outside the CFR, the catchment is mainly characterised by cropland, largely banana plantations. Deforestation and conversion to farmland has left many hills bear with no vegetation cover encouraging soil erosion and landslides on the fragile slopes. In Rwoho CFR, reforestation occurred with non-indigenous species. Overall, the main vegetation type is anthropic landscapes. Ninety-one plant species were recorded in the project area and none of the species was of conservation concern according to IUCN Redlist of 2017. **The project area is classified as a modified non-critical habitat**.

Rwoho CFR is a 9,000 Forest Reserve managed by the National Forestry Authority (NFA), on behalf of the Government of Uganda (GoU) based on the National Forestry and Tree Planting Act 8/2003. The reserve lies on top of a large flat-topped ridge running from North to South. Of the 50 km of external boundary of Rwoho CFR, approximately 9 km follows streams while 41 km is an artificial boundary of straight lines maintained as a planted cutline with earth corner cairns and boundary-directional trenches. Rwoho CFR is classified as a plantation development forest as per the Forest Management Plan for Bugamba and Rwoho Central Forest Reserves (2012-2022). Rwoho CFR is largely degraded and partially restored with non-indigenous species (*Pinus caribaea, Pinus ocarpa* and *Eucalyptus sp.*). Planting of conifer species started in 1964. In the area under reforestation, NFA had a *taungya* farming arrangement, where licensed tree farmers were also allowed to grow crops (mainly beans, maize, Irish potatoes, millet) during tree establishment and gradually cease crop cultivation as the tree canopy closes, so to utilize the land, control weeds, reduce establishment costs, generate early income and stimulate the development of the woody perennials species.

Langdale-Brown *et al*. (1964) reports that Rwoho was characterised by two vegetation communities classified as types D3 (*Albizzia-Markhamia* forest, 45 km^2: 50%) and the other classified as type Q4 (*Themeda-Chloris* grass savanna, 45 km^2: 50%). The Rwoho and Kijanabolola Forest Reserves Biodiversity Report prepared in 1993 described the vegetation of the forest reserve as grass savannah together with original native vegetation characterized by medium altitude moist semi-deciduous forest of *Albizia-Markamia* dominance. However, the 2006 Forest Management Plan reported that "**All forests in the valleys are highly degraded. Trees are small and natural regeneration is rare**". The Plan also mentioned that "the forest is partially degraded, **mainly because of its proximity to communities and easy access from all sides**", and that "there was a period when the country public systems failed due to political upheavals. Then, the forests were not well protected. People entered into the forest and cultivated it, illegal logging took place and fires were not checked. The result was burnt up crops, reduction of tree cover and conversion of the reserve to grazing land. Full control was restored in the early 1990s but financial capacity to reforest the degraded areas was not available".

As part of the feasibility study, an assessment of the current land cover of the catchment area was carried out in 2017. The image in the following page and the table below summarize the results of the assessment. The feasibility study concludes that "the forested area, which originally had to cover a larger part of the catchment, has been reduced to levels below 25% due to deforestation; the remaining part is confined on small areas in the north-west part of the watershed". To be noted that the assessment could not distinguish between natural forest and tree planting.

Table 26: Landcover in the catchment area (Feasibility study, 2017)

Landcover class	Area (km^2)	Area (%)
Cropland	26.8	29.9
Forest	21.8	24.3
Mosaic forest-shrubland-grassland	20.2	22.5
Savannah	19.6	21.8
Bare ground	0.8	0.9
Urban and built	0.6	0.7
	89.7	100.0

As Rwoho CFR contains a large proportion of plant species of non-native origin, and as human activity has substantially modified the area's primary ecological functions and species composition, Rwoho CFR is classified as a modified (not natural) habitat.

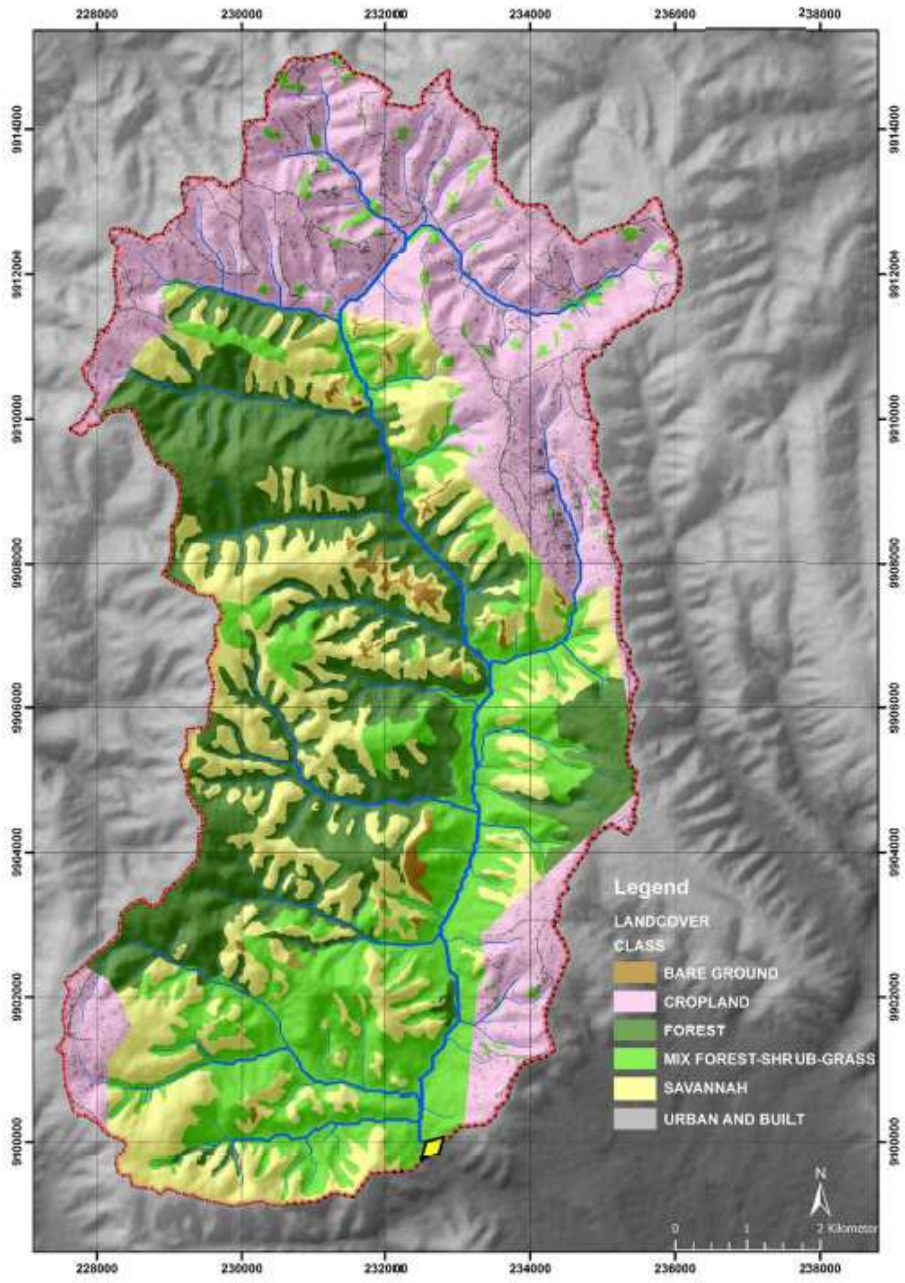


Figure 16: Land Cover Classification for the catchment area[14]

4.2.1 Land cover at the inundated area

The dam and the reservoir of the proposed Kabuyanda Irrigation Scheme will be in the Rwoho CFR. The reservoir area has been thoroughly converted by human activities such as deforestation, agricultural expansion and reforestation with exotic species and therefore the main vegetation type is anthropic landscapes.

The dam and the reservoir were initially supposed to cover an area of 302 ha. In December 2018, NFA undertook an inventory of the trees within the 302 ha, which is included in Appendix 11 and summarized in

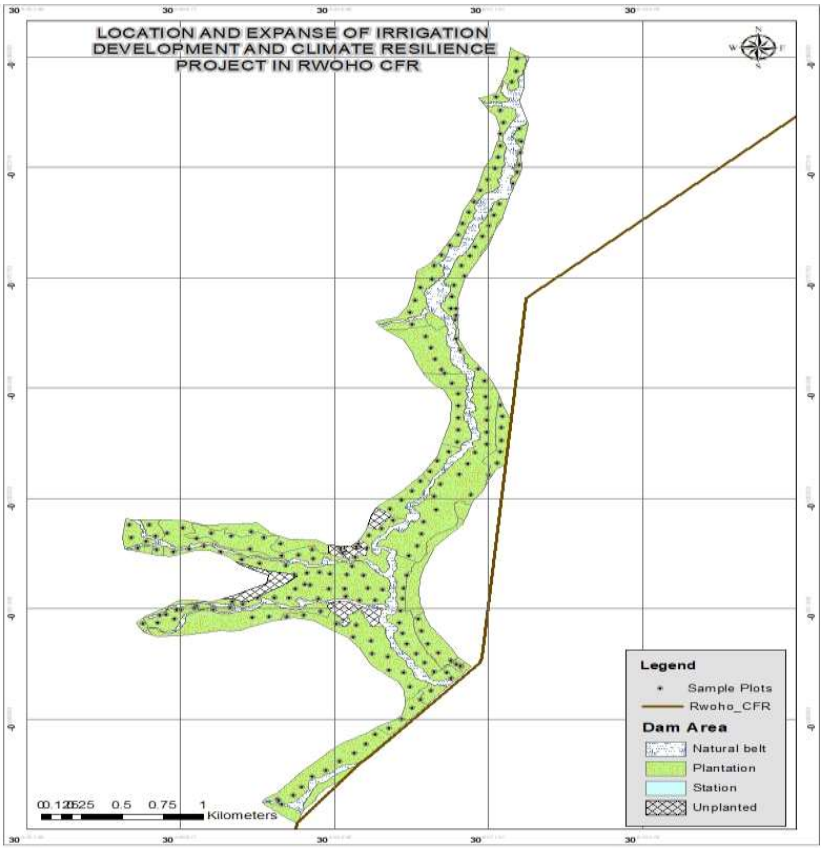
[14] *Source: Studio Ing. G. Pietrangeli S.r.l, Kabuyanda Final Feasibility Report, 2017 (Page 245)*

the table and figure below. The assessment concluded that, out of the 302 ha, 242 ha consisted of tree plantations, including 51.5 ha of plantations established under the Climate Development Mechanism (CDM). **Tree plantations used eucaliptus in 75% over the area, and pine over 25% of the area.** Only 60.52 ha out of 302 ha where kept by NFA as natural belt (this category includes some wetlands along the river, however the extent of the wetland was not assessed during the December 2018 field assessment by NFA) and nursery. **As the 302 ha initially expected to be inundated contain plant species of non-native origin, and as human activity has substantially modified the area's primary ecological functions and species composition, the assessment confirms that the 302 ha is a modified habitat.**

Table 27: Land cover in the 302 ha initially identified to be inundated in Rwoho CFR

	Area (ha)
Tree plantation (pine and eucaliptus) - Individuals licensed	190.92
Tree plantation (pine and eucaliptus) - CDM (Block 3&4)	51.05
NFA Unplanted: Natural Belt (including some wetlands) & Nursery	60.52
Total	**302.47**

Figure 17: Land cover in the 302 ha initially identified to be inundated in Rwoho CFR



In the first half of 2019, the optimization of the project design allowed to reduce the inundated area from 302 ha to 100 ha, substantially reducing the impact of the project on Rwoho CFR. The ESIA team consequently carried out an additional land cover assessment specifically for the 100 ha, which is included in Appendix 14 and summarized in the table below. Also in this case, the assessment confirmed the absence of natural forest and the presence of tree plantations of pine and eucalyptus over 94.4 ha out of the 100 ha. Impact on CDM

area was substantially reduced from 51.05 ha to 15.1 ha. An assessment of area covered in wetlands was this time included, which was quantified in 5.6 ha. Once again, the assessment proved that the 100 ha inundated area contains plant species of non-native origin, and that human activity has substantially modified the area's primary ecological functions and species composition; consequently, the 100 ha inundated area is confirmed as a modified habitat.

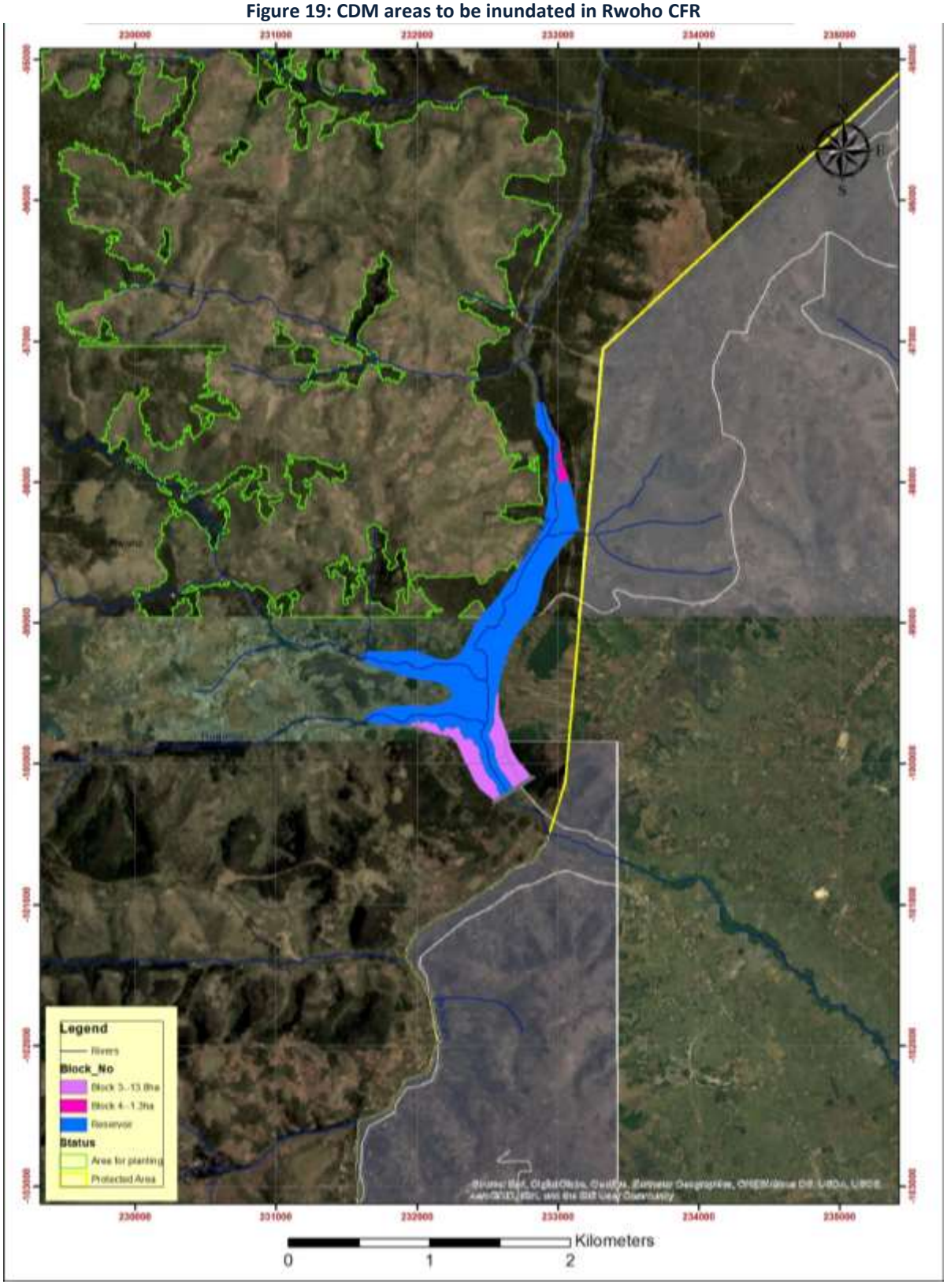
Table 28: Land cover in the 100 ha to be inundated in Rwoho CFR

Type	**Area (ha)**
Tree plantation (pine and eucaliptus) - Individuals licensed	79.3
Tree plantation (pine and eucaliptus) - CDM (Block 3&4)	15.1
Wetland	5.6
Total	**100**

Figure 18: (a) Lower dam area (the end) dominated by fallows with few stands of Pine trees; (b) Upper river with maize gardens on the slopes, the riverine vegetation in the middle and Eucalyptus plantation at the far end

As mentioned, the area to be inundated includes 15.1 ha of plantations established by the National Forestry Authority (NFA) and the forest adjacent community under Collaborative Forest Management (CFM) under Climate Development Mechanism (CDM). This was done as a strategy to mitigate against extremes of weather and climate but also to benefit from the CDM financing mechanisms aimed at sustaining the developments and for resilience to climate. It is to be noted that **the ERPA terminates on December 31, 2019, thus ahead of the commencement of works for the Kabuyanda irrigation project**.

Figure 19: CDM areas to be inundated in Rwoho CFR



The 2019 assessment gave attention to wetlands. Generally speaking, wetlands perform crucial basin-wide functions, including improving water quality, providing resilience against drought and flooding, and sustaining biodiversity. Wetland degradation is already a concern in many areas of the Nile Basin and threatens the ecological functions of these ecosystems. In the project area, the valley bottoms consist of permanent riverine wetlands and floodplains with both aquatic and terrestrial vegetation. The edges of the wetlands have been greatly degraded by human activities. The wetlands found in certain stretches of the river have remnants of *Cyperus sp*, *Typha sp, Phragmites sp, Vossia cuspidata* and *Polygonum coccineum* in areas where the land use has not been altered. To be noted that in the project area there is no cultural nor livelihood value for the papyrus.

Figure 20: Vegetation in the reservoir area with patches of *Cyperus papyrus* along the river

Figure 21: Wetland vegetation at the reservoir

Figure 22: Vegetation scenarios across the R. Mishumba and its environs

Figure 23: (a) ecotone, 1-*Typha domingensis* and *Cyperus papyrus* at the background of the wetland of Dam area. The wetland is in between plantations as shown in background; (b) Typha domingensis and Cyperus dives zone of the upper wetland surrounded by Eucalyptus plantation. The wetland measures between 20-60m wide.

4.2.2 Land cover at the restoration/reforestation area

Dam and reservoir will take up 100 ha (1.1%) of Rwoho CFR. To mitigate for the loss of trees, the project will finance restoration/reforestation of 500 ha within Rwoho CFR (Section 8.3). As per explicit agreement between NFA and MWE, **indigenous species** will be used for the replanting (Appendix 15). The Forest Management Plan for Rwoho CFR will be updated prior to the commencement of the work and it will indicate the the reforested area shall remain intact for biodiversity conservation in line with the present ESIA (Appendix 15).

NFA identified the area within Rwoho CFR directly north of the inundated area to benefit from the restoration/reforestation activity. The biodiversity survey carried out in 2019 (Appendix 14) gave specific attention to the establishment of the baseline for the part of Rwoho CFR identified for replanting. The area is composed of several prominent vegetation mosaics distributed across the area. The vegetation mosaics have been influenced by mostly soil depth and the moisture index of the area.

(i) ***Loudetia Grassland***: The summits and slopes characterized by rocky soils in the south, are dominated by *Loudetia kagerensis* (85%), *Cymbopogon nardus* (5%), *Hyparrhenia newtonii* (10%), and *Andropogon schirensis* (5%) all grasses, and associated with trees such as Parinari curatellifolia as the largest, *Albizia adianthifolia*, *Protea gaguedi*, *Acacia abyssinica* and *Catha edulis* (mairungi tree). **Most of the fairly-large trees have been destroyed and replaced by Eucalyptus plantations, the remnant trees are cleared for charcoal production among others**.

(ii) **The valleys or riverine** in the South-East is located at an elevation of 1,480 m, are characterized by Tropical High Forest, the upper canopy is dominated by *Macaranga schweinfurthii, Hallea stipulosa, Prunus africana, Alangium chinense, Ehretia cymosa*, and *Alangium chinense* all trees. The ground cover is dominated by *Piper umbellatum, Asplenium elliotii*, and *Dicliptera laxata* herbs. *Gouania longispicata*, *Adenia bequaertii, Toddalia asiatica*, *Peponium vogelii*, and *Motandra guineensis* are frequently encountered species of lianas.

(iii) **The Northern forest** or the neck is located at an elevation range between 1,700-1,800 m above, dominated by *Vepris nobilis* by 72%, *Catha edulis* 15%, *Celtis africana* as trees of high canopy, the second strata is dominated by shrubs such as; *Dovyalis macrocalyx, Pittosporum mannii,* and *Ehretia cymosa*. The forest floor is dominated by *Dicliptera laxata, Achyranthes aspera, Oplismenus hirtellus* and *Doryopteris kirkii* herb. The forest is associated with some species of vines which makes it hard to wade through the thick vegetation. *Pterolobium stellatum, Jasminum abyssinicum, Uvaria angolensis*, and *Grewia pubescens* are frequently encountered species of lianas in area.

Figure 24: (a) *Fagarapsis angolensis* (Rutaceae) reprouting in Eucalyptus plantation. The tree species can hardly be seen at maturity all forests apart from Budongo. (b) *Prunus africana* existing in Eucalyptus plantation in the restoration/reforestation area. The area was dominated by *Prunus africana*, Macaranga schweinfurthii, *Fagaropsis angolensis*, and *Hallea stipulosa*. (c) Debarking of *Prunus africana*. The species contains high medicinal values. (d) Destruction of *Hallea stipulosa* of the reiverine forest in the restoration/reforestation area towards the northern sector.

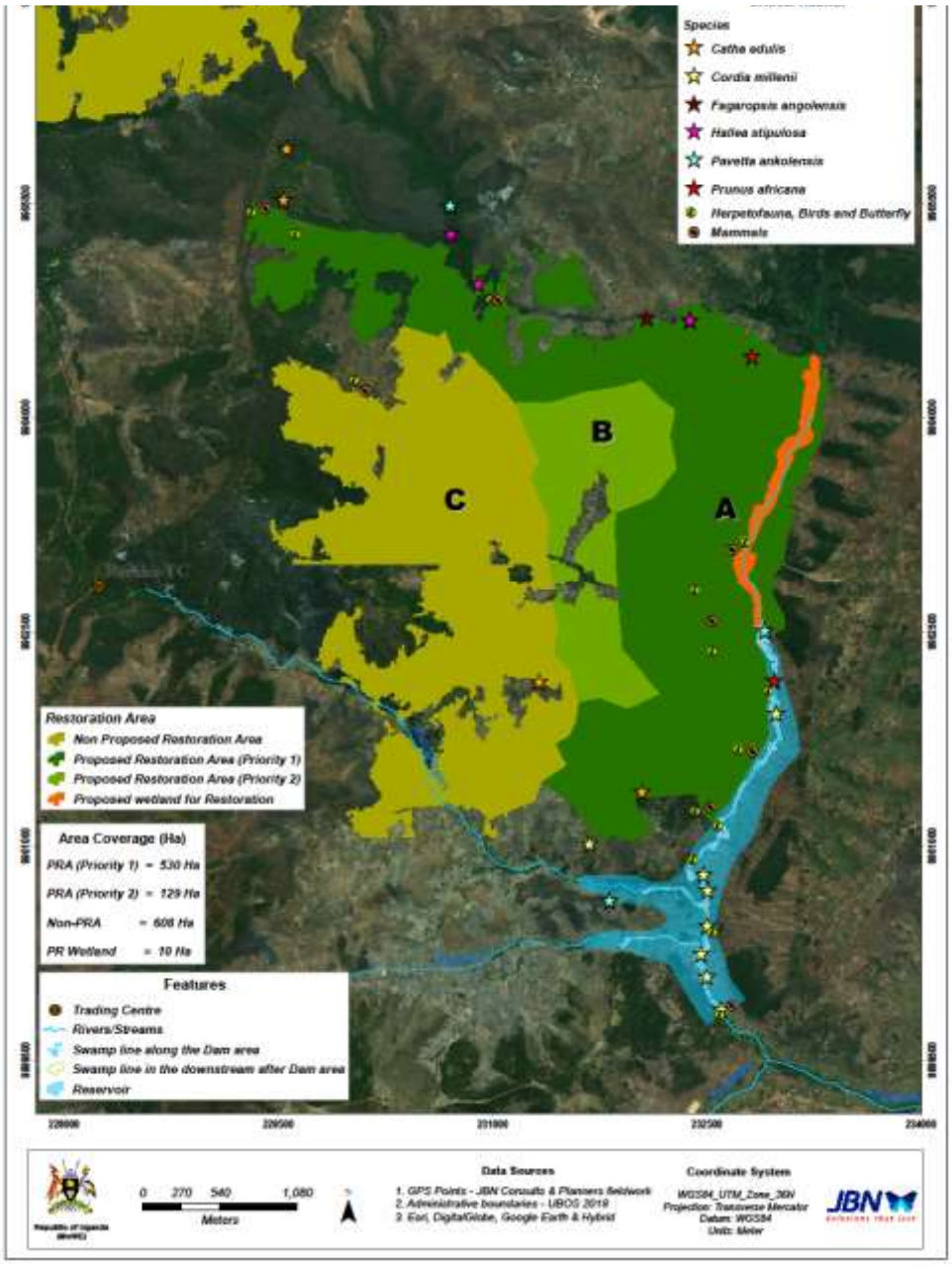
Where remnants of native forest are present, the project will undertake restoration through enrichment planting; while reforestation will be carried out in the rest of the area where natural forest is no longer present. The biodiversity survey (Appendix 14) identified remnants of natural forest and higher biodiversity value along the east and northern border of the potential restoration area with few species listed under the IUCN red data list at the national level and globally (Figure 21). At the far north-western part of the potential restoration area there are also patches of natural forest where small mammals and herptofauna was recorded. Based on this, it was suggested to prioritize this area (Priority A in Figure 21) for restoration activities. Also, this area presents around 10 ha of partially degraded wetlands, which would be restored under the project, thus mitigating for the loss of 5.6 ha of wetland which will be inundated.

Moving towards the center of the potential restoration area (Priority B), the area is rocky, with more of *Loudetia kagerensis* grassland with shrub, fallows and dominated by *Bidens grantii* herb and remnant Parinari trees on rocky soils. The area has low biodiversity mix and with pronounced rocky outcrops which has impacted on plant growth, and it has fairly more pronounced cultivation with large section of tree plantations with Pines and Eucalyptus (Figure 22).

Moving towards the south-west part of the identified potential restoration area (Area C), the environment is increasingly degraded, heavily encroached in terms of loss/degradation of its natural forest cover through agro-forestry, therefore is has low biodiversity composition. Reforestation activities would prevail.

The micro-catchment management plans (CMPs) to be carried out under sub-component 1.3 will include a dateiled baselane survey for the area to be restored/reforested.

Figure 25: Proposed restoration/reforestation area in Rwoho CFR, including wetlands restoration



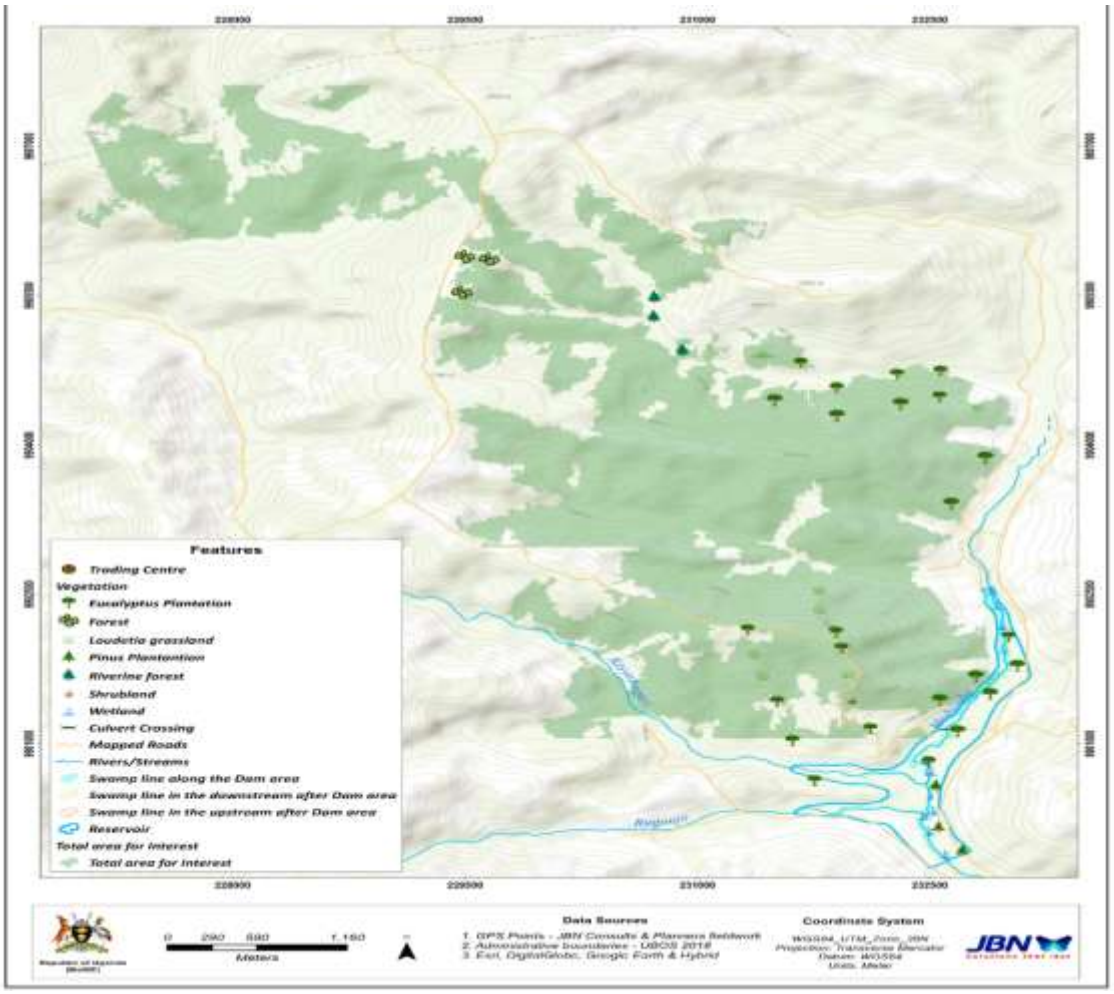


Figure 26: Floristic Composition, Distribution, Density and Diversity of Vegetation of the Restoration/reforestation area and inundation area

Finally, 22 invasive alien plant species were registered in the proposed restoration/reforestation area (Appendix 14, Figure in next page). The existence of invasive species could have been due to a host of anthropogenic activities conducted in the entire forest reserve such as: monoculture or agro-forestry, agriculture, lumbering and charcoal burning among others.

Figure 27: Restoration/reforestation area in Rwoho CFR with invasive species and human enchroachment. (a) Bidens grantii invaded area in the restoration area. Species colonies an area after cultivation. (b) Charcoal burning on the slopes of the restoration/reforestation area. Parinari and Albizia are the species harvested to serve the purpose.

4.2.3 Land cover at the Irrigation Command Area

The irrigation command area is located within Kabuyanda Town Council, Kabuyanda Sub-County and Kikagate Sub-county. The area is pre-dominantly an agricultural landscape with settlement mostly aggregated around Kabuyanda Town Council. Within Kabuyanda Town council, there some scattered trees planted or existing as remnants of the natural vegetation that existed within the area. However, the rest of the area are farmlands. The dominant plants recorded included; Trees; *Erythrina abyssinica, Markharmia lutea, coffea robusta,* Eucalyptus *and Euphorbia tirucalli.* The crops included: bananas, beans, maize, cassava, Irish potatoes, sorghum, and millet. At the end of the irrigation command area, there existed a remnant natural woodland vegetation.

Figure 28: Common crop types in the project areas

Table 29: Common cropping systems in the command area

Species	Common cropping system
Banana *(Musa species)*	Plantations with bean understory
Beans (*Phaseolus* vulgaris)	Intercropped with maize, banana, coffee, cassava
Cabbages (*Brassica oleracea*)	Monoculture in swamps
Carrots (*Daucus carota*)	Monoculture
Cassava (*manihot esculenta*)	Intercropped with maize and beans
Climbing beans ((Phaseolus sp.)	Monoculture
Coffee *(Coffea canephora)*	Intercropped with maize, beans or banana
Groundnuts (*Arachis hypogaea*)	Intercropped with maize
Irish potato(*Solanum tubersosum*)	Monoculture
Maize(*Zea mays*)	Intercropped with beans, groundnuts, millet, cow peas
Millet(*Eleuisine coracana*)	Intercropped with maize
Passion fruit (*Passiflora edulis*)	Monoculture
Peas (*Pisum* species)	Intercropped with maize
Sorghum (*Sorghum bicolor*)	Monoculture or intercropped with maize
Sweet potatoes (*Ipomoea batatas*)	Monoculture

Mixed cropping was the predominant cropping system observed. Maize and beans were the most commonly grown in mixtures with several other crops. Only a few crops, including passion fruits, sweet potatoes, sorghum and cabbages were observed mostly grown in monoculture. In addition to the crops observed, farmers reported that they also grow tomatoes, green pepper, egg-plants, onions, cocoyam, pineapples, and sunflower and soya bean. Nearly all crops observed were ground in less than 5-acre gardens. A few farmers were reported to have banana plantations exceeding 10-acres. Two passion fruit farmers were visited, each had about 1-acre of the crop. The five most staple crops were reported to be banana, beans, maize, Irish potatoes and sorghum, which were cultivated by most farmers for both domestic consumption and sale. Tree species encountered on farmed land were either scattered on farm, in alleys, along boundaries, in home gardens or woodlots.

Table 30: Tree species observed on farmlands in Kabuyanda sub-county and their reported main uses

Species	Common cultivation method	Main use
Accacia hockii	Scattered on farm	Firewood
Artocarpus heterophyllus	Home garden	Fruit, firewood
Casuarina caninghaminiana	Boundary planting	Timber, poles, firewood
Carica papaya (Papaw)	Home garden	Fruit
Citrus species	Home garden	Fruit
Erythrina abyssnica	Scattered on farm	Fencing, floaters
Eucalyptus grandis	Woodlots, boundary, plantation	Poles, timber, firewood
Euphorbia tirucalli	Boundary planting	Fencing
Ficus species	Scattered on farm	Shade
Grevillea robusta	Boundary and roadside planting	Timber, poles, firewood
Maesopsis eminii	Scattered on farm	Timber, firewood
Mangifera indica (Mango)	Home garden	Fruit, firewood
Markhamia lutea	Scattered on farm	Timber, poles, firewood

Melia azadarachta	Scattered on farm	Poles, firewood, timber
Persea Americana (Avocado)	Home garden	Fruit, firewood
Pinus carribaea	Plantation, boundary planting	Timber
Psidium guajava (guava)	Home garden	Fruit
Sapium ellipticum	Scattered on farm	Firewood, medicine

4.2.3.1 *Crop and Tree Pests and Diseases*

A total of 22 pest and disease problems were observed on crops and trees. The most frequently observed pest was fall armyworm on maize and sorghum, bean aphids and maize aphids. Crop diseases were generally rare (less than 5% of crops per garden), except cassava mosaic which occurred on nearly all cassava plants observed. An algal leaf spot infection on Avocado, especially on lower leaves in dense canopies, and leaf anthracnose on mangoes were prevalent. A severe bacterial wilt infection on *Eucalyptus grandis* was observed in one woodlot. Mole rat damage on sweet potato was observed in one garden while a millipede species was reported by a farmer to be the cause of hollowing damage observed on Irish potato tuber in one garden. A fruit fly was found trapped in a passion fruit garden, and the farmer attributed soft spots observed on the fruits to this pest.

Table 31: Common pests and diseases observed on crops during the study

Pest and Diseases	Host Plant	Observed Symptoms and Signs
Pest		
Banana weevil (*Cosmopolites sordidus*)	Banana	Holes in corm
Bean aphid (*Aphis fabae*)	Beans, maize	Aphid colonies on foliage, leaf discoloration
Bronze bug (*Thaumastocoris pelegrinus*)	Eucalyptus grandis	Leaf discoloration, egg batches, nymphs and mature insects on leaves
Cabbage moth (*Crocidolomia pavonana*)	Cabbage	Holes on head, and fecal materials in head.
Fall armyworm (*Spodoptera frugiperda*)	Maize and sorghum	Perforations on leaves and growing point of plant
Maize aphid (*Rhopalosiphum maidis*)		Colonies on young leaves, leaf mottling
Passion fruit	Fruit fly	Soft spots on fruits
Weaver birds	Climbing beans	Missing floral parts or whole flower
Millipede	Irish potato	Missing portions of tubers
Disease		
Banana bacterial wilt	Banana	Whole plant wilting, vascular browning and water soaked pith
Cassava mosaic	Cassava	Deformed abnormally small leaves, stunted growth
Groundnut rosette	Groundnuts	Stunting, leaf discoloration
Leaf anthracnose	Mangoes	Leaf blotch and discoloration, stunting of plant
Bacterial wilt	Irish potato	Browning and wilting of whole plant
Powdery mildew	*Grevillea robusta*	White powdery substance on leaves, leaf deformation

A Pictorial evidence of some of the pests and diseases affecting crops within the project are shown in figure below.

C. pavonana damage on cabbage

Armyworm infestation on maize

Cassava mosaic

Initial appearance of banana wilt

Figure 29: ***Crop Pests and Disease Problems and their Management Practices in the project areas.***

4.2.3.2 *Approaches to the management of pests and diseases on crops*

There has been sensitization on crop pests and disease management spearhead by the Isingiro District Agricultural Department, focusing especially on the management of recent outbreaks such as fall armyworm on maize, banana bacterial wilt and banana weevil. The district recently received insecticides (striker and rocket) from the Ministry of Agriculture Animal Industry and Fisheries (MAAIF), and distributed them to farmers to control fall armyworm infestation on maize. It was indicated that the district has integrated pest management strategies for major crop pests and diseases in the district. Local communities mentioned management practices on about 60% of the pests and diseases problems they reported, but none of the practices was used for managing tree pests and diseases. Pesticide application was reported to be used for controlling most of the crop pests and diseases. The insecticides used, include dimethoate, striker, rocket, ambush and tufgor. Used packets of Indofil M-45, a contact preventive inorganic fungicide (Mancozeb), were encountered in cabbage, bean and Irish potato gardens, indicating that the fungicide was the most commonly used for controlling crop diseases. Agronomic practices were reported to be used in managing banana weevil, banana bacterial wilt, cutworms on beans, smut disease on sorghum and sweet potato weevils.

Removal of mulch and vegetative materials in a 2-feet radius around the plant was reported to be effective in managing banana weevils. The pest is also trapped by cutting infested plants at the corm and covering the stump with soil or banana leaves. The weevils emerge from the covered stump and are picked and killed. The most common management of banana bacterial wilt was reported to be uprooting and burying infected plants, which is effected through a by-law. Cultural pest management methods reported include (i) use of scare crows to protect cereals and climbing beans against birds, and (ii) a traditional tap against mole rats on banana, maize and sweet potato. The trap comprises of a string tied on a bent wooden stick that is fixed in the ground. In order to lure the rodent, baits such as cassava, sweet potato tubers are provided at the loose end of the string, which is supported by pieces of wood and heap of soil raised slightly above ground. When feeding on the bait, the rodent pulls the string which releases the wooden stick upwards with a force that the collapses the heaped soil on the pest.

4.2.4 Land cover downstream of the Command Area

Downstream of the irrigation command area, there is a section with a remnant woodland vegetation. This is dominated by Acacia species mainly *Acacia hocki* and *Acacia nilotica.* The woodland is located within the vicinity of a wetland vegetation dominated by *Typha spp, Cyperus spp* and *Vossia spp*. The other plant species recorded within the area included millet, maize, *Egarostis curva, Solanum incanum,* Eucalyptus *and Lantana camara* a known invasive species in Uganda. Some section has been cleared of the trees and is used for grazing the dominant grasses included *Eleusine indica, Cynodon dactylon* and *Elymus repens*.

4.3 Biological environment: Fauna

A complete assessment of the fauna in the project area was carried out as part of the ESIA. **As presented below, the project area is relatively rich in small mammal, while large mammals have virtually disappeared due to increased conflicts with cattle keepers and related modification of the habitat. The area is poor in birds. None of the mammals, fish, anphibian and reptile species recorded in the project area is of ecological concern according to the IUCN red list 2017. All these elements support the conclusion that the project area is to be classified as a non-critical habitat.**

4.3.1 Phytoplankton

Overall, the green algae (eight species) were the most abundant by numbers and species diversity at almost all the sampled sites, followed by the blue-green algae (five species) and the flagellates (two species) were the least. The dominance of green algae implies that the water quality is uncompromised, despite the observed high concentrations of the total phosphorus.

Table 32: Species composition and relative abundance of phytoplankton

Taxon	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
Blue-Green	**N=26**	**N=105**	**N=55**	**N=32**	**N=56**	**N=51**
Microcystis sp(%)	69.23	40	23.64	68.75	35.71	27.45
Calothrix sp	23.08	3.81	29.1	-	-	35.29
Anabaena sp (%)	7.69	21.91	3.64	-	21.43	11.76
Tollypothrix sp (%)	-	34.29	-	6.25	42.86	25.49
Oscillation sp (%)	-	-	43.64	25	-	-
GREENS	**N=32**	**N=105**	**N=60**	**N=59**	**N=80**	**N=105**
Desmidiun sp (%)	12.5	11.43	-	30.51	-	28.57
Microspora sp (%)	18.75	17.14	-	44.07	-	3.81
Spirogyra sp (%)	43.75	44.76	-	-	40	18.1
Cladophora sp (%)	25	-	28.33	8.48	-	7.62
Zygnema sp (%)	-	24.76	20	6.78	17.5	9.52
Urothrix sp (%)	-	1.91	25	-	7.5	-

Oedogonium sp (%)	-	-	6.67	10.17	-	32.38
Microsteria sp (%)	15.63	-	20	-	35	-
FLAGELLETES	**N=3**	**N=4**	**N=5**	**N=11**	**N=**	**N=**
Uroglena sp (%)	100	100	100	63.64	-	-
Phacus sp (%)	-	-	-	36.36	-	-

4.3.2 Zooplankton

A total of eight species of rotifers and two species of crustaceans were encountered. The sampling site at the dam axis (P2), R. Kasharira (P3) and lower point of the irrigation area (P5) recorded the highest species composition (6 species) and the highest abundance was at P5 (194) despite the low oxygen levels. Rotifers provide a vital food source especially for the young fish (larvae and fry) stages thus their composition and abundance is vital for fish growth and survival.

Table 33: Species composition and relative abundance of zooplankton in the project area

Taxon	Site 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
ROTIFERS	**N=32**	**N=121**	**N=181**	**N=131**	**N=194**	**N=146**
Brachionus sp (%)	56.25	16.53	15.47	27.48	24.74	-
Proales sp (%)	37.5	-	13.26	13.74	-	26.71
Ascomopha sp (%)	12.5	14.88	-	22.9	-	28.77
Trichocerca sp (%)	-	20.66	20.99	9.16	12.89	-
Euclanis sp (%)	-	-	11.05	-	14.43	25.34
Keratella sp (%)	-	19.01	-	-	20.1	19.18
Lecane sp (%)	-	-	15.47	26.72	23.71	-
Hydracarina sp (%)	-	2.48	-	-	4.12	-
Polyathra sp (%)	-	26.45	23.76	-	-	-
CRUSTACEANS	**N=33**	**N=50**	**N=23**	**N=25**	**N=14**	**N=38**
Cyclops sp (%)	39.39	44	69.57	100	100	100
Bosmina sp (%)	60.61	56	30.43	--	-	-

4.3.3 Macro-Invertebrates (Benthic) Fauna

Macro-invertebrates form the line-up that supports the fish food sources. The diversity of benthic organisms is a very important bio-indicator of the soundness of the aquatic ecosystem. Also, benthic communities are important components of a stream ecosystem because they form the foundation of the stream's food web. Changes in benthic community composition and productivity can affect higher trophic levels (fish and amphibians) and stream processes (organic matter processing).

4.3.4 Fish and Fisheries

There were two fish surveys conducted in project area: one fish survey was conducted for the broader area; and one survey was conducted in the immediate downstream area following the dam. The results of these rapid surveys are presented below.

Fish Taxa Composition, Abundance and Distribution. The first suvey covered both upstream and downstream of the project. Study results show that they werein total of seven (7) fish species recorded overall at the sampled sites, belonging to three families. Six fish species were caught during experimental fishing and one was only reported present during interviews. The site at P4 (R. Katenseni) recorded the highest number of fish species (5) of which four were encountered during the sampling and one was reported to exist in the area during interviews with the community. The site P1 (upstream) recorded the

highest number of fish individuals (68), although the catch comprised of only one species (*C. casonii*). See Table 34 for details.

Since *C. casonii* was the most dominant fish species encountered during sampling, further analysis of its length and weight and condition factor K was used to compare their condition (or wellness).

a. At P1 K = 0.56, the size range was 6.7-20.8 cm and weight range was 0.5-40g,
b. P4 K= 0.64, the size range was 9-18.9 cm and weight range was 6-30g,
c. At P6 K = 0.67, the size range was 7-24 cm and weight range was 2-80g,
d. At downstream of confluence K = 0.83, the size range was 6.3-13.9 cm and weight range was 3-17g.

Table 34: Relative abundance of fish species recorded in the overall project area

Fish Family	**Species**	**Seasonality/ regularity (generated during interview)**	**P1 N=68** (%)	**P4 N= 30** (%)	**P6 N= 26** (%)	**Confluence downstream**	**The IUCN Red list 2017-1**
Cyprinidae	*Barbus jacksonii (Also known as Enteromius Jaksoni)*	throughout the year	-	6.67	-	-	Least Concern (Refer to link at the bottom of the table)
	Barbus apleurogramma	throughout the year	-	13.33	R	17.78	Least Concern
	Barbus paludinosus	throughout the year	R	36.67	-	-	Least Concern
Clariidae	*Clarius carsonii*	during rainy season	100 K=0.56	43.33 K=0.64	100 K=0.67	75 K=0.83	Benthonic Cat fish sp. not covered/identified in the IUCN Red list. This species is also not reported in the GBIS. It is also possible that this fish species name was either wrongly reported/identified/ changed – However, it is a common Cat Fish species found in most of the lakes and rivers in Uganda and air breathing
Cichlidae	*Oreochromis leucostictus*	during rainy season	R	R	R	R	Least Concern
	Haplochromines	rainy season	-	-	-	6.7	Least Concern

(R= species reported to exist during interviews)

Among the fish species recorded in the vicinity of the project area, none of them is of serious ecological concern according to the IUCN red list 2017. The common ones encountered include *Barbus jacksonii, B. apleurogramma* and *Haplocromine astatotilapia* spp.

(1). Link to confirm Barbus jacksonii as IUCN Red List species: https://www.iucnredlist.org/species/61311/126424450

(2). Search Links for Clarias casonii
https://www.fishbase.se/identification/SpeciesList.php?class=Actinopterygii&order=Siluriformes&famcode=139&subfamily=&genus=Clarias&areacode=1&c_code=800&depth=&spines=&fins=&TL=&BD=&resultPage=1&sortby=species
https://www.fishbase.se/identification/SpeciesList.php?class=Actinopterygii&order=Siluriformes&famcode=139&subfamily=&genus=Clarias&areacode=1&depth=&spines=&fins=&TL=&BD=&resultPage=1&sortby=species
https://www.fishbase.se/identification/SpeciesList.php?class=Actinopterygii&order=Siluriformes&famcode=139&subfamily=&genus=Clarias&areacode=1&depth=&spines=&fins=&TL=&BD=&resultPage=1&sortby=species

During the second rapid survey conducted in March 2019, catching was carried out at four selected sites within the one kilometer stretch from the dam axis to River Kasharira, plus one point downstream. Interviews with fishermen were conducted as well.

Table 35: *The coordinates and description of sampled points, species composition, numbers observed during the rapid sampling survey of the immediate 1km downstream area of the Kabuyanda dam conducted during March 2019.*

Data point	Coordinates	comments	Fish Family	Fish species	numbers	The IUCN Red list 2017-1
Pt1	36M 0232601 9899879	Area with papyrus vegetation	Clariidae	*Clarias casonii*	12	Benthonic Cat fish sp. not covered/identified in the IUCN Red list. This species is also not reported in the GBIS. It is also possible that this fish species name was either wrongly reported/identified/ changed – However, it is a common Cat Fish species found in most of the lakes and rivers in Uganda and air breathing
			Cyprinidae	*Barbus apleurogramma*	7	Least Concern
Pt 2	36M 0232623 9899808	Area patches of papyrus vegetation	Clariidae	*Clarias casonii*	15	Least Concern
			Cyprinidae	*Barbus apleurogramma*	49	Least Concern
			Cyprinidae	*Barbus jacksonii*	1	Also known as Enteromius Jaksoni is found in IUCN Red list – categorized as of Least Concern – Plz refer to the link below and others at the bottom of this table.
Pt 3	36M 0232720 9899691		Clariidae	*Clarias casonii*	1	See description above.

		Area Covered by papyrus	Cyprinidae	*Barbus apleurogramma*	4	Least Concern
Pt 4	36M 0232874 9899579	Open water	Cyprinidae	*Enteromius jacksoni*	20	Least Concern Please see description above

Limitations: It should be noted that the numbers found do not translate into estimated population density, which could be done through a capture/recapture methodology or to compare it to densities in other locations.

Some key findings of the two fish suveys include:

1. Conservation status of identified species. The fish species identified during the two sureveys are consistent. Both Cyprinedae and Clariidae were found in the two surveys. In the 2015 survey, Cichlidae was also encountered. The fish species encountered are considered common in the area as described below. The International Union for Conservation of Nature (IUCN) holds a worldwide-recognized database of species with special status called the IUCN Red List. Searches on IUCN Red List were carried out in September 2019 to identify potential fish species with special status. Search results indicated that the fish species present in the basin are common in the Lake Victoria basin. The IUCN red list rates all the encountered fish species as least conservation concern. The encountered fish species are accustomed to temporary streams and require a seasonal variation in flow for spawning activities. The encountered fish species in the downstream area are also reflected in the survey of the overall project area. It is noted that interviews with fishermen in the area indicate that the fish survey results are in line with experience in the area. Completion of the lifecycle of these fish species is not dependent on migratory behavior.

- *Catfish (Clarias)*

  More than 100 different species of the Genus Clarias were first described in Africa. However, following a systematic revision based on morphological, anatomical and biographical studies was conducted by Teugels (1982), this was reduced to recognizing 32 valid species. All the large African Catfish species now belong to the subgenus Clarias. Clarias species are the amongst the commonest fish species in rivers, lagoons and estuaries. IUCN lists Clarias species as 'least concern' (or has not been assessed) in the Lake Victoria basin.

- *East African Red Finned Barb (Enteromius apleurogramma)*

  The East African Red Finned Barb is known to inhabit temporary and permanent streams, as well as in marginal water-lily swamps (Greenwood 1962), pools near papyrus vegetation (Okedi 1971), in smaller bodies of water or near the margins of rivers between the vegetation (Seegers 1996) and in fast-flowing water. It feeds on insect larvae (Greenwood 1966), but also aquatic vegetation, molluscs and fishes are taken (Welcomme 1969). Spawning occurs in temporary streams when they are flooded during the rainy season (Greenwood 1962). Seegers (1996) reports spawning activities all year round with a maximum at the beginning of the rainy season. The maximum size is 5.4 cm Standard Length (SL) (De Vos and Thys van den Audenaerde 1990).

- *Jacksons Barb (Enteromius jacksoni)*

The Jacksons Barb is found in lakes and in streams, both permanent and temporary (Greenwood 1966). It feeds on insect larvae and bottom debris (Greenwood 1966). Upstream spawning migrations have been reported for individuals in the Lake Rukwa drainage (Seegers 1996). The maximum size is 11.6 cm SL (Greenwood 1962).

2. it is also noted that fishing activity in the Kabuyanda area is minimal and only at subsistence level and mainly targeting *Clarias carsonii*. The main fishing gear was the baited basket traps. According to the project resettlement action plan (RAP), among activities that generate household income from fishing, one 1% will be potentially affected directly, and 4% indirectly, compared to poultry that is 43% and 56% respectively.

3. However, it is recognized that the historical records of fishery resources in the river is very limited. The Fish surveys conducted during the ESIA development were also constrained by a number of factors such as droughts. As a result, rapid sureveys that have short period with no recurrence, limited spatial coverage were conducted. It is thus recommended that continued fish monitoring and surevey will be carried out during implementation.

4.3.5 Mammals

From interviews with members of the local community, large mammals reportedly used to occur in the area ranging from Hyrax, Olive Baboon, Side-stripped Jackals, and loins and leopards used to roam the areas up to early 1980s. However, due to increased conflicts between mainly cattle keepers in the area and some of the large carnivorous groups of mammals in the area especially leopards, stripped jackals and lions were reportedly been killed by the cattle keepers so, none of those animals exist in the project site. The common species of mammals are largely small mammals which are very common in most areas including outside the project site.

Davenport et al (1996) concluded that Rwoho CFR was the 3rd richest for small mammal richness. One species of small mammals (Sylvisorex lunaris), was from all the surveys they reported considered rare as it was recorded in fewer than 5 of the forest reserves overall. Davenport *et al* (1996) reported the occurrence 13 species of rodents and shrews in Rwoho CFR. The majority of small mammal species are either of wide spread occurrence (W) or open habitats (O). These can still range into agricultural landscapes and will very likely be present in several parts of the project area in different levels of abundance. Because they are small mammals, their survival is not dependent on the existence of large stretches of prime habitat like would be the case for large mammals. Given the nature of the land cover, it is not likely that the general area of Kabuyanda presents prime range area for any significant populations of large mammals. Small and medium sized mammals will, however, likely survive in the remnant natural and/or semi-natural habitats left in the cultivated areas. Except for Davenport et al (1996) no other documentation has been found on mammals in Kabuyanda.

4.3.6 Birds

A total of 53 species of birds were recorded in six general areas where the surveys were conducted. Table below lists the species that were recorded more widely in the project area. The Ring-necked Dove was recorded in all survey areas visited.

Table 35: Most common bird species in the project area

Start point	Species	Mean Timed species counts
346	Ring-necked Dove *Streptopelia capicola*	6.0
1170	Lesser Masked Weaver *Ploeceus intermedius*	3.8

801	African Thrush *Turdus pelios*	3.7
1290	Yellow-fronted Canary *Serinus mozambicus*	3.7
51	Hadada Ibis *Bostrychia hagedash*	3.3
399	Red-chested Cuckoo *Cuculus solitaries*	3.3
732	Common Bulbul *Pycnonotus barbatus*	3.2
837	Grey-backed Camaroptera *Camaroptera brachyuran*	3.2
1122	Scarlet-chested Sunbird *Chalcomitra senegalensis*	3.2
937	Swamp Flycatcher *Muscicapa aquatic*	3.0

Species of water-birds were recorded at the Fish farm (36 M 235667 9890046) where the vegetation around the water bodies was managed and kept low permitting visibility. In the records, two species of raptors; the Black Kite & African Harrier Hawk were also recorded – the presence of these two predatory species would suggest the existence of their prey from the ponds but they are "visitor birds" i.e. not resident in the habitats in the areas. ***Though some 2 Grey Crowned Cranes (Balearica regulorum) were noted on the site during the ESIA, they were reported to be from a family in Kabuyanda Trading Centre. A search for their habitats especially for nests was done and none was encountered in the project areas a position that was confirmed during the meetings with the local communities that, the two birds are like pets in one family. No other populations of the Crane was encountered in the ESIA especially in the fringing wetlands on the river banks. It is therefore noted that the project will not have any adverse negative impacts on the Crested Crane.*** **In addition, table above does not list the Grey Crested Crane as one of the birds occurring in the project areas.**

4.3.7 Herpeto-fauna

A total of 21 transects were established and surveyed for herpeto-fauna in the project area. The location of transects is shown in figure below. Amphibians are of particular ecological importance in wetland ecosystems and can perform a significant function in landscape assessments. Amphibians serve as vital links in food webs and between wetland and upland habitats.

Specific advantages of using amphibians in bio assessments include:

a. Sensitivity. Because of their unique physiology and habitat requirements, amphibians are often regarded as more exposed and potentially more vulnerable to changes in their environment than many other vertebrates (Sparling *et al*., 2000). Amphibians' response to factors such as habitat fragmentation, hydrologic modifications, alterations in water chemistry, water and airborne contamination, and large-scale climatic variation is exacerbated by thin, highly permeable skin exposed to water and the atmosphere; and their limited dispersal and home ranges.
b. Complex life history. Wetland-breeding amphibians exhibit complex life histories, often undergoing dramatic and irreversible morphological and physiological change from sedentary eggs, to free swimming aquatic larvae, to semiaquatic or terrestrial adults. Especially because of their utilization of wetland/upland transitional areas, members of this class are appropriate for assessing impacts on these habitats.
c. Amphibians have been recognized as better indicators of habitat change than other vertebrates because: 1) changes in habitat are reflected in changes in their numbers and species diversity within a short time, and 2) The geographical ranges of amphibians are smaller (Bibby, 1992).
d. Most reptiles on the other hand are highly mobile and are diversified in habitats and can be encountered in aquatic habitats, shorelines, rocky outcrops, trees and bushes and on any slopes of the terrain. The more specialized in habitat use such as crocodiles, monitor lizards and water snakes are good indicators for monitoring changes in a habitat due to human activity.

The project area is comprised of different types of habitat features such as wetlands, farmlands and built environment. These activities have to a large extent, modified the habitats through a range of anthropogenic functions such as cultivation and grazing amongst others.

Figure 30: Locations in Rwoho CFR for Herperto-fauna survey

Table 36: Amphibians in the project area

Family Name	Scientific Name	Common Name	IUCN Conservation Status	National Red List Conservation Status
Pyxicephalidae	*Amietia angolensis*	Angola River Frog	LC	DD
Phrynobatrachidae	*Phrynobatrachus natalensis*	Natal Puddle Frog	LC	
Phrynobatrachidae	*Phrynobatrachus mababiensis*	Dwarf Puddle Frog	LC	
Ptychadanidae	*Ptychadena mascareniensis*	Mascarene Rocket Frog	LC	DD
Ptychadenidae	*Ptychadena anchietae*	Anchieta's Rocket Frog	LC	
Hyperoliidae	*Hyperolius kivuensis*	Kivu Reed Frog	LC	
Hyperoliidae	*Hyperolius cinnamomeoventris*	Cinnamon-bellied Reed Frog	LC	
Hyperoliidae	*Hyperolius viridiflavus*	Common Reed Frog	LC	DD
Hyperoliidae	*Afrixalus quadrivittatus*	Striped Leaf-folding Frog	LC	DD
Hyperoliidae	*Kassina senegalensis*	Senegal Kassina	LC	
Bufonidae	Bufo maculatus	Flat-backed Toad	LC	
Pipidae	*Xenopus victorianus*	Lake Victoria Clawed Frog		

Based on the IUCN 2014 Red List none of the species recorded is of conservation concern, all are listed as of Least Concern. Four of the amphibian species however, are listed as Data Deficient according to the National Red List for Uganda 2016.

Reptiles

Eight reptile species were recorded in Kabuyanda Project Area. The eight species constitute 4.6% of Uganda's total reptiles. The species included two skinks, One Lizard, One gecko, One Chameleon and three snakes. The full species list is found in table below. The Forest Cobra *Naja melanoleuca*, and the Nile Monitor *Varanus niloticus* were reported by the local residents as occurring in the project area.

Table 37: Reptile Species in the project area

Family Name	Scientific Name	Common Name	IUCN Red List Status	National Red List Status
Elapidae	*Naja melanoleuca*	Forest Cobra	LC	
Natricidae	*Natriciteres olivacea*	Olive Marsh Snake	LC	DD
Colubridae	*Lamprophis olivaceus*	Olive House Snake	LC	
Chamaeleonidae	*Chamaeleo ellioti*	Montane Side-striped Chameleon	LC	
Scincidae	*Trachylepis maculilabris*	Speckled-lipped Skink	LC	
Scincidae	*Trachylepis striata*	Striped Skink	LC	
Gekkonidae	*Hemidactylus mabouia*	Tropical House Gecko	LC	
Varanidae	*Varanus niloticus*	Nile Monitor	LC	

According to the IUCN Red List 2014 and the National Red List for Uganda 2016, none of the reptile species recorded during the survey is of conservation concern. The Nile Monitor *Varanus niloticus* is also listed under CITES Appendix II. However, in Uganda, the Nile Monitor was down listed because it is still common and widely distributed in the Country.According to publications by Branch, B., 2005 and Spawls, *et al*., 2008 the distribution of 30 reptile species overlap the Kabuyanda Project Area and may occur.

Angola River Frog, *Amietia angolensis* (36 M 0232614, 9901133)

Kivu tree Frog, *Hyperolius kivuensis*, (36 M 0232920, 9899484)

Montane Side-striped Chameleon, *Chamaeleo ellioti (36 M 0236286, 9897362)*

Olive House Snake, *Lamprophis olivaceus (36 M 0234817, 9890919)*

Figure 31: Reptile Species in the project area

4.3.8 Fauna at the inundated and restorated areas

The biodiversity assessment carried out in 2019 (Appendix 14) for the inundated and restorated areas include a detail assessment of the fauna.

4.4 Socio-Economic Environment

4.4.1 Administrative Framework of the Project Area

Isingiro District is made of 2 Counties (Bukanga and Isingiro), 3 Town Councils (Kaberebere, Kabuyanda, and Isingiro), 14 Sub Counties (Rugaaga, Rushasha, Kashumba, Endiinzi, Ngarama, Mbaare, Birere, Nyamuyanja, Kabingo, Kikagate, Kabuyanda, Nyakitunda, Ruborogota and Masha), 90 Parishes /Wards and a total of 767 villages. The project area is located in Kabuyanda, Kikagate and Nyakitunda Sub-

Counties, and Kabuyanda Town Council in Isingiro District. The dam is located in Kabuyanda Sub-County; the water reservoir is located in Kabuyanda Sub-County and a small section in Rukoni East Sub-county, Ntungamo District. The irrigation command area is located in Kabuyanda Town Council, Kabuyanda sub-county and Kikagate Sub-county.

Table 38: Areas traversed by the project

Sub-County	Parish	Village
Kabuyanda Sub-County	Kanywamaizi	Kanywamaizi I, Kanywamaizi II, Kanywamaizi III, Kanywamaizi IV, Kagoto I, agoto II, Rwabyemera, Nyamiyaga, Muhanga, Kagara I, Kagara II, Rugabano, Bwengyerere, Kyamazinga I and Kyamazinga II
Kabuyanda Town Council	Central Ward	Akatensani, Kabuyanda Town, Kaaro I, Kaaro III, Rutooma, and Kabuyanda
	Kisyoro Ward	Akatembo, Bugarama II, Kisyoro II, Ndaani, Rwembwera II, and Nyampikye II
	Northern Ward	Kisyoro I, Kisyoro III, Bugarama I, Rwembwera I, Kaaro II,
	Iryango Ward	Nyampikye I, Iryango, Ryaboona, Kashaka, Kinyaara I, Kinyaara II, and Kigarama

4.4.2 Population and Demographic Characteristics

4.4.2.1 *Population*

As per the population and housing census 2014, the total population of Isingiro District was 486,360 people, 250,739 females and 235, 621 are males. The district has 101,623 households with an average size of 4.8 persons. Kikagate Sub-County has the highest population followed by Nyakitunga and Mbaare Sub-Counties. The population of Kabuyanda Sub-County and Kabuyanda Town Council. According to the socio-economic household survey, the average size of households included in the survey is 6 persons with the smallest household having 1 member and the largest household having 18 members. This is higher than the average household size of both the country and the district. In terms of household composition by gender, the findings showed that the average number of males living in the household is 3.09 persons and the average number of females living in the household is 3.11 persons.

4.4.2.2 *Gender of Household Heads*

Like the rest of the country and the district, the findings from the socio-economic survey indicated that majority of the household heads are males (74.8%) and 25.2% are females. This is similar to the district statistics where 77.2% of the households are headed by males and 22.8% are headed by females.

4.4.2.3 *Age of Household Heads*

The socio-economic survey findings showed the average age of the household heads in the project area is 42 years with the youngest being 18 years and the oldest being 90 years. The results show that the majority of the household heads are still in their productive years and therefore commendable for employment opportunities on the project.

Table 39: Households Heads by Age Group

Age group	Frequency	Percent
18-25	65	10.0
26-35	198	30.4
36-45	160	24.6
46-55	112	17.2
56-65	83	12.7
Over 65	33	5.1
Total	**651**	**100.0**

4.4.2.4 *Ethnic Composition*

The socio-economic survey findings showed that the resident population in the project area is mainly comprised of the Bakiga (60.8%), Banyankole (26.3%), Bafumbira (12.1%), Baganda (0.5%), Batooro (0.2%) and Rwandese (0.2%). The socio-economic survey revealed that majority of the households (57.5%) migrated to this place, purchased land from the local people they found and settled while (42.5%) households claimed that this is their ancestral land (they are /were borne here). The average duration the households have lived on their land is 18 years with the longest duration being 65 years and shortest being less than a year. This implies that the communities have strong social ties in the area.

4.4.2.5 *Marital Status*

Findings from the socio-economic survey showed that 83.2% of the household heads are married while 10.3% are widowed, 3.7% are single, and 2.8% are divorced /separated. Most of the divorced and widowed household heads were female. Further analysis of the socio-economic survey indicated 68.2% of the household heads are engaged in monogamous marriage and 15.1% are engaged in polygamous marriage.

4.4.2.6 *Religious Affiliation*

The project area consists of five major religious denominations, which mainly include Protestants, Catholics, Muslims, Seventh Day Adventists (SDA), Pentecostal (Born Again Christians). Findings from the socio-economic survey showed that the majority (55.8%) were Protestants and Catholics (30.5%) as shown below.

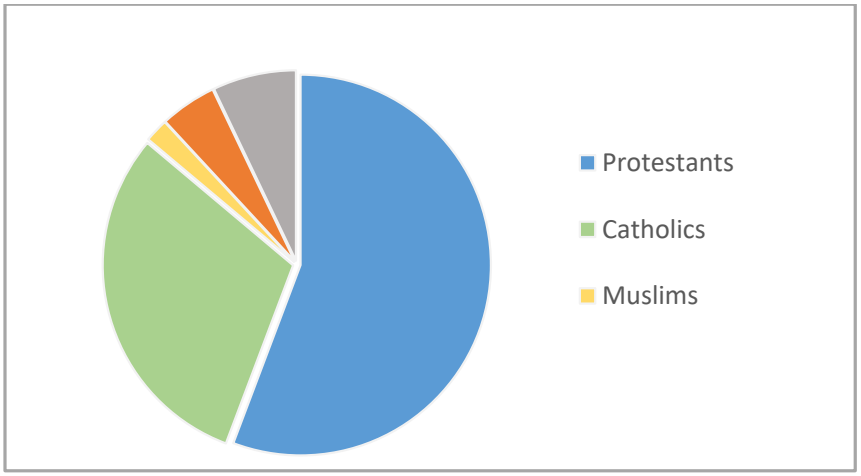


Figure 32: Religious Affiliations in the project area

4.4.2.7 *Education and Literacy Levels*

Literacy is widely acknowledged as benefiting to both the individual and society and is associated with a number of positive outcomes for health, nutrition, status and civil participation in the society of both men and women. According to Kabuyanda Town Council Five Year Development Plan 2015/2016–2019/2020, in the Town Council, on average, 75% of persons aged 10 years and above are literate. Literacy rates are much lower among females (70%) than males (81%). Illiteracy levels are highest (65.4%) among the persons above 60 years *(National Housing and Population Census 2017: Isingiro District Profile).*

Findings from the socio-economic survey revealed that the highest level of education attained by the household heads is primary education (53.5%), followed by secondary education (23%), tertiary (3.4%). Households' heads with no education are 20.1%. Further analysis of the socio-economic data showed that 35.6% of the household heads know how to read and write in both local languages and English while 46.9% of the households only know to how to read and write in a local dialect. Statistics also revealed that 13.2% of the household members received special training /skills and 86.8% of the household members did not attained any skills. Examples of training /skills undertaken by household members include; basics in agricultural skills, brick laying, basics in candle making, carpentry and joinery, computer knowledge, counselling and guidance, crime prevention, driving, electrical, guarding, hair dressing, bakery, midwifery, mechanical, nursing, plumbing, tailoring, military skills, teaching, Village Heath Teams (VHT) Training, welding, tourism, veterinary skills and sanitation.

An analysis of the education levels by gender show that in general, men's levels of education are higher than those of their female counterparts. Out of the households that did not attain any education, the majority are women. This could be attributed to factors like early marriages, poverty, cultural factors, and long distances to schools/institutions among others. Figure below shows the education levels of households by gender. Due to low levels of education in the project area, local population will not be able to apply for skilled work such as water engineering, electrical engineers and road engineers among other positions that will be available. This means that local communities will mainly apply for casual work and semi-skilled work at the time of construction.

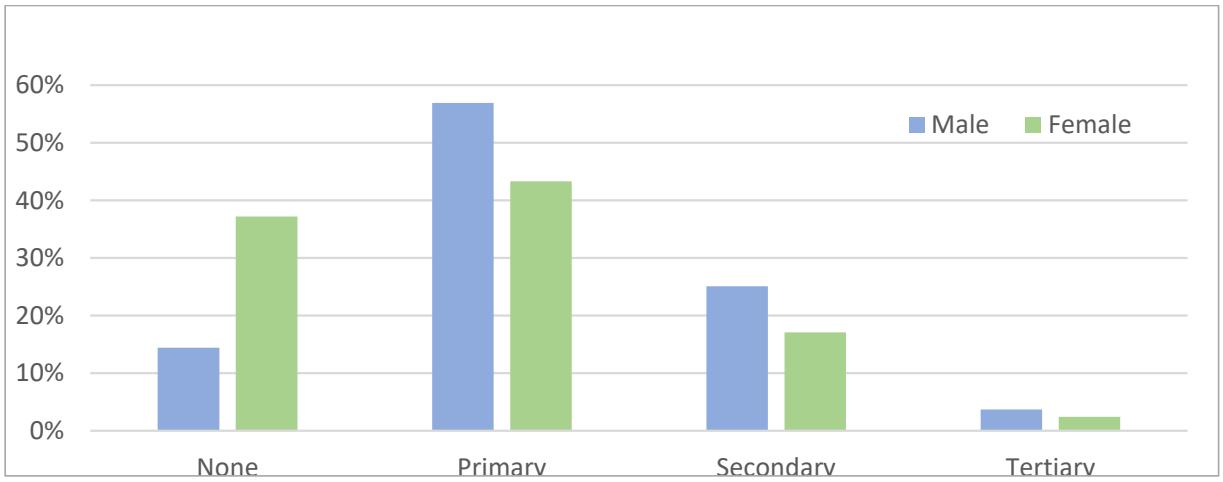


Figure 33: *Education Levels by Gender*

4.4.2.8 *Vulnerable Groups*

Like many other societies, there are vulnerable groups in the project area. According to the national housing and population statistics 2014–Isingiro District Profile, households headed by females in the district are 22.8%, those headed by children aged 10-17 are 0.4% while those headed by older persons (aged 60 and above) are 14.5%. The socio-economic household survey findings show that 25.2% of the households are headed by females, 5.1% are headed by the elderly (over 65 years), 0.9% reported to have

a chronic disease, 14.4% of the households reported to have an orphan in the household and 2% of the households reported to have a disabled person in the household, whilst 0.6% of the household heads reported to be disabled.During a consultative meeting with the women, Persons with Disabilities and the elderly, it was revealed that these groups of people own property such as land and animals. However, the group argued that the land was inadequate to enable them compete favourably with their counterparts. The group also revealed that some Persons with Disabilities were receiving special grant from the government. Those eligible for the grant must meet all the required requirements such as one has to be disabled, form an association, registered with Kabuyanda Town Council and pay UGX 30,000 for registration. The elderly also revealed that they were not benefiting from the Social Assistance Grants for Empowerment (SAGE) programme, and felt that the government was being unfair to them because their colleagues (elderly) from other parts of the country are benefiting from the programme.

4.4.2.9 *Indigenous People*

Consultations with the local leaders and members of the community revealed that there are no indigenous people living in the project area. Therefore, an Indigenous People Plan was not prepared.

4.4.2.10 *Social Structure*

In all rural communities in Uganda, patrilineal kinship i.e. the successive link between the male parent and his children is the most basic structure-organizing individuals into social groups. It is within and through these structures that marriage, property, inheritance, and community welfare of the social system are organized. Like most rural societies, the project area is patrilineal in nature where the men are considered superior to the women. The men are major decision makers on several aspects including resources like land. Sons are mainly chosen as the heirs to their fathers. In some instances, however, women who have children are given the opportunity to look after their deceased's property. The household is the basic unit of social organisation. There are acceptable norms and values that the community members share. These have to be respected by the different team members of the project.

4.4.2.11 *Social Capital and Mechanisms for Social Cohesion*

The communities in the area mainly rely on their family members as most of them stay close to each other, religious institutions such as the churches, mosques, cooperative societies, farming groups and self-help groups. The communities live harmoniously with each other with minimum conflicts.

4.4.3 Land Use, Ownership and Tenure System

Isingiro District has a total land area of approximately 3,010 km^2. The land is characterized by steep hills and deep valleys especially in the sub-counties of Nyakitunda, Kabingo, Kabuyanda, Ngarama and Kashumba. Some parts of the District are characterized by gentle slope hills and low land areas especially for the sub-counties of Mbaare, Endiinzi, Masha and part of Birere. In addition, land is highly fragmented due to high population density. Land tenure systems in the area include customary, leasehold and freehold. The socio-economic survey indicated that most of the land (77.3%) in the project area is customary, 10% is leasehold, 9.4% is freehold and 3.4% is communal land. Some of the institutions that own freehold land include: National Forestry Authority (NFA) and it is on this land where the dam access and water reservoir will be located; Kigarama Commodity Marketing Cooperative Society Limited, Kaiho Farm School Leavers Cooperative Society - this cooperative own approximately 75 ha of land and Tukundane Fish Farm Limited among others.

There are a few local farmer institutions supporting crop production and marketing, notably Kigarama Commodity Marketing Cooperative (KCMC) and Kanywamaizi Environmental group. KCMC is the largest cooperative in water project area, comprising of about 16 farmer groups and 150 individual farmers. The cooperative provides some inputs to farmers such as bean foundation seed and upon harvest, the farmers supply the produce to the cooperative with some interest (1kg bean seed supplied by cooperative: 2.5kg

bean seed returned by farmer). The cooperative also buys foundation seeds from farmers if the seeds are approved by the Isingiro district seed inspection unit. KCMC mainly deals in beans and maize.
The socio-economic survey revealed that all the household heads interviewed own a piece of land in the project area. The average size of land owned is 2.4 acres. The survey further revealed that all the household heads owned land elsewhere besides where the households' reside. The socio-economic survey revealed that majority of the households (57.5%) migrated to this place and purchased land from the local people they found and settled while 42.5% of the households claimed that this was their ancestral land i.e. they were born in the area. The land in the irrigation command area is majorly used for crop farming, animal grazing, tree planting and fish farming among others. Land is owned by individuals and also Cooperative societies. The biggest landlords in this area include; Kaiho School Leavers Cooperative Society and Tukundane Fish Farm Limited. The cooperative society owns about 75 Hectares of land.
The land where the proposed dam access and the reservoir belongs to National Forestry Authority (NFA) and is a forest reserve. Consultations with the community leaders and members of the public revealed that NFA had allowed the community to utilize the land for crop farming. However, NFA in a meeting communicated that the activity is illegal and action is going to be taken by NFA to eradicate the activity. Consultations with the local leaders revealed that about 30% of the population in Kabuyanda Town Council and Kabuyanda Sub-County rent land for cultivation especially from NFA, Kaiho Farm School Leavers Cooperative Society and Tukundane Fish Farm Limited. Renting 1 acre of land for cultivation for one season is about 200,000 UGX. Crops grown include bananas, beans, cow-peas, Irish potatoes, sorghum, millet, cassava, maize, ground nuts, coffee, and fruits like passion fruits, mangoes, paw paws and vegetables. Trees grown include mainly pine and eucalyptus. The trees are mainly for NFA and a few individuals.

4.4.4 Settlement Pattern, Nature and Type of Buildings, Migration Patterns

The downstream /irrigation command area has settlements with some sections concentrated while in others they are scattered. The areas that are heavily congested are the trading centres like Kabuyanda, Kisyoro, Kanywamaizi, Kagoto among others. In the upstream area i.e. dam access/reservoir area, there are no settlements apart from one household that has settled there. The land is majorly used for crop farming and tree planting.

4.4.4.1 *Agriculture*

Agriculture is a core sector of Uganda's economy. The sector employs approximately 69% of the population and contributed about 26% to the Gross Domestic Product (GDP) in 2015. Uganda 's GDP increased from about 5% in 2014 to an estimated 5.6% in 2015 driven by infrastructural development primarily being funded by the Chinese, according to data released by the Uganda National Bureau of Statistics (UNBS). It presents immense opportunities for growth in other sectors like manufacturing especially agro-processing. It is for these reasons that the sector has been given priority in the national development plan.

a. Traditional Cash Crops: include coffee, cotton, tea, cocoa, tobacco and sugarcane.
b. Non-traditional Cash Crops: include; maize, rice, beans, soya beans, palms, and horticultural produce.
c. Livestock sub-sector: The Livestock Census (UBOS 2008) indicated that the national cattle herd is estimated at 11.4 million, 12.5 million goats, 3.4 million sheep, 3.2 million pigs and 37.4 million poultry birds. The Census also showed that livestock numbers had increased across all animal types: cattle, sheep, goats and poultry.

d. Fishing: About 20% of Uganda's surface area is covered by water. The country has enormous potential for fresh water fisheries and aquaculture production. Uganda's fisheries resources are diverse in aquatic ecosystems and in fish species bio-diversity.

Isingiro District Five Year Local Government Development Plan II 2015/2016 – 2019/2020, stipulates that the District economy is largely informal, with more that 80% of the people employed in the agriculture subsistence sector. The majority of the people are engaged in production of crops and livestock products at a subsistence level. According to the national housing and population census 2014 for Isingiro District, 87.6% of the district's population is engaged in crop growing. Field investigation at proposed dam site and irrigation command site showed that the land is mainly utilized for crop farming and trees (Rwoho CFR). Intercropping is majorly practiced in the area. Table below shows the different crops and trees cultivated on land proposed for the different project components.

Table 40: Crops in the project area

Project Components	Crops	Fruits	Trees
Reservoir	Maize, Irish potatoes, beans and ground nuts		Pine and eucalyptus
Dam access	Maize, Irish potatoes, beans, millet, ground nuts and greens like amaranth		Pine and eucalyptus
Irrigation command area	Bananas, beans, maize, sorghum, Irish potatoes, and millet	Passion fruits, mangoes, paw paws	Pine and eucalyptus

It was also observed that the formation of cooperatives has boosted agriculture in the area. The farmers are assured agricultural inputs like better seeds, seedlings, animals, market, advisory services and loans at low interest rates. These cooperatives include; Kabuyanda Dairy Cooperative Society Limited, Tukundane Fish Farm Limited, Kaiho Farm School Leavers Cooperative Society and Kigarama Commodity Marketing Cooperative Society Limited.

Kaiho Farm School Leavers Cooperative Society was established by a Catholic Priest in 1968 and was rejuvenated in November 2017. The cooperative society had 30 members but currently there are 26 active members. The cooperative society was established to support students who completed primary and secondary education and the needy. The main activities of the society are crop farming such as maize, beans, ground nuts, sorghum, irish potatoes, cow peas, cassava, bananas and fruits such as passion fruits and vegetables such as cabbages and onions. The Cooperative owns 75 ha of land of which, 26 ha of land is utilized by the 26 active members while 40 ha of land is leased out to the member of the public and the remaining 9 ha is comprised of swamp/wetland. The cooperative society collects money from the tenants of which the money is used to run activities of the organization such pay the employees of the organization. Initially the harvests used to be sold to the cooperative society. Currently, harvests are sold to the local business men and some is used for home consumption. One of the challenges faced by the cooperative society is water supply for their irrigation and seasonal severe droughts. The cooperative society expects to obtain water for irrigation of their crops and also safe and clean water for domestic use a process that is likely to lead to improved delivery of the Society's improvement in their food crop production which will likely translate to better livelihoods at household levels.

The Kigarama Commodity Marketing Cooperative Society Limited counts 140 members organized under 18 groups. The cooperative society works with about 1,500 farmers in four sub counties of Kabuyanda

Town Council, Kabuyanda, Ruborogota and Kikagati sub counties. The society carries out the following activities. It extends credit in form of loan to the farmers, it provides improve seeds to the farmers, it provides advisory and education to the farmers, it stocks farmers harvests bulk mainly beans and maize, it looks for market for the farmers produce. The markets for the cooperative include three markets types i.e. international market with Rwanda and Kenya, local market supply schools and farmers and Non-Governmental Organizations looking nutritional component like World Vision and Harvest Plus. However, the society faces mainly the challenge of long drought which has affected their production. This society expects to benefit from the Kabuyanda project through accessing water for its irrigation needs. It is noted that, once the water availability is improved, this is likely to lead to expansion of cultivatated acreage thereby putting more pressure on the project water reserve

4.4.4.2 *Livestock Farming*

Generally speaking, the project area falls within the broad zone known as Uganda's "cattle corridor", which stretches from the south-west to the north-east of the country. Characterized by fluctuating rainfall and with up to four months of little to no rainfall, it is dominated by pastoral rangelands and resource variability. Pastoralists cross into Tanzania, and vice versa, in search of water and pastures during the dry seasons. In the project area, there is one valley tank of 10,000 M3 capacity, in Kikagati sub-county (within the irrigation command area). Approximately 10 Km outside the command area, there is a second valley tank of same capacity, in Ruborogota sub-county. Both are fed by surface runoff. In addition, to manage the pastoralists migration, the Governments of Uganda and Tanzania agreed to construct valley tanks at strategic locations. Currently, Uganda is constructing two valley tanks: Nyamarungi valley tank (completed) in Mbaale parish, and Kamwema valley tank (40% completion) in Kamwema parish, all in Endiizi sub-county. This issue will be further looked into in the cumulative impact assessment as part of the overall consideration for water supply and demand.

Field investigations further revealed that there is no animal grazing in the dam access and water reservoir areas. However, animal rearing is mainly practiced in the irrigation command area. Here, farmers practice both zero grazing and free range. The animals kept under zero grazing mainly include Friesian cattle and goats whereas animals kept under free range include the local breed mainly the Ankole long horned cattle, goats, sheep and pigs. To boost the increase of milk production in the area, Kabuyanda Dairy Cooperative Society Limited was established. *The Kabuyanda Dairy Cooperative Society Limited* is predominantly aimed at increasing milk production to beneft the local farmers. It provides its members with improved animals and markets for the milk produced by the members. The cooperative society stocks about 350l of milk daily and about 10,500 liters of milk monthly. The main challenge faced by the cooperative society is lack of adequate water for their operations. This Group expects to access water for its operations from the Project which will improve their operations and have safe working environment and quality products an out come which will yield cumulative positive impact to the community.
The findings from the socio-economic household survey showed that the majority of the households (77%) rear goats, 23.2% rear pigs, 17.8% rear cattle and 14.2% rear sheep. On average, households own 5 cattle, 4 goats, 5 poultry, 3 pigs and 2 sheep.

4.4.4.3 *Fishing and Fish Farming*

Isingiro District is also engaged in fishing activities carried out on L. Nakivale, Rwamurunga and Rivers Kagera and Rwizi. The major types of fish caught include; tilapia, miller caps, lung fish and claris. In the project area, commercial fish farming is practiced using fish ponds. Fish farming is mainly practiced in the downstream area (irrigation command area). The major fish farmer in the project area is Tukundane Fish Farm Limited. This fish farm has 37 fish ponds and the types fish reared include cat fish and tilapia.

4.4.4.4 *Industrial Sector*

There are no major industries in the project area other than the simple carpentry/ wood carving and craft centers, grain processing (maize milling) and coffee hullers (drying and pulping), fruit production, wine packaging, drying and milling, construction and chalk making. Examples of maize milling industries include Kabuyanda Maize Milling Plant constructed by the government of Uganda and funded by the Islamic Development Bank and Islamic Solidarity Fund for Development. There are no mining activities in the project area. Tin mining is mainly done in Kikagati Sub-County which is located over 30 km from the project area.

Figure 34: Kabuyanda Maize Milling Plant

Figure 35: Daily Evening Market at Kabuyanda Trading Centre

4.4.4.5 *Trade*

Trade is practiced mainly in trading centres in form of retail shops and market vending. Items sold include different types of fish, tomatoes, onions and basic necessities such as soap, sugar, salt etc. There is daily market in Kabuyanda Trading Centre where farmers and traders sell their products.

4.4.5 Sources of Livelihoods and Employment Opportunities

Findings from the socio-economic survey showed that farming was the predominant livelihood activity as reported by 86% of the households. Other livelihood activities include; trading (10%), households employed in public and private sectors (formal sector) are 1.8%, 1.7% are in the service provision and 0.5% are casual labourers. It was also revealed that the types of farming practiced mainly include; crop farming, animal husbandry, tree planting and fish farming. Most of the households use rudimentary tools when farming and family labour is majorly used. Agriculture is mainly rain-fed and is affected by weather. Isingiro District is one of the districts that lies in the dry belt and its ecosystem is vulnerable to drought. There is general scarcity of water for production and for domestic use. On a gender perspective, the sources of livelihoods for both men and women do not differ significantly. Women are engaged in almost all activities carried out by men.

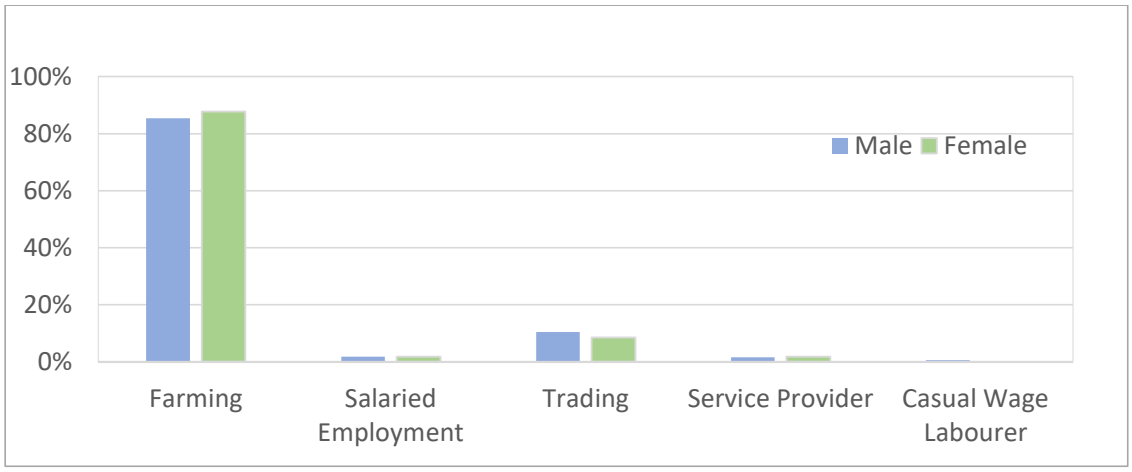


Figure 36: Primary occupation of Household Heads by Gender

4.4.6 Incomes levels

With regard to income, findings from the socio-economic survey indicated that the monthly income earned by the majority (27.8%) of households is between UGX 100,000–200,000, 23.8% earn less than UGX 100,000, 15.8% earn UGX 200,000–400,000. Figure below shows the monthly income of household heads in the project area. On a gender perspective, the female household heads earned a slightly lower income than the male heads of families. The findings show that a sizeable number of households earn a low income compared to those earning a high income implying that most of the households are not considered wealthy.

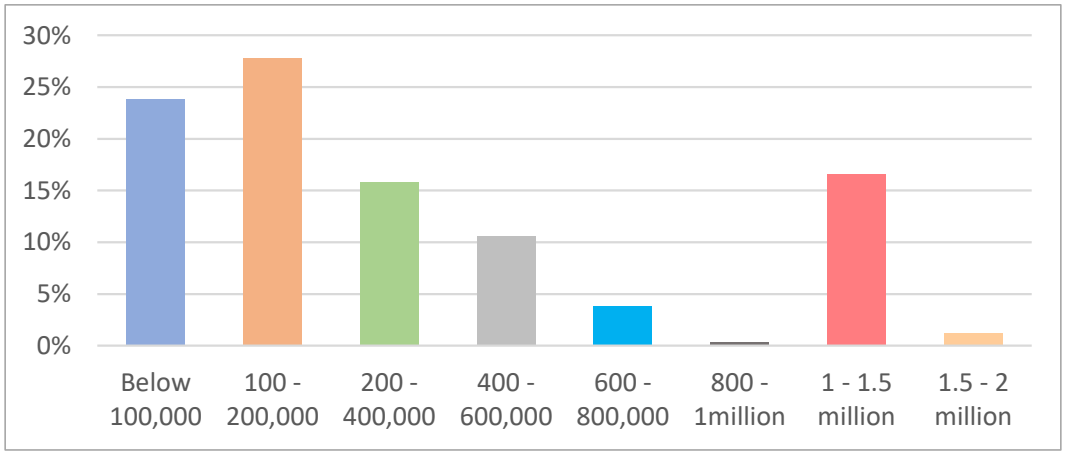


Figure 37: Average Monthly Income of Household Heads

Fifty percent of the households reported to have more than one person working and earning an income in a household. On average 2 other members of the household were reported to be working and supporting the household head.

4.4.7 Expenditure Patterns

With regard to expenditure, the items most spent on annually by the households include school fees, food and transport. Items least spent on include energy, clothing and water bills. Household spend on water in form of periodic contributions to the maintenance and operation of water sources.

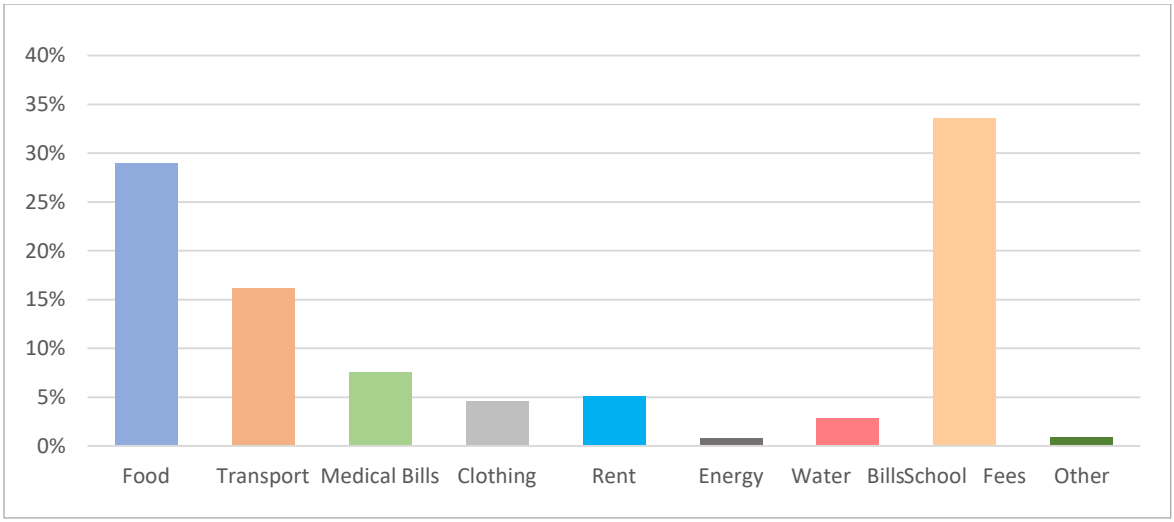


Figure 38: Items Most Spent on by Households

4.4.8 Agricultural Production and its Challenges

The development objectives of the Agricultural Sector include increase the rural incomes and livelihoods, household food and improve nutrition security. The agricultural sector in the District faces a daunting set of output-level challenges. According to Isingiro District LGDPII 2015/2016-2019/2020, the challenges include:

4.4.8.1 *Low levels of Productivity*

These are attributed to:

a. declining soil fertility and land degradation;
b. low application rates of productivity-enhancing inputs;
c. degradation of the natural resource base by human activity in relation to poor crop and livestock farming practices;
d. inadequate public investment in the agriculture infrastructure namely; Irrigation, storage, processing plants, and refrigerated transport facilities;
e. low application of modern technology;
f. Pests, vectors and diseases.

4.4.8.2 *Climate Change*

Due to a number of factors including climate change, there is now so much volatility in precipitation that rain-fed agriculture may not be enough to guarantee production from one season to another. Whenever there is drought, which now comes with a higher frequency, production falls dramatically. The District does not have preparedness plans for adapting to these climatic changes and therefore remains exposed and vulnerable. Climate change studies indicate temperature and annual rainfall are expected to rise in the future over most parts of east Africa where Uganda lies. (Serdeczny et al. (2016)) carried out climate change projections under two scenarios: low; under Representative Concentration Pathway (RCP) 2.6 and high RCP8.5 greenhouse gases (GHG) emissions. Under high emission scenario rainfall is expected to increase by 10-30% above the 1980 level by the year 2099. However, this precipitation increase will be accompanied by unreliable rainfall pattern and extreme weather events such as flooding and prolonged droughts that are destructive to the environment and crop production. The corresponding temperature rise is up to 5^{o}C which is expected to have negative impacts. Studies by Adhikari et al. (2015) on future changes in temperature and rainfall over the east African region showed similar results. Under high emission scenario precipitation is expected to increase by up to 15% in Uganda by the year 2090. The expected corresponding temperature rise is up to 4^{o}C.studie. These changes in temperature and rainfall

are expected to have negative impact on crop yields in most parts of Uganda. However, the reservoir will be able to mitigate most of the impacts of drought and flooding by controlling flooding and storing enough water to be used during the dry periods.

4.4.8.3 *Agricultural Finance*

Despite some development of financial services in the District, the majority of small scale farmers remain without access to the services they need to compete in the market and to improve their livelihoods. The existing Banks in the District such as Centenary, DFCU and other for-profit Financial Intermediaries like Pride Micro Finance and SACCOs tend to limit their activities to urban areas compared to other areas of the rural economy. The root of the problem is that lenders tend to offer only a limited menu of products, mainly with heavy collateral requirements. Asset-poor households are limited to considerably smaller loans at much higher rates. Poor farmers may also turn down loans, even if they qualify, because they are unwilling to bear the risk of losing collateral.

4.4.8.4 *Marketing*

The major items sold in markets include bananas, ground nuts, cow peas, cassava, coffee, beans, cassava, maize, cattle, goats, milk products and poultry. In addition, the products from domestic animals (meat, skin, milk etc.) and poultry (eggs) are among the items sold. It was also observed that some trading centres like Kabuyanda Trading Centre are open for business to the members of the public. The items sold range from foods, utensils, electrical items, solar panels, clothes, shoes, steel and metal works, and beef among others. The survey revealed that 35.2% of the households sell their products within a distance of less than 500ms probably at the farm gates and local trading centres, 26.9% sell their products within 1-3kms, 20% within a distance 500-1km and 18% sell their products within a distance of more than 3kms. Distances travelled to the marketing places depend on their location. Challenges faced while marketing their products include accidents due to poor roads and limited transportation.

Figure 39: ***Market Day at Kabuyanda Town Council***

Figure 40: ***Market Day at Kabuyanda Town Council***

4.4.9 Assets ownership

Ownership of assets is a key indicator for a household's welfare. The most common assets owned by households in the project area include; land, a house, radio, domestic animals, cell phone and a bicycle. Other assets owned include solar panels, motorcycles and television sets.

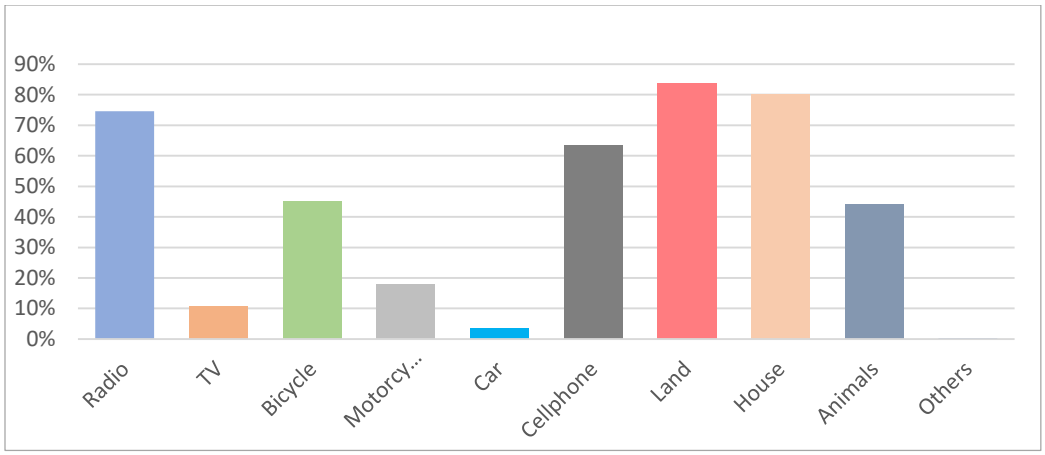


Figure 41: Assets Owned by Households

4.4.10 Social Infrastructure and Service Delivery

4.4.10.1 *Education*

Kabuyanda Sub-County has limited education facilities. The Sub-County has one secondary school, one Technical Institute and seven primary schools. The secondary school and the technical institute are both owned by the Anglican Church. The seven primary schools are government owned and these include:

1. Kigabagaba Primary School
2. Kabugu Primary School
3. Kagoto primary school
4. St. Mary's Primary School
5. Kanywamaizi Primary School
6. Rwabyemera Primary School
7. Rwakakwenda Primary School

Similarly, Kabuyanda Town Council has two secondary schools and six primary schools which are government owned including:

1. St Thomas Aquinas Secondary School
2. Kabuyanda Central Primary School
3. Kaiho Primary School
4. Iryango Primary School
5. Kisyoro Primary School
6. Nyampikye II Primary School
7. Kaaro Karungi Primary School

Due to limited educational facilities in the sub-county, the government allowed the establishment of private schools to help to boost education in the area. As a result, the sub-county has six private schools and these include:

1. Kigabaga Primary School
2. Eden Primary School
3. Beseri Primary School
4. Bam Primary School
5. Future Holds Primary School
6. Dubai Tech Kindergarten

According to Isingiro District LGDPII 2015/2016-2019/2020, the implementation of the Universal Primary Education Program (UPE) by government has increased access to education in the district. However, despite registered successes of the UPE program, a number of challenges still exist such as; low completion rates; high drop out and repetitions; Head teacher, Teacher and pupil absenteeism, weak capacity for school inspection; and inadequate resources for infrastructure and instructional materials. The school enrollments for primary and secondary schools in the project area, including enrollment for special learning children, the number of teachers, number of permanent classrooms, number of permanent latrine stances and number of teachers' houses.

Despite the presence of the UPE program, there are still children who are of school going age but are not enrolled in school. The socio-economic survey findings showed that 16.4% of the households had children of school going age but were not school. The majority of the households attributed this to lack of school fees. Other reasons given include: children stubbornly refused to study, corporal punishment in school, hunger in school and chronic illness.

With regard to distances, the distances to primary schools are shorter than the distance to secondary schools. This is attributed to the few secondary schools in the project area. The findings from the socio-economic household survey findings show that 63.9% of the children in the sampled households travel up 1km to reach a primary school compared to the 30.7% of the students who move up to 1km to reach a nearest secondary schools. The findings further show that 28.9% of the students travel more than 3kms to reach a secondary school and only 2.6% of the students this distance to the nearest primary school. Figure below shows the distances travels by pupils and students in the project area to the nearest primary and secondary schools.

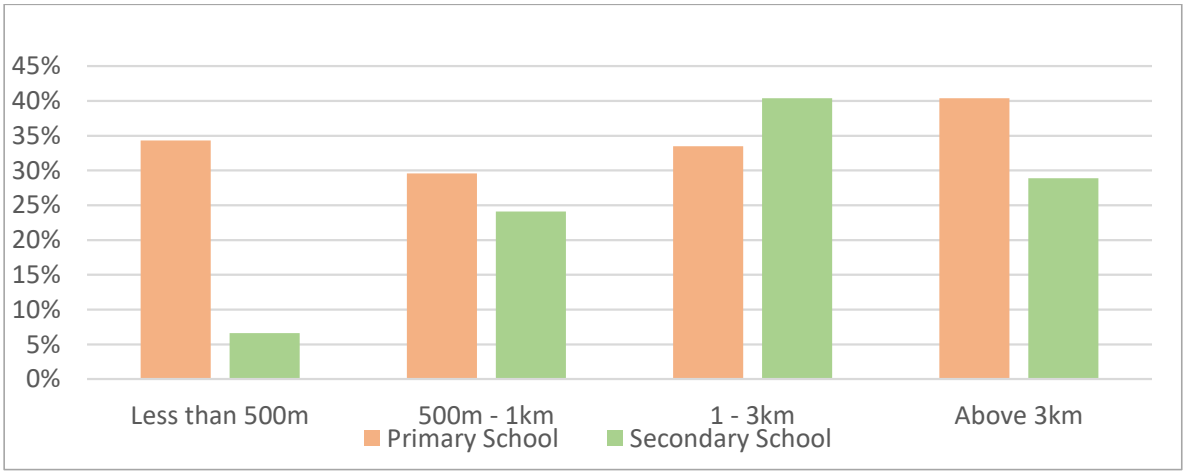


Figure 42: Distance to the nearest Primary and Secondary Schools

4.4.10.2 *Health*

According to Isingiro District Health Management Information Systems (HMIS), Annual Analysis Report (July 2016 – June 2017), the District has 79 Health facilities, 4 Health Center (HC) IVs, 20 HC IIIs, and 55 HC IIs with 54 Gov't owned Health units, and 11 NGO owned Health Units Private Not for Profit Organizations (PNFPs) and 14 PFPs. The District has 32 PMTCT sites, 16 ART sites, 7 SMC sites and 30 TB sites. Kabuyanda Town Council and Kabuyanda Sub-County both have three health units. Kabuyanda Town Council has one Health Center IV and two HC IIs which include; Kabuyanda HC IV, Kisyoro HC II and Kyamosoni HC II while Kabuyanda Sub-County has three HC IIs namely; Kabugu HC II, Kanywamaizi HC II and Rwakakwenda HC II.

The private sector plays an important role in the delivery of health services. The private health system comprises of the Private Not for Profit Organizations (PNFPs) and these are 11, Private Health Practitioners (PHPs) and the Traditional and Complementary Medicine Practitioners (TCMPs). Utilization of public Health facilities in the country is limited due to poor infrastructure, lack of adequate medicines and other health supplies, shortage of human resource, low salaries and lack of staff accommodation at health facilities among others. The majority of the households reported to visit Health Centre IIs in case of an emergency. Among the referral health facilities utilized by the households are Mbarara Main Hospital and

Kabuyanda HC IV. With regard to distances, 86.2% of the households access a health facility within a radius of 5km and 64.4% travel more than 6km to access a referral hospital.

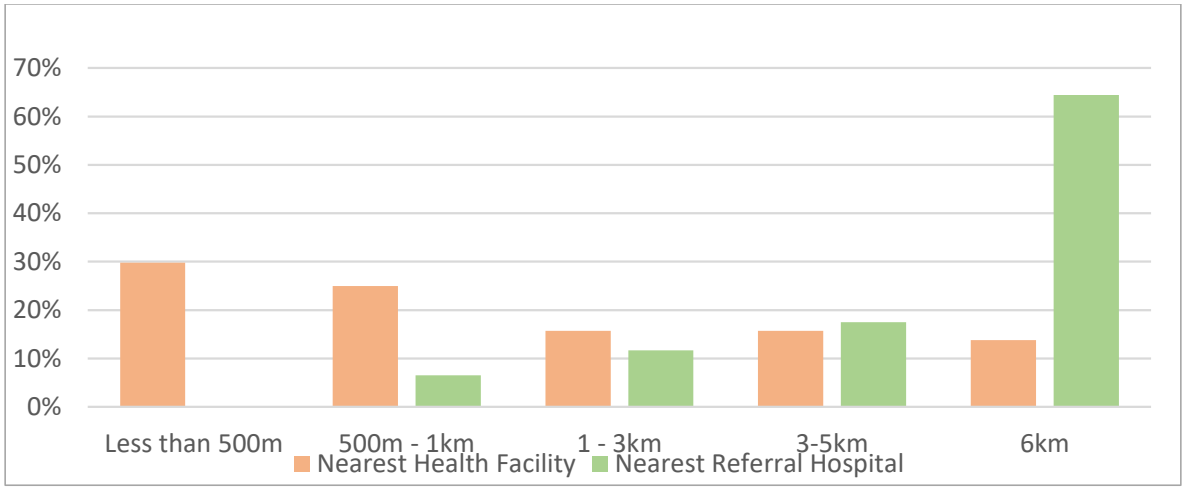


Figure 43: Distance to the nearest Healthy Facility and Referral Hospital

With regard to diseases, Mr. Katugira Alex, an Anaesthetist and Assistant in Charge Kabuyanda HC IV, said that the major common diseases among the populace of Kabuyanda and the surrounding areas include; malaria, Respiratory Tract Infection (RTI), diarrhoea, ear infections and HIV/AIDS. He pointed out that the HIV/AIDS prevalence rate in the area is at 4.6% lower than the national HIV/AIDS prevalence rate of 7%. Findings from the socio-economic survey indicated that the most common diseases affecting households are Malaria as reported by 93.5%, followed by cough (68.7%), water related diseases like diarrhoea (12.6%), Sexually Transmitted Diseases like HIV/AIDS, syphilis etc. (9.5%) Respiratory Infections like RTI (9.7%), ulcers (7.7%) and other diseases such as skin diseases, burns etc. Figure below shows the common diseases reported by households in the project area.

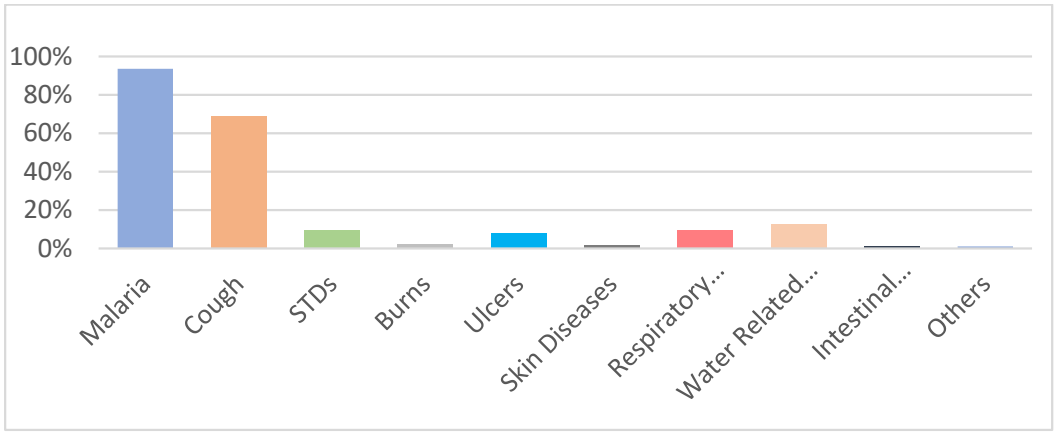


Figure 44: Most Common Diseases in the Project Area

The socio-economic survey further revealed that the children under 5 years suffered from malaria in the last 4 months were 95.5% while their counterparts who are above 5 years who suffered from malaria were 82.9%. According to Mr. Katugira Alex, an Anaesthetist and Assistant in Charge Kabuyanda HC IV, malaria cases are high in the area due to several breeding places for mosquitoes like the swamps, rivers, banana plantations and the forest reserve. The socio-economic survey also revealed that 66.5% of the children

under 5 years suffered from diarrhoea in the last 4 years while 28.7% of the children above 5 years suffered from the disease. This was attributed to poor hygiene and lack of safe and clean water for the households. With regard to HIV/AIDS awareness, the socio-economic survey revealed that 98.7% of the population in the project area are aware of HIV/AIDS while 1.3% are not aware of the killer disease and the major causes stated include; having unprotected sex with an infected person, blood transfusion, sharing sharp objects, having many sexual partners, mother to child, and accident among others.

4.4.10.3 *Energy*

Kabuyanda Town Council and Kabuyanda Sub-County are among the few remote areas in the country that are connected to the national grid. Several villages in Kabuyanda Town Council and Kabuyanda Sub County are connected to the 33kV lines and the power supplier is UMEME. Findings from the socio-economic survey showed that majority of the households (70.7%) use firewood and (23.7%) use charcoal for cooking while 53.4% and 36% of the households use electricity and solar for lighting respectively. During the site inspection, the project affected persons mainly used eucalyptus trees as firewood. The eucalyptus trees are cut into pieces and piled along the road/path and in some trading centres and sold in bundles. On average, a bundle of firewood cost between 3,000 UGX and 5,000 UGX.

4.4.10.4 *Water Supply*

Isingiro District is prone to drought and there is lack of adequate water for both human consumption and production. The average safe water coverage for the entire district is recorded at 37% which is far below the national standard of 66%. According to the National Population and Housing Census 2014–Isingiro District Profile, 12.3% of the households in the district have access to piped water while 6.1% access water through boreholes. Kabuyanda Sub County depends mainly on water from Gravity Flow Schemes (GFS) and borehole water. The sub county has two Gravity Flow Schemes which include; Rwemango GFS, Rwabymera and four boreholes scattered all over the Sub County. Other sources of water for households in the sub county include springs and swampy water although the quality of the water from these two sources is poor in terms of taste, colour, smell and hardness.

Kabuyanda Town Council depends mainly on two streams flowing from Oruhenda from Kabuyanda Sub County and a Gravity Flow Scheme from Rutemba and Kisyoro supplying the town council and other villages in the vicinity. These gravity flow schemes provide water to the communities at no cost. Initially, these gravity flow schemes were owned by associations, organized in small groups through which money was collected for maintenance purpose. These associations later collapsed due to poor management and death of strong leaders. During consultations with the local authorities, they requested the developer of Kabuyanda Water Resource Development Project to assist them in the maintenance of the gravity schemes and to build bigger water storage tanks. The findings of the socio-economic households showed that river/lake/stream/swamps were the main sources of water for households in the project area, followed by unprotected springs, public boreholes, rain water harvesting, public stand posts and protected springs/wells.

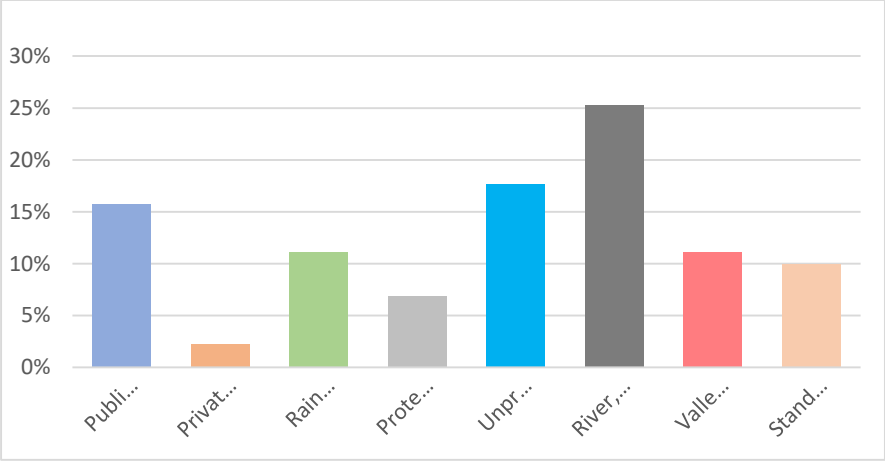


Figure 45: Main water Sources in the Project Area

Results from the socio-economic survey revealed that beside the use of water for domestic purposes, households use water for different purposes i.e. 32.4% use water for watering animals, 30.1% use water for brick making, 26.9% use water for irrigation, 7.7% use water local beer brewing and 2.9% use water for fish farming like Tukundane Fish Farm Limited. At the time of site assessment, it was also discovered that some members of the community use water for washing cars and motorcycles. This was mainly done in the swamps along the road. Further analysis of the socio-economic survey revealed that on average 4 jerry cans are used by the households for domestic use while an average of 3 jerry cans are used for other purposes. In terms of distances travelled to the water source, the majority of the households (74.5%) travel up to 1km to reach a water source. The majority of the households (75.3%) spend up to an hour to collect water from the water source.

4.4.10.5 *Sanitation and Waste Management*

According to the National Population and Housing Census 2014, Isingiro District Profile, 2.3% of the households in the district do not own a toilet facility and only 17.1% of the households dispose of their solid wastes properly. The findings from the socio-economic survey indicated that 99.1% of the households have toilet facilities for disposing human wastes while 0.9% of the households lack toilet facilities The most common type of toilet facility owned/used is the pit latrines as reported by 96.3% of the respondents, followed by Ventilated Improved Pit latrine (VIP) 2.6%, Flush toilet 0.2% and 0.9% lack toilet facilities. The socio-economic survey revealed that the households that lack the toilet facilities utilize their neighbour's' toilets to dispose their human waste and the reason advanced for lack of the toilet was lack of funds to construct a latrine. They intimated that the nature of the terrain makes construction of the toilet expensive. The most common methods of domestic garbage disposal in the project areas are the use of open dumps, burning, shallow pits and scattering in the gardens. These methods are mainly used in the villages. In the trading centre, garbage is collected by the Kabuyanda Town Council and dumped near the Town Council offices.

4.4.10.6 *Transportation*

Isingiro District has one bitumen road that starts from Mbarara and passes through Isingiro, and ends in Kikagati, at the border with the Republic of Tanzania. The district roads are regularly maintained, covering approximately 462.2km. The roads in the project area i.e. Kabuyanda Town Council and Kabuyanda Sub County are gravel in nature and they are characterised by potholes, rough and slippery during the wet season. The project site can be accessed through Isingiro–Kikagati road to the border of Uganda and Tanzania via Kabuyanda Town Council. The section from Isingiro District to Kikagati is tarmac while the section from Kikagati to Kabuyanda is gravel. The project site can also be accessed off Mbarara-Kabale

road, from Kaberebere–Kakoni–Kabuyanda. This section of the road is gravel and finally the project site can be accessed from Ntungamo–Kitwe–Kabuyanda. The access road to the project site from Kabuyanda trading centre is Akatesani–Kagoto–Kyamazinga which is approximately 10km. The road is narrow with potholes and slippery in the wet season.

4.4.10.7 *Communication and Access to Information*

Isingiro District as a whole is connected to a number of telecommunication networks like MTN Uganda, Orange Uganda, and Airtel Uganda. Besides telecommunication, the district is also connected to satellite and free to air television and radio stations. Some of the satellite televisions that are accessible in the district include; DSTV and Azam TV and radio stations include; Radio West, Endigito radio and Ruhiira Radio. Consultation with the community revealed that majority of the people in the project area listen to Ruhiira radio. Ruhiira radio is located in Ruhiira and it is near Kabuyanda. In terms of telecommunication network, Airtel Uganda is the major network to which people in the project area are connected. Figure below shows how people access information in the project area. The socio-economic survey findings indicated that the most common means of access to information by households in the project area are radio, places of worship, through neighbours, community meetings, telephones and village public speakers.

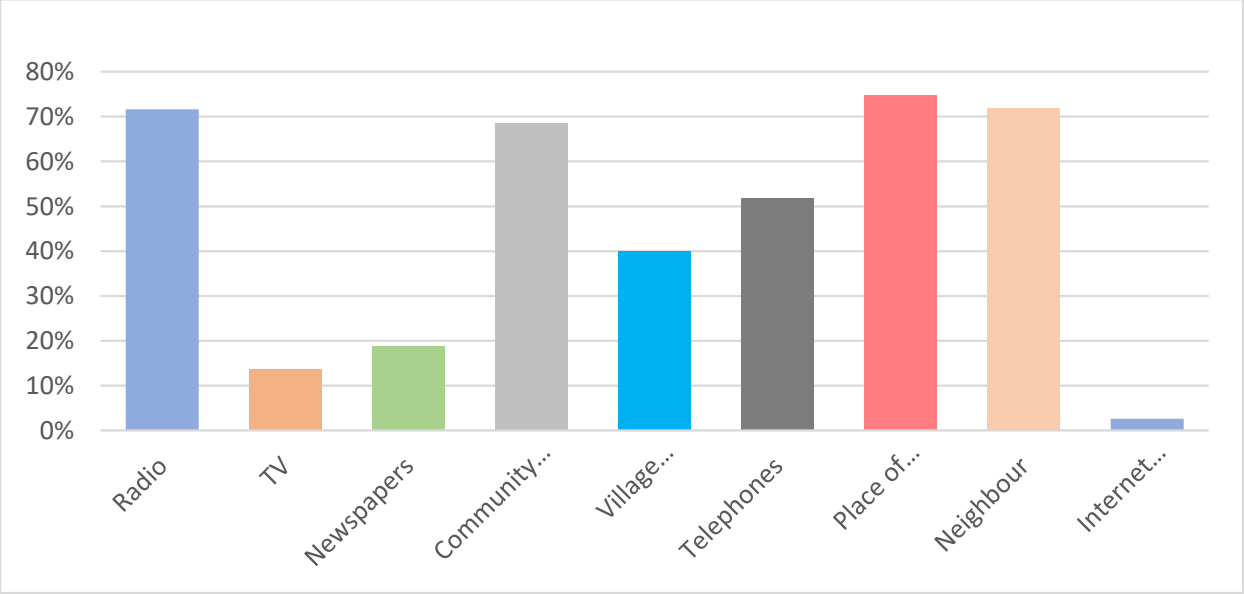


Figure 46: Means of Access to Information by Households in the Project Area

4.4.10.8 *Recreation Facilities*

Isingiro District is gifted with unique features that exhibit potential for tourism and these include; Rivers Kagera and Rwizi and Lakes are Nakivale, and Oruchinga and water falls with good aquatic vegetation and possibilities for boat riding, water rafting, swimming and spot fishing. The district has monumental, leisure and recreation sites in Kabingo and Kikagate. The project area has no major recreational facilities besides the beautiful scenery of the area especially viewed from above the hills.

4.4.11 Access to and Dependence on Natural Resources

In the project area, there are natural resources that can be accessed by the people. There are mining areas in the project hence majority of the people mainly depend on land as natural resource for their livelihood. The land is mainly used for crop farming, tree planting by NFA at Rwoho animal rearing and fish farming. The people also depend on streams and river tributaries for water supply.

4.4.12 Security and Conflict Management

Consultations with security leaders of Isingiro District such as the Residential District Commissioner, (RDC), and Officer in Charge (OC) of Kabuyanda Town Council Police and the Gombolola Internal Security Officer (GISO) revealed that the people in the project area are law abiding citizens and they are peaceful. They also revealed that there are no high crime rates in the area apart from petty thieves and cases of domestic violence like family conflicts, land conflicts. During community consultations, it was reported that cases of rape and defilement, theft and murder were rare in the area and in case of occurrence, the rape and defilement cases were mainly committed by drunkards while the murder cases occurred during the transportation of goods at night. It was revealed that resolution of conflicts is mainly by family members, local authorities, Uganda Police, religious leaders and the Courts of Law as the last resort. In addition, a police post is established in Kabuyanda Town Council to handle any cases that threat public security in the area.

4.4.13 Gender Relations

Consultations with the women groups revealed that women do not have much say as regards ownership of the property. The women further revealed that land and animals belong to the men while food crops belong to the women. A woman is entitled to land if it was given or inherited by her family or if she purchased it. The women emphasized that they should be involved and consulted throughout the project life cycles. In terms of gender roles, women take up most of the workload compared to men. Women are responsible for tilling the gardens, collecting firewood, fetching water, cooking food, keeping the home clean, looking after children. Men are responsible for tilling the gardens, collecting firewood, grazing animals and earning income for the family. However, women are also major contributors to the family income. The boy children are responsible for helping out their fathers with grazing animals, fetching water and any other chores assigned by the parents. The girl children are responsible for helping their mothers with the household chores, fetching water and any other duties assigned by the parents.

4.4.14 Existing Government Programs for Livelihood

There has been some effort by government to improve livelihoods for the communities in the project areas. Table below shows the existing livelihood programs for communities in the project area.

Table 41: Livelihood Programs in the Project Area

Livelihood Program	Activities	Target group
Youth Livelihood Program	a. Government support various youth projects b. Youth are encouraged to form groups of 10-15 members c. Government extend loans to youth and it is a revolving fund where youth have to pay back the loan d. Payable period for the loan is 2 years	Youth
Uganda Women Entrepreneurship Program	a. Government supports women through women's' groups. b. Government extends loans to women groups and loan has to be paid to government	Women
Special Grant for Person with Disabilities	a. Persons with Disability are encouraged to form groups through which the government can extend credit facilities to them. b. The government gives the PWD less than 3,000,000 UGX and the loan is not payable back to the government.	Persons With Disabilities

4.4.15 Planned Developments in the Area

Below is a list of other planned developments in Kabuyanda Town Council and Sub-county

a. Bwegyerere to Kihogo road 2017 – 2018
b. Eden to Paragon road 2019 – 2020
c. Kagoto Kyamazinga Rubagana road 2020 – 2021
d. Construction of Toilet at the Sub County 2018 – 2019
e. Construction of Kabuyanda Sub County headquarter
f. Itare Rukiri road
g. Construction of Staff quarters of all primary schools

4.4.16 Public health

4.4.16.1 *Public Health Information*

The current public health situation in the project area (Kabuyanda) is shown below**.** The health survey reveals that malaria is by far the greatest problem of concern in the project areas. The overall infection rate during the survey was estimated at 51.1% with no significant difference between the females and the males. The female infection rate is 50.9% while for males it is 51.2%. The infection rate greatly varies with age. Among the children five years and younger the rate is over 80%. This confirms the experience and concern in the area that malaria is the greatest killer of children below the age of five years. The possible reason is that children are less immune to malaria than adults who have had enough time to develop immunity. Furthermore, children are more exposed to the mosquito bites than the adults owing to poverty in which more adults have cover against mosquitoes than the children as shown by the social survey. The bedding for a child is usually just a papyrus mat and no more. This indicates the need to emphasise programmes for control of malaria particularly focussed on ensuring the survival of children.

Table 42: Summary of community Health

Disease/Condition	% of all diagnoses
Malaria Confirmed (microscopic and RDT)	30.9
No Pneumonia – cough or cold	29.5
Intestinal worms	4.3
Diarrhoea – acute	3.9
Skin Diseases	3.9
Pneumonia	3.9

4.4.16.2 *The Disease Burden*

In general, in the district, the major disease burden includes: Malaria, Upper Respiratory Tract Infections (URTI), and diarrhoea especially among children, TB, Yellow fever, Cholera, Skin infections, Eye infections, AIDS, Asthma, Dysentery, and worm infestations among children. The health programme related to the project needs to address and reduce these diseases.

4.4.16.3 *Incidence of Malaria*

As mentioned above, the result from analysis of district data for malaria gives infection rate of 51%. This is a high infection rate for a random sample of the population. Experience in hydroelectric development projects elsewhere indicates that a 75% increase in the malaria arises as a result of the hydro project. If this happens in the Kabuyanda Project then there will be an 89% incidence rate. This is a significant potential impact that needs to be addressed from the onset. Mosquito nets should be given out to the communities by the project.

4.4.16.4 *HIV/AIDS and STDs*

Sexually Transmitted Diseases are prevalent. The highest prevalence rate in 2016/2017 was registered at 3.9%. All individuals who are found positive are supposed to be started on cotrimoxazole prophylaxis (CTX). This situation is created by the communities' attitude to sex namely that sex is as "normal as breathing". Sexual Exploitation and Abuse (SEA) increase chances of contracting HIV/AIDs and STDs amongst children, youth and adults. Polygamy is common – approximately 50 % of females are living in polygamous relations. Re-marrying is also common. These pre-disposes persons to HIV/AIDS. The people are promiscuous. In addition, there is excess consumption of alcohol. Cultural attitudes tend to increase exposure. A specific programme from the project is required to address this situation.

4.4.16.5 *Provision of Health Care Services*

In the District hosting the project areas, the health care sector aims to provide curative, preventive, and rehabilitative services with the objective of reducing morbidity and mortality and to improve the health of the people of the area. There is a strong effort to provide both curative and preventive health services. This includes; outpatient service, laboratory services, Immunisation, Family Planning, Antenatal, Maternity, and Maternal Child Health services. However, owing to inadequate funding, the efforts have not yielded enough health. Health care services in the project areas are therefore inadequate (The District Health Management Information System Annual Analysis Report 20/7/2017).

Most of the ill-health among the rural population arises from preventable causes. Conditions which favour disease transmission are in evidence in the project area. These include disease agents, susceptible hosts and conducive environments (physical, socio-economic and biological). Sanitary control measures in the area are inadequate and this has resulted into poor control of pathogens, toxins, disease vectors, infection reservoirs as well as unpleasant physical and chemical agents. This is due to inadequate funding leading to scantly funded public health programmes. As a result, water related diseases, food borne diseases, airborne diseases, and vector borne diseases are pronounced and are causing significant mortality, morbidity and economic loss. Provision of adequate and safe water supplies, proper disposal of refuse, excreta and waste, health education, control of disease vectors, improvement of housing and improvement of food hygiene are few of the measures which would go a long way to prevent the spread of communicable diseases and improve the health and wellbeing of the communities generally. The provision of health services is urban biased - that is urban facilities are better equipped and manned by more qualified personnel and yet 88.6% of the population reside in rural areas and have more health problems. Owing to the poor infrastructure long distances have to be walked to the nearest health facility. The prospects in improving the situation are poor.

4.4.17 Physical cultural resources

4.4.17.1 *Historical Background of the Project Area*

The project area is located in Isingiro district situated along River Kagera bordering Uganda and Tanzania. This area is known to have high Stone Age potential. The most famous site at Nsongezi located just downstream of the Kitagati-Nsongezi gorge was discovered in 1930 by Wayland and excavated by O'Brien in the 1930s, Wayland and Posnansky in the 1950s and Cole in the 1960s (Bishop & Clark 1967). This site has produced some numbers of both Early Stone Age (ESA) lithics (Acheulian) and Middle-Late Stone Age lithics (MSA-LSA, Sangoan and Lupemban). ("Lithics" are stone tools). Most, have come from the M-N gravel (or rubbley) horizon of sediments underlying the '100 ft' Kafunzo flat. The site is also the type locality for the Nsongezi Series, which is sandy fluvio-lacustrine thought to be a remnant deposit of a former Lake Victoria. It is believed that the sediments grade easterly to still-water facies (fully lacustrine towards Sango Bay) but are upwarped up to 400 ft above Lake Victoria to the west. Recent archaeological survey and excavations by Basell (2012-ongoing) has located interstratified ESA/MSA lithics at an

unusually high concentration in sandy terraces of the Orichinga River which drains into the Kagera at Nzongezi. This tributary is less than 8km east of Nsongezi substation and very similar in geology and topography.

4.4.17.2 *Archaeological Baseline Information in the Project Area*

Informal consultation meetings and interviews about the past and present traditional, spiritual and sacrificial relationship between the community and the project area was conducted. The following key issues were noted as below;

a. There is no past and present traditional, spiritual and sacrificial links between the project area and the community. Hence no shrines or burials recorded within the project area. However, the issue that remains clear is that the current population is now a mixture of many ethnic communities and probably may be new. This means they may not be aware of the existence of the past life situations in the project area. Therefore, care should be taken by the project undertakers to identify and report any incidental finds.
b. It is therefore recommended that any unforeseen discovery of cultural significance during project site clearance must be reported to the Department of Museums and Monuments.

At the end of the survey, seventeen (17) sites were recorded as located in figure below, and described in detail in the following table**.**

Figure 47: Location site of Archaeological sites

Table 43: Physical Cultural Resources Survey

Lithic sites (Stone Age sites)		
Site Name	**Lithic Site 1 (LS1)**	 *Julius Examining one of the Quartz Cores at LS1*
GPS Coordinates	36 M 0232509 UTM 9909734, Elevation 1354m.	
Baseline Condition and Significance	The site is located in Kyamazinga village in the maize/beans garden close to River Camp. It is characterized by huge quartz cores with evidence of flake removals but no any sign of tool manufacturing onsite. Hence they could have been transported to other areas seen nearby. With evidence of lithic tools, iron smelting slag, and pottery recovered nearby, the site provides insight into human settlement history and technological development from stone age period to iron age of today. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Lithic Site 2 (LS2)**	 *Quartz Core in LS2*
GPS Coordinates	36 M 0232344 UTM 9900248, Elevation 1355m.	
Baseline Condition and Significance	This site is located in Muruhenda village in a maize/beans garden. It is characterized by a single huge quartz core that shows some evidence of flake removals but just like in LS1, there was no any scatter of lithic tools or debris on site. This however still gives evidence of human utilization of the area from stone age period. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Lithic Site 3 (LS2)**	 *Lithic Scatters in LS3*
GPS Coordinates	36 M 0232607 UTM 9899748, Elevation 1369m.	
Baseline Condition and Significance	The site is located in Muruhenda village, with scatters of microlithic stone tools appearing exposed on the cut surface in large number. There is also huge quartz core besides it. This site could have probably been lithic tool manufacturing site. However due to constant disturbance of the soil through cultivation, the artifacts seem not to be in their original position. In the irrigation command area and therefore outside the reservoir.	

Iron smelting		
Site Name	**Iron Smelting Site 1 (ISS1)**	 *A Piece of Iron in ISS1*
GPS Coordinates	36 M 0232696 UTM 9900750, Elevation 1384m.	
Baseline Condition and Significance	The site is located in Kyamazinga village with a single piece of metal exposed in a bean plantation along the cut road cut surface probably in situ. The piece of metal is however too small to be diagnosed and hence its and components and function cannot be established. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Iron Smelting Site 2 (ISS2)**	 *Pieces of Tuyere in ISS2*
GPS Coordinates	36 M 0232861 UTM 9901061, Elevation 1384m.	
Baseline Condition and Significance	The site is located in Kyamazinga village, characterized by scatters of pieces of Tuyere (clay pipes used to channel pressure to the furnace during iron smelting) in a maize/beans garden. Due to constant agricultural activities on the site, the artifacts have been rolled over and over again, losing their *in situ* position. But, they are a good indicator of iron smelting in the area. Iron smelting practice is known in western Uganda and this evidence though not in context; add more knowledge about iron smelting. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Iron Smelting Site 3 (ISS3)**	 *A Piece of Slag at ISS3*
GPS Coordinates	36 M 0232716 UTM 9901130, Elevation 1364m.	
Baseline Condition and Significance	Located in Kyamazinga village in the road leading to Kirungu village. The slag is within the location of pieces of Tuyeres recorded at ISS2. Hence, it could have been part of an iron smelting process. This gives a clear picture that iron smelting took place in Kyamazinga village but due to the effect of agricultural activities and soil erosion; it is difficult to reconstruct the entire process. In the irrigation command area and therefore outside the reservoir.	

Pottery sites		
Site Name	Pottery site 1 (PS1)	 *Scatters of Potsherds at PS1*
GPS Coordinates	36 M 0232717 UTM 9900788, Elevation 1387m.	
Baseline Condition and Significance	It is located in Kyamazinga village, characterized by tiny pieces of undecorated pottery appearing on the cut surface of the road in a beans garden exposed by agricultural activities. The potsherds recorded here are mostly undecorated and heavily eroded. This has reduced heritage significance of the site. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Pottery Site 2 (PS2)**	 *A Potsherd in PS2*
GPS Coordinates	36 M 0232720 UTM 9900801, Elevation 1389m.	
Baseline Condition and Significance	This is also located along the cut road surface in Kyamazinga village. The potsherds are of tiny pieces with no decoration, exposed by agricultural activities. Due to deep erosion, the potsherds cannot be diagonised and hence their dates and functions are lost, hence low heritage significance. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Pottery Site 3 (PS3)**	 *A Potsherd in PS3*
GPS Coordinates	36 M 0232783 UTM 9900931, Elevation 1388m.	
Baseline Condition and Significance	It is located about 75m from site PS2 in Kyamazinga village. It has huge scatters of tiny undecorated potsherds exposed by agricultural activities. The site, just like PS1 and PS2 has lost its context and diagnostic features making it hard to classify them. In the irrigation command area and therefore outside the reservoir.	
Pottery sites (continued)		

Site Name	**Pottery Site 4 (PS4)**	 *A Potsherd in PS4*
GPS Coordinates	36 M 0232797 UTM 9900949, Elevation 1388m.	
Baseline Condition and Significance	This was recorded in Kyamazinga village in a maize/beans garden. The site has tiny pieces of undecorated pottery. One piece probably could have been a base of an open vessel used as a dish but the potsherd is too small for further analysis. The artifacts are all in a disturbed surface and hence their contexts have been lost. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Pottery Site 5 (PS5)**	 *A Potsherd in PS5*
GPS Coordinates	36 M 0232882 UTM 9901139, Elevation 1377m.	
Baseline Condition and Significance	This is located along the Kyamazinga-Kirungu road. It has huge scatters of tiny piece of undecorated potsherds that could have probably been washed from the upper side of Kyamazinga village. The potsherds are eroded to the extent that they have lost all the diagnostic features making it difficult to determine their shapes and function. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Pottery Site 6 (PS6)**	 *A Potsherd in PS6*
GPS Coordinates	36 M 0232575 UTM 9901122, Elevation 1361m.	
Baseline Condition and Significance	This is located about 15m across River Camp in Camp village. The site has huge scatters of undecorated pottery along the slopping road. The potsherds seem to have been moved from the upper part of the road by running water, hence their contextual positions have been lost and hard to diagnose. In the irrigation command area and therefore outside the reservoir.	
Pottery sites (continued)		
Site Name	**Pottery Site 7 (PS7)**	
GPS Coordinates	36 M 0232441 UTM 9901049m, Elevation 1384m.	

Baseline Condition and Significance	Located in a temporary recent settlement of Mr. Twijukye Samuel, believed to have settled in the area in 2009, purposely for farming. The compound has scatters of potsherds with few decorated in Plaited Grass Roulette (PGR). As compared to other sites, it's only this site that has slight stable ground. In the irrigation command area and therefore outside the reservoir.	 *The Home of Mr. Twijukye Samuel*
Site Name	**Pottery Site 8 (PS8)**	 *Julius Examining Artifacts in PS8*
GPS Coordinates	36 M 0232556 UTM 9900933, Elevation 1358m.	
Baseline Condition and Significance	It is located in the middle of the garden (lower point) close to the River point in Camp village. The site has scatters of tiny pieces of undecorated potsherds that could have probably been rolled over and over again by agricultural activities. They have lost all their diagnostic features and hence low heritage value. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Pottery Site 9 (PS9)**	 *A Potsherd in PS9*
GPS Coordinates	36 M 232431 UTM 9900831, Elevation 1358m.	
Baseline Condition and Significance	Located in a ploughed garden in Kamazinga close to the river point. The potsherds appear in association with lithics. They are tiny, undecorated but quite compacted. The potsherds are diagnostic and hence their date of manufacture and function cannot be determined. In the irrigation command area and therefore outside the reservoir.	

Pottery sites (continued)		
Site Name	**Pottery Site 10 (PS10)**	
GPS Coordinates	36 M 0232371 UTM 9899496, Elevation 1348m.	
Baseline Condition and Significance	It is located outside the project area with high scatters of potsherds in Kagoto village under a banana and coffee plantation. The site also has some small pieces of slag. The potsherds here are tiny and undecorated for their date of manufacture and functions to be determined. In the irrigation command area and therefore outside the reservoir.	*A Potsherd in PS9*

Mixed site		
Site Name	**Pottery, Lithic and Slag Site 1 (PLSS1)**	
GPS Coordinates	36 M 0232872 UTM 9899479, Elevation 1,352m.	
Baseline Condition and Significance	This is located in Katoma village on the steep slope of the hill. The site is characterized by scatters of pottery, lithics and slag in association. The artifacts were exposed by soil erosion though they look in situ. The pottery here are tiny, undecorated and highly eroded with no diagnostic features. In the irrigation command area and therefore outside the reservoir.	*Artifact Scatters in PLSS1*
Burial sites		
Site Name	**Rwembwera 2 Burial Site 1 (R2BS1)**	
GPS Coordinates	36 M 0234725.68 UTM 9894423.196	

Basline Condition and Significance	It is located in Rembwera 2 village in the home of Twimomuhwezi Lucky. The site has 1 graves. According to the owener of the grave, removal of burials/graves is always a painful act since it is taken as disturbing the peace of the resting dead. Relocation is viewed in a negative way but done as the last resort. It is therefore recommended that the elders of the affected family need to be consulted on the appropriate relocation procedures before it is undertaken. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Kigabagaba 2 Burial Site 2 (K2BS2)**	
GPS Coordinates	36 M 0237278.712 UTM 9899638.502	
Basline Condition and Significance	The site is located in Kigabagaba 2 village and has 1 grave. It belongs to Mr. Tusingwire Bernard. When consulted, he also believes that removal of burials/graves is a total disturbance of the resting souls and asked the project undertakers to work hand in hand with the elders of the family, in order to ease the negative effects of relocating the affected grave in his family. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Bugarama 2 Burial Site 3 (B2BS3)**	
GPS Coordinates	36 M 0235561 UTM 9895824	
Basline Condition and Significance	The site has 2 graves, located in the home of Nyanvura Jackline in Bugarama 2 village. The family agrees to the location of the graves but in consultaion with the elders so that the right relocation procedures are followed. It is recommended that consultaion and subsequently relocation, should be done before construction starts. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Ekyisinga Burial Site 4 (EBS4)**	
GPS Coordinates	36 M 0235561 UTM 9895824	
Baseline Condition and Significance	It is located in **Ekyisinga villaged in the home of Kavangyi Ferestansi**. The site has 3 graves. Consultation with the family indicates that relocation is always not preferred but for the sake of the project, they would recommend their traditional cultural practices to be followed in order to relocate the graves. The project undertakers are therefore urged	

	to consult further with elders of the affected family in order to appropriately relocate the graves to a new place. In the irrigation command area and therefore outside the reservoir.	
Site Name	**Kaaro 3 Burial Site 5 (K3BS5)**	
GPS Coordinates	36 M 0235561 UTM 9895824	
baseline Condition and Significance	The burial site is located in the home of Bakabura Wilson in Kaaro 3 village. It contains 3 graves. The family also believes that in case the project requires them to relocate the graves, the elders who are conversant with the relocation process should be closely consulted to guide the process before construction starts. In the irrigation command area and therefore outside the reservoir.	
Places of worship		
Site Name	**Kabugu Catholic Church 1 (KCC1)**	
GPS Coordinates		
baseline Condition and Significance	The church is located in Kabugu village in Kabuyanda Town Council. It belongs to the catholic faith. In relation to the project, the church structure will not be directly affected by the project but only part of the land. Therefore the spiritual component of the church may as well not be affected directly. The Valuation Team will therefore handle the issue of the land. In the irrigation command area and therefore outside the reservoir.	
Site Name	**St. Jude Catholic Church 2 (SJCC2)**	
GPS Coordinates		
baseline Condition and Significance	The church is located in Kanywamizi parish in Kanywamizi village. It belongs to the catholic faith and located in Kabuyanda Town Council. The project will not affect the church structure directly, but part of its land. Therefore, the spiritual component of the church will also not be affected directly by the project. The Valuation Team will therefore handle the issue of the land In the irrigation command area and therefore outside the reservoir.	
Site Name	**St. Jude Catholic Church 2 (SJCC2)**	
GPS Coordinates		

baseline Condition and Significance	St Paul Catholic Church is locate in Kabuyanda Town Council. The project will affect some parts of the land and trees but not the structures. The Valuation Team will therefore take appropriate measures to handle the affected parts of the land and the trees. In the irrigation command area and therefore outside the reservoir.	 *St. Paul Catholic Church, Kabuyanda*

The previous analysis covered the whole district, necessitating revision to restrict direct impact analysis of PCRs to locations of proposed project infrastructure, especially the reservoir. Under Section 2.5.2, the reservoir shall be located at GPS coordinates 23805E and 9903108N in the following villages: Katooma I, Kagoto II in Kanyamizi Parish, Mukazianyara in Kirungu Parish, and the tip end being located between Kagala and Nyakatojo villages. The major excavation works will be at the dam/reservoir area, where no known major PCRs were identified except archaeological deposits which will require professional rescue excavations and chance-finds management.

Based on analysis of the location of the reservoir villages and its coordinates, none of the 17 sites is located within the reservoir/dam area. This implies that the project will not likely have significant impact on the known PCRs in the reservoir area. As for impacts on the church areas, it is noted that, the water mains do not traverse directly the churches but take up sections of church lands and some trees and such impacts will be compensated as already taken up in the RAP. In addition, works will done in close consultations with the laity in the areas to enable proper scheduling of construction activities to avoid disrupting church functions and worship schedules.

4.4.17.3 *Observations on PCRs in the project*

From the above, the following are noted:

a. Though there are reported two graves in the project areas, the project design will endeavor to ensure the alignment of the water mains avoids these PCRs and incase this becomes inevitable, then the PAPs will be compensated and assisted to relocate the remains of their dead;
b. The site areas are reported to have some lithics and potsherds which are virtually spread in many parts of the project and have been subjected to agricultural/cultivation activities which have reduced their sizes as well as their values. It is also noted that, farming activities have contributed to spreading/scattering these PCRs to the extent they are now.

In conclusion, none of the 17 sites identified is located within the reservoir/dam area. This implies that the project will not have significant impact on the known PCRs in the reservoir area.

4.4.18 Socio-economic Environment in the Inundated area

4.4.18.1 *Settlements and Livelihood activities*

There are no settlements in the area to be inundated. Given that this is a forest reserve, permitted activities are limited to commercial tree planting (mainly pine and eucalyptus) by NFA and licenced tree farmers. The sides of the wetland are heavily cultivated with crops including maize, Irish potatoes, beans and ground nuts and are planted with *Pinus carribea* trees. This is in line with the *taungya* cultivation system that allows intercropping tree seedlings with food crops at an early stage of plantation establishment and gradually phased out after crop harvests. There is no animal grazing or fishing.

5 ANALYSIS OF ALTERNATIVES

The EIA Guidelines for Uganda require that any alternatives of a proposed project are compared in order to determine which alternative represents the most desirable balance between environmental, social and economic costs and benefits.

5.1 Project Alternatives considered

From the Feasibility Study, the following project alternatives were identified.

a. Two dam location alternatives;
b. Two dam types;
c. Two dam utilization options;

In line with EIA Guidelines for Uganda, this ESIA report identifies project alternatives, analyses them and presents the preferred alternative. The method used for analysis of the alternatives is presented in Chapter 1 of this report.

5.2 Analysis of Alternatives

5.2.1 The "Project" and "Without Project" Alternative

The project alternative involves implementation of the Kabuyanda Irrigation Scheme project. With this option, the benefits expected from the Project such as improved water availability for food production, increasing food and security in the region; flood control; and restoration of degraded sub-catchments would be realized. This option would also come along with adverse impacts including vegetation loss, loss of climate adaptation investment, inundation of crops and trees, noise nuisance, among others as acknowledged and described in detail in section 7 of this report, and mitigation measures for the negative impacts proposed. Since the adverse impacts associated with this alternative are mitigable, and with very significant project benefits realized, the option is recommended.

The Without project alternative involves not undertaking the proposed project. With this option, the benefits (described above) expected from the project would not be realized and the adverse impacts of the Project presented in this report would be eliminated. However, this is not reason enough to recommend this option against the action alternative since the majority of the adverse impacts are mitigable.

Table 44: Analysis of "With and Without" Project Alternatives

Parameters	Score Definition	With project		Without project	
		Details	Score	Details	Score
Environmental impact					
Flood control	1: high 4: Low	Positive impact will be realized	1	Positive impact will be not realized	4
Restoration of degraded sub-catchments	1: high 4: Low	Positive impact will be realized	1	Positive impact will be not realized	4
Vegetation loss	1: Low 4: High	Negative impact will be realized	2	Negative impact will be not realized	1
Loss of climate adaptation investment	1: Low 4: High	Negative impact will be realized	2	Negative impact will be not realized	1
Inundation of crops and trees	1: Low 4: High	Negative impact will be realized	2	Negative impact will not be realized	1
Noise nuisance	1: Low 4: High	Negative impact will be realized	2	Negative impact will be not realized	1

Social impact					
Increased water availability for food production	1: high 4: Low	Positive impact will be realized	1	Positive Impact will not be realized	4
Feasibility of mitigating negative impacts (costs, benefits, cost effectiveness)	1: High 4: Low	High. Mitigation measures have been provided for all negative impacts	2	No need for mitigation as negative impacts would not be there	1
Technical (time and complexity)	1: Short duration to achieve and less complex 4: Longer duration to achieve and very complex	Time input required	2	No time input required	1
Stakeholder Preference	1: High 4: Low	Preferred because of the associated positive impacts	1	Less preferred despite the negative impacts	4
Capital and recurrent costs	1: Low 4: High	Higher	2	No costs associated	1
Suitability under local conditions	1: High 4: Low	N/A		NA	
Institutional, training and monitoring requirements	1: Low 4: High	Institutional, training and monitoring requirements required	2	Institutional, training and monitoring requirements would not be required	1
		Total Score	**20**	**Total Score**	**23**

As per the score table above, the "project" alternative with the least total score is the recommended option and has been selected for implementation.

5.2.2 Dam Location Alternatives

Two alternative dam locations were identified and studied, located at a distance of approximately 2 km apart along the river.

Table 45: Dam locations alternatives

Site	Location		Basin Elevation		Area
	WGS 84UTM Projection 35 M		Min (m a.s.l.)	Max (m a.s.l)	(Km^2)
	East	South			
Kabuyanda Dam Alt. 1	233602	9899313	1347	1843	90
Kabuyanda Dam Alt. 2	233437	9899331	1341	1843	109

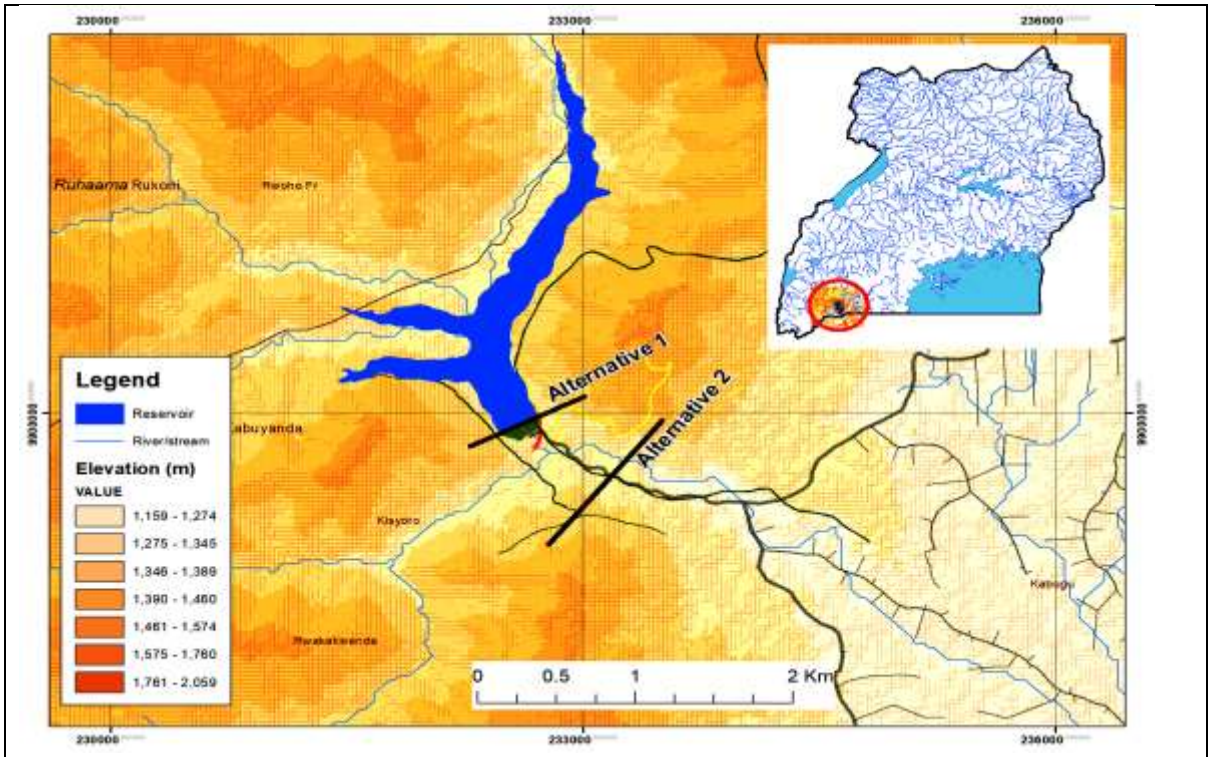


Figure 48: Alternative Dam Locations

Alternative 1 is located about 2km upstream in the forest reserve area whilst Alternative 2 lies downstream in a more urbanized area with settlements and which is heavily used for agriculture.

Figure 49: The area of Alternative 1 has vegetation with patches of *Cyperus papyrus* along the river

Figure 50: Dam Location Alternative 2

The area of Alternative 2 has a wetland vegetation dominated by *Typha sp.* along the river and the sides are heavily cultivated with crops dominated by banana and coffee, *Eucalyptus grandis* is also planted in some sections. There are settlement areas and the economic activities included the brewing of alcohol. Within the area is also a bridge for crossing River Mishumba and a water collection point.

Table 46: Comparison of Dam Location Alternatives.

Parameters	Score Definition	Alternative 1		Alternative 2	
		Details	**Score**	**Details**	**Score**
Environmental Impact					
Environmental impacts including Loss of flora and fauna, loss of habitat and impact on ecosystems	1: Low 4: High	More significant impact due to heavily vegetated area[15] (94.5 hectares of habitat to be lost), bigger reservoir size of 100 hectares and hence bigger area inundated.	3	Less significant impact due to less vegetated area[16] (80 hectares of habitat to be lost), smaller reservoir size of 92.6 hectares and hence less area inundated.	1
Social Impact					
Destruction of property, loss of crops and hence income and inconvenience of resettlement	1: Low 4: High	Less significant due to zero structures and less cultivation land (0.22 hectares).	1	More significant due to 180 structures to be destroyed and larger expanse of cultivation land (16.90 hectares).	4
Feasibility of mitigating impacts (costs, benefits, cost effectiveness)	1: High 4: Low	Higher.	1	Lower because the inconvenience of resettlement cannot be mitigated.	2
Technical					
Volume of water	1: High 4: Low	Higher (0.6Mm3).	1	Lower (0.43-0.23Mm3).	2
Stakeholder Preference	1: High 4: Low	-	-	-	-
Capital and recurrent costs	1: Low 4: High	Higher due to high cost for compensation of tree loss in Rwoho CFR	4	Lower due to elimination of compensation cost for tree loss in Rwoho CFR	2
Suitability under local conditions	1: High 4: Low	Considered similar to Alternative 2[17].	2	Considered similar to Alternative 1	2
Institutional, training and monitoring requirements	1: Low 4: High	Considered similar to Alternative 2	2	Considered similar to Alternative 1	2
		Total Score	**14**	**Total Score**	**15**

As per the score table above, Dam location Alternative 1 with the least total score is the recommended option and was selected for implementation.

[15]*The location is a forest reserve area. It has a wetland dominated by Cyperus papyrus along the river. The sides of the wetland are heavily cultivated with crops including maize, Irish potatoes and beans and are planted with Pinus carribea trees.*

[16]*The location is more urbanized area with settlements and crop planted areas. It however has a wetland dominated by Typha sp. along the river. The sides of the wetland are heavily cultivated with crops dominated by banana and coffee. Eucalyptus grandis is also planted in some sections of the wetland sides.*

[17]*The 2 alternatives sites are separated by a short distance of 2 km. The sites' environments are quite similar for example, both have wetlands and rivers. Local factors such as geology, topography, ground water levels, and climate that can affect the dam are hence assumed similar at both sites.*

5.2.3 Dam Type Alternatives

Two dam types have been proposed; a Homogeneous Earth-Fill Dam (HEFD) and a Concrete-Faced Rock-Fill Dam (CFRD).

Table 47: Comparison of dam types

Parameters	Score Definition	HEFD		CFRD	
		Details	Score	Details	Score
Environmental impact					
Impacts related to extraction of material e.g. changes in geological structure and related hazards	1: Low 4: High	Less significant impact because it requires extraction of mainly clayey silty loam the process of which may be less hazardous.	1	More significant because it requires extraction of mainly rock fill the process of which may be more hazardous.	3
Social impact					
Impacts related to extraction of material e.g. occupational accidents, noise and destruction of property	1: Low 4: High	Less significant impact because it requires extraction of mainly clayey silty loam the process of which may be less hazardous.	1	More significant because it requires extraction of mainly rock fill the process of which may be more hazardous.	3
Feasibility of mitigating impacts (costs, benefits, cost effectiveness)	1: High 4: Low	Higher, Less significant impacts that are easier to mitigate	1	Lower, More significant impacts that would be more difficult (more expensive) to mitigate	2
Technical	Not applicable (N/A)	N/A	N/A	N/A	N/A
Stakeholder Preference	1: High 4: Low	-	-	-	-
Capital and recurrent costs	1: Low 4: High	Lower (USD 18.2M)[18]	1	Higher (USD 19M)	2
Suitability under local conditions	1: High 4: Low	Lower because it can be eroded.	2	Higher because concrete and rock fill cannot be easily eroded.	1
Institutional, training and monitoring requirements	1: Low 4: High	Higher Its suitability being lower under local conditions calls for more monitoring requirements	2	Lower Its suitability being higher under local conditions calls for less monitoring requirements	1
		Total Score	**7**	**Total Score**	**12**

As per the score table above, Dam type HEFD with the least total score is the recommended option and has been selected for implementation.

[18] *Sourced from the Kabuyanda Final Feasibility Study Report of March 2017*

5.2.4 Dam Utilization Alternatives

Three dam utilization alternatives have been analysed, as follows;

a. Irrigation and municipal water supply e.g. for drinking and other uses;
b. Irrigation, municipal water supply and livestock water supply.
c. Irrigation

Table 48: Comparison of dam utilization options

Parameters	Score Definition	OPTION 1: Irrigation, municipal water supply and hydropower production		OPTION 2: Irrigation, municipal water supply, livestock water supply and hydropower production		OPTION 3: Irrigation		
		Details	Score	Details	details	Score		Score
Environmental Impact								
Reduction of water for downstream biota and associated impacts	1: Low 4: High	Ecological release volume of 2.1 mm3 presented in the scoping report is similar to that of Option 2.	2	Ecological release volume of 2.1 mm3 presented in the scoping report is similar to that of Option 1	2	Ecological release volume should be higher considering reduced dam utilization. The impact of dam reduced water downstream would therefore be lower	1	
Social Impact								
Reduction of water of downstream users	1: Low 4: High	Less significant impact because less water is being taken from the river.	2	More significant because more water is being taken from the river.	3	Less significant impact because less water is being taken from the river.	1	
Benefits from Project	1: High 4: Low	Fewer benefits with removal of livestock component.	3	More benefits with inclusion of livestock component.	1	Fewer benefits with removal of water supply and hydropower component	4	
Feasibility of mitigating impacts (costs, benefits, cost effectiveness)	1: High 4: Low	Higher	2	Lower	3	Higher	1	
Stakeholder Preference	1: High 4: Low	-[19]	-	-	-	-		

[19] *Information on stakeholder preference is not available*

Technical	Not Applicable (N/A)	N/A	N/A	N/A	N/A	N/A		
Capital and recurrent costs	N/A	N/A	N/A	N/A	N/A	N/A		
Suitability under local conditions	N/A	N/A	N/A	N/A	N/A	N/A		
Institutional, training and monitoring requirements	N/A	N/A	N/A	N/A	N/A	N/A		
		Total Score	**9**	**Total Score**	**9**	**Total Score**	**7**	

As per the score table above, the dam utilization Option 3 which excludes water supply and hydropower component with the least total score is the recommended option and is the option that has been selected for implementation.

5.2.5 Management of Rwoho CFR alternatives

The dam and the reservoir are to be located within Rwoho CFR, which requires a license to be issued by NFA once ESIA approved by NEMA and Forest Management Plan for Rwoho CFR updated by NFA(Appendix 2; Appendix 15). Alternatives for the locations of offices, management camp and workers camp within or outside the Rwoho CFR were explored. Location of these facilities inside Rwoho CFR would call for degazettment of the affected portion of the CFR.

Table 49: Comparison of different options of managing the uptake of Rwoho CFR

Parameters	Score Definition	Degazzetement		No degazzettement	
		Details	Score	Details	Score
Environmental impact					
Loss of trees and their associated benefits such carbon Sequestration	1: Low 4: High	Very significant impact because the trees would permanently be lost in the affected area	3	Less significant because after the project life trees may be regrown and protected in the affected area since it would it be a forest reserve	2
Fragmentation and its associated impacts such as edge effects	1: Low 4: High	Degazettement would attract potential forest encroachers to degazzeted portion of the forest. This would further lead to forest encroachment, fragmentation and forest edge effects	3	Without degazettement, the possibility of forest encroachment fragmentation and edge effects is reduced	1
Social impact					
Loss of business for the private tree farmers	1: Low 4: High	Although mitigation plan implementation would involve allocating private may not be interested any more in growing tree farmers other areas for tree growing within the same CFR, some private tree farmers trees because of the frustration of resettlement and as such may divert the compensation from tree growing	2	Although mitigation plan implementation would involve allocating private tree farmers other areas for tree growing within the same CFR, some private tree farmers may not be interested any more in growing trees because of the frustration of resettlement and as such may divert the compensation from tree growing	2
Feasibility of mitigating impacts (costs, benefits, cost effectiveness)	1: High 4: Low	Lower, more significant impacts that would be more difficult (more expensive) to mitigate	4	Higher, Less significant impacts that are easier to mitigate	2
Technical (time and complexity)	1: Short duration to achieve and less complex	Degazettement of a CFR is a lengthy process that requires debate and approval from the Parliament of Uganda.	3	Excludes degazzettment, the lengthy process	2

	4: Longer duration to achieve and very complex				
Stakeholder Preference	1: High 4: Low	Not recommended by NFA and would not be liked by encroachers currently using the area for growing crops when trees are still young under an arrangement they say they have with tree growers	4	Recommended by NFA and accepted by MWE	1
Capital and recurrent costs	1: Low 4: High	Higher to due additional costs that would be associated with degazettement such as allowances for people that would be involved in the debate of the degazettement proposal.	3	Lower due to elimination of degazettement costs	2
Suitability under local conditions	1: High 4: Low	NA	-	NA	-
Institutional, training and monitoring requirements	1: Low 4: High	Both options involve mitigation plan implementation that would require the same **Institutional, training and monitoring requirements**	2	Both options involve mitigation plan implementation that would require the same **Institutional, training and monitoring requirements**	2
		Total Score	**24**	**Total Score**	**14**

As per the score table above, alternative 2 for managing the uptake of Rwoho CFR that does not involve degazettement of part of the CFR, with the least total score is the recommended option.

6 PUBLIC CONSULTATION

The International Association for Public Participation defines 'public participation' as a means to involve those who are affected by a decision in the decision-making process. It promotes sustainable decisions by providing participants with the information they need to be involved in a meaningful way, and it communicates to participants how their input affects the decision. This chapter describes the process of the public consultation. Views from national stakeholders, local authorities were sought through meetings. The feedback from these consultations has been taken into account when preparing this report.

Section 12 of the Environment Impact Assessment Regulation of 1998 requires the developer to seek views of the communities that are likely to be affected by the project and to publicize the intended project, its anticipated effects and benefits in a language understood by those communities and for a period of not less than 14 days. The World Bank's Operational Policy 4.01 likewise emphasizes consultation and public disclosure of the project. Stakeholders were first identified before the public consultation activity commenced as part of the scoping for the Environment and Social Impact Assessment (ESIA) process.

6.1 Objectives of Public Consultation and Participation

The broad objective of the stakeholder engagement process was to provide the authorities, interested parties and the communities likely to be affected by the project an opportunity to air out their views, concerns, and opportunities as regards the proposed project and to consequently address their concerns.

The specific objectives of stakeholder consultation include the following:

a. To provide information about the project and to tap stakeholder information on key environmental and social baseline information in the project areas;
b. To provide opportunities to stakeholders to discuss their views, opinions, suggestions and concerns;
c. To manage expectations and misconceptions regarding the project;
d. To collect all relevant information about trends, practices and norms in the project area;
e. To inform the process of developing appropriate mitigation and management measures as well as institutional arrangements for effective implementation and;
f. To create an enabling environment through which the project will smoothly operate.

6.2 Stakeholder Identification and Composition

A stakeholder is anybody who can affect or is affected by a project, policy, programme, plan or an organization. Stakeholder identification was based on issues related to the project scope of works, relevance and influence of the stakeholders and administrative and traditional setting of the project. The main methods used to identify relevant stakeholders include: purposive selection, brainstorming, and review of relevant reports previously prepared for the project. Table below shows the different categories of stakeholders and their relevance in the project.

Table 50: Stakeholders and their Relevance in the project

Stakeholder	Relevance
National Stakeholders	
▪ Ministry of Water and Environment ▪ National Environmental Management Authority (NEMA). ▪ Ministry of Energy and Mineral Development (MoEMD) ▪ Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) ▪ National Forestry Authority (NFA) ▪ Ministry of Gender, Labour and Social Development (MGLSD) ▪ Ministry of Lands, Housing and Urban Development (MLHUD), Chief Government Valuer's Office	▪ Information on national policies and guiding principles in relation to their technical areas ▪ Approval of reports ▪ Monitoring of project activities
Local government stakeholders - Political leadership District Political Leaders (e.g. RDC, LC V Chairperson, District Councillor/Secretary for Education and Health, Councillor in charge of Technical services, LC III Chairperson etc.)	▪ Political support. These leaders represent the communities that are going to be affected by the project. ▪ Responsible for security within the area of operation. ▪ Overall overseers of the planning for development in the districts and therefore require information for planning purposes.
Local Government stakeholders – Technical Staff District Chief Administrative Officer, District Technical Officers (Planner, Environment, Education, Water, Fisheries, Agriculture, Engineer, Health Inspector, Community Development, Production/Commercial Officer, Town Clerk, Sub County Chief, Community Development Officer)	▪ Vital source of information about the population, trends and other dynamics within the project area ▪ Can be utilised as the contact persons in the project area ▪ Their structures at the lower local government can be utilised in the mobilisation of communities for the good of the project. ▪ Can be used in the follow up and supervision of community and technical programs ▪ Can come up with proposals on how to mitigate the impacts of the project.
Village leaders - LC I Chairpersons	▪ Can provide vital information at village level. ▪ Can be used as mobilisers of community members ▪ Provide support to the project
Communities in the project area	▪ They will be the beneficiaries of the proposed project. ▪ They will be directly and indirectly affected by the project ▪ Will provide casual labor during the construction phase. ▪ They have information on land owners and users. ▪ Good source of information on the trends and dynamics within the project area.
Other stakeholders e.g. NGOs/CBOs, Cooperative Societies, large scale farmers etc.	▪ They generally work very closely with communities so they can be a good source of information. ▪ Can be partnered with to minimise some of the negative social impacts.

Table 51: Stakeholders Consulted

Level	Stakeholder
National Stakeholders (Government Institutions / Departments) officials	▪ Ministry of Water and Environment (MWE); ▪ Ministry of Energy and Mineral Development (MEMD) ▪ National Forest Authority ▪ Department of Geological Surveys and Mines ▪ Uganda National Bureau of Statistics ▪ Ministry of Agriculture, Animal Industry and Fisheries ▪ NAFIRRI ▪ Ministry of Lands, Housing and Urban Development ▪ Ministry of Gender, Labor and Social Development ▪ National Environment Management Authority
Local Government Institutions/officials	▪ Chief Administrative Officer (CAO) ▪ District Environmental Officer for Ntungamo and Isingiro Districts Resident District Commissioner ▪ District Forestry Officer ▪ District Agricultural Officer ▪ Operation Wealth Creation ▪ Town Clerk ▪ Councilors ▪ Local Council II Chairpersons ▪ Local Council I Chairpersons ▪ Officer in Charge (OC) ▪ Local Council III Chairperson ▪ Gombolola Internal Security Officer (GISO) ▪ District Speaker ▪ Opinion Leaders ▪ Elders ▪ Sub County Chief ▪ Community Development Officer ▪ Isingiro District Environment Committee
Other stakeholders	▪ Kaiho Farm School Leavers Cooperative Society ▪ Kigarama Commodity Marketing Cooperative Society Limited ▪ Kabuyanda Dairy Cooperative Society Limited ▪ Tukundane Fish Farm Limited ▪ African Panther Limited
Local community	▪ Community members from various villages as indicated on the attendance lists.
Biodiversity experts	▪ The World Conservation Union (IUCN) – International membership NGO with national forestry programmes ▪ The Environmental Conservation Trustee of Uganda (ECOTRUST). A Uganda conservation NGO which supports community-based forest conservation projects ▪ Department of Environment and Natural Resources Management in the College of Agriculture, Forestry and Nature Conservation of Makerere University. The Department houses the National Biodiversity Data Bank.

6.3 Public Consultation and Participation Process

Public consultation and participation is a continuous process throughout the project cycle. The public consultation and participation process was commenced by other consultants in earlier phases of the project such as the feasibility and scoping phases. The process continued during this phase of finalisation of the ESIA process and preparation of the Resettlement Action Plan. Stakeholder consultations for this phase were undertaken in two stages. The first stage of consultations was undertaken 3rd and 14th November 2017 the second stage of consultations was undertaken between August 2018 and 26th January 2019. Appointments with the stakeholders at national and local government were made in writing and in some cases, impromptu meetings were held with the stakeholders. This process was all-inclusive, transparent and highly participatory, through the provision of sufficient information regarding the proposed project. Consulted stakeholders enthusiastically participated during interactions. The project was briefly described, whilst issues arising, comments and/or areas of concern from the stakeholders were documented.

Meetings were organized and held with the directly and indirectly affected communities and also with women and other identified vulnerable groups. Mobilization of the participants and selection of meeting venues, dates, and times was achieved with the help of local authorities, who were met in person at their respective villages. The Local Council Chairpersons were also asked to inform the affected communities through public gatherings like community meetings, church services and other religious congregations and announcements using a public address system.

All the discussions were opened with a brief introduction of the project, its purpose and what its entails, followed by the purpose of the ESIA and the Resettlement Action Plan, description of the activities involved and overview of the different teams involved. The team then guided the participants to express their views. Questions from the participants were answered and some misconceptions about the project clarified. The minutes of the meeting were prepared and are attached to this report as Appendix 5 and 6 together with the list of attendees (Appendix 7). A total of about 520 people attended the meetings. Out these, about 38% were female and 62% were male. The low turn up women was attributed to the fact it was a planting season and many women spent the whole day in the gardens.

It was not possible to schedule the meetings during a different season given the assignment timelines. It is therefore recommended that the planning of meetings with communities in the subsequent consultations carefully takes into consideration factors such as the above that limit women participation so as to ensure their full participation throughout the process. Nevertheless, consultations were held with women as well as vulnerable groups, large scale farmers in the area and cooperative societies. The cooperatives included Kaiho Farm School Leavers Cooperative Society, Kigarama Commodity Marketing Cooperative Society Limited, Kabuyanda Dairy Cooperative Society Limited and Tukundane Fish Farm Limited. These were consulted on aspects such as livelihood, health, gender specific concerns etc.

Table 52: Schedule of Consultations (First stage)

Stakeholders	Venue	Date/Time	Time
Ministry of Water and Environment	Ministry Headquarters	16/11/2017	12:00hrs.
Ministry of Agriculture, Animal Husbandry and Fisheries	Ministry Head Quarters	30/11/2017	09:00am
Ministry of Energy and Mineral Development	Headquarters.	22/11/2017	11:00am-
National Forestry Authority	Headquarters Bugolobi	21/11/2017	10:00am
Isingiro District Local Government Officials	Isingiro District	03 /11/2017	09:00 hrs.
Kabuyanda Town Council Officials	Kabuyanda Town Council	03 /11 /2017	15:00hrs
Kabuyanda Sub County	Kigabagaba CoU	03/11/2017	17:00hrs
Kisyoro Community	Kisyoro Church	04/11/2017	13:00 hrs.
Iryango Community	Iryango Village	04/11/2017	16:45hrs.
Kagoto Community	Kagoto CoU	05/11/2017	13:00hrs.
Kigabagaba Community	Kigabagaba CoU	05/11/2017	16:45 hrs.
Kabuyanda Community	Kabuyanda Trading Center	06 /11/2017	17:00hrs.
Women and vulnerable groups (elderly, PwDs)	Kabuyanda Town Council	07/11/2017	15:30hrs
Kabuyanda Dairy Cooperative Society Ltd	At their offices	07/11/2017	12:30hours
Kigalama Commodity Marketing Cooperative Society Limited	At their offices	07/11/2017	10:50hours
Kaiho Farm School Leavers Cooperative Society	At their offices	07/11/2017	09:50hours

6.4 Issues Raised by Different Stakeholders

As a result of engagement and consultations with the different stakeholders, a number of issues were identified and these have been taken into account in the preparation of the ESIA. The issues raised by the various project stakeholders during stage one and stage two public consultations and disclosure are presented in Tables below.

Table 53: Summary of key issues and responses during stage one public consultations and disclosure

Stakeholder	Issues Raised	Analysis and Way Forward Way on Issues
STAGE ONE CONSULTATIONS		
National level		
Ministry of Water and Environment	The dam should be run by government i.e. Ministry of Energy and Mineral Development, Ministry of Water and Environment and Ministry of Agriculture. A structural model should be formed and put on ground for operational and maintenance management of the project. The structure should involve all responsible entities. A consultant should be hired to run operation, maintenance and business management of the project.	An organizational management structure showing management of the dam of the different components.
	The district should not take full responsibility of the project because they lack human resource and experience.	Recommendations for capacity building of the different stakeholders that will be involved in the implementation and management of the project have been provided.
	There is need for an economic plan or analysis for sustainability management of the project. Government needs to improve their understanding of what people want and are willing to pay for such a service as appropriate pricing is an important tool to improve sector performance and the establishment of achievable targets and effective monitoring systems are useful instruments for enhancing efforts.	Through MWE, the government will develop a economic and sustainability plan for the project.
	Government should encourage active participation and growing self-reliance to enable people to provide their own services. Public awareness is very important. The community should be involved in meeting the objectives of the project	Public participation will be a continuous process in all project phases as emphasized in this report.
	The affected PAPs will need to be compensated for their property i.e. land, houses, trees, crops etc. affected.	A Resettlement Action Plan has been prepared. This will be updated at the time of implementation of the project.
Ministry of Energy and Mineral Development	Will the water be enough for power?	Based on the design and feasibility study report, water will be adequate for power.
	How is the project going to benefit the community? Will they pay a fee or it will be for free?	The project is free to the communities, however they may have to pay a small fee regularly for operation and maintenance of the irrigation scheme.
	MWE should borrow a leaf on how they have managed sustainability of other projects. Bench mark other projects in India, Tanzania	A document on lessons learnt and success on similar projects will be prepared and circulated to the project implementation unit of MWE.
	Tree planting should be done in the catchment areas to reduce on flooding and erosion	Tree planting is one of the mitigation measures recommended.
	Farmers should be assisted with agricultural inputs to boost agriculture	This has been recommended as a way of improving production and livelihood.

National Forestry Authority	Management of sustainability should be run by the government i.e. Ministry of Energy and Mineral Development, Ministry of Water and Environment together with Ministry of Agriculture, Animals and Fisheries.	An organizational management structure showing management of the dam of the different components has been presented in section 6.9 of the ESIA report
	Government should create SACCOS to provide loans and credit to the people to support them in farming.	The recommendation of SACCOS through development of requisite documentation such as the memorandum of understanding and Constitution has been made.
	Government should be able to connect water to people's houses.	This will be applicable under a separate component of water supply which is not part of this ESIA.
	Land compensation should be to NFA and the PAPs should be compensated for their crops and properties since they are licenses and others who are squatters.	The RAP will take into consideration the different types of people eligible for compensation. This information is presented in the RAP report.
Local Government; District and Sub-County Stakeholders		
District officials	The CAO wanted all the district heads of department's including Environmental Officer, District Community Development Officer, Natural Resources Officer, Production and Marketing Officer, Water Officer, Agriculture Officer, Fisheries Officer, to be involved in all activities. He advised land issues to be addressed in the studies including compensation. The study should be holistic and involve all stakeholders. There is need for adequate planning and sensitization of communities.	The roles of the different stakeholders have been defined in this report. Many of the stakeholders have been consulted and the consultation process will continue throughout the phases of the project.
	The project should address issues of conservation of the ecosystem of the project area	Catchment protection has been recommended in the mitigation measures.
	There is heavy loss of soil fertility and therefore the need to have a good conservation plan	Soil conservation plan has been recommended as one of the measures.
	The consultant should develop an agroforestry plan for the project area. Viable alternatives programs for example in fruit tree agriculture should be explored.	Agroforestry has been recommended as one of the ways of enhancing livelihoods.
	There should be zoning of the area to have green belts where agriculture activities would be restricted.	This has been recommended as mitigation measure to vegetation loss
Sub county and Town Council leaders	The people of Kabuyanda should benefit through provision of employment opportunities.	Provision of employment opportunities to the local population has been recommended.
	There is misconception of the project by the local population that gold was being mined in the project area. The leaders advised the consultant to adequately sensitize the population.	During consultations, the objectives of the studies and activities involved were explained.
	Some of the local authorities were concerned if the project would benefit the people living uphill.	Direct beneficiaries are people within the project irrigation command area, the people outside the command area will also benefit indirectly some may get employment or getting market for their goods.

	The local leaders informed the consultant that the project area floods and about three people were killed by the floods in previous years.	Construction of dam will control flooding downstream of the dam. Dam safety plan has been put in place to be followed in case of flooding. This is presented as Appendix K of this report.
	The local leaders were afraid that the water will be diverted to peoples' gardens and as a result the people will deny the developer access to the project site.	Before the drainage network is set up, consent to use their land in form of an M.o.U will be obtained from the affected communities Further sensitization will be carried out during construction and operation phases.
	The local authorities informed the consultant that sometimes the water from the river and streams turns yellow in color which makes it difficult for the farmers to irrigate their crops.	After analysis of the water samples in the river Mishumba, results indicated that the yellow color was due to the presence of iron.
	The local leaders also informed the consultant that the people in the area were experiencing famine due to severe drought	One of the major aims of the project is to improve food production and water supply in the area and to contribute to the alleviation of the severe droughts as highlighted in the report.
	Will the project compensate people for the crops that will be damaged during the construction?	Crops that will be damaged during construction will be compensated. This has been emphasized in the RAP report.
	Will the people pay for the water?	The people will not pay for water but may contribute a small amount periodically for operation and maintenance of the water supply system.
	Will the youth benefit from the project?	There is potential for employment opportunities on the project for the local people including the youth. They will also be able to improve crop production through the irrigation system.
Community Members	Will the project compensate people for the affected land where the water pipes will be laid?	All eligible property will be compensated. A Resettlement Action Plan has been prepared to guide land acquisition and resettlement.
	The community asked the developer to inform the community when they should apply for the jobs	Availability of jobs on the project will be communicated before commencement of the project through meetings and the local leadership.
	What are some of the items eligible for compensation?	Land, trees, perennial crops, structures within the project footprint.
	What will happen to public utilities like electricity poles that will be affected by the access road?	The design will try as much as possible to avoid them, if this is not possible, a Utilities, Relocation Plan for these facilities will be prepared

		and implemented by the relevant authorities.
	What will happen to the boreholes that will be affected?	They will be avoided and this is not possible, they will be replaced.
	Will project compensate us for the land on which grow crops and rear animals	Affected land will be compensated.
Cooperative Societies and large scale farmers	Highly expect, water for irrigation, safe and clean water for domestic use, water for fish farming.	These will be supplied as it's the major objective of the project.
	Crops will be damaged during the laying of the water pipes at construction phase	Destroyed crops will be compensated.
	Project will displace some households especially those households where the water pipes will pass.	The design will try as much as possible to avoid settlements. A Resettlement Action Plan has been prepared to mitigate against these impacts.
	Cooperative societies will encourage farmers to adopt /take up the irrigation scheme	This is well noted.
	Floods could occur as a result of collapse of the dam.	The design has taken into consideration such eventualities. An Emergency Preparedness Plan has also been prepared in case of any accidents.
Women and other vulnerable groups (elderly, PwDs).	The women and other vulnerable groups should be given opportunities for employment.	This has been recommended.
	They request the project to provide support to them e.g. extension of credit.	This was noted
	They fear displacement and loss of property because of the project. Affected property should be compensated	All affected property will be prepared. A RAP has been prepared to take this into consideration.
	Destruction of property in case of dam collapse	The design has taken into consideration such eventualities. An Emergency Preparedness Plan has also been prepared in case of any accidents.
	The dam must meet international standards to hold water throughout all year.	The design followed international standards.

Table 54: Summary of key issues and responses during stage two public consultations and disclosure

Stakeholder	Issues Raised	Analysis and Way Forward on the Issues
STAGE TWO CONSULTATIONS		
National level		
Directorate of Geological Surveys and Mines (under Ministry of Energy and Mineral Development)	**Licensed companies at existing rock** DGSM confirmed that African Panther Resources (U) Limited has a valid license (ML1433 granted on 02nd February 2018 for a period of 21 years) for the rock at Katanga along Isingiro- Kikagati Road. They advised that this rock be avoided by the project to evade conflicting with the licensee. DGSM confirmed that the license awarded to APRU is a Mining Lease. They mentioned that some rocks are scotched and withered and not suitable for dam construction.	It is recommended that alternative rock material sites be identified by the contractors and separate environmental impact assessment (s) be undertaken for each of the sites. Information about this quarry has been provided in this ESIA report.
	Alternative material sites In order to provide technical assistance to the project, DSGM advised that a letter should written to the Director, DGSM for technical assistance to find fresh good quality rock for construction The staff would require 5 working days and 1 week to carry out analysis and provide a report.	MWE will work hand in hand with the contractor to ensure material site are identified with suitable rock material and with minimal or environmental and social risks.
Uganda National Bureau of Standards	**Available standards for project construction materials** Standards for cement and reinforcing steel and concrete are available nationally. However, for rocks, there are currently no set standards because they are a natural resource. She advised that construction materials should be got from Ugandan manufacturers since they go through the UNBS standards system.	MWE will enforce the adherence to national standards for cement and reinforcing steel and ensure that contractors prioritize procurement of available local materials.
	Whether or not UNBS provides permits to import materials: Products must be based on the Ugandan standards and should be tasted. In case the products are not available on the local market then, UNBS advises that international standards be used.	
	Mandate of UNBS in regard to standards for pesticides: Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) advises on the pesticides to be used and provides the entire list of pesticides to be used. However, most pesticides are not made in Uganda. Majority are imported. Therefore, few pesticides have standards. MAAIF is to request for the development of these standards. In case they are not available on the Ugandan market, then UNBS would need to follow the international standards.	During project implementation, MWE will work together with MAAIF and UNBS to agree on the pest sides likely to be used in the project area and this will be based on existing information obtained by MAIIF about the farmers in Kabuyanda, average size of farms, and list of and pesticides used/likely to be used.
	Pesticide Residue Limits The Deputy Executive Director Standards emphasized that products approved by UNBS should be used, and they must be used in the right quantities. Certain residue levels are not acceptable in Uganda, and if the right quantities of pesticides are not used, then they end up as residues in food.	To ensure the pesticide residue standards are complied with, a long term monitoring and evaluation plan will be developed by the Project Implementation Unit of MWE and this should include testing of various food products for residues and compare results with the national standards. Measures to ensure compliance must be developed, implemented and monitored.

National Forestry Authority	NFA confirmed based on the information received from MWE so far, that two (2) CDM projects are to be affected, on both sided of the dam (that is east and west). CDM block 3 and CDM block 4 are to be directly affected, while a section of River Mishumba passes through block 2 and 3. The latter will however be confirmed after coordinates for all project components are shared by MWE. However, NFA requested the World Bank to clarify if they will accept to relocate the CDM projects to other areas of the CFR.	Information on the CDM projects to be affected is provided in the baseline.
	NFA recommended that MWE restricts itself to constructing a dam and reservoir in Rwoho CFR. The management camp, workers camp and project office must be located outside the CFR. NFA added that, if only the reservoir and the dam are established in Rwoho CFR no degazettement will be required. If any other infrastructure such as camps, project office, etc. are put in the reserve, then degazettement will be a requirement. Reference to the National Forestry and Tree Planting Act, 2003 (section 7,8 and 13) must be made. NFA Officials stated that 'Degazetting process" is very long and they discounted it. They proposed that NFA could offer the land for the project on condition that 'Funds be available for restoration and rehabilitation of equivalent existing degraded Rwoho Forest Reserve". The area to be considered as equivalent would take on board only the area for the construction of the Dam and the Reservoir. They put it quite clearly that other infrastructure such as Camps, Hospitals, Offices etc. must be located outside the CFR.	In consideration of the NFA comments, we recommend that only the dam and reservoir be located in Rwoho CFR. Alternative locations for establishment of the management and workers camp, as well as the project offices will be identified by the contractor in liaison with MWE, and separate environmental studies will be undertaken for these and reports submitted to NEMA for review and possible approval. The acquisition of the sites will be in line with national and World Bank Environmental and Social Framework.
Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	**Operation and maintenance challenges faced during irrigation projects** The Highlighted challenges normally encountered include following: • The local people are not willing to pay for maintenance of e.g. blocked canals, silted pipes. They take water to be a free gift from GOD. Currently, the Cooperative societies manage and maintain the schemes. • Mis-use of water. The main purpose of irrigation schemes is to irrigate high value crops such as fruits, vegetables, citrus fruits, maize, and sweet potatoes. There is need to consider how cattle keepers are to share the water with the farmers and that farmers may start using the irrigation water for other purposes.	Before project establishment, the project beneficiaries should be well sensitized about the project benefits and risks of misuse or failure to maintain the irrigation system. As recommended by MAAIF, there should be officials on the ground to monitor the system in order to cub water misuse and prevent people from using the water for other purposes aside from farming since the area has water stressed.
	Operational life of an irrigation scheme The schemes are normally designed for 25 years and they are normally rehabilitated.	
	a. MAAIF advised that there was need to have a plan to take care of the residual water and that there should be a soil and water conservation plan since it's a hilly area.	MWE to develop and implement a residual water management plan and a water conservation plan for the project.

	b. There should be a plan for water users associations to minimize water misuse since they are bigger and can involve people both within and outside the scheme. He mentioned these associations have worked on the four irrigation schemes and that they are better than co-operative societies which are voluntary. c. The fisheries and agriculture policy must be enforced since the availability of water might prompt people to start fish farming.	See section 7.3.5 for this recommendation.
National Fisheries Resources Research Institute (NaFIRRI)	What had been established could stand as a baseline study. There should be a monitoring plan for the project Dam construction would put a barrier on the fish and if their breeding was restricted to the rivers, they would never breed again. NaFIRRI advised that different people in the communities would have different concerns which should be segregated.	A monitoring plan for fish has been proposed as part of Biodiversity Action Plan. Views of the local communities were captured and have been integrated into the report..
Local Government; District		
Ntungamo District Local government	Limit vegetation clearance to control soil erosion	This mitigation measure has been presented in section 7.3.4.2
	For the quarry sites, ensure there are mitigation measures for dust and noise pollution	The mitigation measures for dust and noise pollution have been documented in the Report.
	Put in place the HIV policy and ensure women and youths are involved in the project	
	How will people in Ntungamo District benefit from the proposed project	The positive impacts/benefits of the project are provided in section 7.2
	Sensitize communities and engage those along the catchment areas	
	What is the percentage of the environmental flow remaining?	20%. See details in section 4.1.4.5.3
	Ensure Ntungamo and Isingiro districts are involved in monitoring compliance of the project	The ESMP in chapter provides the Ntungamo and Isingiro Districts as one of the parties responsible for monitoring.
	Water quality monitoring and soil testing should be undertaken during and after project establishment to ascertain the project impact on the parameters	This recommendation has been presented in the ESMP in Table 8-1
	Have in place a joint plan together with Isingiro and Ntungamo Districts on how to protect the environment	This strategy has been presented under recommendations in section 8

Isingiro District Local Government District Environment Committee	What is the current command area (hectares) since during the ministry consultation, it was noted that the area land will reduce	The current RAP report indicates a command area of 3,660 hectares. However, after the resign review, which is currently on going, this will be determined
	In case of any disturbance, will those people affected be compensated?	Yes
	In case of access road are to be expanded, it will require more compensation since people have gardens and infrastructure a few meters away from/ along the road	Yes, any persons to be affected with will be compensated in line with the Involuntary Resettlement OP 4.12

	Will the developer buy off quarry areas or an agreement/ contract will be done	An agreement contract will be done between the land owners and the contractor before land is acquired.
	Since the scope has been reduced, the command area should be reduced and also engage the community and inform them of the changes in the designs of the project	In case of any changes after the design review, the MWE will inform the surrounding communities
	Have in place a tree planting plan for the road reserve and involve the community	This mitigation measure has been provided in section 7.2.5.2.
	Under CSR, the district requests the developer to provide a water storage tank at Kisyoro Secondary School. Also provide tree seedlings to the communities and this should be done in such a way, tree species are given according to the characteristics of the land/ area	A CSR program will be developed and the proposed activities described in section 7.2.5 of this report.
	Put in place a waste management plan for the project especially at the command area	A comprehensive waste management plan has been recommended in 7.3.4 and 7.3.5
	The issue of causal laborers if not well controlled, it may cause unnecessary problems to the management and the communities	Prepare and implement a Labour Force Management Plan in accordance with the environmental and social standard 2 Labour and Working Conditions as provided in section 7.3.3.3.
	HIV and AIDS has been brought up in previous meetings, therefore, the district emphasizes HIV policy in place	An HIV policy will be developed and implemented as proposed in section 7.3.4.3
Kabuyanda Town Council meeting	We expect to benefit a lot from the proposed project especially the road infrastructure, we want to know if the access roads will be tarmacked	Whether or not to tarmac the access roads will be informed by the final design review report.
	All access roads to plantations are impassable, we request the developer to construct all access roads	Access roads to the site will be developed as part of the project as narrated in chapter 4.
	We support the project to be implemented in our area	
	We have noticed the ongoing surveying and some people's land has been left out during the surveys, does it mean they will not benefit from the project? The community would like to know and be informed what the surveyors are doing in their communities and also some cells within the command area have not been surveyed	Only areas where the pipelines are going to be installed have been surveyed. The sociologists in the MWE have to develop and intensify stakeholder engagement and sensitization so that the project-affected communities fully understand the project.
	Is the water for irrigation free?	
	Engage the local authorities of any ongoing project activities like surveying and also surveyors should employ local communities for inquiries	Before any surveys are undertaken, the Isingiro and Ntungamo District local authorities were engaged an informed of the planned surveys.
	During employment, priority should be given to local people	This recommendation has been made in section 7.2.4 and 7.2.5
	Does the government have plans for people living uphill because they have challenges like access to water	To a greater extent people living upstream will be part of the irrigation scheme.
	Train the task force on what to do since most people at the taskforce committee do not know their roles and what to do during project implementation	A training program will be developed by the tax force committee for implementation

	In case an individual refuses and project component to go through his/her land, won't this affect the project implementation and how will such situations be handled?	Before construction of the pipes, community consent will be sought and obtained.
	Will camp sites and project offices be handed over to NFA or town council after the construction phase?	Whether or not to handover the facilities will depend on the landowners
	Police and other security organs are willing to work hand in hand with the developer to protect the project components	This offer has been captured in section 7.3.4 and 7.3.5
	We need a work plan for the proposed project so as we are aware on what will be done on a particular day	The Project contractor will submit their approved work plan to Kabuyanda Town Council
Kabuyanda Sub County Officials	The government should increase awareness of this project through radios and Television networks	A stakeholder Engagement Plan for the project will be developed as described in section
	We need to know what an irrigation scheme is	
	During employment, priority should be given to the local people	Comment incorporated in section 7.2.4 and 7.2.5
	During the feasibility study, communities were informed that hydro power was to be produced and water will be taken uphill, since designs have changed, how will communities in highlands benefit from this project?	Water supply and the hydropower component are not part of this ESIA. Separate studies will be undertaken for these mentioned project components.
	Also we want to know what people will be affected by the project.	The preliminary RAP identified the estimated number of PAPS. However, the actual RAP that is currently on going will inform this comment.
	Kabuyanda town council has benefitted already from the project, i.e. a water office has been constructed at the town council, yet the source of water is at Kabuyanda Sub County, is it possible for an office to be constructed at the sub county	The proposal for construction of an office at Kabuyanda Sub county shall be included in the CSR program for the project.
	have the designs changed since surveyors used different routes to survey last time, and this time round, different routes have been changed	
	The project will need man power, therefore, we request the youths from the sub county to be trained and given jobs during project implementation	First priority for employment will be accorded to local people in Kabuyanda Sub county
	Why was irrigation scheme prioritized yet people lack water from home consumption	Government has provided water for home consumption through another project in the same project area.
	Is the irrigation water free?	Yes, but the community supplied will pay maintenance fees for the irrigation scheme.
	In case someone has a plot of land along the access road, and wants to construct in it, will he/she be stopped	Yes to enable construction of the access road

Rwoho Town Council	NFA gives out land to individuals, and they cultivate along the steeps and valleys hence degrading the environment and endangering water sources, wont this affect the dam water by silting it	Catchment management including protection of the river back will be undertaken during this project
African Panther Resources (U) Limited	There are old tunnels that were used by previous mining companies	
	Most people in the community depend on mining as a way of survival and also break stones into aggregates	
	There are many minerals at the quarry i.e. precious minerals and development minerals but the company is only interested in tin as a precious mineral	
	The artisans are not yet registered with the company but when operations start, the company shall employ all the artisans.	
National Environment Management Authority	NEMA team requested that detailed project designs be included in the report.	Detailed project designs are included in the report (2.5: Project components). Any adjustments made to the designs following on-going design reviews will be presented to NEMA if so required
	The NEMA team raised concern that the economic aspects of the project seem to be silent in the report and advised that the consultant shows clearly issues of cost sharing, social acceptability, linkages with the existing farming practices and the beneficiary components.	Some of the economic aspects are already captured in the report (Section 4.3). The cost sharing aspects of the project are yet to be finalized and once finalized will be presented to NEMA if so required. The project justification that sets the selected water uses is provided in Section 2.2. An analysis of the wager utilization options is given in Section 5.2.5.
Ministry of Gender, Labour and Social Development (MGLSD)	MGLSD provided Newplan a list of available publications relevant to the project which included the following: i. National Policy on HIV & AIDs at Places of work. ii. Child Labor Act 1997 (CAP 59) iii. Occupation health and safety statement iv. Gender Policy 2007 v. Transboundary water resource policy	They have been incorporated in section Chapter 3 The National policy on HIV & AIDs at places of work has been incorporated in section 3.2.7 The Transboundary water resource policy has been incorporated in section 3.2.4 under the Water policy, 1999.
	A safety committee to ensure safeguards in terms of fire prevention and assembly points and also a risk assessment carried out and proper Personnel Protective equipment (PPE) supplied to all workers and the committee enforces supervision and importance of compliance on usage and maintained regularly. Proper induction of workers and training records should be kept on the different methods and an emergency preparedness plan should be formed, first aid services and a standby vehicle/ ambulance in case of any emergency should be available and an MOU with a nearby hospital should be signed.	Occupational health and safety has been looked at, see section 3.2.13 and under 7.2.2 bullet 6.
	Disabled persons need to be taken care of in terms of access to washrooms facilities by putting in	

	place elderly and disabled person friendly facilities at the construction sites, camps and other offices within the project area. Changing rooms for respective gender and nursing homes for breast feeding mothers at the work place should be included in worker's facilities.	
	Proper signage within the project action areas and avoid high traffic on the roads mostly in the busy trading centers and housekeeping sensitization on the disposal of used chemical, their packaging and old PPE for workers should be ensured.	Included under section 7.2.1 bullet 14
	A recruitment policy that views the terms of employment for workers should be put in place and this is to ensure that no employee works for six months without a contract and NSSF registration, including insurance of workers and also encouraged that the project contractors consider also women when recruiting.	

Consultation with Ministry of Agriculture

Consultation with Ministry of Water and Environment Officials

Community Meeting at Iryango Village

Community Meeting at St. James Church of Uganda, Kigabagaba

Meeting wth Women, the Elderly and People with Disabilities

Figure 51: Sample Photographic Documentation of Stakeholder Engagements

6.5 Consultations with Biodiversity Experts

Consultations were undertaken in July 2019 with Biodiversity Experts with specific focus on the impact of the project's reservoir on the 100 ha (1.1%) of Rwoho CFR (Appendix 13). The experts were drawn from World Conservation Union IUCN Uganda Country Office, Environmental Conservation Trustee NGO (ECOTRUST) and Department of Environment and Natural Resources Management in the College of Agriculture, Forestry and Nature Conservation of Makerere University (the Department houses the National

Biodiversity Data Bank). The consultatons indicate that Rwoho CFR is of a low biodiversity conservation status, having been heavily degraded and modified a habitat.

6.6 Stakeholders' Engagement during Subsequent Phases

As mentioned earlier, stakeholder consultation and participation will continuous throughout all the stages of the project. A Stakeholder Engagement Plan has been prepared.

6.7 Project Disclosure

The project was disclosed to the communities and to other stakeholders through meetings. NEMA also requires the Scoping Report to be disclosed to the District Natural Resources Committee to enable the committee provide comments to the reports. This was done by TCP before approval of the Scoping Report. The ESIA, documenting the mitigation measures and consultation process, as well as the RAP report will be made available for public review on World Bank's website.

6.8 Kabuyanda Project Grievance Redress Mechanism (GRM)

6.8.1 Introduction

A Grievance Resolution Mechanism (GRM) is a system by which queries or clarifications about the project are responded to, problems with implementation are resolved, and complaints and grievances are addressed efficiently and effectively. It is best practice for the grievance resolution mechanism to clarify at the outset who is expected to use the procedure, and to assure stakeholders that there will be neither costs nor retribution associated with lodging a grievance. The entire process (i.e. how a complaint is received and reviewed, how decisions are made and what possibilities may exist for appeal) will be made as transparent as possible by putting it into writing, publicizing it and explaining it to relevant stakeholders. Grievance resolution mechanisms should be made available to all stakeholders at no cost, including those with vulnerabilities such as disabilities, chronic disease or lack of access to sources of information. Likewise, anyone using the GRM will be treated fairly and without bias.

General Objective

The objective of the Grievance Resolution Mechanism is to provide a mechanism/process to receive and respond timely to any complaints made about the Project from different stakeholders (including those from members of the communities, local businesses and other stakeholders) and to be the basis for developing appropriate mitigation strategies.

Specific Objectives

The specific objectives of the GRM are to:

a. Facilitate effective dialogue and open lines of communication with the public;
b. Manage expectations and/or negative perceptions towards the Project;
c. Develop an accessible, transparent and efficient complaint procedure for people involved in and/or impacted by the Project;
d. Establish a mechanism for responding to complaints in an understanding, transparent and culturally appropriate way;
e. Establish a system of investigation, response and prompt complaint resolution;
f. Minimize grievances regarding the Project;
g. Improve the Project social performance by evaluating complaints as a basis for taking remedial or preventive actions or developing responsive initiatives.
h. Document all complaints received, and mitigation measures implemented for future reference and longer-term evaluation of objectives achieved.

If implemented well, the grievance resolution mechanism enhances sustainable development, reduces negative impacts from the Project and facilitates overall cohesion among project stakeholders, particularly those employed directly on the Project and/or living adjacent or near to the Project.

Scope

The Grievance Redress Mechanism should be prepared for the Construction Phase and is to be implemented by the Construction Contractor. A separate Grievance Redress Mechanism is to be implemented for land acquisitions, resettlement and livelihood restoration/reforestation activities, as detailed in the Resettlement Action Plan.

6.8.2 Potential Categories of Grievances under the project

Grievances to be dealt with under the Construction phase GRM will include but not be limited to the following:

a. Uptake of land for project works and infrastructures;
b. Issues with recruitment and employment on the project.
c. Labour rights, employment contracts, wages,
d. Health and safety concerns, accidents, injuries and medical treatment,
e. Lack of sanitary facilities on site,
f. Construction-related nuisances such as noise, dust, vibration, light pollution,
g. Degradation of community roads,
h. Traffic accidents involving community livestock,
i. Loss of access and loss of natural resources.
j. Degradation of adjacent arable land and destruction of crops,
k. Disruption in water supply.
l. Conflicts between Project personnel and local community

6.8.3 Disclosure of Grievance Resolution Mechanisms

Stakeholders should be made fully aware (by whatever means is necessary to provide full disclosure of the GRM) of the following points:

a. What project-level grievance redress mechanisms are capable of delivering, as opposed to other resolution mechanisms;
b. Who can raise complaints;
c. Where, when, and how community members can file complaints;
d. Who is responsible for receiving and responding to complaints, and any external parties that can take complaints from communities;
e. What sort of response complainants can expect from the company, including timing of response; and
f. What other rights and protection are guaranteed.

6.8.4 Grievance Resolution Process

Grievances may be made in verbal or written communications. Stakeholders will be able to fill a Grievance Resolution Form or write formally to the implementing team. The form will also be translated into the local language i.e. Runyankore-Rukiga and stakeholders who are illiterate will be assisted by the relevant Project personnel to lodge written complaints, and their complaint should be read back to them for verification of accuracy and to ensure their satisfaction that their grievances have been adequately described.

For those who wish to make complaints anonymously, suggestion boxes should be put in prominent places on the Project, near entrances and at designated locations in the local communities. These boxes should be regularly checked for use, and all suggestions received should be addressed in the same way as other grievances. Local community members should also be provided with a telephone number which they can call for further information or for lodging complaints if disability or distance from Project prevents them from visiting in person.

Grievance forms will be made available on the Project for Project personnel, at Project entrances/gates for the local community and Project personnel, and at the different levels of local government. All grievances received, whether in written or verbal form, will be registered in a Grievance Log with reference numbers. Security personnel dealing with community members at the Project entrances should be made aware of the grievance resolution mechanisms and be trained in how to appropriately facilitate community members to

lodge their complaint. Depending on Project security arrangements, a designated office should be provided for receiving community members and other stakeholders.

All incoming grievances will be acknowledged and a formal confirmation with reference number and timeline for response should be provided, to indicate that the organization is responding properly and to provide records for the Project. If grievances are clearly outside the scope of the GRM, this should be explained as soon as possible, and recommendations given for alternative avenues which the communities can use to address the issues they face.

6.8.5 Monitoring and Evaluation

The Grievance Resolution Mechanism should be monitored and evaluated for efficiency and effectiveness. The Construction Contractor should keep full records of all grievances lodged and how they were resolved. Summaries of GRM activities should be included in the Contractor's Monthly Progress reports, quarterly Progress reports and all relevant HSE reports, with Client and on-site supervisory engineer conducting periodic audits. Evaluation should be undertaken for the frequency of grievances lodged, nature of grievance, method of resolution, time taken for resolution and satisfaction of the complainant. Where shortcomings are identified in the GRM, alterations and mitigation measures should be implemented in a timely way and communicated with stakeholders.

6.9 Institutional Safeguard mechanisms for the management of Kabuyanda project

6.9.1 Introduction

This section describes institutional safeguard mechanisms for the management of Kabuyanda Irrigation Scheme Project. It highlights the position of the Kabuyanda Water Resources Project in as far as it will be managed and monitored within the Ministry of Water and Environment (MWE) including the participation and linkage with other ministries and agencies. This takes into account, institutional and agency structures, roles and capacities to ensure that the Environment and Social Management Plan and the Environment and Social Monitoring Plan are fully implemented and monitored and are adequately reported upon. The following safeguard mechanisms were extensively discussed with stakeholders at various levels and were accepted as the best and most effective options for ensuring implementation of the Environmental and Social Management Plan and for implementation of the Environment and Social Monitoring Plan. These mechanisms will ensure compliance with national regulations as well as complying with guidelines of international and regional bodies like the World Bank and the East African Community.

This section presents the institutional safeguard mechanisms for the management of Kabuyanda Project. However, an appraisal is required for management intended for this Project as there are implications on resettlement of PAPs already operating in the project area.

6.9.2 Central Safeguard mechanism at the Ministry of Water and Environment

6.9.2.1 *Membership of the Central Safeguard mechanism at the Ministry of Water and Environment*

After Consultations with the Ministry of Water and Environment (MWE), it was understood that there exists a Safeguard Team with 15 persons from the Department of Water for Production. These individuals are made up of Environmentalists, Sociologists, Surveyors, Agriculturists and Land use experts. It is proposed that this safeguard team will also be the safeguard team for the Kabuyanda Irrigation Scheme Project which will have over sight roles over the activities of the project. It is however proposed that the Safeguard Team at the MWE be beefed up by taking membership from the National Environment Management Authority (NEMA), the National Forest Authority, the Directorate of Wetland Management and indeed from other Ministries such as the Ministry of Local Government, the Ministry of Agriculture, Animal Industry and Fisheries, the Ministry of Gender, Labor and Social Development (MGLSD), the Ministry of Energy and Mineral Development, the Ministry of Health, the Ministry of Lands, Housing and Urban Development, the Ministry of Works and Transport, the Ministry of Tourism, Trade and Industry.

6.9.2.2 *Roles and responsibilities*

The functions and roles of the Central Safeguard Team will include general supervision and over sight of the project and in particular it will monitor the implementation of the project;

a. it will guide the Contractor;
b. it will ensure that all pertinent laws and regulations are followed;
c. it will ensure that there is full and participatory engagement of the communities;
d. it will ensure that there is sufficient budgetary provision for the project;
e. and it will ensure that all training and capacity building activities are implemented.

This is in line with the Ministry's mandate to provide overall policy direction, supervision and guidance and monitoring the performance of environment in the country. The Ministry is also be mandated to promote and ensure the rational and sustainable utilization and development of the environment, water resources and social and economic welfare and development.

In the Project, the Ministry guides and coordinates all environmental activities in particular activities detailed out in this ESIA. The Ministry's Safeguard Team is supported at the level of the Ministry by the Directorate of Environmental Affairs and the Department of Environmental Support Services which provides technical support functions. Further, there are agencies in the MWE responsible for aspects of the project include the Directorate of Water Resources Management (DWD), the National Environment Management Authority (NEMA) and the National Water and Sewerage Corporation (NWSC).

6.9.2.3 *Reporting*

The Central Safeguard mechanism at the Ministry of Water and Environment will produce quarterly and annual reports to the Permanent Secretary of the Ministry and to the Director. The MWE has a lot of experience running similar projects over many years. Some of the projects which have been run by the Ministry are the Mobuku Irrigation Scheme, the Doho Rice Scheme, the Ngenge Irrigation Scheme and the Toch Project in northern Uganda.

6.9.2.4 *Regional Safeguard mechanisms at the Regional level of the Ministry of Water and Environment*

The Ministry of Water and Environment (MWE) operates regional centers at Mbale, Mbarara, and Lira. There are Safeguard Teams at each of the regional centers manned by Environmentalists, Sociologists, Surveyors, Agriculturists and Land use experts. These regional centers are extensions of the Ministry at regional level. The Mbarara Regional Center will be the one to oversee the operation and activities of the Kabuyanda Water Resources Project. The Mbarara Regional Center will also perform the role of being a Regional Safeguard mechanism for the Kabuyanda Water Resources Project. The role and mandate of the Mbarara Regional Center as a Regional Safeguard mechanism point will be similar to that of the Safeguard Team at the Ministry of Water and Environment. The Mbarara Regional Center will work hand in hand and re-enforce the capacity of the Safeguard Team at the Ministry of Water and Environment. Its specific roles will be general supervision and over sight of the project, monitoring the implementation of the project, guiding the Contractor, ensuring that all pertinent laws and regulations are followed, ensuring that there is full and participatory engagement of the communities and ensuring that all training and capacity building activities are implemented.

6.9.3 District Safeguard mechanism at the District Level

Local Governments are important providers of local service delivery including aspects of managing projects initiated by Ministries and agencies. In this project, Isingiro Local Government will be a principal agent in the supervision of the implementation of the Environment and Social Management Plan as well as the implementation of the Environment and Social Monitoring Plan. In performing these duties, the Isingiro District will be cognizance of the need to ensure linkage between sectors and the project. NGOs and other sectors will work with the Isingiro Local Government to enhance service delivery but also pursue sector specific strategies to enhance service delivery. After consultations with the district authorities, it was proposed that a subcommittee at the Isingiro District level will be formed to the District Safeguard team to

supervise and oversee the implementation of the Environment and Social Management Plan as well as the implementation of the Environment and Social Monitoring Plan and other operations of the project. This concept is the one that the Isingiro District Local Government preferred. This Subcommittee will operate under the District Technical Planning Committee and will be called "The Isingiro District Kabuyanda Water Resources Technical and Safeguard Sub Committee" (IDKWRTSC) or any other name that will be preferred. It will be the CAO to establish the IDKWRTSC. The IDKWRTSC will be under the District Technical Planning Committee. The IDKWRTSC can appoint one or several of their own members to represent them at the operational site of the project.

6.9.3.1 *Membership of the IDKWRTSC*

a. A representative of the Chief Administrative Officer (CAO) as Chairperson
b. The District Engineer
c. The District Water Officer
d. The District Community Development Officer
e. The District Planning and Marketing Officer
f. The District Natural Resources Officer
g. The District Agricultural Officer
h. The District Fisheries Officer
i. The District Planner
j. The District Trade Officer
k. The District Forest Officer
l. The Town Clerk Kabuyanda Town Council
m. The Kabuyanda Sub-County Chief

It is felt that while there is capacity at the Ministerial and regional level to carry out over sight role of policy, regulation and standard setting, there will be need to build capacity at the District level to enable district and sub district officials' conduct their duties effectively. Implementation of the Environmental and Social Management Plan and the Monitoring Plan in the project will involve implementing the mitigation measures and the monitoring plan measures proposed in the ESIA. At both enhancement and mitigation monitoring, the IDKWRTSC staff will be trained in the principles of environment management, the principles of EIA and environmental auditing, climate change and global warming, aquatic ecology, water quality, pollution and pollution control, fish, the ecology of natural resources like forests, wetlands, lands and soils, wild life, public health, pests and diseases, agricultural resources and agricultural practices, animal resources, natural resource economics, international and regional environmental issues, treaties and conventions, environmental laws and regulations of Uganda, international and regional bodies.
The technical staff who are members of the IDKWRTSC should be familiar with practical methods of assessing the quality of water, soils, vegetation, air and noise. They should also be familiar with research methods and data reporting. Arrangements can be made with Makerere University, Kyambogo University, NARO, and NWSC to run short skill upgrade courses for these staff. The Ministries of Water and Environment and that of Agriculture Animal Industry and Fisheries should also be able to run workshops for staff of their ministries as well as those of Isingiro Local Government and the communities of Kabuyanda and the Kabuyanda Town Council. The workshops can be held at the Isingiro District Headquarters, in Isingiro Town Hall or at the Kabuyanda project site.

6.9.3.2 *Roles and responsibilities of the IDKWRTSC*

a. General supervision and over sight of the project;
b. Monitoring the implementation of the project;
c. Guiding the Contractor;
d. Conducting on site assessment of the quality of bio-physical and social environment;
e. Periodic verification of the activities, data, procedures and information from the Contractor;
f. Periodic assessment of implementation of enhancement/mitigation measures of the ESMP;
g. Ensuring that all pertinent laws and regulations are followed;

h. Ensuring that there is full and participatory engagement of the communities and;
i. Ensuring that all training and capacity building activities are implemented;
j. Regular attendance of site meetings;
k. Preparing and submitting regular reports to the Ministries

6.9.3.3 *Reporting*

The IDKWRTSC will produce monthly and annual reports to the CAO whilst the technical members of the team will submit monthly and annual reports directly to their supervising Ministries and agencies like the Environment Officer will report direct to the MWE and to NEMA; the Forest Officer will report direct to the Ministry and to the National Forest Authority; NFA; The District Water Officer will report direct to the MWE through the Department of Water for Production; The District Community Development Officer will report direct to the Ministry of Gender, Labour and Social Development (MGLSD)and Community Development; The District Planning and Marketing Officer will report direct to the Ministry of Trade; The District Agricultural Officer and the District Fisheries Officer will report direct to the Ministry of Agriculture Animal Industry and Fisheries (MAAIF).

6.9.4 The Sub-County Safeguard mechanism at the Sub-county level

The Sub county Safeguard Team operates at community level. It is made up of the following:

i. Sub county Chief, as Chairperson of the team,
ii. The Community Development Officer,
iii. Elders Representative,
iv. Women Representative,
v. Youth Representative,
vi. The Town Clerk of the Kabuyanda Town Council,
vii. LC 111 Chairperson,
viii. LC 111 Councilors and Secretaries for Health, Environment, Production, Works and
ix. The Kabuyanda Sub county Internal Security Officer (GISO),
x. NGOs operating in the project area.

6.9.4.1 *Roles of the Kabuyanda Sub County Safeguard Team*

- Hold meetings with communities,
- Act as liaison between the Contractor and the communities,
- Receive community complaints arising from the project activities,
- Arbitrate and settle disputes arising from conflicts between the Contractor and the communities,
- Assist the Contractor in matters of security for the project and its personnel and equipment,
- Report periodically to the IDKWRTSC.

6.9.4.2 *Reporting*

The Kabuyanda Sub County Safeguard Team will submit monthly and annual reports to the Chief Administrative Officer (CAO) through the IDKWRTSC.

6.9.5 The Contractor's Safeguard Team

The Contractor's Safeguard Team will operate on site at the location of activities of the project. The contractor will be required to make appointment of the safeguard team. The appointments to be made by the contractor in order to create the necessary capacity for adequate HSE fit for the demands of the legal framework and implementation of the ESMP. It is expected that the contractor will appoint and keep records of proof of appointments of the following;

2. Site Supervising Engineer,
3. Environmentalist,
4. Sociologist,
5. Employees' Representative
6. Health, Safety and Environment (HSE) Representative
7. Traffic Safety Officer
8. Work site Construction SupervisorsElectrical Installation Competent Person

6.9.5.1 *The roles of the Contractor's Safeguard Team*

a. Implementation of the ESMP enhancement and mitigation measures,
b. Collecting samples, carrying out analysis and determining the quality of the physical, chemical, biological and ecological environment,
c. Collecting data on social and economic impacts of the project,
d. Conducting site meetings with all the relevant officials,
e. Holding regular consultative meetings with the Client and the communities,
f. Implementing all the necessary remedial measures to counter any negative impacts of the project,
g. Submitting monthly and annual reports on the progress of implementation of the ESMP with all its enhancement and mitigation measures.

6.9.5.2 *Reporting*

The Contractor's Safeguard Team will report monthly and annually to the IDKWRTSC and MWE on all matters regarding the implementation of the ESMP and how it is being monitored as well as the results of all the monitoring measures being undertaken. The Contractor's Safeguard Team will also submit any other reports that may be requested on any aspects of the impacts of the project on the bio physical and social environment.

7 POTENTIAL ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS, MITIGATION AND ENHANCEMENT MEASURES

The construction and implementation of the Kabuyanda Irrigation Scheme will have impacts on the biophysical environment as well as the human and socio-economic environment in the area. These impacts will occur during all phases of the project, including the preparation and planning phase, construction phase and operational phase. Accordingly, this chapter presents the anticipated impacts (both positive and negative) of the project. This chapter then further analyses the nature of the impacts as to whether they are direct or indirect, immediate or long-term, or if they are avoidable, unavoidable and/or irreversible. The likelihood of each impact occurring is also analyzed. The impacts are then summarized in accordance with the methodology as presented as low, medium or severe and their significance determined as to whether they are acceptable, require mitigation or are unacceptable as too risky to the environment and for the socio-economic human setting. The significance of project impacts identified will be analyzed using the same method that was presented in the NEMA approved scoping report prepared by TCP, and which is outlined in detail in Chapter 1 of this report.

7.1 Positive Impacts

The project has many positive impacts, as given below.

a. ***Transformation of agriculture practice in the areas:*** The proposed Kabuyanda Irrigation Scheme is consistent with GoU strategic development enshrined in its Vision 2040 in which, the country strives to transform its economy from largely peasantry and subsistence agriculture to modern economy. In this Vision, Uganda aspires to transform the Agriculture sector from subsistence to commercial agriculture through mechanization and introduction of modern irrigation systems which is what is being planned under this project.

b. ***Sustainable and optimal use of irrigation water resources:*** The project provides opportunity to promote agricultural development strategies through sustainable use of the country's fresh water resources through measures such as irrigation coupled with catchment management interventions. Available information indicates that, with even full exploitation of irrigation potential only 14.1% of Internal Renewable Water Resources will be utilized. To mitigate rampant country wide seasonal local scale water shortages, GoU plans to put in place large and medium water reservoirs as planned under this project[20].

c. ***Serve to address food security in the areas of the project:*** The planned irrigation project, is a timely intervention by GoU to address water scarcity which has chronically affected crop production in Isingiro District. The New Vision newspaper of January 25, 2018 reported that…." *Isingiro is one of the leading producers of matooke in Uganda but that exalted position is now threatened by the rampant and persistent droughts since 2015"…*Therefore, the planned irrigation intervention is timely in addressing water needs for crop production and addressing food security a situation which is worsening by over-reliance on traditional rain-fed crop production.

[20] *Uganda Vision 2040 NPA/MoFPED-Kampala*

Figure 52: Relief food items delivered by American Reverend to the people of Isingiro.

d. ***Provide employment opportunities:*** According to UBOS Abstract for Isingiro District, is reported that about 6,039 (6.3%) youth are unemployed. Therefore, the planned irrigation will likely provide opportunities to work in construction and related engagements thereby contributing to youth empowerment.

e. ***Improved household acreages:*** In most rural areas, crop production systems using rudimentary cottage labor and equipment have for long typified agricultural production in the proposed project areas which in a way has kept it plunged in food insecurity, limited production and productivity, limited household acreages summing to poor household incomes. In addition, the irrigation technology to be introduced will likely be one which is more adaptable can be customized to household levels. The project is envisaged to assist farmers clear their lands alongside a host of farming husbandry support services which will bring about improved production at household levels.

Figure 53: Emaciated cow a result of water and pasture scarcity in Isingiro areas

f. ***Improved access to social services:*** There will be improved accessibility, trade and commercial opportunities after the planned rehabilitation of community access roads which will enhance commercial opportunities as well as delivery of social services in the beneficiary areas.

g. ***Gender empowerment:*** Aware of eminent gender disparities in the project areas, the project has measures aimed at empowering the women who are participating in the project through training and skilling on income generation, record keeping and savings which will be some stride towards women empowerment.

h. ***Crop diversification and intensification:*** Available information indicates that, the local population in the areas of Kabuyanda are largely engaged in banana production despite the climatic limitations affecting the crop. Once the irrigation scheme is operational, it is expected that, the famers will take up horticultural production thereby diversifying their income base. This diversification implies diverse sources of income at household and improved livelihoods as well.

i. ***Tourism Potential:*** Water projects can facilitate the development of recreation facilities in the form of picnic resorts, holiday resorts etc. which are having much commercial viability nowadays. Therefore, the proposed development of a water reservoir and a dam in Kabuyanda may act as a tourist attraction, thereby generating income for the local people, the government and the proprietors of recreational centers and tourism facilities. In addition, the irrigation scheme will attract the students from different schools for study tours. The impact will be long-term and it will be at national/ international scales. It will moderately benefit the communities and those outside the project area, and the likelihood of the impact occurring is probable. The significance of this impact is therefore expected to be **moderate to high positive.**

j. **Increased Trading and Services:** On-site facilities tend to be minimal during the Planning Phase such as clearing and citing for material lay down grounds, so reliance on the local community for products and services tends to be quite high, even if by limited numbers of personnel and for short periods. A positive impact would be increased business for shops and services, particularly those in linear market developments along main roads accessing the proposed Project area. This would also apply to guest houses or other places offering local accommodation. The impact will be short term for those with existing small businesses which are easily accessible. However, relatively few businesses will benefit, influxes of personnel will be limited to relatively small numbers, and influxes will be sporadic, depending on the field activities. The likelihood of this impact occurring is certain, and the significance is considered **low positive**.

7.2 Potential Negative Impacts

The proposed project has many negative impacts, during the planning, construction and operational phases. However, the identified impacts shall be mitigated according to the mitigation hierarchy. These have been placed according to the phases of the project as follows:

7.2.1 Planning phase impacts

1. **Anxiety and speculation by the communities:** This is likely to arise through sessions of surveying the routes and material sources whereby the communities will be subject to speculation interms of compensation and employment opportunities from the project. This will be managed through a structured and sustained community mobilization and sensitization by the project using available avenues such radio, mass/public meetings, places of worship and council meetings.
2. **Setting up camps and access to the site:** These will likely generate anxiety and in some cases, thefts of project equipment/equipment parts by sections of the community especially where there is inadequate sensitization hence, a need for the project to have its launch process held in the area of implementation. This process ought to be well publicized.
3. **Vegetation loss:** The proposed project envisages to inundate 100 ha (1.1%) of Rwoho CFR, a 9,000 ha plantation development forest, largely degraded and partially restored with non-indigenous species (*Pinus caribaea, Pinus ocarpa and Eucalyptus sp.*). Rwoho CFR is a modified non-critical habitat. Of the inundated area, 15.1 ha are under the Clean Development Mechanism programme (CDM and for which the ERPA terminates on December 31, 2019, thus ahead of the commencement of works for the

Kabuyanda irrigation project, while it would not be possible to take advantage of the option of a 20 year renewable crediting period until 2029), and the rest under private developers through concessionary agreements with NFA, or kept unplanted under NFA unplanted (Natural Belt & Nursery). Once the project is implemented there will be estimated loss of 4,292 m^3 of wood plantation, about 112 m^3 standing natural trees and other aspects all valued at UGX 2,995,520,800.[21]

Mitigation measures

- NFA will issue a license to MWE to use part of CFR for the dam and reservoir, which will include the restoration/reforestation of an area of 500 ha in Rwoho CFR using indigenous trees as a condition; there will be no degazettement of Forest, thus land will remain for and NFA's management, in accordance with the National Forestry and Tree Planting Act, 2003;
- The private tree owners in the inundated area will be compensated for loss of trees as per RAP; and
- The project under its sub-component 1.3 Catchment Management Plans will prepare and implement catchment management plans within the project catchment area including some forest reserve areas, to be implemented in collaboration with local communities and NGOs.

7.2.2 Construction Phase impacts.

These include:

1. **Air quality:** The project initial works of site clearance and excavations will likely cause loose soils which in the end can be blown by wind causing dust nuisance a process that will likely compromise visibility and air quality. However, this is assessed as short-term and a negative impact which can be mitigated through sprinkling water on loose/exposed surfaces and restricting excavations to those sites needed for the works.

Mitigation measures

a. The areas of such works be routinely sprinkled with water to suppress dust during works.
b. Restricting excavations to those sites needed for the works.
c. For the safety of the workers on such areas, the workers supplied with appropriate PPEs to protect them dust nuisance.

2. ***Noise nuisance:*** It is envisaged that, short-term noise exceedances during construction operations causing nuisance, issues of vibration, and noise from associated project facilities. This will be short-term negative impact.

Mitigation measure: The impact is to be mitigated through ensuring working hours in the project will be between 8:00am-5:00 pm and having project construction equipment routinely maintained.

3. ***Impact on faunal groups***

These have been considered as follows:

d. ***Mammals:*** From interviews with the local community and the ESIA surveys, no large mammals were reported to occur in the area. However, several species of medium sized mammals such as (Olive Baboon, Savanna Hare and monkeys) were reported to be in the area. Through transect walks, evidence of the presence of Marsh Mongoose was recorded. The majority of small mammal species recorded are of wide either spread occurrence (W) or open habitats (O). These can still range into agricultural landscapes and will very likely be present in several parts of the project area in different levels of abundance. None of the mammals are reported to be in the IUCN Red Data List.
e. ***Birds:*** A total of 53 species of birds were recorded in six general areas where the surveys were conducted. By and large, the species that were recorded occur more widely in the project area. The earlier reports of the Grey Crowned Crane *Balearica regulorum* were later confirmed to be pet-like animals in one home in Kabuyanda Town Council hence, no direct project impact expected to have on

[21] In December 2018, NFA carried out an inventory and economic assessment of project affected portion in Rwoho CFR, which at the time corresponded to 302 ha. The assessment estimated that once the project is implemented there will be loss of 12,876 m3 of wood plantation, about 338.09 m3 standing natural trees and other aspects all valued at UGX 8,986,562,400. As the affected area is now reduced to 100 ha, the impact is reduced to a third.

the Crested Crane. In addition, there were no roosting or breeding nests encountered in the areas of the project confirming further no impact on the Cranes.

f. ***Herpetofauna:*** The project area is comprised of different types of habitat features which may govern the occurrence and distribution of herpetofauna, including tree plantations, farmland, built environment and wetlands, ponds, rivers and streams. Based on the IUCN 2014 Red List none of the species recorded is of conservation concern, all are listed as of Least Concern.

g. ***Reptiles:*** Eight reptile species were recorded in Kabuyanda Project Area. The species included two skinks, One Lizard, One gecko, One Chameleon and three snakes. The Forest Cobra *Naja melanoleuca*, and the Nile Monitor *Varanus niloticus* were reported by the local residents as occurring in the project area. According to the IUCN Red List 2014 and the National Red List for Uganda 2016, none of the reptile species recorded during the survey is of conservation concern.

Mitigation measures: A biodiversity action plan has been developed for the project and shall be implemented. There were no special faunal groups of key concern as such, good construction practices coupled with implementation of the ESMP will go along to addressing any concerns relating to fauna conservation in the project. The project activities, including vegetation clearance in the reservoir area shall be restricted to 100 ha and any faunal encounter shall be evacuated in consultation with NFA and Uganda Wildlife Authority (UWA). The Code of Conduct for workers shall prohibit workers from engaging in hunting activities within the project area.

4. *Concerns regarding labor influx to the area*

Once the project works are launched, there are risks relating to labor influx in which, those seeking employment or enterprises opportunities begin to come into the area hoping to sell goods and services to the temporary project workforce, as well as "associates" who often follow the first two groups to exploit opportunities for criminal or illicit behavior (e.g. prostitution and crime).

More typically, labor influx is associated with negative impacts such as:

i. ***Environmental:*** population pressure due to labor influx may lead to expanded use of natural resources, such as forests and aquatic resources. Influx may induce increased vegetation degradation through collection of fuel-wood and housing needs. There may also be impacts on biodiversity and wildlife from hunting since this is one of the local people activities in the areas of the project.

ii. ***Economic and livelihood strategies:*** influx, when significant in relation to local community size, can result in increased pressures on the demand for food, fuel, housing and land. Pressures on land and water systems may also have economic impacts for those with resource-based livelihoods (e.g., agriculture, hunting etc.).

iii. ***Pressure on infrastructure, services and utilities:*** population influx can stretch the capacities of social infrastructure especially housing and water supply leading to additional pressures on waste management and sanitation. Labor influx can also create direct demands on social, health and emergency services. Lack of adequate housing may also lead to unplanned and controlled development of squatter settlements in the project area.

iv. ***Health:*** labor influx can provoke higher rates of violence, injury, alcohol and drug consumption and sexually transmitted diseases in the local population. Over-crowded or camp-based living conditions can significantly alter existing levels of communicable diseases including respiratory problems, diarrheal and vector-borne diseases and tuberculosis, which increases the risks of disease being introduced and spreading through host communities.

v. ***Social and Community well-being:*** labor influx, can have effects on community cohesion which can be particularly acute in smaller communities hosting a largely male workforce, and/or a workforce from other regions which may result in conflicts between locals and non-locals concerning employment opportunities, wages, and natural resources. While crime rates may increase generally, increases in crime and violence against women and girls may be particularly acute in socio-economic settings where there is an existing gender differentiation in terms of power and norms, coupled with limited governance capacity. In locations with pre-existing sexual and gender-based violence (SGBV) issues such as in the project area, labor influx can exacerbate SGBV risks.

Mitigation measures: First and foremost, the Contractor/s shall be required to develop and implement a Labour Management Plan that shall guide hiring of workers to ensure proper identification, avoidance of forced and child labour, issuance of work contracts including code of conduct, formation and operationalization of workers' Grievance Redress Committee, Workers' Union, induction and continuous workers' training, provision of workers' accommodation/camp to isolate work-force from communities, development and implementation of an HIV/AIDS and Gender management plans and hiring a service provider to undertake implementation of HIV/AIDS and Community Health and Saefty activites in the project area/ host community.

5. ***Loss of structures:*** The RAP (February 2019) established that, the project will take up a total of 185 structures of mainly 62 commercial buildings, 69 auxiliary structures (kitchen, toilets and bathrooms), 13 animal houses and 20 hedge fencings.
   Mitigation measure: The RAP has provided for compensation for these assets and that process should be fair, timely and adequate in keeping GoU land acquisition laws and procedures.
6. ***Impacts on physical cultural resources:*** Based on analysis of the location of the reservoir villages and its coordinates, none of the 17 PCR sites presented under baseline are located within the reservoir/dam area. This implies that the project will not likely have significant impact on the known PCRs in the reservoir area. However, the project's implementation in the command area where most of the PCRs will necessitate;
   a. Clearly marking out the identified PCRs locations before implementation of the project
   b. Realignment of the water transmission canals to bypass any PCRs in the alignments. Where it becomes inevitable to avoid PCRs especially the graves, the developer will pay compensation for relocation of human remains in accordance with RAP provisions.
   c. Archaeological watching briefs to be undertaken during ground breaking and site clearance/construction phase by a professional archaeologist(s).
   d. Training of construction workers in basic skills of identification, handling and reporting of any new archaeological sites and artefacts during site clearance and construction.
   e. Providing a copy of chance finds procedure to construction workers to guide them in management of archaeological sites and materials.
   f. Prohibiting Project workers to remove archaeological material from the site unless authorized to do so.
   g. Professional rescue excavations on site. Where there could be accidental encounters of PCRs, a ***Chance Finds Procedures*** is provided below to guide salvage such materials.

CHANCE FINDS PROCEDURE

Introduction

Archaeological sites are the only physical evidence that tell us about the past history of Uganda and are indicators of the indigenous people's cherished values and identity. The 1995 Constitution of Uganda, under the national objectives and directive principles of the policy (XXV), obligates the state to protect and preserve Uganda's Heritage. This emphasizes the Historical Monuments Act 1967 amended in a decree in 1977 that governs the protection of all cultural property in Uganda. The Department of Museums and Monuments (DMMs) therefore is mandated to protect, preserve, gazette and rescue/salvage any material of archaeological, paleontological or historical importance on behalf of the state.

Protection of Discovery of previous Unknown Archaeological Sites

As noted earlier Chance Finds are site or material such as pottery or stone tools, iron slag, Charcoal that could be found during earthworks of any development. Pottery or broken pots may be decorated or plain, red ware or brownish or even yellow-white for those that used kaolin. Stone tools may also be in black/dark (Chert), white without or with crystals (Quartz/Quartzite) and many others. Some other people may find iron slags, spears, knives or other objects made from iron ore and bones of either human or animal remains.

Procedures to address chance find

a) In line with the General Specification for Road and Bridge and WB Physical cultural Resource Safeguard Policy Guidebook, the contractor must stop work immediately after discovering evidence of possible scientific, historical, prehistoric, or archaeological data and notify the Resident Engineer or supervisor of works giving the location and nature of the finds.
b) The contractor shall exercise care so as not to damage artifacts or fossils uncovered during excavations operations and shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition by the Employer.
c) The Contractor shall also document/record the Chance Find and provide a report with the following

- Date and time of discovery
- Location of the discovery
- Description of the PCR
- Estimated dimensions of the PCR
- Temporary protection implemented

Note: this report will first be submitted to the Resident Engineer/Supervisor who will report to responsible authorities for further communications and actions.

d) The Resident Engineer/supervisor should notify the commissioner DMMs of such finds for verification and salvage by writing a notification letter or email and where urgency is needed a telephone call. The contact name' Rose NkaaleMwanja; email; mwanjankale@gmail.com and tell; 0414 232707 or 0772 485624. This is in line with the Historical Monument Act 1967, Section 11 (1&4) and section 12b).
e) The DMMs should be able to provide a solution at least within 7 to 28 days after being contacted. This implies that there where salvage archaeology is required, works of the contractor should be suspended for at least not more than 28 days. A report of the finds should be shared with all relevant authorities such as MWE, MAAIF, MEMD or any other development companies and DMMS.

7. ***Impacts on current water supply facilities:*** There are two valley tanks of 10,000 m^3 capacity each, in Kikagati sub-county (within the irrigation command area) and Ruborogota sub-county (10 km outside the command area) which could be influenced by the project. The project may affect access to these facilities.
   Mitigation measure: Project implementation should be planned in a way to allow users of these valley tanks continued access. This is to be adhered to, bearing in mind that the project area is prone to water scarcity and long droughts.
8. ***Physical displacements:*** According to the RAP (February 2019), the main pipeline and secondary pipes will pass through five freehold land holdings, 1,778 customary lands and two licensees. It is also estimated that, a total of 1,785 PAPs will be affected by the project through construction of both the main pipe line and its secondary lines. It is proposed that adequate time and fair compensation be paid out to the PAPs to enable them settle to normal livelihoods before construction. Above all, the project as per its RAP has a livelihoods restoration program which should assist the PAPs to resettle fully after the project.
9. ***Impact on vulnerable groups:*** The analysis of socio-economic data reveals that, some of the PAPs qualify to be categorized as vulnerable and they include people with physical disabilities and impairments, the elderly and widows and families headed by children. Results from the socio-economic survey further showed that; an estimated fifty-one households (18%) were living with members aged 70 years and above and in such households. Though these vulnerable groups will not be physically displaced by the project, they will be indirectly affected in that, their bread winners could likely move to work in the project leaving them without attention in the households. The women (including widows) could face segregation in terms of employment and sexual harassment. Such social concerns could be mitigated through providing them with employment opportunities in unskilled areas depending on their ability andputting in place an explicit Gender Management Plan in place for purposes of dealing with gender mainstreaming in the project.
10. ***Traffic related impacts:*** Movement of construction traffic fleet through trading centers and in the community areas (leading to the project site), will likely pose a risk to the safety of the public in terms

of motor accidents and interference with public traffic and deteriorate safety (especially the school children and elderly people). The contractor will put in place, a traffic management plan and work with the traffic police to guide and control traffic during construction works across public places. Project drivers shall be requied to sign specific Code of Conduct for Machine Operators, requiring among others observance of speed limits and ensuring regular servicing and maintenance of vehicles. The project shall ensure installation of appropriate safety signage, speed control structures, and sensitization of the public on safety measures by a nominated service provider.

11. ***Impact on faith-based establishments:*** The project will impact on two places of worship i.e. Kabugu Catholic Church and St. Jude Catholic Church whose lands and trees (not church structures) will be taken up the project main water lines. This will be a direct negative impact to be mitigated through compensation for the lost properties and adequate and full restoration of the sites, as already taken up in the RAP. In addition, impacts relating to disturbance of worship programs in the two churches are to be mitigated through ensuring that, project works are undertaken outside days of church worship and in full and close consultations with laity in such areas.
12. ***Impacts on education establishments:*** The project will have direct negative impacts on schools established to be on its infrastructures alignments i.e. Kabesekye Primary School (land and crops), Bakurungu P/S (land), Kitezo Primary School (land), Kigarama International School (crops and land), Nyamichi P/S (land and trees), Kabuyanda P/S (land), Kabugu P/S (land and trees) and St. Mary's P/S (toilet, teachers' houses 2N^{o}; and water tank. These will be impacted through construction of water main line an activity that is likely to cause inference with teaching programs due to noise and general construction disturbances. These will be mitigated through screen out schools from direct interaction with construction activities, providing safety structures near schools such as speed control, humps, dust screens, hoarding off excavations, limiting noisy activities to non-school hours, sensitization of school children and teachers on project impacts, and so on. There will also be compensation for lost land and trees.
13. ***Impacts of sourcing soils, sand and clay material, mining, borrow pits and transportation***: Stockpiles of rock and earth materials will be a source of pollution. Excavation will also have visual impacts resulting from landscape degradation and may expose some cultural artefacts as well as soil erosion. It is also envisaged that extraction construction materials will likely result into accidents on people and cattle as well as causing air pollution through release of dust. Animals will lose their habitat and some killed in the process. The overall impact resulting from material mining and transportation is likely to be of **medium magnitude negative** because most impacts will be short term, localized in one area and mitigable. The land will be for temporary use and will revert to the owners after restoration. Survey of material sites were carried out and candidate sites have been identified considering environmental and social criteria. Environmental audit of existing sites and ESIA/RAP of new sites will be conducted during implementation following the project ESMF.

Mitigation measures

a. Restoration of the land through grassing and tree planting;
b. Non-active areas of the borrow pits will be landscaped and re-vegetated as soon as possible to avoid erosion and stagnant water;
c. The extraction of materials will be planned so that overburden and top soil is used in re-development and restoration works; and
d. Agreements between the contractor and borrow pit owners will clearly indicate the Contractor's obligations of sound environment management.

14. ***Impact on wetlands:*** Baseline information shows that the project area valleys consist of some wetland relics with a mix of vegetation lagerly of *Typha sp, Cyperus sp* and *Vossia sp*., a factor due to cultivation amongst others. The project is expected to inundate 5.6 ha of wetlands.

Mitigation measures

a. The project will restore 10 ha of wetlands along the River Mishumba, upstream of the reservoir location and within the Rwoho CFR and specifically within the 500 ha targeted by the restoration/reforestation activities;

b. Maintain the 30 m buffer zone around the river lines and wetlands in line with provisions of the National Environment (Wetlands, River Banks and Lake Shores Management Regulations, S.I. No.3/2000) This would conserve the wetland ecology by avoiding degradation activities such as cultivation (soil erosion and siltation), and pollution from agricultural chemicals.

c. In case of any construction is to be done on the wetland shore-lines outside the Rwoho CFR, an Independent Environmental Assessment will be done and a User Permit will be issued in line above Regulations.

d. After construction, all degraded wetland vegetation cover will be restored along the buffer zone downstream following the Catchment Management Plan (CMP).

15. ***HIV/AIDS risks:*** According to UPHIA 2016-2017[22] HIV/AIDS prevalence among adults aged 15-64 years in Isingiro District (South-West Uganda) has a prevalence of HIV reported to be 7.9% (see purple arrow below the map) which is second to central region areas with a rate of 8.0%. This spells a challenge for the project and it is proposed that, there will be measures to address the scourge. ***The project will therefore put in place, measures to mitigate the risks in terms of sensitization and awareness campaigns as well as distribution of condoms, voluntary counselling and testing (VCT) and distribution of ARVs to the workers who test positive and such services will be extended to the communities in the vicinity of the project areas.***

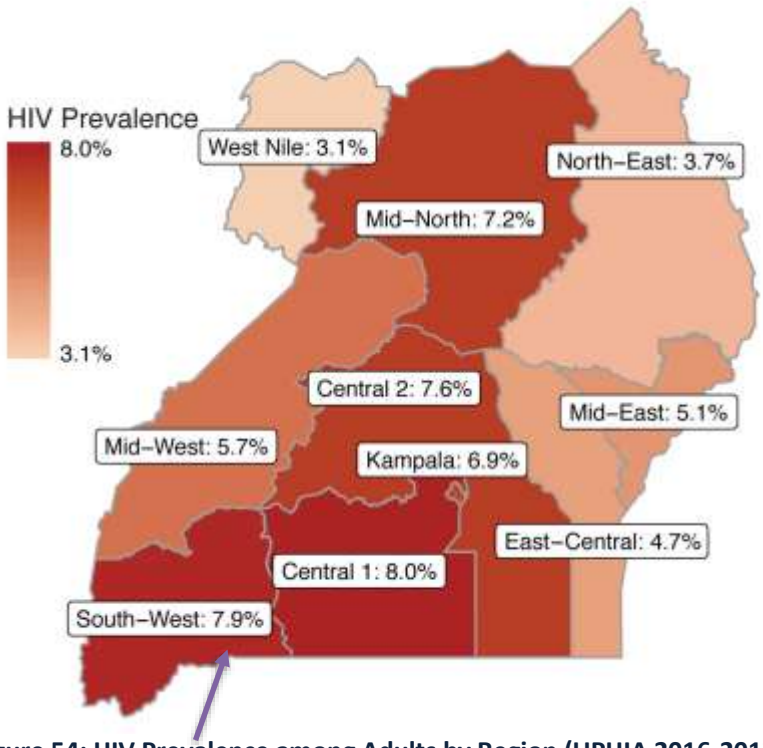


Figure 54: HIV Prevalence among Adults by Region (UPHIA 2016-2017)[23]

16. ***Impacts due to creation and widening of access roads:*** The project will construct 2 km of access roads, including access to the dam site, and including the roads running from the dam site to the north on the left bank of the river (about 190 m). The 25km will be rehabilitated from the branch out from the main road Mbarara-Kikagati to the dam and irrigation appurtenances structures. The access road will be enlarged and stabilized in order to transport heavy construction materials and machineries. As result there will be dust creation and therefore polluting air quality, speeding cars on the access roads will create noise pollution and impacts due to increase in traffic like traffic accidents. There will also be loss of land to pave way for construction of the access roads. There will be vegetation loss as there will be

[22] *Uganda Population-based HIV Impact Assessment: Summary Sheet: Preliminary Findings August, 2017*
[23] Ibid

vegetation clearance. There will also be loss of habitat to fauna. Some plants and animals will be trampled by moving vehicles and therefore leading to loss of biodiversity. Opening up areas for access roads will cause soil erosion and therefore reducing water quality of the river Mishumba and associated wetlands and therefore a negative impact on the aquatic ecosystem.

This impact resulting from creation of and widening of access roads will occur but it will be short term as will occur mainly during construction phases and therefore the impact is rated as medium negative and will require mitigation measures

Mitigation measures

a. It is recommended that construction be undertaken during the dry conditions to minimize erosion;
b. Map out areas to be used for access and only clear vegetation in such areas without necessarily clearing other sites anyhow;
c. Suppress dust by sprinkling water on dusty surfaces and loose soils;
d. Safety signage and speed control structures shall be installed at points of high human activity, deployment of traffic guides; and
e. Project workers will use appropriate PPE while at work;

17. ***Impacts of the quarrying activity:*** It is expected that there will be stone blasting at the quarry sites during the construction phase of the project. Accidents may arise as a result of the flying stones that may cause damage to the neighboring structures, banana plantations or to any passer-by close to the quarries. This impact is expected to be medium negative as most homesteads are not very close for the quarry site.

Mitigation measures

a. A separate ESIA for the proposed quarry and other auxiliary facilities will be carried out as required and has to be approved by NEMA before quarrying activities start;
b. Relevant environmental and social due diligence should be undertaken during acquisition or procurement of quarry materials especially where quarries exist;
c. Areas that will be identified for quarrying will be clearly zoned with clear safe zone demarcated to keep the public;
d. The land owners where the stone quarry is located will be compensated on willing seller willing buyer basis;
e. Demobilize work equipment and staff, taking care to prevent adverse impact on the environment.
f. Restoration of the land after quarrying will be done to acceptance of NEMA and DEO of the area.

18. ***Impacts relating to laying of water pipes:*** The laying of water pipes for water transmission and distribution with respect to water supply and for irrigation will likely have the following impacts:

a. land take a process which will be mitigated through compensation for land areas taken up by the infrastructures;
b. Warning signs will be posted in strategic sections before and after such works sites to warn the public about such works;
c. Disruption of traffic especially where pipes cross roads. It is proposed that, such work areas are sealed off with barricades to keep off the public and livestock; and
d. Restoration of the sites after works are completed.

19. Impacts due to creation of camp sites, offices, parking and storage of project equipment/ materials: The project office/yard, the workers camp and the management camp will be constructed outside Rwoho CFR. The workers camp will be accommodating about 120 workers, while the management camp will be accommodating about 42 workers and some support facilities whose details are not now established. Likely impacts from these activities will be mitigated through ensuring that:

a. The contractor will develop and implement a waste management plan and dispose of waste in accordance with the National Environment (Waste Management) Regulation 1999.
b. Put in place proper sanitation facilities at the campsite and offices and such facilities should be separate for male and female and should be clearly labeled so;
c. Put in place a designated and labeled areas on the camp site for temporary storage of waste and the storage bins should be accordingly coded and well labeled.

d. Overburden or spoil material will be used for rehabilitation of affected areas around the project site.
e. Work sites must be adequately equipped with portable toilets.

Figure 55: Coded waste bins

20. **Impacts to hydrology and sedimentation**

It is noted that, works relating to river diversion and its subsequent interception and dam construction activities have a potential to generate a number of impacts on hydrology and sedimendation, including:

d. Management of cut-to spoil materials arising from excavations. Some of the cut to spoil materials can be used as field materials with approval of the project engineer while excess will be disposed into approved sites by the District Environmental Officer;
e. During construction stage, river diversion, dam construction and other construction activities will alter river flow regime. Altering the river flow regime will increase the likelihood of soil erosion and sedimentation. This will be mitigated through following good construction practice, such as: carrying out construction during dry season to the extent possible; installation of soil trap onsite; and appropriate management of excavated soils.
f. Contractor's environmental and social management plan will based on detailed design include detailed constuctdion schedule and implementation plan to mitigate such impacts properly.

21. **Impacts on fish and fishing**

During construction, river diversion, interception and dam construction will have potential imapcts on river flow regime, water quality, riverine and riparian ecosystem, resulting negative impacts on fish, its habiats and fishing activities. It is expected that the impacts will be limited as fish surveys and livelihood assesement conducted during the ESIA preparation indicated limited fish stocks, small-size fish individuals and minimal fishing activities in the project river. Fish impact assesement also indicated the identified fish species in the river belonging to the *Barbus, Clarias, Haplochromus* and tilapiine families. These fish species are mostly categorized as Least Cocern according to IUCN Red List, the remaining one is not included in the Red List but all are common species in the region, and are found upstream and downstream of the Mishmba river, streams and ponds in the project irrigation command area. Thus, it is expected the construction impacts on fish and fishing activities will be temporary and limited.

Mitigation measures

- Measures mitigating impacts on hydrology, sedimentation, water quality and habitats (see relevant sections) will be duly implemented to protect fish and fish habitats;

- Sebsitization of contractors including awareness raising and training will be conducted during construction to prohibit workers from fishing and damaging fish habitats;
- Additonal fish survey and monitoring and RAP monitoring will be carried out during the project implementation.

22. Impacts on Water quality

Water quality in the water courses may be affected by in the following ways:

- Site clearing and the disruption of the natural drainage patterns,
- There will also be potential water contamination from hydrocarbons mainly from the contractor's machines,
- Vegetation and humic soils leading to elevated organic pollutant levels.
- A high nutrient level is essential for productive agriculture. However, the use of both natural and chemical fertilizers may result in an excess of nutrients which can cause problems in water bodies and to health.
- Increase in contaminate concentration as a result of decrease in river flow volume.

Mitigation measures

- It is recommended that construction be undertaken during the dry conditions to minimize erosion when the soil is loosened. The top soil removed will be required to be moved to an alternative site where storm water cannot carry the soil to the streams.
- A water pan (silt trap) may be established downstream of the dam which will act as a soil trap to hold the excessive silt during construction.
- The steep slopes surrounding the dam construction will be stabilized, and compacted to reduce on erosion and potential landslides as a result of deep cutting,
- Drainage channels shall be installed where necessary,
- Undertake re-afforestation and improved farming systems upstream of the dam as part of the catchment management plan (CMP),
- There shall be an integrated catchment management plan (CMP) targeting R. Mishumba and other rivers affected by the project. In this regard, involvement of the communities, landowners and relevant authorities will be undertaken,
- Develop a deliberate initiative for monitoring water quality both upstream and downstream in order to inform cathment management strategies and management in compliance with the water abstraction permit that shall be obtained from Directorate of Water Resources Management.
- Installing gauging stations for monitoring the immediate trends in the upper zones of the river basin
- Provide mandatory buffer area for conservation of the riverine and dam ecosystem through the review of riparian land ownership and control of wetland/floodplain encroachment, as part of the catchment management measures.
- Monitor the relationship of the dam to the downstream flooding trends. Periodically make corrective improvements to sustain/enhance environmental sustainability.

23. Impacts on existing NFA roads

Dam and reservoir construction will result in the inundation of sections of roads within the Rwoho CFR.

Mitigation measure: The project will finance the construction of new roads within the NFA reserve to account for those which will be inundated. These roads will be designed by the supervision consultant for Kabuyanda under component 1, in consultation with NFA. Construction of the roads will be undertaken by the Dam Contractor. Funds to this effect have been embedded in the project costs.

24. Accidents and health impacts: This relates to poor worker safety management and general safety risks to the workers and the community as well as poor health management. There is also concern on working hours the laborers can be exposed to.

Mitigation measures

a. Have Occupational health and safety procedures enforced at site by both the engineer and contractor i.e. develop and implement appropriate occupational health safety measures during project construction;

The workers shall be given trainings and briefings on code of conduct while on the project in a manner consistent with provisions in Occupational Health and Safety Act 2006 requirements;

b. The contractors will be required to prepare, obtain approval of, and implement an occupational health and safety (OHS) plan which has to be approved by the supervising engineer;
c. Provide workers with appropriate personal protective equipment and ensure that they are used as intended;
d. Maintain qualified first aid staff and first facility on site;
e. Ensure that construction equipment is kept maintained and regularly checked for defect;
f. Ensure that all open trenches are marked and appropriately barricaded where possible and where trenches cross pedestrian access, suitable walkways should be established to permit pedestrian access; and
g. Control access to working site and implement appropriate traffic management system including use of appropriate signage, flag men, mandatory site speed limit, etc.
h. The Contractor shall report all accidents and incidents in a timely manner to the Supervision Consultant. All severe (fatalities) and serious accidents shall be reported to the Supervision Consultant immediately and to MWE and the Bank within 24 hours of occurance.

25. ***Pressure on public health and sanitation facilities*****:** Isingiro District as a whole is water stressed with insufficient water throughout the year. Findings indicated that safe water coverage stands at 35% at the district level as compared to the national average of 66%. The risk of inadequate sanitary facilities may result in open defecation or bathing in or next to open water bodies which may contribute to an outbreak of hygiene related diseases like diarrhea, cholera among others, although the poor community sanitation is not a result of the project. The impact will be short term The significance of this impact is thus assessed as **medium negative.**

Mitigation measures

g. Provision of adequate water supply facilities for the project workers.
h. The project will provide additional sanitation facilities to its workers.
i. Public health-based waste especially from wash-rooms will be disposed into soak-away pits. While pit latrines will be dug, and such pits will be located at least 100 yards (90 meters) downwind (prevailing wind) and down gradient from the food service facility such as kitchen/dining) and at least 100 feet (30m) from any unit ground water source;
j. The pit latrines should be for separate sexes i.e. male and female;
k. On the other hand, all domestic waste like polythene papers, food wrappings, plastic bottles, torch batteries, will be collected and disposed in the existing dump site for Kabuyanda Town Council; and
l. Food remains from the canteens will be disposed in the rubbish pits to be dug in the vicinities of the kitchen (at least 30m downwind direction).

26. ***Risks of disease incidences:*** During construction, diarrhea, malaria and HIV/AIDS prevalence as well as other sexually transmitted infections are cited as some of the likely ailments that can affect the project especially resulting from population influx amongst others. The likelihood of the impact occurring is probable. The significance of this impact is thus assessed as **high negative.**

Mitigation measures

d. Strategies to control malaria and HIV/AIDS e.g. sensitization of communities. This can be done through health centers and NGOs operating in the area.
e. Partner with Kabuyanda Health Centre IV to carry out HIV/AIDS voluntary testing and counselling.
f. The Contractor will have an HIV/AIDS prevention plan for his workers so as to reduce the risk of spreading the disease. For instance, condoms should be made available to workers by having a constant supply in in discreet places.

27. ***Insecurity risks:*** Influx of people in a project area in search of jobs is likely to come with a host of vises such as thefts, crime and general deterioration of area security. Materials prone to theft include cement, fuel and equipment. Theft of materials will lead to an increase in the project cost and project delays. Besides theft of the project materials, the community property and assets could also be stolen. The impact will be short term and may go up to district level. The impact will moderately affect the communities and the project in general. The significance of this impact is thus assessed as **medium negative.**

Mitigation Measures

f. Collaborate with the local security set ups in areas of labor recruitment such that, priority is given to locals in the areas in terms of casual and non-skilled jobs;
g. Those seeking jobs are to present their details accompanied with recommendations from their area LCs as well as next of kin for purposes of traceability in case of engagement in any misconduct or otherwise;
h. Employ private security guards at the construction site.
i. The contractor should work closely with the area police out-posts, local defense secretaries and general community policing.
j. Contractor will put in place an internal control system to curb cases of theft of materials.

28. ***Community Health and Safety:*** Like any development project brought in an area, it is likely that a considerable number of people will be attracted to the construction site. These will include both the job seekers from outside the project area and the local residents in the neighboring villages and towns. The construction of the project facilities will introduce machinery and other equipment such as vibrators, trucks, ramming machines etc. There will be increased traffic and population influx and its associated effects. The likely community health and safety hazards include: dust; noise and vibration from construction vehicles, risks of communicable diseases associated with the influx of temporary construction labor; and accidents and injuries;

The significance of the impact is therefore considered to be **medium negative.**

Mitigation Measures

f. Instituting speed limits on project vehicles,
g. Use of signs and barriers to show the dangerous areas;
h. Identify and clearly mark all areas with restricted accessibility to the public;
i. Enforce restrictions on unnecessary entry into the project site or any protected zone
j. Follow the mitigation measures prescribed to reduce any dust or noise impacts.

29. ***Risks of sexual exploitation and abuse:*** The project will not only increase social diseases and in particular sexually transmitted diseases (such as HIV/AIDS) but will also affect social dynamics as a result of increased human social activities in the project area. In addition to this, some project workers may have to be living away from home and families which exposes them to risks of unprotected sex.

The influx of workers and followers could also lead to social effects such as Sexual Exploitation and Abuse. Furthermore, in rural settings, the risk of sexual harassment for local women can be common. The magnitude of the impact is thus assessed as **medium negative.**

Mitigation Measures

e. Key will be sensitization of the Project Staff on the risks associted with gender voilence and discrimation of person while working on the project;
f. The project will not employ persons below ages of 18 in the site and the Ministry of Gender, Labour and Social Development will be in forefront to monitor the possibilities of such occurences.
g. The local Police together with the local authorities will monitor and look out for any possible cases related to child abuse and sexual abuse.
h. The contractor will implement robust measures to address the risk of gender-based violence and sexual exploitation and abuse in the project.

30. ***Impact on vulnerable groups:*** In the project area, there are several categories of vulnerable people including female heads of households, widows, the elderly, and people with disabilities. From the socio-

economic surveys, 12.4% of the household heads were 65+years while 9.7% were widowed. 12.4% of interviewed household did not own land, 23.3% had an orphan in their home while 12.7% had a person with disability in their home. Construction of the dam will lead to a reduction in farmland and loss of livelihoods for some of these households, thereby making their already vulnerable situation worse. The impact on the vulnerable groups will be long term, affecting these groups of people, the severity of the impact will be moderate because the nature of the project especially where the water pipelines will be located will require acquisition of a strip of land. The significance of the impact is thus assessed as **medium negative.**

Mitigation Measures

a. Livelihood restoration strategies will be extended to the vulnerable groups and their income levels monitored closely during and after the implementation process.
b. Vulnerable households should be provided with assistance by the project as part of its corporate social responsibility (CSR) considered for employment opportunities.

7.2.3 Operational phase impacts

1. ***Water quality impacts:*** With the exception of Dissolved Oxygen (DO), *in-situ* measurements showed that the water quality in respect to pH, temperature, Electrical Conductivity (EC) and salinity were within the acceptable limits according to the UNBS standards for Natural water**.** However, during project implementation, water quality issues could arise through erosion and sedimentation from storm water.

   Mitigation measures

   These concerns are to be addressed by putting in place measures for soil erosion control as well as restricting clearance of vegetation to areas only needed for project works alongside full restoration of the sites. Water quality tests shall be undertaken on a regular basis (quarterly) in order to detect and rectify if any anomalies occur during operation phase, by Directorate of Water Resources Management at MWE.

2. ***Impact on water demand and usage:*** Based on the findings, the ESIA established that, the demand from surface water could increase though this is likely to be short-term. There are other on-going water interventions in by GoU to improve water supply in the areas through borehole repairs, sinking of more shallow wells as well as some Gravity Flow Schemes which will all address water supply constraints in the areas.

   Mitigation measures

   The project will provide information on sustainable water management practices, and carry out sensitization campaigns and distribution of learning material.

3. ***Gender and vulnerable groups:*** Based on ESIA surveys for the project, identification of vulnerable project-affected persons revealed that 25.2% of households heads are female, 5.1% of household heads are 65 years or older, and 1.5% of households were reported to have a head suffering from chronic disease or disability. I addition, about 14.4% of households surveyed had at least one member who is an orphan and 2% of households reported to have at least one disabled member other than the head. ***To mitigate these vulnerabilities, the project will provide deliberate initiatives to enhance women participation in the project through ensuring 30% of work opportunities are provided for the women to amongst others, improve on household income***. ***Furthermore, the project is to support women and youth in empowerment drives such as skilling in savings and start of enterprises such as value addition to agriculture based commodities.***

4. ***Risks of water and vector-borne diseases:*** The water in the reservoir will be stagnant and will act as a breeding ground for mosquitoes and this will have consequence in terms of incidence of mosquitoes and malaria at large in the area. The water in the reservoir may also be unsafe for human consumption as such, contaminated by human activities in the vicinity of the dam, thereby leading to water borne diseases like typhoid. The impact will be medium negative and can be mitigated through:

   Mitigation measures

- The project will work closely with some of the on-going water and sanitation programs in the district especially on hygiene and water to reduce mosquito breeding areas and bushes around households;
- The reservoir is located in a CFR with restricted access, but in addition the communities will be sensitized to sleep under treated mosquito nets distributed under the Ministry of Health Malaria Control Program; and
- Have primary health care programs in place to create awareness on the risks of diseases from dam waters to discourage farmers from using the irrigation water for domestic purposes.

5. ***Water System leaks and loss of pressure:*** Water system leaks does not only reduce the pressure of the water, it also compromises the quality of the water by allowing contaminated water to leak into the system. Therefore, it is important that, the construction of water supply system meets Best Industry Standards (BIS), and include BIS in Technical design specifications in Tender documents alongside conducting regular inspection and maintenance including a leak detection and repair program during the operations of the facility.
6. ***Impacts on water supply and flood control:*** The project will impound up to 8.8 million m^3 to supply water for irrigation over 3,300ha. If the dam is well constructed, dam failure risks can be high and such could cause flooding, damage to property to even loss of lives. The impacts are therefore rated as medium negative which can be mitigated through**:**

Enhancement Measures

a. There will be dam safety plan in place which guides on aspects of dam risks including its possible failures;
b. There will stand-by emergency response measures for the safe operations of the investment;
c. Regular maintenance programs should be put in place for the dam facility;

7. ***Impacts on climate change:*** Once the dam/reservoir is in place i.e. after construction, its process of inundation will submerge vegetation and such a process is likely to generate methane gas which ozone depleting gas. In addition, cleared vegetation needs to be disposed and such a process will likely generate carbon emissions that are of climate change concerns and the following measures are proposed:

Mitigation measures

a. There should be salvage harvesting of vegetation in the area to be inundated for use in the project and by the communities and such a process will reduce the amount of vegetation to be submerged;
b. No open burning of cleared vegetation during project preparation works;
c. 500 ha in Rwoho CFR are to be planted with indigenous trees which will augment vegetation growth and enhance carbon gas absorption thereby checking climate change risks;
d. The project will put in place, measures to address soil erosion thereby checking climate change risks as well;
e. Enforce the NEMA 30m protection buffer zone regulation on the river where there will be no cultivation allowed; and
f. Sensitization of Communities about climate change and grass burning.

8. ***Introduction of invasive species:*** The invasive species may include pests and noxious weeds. Accumulation of sediments and high concentration of nutrients in the water can lead to proliferation of aquatic weeds like water hyacinth, *Pistia* and water cabbage. The impact is likely to occur in the dam reservoir and its shores. The likelihood of the impacts occurring is small negative.

Mitigation measures

a. Ensure construction equipment come on site while clean and leave site after being cleaned to avoid spread of noxious weeds or invasive plant species; and
b. Sensitize communities about the need to control the spread of water hyacinth and encourage them to physically remove and destroy water hyacinth found floating on the river and other water courses. In addition, mechanical removal will be considered.

9. ***Impacts on fish and fishing:*** Dams generally have signifacant impacts on fish and fish habitats. They affect fish populations by disrupting their upstream/downstream movements and by replacing riverine ecosystem with lacustrine ecosystem. Two rounds of fish suveys including interviews with communities

were conducted during the ESIA preparation. The surveys find that the fish identified include several specieis belonging to Cyprinedae, Clariidae and Cichlidae families. The conservation status of the identified fish species are listed as 'Least Concern' according to the IUCN Red List (2017-1), except Clarias casonii (catfish) which is not included the Red List. However, this remaining fish species is a common Cat Fish species found in most of the lakes and rivers in Uganda. Based on available information, the fish species and ecological habitats downstream the reservoir are likely not significant (see Annex 9 for additional information). Completion of the lifecycle of these fish species is not dependent on migratory behavior. The suveys also indicate that the population abundance is low. *C. casonii* was the most dominant fish species encountered during the suvey, further analysis of the length and weight indicate small individuals. It is also noted that fishing activity in the Kabuyanda area is minimal and only at subsistence level and mainly targeting *Clarias carsonii*. The main fishing gear was the baited basket traps. According to the project resettlement action plan (RAP), among activities that generate household income from fishing, one 1% will be potentially affected directly, and 4% indirectly, compared to poultry that is 43% and 56% respectively. The surveys on fish and fishing activities during ESIA and RAP preparation indicate that the fish abundance, diversity / conservation status, as well as fishing activities are not significant in the area. However, it is also recognized that the historical records of fishery resources in the river is very limited. Fish surveys conducted during the ESIA development were also constrained by a number of factors such as drought. However, it is also recognized that the historical records of fishery resources in the river is very limited. Fish surveys conducted during the ESIA development were also constrained by a number of factors such as drought. As result, rapid surveys that had short period and limited spatial coverage were conducted. Continued fish monitoring and surevey will be carried out during implementation

Mitigation measures

g. Environmental flow. River Mishumba is not a permanent river, often drying up in February, July to September (zero flow identified 10 out of 46 years). The project will ensure a minimum flow in the stream equaling 10% in the dry season, and 20% in the wet season. Tributaries contribute to the river flow, at 1km and 5km, downstream the dam. The environmental flow will be beneficial for fish and fish habitats during dry seasons. During wet season the water flow downstream of the dam will be reduced with less variation, in particular 1km immediately downstream the dam. Some natural hydrological variation will be kept by allowing the passing of a yearly natural flood event which will mitigate dam impact to downstream fish and fish habitats.

h. The surrounding catchment areas are degraded as a result of poor land management practices, such as poor agricultural practices and deforestation. This has inevitably affected riverine and riparian habitats. The project will support the development and implementation of catchment management plans (CMPs), in collaboration with local communities, NGOs, NFA and District local government. The CMPs will be beneficial to fish habitats;

i. Similarly, save natural vegetation cover within a 30-meter band along the river, to conserve fish habitats. This is best done by enforcing the NEMA River Banks and Lake Shore Regulation by the District Environment Officer;

j. In terms of mitigation for the impacts on fishing activities. Though the household income from fishing activities (according to survey during RAP development), the scale and impact of fishing activities is very limited. Compensation for livelihoods of fishermen shall be addressed in the RAP to be updated, and as part of socio-economic assessment of fisheries resources, during the additional baseline study to be undertaken before commencement of implementation.

k. As the baseline of fishery resource based on rapid surveys that were endorsed by National Fisheries Resources Research Institute, the limitations of data availability, resources, scope and timeframe of the surveys have been recognized. It has been agreed that additional riverine ecological baseline assessment, including additional fish surveys, will be conducted covering both upstream and downstream of the dam. A fish monitoring plan will be developed, as proposed by NAFiRRI, as part of the Biodiversity Action Plan (BAP).

10. ***Impact on vulnerable groups:*** In the project area, there are several categories of vulnerable people including female heads of households, widows, the elderly, and people with disabilities. From the socio-economic surveys, 12.4% of the household heads were 65+years while 9.7% were widowed. 12.4% of interviewed household did not own land, 23.3% had an orphan in their home while 12.7% had a person with disability in their home. Construction of the dam will lead to a reduction in farmland and loss of livelihoods for some of these households, thereby making their already vulnerable situation worse. The impact on the vulnerable groups will be long term, affecting these groups of people, the severity of the impact will be moderate because the nature of the project especially where the water pipelines will be located will require acquisition of a strip of land. The significance of the impact is thus assessed as **medium negative.**

    Mitigation Measures

    c. Livelihood restoration strategies will be extended to the vulnerable groups and their income levels monitored closely during and after the implementation process.
    d. Vulnerable households should be provided with assistance by the project as part of its corporate social responsibility (CSR) considered for employment opportunities.

11. ***Impacts on the hydrology of the river:*** Impoundment of the Mishumba River means there will be a consequential reduction in water flow in the river that will likely affect the water availability downstream, for both surface sources and recharging of ground water. The presence of the reservoir will further alter the groundwater table in the near vicinity of the reservoir. It has previously been observed that reservoir construction is associated with the raising of the groundwater table in near upstream vicinity of the reservoir and altered groundwater flow downstream of the reservoir. The clay soils in the area indicate low permeability and the presence of the reservoir may increase infiltration as this is dependent on residence time. The project impact on groundwater in the area will be further assessed in the ongoing Integrated Water Management Development Project (P163782) which will carry out a compressive National groundwater assessment. Tributaries downstream may be impacted primarily at the confluence where reduced flow will be noticeable, however the any impact on the estuary downstream will be limited. Upstream the impoundment area there are no significant tributaries that will be impacted. The dam has the potential for downstream flood moderation during heavy rains and hence flood plain protection, reduction in property and crop loss and enhanced/better usage. This has been taken into account in the operation planning for the dam. There will be changes in the river hydrology which has the potential to have an effect on the aquatic habitats such as fish breeding and migration hence habitat loss. The downstream river flow will be altered to follow an environmental flow regime as the minimum discharge in the river. Rapid biodiversity surveys conducted of the downstream areas indicated that fish biodiversity, breeding and migration areas are not significant in the area. The conservation status of the encountered flora, fish, reptile, and amphibian species are listed as 'Least Concern' by the IUCN. Search results of the IUCN red list indicated that the fish species present in the basin are common in the Lake Victoria basin. Based on available information, the fish species and ecological habitats downstream the reservoir are likely not significant (see Annex for additional information). However, considering the limitation in the information available, additional biodiversity surveys, sedimentation, and cumulative impact assessments as well as an updated environmental flows assessment will be continued during project implementation and prior to dam construction to confirm the adequacy of the mitigation measures. If needed, appropriate adjustments to dam design and/or operation will be introduced prior to dam construction in a manner satisfactory to the World Bank. The impact is **high negative.**

    Mitigation Measures

    d. The river flow regime influences the water quality, energy cycles, biotic interactions, and habitat and any modification of the flow regime has implications on these and organisms/species that depend on them for their livelihoods. The environmental flow will ensure the sustainability of the downstream environment through the provision of the water to satisfy the needs of downstream communities and ecological environment. Altering the flow of a river may impact the water

chemistry and quality, the physical habitats for species, the biological composition and interactions in the stream as well as floodplains. Based on the needs of the downstream environment and community needs, the Environmental Flow is determined to be optimally set at 10% of the mean annual flow during the dry season and 20% of the mean annual flow during the wet season. The environmental flow is deemed adequate to sustain the significantly modified environment downstream the Kabuyanda dam. The environmental flow requirement was determined by a low-resolution hydrological methodology, the use and results of which were verified by surveys and assessments of the modified downstream environment. Measurements of water flow, water quality as well as ecosystem variables downstream the dam will be regularly monitored by MWE to ensure compliance with agreed scheduling and compliance with environmental flow requirements. The monitoring data collected by MWE will feed into management decisions of the operator to ensure appropriate action is taken.

e. The environmental flow regime scheduling will include one peak flood per year during the wet season for downstream sediments replenishment and mitigate sediment starvation downstream the dam. The flood pulse release shall be timed with a high flow event to coincide with the higher sediment load of the water flow as well as allow for the flooding of the downstream floodplains. The flood releases will also have potential impacts on downstream river bank stability, community safety, aquatic and riparian habitats which will be mitigated by i) the gradual changes in volume of flow releases during flood event to minimize rapid variation in downstream water level; and ii) community announcements and advertisements, as well as in the dam Emergency Preparedness Plan (EPP) which is periodically updated.

f. Natural vegetation cover within a 30meter band along the river will be saved to reduce any project impact on river bank erosion and stability. This is best done by enforcing the NEMA River Banks and Lake Shore Regulation.

12. **Impacts on the sediment loading and management of the river:** The sediments generated depend on the upstream catchment characteristics i.e. soils, topography and vegetation cover. The ecological environment of river flood plains is dependent on deposition of silt from the catchments upstream that brings with it nutrients and minerals. Retention of silt in Kabuyanda Dam over duration of time will effectively reduce the overall silt loading as well as the overall flood areas. Construction of the dam will result in high retention and storage capacity and ability compared to the transportation speed. From the hydrology studies of the project catchment area, the sedimentation rate estimated that 290 Ton/km^2/year equivalent to 26,100 tons/year of sediments will be moved per year into the dam from the catchment. The implication of this is that with a lifespan of 50 years, the dam requires 0.9Mm3 for dead storage. This storage will trap sediment in the reservoir, thereby reduce the sediment loading to the downstream flood plains, limiting the opportunity for production on ecological and social terms. The impact is **low-medium negative**.

    1. Sediments to the downstream areas will be limited by the project. However, this impact will decrease further downstream as sediments are naturally deposited, and tributaries add flow and sediments (1km downstream).

    2. The environmental flow regime scheduling will include one natural peak flood event per year during the wet season to mitigate the sediment starvation downstream the dam. This entails that the dam operator will, during the occurance of a natural flood, open the spillway to allow the natural flow to pass the impounding reservoir. This will occur at least once (1) per year. Although sediments will still pass the dam throughout the year, the high flow events are necessary for the sediments to reach the floodplains of the downstream river stretch. The flood pulse release shall be timed with a natural high flow event to coincide with the higher sediment load of the water flow. The dam design and/or operation do not include the use of sediment flushing practices of deposited sediments in the dam, instead all water and sediment release will be done through the spillway. This operation will be included in detail in the reservoir operation, maintenance and surveilance manual (OMS) for the dam, which is reviewed and updated continuously during dam operation. This practice will have potential impacts on downstream river bank stability,

community safety, aquatic and riparian habitats. The scale and scope of the potential impacts are subject to the status of these components and the hydraulic process.

g. The project will support further efforts to limit the land degradation of the downstream sub-catchments through sustainable land management (SLM) practices. This will include developing catchment management plans (CMPs) for R. Mishumba and other rivers in the areas of the project. The SLM practices will limit the soli erosion in the area, and consequently the sediments transported to the river.

13. ***Water loss impacts:*** Water storage and irrigation systems are subject to water losses from reservoirs through evaporation, infiltration, losses in transmission and distribution systems, and illegal/unregulated abstractions. In hydrological terms, open water surfaces have potential evaporation rates of over 1,200 mm per year or 3.3 mm per day causing a water loss of about 870,000 cubic meters per year. If the ground was always wet, the equilibrium will be achieved between open surface water evaporation and ground evaporation of the same area (ground evaporation before reservoir created and open water surface evaporation after reservoir created). The other likely water loss from the reservoir is likely to be through seepage. During operation of the project there may be potential water loss in water transmission systems and appurtenances, at consumer points through wastage, leakage in distribution pipes, overflowing storage tanks, irrigation ditches and overuse through irrigation. Other avenues of water loss are at the consumption points and include burst pipes, unmaintained irrigation drains, leaking taps, overflowing storage tanks and illegal connections. The impacts are therefore rated **medium negative** and will require mitigation.

Mitigation Measures

a. Ensure appropriate compaction of the dam floor embankment walls to minimize leakages and infiltration upon commissioning of the dam;
b. Institute surveillance around the dam and along all water transmission pipeline corridors to control illegal water abstractions;
c. Ensure optimum maintenance of the water transmission, storage and distribution system components including pipelines, valves, tanks, irrigation system and consumer taps;
d. Enhance buffer zones with appropriate tree species around the dam may assist in checking on the rate of evaporation; and
e. Educate and create awareness to the water users in the service areas of Kabuyanda Town.

14. ***Problems of crop pests and diseases in the project areas:*** In Kabuyanda areas, a number of crop pests and diseases were reported and the problem seems to be growing due to climatic variability which farmers attribute to frequent outbreaks of pests and diseases. To address issues of disease and pest on crops, a Pest Management Plan has been included into this ESIA and it advocates for use of a number of options in the controls of pests and diseases not only use of pesticides.

15. ***Community Health and Safety*****:** During the operational phase, there is likely to be risk of drowning by both children and adults in the reservoir. The children or adults may be enticed to swim in the reservoir and may end up drowning or may drown accidentally while passing by. Furthermore, domestic animals may also drown in the reservoir while trying to drink from it. The risk of drowning can be long-term and irreversible when it involves death/loss of life**.** Dam release operation may lead to unexpected high flows downstream and potential impacts on community safety and downstream activities.

Mitigation measures

e. Sensitization of the community on the risks/dangers of swimming in the reservoirs especially for the children;
f. Provide watering points for livestock outside the reservoir; and
g. There should be Project Management Committee which should address issues of operations of the reservoir.

h. Impacts on community safety and downstream activities will be mitigated by i) the gradual increases changes in volume of flow releases during flood event to minimize rapid variation in downstream water level; and ii) community announcements and advertisements, as well as in the dam Emergency Preparedness Plan (EPP) which is periodically updated.

7.3 Cumulative impacts

The U.S. Council on Environmental Quality (1997) defines cumulative impacts as the impact on the environment which results from the incremental impact of the action when added to their past, present and reasonably foreseeable future actions regardless of who undertakes such an action. These impacts can be individually limited but cumulatively considerable, or for which the incremental effects of individual projects are considerable. In practice, assessment of cumulative impacts requires consideration of other assessment concepts, which are different from the conventional approaches used in a normal ESIA. These concepts include:

- Assessment of impacts during a longer period of time into the past and future;
- Consideration of impacts on Valued Environmental and Social Components (VECs) due to both the project and interactions with other past, existing, and reasonably foreseeable future actions;
- Evaluation of significance in the consideration of other impacts, than just local and direct effects (such as indirect impacts, cumulative impacts, and impact interactions); and
- Assessment of impacts over a larger (i.e., "regional") area.

Cumulative impacts of the Kabuyanda Irrigation Scheme were assessed using the following six steps.

STEP 1: Definition of Spatial boundaries

River Mishumba catchment area is the local area identified under this scope in which the obvious, easily understood, and mitigable effects may occur. Under this assessment, the study has not identified or come across any past, current or foreseen cascade development along the Mishumba River. There is therefore no cascade development in the project area, as of July 2019. In the absence of water abstraction, dams and/or water reservoirs along the river in addition to the one foreseen under the project, the assessment of the cumulative impacts can be limited to the area around the dam embankment, the reservoir area, the Rwoho forest reserve upstream, the command area of the irrigation scheme.

STEP 2: Definition of Temporal boundaries

This step considers regional study area that includes the areas where there could be possible interactions with other actions. The interests of other stakeholders also fully considered. In this project (Kabuyanda Irrigation project), temporal boundaries can best be determined with reference to Isingiro District Development Plan 2015/2016 - 2019/2020. Mainly because the development at District level in Uganda is largely public sector-led, with very limited private activities at scale. Consequently, it makes sense to align the temporal boundaries of the analysis with the five-year time horizon of the District development plan, owing to the uncertainty about longer term developments.

STEP 3: Review of past, present and future development activities within the analytical boundaries

Cumulative impacts occur when two or more developments are located sufficiently close and with relatively similar implications, such that their combined impact needs to be considered. The purpose of this step is to identify the totality of stresses that determine the condition of VECs selected for Cummulative Impact Assessment (CIA). This involves identification of the sources of stress—past developments whose impacts persist, existing developments, and foreseeable future developments, as well as any other relevant external social and/or environmental drivers (e.g., wildfires, droughts, floods, predator interactions, human migration, and new settlements).

Table 55 below presents all projects included in the five-year Isingiro District Development Plan II for financial year 2015/2016 - 2019/2020. Figure 56 presents all the sub-counties mentioned in the table.

Table 55: Planned and On-going Projects within Isingiro District (2015-2020)

PROJECT	LOCATION WITHIN ISINGIRO DISTRICT	POTENTIAL IMPACT
New Water supply system for Kabuyanda town	The site is down stream of the dam area, within the irrigation command area, to benefit Kabuyanda Town residents.	The project has a positive impact by providing clean and safe water to residents of Kabuyanda town. Source of water is groundwater. While there is geographical overlap, there is no major interaction between this project and River Mishumba ecosystem, and thus no negative impact. There is likely minimal impact on groundwater quality in case of heavy use of pesticides under the Kabuyanda irrigation project. Hence the need for monitoring of groundwater quality within Kabuyanda.
New Water and Sanitation Project for Kabuyanda and enroute communities in Isingiro District (Financed by AFD)	The intake site for this project is downstream the project area, on the River Kagera, of which River Mishumba is a tributary	The project has a positive impact by providing clean and safe water and improved sanitation to residents of Isingiro District. The reduced flow in R. Mishumba will not affect the feasibility of the planned project as R. Mishumba catchment is only 0.15% of the R. Kagera basin, and the Project will only take flow from 30% of the R. Mishumba catchment. The intake is designed to supply water for both domestic and livestock use. However, current financing is only enough to cover domestic water supply, with livestock facilities to be constructed at a later stage.
New Mini Water Supply Schemes	Ruborogota Phase 2 – Ruborogota sub-county Rwacece Extension – Kikagate sub-county, Nyakihoko GFS – Birere Extension of Nyakigyera GFS – Kabingo sub-county Ngarama sub-county Kyakabindi	The project has a positive impact by providing clean and safe water and to residents of some sub-counties. Source of water is groundwater. Most of these planned mini Water supply schemes are located outside Kabuyanda project area and outside River Mishumba ecosystem. The scheme in the Kikagate sub-county is the closer one to the command area, but there is no foreseen interaction with the project.
Rehabilitation of existing water supply Schemes	Kyabishaho, Isingiro town council Mikonoigana-Birere Sub-county Murema-Kashumba sub-county Kasumanga- Ruborogota Sub-county Rwemango	Water source is groundwater. There is no interaction between Kabuyanda Irrigation project and these projects as there is no geographical overlap.

New piped water Schemes	Ngarama sub-county Kyakabindi, Kyabahetsi-Mbaare sub-county Extension of Murema GFS-Kashumba sub-county Kinyaara-Kabuyanda sub-county	Their proposed water source is groundwater except for the Kinyaara water project located in Kabuyanda sub-county for which the water source is proposed on a stream located downstream of River Mishumba at a distance of about 50 km from the Kabuyanda irrigation project. There is no interaction between Kabuyanda irrigation scheme. The irrigation project will not affect Kinyaara water project because its water intake will be located on the stream before it joins River Mishumba.
Construction of new dams / Valley tanks	Rushasha – Rwantaha Rwangabo, Kyamugasha- Rugaaga sub-county Masha-Kakuuto Kashumba Sub-county – Kashumba Mbaare sub-county- Nyamarungi	There is no interaction between these projects and Kabuyanda Irrigation project as geographically they do not overlap. The water sources are in different river ecosystems that are not in any interaction with the R. Mishumba.
Construction of new shallow wells	Rugaaga, Endiinzi Ngarama, Kashumba Mbaare Nyakitunda Nyamuyanja, Masha Sub-Counties. Nyakitunda	There is no interaction between these projects and Kabuyanda Irrigation project as there is no geographical overlap. The water sources are ground water in the respective communities which are located more than 60 km from the project area.
Rehabilitation of existing boreholes	Birere, Nyamuyanja, Masha, Kabingo, Nyakitunda, Kikagate, Kabuyanda, Ruborogota, Ngarama, Kashumba, Mbaare, Endiinzi, Rushasha, Rugaaga, Kabuyanda town council, Kaberebere town council, Isingirotown council	There is also a positive impact by providing clean and safe water to the communities. These being existing underground water sources, there is no interaction between these projects and River Mishumba ecosystem. There is likely minimal impact on ground water quality in case of heavy use of pesticides. Hence the need for monitoring of ground water quality.

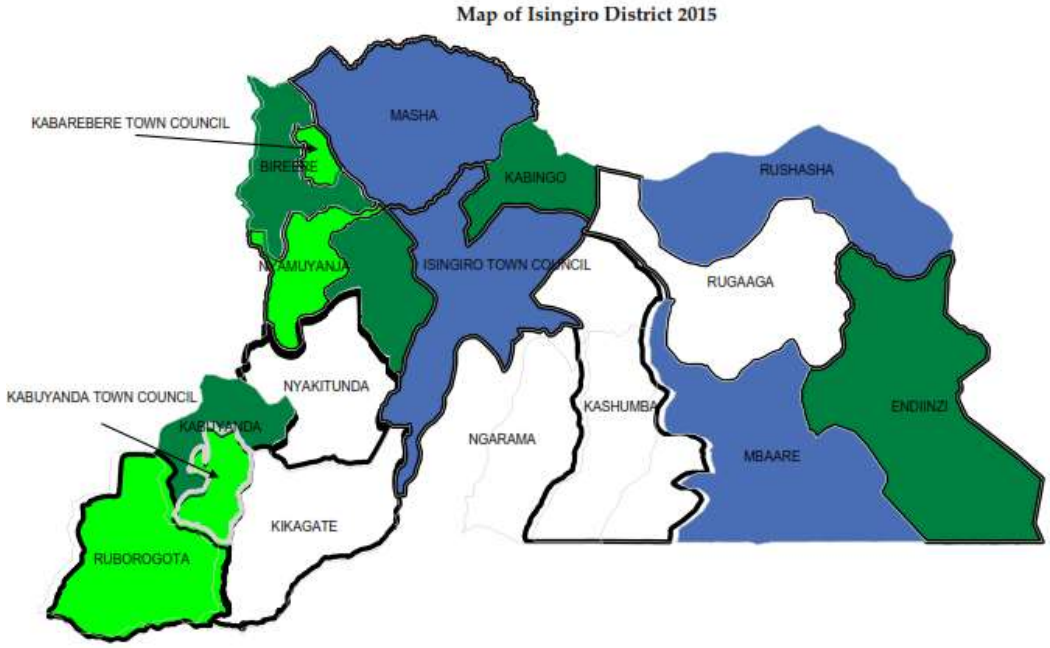


Figure 56: Location of Kabuyanda within Isingiro District

As highlighted in the table, none of the projects included in the five-year development plan for Isingiro District is expected to have major cumulative impacts when interacting with the Kabuyanda irrigation scheme. The project with the highest likelihood of cumulative impacts is the Kabuyanda Water Supply and Sanitation project under MWE, due to the size of the project and the geographical overlapping within the command area. It is worth noting that, the Water Supply and Sanitation project will utilise only groundwater and as such, will not impact directly on the proposed Kabuyanda Project water supply source from Mishumba River since there is no exiting interaction between this project and River Mishumba ecosystem. However, there is likely minimal impact on groundwater quality in case of heavy use of pesticides. Pesticides use is expected to be minimal since Mnistry of Agriculture is promoting more the application of integrated pest management. Hence the need for monitoring of ground water quality within Kabuyanda. The feasibility study report for Kabuyanda Water Supply and Sanitation (WSS) System prepared by Rural Water Supply and Sanitation Department of MWE shows that the source of water is groundwater and will be located in Kabuyanda town council. Siting of borehole has been completed and is waiting for drilling, planned to be done in June 2019. Discussions held with the Engineer responsible for the WSS system design indicated that the proposed design is a temporary solution to the water scarcity for at least the next five years in Kabuyanda town council and its surrounding communities. For the long-term solution, MWE has planned for an alternative water source as River Kagera; to construct a bulk water suppy system for Isingiro district, to supply Kabuyanda town and all the communities' enroute. Kabuyanda has existing boreholes and the ground water quality is currently portable for drinking. Though expected to be minimal, the use of pesticides with increased agriculture as a result of the planned Kabuyanda irrigation scheme may have some impact on the ground water quality, hence the ESIA recommends that regular monitoring of ground water quality be done by the District Water Office at different locations within the project area during the operation of the scheme, to ensure any impact is mitigated immediately.

STEP 4: Identification of Valued Environmental and Social Components (VECs)

VECs are environmental and social attributes that are considered to be important in assessing risks; they may be: physical features, habitats, wildlife populations (e.g., biodiversity), ecosystem services, natural

processes (e.g., water and nutrient cycles, microclimate), social conditions (e.g., health, economics), or cultural aspects (e.g., traditional spiritual ceremonies).

VECs are selected once there is an understanding of (i) the project works and activities; (ii) the environment likely to be affected; and (iii) the potential interactions between project works and activities and the environment. The following are considered to identify the VECs; Abundance in the site and local and regional study areas, Data availability, Ecological importance, Native species, Exposure, Ecological sustainability, Human health, Socio economic Importance, Conservation status and Importance to society in terms of cultural heritage.

Referring to the above mentioned considerations, it worth noting that development of irrigation schemes is often associated with an increase in intensity of human activity in areas surrounding the scheme. This may be due to people moving into the areas as result of the increased economic activity or may be carried out by farmers and their families who are directly engaged in irrigation activities. In either case typical activities are: more intensive rain fed agriculture; an increase in the number of livestock; and, greater use of forest resources, particularly for fuel wood. All these activities are liable to increase erosion in the area by decreasing vegetative cover which will have a detrimental effect on the local fertility and ecology as well as contribute to sediment related problems within the River ecosystem.

From the location of the proposed project, the VECs were defined as the River Mishumba ecosystem and the Rwoho CFR.

This step involves definition of the existing condition of each VEC, understanding its potential reaction to stress, its resilience, and its recovery time, and assessing the trends.

1. River Mishumba ecosystem
   River Mishumba has its headwaters in Mbarara District. The river then flows in a generally southern direction through Rwoho Central Forest Reserve and is fed by numerous streams that flow in from the east and west towards the river. The estimated monthly runoff for the river exhibits a bimodal variation with two peak flows in April and October of 0.8m^3/s and 0.89 m^3/s, respectively. The mean annual flow is 0.51 m^3/s. Based on the data series, the river sometimes dries up in the dry months of July and August, and February and September. Flow in the months of September-November is more variable than during the other months. The maximum flows that lead to flooding are most likely to occur during the months of September - December. River Rweibara (also known as Kasharira) joins Mishumba about 1 Km downstream of the proposed dam location. From this point onwards, the tributaries contribute to the flow of Mishumba. River Rwamango and Kyabayanda join river Mishumba about 5 km downstream of the dam site. These flows from the tributaries contribute significantly to satisfy the downstream water demands. The river valley has slow-moving clear water. The water in the Mishumba river remains crystal clear while the waters of the Kasharira River, although looking clear, the bottom substrate appeared red and this was thought to be due to contamination of iron oxides. There is limited water abstraction for domestic use. The first major domestic water abstraction point is at the river Rweibara and Mishumba confluence. There is also some limited fishing activity using traditional fishing gear. The main water use is downstream of the Rweibara and Mishumba confluence up to River Rwamango, Kyabayanda and Mishumba confluence, and it includes domestic supply, alcohol distillation, vehicle and motorcycle washing and fishing. Because there is a hydrological connection between rivers and groundwater in the areas around them it is likely reservoir impoundment, release of E-Flows, induced farming irrigation activities and these groundwater based water projects will have cumulative impacts on groundwater.

2. Rwoho CFR
   The Rwoho Forest Reserve covers an area of about 90 km^2, with an altitudinal range of 1,360–1,807m above sea level. The reserve lies in the transition zone between the wetter mountain area in the

west and the dry hilly areas of eastern Mbarara district. The Rwoho and Kijanabolola Forest Reserves Biodiversity Report prepared in 1993 described the vegetation of the forest reserve as moist grass savannah together with medium altitude moist semi-deciduous forest of *Albizia-Markamia* dominance. All this vegetation cover is now mostly cleared except on hill sides that cannot quite be cultivated. The forest reserve has been converted into patches of tree plantations and some sections planted with agricultural crops especially the hill slopes and the valleys. The trees predominantly planted included: *Pinus carribea*, *Eucalyptus grandis*, and an indigenous tree species *Maesopsis eminni*, *Albizia coriaria* and *Markhamia lutea*. The National Forestry Authority (NFA) and the forest adjacent community under Collaborative Forest Management (CFM) have established plantations under Climate Development Mechanism (CDM). Rwoho CFR is a modified habitat.

STEP 4. Assessing cumulative impacts on the VECs

This step considers the potential combined effects of Kabuyanda irrigation project and of external developments (stressors) on the Valued Environmental and Social Components (VECs). Specifically, it accounts for additional or interacting effects with other projects on an appropriate scale, considering past, present and future impacts on the same VEC. It involves the assessment of the contribution of the Kabuyanda Irrigation Scheme to the predicted cumulative impacts.

Changes to the local hydrological regime

Construction of Kabuyanda dam to provide water for irrigation will lead to changes in the local hydrological regime within the River Ecosystem. The ecology and uses of River Mishumba have developed as a consequence of the existing regime and may not be able to adapt easily to major changes due to the project. It is also important to recognize the interrelationship between river flows and the water table which may be altered.

The development of the infrastructure and abstraction of water from Mishumba River system will introduce changes in the river system both upstream and downstream of the dam. The anticipated cumulative impacts are also attributed to the use of the water, especially irrigation of large areas that are currently either under subsistence agriculture or are uncultivated altogether. The cumulative factors include the following;

i. Effects of the dam, reservoir storage and associated water abstraction to the increasing demand for social needs and the ecological requirements, hence potential long term reduction to available flows. The project will result in storage or diversion of 70-80% of the mean river flow resulting in modification of the hydrology of the system.
ii. Increasing demand of water in the area from the residents who depend on the River and other rivers/streams. This situation may lead to challenges to long term recharge of the dam from its catchment. However, the areas upstream of the dam are sparsely populated and impacts on recharge impact is unlikely to be significant,
iii. Potential change in the local weather including ambient humidity because of additional water surfaces arising from the proposed reservoir. This scenario may be experienced throughout the year,
iv. Retention of water in the reservoir will have a moderation effect on the base flow downstream over the seasons. This will include release of lower flows during wet seasons and release of higher flows (as environmental flows) during dry seasons. This implies that even though the water supplies, irrigation abstraction will receive reduced flows, there will be a regular discharge throughout the year,
v. Downstream of the dam, the river flow dynamics may suffer modifications including others flood regimes, moderated but lower levels and runoff distribution, decrease in downriver sediment transport, decrease of downriver flux of nutrients as well as disruption of flora and fauna along the river length,
vi. Productivity (agricultural or otherwise) of river flood plains is dependent on deposition of silt from the catchment that brings with nutrients and minerals. Retention of silt in Kabuyanda Dam over

duration of time will effectively reduce the overall silt loading as well as the overall flood areas. This may lead to reduction in productivity in the irrigation command area and it will encourage the use of artificial fertilisers with an increased potential for soils and water sources,

vii. Changes due to construction of the dam may result in changes to the biodiversity. There is potential attraction of new animal species into the dam reservoir including, snakes and certain fish species and lesser aquatic fauna. Emergence of new wildlife species in the greater area may have notable conflicts with people's safety,

viii. Reduction of stream flow in the downstream of the dam also affects the capacity of the handling the pollutants discharging from agricultural, settlements and urban areas including agro-chemicals, organic matter and urban pollutants through dilution,

ix. Mishumba river has an insignificant contribution to the overall flow of River Kagera of only 0.2% of the mean flow. Therefore, any cumulative impacts of the project will be restricted to the stretch between the dam reservoir and the border with Tanzania at the confluence between the two rivers. However, should the population especially in Kabuyanda Town grow significantly, municipal pollution might start having a significant impact on Kagera River.

x. The hydrological connection between rivers and groundwater in the areas around them, i.e. the reservoir impoundment, limitation of river flow, as well as the induced farming irrigation activities and these groundwater-based water projects will have cumulative impacts on groundwater. The impoundment of reservoir may alter the groundwater level in the near vicinity of the reservoir. The impact of diversion of river flow to irrigation on groundwater table will depend on the soil permeability as well as the agricultural practices and climate. Other ongoing groundwater abstraction projects will have a direct impact on the water table. Available data related to groundwater are limited, however the ongoing Integrated Water Management Development Project (P163782) is going to carry out a compressive National groundwater assessment. This assessment is under procurement and expected to commence by September 2020, and will provide input to further the CIA.

Biological and ecological impacts

The most obvious ones are a consequence of the change of landuse and water use in the project area, cumulative effects on the land around the project and on aquatic ecosystems that share the catchment. The intensification of agriculture can lead to groundwater pollution related to the increased use of pesticides and fertilizers, and encroachment on the Rwoho CFR. Improved efficiency may significantly reduce return flows which are often utilized downstream by other irrigation schemes or wildlife habitats. Similarly, any upstream developments outside Rwoho Central Forest Reserve are likely to impact on the irrigation scheme either in the form of reduced water availability or reduced water quality for Irrigation.

Water logging

In the long-term, one of the anticipated challenges to the scheme is the rise in the local water-table (waterlogging) that can be caused by low irrigation efficiency. Poor water distribution systems, poor main system management and poor in-field irrigation practices also contribute to the problem. This can be easily mitigated by increasing field application efficiency to about 50% to significantly reduce the rise in the groundwater.

Impact on fish

The construction phase of the project will have little negative impact on the fish stocks of the river. This is because the current fish species of the Mishumba River are very few and have been recorded as belonging to the Barbus, Clarias, Haplochromus and tilapiine families. These species are very small and hide within the river bed and within the vegetation. These fish migrate between the river and the lateral pools along the river. These fish are found both upstream and downstream of the proposed dam axis as well as along the streams and pools in the irrigation command area. Hence there is no danger that the species will be exterminated as they will be able to return to the river and within the irrigation command area after construction. The fish species within the river are very few and of no commercial significance

hence, in terms of mitigating this impact, it is considered that the impact is not significant and natural conditions will return the fish to their normal habitats.

STEP 6: Proposed mitigation measures

This step involves the design and implementation of mitigation measures to manage the development's contribution to the cumulative impacts and risks.

The main cumulative environmental and socioeconomic impacts resulting from the proposed development of Kabuyanda Project will be related to the damming and abstraction of water and the resulting reduction in downstream flows in the river. The increased agricultural production arising from all year-round water supply may also change the social dynamics on landuse, including the possibility of increased land-demand, which may exert more stress on Rwoho CFR.

The following are mitigation proposed measures;

iv) There shall be appropriate mechanisms for continuous assessments of the required downstream reserve flows including both environmental flows and also compensation flows for sustaining the base flow through the dam to the extent possible,

v) On the basis of the above mechanisms, the management of the project will need to establish, and continuously update, operational procedures so that under periods with naturally low flows (e.g. extreme dry conditions) sufficient flows are allocated to;
   a) Cater for downstream demands from communities, households, agriculture (crop production and livestock), commercial or industrial requirements (if any). The design of the system is based on an assumption that where flows are not sufficient to satisfy all users, environmental, drinking water and livestock needs will be considered a priority,
   b) Continuously provide environmental flows of sufficient quantity to prevent critical decline of downstream aquatic environments and aquatic productivity,
   c) Ensure the maintenance of water quality (including the requirements related to sewage treatment and disposal) through adequate dilution of pollutants discharging into the downstream zones of the rivers. The pollution loading from sources may require to be monitored and allocations made for appropriate flows for pollution dilution,
   d) Continuously provide adequate water for Kabuyanda Town,

vi) Design management monitoring and reporting procedures so that Mishumba flows can be monitored and reported on a regular daily basis both upstream and downstream the dam structures to provide the basis for day-to-day operational management decisions. Flows in other streams into the irrigation command area to support system wide decision making. In terms of groundwater, the ongoing Integrated Water Management Development Project (P163782) is going to carry out a compressive National groundwater assessment. This assessment is under procurement and expected to commence by September 2020, and will provide input to further the CIA.

vii) Prepare a programme for cumulative impact audits for project which should include the following primary considerations; (a) flow trends downstream, (b) emerging water demand against the available flows to be shared, (c) level of flow moderation downstream without compromising on the desired off-takes; (d) NFA to closely monitor community impacts on the forest and be involved in the catchment management planning and implementation in order to avert any likely increased encroachment from the communities.

viii) Continuous consultations with the Agricultural Sector on flows availability for use in future agricultural activities in the irrigation command area,

- It is agreed that a more detailed CIA, building on this preliminary study, will be prepared during the project implementation.
- As a mitigation measure to the likely impact on ground water quality, regular monitoring of ground water quality should be done by the District Water Office at different locations within the project

area after project completion and during operation of the scheme, to ensure any likely impact is mitigated immediately, by either change of pesticide application methods or stopping the use of certain pesticides among others.

- Installing gauging stations for monitoring the immediate trends in the upper zones of the river basin.
- Provide mandatory buffer area of atleast for conservation of the riverine and dam ecosystem through the review of riparian land ownership and control of wetland/floodplain encroachment, as part of the catchment management measures.
- Monitor the relationship of the dam to the downstream flooding trends. Periodically make corrective improvements to sustain/enhance environmental sustainability.

ix) Undertake capacity building on Cumulative Impact Assessment (CIA) for the Government Agencies involved, Consultant/s and Contractor/s to ensure adequate attention and managenment of any CIAs that may arise during project implementation.

Generally, other cumulative impacts expected to arise from a combination of the proposed Irrigation Scheme project include the following;

a. Increased air pollution from increased traffic levels, material excavations and machinery use
b. Increased noise pollution from increased vehicular traffic, increased machinery use
c. Increased traffic accidents and damage of existing roads due to an increase the overall project traffic, further weakening the weak project roads and increasing the potential for vehicle accidents to the local people who are not used to high traffic volumes.
d. Increased vegetation loss due to an increase in the overall project associated vegetation loss

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The objective of the ESMP is to ensure that steps are taken to address the potential impacts of the project and to ensure that the project is compliant with applicable national environmental and social legal requirements and the Bank's safeguards policies and procedures.

8.1 Scope of the Management Plan

The management plan is aimed at ensuring that:

a. Environmental management conditions and requirements are implemented during the construction and operation of the project;
b. The social concerns are put into consideration throughout the construction and operation phases of the project;
c. There are maximum economic benefits to the communities in the districts in and around the project area and the two countries at large; and
d. Precautionary measures are in place to safeguard against possible damage to the social and environmental set-up.

8.2 Responsibilities

In view of the above, the project management is expected to commit itself on the following aspects:

a. The Contractor(s) will engage services of environmental and social experts to provide quality control and oversight in the implementation of the ESMP;
b. The client at its different levels, shall fully supervise the project implementation in all phases;
c. Ensure that the proposed environmental and social mitigation measures stipulated in the ESIA as a whole are to the extent possible, fully integrated in the project;
d. The project puts in place and also operationalizes a Grievance Redress Mechanism aimed at providing an avenue for PAPs to express their concerns regarding the project;
e. MWE has been implementing Catchment Based Integrated Water Resources Management since 2011 with the aim of facilitating sustainable development and management of water and related resources. As a result, catchment management plans (CMPs) have been prepared for various catchments in the Country. Therefore, The Directorate of Water Resources Management (DWRM) under MWE shall be responsbe for the implementation of the CMPs processes which are already been undertaken in the Ministry on a number of catchments as such, they will be leading the process in consultation with other National Stakeholders namely: communities, NGOs, NFA, NEMA, MAAIF, Directorate of Environmental Affairs and Isingiro District Local Government. The CMPs will be reviewed and approved by Catchment Management Committee (CMC). The CMC is constituted of Civil Society, Private Sector, Technical Officers, Political Leaders chaired by an elected Political Head from the catchment area; and
f. Implement and continuously review this Plan to ensure its acceptability by the stakeholders.

Catchment Management Plan (CMP)

The process of formulating and implementing the CMP will be in accordance with MWE Catchment Management Planning Guidelines of 2014 which provide the following guide process. Details are provided in Appendix 12.

Step 1 establishing information foundation on which, the planning process rests and is aimed at delineating and describing the catchment, compile and organize the data and information that is needed to support the planning process;

Step 2 involves three interrelated steps implemented more or less in parallel:

i. ***In Step 2.1 the analytical framework for planning*** analysis in the catchment is established and operationalized including catchment hydrologic and water system simulation models. Analysis in this step includes a water resource assessment and water balance;
ii. ***In Step 2.2 the framework for the participation of stakeholders*** in the preparation of the catchment plan is established and operationalized i.e. stakeholders are identified, mapped and mobilized; the Catchment Management Organization (CMO) is created and its membership

identified and motivated; and the program to inform, train and operationalize the CMO is designed and implemented;

iii. ***Step 2.3 is the critical strategic social and environmental assessment*** in which the key vulnerabilities in the catchment are identified, and linkages, cumulative impacts and options for mitigation are assessed. Since the SSEA process is participatory, this step must be planned and carried out in close coordination with Step 2.2 above.

Step 3 involves establishing a framework for catchment water planning a process which is a highly participatory step with four key tasks namely;

i. ***Presenting to the Catchment Management Committee (CMC) and Catchment Technical Committee (CTC)*** an overview of the catchment; its major issues, problems, trends; and the opportunities and options identified by the Water Management Zone (WMZ) planning team in Step 1 and Step 2;

ii. ***Reviewing and agreeing with the CMC and CTC on planning objectives and indicators*** – this is to be a critical task since these objectives and the corresponding indicators will guide the formulation and evaluation of options and scenarios;

iii. ***Reviewing and agreeing with the CMC and CTC on the major issues***, problems and trends in the catchment that need to be addressed by the catchment plan. This would include the aspirations and needs for water expressed by stakeholders;

iv. ***Reviewing and agreeing with the CMC and CTC on the range and scope of options*** to be considered – what stakeholders want done and what does the planning team see as being needed.

Step 4 will consist of the analysis (using the tools developed and operationalized in Step 2.1) of options and scenarios within the framework for planning developed in Step 3. This step will be iterative and interactive. It will be challenging for the CMC and CTC to follow the reasoning if the presentation is too complex. Hence, the WMZ planning team needs to carefully walk the CMC and CTC through the process and results in order to foster good understanding and a consensus draft catchment plan.

Step 5 consists of a series of tasks that prepare the agreed draft catchment plan for implementation including its review and approval by MWE.

(Refer to Appendix 12 for some of the elements to be covered under the catchment Plan)

Precautions to ensure damages to the environment are minimized, calls for a concerted effort from the project management, the Contractor(s) and all stakeholders. The Supervising Engineer is expected to discuss and convey the contents of this management plan, to the Contractor and construction workers for integration in the construction process. The Local Governments (especially the DEOs and CDOs) are expected to work hand in hand during project implementation.

Some Stakeholders might find the construction period an inconvenience to their daily activities and safety, though the opinion on the long-term benefits from the NMWR project is positive. In this regard, they will need to be involved in the project monitoring framework through good relations between the contractor and the stakeholders and through timely information on the construction schedules, duration of construction works, and potential interference with their daily activities, alternative solutions to the interference and inconveniences as well as other issues arising. This will help in resolving problems related to construction and prevention of possible social conflicts associated with the project. Communication channels should always be open to ensure proper and timely responses to any complaints that may arise from the project.

8.3 Restoration/reforestation as mitigation for the inundation of 100 ha of Rwoho CFR

The dam construction and reservoir inundation will result in the loss of 100 ha (1.1%) of Rwoho CFR, consisting of 94.4 ha of pine and eucalyptus tree plantations (out of which 15.1 ha planted under CDM project) and 5.6 ha of wetlands (Table 24). In order to mitigate the impact of this loss, the project will undertake **restoration/reforestation of 500 ha of Rwoho CFR**, as part of the catchment management sub-component 1.3, with budget allocation of USD 1 million. As per explicit agreement between NFA and MWE, **indigenous species** will be used for the replanting (Appendix 15). The decision of the extent of the area to be restored/reforested (500 ha) was guided by NFA during consultative meetings held with MWE, based on MWE principle implemented under past projects of replanting at-least three times the lost tree stand. Where remnants of natural forest are present, the project will undertake restoration through enrichment planting; while reforestation will be carried out in the rest of the area where natural forest is no longer present. The National Forest Authority (NFA) has identified an area for restoration/reforestation activities, located directly north of the inundated area within the Rwoho CFR (Section 8.3.1). As part of the ESIA, a biodiversity baseline survey was carried out for this area (Appendix 14), including an assessment of the land cover (summarized in Section 4.2.2) and of the Fauna (summarized in Section 4.3.1).

Restoration/reforestation activities (Section 8.3.2) shall be undertaken by MWE (performing fiduciary and administrative functions) with technical leadership by NFA (performing technical functions and supervising all restoration/reforestation activities) (Appendix 15). Sub-component 1.3 will also support update of Rwoho CFR Forest Management Plan (Appendix 15) required in order to: (i) ensure that the 500 ha restored/reforested under the project are included in the area set aside for biodiversity conservation rather than sawlog production, and (ii) the construction of the dam and inundated area is included and thus in line with the development plan as required by the Forest Act.

Implementation of reforestation activities under sub-component 1.3 shall commence after project's effectiveness, and supervised by the project for three years after restoration/reforestation, and thereafter be handed over to NFA for O&M before project closure in order to ensure implementation of sustainability measures by NFA after project closure.

8.3.1 Selection of restoration/reforestation area

The National Forest Authority (NFA) has identified a potential area for restoration/reforestation activities, located directly north of the inundated area within the Rwoho CFR. The micro-catchment management plans (CMPs) to be carried out under sub-component 1.3 will include a dateiled baselane survey for the area to be restored/reforested and identification of related specific activities.

As part of the ESIA, a biodiversity baseline survey was carried out for the restoration/reforestation area (Appendix 14), including an assessment of the land cover (summarized in Section 4.2.2) and of the Fauna (summarized in Section 4.3.1) which allowed to prioritize the area. Where remnants of natural forest are present, the project will undertake restoration through enrichment planting; while reforestation will be carried out in the rest of the area where natural forest is no longer present. The biodiversity survey (Appendix 14) identified remnants of natural forest and higher biodiversity value along the east and northern border of the potential restoration/reforestation area, with five species listed under the IUCN Red list data of threatened floral species and one of them was categorized as Endangered (EN) (Figure 53). At the far north-western part of the potential restoration/reforestation area there are also patches of natural forest where small mammals and herptofauna was recorded: this is indeed the only remaining forested area that can support i.e. the blue and Red tailed monkeys (Appendix 14). Based on this, as well as on the fact that the area exhibits suitable soil characteristics (dark fertile soils from outlook), it was suggested to prioritize this area (Priority A in Figure 53) for restoration activities. Also, this area presents sizeable wetlands for restoration as a mitigation to the 5.6 ha of wetlands to be lost due to dam construction and reservoir inundation. The 5.6 ha of the wetland to be inundated are degraded/modified.

Moving towards the center of the identified potential restoration/reforestation area (Priority B), the area is rocky, with more of Loudetia kagerensis grassland with shrub, fallows and dominated by Bidens grantii herb and remnant Parinari trees on rocky soils. The area has low biodiversity mix and with pronounced rocky outcrops which has impacted on plant growth, and it has fairly more pronounced cultivation with large section of tree plantations with Pines and Eucalyptus.

Moving towards the south-west part of the identified potential restoration/reforestation area (Area C), the environment is increasingly degraded, heavily encroached in terms of loss/degradation of its natural forest cover through agro-forestry, therefore is has low biodiversity composition. Reforestation activities would prevail.

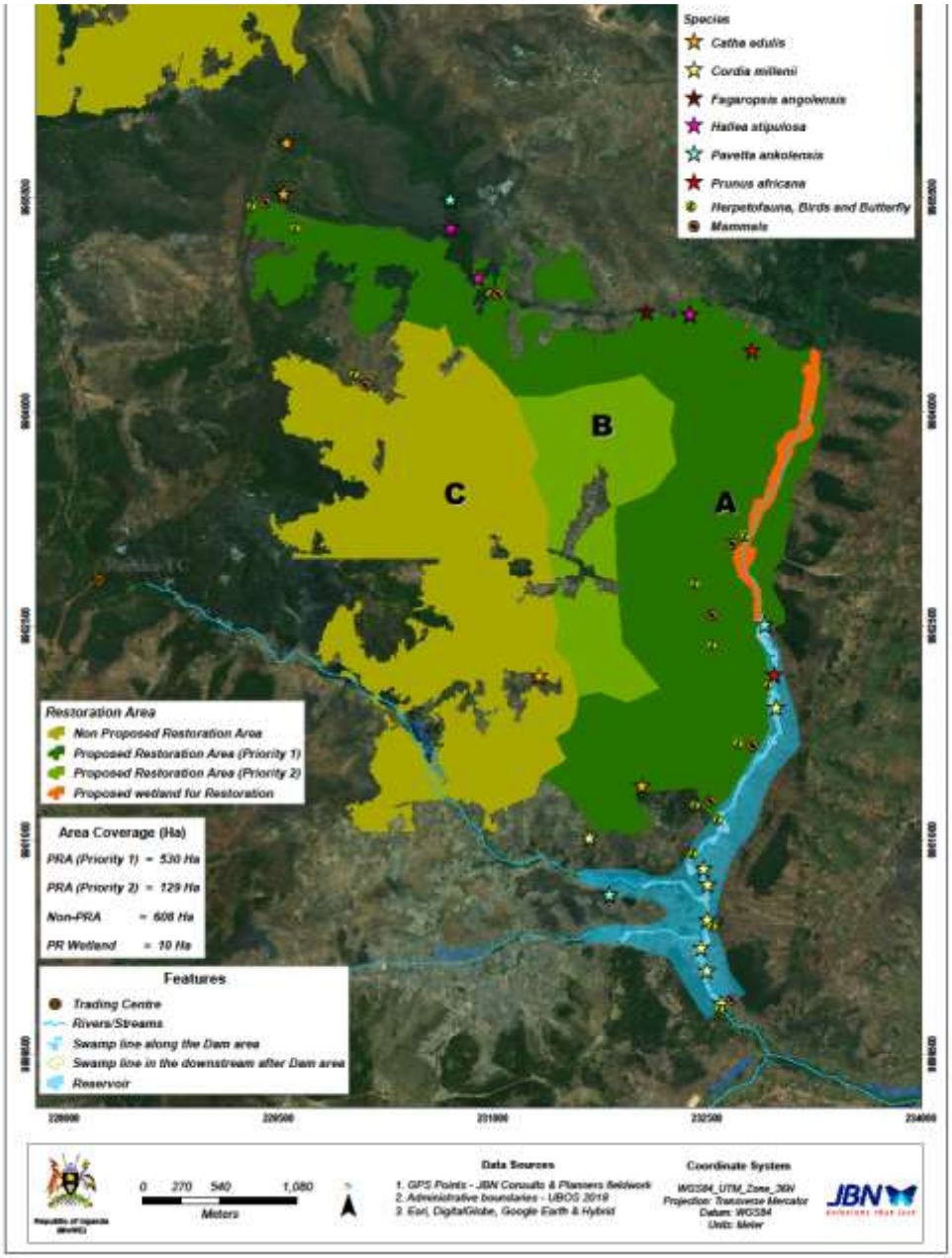


Figure 57: Location of the restoration/reforestation activities in Rwoho CFR

Overall, the restoration/enrichment area will strategically help to conserve the two endangered species that were recorded from the dam area to be inundated (*Cordia millenii* and *Prunus africana*). The wetlands are located upstream of the proposed dam and reservoir, on the same river as the impacted wetlands.

8.3.2 Restoration/reforestation activities within the Rwoho CFR

a. Update of the Rwoho CFR Forest Management Plan

The Rwoho CFR Forest Management Plan shall be updated by NFA (Appendix 15). The update is required in order to: (i) ensure that the 500 ha restored/reforested under the project are included in the area set aside for biodiversity conservation rather than sawlog production, and (ii) the construction of the dam and inundated area is included and thus in line with the development plan as required by the Forest Act. It is estimated that it will take a period of three month of technical input, after which board and political approvals is done. NFA plans to use a landscape approach. The activity will cost approximately USD 10,000 using Technical Planning Team that include the natural resources, NGOs among others.

b. Restoration of native forest and Reforestation of degraded areas

Where remnants of native forest are present, the project will undertake restoration through enrichment planting; while reforestation will be carried out in the rest of the area where natural forest is no longer present. The restoration/reforestation activities shall include, among others: sensitization of neighbouring communities, formation and training of Community Collaborative Forest Management Groups, forest boundary surveys and opening, boundary marking using concrete pillars, procurement of tree seedlings, enrichment planting and spot weeding, tree seedlings given to neighbouring communities to plant buffer around forest, beeting up, silvicultural tending operations for 3 years, and handover to NFA for O&M. In addition, an invasive species eradication program should be incorporated in the restoration program.

The micro-catchment management plans (CMPs) to be carried out under sub-component 1.3 will include a dateiled baselane survey for the area to be restored/reforested, based on which these activities will be detailed over the area.

c. Restoration of Wetlands

The Wetland restoration will be done in line with the revised Rwoho CFR Management Plan, and will draw on the wetland restoration guidelines of the Wetlands Management Department under the Directorate of Environmental Affairs in the MWE, as summarized below.

Wetland Demarcation

i) Wetland boundary assessment – to establish the status of encroachment and degradation. This will involve reconnaissance field visit (s), Mobilisation and sensitisation of stakeholders, Ground truthing and production of draft maps.
ii) Procurement and production of pillars and beacons – casting with inscriptions
iii) Survey of the wetland boundary
iv) Physical marking of the boundary – planting of Pillars and beacons
v) Final Map of the demarcated boundary

Wetland Restoration

i) Pre-restoration
   - Assessment of the wetland status – nature/type and extent of degradation
   - Development of a restoration plan as
   - Constitution of restoration team
   - Awareness creation

   These respective activities prescribe the extent of wetland degradation, management interventions required, relevant stakeholders to execute the exercise as well as consensus generation.
ii) Restoration
   - Different techniques to be employed depending on the extent and type of degradation
iii) Development of a wetland management plan

8.4 Environmental and Social Mitigation Measures and Budget

Table 56: Environmental and Social Management Plan (ESMP) with budget

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
Planning phase						
	Anxiety and speculation by the communities	Project site	• Sensitization and mobilization communities Use of mass media tools such as radio and newspapers to inform public about the project • Launch of the project be held on the site and the communities be well mobilized	Plan and schedule of awareness campaigns in place Plan for project launch in place. • Mobilization of the communities	MWE,	32,000
	Loss of vegetation	Dam/reservoir in Rwoho CFR	• NFA will issue a license to MWE to use part of CFR for the dam and reservoir • The private tree owners in the inundated area will be compensated for loss of trees as per RAP • The project under its sub-	• NFA permit issued	MWE/NFA	41,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			component 1.3 shall prepare Catchment Management Plans			
	Additional studies: Biodiversity surveys (with more focus on fish) along the upstream of the reservoir, extending up-to 10Km downstream; including socio-economic impacts Environmental Flow Analysis; Cumulative Impact Assessment & Underground water assessment (under IWMDP P163782)	Project area	Biodiversity, sedimentation, and cumulative impact assessments as well as an updated environmental flows assessment will continue during project implementation and prior to dam construction to confirm the initial findings described in this ESIA. If needed, appropriate adjustments to dam design and/or operation will be introduced prior to dam construction in a manner satisfactory to the World Bank.	Updated Biodiversity Mgt Plan & ESMP and RAP (if needed) Updated EFs & mitigation actions Updated CIA & mitigation actions	MWE After project effectiveness After project effectiveness Sept. 2020	50,000
Construction Phase						
	Loss of vegetation	Dam/reservoir in	• Restoration/reforestation with an area	• 500 ha restored	MWE/NFA	1,200,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
		Rwoho CFR	5 times larger (500 ha in Rwoho CFR) to increase vegetation cover of the Rwoho CFR and increase the stock of indigenous species in the CFR			
	Air quality	All sites cleared	• Areas of such works be routinely sprinkled with water to suppress dust • Restricting excavations to those sites needed for the works • The workers supplied with appropriate PPEs to protect them dust	• Vehicle movement schedule in place; • Dust control measures in place; • PPEs procured and worn by the workers.	Contractor	65,000
	Impact on faunal groups	Project sites and mostly Rwoho CFR	• Project activities, including vegetation clearance in the reservoir area shall be restricted to 100 ha • Any faunal encounter shall be	Biodiversity Action Plan implemented	MWE/NFA/NEMA,/ Contractor	350,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			evacuated in consultation with NFA and Uganda Wildlife Authority (UWA) • Develop Code of Conduct for workers to prohibit them from engaging in hunting activities within the project area			
	Influx of migrants as such pressure on natural resources	Construction camps for the project, within project beneficiary communities, and with the neighboring communities	• The Contractor will be required as Contractual obligation to develop a Camp Management Plan and obtain ESIA approval from NEMA and Workplace-Registration by Ministry of Labour. • The Contractor will be required as Contractual obligation to	• NEMA approval and DOSH-Work-place Reg. Permit. • LFMP in place • Code of conduct in place and implemented • Schedule and minutes of meetings with area leadershi	MAAIF/M/CDO/MWE/Contractor	55,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			develop and implement Labour Force Management Plan. • The Contractor will be required as Contractual obligation to develop and implement Code of Conduct for workers. • The contractor should work in close collaboration with area police on matters of recruiting labor force; • Workers will be briefed on the requirement not to engage in illegal collection of natural resources.	p in place; • Training or briefing minutes for workers in place; and • Integrated sustainable land management measures in place.		
	Loss of housing structures	Near the dam sites	• Compensation and resettlement of PAPs	• Census of houses done and in place;	MWE/Consultant	RAP budget

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
				• Plans for their replacement in place and implemented.		
	Impact on water demand and usage	Areas in the project especially those collecting water from R. Mishumba and the existing valley tanks	• Ensure the on-going and planned water interventions in Kabuyanda are implemente by GoU to improve water supply in the areas. (Kabuyanda Gravity Flow Scheme, River Kagera water supply, borehole repairs, shallow wells). • Project implementation should be planned in a way to allow users of these valley tanks continued access	• Water systems constructed • Existing valley tanks continued access	MWE	GoU Budget
	Physical displacement of people 1,785 PAPs are to be directly	Project areas	• Fair, timely and adequate compensation of the PAPs; • Operationalize the RAP Livelihood	• RAP and compensation values approved by the Chief	MWE	RAP Budget

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
	affected by the project.		Restoration Plan.	Government Valuer; • Livelihoods Restoration Plan in place and implemented.		
	Impact on women and other vulnerable groups including managing concerns of sexual exploitation etc.	Project Area	• Have an explicit Gender Management Plan in place for purposes of dealing with gender mainstreaming in the project. • Provide the vulnerable groups with employment opportunities in unskilled areas depending on their ability.	• Gender management plan in place and implemented	MWE/Contractor	60,000
	Traffic related impacts	Access Roads	• Prepare a Traffic Management Plan; • Employ flag-persons to guide traffic and also use of signposts;	• Plan for implementation of the TMP in place; • Budget for traffic manage	Contractor	Part of contract

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			• In case of diversions, provide alternative routes to be used by the locals to reduce inconvenience on their transportation; • Regular maintenance of alternate community access roads damaged by construction vehicles to keep them motor able; and • Install speed humps and maintain low speeds e.g. 30 m/hr. along busy sections.	ment in place.		
	Impact on the concessionary tree planters on part of Rwoho CFR	Part of Rwoho CFR	Direct compensation for the areas of private tree planters taken up in the project.	Values of compensation in place	MWE/NFA	RAP Budget
	Impact on climate change investment	Part of Rwoho CFR	Direct compensation for the areas of private tree	Values of compensation in place	MWE/NFA	RAP Budget

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
	under CDM facility in Rwoho CFR		planters taken up in the project.			
	Noise nuisance/impacts	Within the project sites and nearby settlements	• Restrict works to day time (7am–5pm); • Provide PPEs for protection of staff working in noisy areas or operating noisy equipment; • Regular servicing of project equipment; • Behavior codes for workers to limit noise sources e.g. music etc.	• Construction schedule in place; • PPEs in place; • Schedule for servicing equipment in place; and • Code of behavior for workers in place.	Contractor	85,500
	Impact on PCRs	Dam site and command area	• Clearly marking out the identified PCRs locations before implementation of the project • Realignment of the water transmission canals to bypass any PCRs in the alignments.	Compensation plan in place and values approved by the Chief Government Valuer (CGV)	MWE	20,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			Where it becomes inevitable to avoid PCRs especially the graves, the developer will pay compensation for relocation of human remains in accordance with RAP provisions. • Archaeological watching briefs to be undertaken during ground breaking and site clearance/construction phase by a professional archaeologist (s). • Training of construction workers in basic skills of identification, handling and reporting of any new archaeological sites and artefacts			

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			during site clearance and construction. • Providing a copy of chance finds procedure to construction workers to guide them in management of archaeological sites and materials. • Prohibiting Project workers to remove archaeological material from the site unless authorized to do so. • Professional rescue excavations on site. • As for impacts on the church areas, it is noted that, the water mains do not traverse directly the churches but take up sections of			

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			church lands and some trees and such impacts will be compensated as already taken up in the RAP. In addition, works will done in close consultations with the laity in the areas to enable proper scheduling of construction activities to avoid disrupting church functions and worship schedules. • Where there could be accidental encounters of PCRs, a Chance Finds Procedures is provided below to guide salvage such materials.			
	Impact on schools, fence, land and trees	Water mains alignments	• Compensation for lost trees and	Compensation plan in place and values	MWE	RAP Budget

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			land taken up by the project.	approved by the CGV.		
	Impacts of extraction of construction materials.	Areas of the project	• For existing materials sources, Contractor shall undertake environmental and social due diligence while procuring construction materials to ensure supply by licensed and compliant firms. • For new material sources, Contractor shall carry out ESIA and obtain approval by NEMA prior to commencement of extraction. • Lease agreements for such sites with the landlords in place; and	Due diligence report confirming compliance, Copies of Statutory approvals in place. ESIA report, NEMA Approval. Lease agreements in place for the sites; Site restoration plan in place and	Contractors, MWE, Supervision Consultant/s, Isingiro DLG	Part of Contract

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			Sites to be fully restored at close of works and handed back to the land lords after clearance by DEO, NEMA and MWE.	sites fully restored and cleared by NEMA.		
	Impacts on wetlands by project works	Wetlands systems	The project will restore 10 ha of wetlands along the River Mishumba, upstream of the reservoir location and within the Rwoho CFR and specifically within the 500 ha targeted by the restoration/reforestation activities; Maintain the 30 m buffer zone around the river lines and wetlands in line with provisions of the National Environment (Wetlands, River Banks and Lake Shores Management Regulations, S.I. No.3/2000) This would conserve the wetland ecology by avoiding degradation	1.Contractors Method Statement on how to work in wetlands in place and endorsed by NEMA and Wetlands Department. 2.Restored wetland	MWE	Part of Catchment Management Plan

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			activities such as cultivation (soil erosion and siltation), and pollution from agricultural chemicals. In case of any construction is to be done on the wetland shore-lines outside the Rwoho CFR, an Independent Environmental Assessment will be done and a User Permit will be issued in line above Regulations. After construction, all degraded wetland vegetation cover will be restored along the buffer zone downstream following the Catchment Management Plan (CMP).			
	Spread of HIV/AIDS due to interaction of workers and the community.	Project Area	Procure an HIV/AIDS Service Provider to handle HIV/AIDS mitigation in the project.	Contract agreement with an HIV/AIDS service provider in place; and Schedule of HIV/AIDS	Contractor/MWE	150,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
				mainstreaming in place.		
	Impacts relating **to hydrology and sedimentation**	Dam site, downstream of River Mishumba	• It is noted that, works relating to river diversion and its subsequent interception and dam construction have a potential to generate a number of impacts on hydrology and sedimendation: • Management of cut-to spoil materials arising from excavations. Some of the cut to spoil materials can be used as field materials with approval of the project engineer while excess will be disposed into approved sites by the District	Use of PPE by workers Records of OSH training No complaints from downstream users Spoil on site	Contractor	Part of Contract

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			Environmental Officer; • During construction stage, river diversion, dam construction and other construction activities will alter river flow regime. Altering the river flow regime will increase the likelihood of soil erosion and sedimentation. This will be mitigated through following good construction practice, such as: carrying out construction during dry season to the extent possible; installation of soil trap onsite; and appropriate management of excavated soils.			

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			• Contractor's environmental and social management plan will based on detailed design include detailed constuctdion schedule and implementation plan to mitigate such impacts properly.			
	Impacts on fish and fishing	Dam embankment and reservoir	• Measures mitigating impacts on hydrology, sedimentation, water quality and habitats (see relevant sections) will be duly implemented to protect fish and fish habitats; • Sebsitization of contractors including awareness raising and training will be conducted during construction to prohibit workers from	Monitoring results of fish both upstream and downstream. Delivered CMPs.	MWE	

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			fishing and damaging fish habitats; • Additonal fish survey and monitoring and RAP monitoring will be carried out during the project implementation.			
	Impacts on Water quality	Reservoir and downstream river stream	• Steep slopes surrounding the dam construction stabilized • Drainage channels shall be installed where necessary, • Monitoring water quality both upstream and downstream. • Provide buffer area for conservation of the riverine and dam ecosystem.	Monitoring results of water quality both upstream and downstream CMPs developed	MWE	
	Impacts on existing NFA roads due to Dam construction and reservoir inundation	Dam embankment and reservoir	The project will finance the construction of new roads within the NFA reserve to account for those which will be inundated.	Newly constructed roads restoring the accessibility within the CFR	MWE NFA Supervision Consultant Contractor	Enbedded in project costs

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			These roads will be designed by the supervision consultant for Kabuyanda under component 1, in consultation with NFA. Construction of the roads will be undertaken by the Dam Contractor.			
	Waste management concerns	Camp site areas, areas for irrigation fields	• Some will be used as fill materials with approval of RE; • Scrap metal will be collected and disposed-off to scrap metal dealers; • Construction spoil will be disposed-off to sites approved by the RE; Domestic waste accumulated on the construction site has to be disposed to approved site by the district Environment Office and/or the Supervising Engineer.	• Testing results for cut to spoil materials in place; • Stockpile of scrap metal; Waste handler in place with approved schedule of operations.	MWE	55,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
	Occupational Health and Safety	Construction sites	• Have in place an OSH Plan in place; • Provide adequate PPEs to all staff; • Ensure that First-Aid kits are available at different locations in the project; • Put in place appropriate safety signs in strategic areas in work areas; Personnel should be trained in labor safety issues during acceptance on the job and afterwards several times a year.	• An OSH plan in place and approved by RE; • PPES in place for the workers; • First Aid Kit in place; • Posting appropriate signs on safety • Training of personnel on OHS aspects in the project.	MWE	120,000
	Land submergence impacts	Dams and reservoirs	• Before inundation of the reservoir, there should be salvage harvesting of economically useful vegetation; and • Engaging a Conservation NGO to	• Vegetation to be salvaged identified; • Modalities of engaging NGO to effect Biodiversity	Design Engineer/Contractor	See above

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			rescue any wildlife before submergence of the areas.	Action Plan in place.		
Operational Based Impacts						
	Water quality management – downstream	Downstream & Upstream	• Develop a deliberate initiative for monitoring water quality both upstream and downstream in order to inform catchment management strategies and management in compliance with the water abstraction permit that shall be obtained from Directorate of Water Resources Management. • Installing gauging stations for monitoring the immediate trends in the upper zones	• Monitoring reports	MWE – DWRM	50,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			of the river basin			
	Impacts on fish and fishing:	Upstream and downstream	• Ensure the provision of adequeate Environmental flow. This includes allowing the passing of a yearly natural flood event; • Develop and implement catchment management plans (CMPs); • Save natural vegetation cover within a 30-meter band along the river, to conserve fish habitats. • Impacts on fishing addressed in RAP. • Ddditional riverine ecological baseline assessment, including additional fish surveys will be conducted covering both upstream and downstream of the dam during project			

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			implementation.			
	Risks of drowning in the reservoir by children and livestock.	Water reservoir	• Sensitization on public the risks associated with swimming and fishing in the reservoir.	• Awareness campaigns plan by the project in place. • Records of such meetings in place.	DEO, MWE	25,000
	Surface water pollution control measures as well as erosion	• Dam sites • Camp sites • Parking yard • Maintenance Workshops	• Ensure proper working conditions of machinery to avoid oil and fuel spill risks; • Develop and implement a site construction waste and wastewater management plan. • Ensure proper waste management, including separation and reuse as much as possible; waste not appropriate for reuse must be stored in	• Maintenance schedule for equipment in place; • Site construction waste management plan in place; • Waste management plan in place; • Use of PMP already in place.	MWE, Contractor	85,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			special containers and taken out of the site by the licensed Contractor; and • Undertake regular water quality monitoring in reservoir, and water body downstream to include dissolved oxygen, nutrients (N & P), turbidity, total dissolved solids, conductivity, TSS, etc.			
	Sedimentation and siltation of the water courses	Downstream due to excavation of dam foundation	• Institute soil erosion control measures in the project especially under its sustainable land management component; • Disposal of cut to spoil should be done outside fragile	• Soil control measures instituted; • Disposal of cut to spoil in designated areas; • Roadside drains regularly	MWE	See above

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			ecosystems and water sources downstream and it should be done under the direction of the supervising engineer who should approve disposal sites. • This operation will be included in detail in the reservoir operation, maintenance and surveilance manual (OMS) for the dam, which is reviewed and updated continuously during dam operation. •	cleaned and maintained.		
	Impacts on the hydrology of the river and sediment loading.	Flood plain downstream of dam	• Environmental Flow maintained at 10% of mean annual flow during the dry season and 20% during the wet season. The	• SLM measures implemented	MWE	CMP implementation budget

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			environmental flow regime scheduling will include one peak flood per year during the wet season to mitigate the sediment starvation downstream the dam. The flood pulse release shall be timed with a high flow event. • Develop catchment management plans (CMPs). • Sustainable land management measures to improve agricultural production. • Save natural vegetation cover within a 30 meter band along the river, to reduce on erosion into the rivers.			
	Potential reduction in downstream flows	River system	Monitor river flows to ensure the design environmental flow for the	Monitoring results for MEF in place.	MWE	Embedded in overall project cost

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			project is maintained in the project.			
	Potential risks of land related conflicts	Project land areas	• First clearly set out individual plots of land before mass clearance of vegetation; and • Guided by the GRM.	• Plans for individual lands boundary marks in place; • RAP livelihood restoration plan in place • Schedule for GRM implementation in place.	MWE and Isingiro District	Part of RAP Budget
	Risks of water and vector borne diseases	Communities living close to the reservoir	• work closely with on-going hygiene and water programs to reduce mosquito breeding areas; • regulated/controlled access to the reservoir area. • Sensitize communities to sleep under treated mosquito	awareness campaigns in place	MWE, District Public Health Officer, DEO	65,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			nets distributed under the Ministry of Health Malaria Control Program; • discourage farmers from using the irrigation water for domestic purposes.			
	Loss of income sources	Project areas	• The project will operationalize the proposed RAP livelihoods restoration plan, which outlines measures for restoring livelihoods of the PAPs. • Need for an aggressive sensitization and mobilization of the PAPs for them to be able to engage in meaningful investments in income	• RAP livelihood restoration schedule in place; • Schedule for PAPs sensitization in place and with a budget for its implementation.	Contractor	RAP implementation costs

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			restoration venture.			
	Impacts of vermin	Project fields of rice and other crops.	Pest Management Plan in place.	PMP prepared	MWE/MAAIF	250,000
	Visual landscape based impacts	Areas where infrastructure will be erected	• Proper site restoration in terms of planting trees and re-vegetating the sites; • Cleanup of the areas of any temporary structures, • Materials and waste must be stored in a way that is less noticeable for visual receptors.	• Schedule for site restoration in place; • Tree planting and regressing schedule; and • Sites for materials stockpiles in place and plans for the cleanup in place.	Contractor	Covered under Biodiversity Action Plan and erosion control
	Security risks, thefts and possible vandalism on project facilities and installations.	Project Site	• Entrance to the camp site to be controlled through guards and vehicles entering and leaving the	• Secure security gate in place to the camp site; • Visitors Identity	MWE	85,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			camp site will be subject to checks; • All visitors to the camp to wear visitors' cards to be exchanged with their identity cards which they will surrender to security at the gate; • Proper lighting to be ensured to supplement the security system. The project management and staff to be keen on idlers in the camp site; • Management of the project to liaise with nearby police units to reinforce their security; and • The contractor will hire security personnel from a reputable	Cards secured and worn by visitors; • Lighting facilities installed in the camp site strategically		

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			local security firm.			
	Impacts on climate change	Project areas	• Planting of 500 ha of CFR land with indigenous trees; • Full site restoration and clean up after works.	Plan to implement ESMP in place	MWE/NFA	Cost of ESMP as a whole.
	Possible risks of dam failure	Dam site	The project to operationalize the Dam Safety and Emergency Response Plans.	Plan for implementing the Emergency Response in dam safety Plan in place	MWE	Embedded in Dam Safety Plan
	Oil spills due to parking and servicing of equipment	Parking Yards and Maintenance Workshops	• Workshop will have a smooth impermeable (concrete or thick plastic covered with sand) floor. The floor is to be bunded and sloped towards an oil trap or sump to contain any spillages. • Contractor should not discharge oil or lubricants indiscriminately on the site	Project Office with standard equipment workshop / yard with standard maintenance yard.	MWE	15,300

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			except at designated locations. The contractor will take proper control measures prior to commencing such activities and is to ensure that appropriate absorbent materials and/or drip trays are available to collect any oil, fluid, etc.			
	Risks associated with the flushing process of water supply systems.	Areas of water supply storage and transmission	• In place of chlorine, it is the contractor opts for house disinfectant especially, JIK/bleach which should be diluted to acceptable application levels as shall be agreed with the Resident Engineer and MWE;	Contractor's plan for flushing water supply facilities in place and approved by the RE	Contractor, Resident Engineer	25,000

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			• The date of flushing of the system be communicated in advance to the security agencies especially the police who are to ensure the process is done under strict security check; • Contractors' employees to be properly and adequately instructed on the handling of chlorine; and • Upon completion of flushing of the water supply system, all the solution is drained to a set out area in the strict watch of the police to ensure all the solution is fully drained.			
	Impacts relating to	Dam site, downstre	• It is noted that, works	Use of PPE by workers	MWE	Already covered

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
	river diversion	am of River. Mishumba	relating to river diversion and its subsequent interception constitutes one of the critical steps in dam construction with a potential to generate a number of impacts such as: • Occupational health and safety for the workers which will be mitigated through providing appropriate PPE, OSH training and first aid kit on site • Management of cut-to spoil materials arising from excavations. Some of the cut to spoil materials can be used as field materials	Records of OSH training No complaints from downstream users Spoil on site		

No.	Anticipated Environmental/Social Impact	Location where impact(s) will most likely occur from	Proposed Mitigation Measures	Indicators to show implementation of mitigation measures	Responsible entity	Budget estimate for mitigation USD
			with approval of the project engineer while excess will be disposed into approved sites by the District Environmental Officer; • Reduced water volumes and flow between diversion sections. These will be addressed through maintaining the recommended Environmental Flow.			
	ESMP TOTAL					3,842,800
	Compensation of PAPS					121,440
	Dam safety					300,000
	Development and Implementation of Grievance Redress Mechanism (GRM)					30,000
	Capacity Building Budget					680,000
Total for ESMP Implementation						**4,974,240**

All the environmental and social mitigation/enhancement measures and monitoring measures to be implemented will cost up to **USD 4,974,240** including administration costs at 2% and contingence costs at 10%. In addition to the expenses highlighted here, other costs for monitoring during implementation of the project will occur. These costs if not included here should be included in the operation cost of the developer or Contractor.

8.5 PEST MANAGEMENT PLAN

8.5.1 Objective of the PMP

The objective of the Pest Management Plan is to promote the use of a combination of environmentally and socially friendly practices (hygienic, cultural, biological or natural control mechanisms and the judicious use of chemicals) and reduce reliance on synthetic chemical pesticides and ensure that health, social and environmental hazards associated with pesticides are minimized under the Project and within acceptable limit requirements of key stakeholders (i.e. primary users among farmers and their immediate defendants/families).

The specific objectives of the PMP are to:

a. Ensure appropriate pest management techniques into technologies supported under the Project;
b. Effectively monitor pesticide use and pest issues amongst participating farmers;
c. Provide for implementation of an IPM action plan in the event that serious pest management issues are encountered, and/or the introduction of technologies is seen to lead to a significant decrease in the application of pesticides;
d. Assess the capacity of the country's regulatory framework and institutions to promote and support safe, effective, socially and environmentally sound pest management and to provide for appropriate institutional capacity support recommendations;
e. Ensure compliance with regional standards, laws and regulations; and
f. Ensure compliance with World Bank safeguard policy OP 4.09.

8.5.2 Rationale for preparing a Pest Management Plan

The Pest Management Plan (PMP) addresses relevant stakeholder concerns about pests and pesticides. It stresses the need to monitor and mitigate negative environmental and social impacts of the Project (which includes the use of pesticides) and promote ecosystem management with the human health risk being the underlying principle from seed usage, through planting and growth stage and also post-harvest issues including safe crops for consumption. It emphasizes the need for an integrated approach to the management of pests in line with the nation's policy on IPM as well as funding agencies requirements on pest management and makes provision for adequate measures to enable the Project to sustain the adoption of IPM techniques.

8.5.3 Risk Levels of some crops to pests and diseases

Disease epidemics are strongly linked to climatic conditions and therefore some diseases may disappear or lose their predominance in a given production system and new pathogens or new strains may become more important. Climate variables control the geographical distribution of pests and diseases, and therefore expand their distributions to new areas. Temperature rise in cold mountain areas enables vector and pests to increase their ecological range to areas where they would otherwise be limited by low temperatures (GoU, 2007). Pest and disease pressure is likely to continue in many regions of Africa, moving into some new regions, as well as reducing pressure in other regions (Jarvis et al. 2012). This causes more infestation during the following production season, as the new hosts will not have had immunity. Altered wind patterns also change the spread of wind-borne pests, vectors and pathogens for crops (GoU, 2007). Plant pests and diseases could potentially deprive humanity of up to 82% of the attainable yield in the case of cotton and over 50% for other major crops and, combined with postharvest spoilage and deterioration in quality, these losses become critical, especially for resource-poor regions (Chakraborty and Newton, 2011). The introduction of diseases and pests will result in higher costs to national food industry in relation to inspection, treatment and compliance with obligations of the importing trading partners (FAO, 2008).

a. Cassava

Cassava mosaic disease represents one of the primary constraints to cassava production in Uganda including areas of Kabuyanda**.** The only alternative for its control is with host plant resistance, appropriate crop management, and through management of the vector (*Bemisia tabaci*). Two particularly aggressive strains can produce mixed infestations in the crop, making its management highly complex. With climate change,

and the predicted shift in geographic distributions this could bring into contact multiple strains which previously have not been in contact, causing more virulent strains and contributing to greater losses (Jarvis et al. 2012).

Figure 58: Severely affected cassava grown from a healthy cutting and subsequently infected during growth by Viruliferous whiteflies[24]

a. Coffee

The possibility of renewed outbreaks of CWD and the unchecked spread of other pests and diseases could potentially devastate the entire coffee sector, causing greater losses than those from CWD to date or even causing farmers to abandon coffee production and subsequent loss of Uganda's share of the global market (World Bank, 2011). An already high prevalence of disease and pest outbreaks, together with the historic failure of the sector to adequately manage such outbreaks in a timely manner, suggests that future losses from pests and disease are highly probable and likely to generate high industry losses. The coffee berry borer only appeared a few years ago and it is becoming worse (Oxfam, 2013). Others are fungal infestations on coffee berries.

[24] J. *M. Thresh and R. J. Cooter Plant Pathology (2005): Strategies for controlling cassava mosaic virus disease in Africa 54, 587–614 Natural Resources Institute, University of Greenwich, Chatham ME4 4TB, UK*

Figure 59: Fungal infection on coffee berries (*Verticillium*)

b. Rice

Rice is also susceptible to considerable disease stress. Three major rice diseases (Rice Blast, Rice Yellow Mottle Virus and the Bacterial Leaf Blight) are significantly aggravated by adverse weather conditions that affect temperature, air humidity, and soil moisture status, posing a threat to the crop (ARCC, 2013).

Pest Problems and Control Practices on rice

Common pests in the project areas include: rodents and migratory and outbreak pests such as birds, locusts and armyworms. IPM strategies are recommended and used by some farmers as much as it is possible because there is no one control practice/measure that can provide acceptable control of the target pest.

Rodents on rice

Rodents, particularly the field rats (*rattus rattus*), the small house mice (*rattus norwegicus*) and multi-mammate shamba rat, (*Mastomys natalensis*) are key pests of food crops. The most affected crops are maize, millets, paddy and cassava. The damage caused by rodents starts at early booting and continues through the mature grain stage as well as the storage stage. Rice is the most susceptible of all the crops. At the pre-harvest stage, rice is attacked at planting (the rodents retrieve sown seeds from the soil causing spatial germination). The rodents cut and eat the fresh stems and parts of the panicle.

Figure 60: A rodent feeding on panicles of near mature rice

Control of rodents on rice

Farmers are strongly advised to do the following to reduce potential damage to crops and the environment:

a. Weeding for clean bunds and fields;
b. Regular surveillance such that, the earlier incidence of rodents is detected making it cheaper and simpler to effect control measures to keep loses low and negligible;
c. Sanitation: it is much easier to notice the presence of rodents if the store is clean and tidy;
d. Trapping: by placing the traps in strategic positions to catch the rats;
e. Encourage farmers to synchronize field husbandry where fields are grouped together; and
f. Predation. Keep cats in stores and in the homesteads.

Migratory outbreaks pests on rice and cereals

Army worm problems

The key migratory and outbreak pests of economic significance in Uganda are armyworm (*Spodoptera exempta*), birds, and the red locusts whose management is coordinated by the Ministry of Agriculture, Animal Industry and Fisheries alongside NARO. The African armyworm (*Spodoptera exempta*) is a major threat to cereal production in a number of African countries. It is a major pest of cereal crops (maize, rice, sorghum and millets) as well as pasture (grass family) and therefore a threat to food security and livestock. The problem with armyworms is that they are highly migratory so that larval outbreaks can appear suddenly at alarming densities, catching farmers unawares and unprepared. The worms destroy crops in the grass family like maize, rice and millet and in addition, animals that feed on infested pasture get bloated and can even die.

Figure 61: Infestation of Army Worm in recently transplanted rice field

Problems of swarming migratory vermin birds

It is recognized that, birds are serious migratory pests of cereal crops, namely rice, maize, sorghum and millet. With birds, the time of damage starts at heading (formation of the grains) or the early milky stage. Damage involves the sucking of juice from grains or the removal of whole grains from the plant's spike. The major culprits are the weaver birds and the *Quelea quelea*. Bird pest problems in agriculture have proved difficult to resolve due in large part to the behavioral versatility associated with their flocking ability as well as the array of food choices available to the flocking birds. Based on these two factors, effective control is information intensive and therefore rather challenging. Several techniques have been tried to reduce bird populations to levels where crop damage is minimal. Traditional methods, slings, bird scares, and scarecrows, are still being used in many parts.

Figure 62: Swarming Birds in rice fields

a. Maize and Beans

According to ARCC (2013), maize and beans can both be produced under a wide range of climatic conditions and are not likely to be significantly affected by predicted temperature changes. The greatest impact of climate change on these crops is due to continued high inter-annual variability and amount of precipitation. Maize is greatly affected by short-term water stress or hail, while beans in particular develop significant fungal and viral diseases in the event of excessive rainfall during critical periods. Erractic weather condition

have made prolifireation of pests on a number of crops thereby affecting productivity and earnings due to lowered quality of produce.

Figure 63: Maize kob being attacked by caterpillars.

Figure 64: Fungal Infected bean leaf

8.5.4 Post-harvest losses due to pests

The project is likely to increase the impact of some post-harvest pests because of the expected increase in crop production through irrigation, and this will necessitate proper storage facilities and management. One of the key post-harvest pest in Uganda is the Larger Grain Borer (*Prostephasnustruncates*), which feeds on the most nutritious part of the maize kernel. The sources of infestation include; cross infestation from neighbouring lots of stores; migration from waste or rubbish; hiding places in stores e.g. cracks; use of infested bags; and introduction of infested lots.

The pest can cause major losses due to:

a. Loss of weight to the grain due to feeding
b. Loss in quality due to:
    - Impurities like droppings, cocoons and parts of insects, which may also lead to microbial infestation as a result of increased temperature and moisture
    - Reduction of nutritional value
    - Reduction in germination ability for seeds.
c. Creation of localized hotspots within the grain that may initiate wet heating, causing stack collapse due to weakening of bag fibre.

Figure 65: Drying of rice on the floor has impact on post- harvest storage and its value

8.5.5 Some of the challenges with use of agro-chemicals in Uganda

Generally, pest management in Uganda is characterized by large use of agrochemicals with also use other methods largely the cultural approaches. The cultural methods employed usually include the use of manual traps and some predators to check some kind of pest's species. However, application and use of agro-chemicals has of late increasing challenges which include:

a. ***Continued use of Persistent Organic Pollutants (POPs):*** Uganda is a signatory to the Stockholm Convention on Persistent Organic Pollutants and ratified in 2004. Under Annex A (listed for Elimination) of the convention, Parties must take measures to **eliminate** the production and use of the chemicals listed under Annex A. These obsolete pesticides are characterized by a high persistence in the environment (e.g. half-life for DDT in soil ranges from 22 to 30 years, Toxaphene -14 years, Mirex -12 years, Dieldrin- 7years, Chlordecone up to 30 years), low water solubility and thus potential to accumulate in fatty tissue of living organisms including humans and toxicity to both human and wildlife. Considering that Uganda is a Signatory, the country is obligated to stop the use of POPs pesticides if still in use. For other pesticides, which are not POPs, the issue of toxicity still remains and the consequence of application on agricultural farm land, and resultant wider environmental and social impacts.

b. ***Prevalence of adulterated and expired pesticides:*** Challenges associated with direct procurement of pesticides by smallholder farmers in Uganda include the proliferation of illegal imports by unscrupulous private companies and the presence of unlicensed dealers. While it is illegal to sell unregistered pesticides, some pesticides are being sold without registration. Similarly, there are cases of pesticides being re-packaged, and sold in smaller amounts without any, or at least proper, labels. It is important to note that, the labels on the agro-chemicals containers have information on a number of aspects on the pesticides which is useful to its end users.

c. ***Health risks of agro-pesticides on the farmers:*** Concerning health effects resulting from pesticide application, studies indicate no significant disparity occurs between sexes of the farmers who apply agro-chemicals. Some of the reported common health effects include skin irritation, itching, and watery eyes are some of the common health effects experienced by the farmers when thy apply agro-chemicals. It is acknowledged that, these impacts are felt because the agro-chemicals are applied without following standard procedures and no use of PPEs in the process. Pesticides have also been linked to a wide range of human health hazards, ranging from short-term impacts such as headaches and nausea to chronic impacts like cancer, reproductive abnormalities, and endocrine disruption. Chronic health effects may occur years after even minimal exposure to pesticides in the environment,

or result from the pesticide residues, which we ingest through our food and water. Pesticides can cause many types of cancer in humans.

d. ***Risks to non-target species:*** The environmental impact of pesticides consists of the effects of pesticides on non-target species. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, because they are sprayed or spread across entire agricultural fields. Runoff can carry pesticides into aquatic environments while wind can carry them to other fields, grazing areas, human settlements and undeveloped areas, potentially affecting other species. Other problems emerge from poor production, transport and storage practices. Over time, repeated application increases pest resistance, while its effects on other species can facilitate the pest's resurgence.
e. ***Social and health Impacts:*** Pesticides can enter the body through inhalation of aerosols, dust and vapor that contain pesticides; through oral exposure by consuming food and water; and through skin exposure by direct contact. The effects of pesticides on human health depend on the toxicity of the chemical and the length and magnitude of exposure. Farmer, farm workers and their families experience the greatest exposure to agricultural pesticides through direct contact. Children are more susceptible and sensitive to pesticides, because they are still developing and have a weaker immune system than adults have. Children may be more exposed due to their closer proximity to the ground and tendency to put unfamiliar objects in their mouth. Hand to mouth contact depends on the child's age. Children under the age of six months are more apt to experience exposure from breast milk and inhalation of small particles. Pesticides can bio-accumulate in the body over time.

8.5.6 Concept of integrated pest management options in crops management

In general terms, there are three possible approaches to decreasing the losses due to a virus disease:
decrease the proportion of plants that become infected. In general terms, there are three possible approaches to decreasing the losses due to a virus disease:

a. decrease the proportion of plants that become infected;
b. delay infection to such a late stage of crop growth that losses become unimportant;
c. decrease the severity of damage sustained after infection has occurred. These objectives can be achieved in diverse ways (Thresh, 2003) and the main possibilities for controlling CMD are phyto-sanitation, disease-resistant varieties, cultural practices, vector control and mild-strain protection.

8.5.7 Integrated Pest Management Measures

These include:

a. **Phyto-sanitation:** This term is used in a general sense for the various means of improving the health status of cassava planting material and for eliminating sources of inoculum from which further spread of CMD can occur through the activity of the whitefly vector. There are three main features of phyto-sanitation for the control of CMD:
   - ❖ crop hygiene involving removal of all diseased cassava or other host plants from within and immediately around sites to be used for new plantings;
   - ❖ use of CMD-free stem cuttings as vegetative planting material;
   - ❖ removal (rouging) of diseased plants from within crop stands.

b. **Crop hygiene:** This is a basic means of facilitating control of many pests and diseases by removing the debris and surviving plants of previous crops to decrease the risk of carry-over of pests or pathogens to any new plantings at the site or nearby. Little attention has been given to adopting this approach with cassava and CMD, and the benefits to be gained have not been demonstrated. They could be substantial because cassava plants, including those affected by CMD, regenerate readily from stems left in or on the ground at harvest.
c. **Use of disease free planting material:** A basic approach to disease control is to use uninfected propagules for all new plantings. The benefits to be gained with cassava and CMD are considerable because healthy stem cuttings establish more readily and grow more quickly than infected ones. The subsequent yields of initially healthy plants are also substantially greater, even if they are infected during growth by whitefly. Moreover, the use of healthy cuttings together with crop hygiene means that initially there are no foci of infection within or alongside new plantings from which spread can

occur. This avoids, or at least delays, the onset of CMD and decreases the period over which spread can occur during the early, most vulnerable stages of crop growth.

d. **Rouging:** Rouging is a well-known means of virus disease control of wide applicability. It has been recommended repeatedly to control CMD. For example, it is advised that cassava plantings should be inspected at least weekly for the first 2–3 months of growth, to find and remove immediately any diseased plants that occur. Thus, unless diseased plants are removed promptly, they can be expected to make a disproportionately large contribution to the overall flux of vector activity in the area.
e. **Use of Resistant Species:** Resistant and tolerant rice cultivars play an important role in the reduction of yield losses due to insect pests and assessment of different rice varieties for insect resistance is an integral component of pest management. Because of its unique advantages (e.g. generally compatible with other control measures), host-plant resistance is a key component in the integrated control of rice insect pests in Africa. Success in identifying resistant material depends to a large extent on the ability to adequately evaluate germplasm and improved genotypes. Screening germplasm under artificial and natural pest infestations is essential for identifying better sources of resistance to major insect pests of rice.
f. Knowledge of the mechanisms and factors contributing to host-plant resistance to insects is useful in selecting suitable criteria and breeding methodology for the genetic improvement of rice plants for insect resistance. Some of the factors associated with resistance, such as silica content and longer internode elongation in *Oryza sativa* varieties, can be used as 'marker traits' to screen and select for resistance to pests. Considerable progress has been made by the Africa Rice Center (AfricaRice) in the development of NERICA varieties that combine the high yield potential of Asian rice (*Oryza sativa*) with many useful traits from the African cultivated.
g. **Biological Control Agents:** Biological control means use of living organisms to suppress pest populations and damage. These living organisms can be parasitoids, predators and use of sterile males during breeding or pathogens. Environmentally friendly chemical interventions such as the use of semio-chemicals (e.g. pheromones and parapheromones), biopesticides and relatively less toxic insecticides can be used together with biological control agents. This tactic takes advantage of the fact that organisms depend or even feed on each other for survival. Thus, biological control method tries to ensure that pests are reduced by organisms which are their natural enemies. These natural enemies can be conserved by taking care with farming practices so that they are not killed but are actually encouraged. Under the project, biological control could be considered by the Project as the first line of control for pests and diseases, when incidence is noticed and where an appropriate biocontrol agent is available.
h. **Cultural Control Practices:** Cultural control means use of usual crop and livestock production practices to suppress pest population and damage in the field. These practices include ploughing to expose and kill soil pests, using pest and disease-free seed, planting in time, intercropping, timely weeding, mulching, field sanitation, harvesting in time to minimize exposure of the crop to pests, practicing crop rotation, selection of breeding livestock with the desired traits, general hygiene for livestock and practicing all in all out-livestock production systems.

Other cultural practices include:

a. Crop rotation - crop rotation helps to prevent pest populations building over a number of years,
b. Inter-cropping practices,
c. Field sanitation and seed bed sanitation,
d. Use of pest-resistant crop varieties,
e. Managing sowing, planting or harvesting dates;
f. Water/irrigation management,
g. Practices to enhance the build-up of naturally existing predator populations;
h. Hand-picking of pests or hand-weeding;
i. Use of traps or trap crops. Other special considerations.

Figure 66: Post harvest storage of maize in Kabuyanda areas

8.5.8 Guidance on pesticides that could be procured and used under the project

8.5.8.1 *World Bank Safeguards Requirements under OP 4.09 Pest Management*

Envisaged agricultural transformation resulting from project interventions may lead to increased use of pesticides in cultivated land in intervention areas. Due to weak import controls, there are indications that poor quality, unregistered, and unregulated pesticides are being imported to Uganda, and that farmers who lack knowledge on their appropriate handling and use are using them (USAID FED, 2013). While pesticides are designed to kill specific pests, they can easily reach destinations other than their targets through entering the air, water, and sediments during handling, storage, application, and disposal of material and containers. Without specific management, impacts could include:

a. Destruction of crop pollinators leading to poor crop yields;
b. Elimination of the natural enemies of crop pests and consequent loss of natural pest control that keeps the pest population low;
c. Development of resistance to pesticides, encouraging further increases in the use of chemical pesticides;
d. Contamination of soil and water bodies;
e. Toxicity to fish and birds;
f. Proliferation of aquatic weeds;
g. Pesticide poisoning of farmers and deleterious effects on human health;
h. Unacceptable levels of pesticide residues in harvested produce and in the food chain; and
i. Loss of biodiversity in the environment, particularly of the aquatic non-target species.

Use of pesticides can present acute and/or long-term and eco-toxicological hazards, especially if used incorrectly.

Notably:

a. Uganda has a list of pesticides banned under the Stockholm conventions, but there are inadequate controls on imports and it is understood that, there are still incidents where farmers in the country continue to use banned pesticides;
b. Few pesticides with choices of active ingredients are available in the country, though there are fears that, some of those available pesticides contain generic versions of patented ingredients;

c. NEMA and Agricultural Chemicals Board do have not effectively means and capacity to test, register, and manage pesticides entering Uganda, or to ensure adequate training is undertaken to those using such products.
d. No national system established system to regulate spraying of pesticides by spraying providers or individuals.

As a result, the pesticide risk profile for Uganda is growing just like in a number of sub-Saharan Africa countries as such, extra care need to be develop and implement risk mitigation and management measures that can function in this context. National Environment Act Cap 153 makes specific provisions for the management of pesticide and toxic and hazardous chemicals and materials. However, the regulations to implement such requirements are not yet in place.

In addition, Uganda is a signatory to the Stockholm convention, is required to take measures (legal and/or administrative) to eliminate or heavily restrict the production and use of persistent organic pollutant (POP) pesticides and polychlorinated biphenyls (PCBs), and to minimize the unintentional production and release of POPs. Substances are listed in three categories: elimination, restricted use, and unintentional production. WB OP 4.09, Pest Management, requires WB-funded projects to include a Pest Management Plan prepared by the borrower. The Pest Management Plan is meant to promote the use of biological or environmental control methods and reduce reliance on synthetic chemical pesticides through implementation of Integrated Pest Management (IPM) techniques. These involve the integration of cultural, physical, biological and chemical practices to grow crops with a minimal use of pesticides.

The WB applies the following criteria to the selection and use of pesticides:

a. Have negligible adverse human health effects.
b. Be effective against the target species.
c. Have minimal effect on non-target species and the natural environment.
d. Take into account the need to prevent the development of resistance in pests.

8.5.8.2 *Overall Standards*

The World Bank has been a longtime partner in the agricultural sector. Given its safeguard policies, it has to ensure that the procurement/use of pesticides is done as cautiously as practicable, with proper safeguards in place, and through the use of the least toxic means of effective pest control. In that regard, the following criteria will apply to the selection and use of pesticides in activities under the planned irrigation project:

a. Pesticide that could be financed under the Project must be manufactured, packaged, labelled, handled, stored, disposed of, and applied according to standards that, at a minimum, comply with the FAO's Pesticide storage and stock control manual (FAO, 1996), Revised guidelines on good labelling practice for pesticides (FAO, 1995), Guidelines for the management of small quantities of unwanted and obsolete pesticides (FAO, 1999), Guidelines on Management Options for Empty Pesticide Containers (FAO, 2008), and Guidelines on personal protection when using pesticides in hot climates (FAO, 1990).
b. Consistent with World Bank OP 4.09, project finances will not be used for formulated products that fall in WHO classes IA and IB, or formulations of products in Class II, if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.
c. Project financing will not be used for any pesticide products which contain active ingredients that are listed on Annex III of the Rotterdam Convention (on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade), unless the Country has taken explicit legal or administrative measures to consent to import and use of that active ingredient.
d. Project financing will not be used on any pesticide products which contain active ingredients that are as per the Stockholm Convention on Persistent Organic Pollutants, unless for an acceptable purpose as defined by the Convention, or if an exemption has been obtained by the Country under this Convention.
e. Project financing will not be used for any pesticide products which contain active ingredients that are listed on Annex III of the Rotterdam Convention (on Prior Informed Consent Procedure for Certain

Hazardous Chemicals and Pesticides in International Trade), unless the Country has taken explicit legal or administrative measures to consent to import and use of that active ingredient.

8.5.8.3 *Pesticides Usage Records*

Under circumstances where the project and its stakeholders directly procure pesticides for distribution to the farmers, the PIU will be required to maintain records of all pesticides annually applied under the project. The following usage information will be reported:

a. Pesticide trade name(s)
b. Active ingredient(s)
c. Total acres treated
d. Total amount of pesticides used
e. Total amount of active ingredient(s) used
f. Target pest(s)
g. Efficacy (percent control)
h. Total number of containers returned to the stores where chemicals are purchased

8.5.8.4 *Use of Pesticides*

a. ***General Criteria for Pesticide Use:*** An approved list by the Agricultural Chemicals Board exists will be used according to their labeled uses when all of the following criteria are met:
   i. The activity is part of an IPM strategy that seeks to minimize pesticide use or use pesticides as a last resort;
   ii. Best technology-based practices are followed, leaks or spills are reduced, and application equipment is maintained in good working order;
   iii. Timing of pesticide application corresponds to the life cycle of the pests to be treated, and the life cycle is monitored appropriately;
   iv. Pest population action thresholds are determined, and monitoring ensures treatment only when the threshold is exceeded;
   v. Weather conditions are appropriate for the application;
   vi. Applicators adhere to all of the label requirements concerning the safe and effective use of the pesticide(s); and
   vii. Activity minimizes pesticide application within 50 meters buffer of streams or other water bodies.
b. **Pesticide Application Decisions and Procedures:** Pesticides should be applied by directed, low volume, single wand sprayers, wiping, daubing and painting equipment, or injection systems. Boom application shall be limited to large scale (>5 acres) natural resources enhancement or farming activities. It is important to manage pesticide drift when surface waters or beneficial plants are nearby. Control nozzle size, pressure and droplet size to minimize drift.
   Application checklist shall include the following procedures:
   - ❖ Read pesticide label.
   - ❖ Check and calibrate application equipment for safety and efficiency.
   - ❖ Check the weather conditions. Unless otherwise indicated on the product label, avoid pesticide use it is raining or expected to rain within 24 hours, or wind speed is very high
   - ❖ Post notification signs at all entrances to sites associated with pesticide applications.
   - ❖ List re-entry specifications on the signs if required by the label.
   - ❖ Apply material according to the label.
   - ❖ Record pesticide application on application forms.
   - ❖ Remove signs when the liquid pesticide has dried, unless indicated otherwise on the label.
c. **Rules and Procedures for Application of Pesticides:** It is virtually impossible to train all small-scale farmers in Uganda in the safe and responsible use of pesticides. The solution, therefore, is the concept of Spray Service Providers (SSPs) as part of an initiative to promote the safe and responsible use of pesticides and timely control of outbreaks and occurrence of new pests, or to manage regular pests, to benefit small-scale farmers. This approach will recruit trained and certified lead farmers in the

application of pesticides and they will hire out their services to fellow farmers to spray their lands/crop. This implies that untrained farmers will no longer handle pesticides and that this application will only be undertaken by those who are properly trained and certified.

d. **Safety and Protection:** There are certain measures which should always be undertaken by pesticide operators to help protect against contamination during the handling and application of pesticides. These measures should always be followed.
e. **Reading and Understanding Labels:** The first principle is to always read and follow the label recommendations on the pesticide container. If the label information cannot be read or understood for any reason, then the operator should find someone who can explain the instructions to him. Apart from the written instructions, the operator should also look for pictorial information on the label which will indicate the degree of hazard presented by the pesticide formulation. Similarly warning symbols, such as skull and crossbones, give information on the type of chemical hazard.
f. **Avoiding Contamination:** Direct exposure of the skin, nose, mouth or eyes should be avoided or minimized when working with pesticide products to reduce the chances of personal contamination. When pouring and mixing the concentrated product, every effort should be made to avoid splashing or spilling onto skin or clothing. If any product falls on the skin, or into the eyes, then this should be washed off as soon as possible. Heavily contaminated clothing must be removed and washed with detergent and water. The likelihood of contamination can be greatly reduced by using suitable equipment for measuring out and transferring the product. In particular, the hands must never be used as scoops nor should the hands or arms be used to stir liquids. The most appropriate application technique should be selected to control the pest problem. It is very important that the application equipment is in a good state of repair and that it is properly maintained and calibrated. When spraying the diluted product, the applicator should always work upwind of the spray to avoid coming into contact with it. He should also avoid contact with freshly sprayed foliage as far as possible.
g. **Personal Hygiene:** Another basic principle of personal protection is good hygiene when working with pesticides. This is to ensure that if any contamination occurs then it is removed in good time. In addition, personal habits will help avoid direct contamination in itself. Operators should not eat, drink or smoke during work and should not touch their face or other bare skin with soiled hands or gloves. They should always wash their hands and face after handling pesticides and before eating, drinking, smoking or going to the toilet. When they have finished work for the day they should then wash themselves thoroughly. Their work clothes should also be washed after work, separately from other clothing, and then dried.
h. **Safety Gear:** For the effective safety and protection of the workers handling agro-chemicals, the provision of the following is deemed necessary.
    - ❖ Helmet or cloth cap
    - ❖ Safety spectacles, goggles or face shield (attached to helmet)
    - ❖ Dust or light fume masks
    - ❖ Emergency vapor masks or half-face respirators with organic vapor cartridges
    - ❖ Nitrile rubber or neoprene gloves or gauntlets
    - ❖ Overalls
    - ❖ Nitrile rubber or neoprene aprons
    - ❖ Strong rubber or neoprene boots

Selection, care, and maintenance of work clothing and protective equipment will be paramount given the hot conditions in some parts of Uganda. This is because the wearing of additional protective clothing and other equipment can cause severe discomfort and even physical distress due to heat stress if they are made of inappropriate materials. In addition, because of the discomfort, operators may dispense with protective apparel and become subject to greater exposure and possible contamination. There are certain measures which can help reduce this problem, namely:

a. Where possible using a pesticide formulation which does not require the wearing of additional items of protective clothing;

b. Applying the pesticide in the cooler hours of the day when it is more comfortable to wear protective equipment.

8.5.8.5 *Instructions on Wearing of PPE*

Table 57: Appropriate PPEs for handling Agro-pesticides

Equipment	Protection	How to wear it
Coveralls	There are two types of coveralls: disposable and reusable. Disposable coveralls are lightweight and comfortable on warm days. They can be worn for mixing and applying pesticides, and then discarded at the day's end. If they become contaminated, they should be discarded at once. The second type of coverall is made of washable fabric and may be reused many times. These fabric coveralls are adequate for use with all but the most highly toxic and concentrated pesticides.	Button (or zip) right up to the neck. Loose coveralls around the neck will suck and blow pesticide in and out of the interior of the coveralls as you bend and move. Wear coveralls over a long-sleeved shirt and pants.
Aprons	When pouring or otherwise handling concentrated pesticides, it makes good sense to wear protection in the form of an apron. The apron protects the front of your body from spills or splashes of the concentrate. The apron should be made of rubber or synthetic liquid-proof material that will resist the solvents used in formulating the pesticide.	Make sure the apron covers your body from your chest to your boots.
Gloves	Protect your hands by wearing chemical- resistant gloves. Neoprene gloves provide the best protection. Natural rubber gloves may be used when handling organo-phosphorus or carbamate pesticides. Be sure that they are designed for use with solvents and pesticides. Never use lined gloves, gloves with wristbands or leather gloves.	Put gloves on and roll up the first inch or two of the cuff. That way when you lift your hands, any liquid on the gloves won't drip down your arms.
Hats	Use a chemical-resistant hat, preferably made of washable plastic. The hat may be a hard hat or made of flexible plastic. In either case, it should have a plastic sweatband. Wash and dry entire hat after each use and before storing. Ordinary baseball caps with cloth sweatbands are dangerous as they absorb the pesticide and re-contaminate the forehead each time you wear them. Even small amounts of moderately or slightly toxic pesticides may cause severe skin irritation or other illness if exposure continues for several days.	
Boots	Wear chemical-resistant, unlined boots. These boots are available in a variety of styles and materials. Neoprene boots are the best. Knee-length boots offer greater protection because they extend above the lower end of the apron. Avoid leather or fabric boots and shoes because these will absorb pesticides and cannot be cleaned effectively.	Wear your trouser legs outside the top of your boots. This will prevent spills and splashes from running into the boot and onto your leg.
Goggles	Chemical-resistant goggles keep your eyes safe from both splashing and, if using dry formulations, dusts or granules. Don't use goggles with cloth or elastic headbands as these will absorb pesticides.	Wear goggles snugly on your face so that the sides of your head are protected from splashes. If you wear glasses, make sure you purchase goggles that fit snugly over them. Never wear contact lenses when working around pesticides.
Respirators	Only approved respirators should be used. Do not exchange parts of different respirators. (For example, do	When carrying out operations, change filters each day. The cartridge

	not use a cartridge produced by Company "A" with a respirator produced by Company "B" as the combination may not provide adequate protection to the user). Dust masks are ineffective in protecting against herbicide vapors. Similarly, the filters on tractor cabs are intended to remove dust and are not designed to protect against herbicide vapors or mists. Chemical cartridge respirators are recommended for outdoor use when mixing and applying herbicides.	should be replaced when chemical odor becomes apparent or when breathing becomes difficult. New cartridges should always be installed at the beginning of the spray season. Prior to commencing work, check the face seal while the respirator is on the wearer's face. Regardless of design, respirators cannot be worn securely by people wearing beards, moustaches or sideburns.
Face Shields	Goggles offer some protection, but frequently full-face protection is advised or required according to the pesticide label. It is especially important to protect your eyes and face when pouring or mixing liquid concentrates. Effective face shields are made of clear plastic.	Since the shield attaches to the hard hat, you can raise or lower it as needed.

8.5.8.6 *Post-application Visual Assessment*

All operators must conduct visual assessments of application sites. Visual assessments will consist of spot checks in the area in and around where pesticides are applied for possible and observable adverse impacts caused by an application of pesticides. Possible and observable adverse impacts include, but are not limited to, the unanticipated death or distress of non-target organisms, disruption of fish and wildlife habitat.

a. ***Records Keeping:*** All records will have to be documented as soon as possible but no later than 14 days following completion of each pesticide application in a treatment area. On or before the 14th day after any pesticide application, a copy of the below information will need to be on file with the Extension Workers.

Information for each treatment area to which pesticides are discharged as follows:

- Surveillance methods used, dates of surveillance, and findings of surveillance
- Target pest(s) and explanation of the need for pest control
- Pest or site-specific action thresholds prior to pesticide application
- Description of pest management measures implemented prior to the first application
- Company name and contact information for pesticide applicator
- Pesticide application dates and time of day of application
- Description of treatment area, including location and size of treatment area and identification of any waters
- Name of each pesticide product used to include registration number
- Quantity of pesticide applied
- Concentration (%) of active ingredient
- Effective concentration of active ingredient
- Any unusual or unexpected effects identified to non-target organisms
- Was a visual assessment conducted? Was it done during or post pesticide application, if not explanation why not
- Assessment of environmental conditions relating to proper pesticide use.

b. ***Controlling pesticides used in crop protection:*** In Uganda, industrial units ensuring the synthesis of active materials through brandy laboratories is at its infancy and sometimes under the private sector mostly. Thus, production of pesticides in the proper way is not effective in the country. Finished products are rather imported notably through mother companies represented at the national level or active matters for formulation purposes. In order to ensure that it is done, Phytosanitary Controls need to be stationed at the borders (sea ports, airports, and roads). The control of pesticides for now, is wanting in the country save for the large companies especially Sugar companies which endeavor to follow their company and international best practices while bringing pesticides into the country.

c. ***Organization and practice used in selling and distribution:*** The distribution channel for agro-inputs is entirely private. Suppliers who import the products feed the market through distributors, retailers who supply traders and they display for sale. Certain distribution spots sales points try to abide by the terms in their licenses but there is no effective follow up NEMA is well kept and abide by commercial rules; in general, the products are well displayed on shelves. However, at the level of many retailers and traders who display for sale there are great risks. Because of the low financial capacity of local farmers/peasants and other buyers, some of the products are sold in retail. This practice is carried out without caution notably with decanting. Smaller retailers may decant products into smaller containers to meet farmers' purchasing ability, usually without proper labels, which should describe active ingredients and concentration, dosage, handling instructions and hazards, batch and date of expiry.

Some retailers are polyvalent and therefore engage in other types of commerce in the same premises. Distribution is also carried out sometimes without authorization as required by the regulation and with the personnel not having received any training in the pesticides chemical products domain in general. In actual fact many of these actors do not have the requisite approvals/permits/license. Nevertheless, retailers affiliated to suppliers receive this type of training through the suppliers themselves.

d. ***Other challenges:*** The problems associated with the adulteration of pesticides by some pesticide dealers have created real concern for a wide variety of interest groups in recent times. Stakeholders from NEMA, MAAIF, NARO as well as Uganda National Agro-input Association (UNADA) all do observe that some pesticide dealers adulterate and fake pesticides, using methods such as the alteration of expiry dates of pesticides, the change of labels on pesticide containers, and the preparation and bottling of mixtures in already used pesticide containers. These criminal and unethical practices are attributed to the desire of bad dealers to make huge profits. These unscrupulous dealers exploit the low literacy levels and financial capacity of their customers, most of whom are smallholder farmers, who cannot tell the difference between fake and genuine products and the implications and sources of low-priced pesticides.

b. ***Use of pesticides by farmers:*** In most cases, farmers themselves or farm assistants spray the plant products. The protection of farmers and farm assistants against any type of contamination by pesticides is not guaranteed. Farmers use various types of applications and in most cases the appropriate personal protective equipment (PPEs) such as hand gloves, overalls etc. are not worn. The time of spray during the day is sometimes not appropriate. Farmers have been observed spraying during hot afternoons when sunshine is at its peak and such farmers who are usually not in appropriate PPEs are exposed through inhalation and skin contacts. As regards the bad use of pesticides, the treatments are done several times which leads to product waste but also to a lack of good judgement as regards their efficiency. The documents that allow monitoring product traceability are very scarce or even non-existent as well as the notification of product usage. All of this could lead to the availability of residues in the products with the associated difficulties to export these.

c. ***Management of pesticide containers:*** The management of pesticides containers is under the responsibility of resellers and farmers because of the retail sales system. They find themselves with the most important share of the empty containers, which are differently managed. Sales to pesticides buyers who do not have empty containers and who straightforward reuse these containers. However, with big commercial farms or companies (sugar cane plantations) management of pesticide containers is in accordance with their environmental policies. Some of the recommended IPM practices for some major pests and diseases reported in the project area.

Table 58: Some crop based IPM Measures in the project areas

Host plant	Pest and disease	Management
Banana	Banana weevil	Cleaned field by removing the dried leaves, plant debris, and destroy them by burning or by dumping in mulching pit and covering with soil.
		⧫ Use healthy, uninfected sucker or rhizomes for planting ⧫ time. Wash the suckers and dip in a solution of Chlorpyriphos 20 EC @ 2.5 ml/l before planting. ⧫ Soil application of carbofuron @ 20g/plant during 3rd, 5th ⧫ & 7th month after planting. ⧫ Monitor weevil regularly by keeping longitudinal cut stem banana traps trap of 30 cm size @ 10-15 per acre. ⧫ In case of post-planting infestation, spray the pseudostem and drench around the base of the tree with Chlopyriphos 20 EC @ 2.5 ml/l. After one week spray and drench with Malathion 50 EC @ 2 ml/l. ⧫ Cut the banana plant after harvest at the ground level and treat it with carbaryl (1g/liter) or chlorpyriphos (2.5 ml/lit) at the cut surface. ⧫ Keep pheromone (cosmolure) trap @ 5 traps / ha. The position of traps should be changed once in a month.
	Banana bacterial wilt	❖ Remove the male bud after the last hand has set ❖ Keep cutting tools clean ❖ Remove diseased stem to reduce the incidence of new infections ❖ Grow cultivars that have persistent bracts.
Beans	Aphids (*Aphis fabae, A. craccivora*)	❖ Promote buildup of indigenous natural enemies such as ❖ green lacewings (Chrysopidae), various lady beetles, the minute pirate bug, syrphid flies and parasitic wasps ❖ Observe recommended time of planting ❖ Apply wood ash in case of a heavy attack ❖ Carry our regular crop inspection to detect early attacks ❖ Apply recommended insecticide when necessary
	Bean fly *Ophiomyia* spp.	❖ Growing beans in fertile soils to improve tolerance to infestations ❖ Use resistant varieties such as EXL 55, G11746, G22501 and other resistant varieties, where available. ❖ Mulching with materials such as rice straw enhances adventitious root formation and recovery tolerance to
		⧫ Formulations such as “Murtano” combine insecticides and fungicides to protect against bean stem maggots and root rot pathogens.

	Leaf beetles– *Ootheca* spp.	⧫ Post-harvest tillage exposes the dormant adults in the soil to the heat of the sun and increases mortality. ⧫ Crop rotation with non-hosts (e.g. maize or sunflower) breaks the development cycle and reduces the emerging adult population. ⧫ Delayed sowing of beans helps to avoid susceptible stages of the crop coinciding with peaks in the pest population cycle. ⧫ Application of botanical pesticides such as neem (*Azadirachta indica*) seed extracts deter infestation and reduces the damage.
	Cutworm (*Agrotis* and *Spodoptera* spp.)	❖ Bait larvae with straw mixed with insecticides such as carbaryl (or other stomach poisons) and molasses and spread within the field.
Maize	Fall armyworm	⧫ Use pheromone traps to detect when adult months are flying and preparing to lay eggs ⧫ Use approved short-term persistence pesticides e.g. Lambda-cyhalothrin (106g/l) and Thiamethoxam (141g/l) to spray young caterpillars
	Stalk borers	⧫ Intercropping with pulses ⧫ Early sowing and early maturing varieties reduce infestation ⧫ Destroy (make compost, burn or feed livestock) crop residues ⧫ Apply neem seed cake during planting (4 gm/hole) ⧫ Apply neem cake (a 50:50 mixture of neem and sawdust) at the rate of 1g per plant into the funnels in cereal stems ⧫ Use the extract botanical pesticides
Coffee	Brown scale *Saissetia Coffeae*	⧫ Trim heavily infested branches and leave on the ground to allow the parasites to emerge from the scales. ⧫ Optimum mulch and fertilizer application ⧫ Insecticide banding if ants are attending the insects
	Berry borer *Hypothenemus* *Hampei*	⧫ Pruning to reduce shade. ⧫ Regular picking of ripe cherries (at least once fortnightly). ⧫ Use sacks or Hessian cloth spread on the ground during picking to prevent loss of infested cherries in the mulch. ⧫ Dry or over-ripe cherries should be stripped and burnt.
	Twig borer *Xylosandrus* spp	⧫ Use a combination of good field hygiene practices (e.g. clean weeding, shade reduction, pruning and burning infected twigs and branches) and spraying regime using systemic pesticides such as Monocrotophos, Chlorpyrifos and Permethrins. ⧫ Spray using IMAX (Imidacloprid), Thionex (Endosulfan), and Malathion
Tomatoes	Fruit caterpillar	⧫ Grow trap crops such as pigeon pea (*Cajanus cajan*) and Crotalaria in and around tomato fields ⧫ As soon as young caterpillars are seen, spray with Bacillus thuringiensis based bio-pesticides, neem seed extracts or short residual pyrethroid after AESA

	Blights (*Alternaria solani*- early blight, *Phytophtora infestans*- late blight)	❖ Remove and burn affected leaves ❖ Rotate crops and observe strict sanitation (no new plots alongside old ones) ❖ Use clean, disinfected seeds ❖ Practice staking and mulching ❖ Spray with fungicides when environmental conditions are favorable for infection (cool and humid, for several days after rains), or at first sign of disease and every 7-10 days there after ❖ Grow resistant cultivars where available ❖ Use copper fungicides after AESA in disease favoring weather ❖ Remove and destroy infected plants detected early ❖ Avoid wetting plants for protracted periods
	Wilts (*Fusarium oxysporum*)	❖Destroy whole plant and roots after harvest ❖Use resistant varieties (e.g. Roma VF) ❖Follow strict field sanitation ❖Remove solanaceous weeds ❖Avoid infected fields
		❖Use health seedlings ❖Controlled burning on fields ❖Use clean seed-beds (subsoil nurseries, solarization) ❖ Avoid excessive use of nitrogen fertilizer, which encourages the fungus ❖ Practice rotation with non solanaceous crops (minimum of 5 years)
Cassava	African Cassava Mosaic Disease	❖Rouging of infected plants ❖Planting 'clean' planting materials ❖Use of resistant varieties ❖Crop disposition and isolation ❖Avoid planting cassava towards the end of the rains. This is the time when transmission of mosaic by the whitefly is rapid. ❖Do not gather planting materials from cassava stems lying on the ground. You will not know the status of the stems or else you may transfer mosaic to your field. ❖ Protect cassava from livestock damage during the dry season. This reduces the quality of planting materials and makes it difficult to select mosaic-free stems as the leaves would be absent.

Cabbages	Aphids (*Brevicoryne brassicae*)	❖ Avoid planting cabbage near an aphid infested crop or on ❖ land, which a recent infested crop has been removed ❖ Conserve and encourage natural enemies (ladybird beetles, hoverfly maggots, lacewing larvae, parasitic wasps) by enhancing diversity and avoiding broad spectrum pesticides ❖ Avoid application of too much nitrogen fertilizer as this ❖ makes the plant very soft, juicy and attractive to aphids but apply organic manures liberally ❖ Rainfall and overhead irrigation washes aphids off. ❖ Scout and monitor aphid infestation for early detection and control. ❖ Control ants that protect aphids against attack to ensure ❖ the supply of honeydew, which they also feed on either with pesticide or by removing nesting sites such as old tree trunks, rock heaps, debris and weeds.
		❖ Prune/remove basal (lower) old leaves of head forming cabbages as may be a source of aphid infestation ❖ Use water jet spray for the lower leaves to wash off aphids. ❖ Plant solutions such as chilli, neem and garlic can also be applied on the crop. Spray with a soapy solution (local soap - alata samuna) to wash off aphids and disturb their breathing. Use soap solution as a spray by mixing together and stir well 30 ml liquid soap in 5 litres of water. Test a small area first to ensure that the soap preparation does not damage the crop plant. ❖ Use chemical spray with recommended and approved insecticide only when heavy infestation occurs ❖ Promote insects/organisms that feed on the aphids (natural enemies). The most common natural enemies of aphids ❖ include ladybird beetles, hover fly larvae, lacewings, spiders, damsel bugs, ground beetles, rove beetles, wasps. ❖ Use nitrogen fertilizers in moderation because heavy doses of soluble nitrogen fertilizers encourage multiplication of the aphids. ❖ Interplanting cabbage with cover crops has been found to reduce aphid infestations. ❖ Mulching cabbage with brightly coloured straw or plastic paper has been found to reduce aphid infestations. ❖ Spraying with soapy water solutions can be effective ❖ Apply granular systemic insecticides such as carbofuran at planting
	Cabbage head caterpillar	Plant strips or patches of more favored crops (trap crops) in or around the cabbage field and destroy the pests in the trap crops so that they do not transfer to the cabbage. Trap crops for the cabbage head caterpillar include Indian mustard and Chinese cabbage. Encourage natural enemies in the field. Handpick eggs and larvae and destroy them. Apply bio-naturals such as Neem (Azadirachtin). Crop rotation with non-cruciferous crops.

	Cutworm (*Agrotis* sp.)	◊Timely weed control. ◊ Plough to expose larvae (specially Egret birds) and to bury others and prevent them from reaching the surface ◊Replant severe losses ◊ In severe cases, dust around the plant with a recommended insecticide such as an Organophosphate (OP). ◊ Dried grounded red pepper sprinkled on dampened plants deters insect attacks. Spreading red pepper powder around the base of plants can repel cutworm such as Braconid wasp larvae (Meteorus communis), Ichneumonid wasp larvae (Nepiera spp), and Green Lacewing larvae (Chrysopidae). ◊ Flooding the soil before planting will expose caterpillars to predators
General	Rodents and rats	❖ Weeding for clean bunds and fields ❖ Regular surveillance. ❖ Trapping. Place the traps in strategic positions ❖ For maize, plant 3-4 plants per hill in areas of the field infested by rodents and thin to 2 seedlings in the third week. ❖ Use recommended rodenticide.
	Quelea birds	Scaring using e.g. slings and scarecrows Monitoring and management of outbreak flocks by spraying breeding or roosting areas with recommended chemicals such as Fenthion (quelea-tox)

8.5.9 Implementation Strategies, Capacity Building and Monitoring

The following strategies are recommended to achieve effective pest management:

a. ***Safeguard team:*** The project coordinators at MWE, MAAIF, IDLG and Kabuyanda sub county will form a Safeguard Team to oversee and ensure that the project complies with relevant safeguard policy documents prepared for the Project, including this PMP.

b. ***Registration and training of all interested agro-input dealers in the project:*** The project will notify, register and train agro-input dealers (pesticides and seeds) interested in providing services or products for the Project. This will be done in collaboration with relevant institutions such as UNADA**.**

c. ***Stakeholder awareness creation:*** The project will communicate the content of the Pest Management Plan (PMP) to all relevant stakeholders. It will organize awareness creation workshops for different actors (ministry, district local government, agro-input suppliers, extension workers and farmers). Participants will be informed of issues such as the importance of pest management in the framework of this PMP, mechanisms planned for sustainable pest management, procedures of supplying and buying agro- inputs.

d. ***Availability of pest management information:*** The project will collaborate with other institutions (e.g. NARO, IDLG) to provide to local actors (extension agents and farmers) key information on crop pests in the project area, including pest identification, pest surveillance procedures, IPM strategies for major pests, and pesticide use toolkits. Such information will be provided in the local, and in an easy to read and understand format, including pictorials.

e. ***Training extension agents and farmer:*** The project will organize periodic training for farmers and extension workers in the project in relation to the project impacts identified in this plan. A Participatory Pest surveillance and Monitoring team will be establish comprising of farmers, extension workers, project coordinator and technical staff from IDLG, MWE and MAAIF. The team will conduct periodic surveys and record all pest cases, including pest type, incidence, severity, host plants, location of infested gardens, period of infestation, etc. A rapid response mechanism for managing new pest infestations will be established. The PMP implementation team will consult other stakeholders and interest groups such as land owners, health units, fish farmers in the project area. The aim will be to identify and address activities that may have an impact on pest management in a participatory manner.

f. Capacity building

Farmer Field Schools, Farmer participatory research and participatory learning approaches will be used to build the capacity of extension workers and farmers in pest management. The project implementation unit will assess the pest management needs in the project area in collaboration with other institutions such as NARO, NAADS and UNADA. The crop protection department in MAAIF will be responsible for; (i) planning training implementation, and (ii) providing technical support such as preparation of training materials and selection of training facilitators. The Isingiro District Agricultural Officer will collaborate with local councillors in the project area (LC3, LC2 and LC1) and NGOs operating in the area, farmers groups and individual farmers to:

a. Identify and organize farmers into groups for training
b. Prepare, organize and supervise training implementation plan,
c. Verify reports of persisting pest problems and farmers training needs,
d. Facilitate farmers to set up Community IPM Action Committees to coordinate post-training IPM activities
e. Monitor performance of farmer trainers and post-training assignments, and
f. Prepare training progress reports.

g. ***Monitoring and reporting:*** There will be regular monitoring and evaluation of control programs to determine the level of progress being made with regard to pest and pesticide management and control issues identified in the PMP. The following performance indicators will be included into a participatory monitoring and evaluation plan.

i. Types and number of participatory training modules (PTM) delivered

II. Category and number of extension agents and farmers trained and reached with each PTM
III. Category and number of participants reached beyond baseline figures
IV. Practical skills/techniques most frequently demanded by extension agents and farmers
V. Crop management practices preferred by farmers
VI. Category and number of farmers who correctly apply the skills they have learnt
VII. New management practices adopted most by farmers
VIII. Category and number of other farmers trained by project trained farmers
IX. Types of farmer-innovations implemented
X. Level of pest damage and losses
XI. Rate of adoption of IPM practices
XII. Increase in crop production
XIII. Increase in farm revenue
XIV. Incidence of pests and diseases
XV. Social benefits: e.g., improvement in the health status of farmers
XVI. Level of reduction of pesticide purchase and use.

The project implementation unit will prepare annual pest management reports, indicating information such the pest cases identified and treated using IPM approaches, level of success of treatment, levels of farmers' involvement, capacity building success and challenges.

Summary of implementation plan

As indicated in section 5, a number of impacts and challenges are likely to be associated with the dam project with regard to pest and pesticide management. These include the following:

a. Pesticide contamination in water bodies
b. Improper use of pesticide
c. Soil contamination and poisoning from improper disposal of pesticide containers
d. Abuses in pesticide supply and sales
e. Production losses from fall armyworm and other crop pest outbreaks
f. Post-harvest losses due to pests
g. Reduction in natural enemy populations
h. General public health concerns
i. MAAIF, Ministry of Health, IDLG

A summary of the mitigation measures, implementation tools, expected results, monitoring indicators and key implementation actors are presented in table below.

Table 59: Integrated Pest Management

Potential Impact	Impact Mitigation/ enhancement measure	Implementation tool	Expected results	Monitoring indicators	Implementing actors
Pesticide contamination in water bodies	Regulate and oversee pesticide use by farmers	Adoption of IPM techniques	Farmers and extension agents trained in IPM	Number of farmers and extension agents trained Training records	MAAIF, IDLG
	Proper disposal of pesticide containers by farmers and resellers	Pesticide disposal and collection plan	Pesticide container disposal plan developed and implemented	Number of farmers and resellers aware of pesticide container disposal plan Number of pesticide containers collected and disposed	MAAIF, NEMA, IDLG
	Monitor pesticide residues in water bodies	Environmental quality monitoring plan	Pesticide concentration in water resources	Levels of pesticides in water resources	MAAIF,NEMA, IDLG
Improper pesticide use	Train farmers and extension agents on judicious use of pesticides and other pest management options	Adoption of IPM techniques	Farmers and extension agents trained in IPM	Number of farmers and extension agents trained in IPM Training records Levels of pesticides in crop harvests and residues Pesticide application frequency and dose	MAAIF, NEMA, IDLG
	Monitor pesticide residues in soils, and crop harvest and residues	On-farm pesticide monitoring plan	On-farm pesticide monitoring plan developed and implemented	Pesticide levels in soil, and crop harvests and residues	MAAIF, NEMA, NARO, IDLG
Soil contamination and poisoning from improper disposal of pesticide containers	Properly dispose pesticide containers	Pesticide container cleaning and disposal plan	Pesticide container cleaning and disposal plan developed and implemented	Number of cases of pesticide poisoning through use of pesticide containers Number of empty pesticide containers collected for disposal; Number of farmers, extension staff, and pesticide sellers trained in proper disposal of pesticide containers	MAAIF, NEMA, NARO, IDLG
	Confirm status and integrity of pesticides supplied in the project area	All pesticides are to be in the original well-	Only approved and registered pesticides used under project	List of pesticides supplied and used Inspection records for pesticides at farm gate prior to use cases of counterfeit and expired pesticides supplied	MAAIF, NEMA, IDLG

Potential Impact	Impact Mitigation/ enhancement measure	Implementation tool	Expected results	Monitoring indicators	Implementing actors
		labeled pesticide containers prior to use Inspection of pesticides at farm gate prior to use	Banned pesticides avoided Fake and expired pesticides avoided Integrity of pesticide guaranteed at farm gate level		
Productio n losses from fall armyworm m and other crop pest outbreaks	Educate farmers and extension agents on best agronomic and silvicultural practices	Adoption of IPM techniques	Farmers and extension agents trained in IPM	Number of farmers and extension agents trained Training records Crop losses due to pests	MAAIF, IDLG
	Establish mechanisms for monitoring and reporting pest outbreaks	Early pest detection and alert system developed and implemented	Minimal crop losses due to pests	Records of pest outbreaks	MAAIF, IDLG
Post- harvest losses due to pests	Train farmers on post-harvest pest management	Adoption of IPM techniques	Farmers and extension agents trained in IPM of post-harvest pests	Number of farmers and extension agents trained Training records Levels of losses due to post-harvest pests	MAAIF, IDLG
	Ensure adequate and timely drying of harvested crops for storage	Drying and storage plan for crop harvests	Drying and storage plan developed and implemented	Number of farmers crop harvests according to plan Levels of losses due to post-harvest pests	MAAIF, IDLG
Reduction in natural enemy	Enhance and protect natural enemies	Natural enemy enhancement and protection plan	Natural enemy enhancement and protection plan developed and implemented	Levels of natural enemy populations upstream, around the dam and downstream Number of farmers aware of important natural enemies Levels of habitat restoration and/or Conservation with natural vegetation.	MAAIF, IDLG
General public health concerns	Monitor malaria cases in the project area	Hospital/clinical records of malaria cases in project area	Malaria cases before and during project implementation on established	Trend in malaria cases during project implementation	MAAIF, Ministry of Health, IDLG

Potential Impact	Impact Mitigation/ enhancement measure	Implementation tool	Expected results	Monitoring indicators	Implementing actors
	Provide mosquito treated bed nets to local communities	Malaria control plan	Minimal malaria cases under project	Frequency of reported malaria cases among farmers and communities	

8.5.10 Budgeting

The implementation of the Pest Management Plan (PMP) requires USD 174,000 as detailed in Table below.

Table 60: PMP Budget Estimates

Nº.	**Activity/Programme**	**Budget, USD**			
		Year 1	**Year 2**	**Year 3**	**Total**
1.0	**Capacity building**				
1.1	Orientation workshop on PMP and IPM for farmers, extension workers, agro-input dealers and upstream actors	5,000	3,000	2,000	10,000
1.2	Training of farmers and extension workers in IPM	10,000	8,000	4,000	22,000
1.3	Training IPM Action Committees	3,000	2,000	2,000	7,000
	Sub-total	**18,000**	**13,000**	**8,000**	**39,000**
2.0	**Support/advisory services**				
2.1	Registration of pesticide suppliers	2,000	1,000	1,000	4,000
2.2	Production and distribution of IPM field	5,000	3,000	2,000	10,000
2.3	Sensitization campaigns	4,000	2,000	1,000	7,000
2.4	Pest/vector surveillance and Monitoring	10,000	8,000	6,000	24,000
2.5	Laboratory analysis support	8,000	5,000	3,000	16,000
2.6	Emergency response support	1,000	1,000	1,000	3,000
	Sub-total	**30,000**	**20,000**	**14,000**	**64,000**
3.0	**Environmental Management**				
3.1	Pesticide monitoring in water bodies, soils and crop residues in and around the project area.	10,000	8,000	5,000	23,000
3.2	Collection of pesticide containers, and expired pesticides	5,000	4,000	3,000	12,000
3.3	Supply of bed nets for malaria control	2,000	2,000	1,000	5,000
	Sub-total	**17,000**	**14,000**	**9,000**	**40,000**
4.0	**Project management**				
4.1	PMP coordination	3,000	3,000	3,000	9,000
4.2	Monitoring and evaluation	5,000	5,000	3,000	13,000
S/no.	Activity/Programme	Budget, USD			
		Year 1	Year 2	Year 3	Total
4.3	Reviews and reporting	3,000	3,000	3,000	9,000
	Sub-total	**11,000**	**11,000**	**9,000**	**31,000**
	GRAND TOTAL	**76,000**	**58,000**	**40,000**	**174,000**

8.6 ENVIRONMENT AND SOCIAL INCIDENTS RESPONSE TOOLKIT

Despite significant efforts to manage environmental and social risks associated with projects, incidents may always occur. In this context is an accident or negative event resulting from failure on the part of the Developer or his agent to comply with Bank safeguards policies, or conditions that occur because of unexpected or unforeseen events during project implementation. During project implementation, incidents happenings can include; fatalities (small injuries to serious accidents), social impacts including labor influx, sexual exploitation and abuse/or other forms of gender-based violence (GBV), major environmental contamination, loss of biodiversity or critical habitat/s, loss of physical cultural resources, and loss of access to community resources such water sources, communal grazing lands or areas for collection of wood fuel amongst others.

Therefore, the Environment and Social Incidents Response Toolkit (ESIRT) is to assist the Ministry/Project implementers as well as World Bank Supervision Teams effectively to manage incidents that may occur during project implementation. It aims is to help organize and systematize the response to incidents, and to foster learning to help design approaches and measures to reduce similar incidents occurring in Bank financed projects. It is important to note that, ESIRT does not in itself, replace regular project supervision and reporting and is to help Project Management Teams at the Bank to effectively respond to incidents for any due action.

The ESIRT is comprised of the following six steps under the incident management and reporting process:

a. Step 1: Initial communication
b. Step 2: Classification
c. Step 3: Notification
d. Step 4: Investigation
e. Step 5: Response
f. Step 6: Follow-up

8.6.1 Incident Management and Reporting Process

The ESIRT establishes for the teams a clear pathway to alert the right people internally, according to the severity of the incident, and to help achieve an effective and appropriate response to an incident. It also highlights the process roles of the Bank and the project implementers in every step and provides guidance on the tools can be used in the management of incident. As stated, incident management and reporting process comprises six steps. Each step has clear sub-sets of activities.

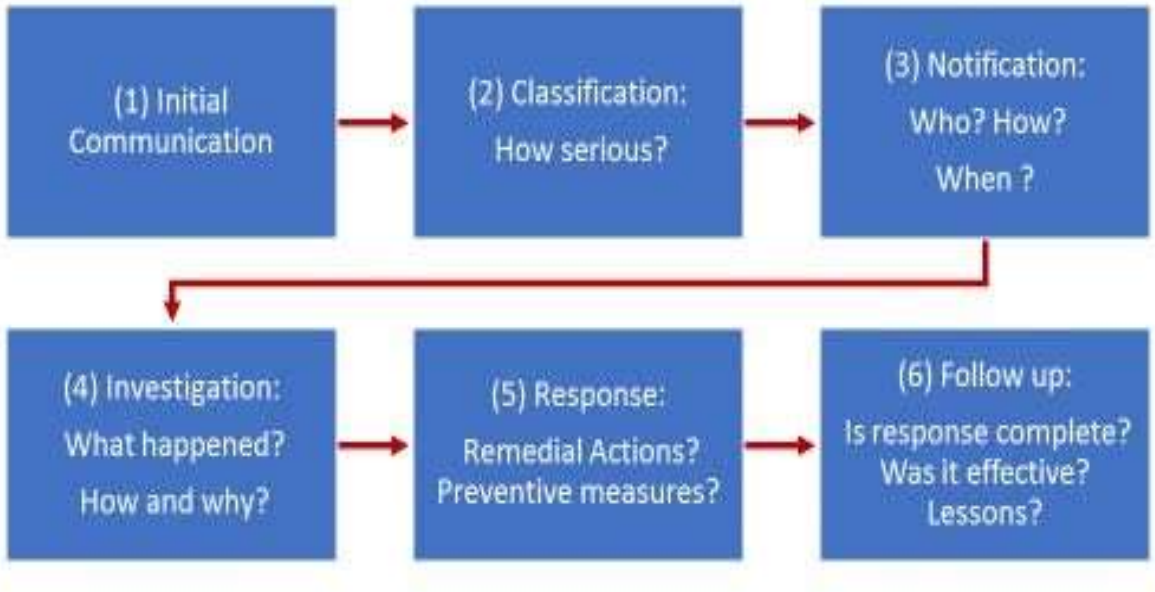


Figure 67: Management and Reporting Process[25]

8.6.1.1 *Step 1 –Initial Communication*

The following process are to be followed once the Task Team becomes aware of an incident at the project site.

Table 61: Initial Communication when an Incident Occurs

Action	Bank Role	Project Team Role
Incident Occurs	a. Ensure TTL, Environmental and Social (E&S) specialists, Regional Safeguards Coordinator (RSC), External and Corporate Relations (ECR) and E&S PMs are aware (including RSA/ESSA for projects under their oversight); advise Borrower if not already aware; b. launch the ESIRT process with an initial communication of the incident to relevant team members copying the project's Global Practice (GP) PM. c. If Bank staff or consultant is involved, the Task Team Leaders (TTL) should refer the matter to their PM and Human Resources.	a. Inform Bank; b. Inform appropriate authorities in compliance with local regulations; and c. Secure the safety of workers, public, and provide immediate care.

As soon as any member of the team member becomes aware of an alleged or actual incident, the team member should prepare an email to the TTL, E&S specialists, RSC, and E&S PMs (including RSA/ESSA for projects under their oversight), copying the project GP PM and ECR to alert them. This initial communication is sent prior to classifying the incident. The most crucial element of this communication is speed.

When an incident is reported, the following questions are a guide to the type of information to be gathered quickly by the Task Team:

a. What was the incident? What happened? To what or to whom?
b. Where and when did the incident occur?
c. What is the information source?

[25] *World Bank Safeguards Incident Response Toolkit (SIRT) 2018*

d. How did you find out about the incident?
e. Are the basic facts of the incident clear and uncontested, or are there conflicting versions?
f. What were the conditions or circumstances under which the incident occurred?
g. Is the incident still ongoing or is it contained?
h. Is loss of life or severe harm involved?
i. How serious was the incident? How is it being addressed? How is the Project/Ministry responding?
j. What, if any, additional follow up action is required, and what are the associated timelines?
k. Are any Bank staff involved in the incident?

Typically, the TTL, E&S Specialists or other staff in the country office will be the first to be aware of an incident, but it may be any member of the extended team, including ECR staff, Country Management Unit (CMU) staff, consultants, or others in country or at Headquarters (HQ).
Information about an incident may come as:

a. information discovered during a regular implementation support/supervision mission;
b. or a call;
c. or an email;
d. or through social media channels;
e. contact or letter from a community member or an injured party, the Borrower, a Works Contractor; or
f. a message from an NGO.

The information may also come formally via the Contractor's project reporting, the Project Grievance Redress Mechanism (GRM), or the Bank's Grievance Redress Service (GRS). The facts may be known or may consist of a vague allegation though ideally, the source of the information should not affect the response. What matters at the outset is for the Task Team to gather what information is available and appropriately share that information as early as possible. When Management is informed, the Bank can assess the seriousness of the incident, and decisions can be made on how the Bank should respond. Sometimes the Bank becomes aware of the incident several weeks or months after its occurrence. In such instances, the same procedures should be followed. If the initial fact-finding by the TTL determines that, the alleged incident did not occur, or that the incident was outside of the scope of the project, no further action beyond the initial communication will be needed.

8.6.1.2 *Step 2 – Classification - Assessing the severity of the incident*

Table 62: **Incident Classification**

Action	Bank Role	Ministry's Role
Classify Incident	TTL with support of E&S specialists classifies incident in terms of severity, (including RSA/ESSA for projects under their oversight), using the Incident Classification Guide.	Promptly provide information about the incident to the Bank as well as further details as they become available.

Classifying the incident will guide decisions as to who in the Bank should be informed, and what resources will be needed to understand the incident and support the project in addressing the underlying cause(s). Classification has to be done as rapidly as possible to enable the Bank respond to the incident within a reasonable time-frame. The incident should be classified within 48 hours of receipt of the information, within 24 hours will be preferable if possible. However, if it the incident cannot be fully classified due to missing information, then a preliminary classification should be provided and confirmed as details become available.

The classification is based on several factors, including the nature and scope of the incident, as well as the urgency in which a response may be required.

Levels of incident classification

There are three levels of classification of an incident i.e.: Indicative, Serious and Severe

Indicative: Is a relatively minor, small-scale, localized incident that negatively impacts a small geographical area or a small number of people and does not result in significant or irreparable harm to people or the environment, or failure to implement required E&S measures with limited immediate impacts. Although relatively minor and limited in its immediate effects, this type of incident may be indicative of wider-scale issues or underlying organizational weaknesses within a project that could lead to serious or severe incidents if left uncorrected. Criteria for determining when to escalate indicative incidents to Serious or Severe categories include recurrence of the incident on more than one occasion within a six-month period despite corrective actions, cumulative impacts of the incident, or inability or unwillingness of the Borrower to rectify the condition within an agreed timeframe.

The E&S specialist(s) and the TTL should consult with the RSC, E&S PMs or RSA/ESSA for guidance on upgrading the incident from Indicative to Serious and/or Severe. Indicative incidents can be investigated, evaluated, managed, and resolved by the Contractor or Borrower using existing, project-level resources and with the support of the Task Team. Indicative incidents can be resolved by the Task Team; however, it would be good practice for the TTL to inform the project GP PM and E&S PMs of indicative incidents, depending on the circumstances and country context.

Serious: An incident that caused or may cause significant harm to the environment, workers, communities, or natural or cultural resources, is complex or costly to reverse and may result in some level of lasting damage or injury; or failure to implement E&S measures with significant impacts or repeated non-compliance with E&S policies; or failure to remedy Indicative non- compliance that may potentially cause significant impacts.

Examples of serious incidents may include:

a. injuries to workers that require off-site medical attention,
b. exploitation or abuse of vulnerable groups,
c. consistent lack of Occupational Health and Safety (OHS) plans in a civil works project, and
d. Large-scale deforestation.

Serious incidents require an urgent response and could pose a significant reputational risk for the Bank. There are situations where evaluating and resolving incidents may require additional Bank support in the form of resources or specialists from outside the Task Team, such as when a Contractor or the Developer does not have the internal capacity to, is reluctant to, or refuses to investigate or resolve incidents.

Severe: Incidents that caused or may cause great harm to individuals or the environment, or present significant reputational risks that could hamper the Bank's ability to operate in a country or region. The Borrower's inability or unwillingness to remedy situations that could result in serious or severe harm would be a factor in classification. A severe incident is complex and expensive to remedy (if possible), and is likely irreversible. A fatality is automatically classified as severe, as are incidents of major environmental contamination, forced or child labor, abuses of community members by project security forces or other project workers (including GBV) violent community protests a project, kidnapping, and trafficking in endangered species. Severe incidents' responses will often exceed the Task Team's resources. Resolving the incident will require the notification and engagement of the Bank's Senior Management. A severe incident may cause the Bank's Senior Management to suspend civil works or the relevant component, depending on the

circumstances and in close consultation with the Legal Department for the specific grounds under which contractual remedies can be invoked.

Box 1: Incident Classification Guide

Indicative
a. Relatively minor and small-scale localized incident that negatively impacts a small geographical areas or b. small number of people c. Does not result in significant or irreparable harm d. Failure to implement agreed E&S measures with limited immediate impacts.
Serious
a. An incident that caused or may potentially cause significant harm to the environment, workers, communities/ or natural or cultural resources. b. Failure to implement E&S measures with significant impacts or repeated non-compliance with E&S policies incidents. c. Failure to remedy Indicative non-compliance that may potentially cause significant impacts. d. Is complex and/or costly to reverse. e. May result in some level of lasting damage or injury. f. Requires an urgent response. g. Could pose a significant reputational risk for the Bank.
Severe
a. Any fatality. b. Incidents that caused or may cause great harm to the environment, workers, communities, or natural or cultural resources. c. Failure to remedy serious non-compliance that may potentially cause significant impacts that cannot be Reversed. d. Failure to remedy Serious non-compliance that may potentially cause severe impacts is complex and/or costly to reverse. e. May result in high levels of lasting damage or injury. f. Requires an urgent and immediate response. g. Any fatality h. Incidents that caused or may cause great harm to the environment, workers, communities, or natural or cultural resources. i. Failure to remedy serious non-compliance that may potentially cause severe impacts is complex and/or costly to reverse. j. May result in high levels of lasting damage or injury. k. Requires an urgent and immediate response l. Poses a significant reputational risk to the Bank.

Classification of an incident is a two-stage process:

a. Preliminary classification
b. Confirmed and contextual classification

If documented circumstances and relevant discussions confirm that the incident is ***Indicative, Serious*****, or *Severe,*** then a one to two-page Incident Report should be prepared and issued by the TTL with the support of the project's E&S specialist(s) within 48 hours of receipt of the information, in accordance with the Incident Notification Guide. Clearance of the Incident Report by the RSA/ESSA or PM ENV and/or PM Social is not required, but it would be prudent to have the project GP PM review it and RSA/ESSA and Environment and Social PMs should be copied.

The **Incident Report** should be 1–2 pages and include, at a minimum, the following information:

a. Country, Name of Project, Project Number, Name of TTL and E&S specialists assigned to the team;
b. Preliminary classification of the incident;
c. What was the incident?
d. What happened? To what or to whom?
e. Where and when did the incident occur?
f. When and how did we find out about it?
g. Are the basic facts of the incident clear and uncontested, or are there conflicting versions?
h. What are those versions?
i. What were the conditions or circumstances under which the incident occurred (if known at this stage?
j. Is the incident still ongoing or is it contained?
k. Is loss of life or severe harm involved?
l. Is the Borrower aware of the incident? What is their response to date?
m. What measures have been or are being implemented by the Borrower/Contractor?

8.6.1.3 *Step 3 – Notification – Who needs to know about the incident?*

Table 63: Notification of Incident

Action	Bank Role	MWE /Project Role
Notify Bank management according to severity of the incident	TTL prepares Incident Report (see Step 2) within 48 hours) and circulates it as per the Incident Notification Guide.	a. The Ministry reports the incident to the Bank. The requirement to report should be defined in the Project's Operating Manual. b. As required by the contracts, the Contractor should report incidents to MWE who should ensure that reporting obligations on compliance with ESHS requirements are to be incorporated into works and other relevant contracts. c. Developer should monitor the reports for incidents. Follow national requirements for incident reporting and management.
Notify MWE Developer about the Bank's process for addressing the incident	Communicate with MWE regarding investigation requirements	Respond to Bank communications regarding investigation

Ensuring that the appropriate level of Management is aware of and understands the issues surrounding any given incident is critical to the Bank's response, including securing the resources necessary to address the situation and issues arising. Once an incident has been classified, the Task Team Leader and team will follow the Incident Notification Guide shown in the figure below to inform relevant parties within the Bank. The email notification should include the Incident Report prepared under Step 2. Task teams should not under any circumstances share information about incidents with anyone outside of authorized representatives of the Bank, co-financiers (if present) and the Borrower, unless directed to do so by Bank Management.

The E&S Specialists or any other team member should communicate with the RSC and E&S PMs (including RSA/ESSA for projects under their oversight) as needed, to enlist their advice and support on timely and appropriate reporting of incidents. For severe incidents, the RVP, OPCS VP and SD VP (or appropriate network VP) will decide whether other senior management should be informed. The notification email should be sent to the OPCS VP, SD VP (or appropriate network VP) and RVP within 24 hours of the decision to classify the incident as severe.

Where the Bank becomes aware of an incident independent of MWE reporting, it will be critical for the TTL to open lines of communication with the Developer to make sure that:

a. MWE is fully aware of the incident, understands the severity of the situation, and has or will undertake response measures as needed, and
b. b) if needed, that the Ministry/Project ensures that an appropriate investigation is conducted (see step 4).

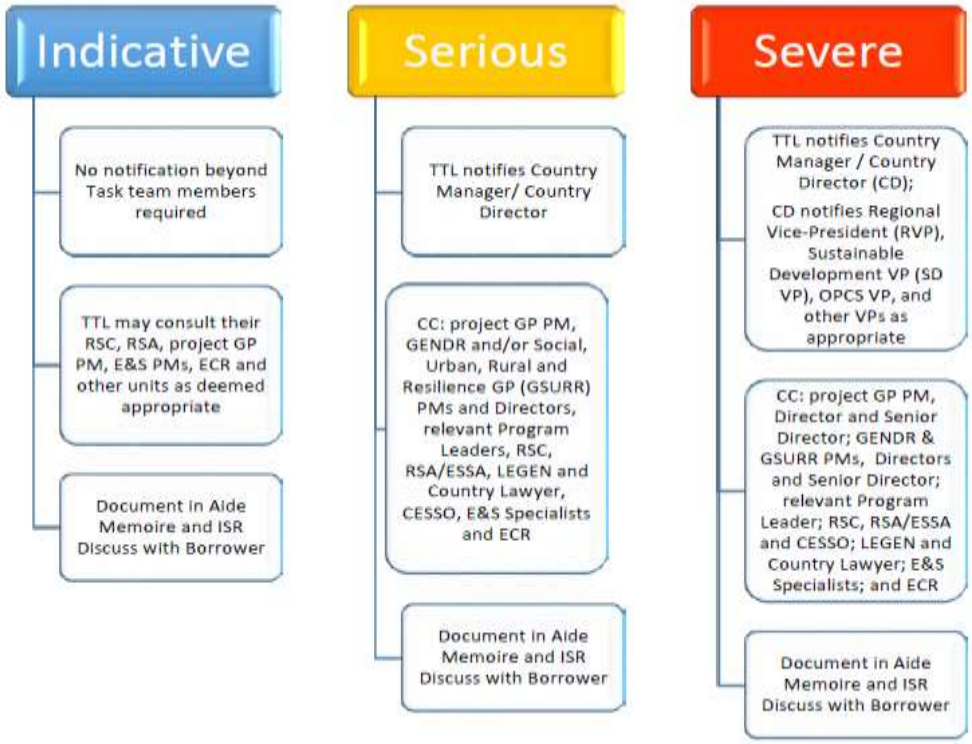


Figure 68: Incident Notification Guide[26]

8.6.1.4 *Step 4 – Investigation – What happened?*

It is important to note that MWE or the contractor will be responsible for carrying out investigations of incidents while the Bank will be responsible for ensuring that, appropriate investigations are conducted as needed.

Table 64: Investigation Aspects under Step 2

Action	Bank Role	MWE Role
Understand facts on the ground	a. For severe incidents or in cases where information is lacking, the Bank (task team) fields a	Promptly provide information requested by the Bank and facilitate incident site visits.

[26] *WB Environment and Social Incident Response Toolkit for World Bank Staff*

	preliminary fact-finding mission with necessary expertise for the specific incident. b. Due consideration should be given to safety issues prior to fielding a mission, following country office clearance and Bank security practices. Input from the CMU and country office team will be important in understanding the event and country context, including interactions with the Borrower.	
Ministry's Root Cause Analysis	a. Support MWE to carry out an RCA. An RCA or equivalent analysis to be conducted by the Borrower (or Contractor of the Borrower) would be required for all serious and severe incidents. b. If needed, provide ToRs for consultant(s) to be retained by the Borrower and/or the Contractor to undertake an RCA. c. Receive and review the RCA and discuss with the Borrower their plans or actions taken and any further required remedial measures based on the findings of the RCA.	a. Undertake or cause the Contractor to undertake a RCA to understand and document the root cause(s) of the incident. b. The RCA should be based on existing country processes, where available. It is only in the absence of systems or weak experience that consultants (national or international) may need to be recruited by the Contractor to undertake the RCA. c. MWE or contractor usually is responsible for funding the preparation of the RCA. d. An RCA should be completed as soon as possible, ideally within 10 days of the incident. e. The findings of the RCA should be used by the Contractor and Borrower to develop measures to be included in a Safeguards Corrective Action Plan (SCAP). f. Share the RCA with the Bank and provide complete information about the incident; facilitate additional site visit(s) if needed.
Discussions with MWE	The Bank team discusses the findings of the RCA with the Government team including the PIU staff and senior officials of the relevant ministries including Finance.	

Complete Bank documentation	a. Aide Memoire reflecting findings of RCA, supervision missions and other information related to the incident. b. An interim Integrated Status and Results Report (ISR) may be prepared after investigation of an incident. It can be updated by the TTL after the matter has been resolved.	n/a

MWE is to ensure that, incidents are investigated to determine what happened and why, so that processes and measures can be put in place to avoid reoccurrences and so that appropriate remedies are applied. The Task Team may support MWE in ensuring an appropriate RCA is conducted by the contractor or the implementing agency, for example by identifying experts and providing sample ToRs.

The extent of the investigation (RCA) carried out by MWE should be proportionate to the severity of the incident. The RCA findings would be used by the Contractor and/or MWE to develop a Safeguards Corrective Action Plan (SCAP) as a complement to existing project safeguards instruments. In severe incidents, or where there is relatively limited or contradictory information and/or capacity available, the Task Team may need to carry out a preliminary fact-finding mission with appropriate expertise to assess the severity of the incident and help the Developer to determine the next steps. The preliminary mission may conclude that no further investigation is necessary.

However, in most serious or severe incidents, the Ministry should ensure that an RCA or equivalent is conducted. Funding of the RCA is the responsibility of the Ministry or the contractor. While an RCA is not mandatory, especially in cases where information is clear and readily available, it is essential that the Ministry and the Bank understand the underlying cause(s) of the incident to agree on measures to prevent recurrences. It is important that the Bank is swift in its response to clarify what happened, how and why, to advise and guide the Borrower in the analysis of root causes, and identification of appropriate mitigation measures.

8.6.1.5 *Step 5: Response*

Table 65: Response Matrix

Action	Bank Role	MWE Role
Develop Safeguards Corrective Action Plan (SCAP)	Support the Ministry to design and agree on an appropriate SCAP. Example of the types of measures that may be included in a SCAP are in *Annex 5.*	Design the SCAP and discuss with the Bank, including actions, responsibilities and timelines for implementation, and a MWE/PIU monitoring program

For Indicative incidents, documentation of the incident and MWE/Contractor response may be the only action required. For serious and severe incidents, where an RCA or other investigation is to conducted by the MWE/Contractor, the Bank and the Borrower agree on a set of measures as appropriate to address the root causes to help prevent any recurrence of the incident. The measures determined as appropriate by the Task Team should be captured in a Safeguards/[Standards] Corrective Action Plan (SCAP).

Example of a Ministry's Action Plan Following a Project Related Fatality

a. Monthly site meetings attended by PIU and covering safeguards updates.
b. The supervision consultant monthly progress report will provide details on ESMP implementation status as well as accidents and grievances.
c. PIU will send to the Bank monthly progress reports within 1 week of receipt from the supervision consultants.
d. Accidents and grievance logbooks are to be placed in all project construction sites.
e. Any severe injury (requiring off-site medical care) or fatality incident shall be reported to the Bank within 48 hours with basic information and a detailed incident report including the following will be submitted as soon as possible, ideally within 10 working days:
    i. root cause analysis, and
    ii. corrective action plan on:
        - ❖ Immediate mitigation measures in case of continuing danger (e.g. fencing, signboard, guards)
        - ❖ Compensation to the affected family based on a clear rationale.
        - ❖ Risk assessment and correct application of ESHS management procedures, and
        - ❖ Medium- and long-term mitigation measures including enhancement of safety measures, audits, and additional training.
f. Progress monitoring and reporting

The SCAP specifies the actions, responsibilities, and timelines to be implemented by the Ministry. The Ministry is to be responsible for implementation of the SCAP. The SCAP may include, for example, Project actions such as the design or upgrading and implementation of Environmental, Social, Health and Safety management systems, processes and training to support consistent safe performance, compensation for injuries or a fatality, pollution prevention and control remedies to be implemented over a few weeks or a multi-year period, according to the specific project circumstances. The SCAP might include requirements for community consultation, compensation payments relating to a resettlement program, or remediation of farmland damaged by contractors. The SCAP also may include or request Bank actions such as provision of technical assistance by the Bank, and/or loan restructuring, including additional financing, if necessary.

If the Bank considers that, the SCAP measures will not be effective, or where the Ministry has shown itself unwilling or unable to put corrective measures in place, the Bank may consider a decision to fully or partially suspend disbursements until such actions are in place, or, in some circumstances, may consider cancelling all or part of the project following the suspension. Ordinarily, such considerations should be referred by the TTL, in close coordination with the Legal Department, to Senior Management for determination of the appropriate Bank action.

8.6.1.6 *Step 6 – Follow up*

Once the SCAP has been prepared, the Bank is responsible for fulfilling any Bank actions outlined in the document and for monitoring the Project implementation of the SCAP. In addition, the TTL should complete an ISR and update the E&S risk rating and overall project risk rating, as appropriate. Finally, the TTL is responsible for preparing an After-Action memo for the Country Director. The After-Action memo is prepared once the SCAP has begun implementation and is cc'd to Bank management that were notified about the incident.

8.6.2 Responses and Remedies

Illustrative examples of responses and remedies available for different types of incidents prior to and during project implementation are set out in this section for guidance of task teams and management.

Health and Safety Examples

Examples of **potential responses** by the Bank and the Ministry to worker occupational health and safety incidents of varying severity.

Table 66: Potential Responses to Health & Safety Incidents of Different Severity

Health & Safety Issues	Potential MWE actions	Potential Bank actions
Severe: Any fatality, permanent disability, or outbreak of life threatening project-related communicable disease.	a. Improve barriers, alarms, signage, training, work processes and procedures. b. Address gaps in competence, expertise, and numbers of project OHS team and/or project management team. c. Ensure that Health and Safety risk assessment has been conducted and appropriate management plans are put in place, implemented and enforced.	a. Allocate additional senior environment and social development staff for site visits and guidance to team and Borrower. b. Require the Ministry to conduct spot checks of project sites or retain independent consultant for this purpose. c. Document in ISR (internal and/or public disclosure to be determined by TTL). d. Suspension of disbursements for the project works until specified remedial actions are implemented.
Serious: Major (non-fatal) accident or near miss.	a. Review relevant sections of health and safety risk assessment for adequacy. b. Improve barriers, signage, training, working methods. c. Enforce use of personal protective equipment. d. Complement project OHS or management team/Project Implementation Unit (PIU) with adequate competencies and expertise. e. Repeated observations of dangerous behavior or clear violations of safety protocols.	a. Report in ISR. b. Potential increase in project E&S risk classification. c. Review/verify the Borrower / Contractor RCA. d. Require MWE to retain independent OHS consultant to do spot checks of project sites. e. Amend risk rating of project in IRT as appropriate OHS Spot checks of project sites.
Indicative: Repeated failure to respond to notification to remedy safeguards issues (e.g., safety kit incomplete or not present).	a. Remedy the outstanding issues. b. Repeat awareness training and messaging. c. Improve work process or procedure.	a. Report in ISR. b. The TTL highlights issue in Aide Memoire transmittal letter to Borrower. c. Increase frequency of missions and site visits with OHS focus.

8.6.3 E&S Examples

Examples of **potential responses** by the Bank and the Borrower to worker occupational health and safety incidents of varying severity are presented in table below.

Table 67: Potential Responses to Environmental and Social Incidents of Different Severity

Environmental/Social	Potential Ministry/Project Actions	Potential Bank responses
Severe (Social): Forced resettlement without due process or compensation	a. Identify evicted people and provide compensation and support for identification of new housing/other facilities as relevant, in line with Bank safeguards requirements, including appropriate consultation. b. Clear instructions to project implementer(s) with respect to resettlement process, including sanctions for non-compliance with NEMA /Bank requirements; and c. Implement all measures identified in SCAP	a. Allocate additional senior safeguards staff for site visits and guidance to Borrower. b. Require Borrower to retain independent consultant to do frequent and regular spot checks of project sites and, if necessary, to do capacity building work with the Borrower team. c. Written notification to Borrower requiring certain actions to be taken/follow up. d. Inclusion in ISR. e. Monitor SCAP implementation. f. Partial or total suspension of disbursements for project component or civil works (see
Severe (Environmental): Poaching or trafficking in endangered species	a. Engage with law enforcement to halt the poaching. b. Anti-poaching training for project workers and community members to make clear incentives and penalties. c. Include sanctions for inappropriate worker behavior, including poaching, in Contractors' contracts. d. Develop an alternative livelihoods program for communities around protected areas.	a. Allocate additional senior safeguards staff for site visits and guidance to the Ministry. b. Require the Ministry to retain independent consultant to do frequent and regular spot checks of project sites and, if necessary, to do capacity building work with the Borrower team. c. Written notification to the Ministry requiring certain actions to be taken/follow up. d. Inclusion in ISR. e. Partial or total suspension of disbursements for project component or civil works (see Bank 2015 Instructions for suspension and cancellation).
Serious (Social): GRM not functioning.	a. Review GRM and address issues (upgrade, improve access, publicize GRM in communities, and better organize response process. b. Train PIU staff on GRM management and monitoring. c. Assign responsibility to qualified PIU staff.	a. Allocate additional senior safeguards staff for site visits and guidance to Borrower. b. Written notification to the Ministry requiring certain actions to be taken/follow up. c. Inclusion in ISR

Indicative (Environmental): Hydrocarbon or chemical spills with low to medium environmental impact.	a. Improve work process or procedures as necessary. b. Train project staff on spills and associated procedures. c. Increase on-site monitoring if necessary. d. Review contract language for appropriate sanctions language.	a. Increase frequency of monitoring until remedies are completed and risks of repeated incidents are reduced to acceptable levels Report in ISR. b. TTL highlights issue in Aide Memoire transmittal memo.

8.7 MANAGEMENT AND INSTITUTIONAL FRAMEWORK FOR THE IMPLEMENTATION OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.7.1 Institutional arrangements

8.7.1.1 *Ministry's' level coordination mechanism*

The implementation of proposed irrigation project will be done under the overall ICRP implying that, its implementation will be guided under the broader Multi-sectoral Steering Committee**.** A multi-sectoral Project Steering Committee (PSC) will be set up to provide high-level operational and policy guidance to ensure that the Project component and its activities are implemented as planned. The PSC will be chaired by the Permanent Secretary of MWE and will comprise Permanent Secretaries (or their representatives at high technical level) of the Ministries and stakeholder statutory agencies as well as Isingiro district. The PSC will meet quarterly to review work plans, budgets and progress of implementation, and ensure adherence to relevant Government policies and strategies during implementation of the Project.

8.7.1.2 *The Project Support Team - PST*

The Permanent Secretary of the MWE will be the Accounting Officer for all Project's funds. MWE through its Water for Production Department will have overall responsibility for Components 1 in which the project falls. As the Lead implementing agency for the Project, MWE will be responsible for planning, procurement, budgeting, Financial Management (FM), Monitoring and Evaluation (M&E), and reporting, among others. A Project Support Team (PST) will be constituted within the Water for Production Department of MWE will oversee selected activities, in addition to key hired technical specialists (procurement, accountant, environmental, social, and M&E specialists). The PST will also be responsible for preparing plans, developing budgets, monitoring results, compiling reports, and disseminating outputs and outcomes.

8.7.1.3 *Roles of other ministries in the project*

The role of other stakeholder ministries can be summed up as follows:

a. *Ministry of Trade, Industry and Co-operatives (MoTIC)* will be responsible amongst others, for developing, coordinating, regulating, promoting and facilitating domestic and external trade with particular emphasis on value addition drives in the project as well as export promotion and access to regional and international markets for the commodities under this project;
b. *Ministry of Gender, Labor and Social Development (MoGLSD) w*ill be key with respect to the supervision of implementation of livelihood restoration programs as well as providing guidance in mitigation of risks of sexual exploitation and abuse, and employment of children. The Ministry will be key in aspects of HIV/AIDS mainstreaming, occupational health and safety as well as gender issues in the project; and
c. *Ministry of Agriculture Animal Industry and Fisheries (MAAIF)* will be one of the key implementing partner of the Project's activities that fall within its mandate especially implementation processes

for the agri-business development component, which is important for value addition on crop products from the project.

8.7.1.4 *Role of National Environment Management Authority-NEMA*

National Environment Management Authority (NEMA) will review and approve the Project ESIA and any subsequent Environmental Assessments that will be prepared for project infrastructures not covered under this study as well as monitoring records submitted in accordance with the National Environment Act and its respective Regulations.

8.7.1.5 *Isingiro District local government administration*

The Isingiro District on its part, will designate a Project Support Officer (PSO) amongst its staff, who will head the District Technical Support Team to support the implementation and technical supervision of the Project, including sensitization of farmers, training, and monitoring and evaluation in the respective local governments. In addition, the DEO and CDO are all key in the implementation of the project with respect to observance of environmental and social safeguards during project implementation.

8.7.1.6 *Role of the contractors*

Contractors hired to undertake project civil works shall be required to develop their own Contractor's ESMP which will include among others; the project ESIA approved by both NEMA and World Bank, Health and Safety Management Plan, Traffic Management Plan, Waste Management Plan, Construction Camp and Equipment Yard Management Plan, Labor Force Management Plan which shall also include Code of Conduct for Workers, Construction Materials Acquisition Due Diligence Procedure, etc. The Contractors shall hire the following key staff to undertake project implementation: Project Manager, Environmental Specialist, Sociologist, Health and Safety Officer.

8.7.1.7 *Role of the supervising consultant*

The Engineer/Supervising Consultant will be responsible for the technical and contractual implementation of the works to be undertaken. The responsibilities of the Engineer/Supervising Consultant will include:

a. Ensure that, the requirements as set out in the ESMP and any other conditions stipulated by the relevant Authorities are implemented;
b. Assist the Contractor in ensuring that the conditions for ESMP are adhered to and promptly issue instructions to the Contractor;
c. Support the Contractor in the preparation of monthly site meetings and that, such meetings have their agenda embody aspects of environmental and social compliance; and
d. Review and approve work method statements by the contractor to ensure environmental and social safeguards are fully addressed in works to be undertaken.

8.7.1.8 *Project implementation support*

The World Bank task teams will support implementation of the Project. The type and level of support will be guided by the scope of the Project, the activities in each component, relative risks involved, and the institutional capacity of the government counterpart. Implementation support by the World Bank will consist of at least semiannual full supervision missions, short technical missions, meetings and audio conferences between the World Bank and relevant implementing agencies. Field visits to key construction and rehabilitation sites will be conducted during supervision missions. Additional support will also be provided by the World Bank's procurement, FM, and safeguards specialists, most of whom will be based in the Kampala office, on Project contracts and overall compliance with safeguard and fiduciary requirements. In addition, the Project will support international technical experts to advise the GoU and to provide technical support to the implementing agencies as they develop ToRs, design and feasibility studies. This Implementation Support Plan is indicative and may be revised during Project

implementation based on emerging Project challenges and field conditions.

8.7.2 CAPACITY BUILDING AND TRAINING

Despite there being fairly adequate staff to handle environmental and social safeguards in the Ministry of late, there is need to augment that potential through tailor-made trainings and provision of equipment-based support in-terms of computers and transport. The plan for this can be summarized as follows:

Table 68: Summary of capacity building for safeguards management

Item	Agency	Safeguards Capacity Needs	Target staff	Costs (USD)
01.	MWE	a. Concept of environmental and social safeguards; b. Project management c. Mainstreaming environmental and social safeguards in to development projects; d. Reporting on environmental and social safeguards. e. Preparation of Catchment Management Plans (CMPs).	a. Steering Committee b. Heads of Departments-MWE c. PST	35,000
02.	MWE	a. Provision of equipment and transport to facilitate supervision and monitoring. b. Tailor made trainings in areas of climate change mainstreaming. c. Environmental and social safeguards management. d. Gender mainstreaming into development process. e. Environmental Auditing; f. Mainstreaming cross-cutting themes into bid documentations. g. Environmental Monitoring and Reporting. h. Occupational Health and Safety management	d. Environment Officers in MWE e. Water Zonal Managers	265,000
03.	MAAIF	a. Provision of equipment and transport to facilitate supervision and monitoring. b. Tailor made trainings in areas of climate change mainstreaming. c. Environmental and social safeguards management. d. Environmental Monitoring and Reporting. e. Occupational Health and Safety management	Safeguards staff in Dept of Agricultural Infrastructure, Mechanization and water for agricultural production.	85,000

04.	NFA	a. Climate Change mitigation b. Participate in Development/preparation and implementation of catchment management plans (CMPs). c. Environmental and social safeguards management.	Project coordinators	45,000
05.	Isingiro District	α. Sensitization and mobilization on matters of environmental safeguards in the project; b. Participate in Development/preparation and implementation of catchment management plans (CMPs). χ. Equipment in terms of computers; δ. Motor cycles; ε. Fuel; ϕ. Field allowances	Districts Development Committees (DDCs) District Environment Officers.	150,000
06.	MWE, MAAIF, NFA, NEMA, MGLSD, MLHUD, Isingiro DLG, Consultant/s, Contractor/s.	Cummulative Impact Assessment (CIA) and Management (onsite training during mobilization under Construction phase)	• Steering Committee, • Heads of Departments, • Safeguards Staff, • District Technical Planning Committee, • Consultant/s & Contractor/s.	Part of Construction cost during Mobilization stage by the Contractor
				680,000

There is need to build the safeguards capacity in terms of;

a. Work based support to enhance timely reporting, and tailor-made training to orientate the sociologists to have basics of environmental and social safeguards monitoring and reporting,
b. Development and implementation of ESIAs, and Management and reporting on environmental and social aspects in projects,
c. HIV/AIDS, GBV/SEA, and gender mainstreaming in projects and reporting on such themes, Management of involuntary processes in projects,
d. employment and labor engagement processes, and
e. GRM issues in the projects and their resolution mechanisms.

8.8 IMPLEMENTATION SCHEDULE

Not only is the ESMP a reference source in the management of environmental and social impacts of the project, it is also a guide for the rolling-out of various steps and procedures that are necessary for its sound implementation. The following provides an overview of the key logical steps necessary to ensure the efficiency of the ESMP, avoid doubling efforts and ensuring that information is shared among all key parties to the project. Site preparation activities may start in late 2018 or early 2019. These preparation activities include training of staff, the construction of campsites and other temporary buildings, the establishment of water and power supply systems as well as communication facilities on project site and office.

The construction phase is to be characterized, with regards to the ESMP, by the clearing of the Right of Way and the compensation, restoration of livelihoods and rehabilitation of revenue-generating properties and land. Also, and in parallel with these activities, is the implementation of the ESMP and its monitoring by the lead Ministries, Local Government and NEMA. It is crucial that responsibilities for the supervision and

monitoring of the ESMP are clearly defined by developer. It is recommended that the supervision and verification of the implementation of the ESMP is done through periodical audits, preferably by a third party (Supervising Engineer/Consultant). The cost of audits is included in the overall ESMP implementation costs.

In the first year of the operation phase, some measures of the ESMP will still be implemented (such as some wildlife monitoring plans). More generally, however, the first year of operation will be devoted to measuring the performance of the project against the environmental and social indicators listed above.

Table 69: RAP and ESMP Implementation Schedule

Activities		Year of 2018												Year of 2019												Year of 2020											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Phase 1: Preparatory activities (7 months)																																					
1.1	Modification of project design	X	X	X	X	X																															
1.2	Physical verification of modifications made on line routing	X	X	X	X	X																															
1.3	Stakeholders consultation on modifications made and verification if there is planned infrastructures under ROW		X	X																																	
1.4	Adjustment of the project/line routing after feedback from the stakeholders			X	X	X																															
1.5	Preparation of Preliminary RAP	X	X	X	X																																
1.6	Preparation of Draft ESIA and ESMP	X	X	X																																	
1.7	Preparation of final ESIA and ESMP			X	X																																
	Approval Final ESIA and ESMP					X	X	X																													
Phase 2: Census and final RAP activities (6 months)																																					
2.1	Update of RAP assets and socioeconomic survey of PAP and affected communities							X	X	X	X	X	X																								
2.2	Preparation of final RAP report							X	X	X	X	X	X																								
Phase 3: RAP Implementation (6 Months)																																					
3.0	Compensation for affected property											X	X	X	X	X	X																				
Phase 4: Construction (24 Months)																																					
4.0	Construction of project structure and installations																	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase 5: Operation																																					
5.0	Project operation																																				

8.9 ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME

The general approach to effect monitoring is to compare the pre- and post- project situations, measuring relevant environmental impacts against baseline conditions. Baseline data already in place establishes a reference basis for managing environmental impacts throughout the life of the project. The monitoring process will be instituted to check progress and the resultant effects on the environment arising from infrastructure works of the project.

The Contractor and Developer (MWE) will undertake the necessary monitoring measures for short- and long-term monitoring programme respectively. However, during monitoring, close links should be maintained with other relevant lead agencies and the Local Governments. Much of the work during the construction stage can form part of the contractor's routine inspection activities that will be included in the construction contract. The planned mitigation measures should, therefore, be included on the list of contractual items. These should be planned and checked against their effectiveness in reducing the negative impacts/or enhancing the benefits identified in this report.

8.8.1 Issues to Be Monitored in the Project Phases

The monitoring agenda will focus on the following:

a. Supervision of all excavation works including irrigation channels;
b. Implementation and effectiveness of soil erosion and sedimentation control measures;
c. Restoration and regeneration of opened up areas such as campsite, borrow pits and others;
d. The fate of solid waste disposal and other wastes after they have left the site;
e. HIV/AIDS sensitization and awareness campaign programme;
f. Number of rehabilitated and graded sites at quarries, borrow pits and steep slopes;
g. Resettlement of involuntary displaced people;
h. Compensation for land, crops, trees, build up structures and others;
i. The livelihood of displaced persons;
j. Relocation of water sources;
k. Management and application of agro-pesticides;
l. Water quality downstream;
m. Water flow dynamics;
n. Aquatic ecology and biodiversity both upstream and downstream of the project facilities; and
o. The occupational health and safety of workforce.

8.8.2 Monitoring Reports

It is recommended that the Contractor to develop an environmental summary report that will form part of the monthly progress reporting that is issued to the Employer. The environment sections would detail the following:

a. Number of employees on site.
b. Any significant changes in the approved Contractor's ESMP (significant changes include but are not limited to the number and type of Contractor's equipment, changes in the construction programme and mitigation measures);
c. Details of environmental incidents and issues;
d. A summary of any grievances lodged against the project;
e. A brief summary of the number and type of any medical conditions or treatments dispensed by the medical centre;
f. The planned environmental and social works to be undertaken in the next two months; and
g. The results of any sampling or monitoring that occurred.

8.8.3 Compliance Audits

Overall, the Contractor will have the lead role in monitoring to ensure that its various environmental and social obligations are met, and will have to fulfil the requirement for an environmental and social audit, not less than 12 nor more than 36 months after project completion or commencement of operations respectively in line with the Uganda National Environment Act Cap 153 and the Audit Regulations of 2006. Therefore, the Contractor will have to recruit a registered Environment Practitioner to carry out an independent annual audit of the project.

The Contractor is also aware that NEMA has a monitoring and compliance team and Environmental Inspectors under NEMA's Department of Monitoring and Compliance, who are expected to ensure compliance by the Contractor with permits, standards, regulations and all approval conditions. If the Contractor fails to put in place mitigation measures as set out in this ESMP, NEMA's Environmental Inspectors may issue an improvement notice and/or commence criminal or civil proceedings against the Contractor as laid out in the National Environment Act Cap 135. Therefore, the Contractor shall endeavour to strictly follow this CESMP.

8.10 DECOMMISSIONING

All project structures not required during the operation phase of the Project, including workshop structures and workers' camps, will be demolished and the debris disposed of in a legally acceptable manner. Any waste on the project site at the end of the Construction period will be properly disposed of. The Project site will be reinstated to as near as possible its original state. Landscaping and grassing of degraded areas will be done.

Thus the positive impact will be the recreation of the habitats for small fauna through revegetation. Besides, some socioeconomic benefits will also be attained by the facilities' host communities. In fact, workers will be required to undertake the activities involved in dismantling of the project infrastructure. Activities will involve sensitization of the relevant stakeholders about the activity, restoration of the areas, ensuring that the dismantled construction material is gathered and removed etc. The activities will require different levels of skills ranging from skilled, semi-skilled and unskilled. The impact will be temporary over a short duration; it will benefit a few people from the project area who will provide mainly unskilled labor and few from outside the project area who will provide semi-skilled and skilled labor. The likelihood of the impact is occurring is probable.

9 CONCLUSIONS AND RECOMMENDATIONS

From this study, we conclude that there is no environmental or social obstacle to the implementation of the Kabuyanda project, and we recommend that the proposed mitigation/enhancement measures to the identified impacts be implemented.

The project is well placed to address persistent water scarcity which very much affect agricultural production in Kabuyanda and Isingiro District at large because of its reliance on rainfalls only. The construction of the irrigation scheme will guarantee all year crop production thus ensuring household income for the local population in keeping with aspiration of Agriculture Sector Strategic Plan 2015/16-2019/2020. The project can likely have a number of environmental, social and economic benefits that are geared towards improving the livelihoods of the households in terms of infrastructure development, stimulating economic development, creation of employment opportunities, enhanced service delivery. The project area is prone to effect of weather and climatic variability i.e. drought and flooding as such, the planned intervention will help augment agricultural productivity in the area through instituting sustainable means of water management through water harvesting and irrigation. Such measures will guarantee food security at household levels and improved incomes.

Despite these benefits, the project will likely have some negative environmental and social impacts and the ESIA has identified some mitigation measures which, when implemented, are expected to address such concerns. The anticipated impacts can be mitigated and are associated with construction and operations of the dams. Through proactive monitoring, such impacts will be addressed while keeping the project on a sustainable path in line with NEMA Approval Conditions and the requirements in its financing agreements.

Notably, the project will result in the inundation of 100 ha (1.1%) of Rwoho CFR, a plantation development forest, largely degraded and partially restored with non-indigenous species (Pinus caribaea, Pinus ocarpa and Eucalyptus sp.), and classified as a modified non-critical habitat. This area includes 15.1 ha under the CDM programme (for which the ERPA terminates on December 31, 2019, thus ahead of the commencement of works for the Kabuyanda irrigation project), as well as private developers through concessionary agreements with NFA, and unplanted area under NFA (Natural Belt & Nursery). As such, inundation of this CFR will have a negative environmental and socio-economic dimension. Therefore, the project will: (i) compensate the private tree planters on Rwoho CFR as per RAP; (ii) mitigate impact of the loss of trees by financing reforestation of 500 ha with indigenous tree species within the Rwoho CFR, in collaboration with NFA; and (iii) support the preparation and implementation of Catchment Management Plans (CMP), in collaboration with- among others - communities, NGOs and NFA.

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APPENDICES

Appendix 1: NEMA Approval Letter for ESIA Terms of Reference

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

NEMA House
Plot 17,19 & 21, Jinja Road.
P.O.Box 22255, Kampala, UGANDA.

Tel: 256-414- 251064, 251065, 251068
342758, 342759, 342717
Fax: 256-414-257521 / 232680
E-mail: info@nemaug.org
Website: www.nemaug.org

NEMA/ 4.5

20th October, 2016

The Regional coordinator,
Nile equatorial lakes subsidiary action program (NELSAP),
Nile Basin Initiative,
P.O. Box 6759,
KIGALI, RWANDA

Tel: +256 (0) 788 307334

RE: SCOPING REPORT AND TERMS OF REFERENCE PERTAINING PROPOSED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND RESETTLEMENT ACTION PLAN STUDIES FOR BAYANDA IRRIGATION AND WATERSHED MANAGEMENT PROJECT IN ISINGIRO DISTRICT.

Reference is hereby made to the Scoping Report and Terms of Reference (TORs) for carrying out an environmental and social impact assessment (ESIA) and Resettlement Action Plan (RAP) Studies for the above mentioned proposed project, which you submitted to this Authority on 3rd October, 2016 for the review and consideration for approval. This is Authority has finalized the review and grants formal **APPROVAL** of the said Scoping Report and TOR.

Please, note that approval of the scoping report and TOR DOES NOT give you permission to start implementing any of the proposed project activities. In addition, you are advised to ensure that the key aspects highlighted below are considered during the conduct of the ESIA and preparation of the environmental impact statement.

(i) Ensure that the ESIA practitioners (consultants) and the team leader registered by this Authority are contracted to undertake the environmental impact study and, the names of the said practitioners included in the ESIA report.

(ii) Provide **correct citation of details of the location of the areas** that will accommodate the respective project components/infrastructure and auxiliary support structures, preferably in tabulated format-that is, *by name of Village, Cell, Parish, Ward, Sub-County-whichever administrative unit is applicable.*

Page 1 of 3

(iii) Carry out comprehensive stakeholder consultations involving, among others, the Directorate of Water Resources Management, Isingiro District Local Government and the concerned local communities in the target project areas that will accommodate the project infrastructure and the related activities, and other Authorities responsible for provision and management of other public utilities (road network, amongst others) respectively and, ensure that the stakeholder **views/ concerns well-documented and included in ESSIA report.**

(iv) Provide comprehensive **baseline information and data** relating particularly to the project areas that will accommodate the project components and characteristic of the immediate environs, other existing facilities, regulated sensitive and fragile areas, settlements, as well as the **water source(s) targeted to support the project.**

(i) Provide **coloured location / google maps** that are clear and well-labelled (preferably each covering A-4 or A-3 paper size) that are clear, well-labelled and legible and showing the project areas, a set of **GPS coordinates and a set of colored photographs** showing the current state of some of the critical section of the project area(s).

(ii) Provide **comprehensive narratives on the proposed project components and activities,** including support structures/ Facilities and size of the workforce.

(iii) Provide **comprehensive analyses of alternatives/ options**, in terms of location of potential project site(s), project design, and technology, among others aspects.

(iv) Ensure that the concerns and list of identified persons or entities that are likely to be affected by the proposed project, including the types of compensation that will be accorded to the project affected entities, **are well presented in the ESIA Report.**

(v) Carry out analyses of soil, water, and air quality, as well as level of noise relating to the project-affected areas, and **append the baseline soil, water, and air quality and noise levels analyses results** to the EIA report.

(vi) Describe the different **kinds of machinery/ equipment and methods of irrigation** that will be used.

(vii) Give detailed description of the **various potential pollution sources**, including the method of handling, containing and disposing the different kinds of waste (excavated soil, amongst others) and measures for controlling pollution of air, water and land in the project area and its environs.

(viii) Include in the EIA report information on sources and details of location where different raw materials (water, construction materials) are to be extracted from to cater for various project components and activities.

(ix) Ensure that **detailed evaluation of the potential environmental impacts**, risks and residual impacts associated with the proposed project component and activities is provided.

(x) Provide **detailed mitigation and environmental management and monitoring plans** (*preferably in table matrix format*) are provided, to cater for the environmental impacts associated with the proposed project activities. Also include the roles of developer and relevant lead agencies in monitoring the performances of the proposed project.

(xi) Consider any other critical environmental aspects / concerns which may have not been initially foreseen during the preparation of the scoping report and TOR, and include an evaluation of such concerns/ environmental aspects in the ESIA report.

(xii) Append to the ESIA report **authentic copies of land acquisition and ownership documents.**

(xiii) Indicate the actual total project (investment) cost including copy of certificate of valuation issued by certified professional value/quantity surveyor.

This is therefore, to issue formal **APPROVAL** of the Scoping Report and Terms of Reference, and to recommend that you proceed with carrying out of the ESIA for the proposed project.

(NOTE: THIS IS NOT A CERTIFICATE OF APPROVAL.)

We look forward to your cooperation and receipt of copies of a comprehensive ESIA report, for our further consideration.

Margaret Aanyu
FOR: EXECUTIVE DIRECTOR

c.c The Director,
Directorate of Water Resources Management,
ENTEBBE.

Appendix 2: NFA Letter on License

10/20 Spring Road
P.O. Box 70863
Kampala, Uganda
www.nfa.org.ug

NFA
National Forestry Authority

Tel: 031-264 035/6
0414-360400
Fax: 041 230369
info@nfa.org.ug

NFA/C/01/19

14th February 2019

The Permanent Secretary
Ministry of Water and Environment
KAMPALA.

COMMENTS ON THE DRAFT ESIA REPORT FOR KABUYANDA IRRIGATION SCHEME UNDER THE PROPOSED IRRIGIGATION DEVELOPMENT AND CLIMATE RESILIENT PROJECT (P163836)

Reference is made to yours ref: wsd/165/258/01 dated 12th February 2019 on the above subject.

Rwoho Central Forest Reserve is a production forest planted with pine and eucalyptus species without strict nature reserve. Therefore there are no zones within the forest.

Under Section 38 of the National Forestry and Tree Planting Act 2003, "A person intending to carry out a project or activity which may, or is likely to have a significant impact on a forest reserve shall undertake an Environmental Impact Assessment" (EIA). Upon completion and approval of the said EIA, National Forestry Authority (NFA) will license the developer with user rights of the site with terms and conditions applicable.

The accompanying infrastructure including camp, offices, new access road and the quarry site will be located outside the Central Forest Reserve.

Tom .O. Okello
EXECUTIVE DIRECTOR

Cc: Chairman/NFA Board of Directors
Cc: Director Policy and Planning/NFA

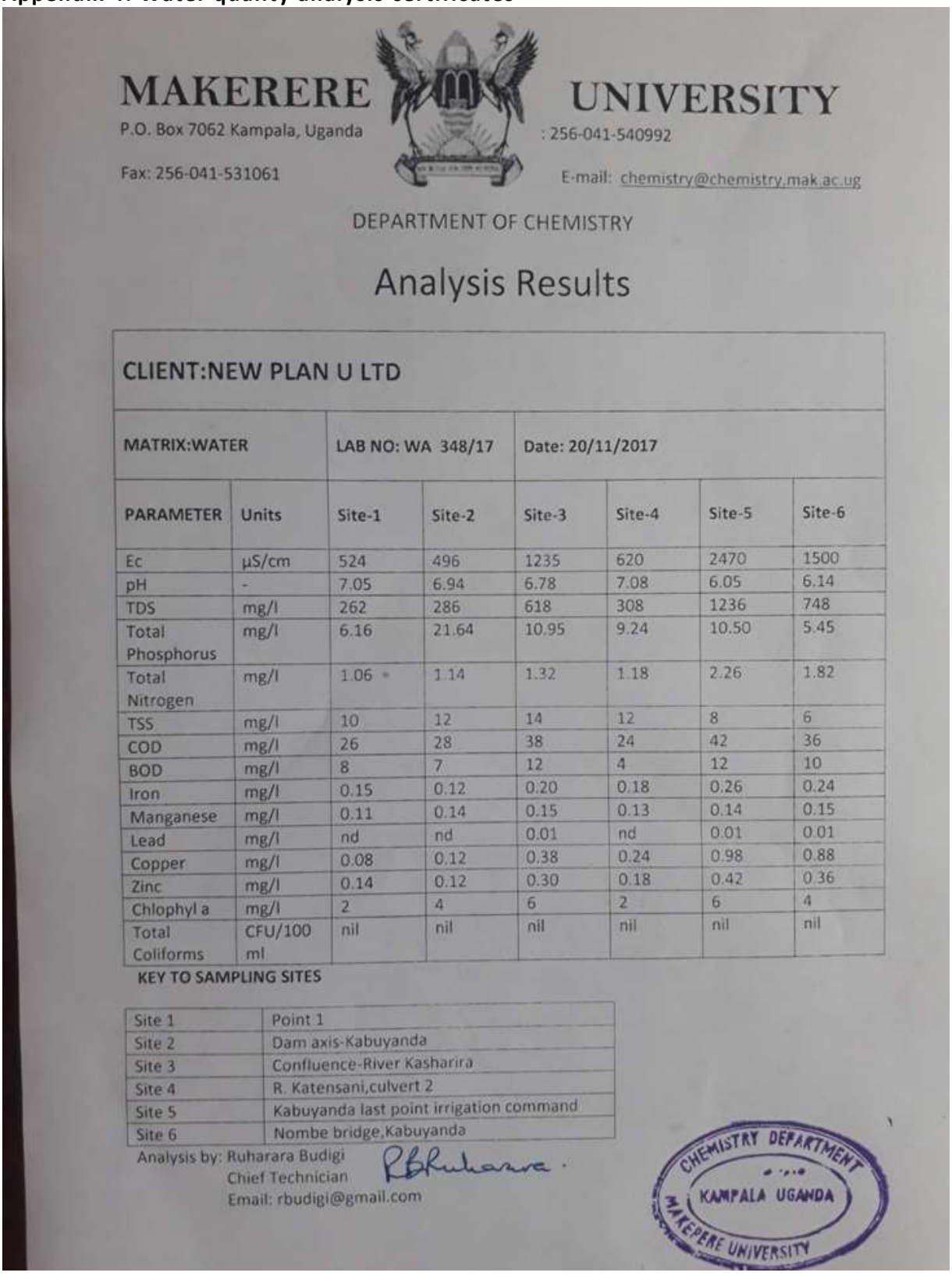
Appendix 3: Plant Species List

No.	Scientific Name	Conservation Status IUCN
1	*Acacia hockii*	Not yet Assessed
2	*Acacia nilotica*	Not yet Assessed
3	*Acanthus eminens*	Not yet Assessed
4	*Agaratum conzyzoides*	Not yet Assessed
5	*Albizia coriaria*	Not yet Assessed
6	*Aleurites moluccana*	Not yet Assessed
7	*Amaranthus cruentus*	Not yet Assessed
8	*Amaranthus dubius*	Not yet Assessed
9	*Antiaris toxicaria*	Not yet Assessed
10	*Arachis hypogaea*	Not yet Assessed
11	*Araucaria cunninghamiana*	Not yet Assessed
12	*Artocarpous heterophyllus*	Not yet Assessed
13	*Bambusa vulgaris*	Not yet Assessed
14	*Biddens pilosa*	Not yet Assessed
15	*Brassica oleracea*	Data Deficient
16	*Calliandra haematocephala*	Not yet Assessed
17	*Canna indica*	Not yet Assessed
18	*Carica papaya*	Data Deficient
19	*Casuarina cunninghamiana*	Not yet Assessed
20	*chrysopogon aciculatus*	Not yet Assessed
21	*Coffea Arabica*	Not yet Assessed
22	*Coffea canephora*	Not yet Assessed
23	*Colocasia esculenta*	Least Concern
24	*Combretum molle*	Least Concern
25	*Commelina banghensis*	Not yet Assessed
26	*Commiphora sp*	
27	*Cucurbita pepo*	Least Concern
28	*Cuppressus lustinanica*	Not yet Assessed
29	*Cynodon dactylon*	Not yet Assessed
30	*Cyperus latifolius*	Least Concern
31	*Cyperus rotundus*	Least Concern
32	*Cypreus alternifolius*	
33	*Cypreus Papyrus*	Data deficient

No.	Scientific Name	Conservation Status IUCN
34	*Cythea sp*	Not yet Assessed
35	*Daucus carota*	Not yet Assessed
36	*Draceana fragrans*	Not yet Assessed
37	*Egarostis curva*	Least Concern
38	*Eleusine coracana*	Least Concern
39	*Eleusine indica*	Not yet Assessed
40	*Elymus repens*	Not yet Assessed
41	*Erythrina abyssinica*	Not yet Assessed
42	*Eucalyptus grandis*	Leat Concern
43	*Euphorbia hirta*	Not yet Assessed
44	*Euphorbia tirucalli*	Not yet Assessed
45	*Ficus natalensis*	Not yet Assessed
46	*Ficus natalensis*	Not yet Assessed
47	*Grevillea robusta*	Not yet Assessed
48	*Grewia mollis*	Not yet Assessed
49	*Hibiscus rosa-sinensis*	Not yet Assessed
50	*Ipomea batatas*	Not yet Assessed
51	*Jatropha curcas*	Not yet Assessed
52	*Lantana camara*	Not yet Assessed
53	*Leonotis mollissima*	Data deficient
54	*Maesopsis eminii*	Not yet Assessed
55	*Mangifera indica*	Not yet Assessed
56	*Manihot esculenta*	Not yet Assessed
57	*Markharmia lutea*	Not yet Assessed
58	*Melia azadirachta*	Not yet Assessed
59	*Moringa mollifera*	Not yet Assessed
60	*Musa acuminate*	Not yet Assessed
61	*Musa balbisiana*	Not yet Assessed
62	*ocimum gratissimum*	Not yet Assessed
63	*Parinari curatellifolia*	Not yet Assessed
64	*Passiflora edulis*	Least Concern
65	*Persia Americana*	Not yet Assessed
66	*Phaseolus vulgaris*	Least Concern
67	*Phragmites australis*	Not yet Assessed
68	*Physalis angulate*	Not yet Assessed
69	*Pinus caribaea*	Not yet Assessed
70	*Pithecellobium dulce*	Not yet Assessed

No.	Scientific Name	Conservation Status IUCN
71	*Pittosporum viridiflorum*	Not yet Assessed
72	*Plumeria rubra*	Not yet Assessed
73	*Polugonum coccineum*	Least Concern
74	*Psidium guajava*	Not yet Assessed
75	*Ricinus cummunis*	Not yet Assessed
76	*Sapium ellipticum*	Not yet Assessed
77	*Senna alata*	Not yet Assessed
78	*Senna didymobotrya*	Not yet Assessed
79	*Senna spectabilis*	Least Concern
80	*Solanum incanum*	Not yet Assessed
81	*Solanum melongena*	Not yet Assessed
82	*Solanum tubersosum*	Least Concern
83	*Sorghum bicolor*	Not yet Assessed
84	*Sorghum vulgare*	Not yet Assessed
85	*Sterculia appendiculata*	Not yet Assessed
86	*Thevetia peruviana*	Not yet Assessed
87	*Typha capensis*	Not yet Assessed
88	*Typha latifolia*	Not yet Assessed
89	*Vernonia amygdalina*	Not yet Assessed
90	*Vossia cuspidate*	Not yet Assessed
91	*Zea mays*	Least Concern

Appendix 4: Water quality analysis certificates



MAKERERE UNIVERSITY

P.O. Box 7062 Kampala, Uganda : 256-041-540992

Fax: 256-041-531061 E-mail: chemistry@chemistry.mak.ac.ug

DEPARTMENT OF CHEMISTRY

Analysis Results

CLIENT:NEW PLAN U LTD

MATRIX:WATER		LAB NO: WA 348/17		Date: 20/11/2017			
PARAMETER	Units	Site-1	Site-2	Site-3	Site-4	Site-5	Site-6
Ec	µS/cm	524	496	1235	620	2470	1500
pH	-	7.05	6.94	6.78	7.08	6.05	6.14
TDS	mg/l	262	286	618	308	1236	748
Total Phosphorus	mg/l	6.16	21.64	10.95	9.24	10.50	5.45
Total Nitrogen	mg/l	1.06	1.14	1.32	1.18	2.26	1.82
TSS	mg/l	10	12	14	12	8	6
COD	mg/l	26	28	38	24	42	36
BOD	mg/l	8	7	12	4	12	10
Iron	mg/l	0.15	0.12	0.20	0.18	0.26	0.24
Manganese	mg/l	0.11	0.14	0.15	0.13	0.14	0.15
Lead	mg/l	nd	nd	0.01	nd	0.01	0.01
Copper	mg/l	0.08	0.12	0.38	0.24	0.98	0.88
Zinc	mg/l	0.14	0.12	0.30	0.18	0.42	0.36
Chlophyl a	mg/l	2	4	6	2	6	4
Total Coliforms	CFU/100 ml	nil	nil	nil	nil	nil	nil

KEY TO SAMPLING SITES

Site 1	Point 1
Site 2	Dam axis-Kabuyanda
Site 3	Confluence-River Kasharira
Site 4	R. Katensani,culvert 2
Site 5	Kabuyanda last point irrigation command
Site 6	Nombe bridge,Kabuyanda

Analysis by: Ruharara Budigi
Chief Technician
Email: rbudigi@gmail.com

CHEMISTRY DEPARTMENT KAMPALA UGANDA MAKERERE UNIVERSITY

MAKERERE UNIVERSITY
P.O Box 7062 Kampala Uganda
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Fax: +256 414 531061

COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF ZOOLOGY, ENTOMOLOGY & FISHERIES SCIENCES

28th Nov. 2017

SITES OF PHYTOPLANKTON OF THE SAMPLES

1. SITE 1: Upstream culvet Kabuyanda.
2. SITE 2: Dam axis.
3. SITE 3: Confluence: R iver Kashanira.
4. SITE 4: River Kateseni Culvet 2.
5. SITE 5: Lower end of irrigation area.
6. SITE 6: Nombe Bridge

NUMBER OF PHYTOPLANKTON IN THE WATER SAMPLES
(Number of organisms per litre)

TAXON	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
BLUE – GREEN						
Microcystis(sp)	18	42	13	22	20	14
Calothrix (sp)	06	04	16	-	-	18
Anabaena (sp)	02	23	02	-	12	06
Tollypothrix (sp)	-	36	-	02	24	13
Oscillation (sp)	-	-	24	08	-	-
GREENS						
Desmidiun (sp)	04	12	-	18	-	30
Microspora (sp)	06	18	-	26	-	04
Spirogyra (sp)	14	47	-	-	32	19
Cladophora (sp)	08	-	17	05	-	08
Zygnema (sp)	-	26	12	04	14	10
Urothrix (sp)	-	02	15	-	06	-
Oedogonium (sp)	-	-	04	06	-	34

Appendix 5: Minutes of first stage stakeholder engagements

District	Isingiro District Local Government
Venue	Chief Administrative Officer's office
Date	3rd November 2017
	10:00:00hrs

ATTENDANCE

NAME	DESIGNATION
Donata Eswilu	Chief Administrative Officer (CAO)
Francis Rwezahara	Water Officer
Patrick Tumwesigye	District Agricultural Officer
Benson Rweogosha Bashaga	APO, Kagera
Francois Xavier Ndekezi	Project Manager, Kagera
Boaz Niwamanya	EIA /DFPP
Prof. John Okedi	Team Leader
Moses Dakasi	Sociologist
Jerome K. Mugondi	Flora Ecologist
Emmanuel Bwenge	District Natural Resource Officer

Min No 1 Mr. Eswilu Donata, ushered in the Consultants and Kagera River Basin Management officials to his office.

Min No 2 Mr. Niwamanya Boaz, the District Focal Point Person informed the Chief Administrative Officer and colleagues that team before them were officials from Kagera River Basin Management Project (Nile Basin Initiative /NELSAP) and the Consultants from NEWPLAN Limited. He informed them that their purpose of visit was to consult the local leaders and members of the community and to familiarize themselves with the project. Thereafter, the Consultants and Kagera River Basin Management officials introduced themselves.

Min No 3 Ndekezi Francois Xavier, informed the meeting that the purpose of the visit was to introduce the consultants. He informed the officials that Kagera River Basin contracted NEWPLAN Limited to finalize the Environmental Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) studies for the proposed Kabuyanda Water Resources Development Project. He described the different project components. He informed the officials that the consultants has five months to undertake and complete the assignment. He also informed the officials of the plan workshop in November 2017.

Min No 4 Presentation of the project by Prof. Okedi John

He described the purpose for the visit of Kabuyanda. He said there was a team of consultants which include the experts on social issues, plants and vegetation, wild animals, soils, hydrology, animals, fish and water quality, birds, insects, socioeconomic, pests and aquatic animals.

The consultant team will stay on the site to carry out baseline studies.

He emphasized that the project would benefit the local communities and therefore there was need for the communities to be properly informed and to get involved in all activities of the project from inception to the implementation. During the baseline studies the consultant would be working 24 hrs a day.

There would therefore need security and guides to help them more particularly at night, the consultants would need local coordinator to assist in setting up community consultation in the project area.

He informed the CAO that they would be stakeholder workshop to discuss the interim in planned for the first of December 2017

Min No 4 Issues raised by the Chief Administrative Officer (CAO)

The CAO wanted all the district heads of department's including environmental officer, District Community Development Officer, natural resources officer, production and marketing officer, water officer, agriculture officer, fisheries officer, to be involved in all activities. He advised land issues to be addressed in the studies including compensation.
He also said the study should be holistic and involve all stakeholders.
The project should be implemented quickly to avoid speculators.
He recommended the need for adequate planning and sensitization of communities.

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Venue	Natural Resource office
Date	3rd November 2017
Time	11:00hrs

ATTENDANCE

NAME	DESIGNATION
Abdu Kamoga	Environmental Officer
Ayorekire Fredere	District Forest Officer
Patrick Tumwesigye	District Agricultural Officer
Benson Rweogosha Bashaga	APO, Kagera
Francois Xavier Ndekezi	Project Manager, Kagera
Maj. Topher Agaba	Operation Wealth Creation
Prof. John Okedi	Team Leader
Moses Dakasi	Sociologist
Jerome K. Mugondi	Flora Ecologist
Herbert Muhangi	Residential District Commissioner

Min No 1 Mr. Niwamanya Boaz, the District Focal Point Person informed his colleagues that team before them were officials from Kagera River Basin Management Project (Nile Basin Initiative /NELSAP) and the Consultants from NEWPLAN Limited. He informed them that their purpose of visit was to consult the local leaders and members of the community and to familiarize themselves with the project.
Min No 2 Ndekezi Francois Xavier, informed the meeting that the purpose of the visit was to introduce the consultants. He informed the officials that Kagera River Basin contracted NEWPLAN Limited to finalize the Environmental Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) studies for the proposed Kabuyanda Water Resources Development Project. He described the different project components. He informed the officials that the consultants have five months to undertake and complete the assignment. He also informed the officials of the plan workshop in November 2017.
Min No 3 Prof. Okedi John informed the officials that we were an advanced team. He informed the officials that the team will be looking at the baselines conditions of the project area. He also informed the meeting that the consultant will produce an ESIA and RAP report including an Environmental Social Management Plan and it will be the responsibility of the District to implement the ESMP to protect the environment and ecosystem and to ensure

the dam does not burst. He also informed the meeting that the consultant has six months to produce the final ESIA and RAP report. He informed the meeting that the beneficiary of this project is the Government of Uganda (GoU) and is funded by the World Bank. He informed the meeting that the project area is composed of two sections, upstream area (dam) and the downstream area which is a command area for irrigation. Furthermore, he informed the officials that the consultants will traverse the entire project area such as the valley area, hills of Kabuyanda, and the forest area. He also informed the meeting that studies will be conducted during the day and night. He informed the meeting that it is a requirement by World Bank to conduct an ESIA study for the projects of this nature.

The officials were informed that the project will provide electricity, water for domestic use and water for irrigation mainly to the residents Kabuyanda. The officiaals were informed that when the dam is constructed, it will help in controlling floods. The officials were informed that NELSAP will organize a workshop in December 2017 whereby the consultant will present the key findings on the social and environmental aspects.

Min No 4 Issues raised by District Natural Resource Officer and District Environment Officer

Mr.Ayorekire requested the NEWPLAN Limited and Kagera River Basin to share with them the Interim report with different heads of departments in the District to enable them study the document in preparation for the planned workshop in December 2017.

There was degradation in the project area

The project should ensure issues of conservation of the ecosystem of the project area

He decried heavy loss of soil fertility and therefore the need to have a good conservation plan

He requested the consultant to develop an agroforestry plan for the project area.

He advised to have green belt in the project area

He recommended zoning of the area to have green belts where agriculture activities would be restricted. He requested viable alternatives programs for example in fruit tree agriculture.

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Venue	Residential District Commissioner's office
Date	3rd November 2017
Time	13:00hrs

ATTENDANCE

NAME	**DESIGNATION**
Muhangi Herbert	Residential District Commissioner (RDC)
Benson Rweogosha Bashaga	APO, Kagera
Francois Xavier Ndekezi	Project Manager, Kagera
Maj. Topher Agaba	Operation Wealth Creation
Prof. John Okedi	Team Leader
Moses Dakasi	Sociologist
Jerome K. Mugondi	Flora Ecologist

Min No 1 Mr. Niwamanya Boaz, the District Focal Point Person informed his colleagues that team before them were officials from Kagera River Basin Management Project (Nile Basin Initiative /NELSAP) and the Consultants from NEWPLAN Limited. He informed them that their purpose of visit was to consult the local leaders and members of the community and to familiarize themselves with the project.

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Min No 3 Prof. Okedi John informed the officials that we were an advanced team. He informed the officials that the team will be looking at the baselines conditions of the project area. He also informed the meeting that the consultant will produce an ESIA and RAP report including an Environmental Social Management Plan and it will be the responsibility of the District to implement the ESMP to protect the environment and ecosystem and to ensure the dam does not burst. He also informed the meeting that the consultant has six months to produce the final ESIA and RAP report. He informed the meeting that the beneficiary of this project is the Government of Uganda (GoU) and is funded by the World Bank. He informed the meeting that the project area is composed of two sections, upstream area (dam) and the downstream area which is a command area for irrigation. Furthermore, he informed the officials that the consultants will traverse the entire project area such as the valley area, hills of Kabuyanda, and the forest area. He also informed the meeting that studies will be conducted during the day and night. He informed the meeting that it is a requirement by World Bank to conduct an ESIA study for the projects of this nature. The officials were informed that the project will provide electricity, water for domestic use and water for irrigation mainly to the residents Kabuyanda. The officiaals were informed that when the dam is constructed, it will help in controlling floods. The officials were informed that NELSAP will organize a workshop in December 2017 whereby the consultant will present the key findings on the social and environmental aspects.

Min No 4 Mr. Muhangi Herbert pledged full support to the project. He pledged to provide security to the teams and personnel likely to work at night.

Min No 5 The RDC asked the consultants to fully involve the local leaders and the community of Kabuyanda Town Council and Kabuyanda Sub County in all project activities.

Min No 6 The RDC also assured the consultant that the people of Kabuyanda are friendly and they won't reject the project.

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Sub County /Town Council	Kabuyanda Sub County
Venue	St. James Kigabagaba Church of Uganda
Date	3rd November 2017
Time	17:00hrs

ATTENDANCE

NAME	**DESIGNATION**
Prof. John Okedi	Team Leader
Moses Dakasi	Sociologist
Jerome K. Mugondi	Flora Ecologist
Arinaitwe Silver	Community Development Officer
Mutaremusha Justus	OC CID, Kabuyanda

Gunobire Tadeo	
Kahimbise Jack	
Ndyomugyennyi John	Councilor
Kyomukama Sam	Councilor
Murangira	
Nkwase Francis	Lay Leader
Annet Nkwase	
Tibwabwine B	Councilor LC III
More Zoro	Publicity
Nkwase Loice	Lay Leader
Kakwenza J	Elder
Julius Rwabujere	Gombolola Internal Security Officer
Akankwasa G.W	Sub CountynChief
Kedress Ategyereize	Vice Chairperson LC III
Akankwasa Hope	C.M
Odeta Siyajavi	Councilor

Min No 1 Mr. Niwamanya Boaz, the District Focal Point Person informed his colleagues that team before them were officials from Kagera River Basin Management Project (Nile Basin Initiative/NELSAP) and the Consultants from NEWPLAN Limited. He informed them that their purpose of visit was to consult the local leaders and members of the community and to familiarize themselves with the project.

Min No 2 Prof. Okedi John informed the officials that we were an advanced team. He informed the officials that the team will be looking at the baselines conditions of the project area. He also informed the meeting that the consultant will produce an ESIA and RAP report including an Environmental Social Management Plan and it will be the responsibility of the District to implement the ESMP to protect the environment and ecosystem and to ensure the dam does not burst. He also informed the meeting that the consultant has six months to produce the final ESIA and RAP report. He informed the meeting that the beneficiary of this project is the Government of Uganda (GoU) and is funded by the World Bank. He informed the meeting that the project area is composed of two sections, upstream area (dam) and the downstream area which is a command area for irrigation. Furthermore, he informed the officials that the consultants will traverse the entire project area such as the valley area, hills of Kabuyanda, and the forest area. He also informed the meeting that studies will be conducted during the day and night. He informed the meeting that it is a requirement by World Bank to conduct an ESIA study for the projects of this nature.

The officials were informed that the project will provide electricity, water for domestic use and water for irrigation mainly to the residents Kabuyanda. The officials were informed that when the dam is constructed, it will help in controlling floods. The officials were informed that NELSAP will organize a workshop in December 2017 whereby the consultant will present the key findings on the social and environmental aspects.

ISSUE/CONCERN RAISED	**RESPONSE**
The local leaders informed the consultant that project area floods and about three people were killed by the floods.	The local authorities were informed that the dam will help will controlling floods.

The local leaders were afraid that the water will be diverted to peoples' gardens and as a result the people will deny the developer access to the project site.	
The local authorities informed the consultant that sometimes the water from the river and streams turns yellow in color which makes it difficult for the farmers to irrigate their crops.	
The local leaders also informed the consultant that the people in the area are experiencing famine due to severe drought.	
The consultant was informed that there is forest reserve in the project area.	

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Sub County /Town Council	Kabuyanda Sub County
Village	Kisyoro
Venue	Kisyoro Church of Uganda
Date	4th November 2017
Time	15:00hrs
Attendance list attached	

Min No 1 The meeting commenced with a prayer and thereafter self-introductions of all the members present.

Min No 2 The chairman local council one welcomed the consultant and the people present for the meeting. The chairman asked the people to embrace the project since the project is meant benefit the people of Kabuyanda.

Min No 3 The speaker pledged full support to the project. He also asked the people to support the project since they are the direct beneficiaries. The speaker informed the consultants that the community has been expecting the project to commence some time ago.

Min No 4 The GISO pledged to provide security to the consultants while conducting various activities in the project area.

Min No 5 Prof. Okedi John informed the officials that we were an advanced team. He informed the officials that the team will be looking at the baselines conditions of the project area. He also informed the meeting that the consultant will produce an ESIA and RAP report including an Environmental Social Management Plan and it will be the responsibility of the District to implement the ESMP to protect the environment and ecosystem and to ensure the dam does not burst. He also informed the meeting that the consultant has six months to produce the final ESIA and RAP report. He informed the meeting that the beneficiary of this project is the Government of Uganda (GoU) and is funded by the World Bank. He informed the meeting that the project area is composed of two sections, upstream area (dam) and the downstream area which is a command area for irrigation. Furthermore, he informed the officials that the consultants will traverse the entire project area such as the valley area, hills of Kabuyanda, and the forest area. He also informed the meeting that studies will be conducted during the day and night. He informed the meeting that it is a requirement by World Bank to conduct an ESIA study for the projects of this nature.

The officials were informed that the project will provide electricity, water for domestic use and water for irrigation mainly to the residents Kabuyanda. The officials were informed that when the dam is constructed, it will help in controlling floods. The officials were informed that NELSAP will organize a workshop in December 2017 whereby the consultant will present the key findings on the social and environmental aspects.

ISSUES RAISED /CONCERNS	RESPONSES
Will the people from the uphill benefit from the project?	The project has diverse benefits. Some people will benefit by use of water for irrigation, use of water for domestic and hydroelectric that will be generated.
Will the project compensate people for the crops that will be damaged during the construction?	Properties that will be damaged during project construction will be valued and paid
Will the people pay for the water?	The people intending to use the water for different purposes will pay for it.
Will the youth benefit from the project?	The youth will benefit from the project by using water for irrigation, use water for domestic use, and directly be employed in the project.

There being no any other business to discuss the meeting was closed by prayer.

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Sub County /Town Council	Kabuyanda Town Council
Village	Iryango
Venue	Local Council one residence
Date	4th November 2017
Time	17:00hrs
Attendance list attached	

Min No 1 The meeting was opened with a prayer led by the area reverend.

Min No 2 The chairman local council one welcomed the consultant and the people present for the meeting. The chairman asked people to pay attention and ask questions thereafter.

Min No 3 The area councilor welcomed the consultants and the people. He informed the community that the project will benefit the people of Kabuyanda mainly through the use of water for irrigation. The councilor also asked the people to support the project.

Min No 4 Prof. Okedi John informed the officials that we were an advanced team. He informed the officials that the team will be looking at the baselines conditions of the project area. He also informed the meeting that the consultant will produce an ESIA and RAP report including an Environmental Social Management Plan and it will be the responsibility of the District to implement the ESMP to protect the environment and ecosystem and to ensure the dam does not burst. He also informed the meeting that the consultant has six months to produce the final ESIA and RAP report. He informed the meeting that the beneficiary of this project is the Government of Uganda (GoU) and is funded by the World Bank. He informed the meeting that the project area is composed of two sections, upstream area (dam) and the downstream area which is a command area for irrigation. Furthermore, he informed the officials that the consultants will traverse the entire project area such as the valley area, hills of Kabuyanda, and the forest area. He also informed the meeting that studies will be conducted during the day and night. He informed the meeting that it is a requirement by World Bank to conduct an ESIA study for the projects of this nature. The officials were informed that the project will provide electricity, water for domestic use and water for irrigation mainly to the residents Kabuyanda. The officials were informed that when the dam is constructed, it will help in controlling floods. The officials were informed that NELSAP will organize a workshop in December 2017 whereby the consultant will present the key findings on the social and environmental aspects.

ISSUES RAISED /CONCERNS	RESPONSE

Supposing the farm is about 400m away from the main pipe that supplies water to the area. Who will meet the cost of extending water to the farm?	Water points will be provided by the project to enable the farmers' access water to their gardens thus the farmers will pay for the cost of extending water to their gardens and households.
The community asked the developer to inform the community when they should apply for the jobs.	
He is grateful for this project. How will all the people benefit from this project?	The community will benefit from the project through using water for irrigation, provision of safe and clean water for domestic use and employment opportunities.
Will the community pay for the water?	The community will be pay for the cost of the water.
Will the project compensate people for the affected land where the water pipes will be laid?	
Is the World Bank funding for the construction of the project?	The World Bank is funding for the construction of the project.

Professor Okedi closed the meeting by thanking people for coming to the meeting, listening and waiting patiently.

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Sub County /Town Council	Kabuyanda Sub County
Village	Kagoto
Venue	Kagoto Church of Uganda
Date	5th November 2017
Time	13:00 hrs
Attendance list attached	

Min No 1 The meeting was opened with a prayer led by the area reverend.

Min No 2 The chairman local council one welcomed the consultant and the people present for the meeting. The chairman asked people to pay attention and ask questions thereafter.

Min No 3 The area councilor welcomed the consultants and the people. He informed the community that the project will benefit the people of Kabuyanda mainly through the use of water for irrigation. The councilor also asked the people to support the project.

Min No 4 Prof. Okedi John informed the officials that we were an advanced team. He informed the officials that the team will be looking at the baselines conditions of the project area. He also informed the meeting that the consultant will produce an ESIA and RAP report including an Environmental Social Management Plan and it will be the responsibility of the District to implement the ESMP to protect the environment and ecosystem and to ensure the dam does not burst. He also informed the meeting that the consultant has six months to produce the final ESIA and RAP report. He informed the meeting that the beneficiary of this project is the Government of Uganda (GoU) and is funded by the World Bank. He informed the meeting that the project area is composed of two sections, upstream area (dam) and the downstream area which is a command area for irrigation. Furthermore, he informed the officials that the consultants will traverse the entire project area such as the valley area, hills of Kabuyanda, and the forest area. He also informed the meeting that studies will be conducted during the day and night. He informed the meeting that it is a requirement by World Bank to conduct an ESIA study for the projects of this nature.

The officials were informed that the project will provide electricity, water for domestic use and water for irrigation mainly to the residents Kabuyanda. The officials were informed that when the dam is constructed, it will help in

controlling floods. The officials were informed that NELSAP will organize a workshop in December 2017 whereby the consultant will present the key findings on the social and environmental aspects.

ISSUES RAISED	RESPONSES
What are some of the items the project will be compensating?	Items to be compensated include; land, structures both temporary and permanent, perennial crops and trees, graves, and shrines.
Do you assess gardens that will be affected?	Gardens will be assessed if affected by the project.
What will happen to structures that will be damaged as a result vibration from the machinery?	We shall request the owners of such properties to report such cases and thereafter such properties shall be inspected to establish the magnitude of the damage.
Will the project compensate PAPs who are in possession of land titles for their deceases relatively?	The relatives of the deceased will be compensated if provide proof such as death certificate and Letters of Administration.
Will the new road have a road reserve?	This road will have a carriage way and a road reserve.
What will happen to public utilities like electricity poles that will be affected by the road?	Public utilities that will be affected by the road will be transferred to the road reserve.
What will happen to the boreholes that will be affected?	Water sources that will be affected by the road project will be replaced.

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Sub County /Town Council	Kabuyanda Sub County
Village	Kagoto
Venue	Kagoto Church of Uganda
Date	5th November 2017
Time	13:00 hrs
Attendance list attached	

Min No 1 The meeting was opened with a prayer led by the area reverend.

Min No 2 The chairman local council one welcomed the consultant and the people present for the meeting. The chairman asked people to pay attention and ask questions thereafter.

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ISSUES RAISED	RESPONSES
Will the project compensate people without land titles?	People with or without land titles will be compensated by the project.
How much time will the project give people affected to relocate from the affected areas?	The developer will communicate but usually the period timeframe is between 3-6 months.
When shall we be compensated, before or after construction?	PAPs are usually compensated before construction activities commence.
Will project compensate us for the land on which grow crops and rear animals	The project will compensate for the land but the bricks will noted be compensated as the bricks can be shifted away from the affected place.
How will the project compensate people without bank accounts?	PAPs without bank accounts will be encouraged to open with the banks of their choice.
Will the project compensate me for the bare land?	PAPs with bare land will be paid for the land.
What will happen to PAPs who are living outside the country and will not be present during compensation exercise?	We expect such PAPs to come and receive his or her compensation in person or unless they grant powers of attorney to their trusted relatives.
Will the project compensate affected institutions?	Institutions that will be affected by the project will be compensated.

MINUTES OF STAKEHOLDER ENGAGEMENTS

District	Isingiro District Local Government
Sub County /Town Council	Kabuyanda Sub County
Village	Kabuyanda Town Council Community
Venue	Kabuyanda Trading Centre
Date	5th November 2017
Time	13:00 hrs
Attendance list attached	

Min No 1 The meeting was opened with a prayer led by the area reverend.

Min No 2 The chairman local council one welcomed the consultant and the people present for the meeting. The chairman asked people to pay attention and ask questions thereafter.

Min No 3 The area councilor welcomed the consultants and the people. He informed the community that the project will benefit the people of Kabuyanda mainly through the use of water for irrigation. The councilor also asked the people to support the project.

Min No 4 Prof. Okedi John informed the officials that we were an advanced team. He informed the officials that the team will be looking at the baselines conditions of the project area. He also informed the meeting that the consultant will produce an ESIA and RAP report including an Environmental Social Management Plan and it will be the responsibility of the District to implement the ESMP to protect the environment and ecosystem and to ensure the dam does not burst. He also informed the meeting that the consultant has six months to produce the final ESIA and RAP report. He informed the meeting that the beneficiary of this project is the Government of Uganda (GoU) and is funded by the World Bank. He informed the meeting that the project area is composed of two sections,

upstream area (dam) and the downstream area which is a command area for irrigation. Furthermore, he informed the officials that the consultants will traverse the entire project area such as the valley area, hills of Kabuyanda, and the forest area. He also informed the meeting that studies will be conducted during the day and night. He informed the meeting that it is a requirement by World Bank to conduct an ESIA study for the projects of this nature.
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ISSUES RAISED	**RESPONSES**
Will the project compensate people without land titles?	People with or without land titles will be compensated by the project.
When shall we be compensated, before or after construction?	PAPs are usually compensated before construction activities commence.
Will project compensate us for the land on which we make bricks?	The project will compensate for the land but the bricks will noted be compensated as the bricks can be shifted away from the affected place.
How will the project compensate people without bank accounts?	PAPs without bank accounts will be encouraged to open with the banks of their choice.
Will the project compensate me for the bare land?	PAPs with bare land will be paid for the land.
What will happen to PAPs who are living outside the country and will not be present during compensation exercise?	We expect such PAPs to come and receive his or her compensation in person or unless they grant powers of attorney to their trusted relatives.
Will the project compensate affected institutions?	Institutions affected by the project will be compensated.

Interview with the Farm Manager Kaiho Farm School Leavers Cooperative Society	
What is the name of this cooperative society?	Kaiho Farm School Leavers Cooperative Society
Date consulted	7th November 2017
Farm Manager	Turyahebwa Sylivano
Number of member	The cooperative society had 30 members but currently there are 26 active members.
When was the cooperative society established?	The cooperative society was established by father Ampey from Britain in 1968. Fr. Ampey was a priest at Kaiho Catholic Church. The cooperative society was established to support students who completed primary and secondary education and the needy.
What activities is this cooperative society involved in?	Kaiho Farm School Leavers Cooperative Society are farmers and they group crops such as maize, beans, ground nuts, sorghum, Irish potatoes, cow peas, cassava, bananas and fruits such as passion fruits and vegetables such as cabbages and onions. The cooperative also practiced dairy farming at the early of the cooperative.
Size of land owned by the cooperative society	The cooperative owns 75 hectares of land. The 26 hectares of land is utilized by the 26 active members while 40 hectares of land is hired / rented out to the member of the public and the remaining 9 hectares is comprised of swamp/wetland.
Achievement / benefits	The cooperative society collects money from the tenants of which the money is used to run activities of the organization such pay the employees of the organization. The cooperative society members earn dividends from the proceeds collected.

	The cooperative society members have benefited through utilization of the cooperative land (26 hectares) for crop farming.
How many tones do you harvest per season	The cooperative society does not have such data.
Do you have market for food crops that cooperative society produces?	Initially the harvests used to be sold to the cooperative society. Currently, harvests are sold to the local business men and some is used for home consumption.
What are challenges faced by the cooperative society?	The Tanzanian invasion of Uganda crippled the cooperative society thus cooperative society lost property such as the machinery like tractors. The cooperative society machinery like tractors, watering cans, wheel barrows, spray equipment and chemicals. The cooperative lack water for irrigation. Severe drought has affected in the last 2 years has affected their output. Thieves who steal mainly bananas while in the gardens The cooperative society lacks access roads in the various parts of the farms thus farmers find it difficult to transport their produce from the farm to their homes and the market.
What are your expectations from the Kabuyanda Water Resources Project?	The cooperative society is highly expectatant of the water for irrigation. The cooperative society expects safe and clean water for domestic use. The cooperative society expect water to start a fish farm in the 9 hectare swamp / wetland.
What are your fears from the Kabuyanda Water Resources Project?	Crops will be damaged during the laying of the water pipes at construction phase Project will displace some households especially those households where the water pipes will pass through.

Interview with the Manager Kigarama Commodity Marketing Cooperative Society Limited	
What is the name of this cooperative society?	Kigarama Commodity Marketing Cooperative Society Limited
Date consulted	7th November 2017
Manager	Arinaitwe Innocent
Number of member	The cooperative society has 140 members organized under 18 groups. The cooperative society works with about 1500 farmers in 4 sub counties of Kabuyanda Town Council, Kabuyanda, Ruborogota and Kikagati sub counties.
When was the cooperative society established?	
What activities is this cooperative society involved in?	Extends credit in form of loan to the farmers Provides improve seeds to the farmers Advisory and education to the farmers Stocks farmers harvests bulk mainly beans and maize Looks for market for the farmers produce They also deal in other items like bananas, potatoes etc.
Achievement / benefits	
How many tones of produce do you stock?	
Do you have market for food crops that cooperative society produces?	The cooperative has 3 types of markets i.e. international market with Rwanda and Kenya, Local market supply schools and farmers and Non-Governmental Organizations looking nutritional component like World Vision and Harvest Plus.
What are challenges faced by the cooperative society?	Poor weather that contributed to drought thus affecting their output for the last 2 years.

What solutions have you provided to the farmers?	Farmers have been encouraged to plan trees especially on the bare hills. Farmers have been encouraged to plan drought resistant crops
What are your expectations from the Kabuyanda Water Resources Project?	Irrigation. Cooperative society will encourage the farmers to adopt /take up the scheme
What are your fears from the Kabuyanda Water Resources Project?	Floods as a result of the breakdown of the dam Emergency of new pests and diseases as a result of the dam.
Interview with the Manager Kabuyanda Dairy Cooperative Society Limited	
What is the name of this cooperative society?	Kabuyanda Dairy Cooperative Society Limited
Date consulted	7th November 2017
Manager	Biryomumaisho Elias
Number of member	Cooperative society has 123 registered members but have 90 active members
What was the purpose of establishing this cooperative society?	The cooperative society was established to increase milk production so that the people in the area can benefit. Cooperative society was established with the aim of changing and keeping animals that are productive. Cooperative society provides the members with improved animals. Provide market for the milk produced by the members
Where do you sell the milk that you stock?	The main market for the milk is for the residents of Kabuyanda Town Council and the neighboring communities.
How many liters of milk does the cooperative stock on daily /monthly basis?	The cooperative society stocks about 350 and 10,500 liters of milk on daily and monthly basis respectively.
What are challenges faced by the cooperative society?	Lack adequate water to enable the cooperative clean their tanks / machines Lack electricity to enable the machines to run. The cooperative currently uses solar. The cooperative has not yet paid back the loan that was used to purchase the coolant The members of the society face shortage of water for the animals.
What are your expectations from the Kabuyanda Water Resources Project?	Expect fresh water supply for the animals Expect to get connected to electricity Encourage the members to take the scheme from the project

What are your fears from the Kabuyanda Water Resources Project?	Floods in case the dam collapses

Figure 69: Staff of Kabuyanda Dairy Cooperative Society Limited

Interview with Assistant in Charge of Kabuyanda Health Center IV		
Name of Personnel	Mr. Alex Katagira, Assistant in Charge, Kabuyanda Health Center IV	
Date consulted	7th November 2017	
How many health workers does Kabuyanda Health Center IV have?	Health center has 49 health workers and these include:	
	3 medical Doctors 8 Nurses 8 Midwives 4 Clinical Officer 1 Dentist 4 Laboratory Technicians 3 Nursing Officers 1 Anesthetist	2 Counselors 2 data Clerks 2 Nursing Assistants 1 Theatre Assistants 1 Public Health Nurse 1 Records Assistant 1 Accountant and 7 Porters
What are the services offered by the health facility?	Outpatient Department. Facility receives patients get treated and return back home Laboratory services. Tests are done on HIV, Malaria, Syphilis, Urine, Stool, Sputum, CD4, Viral load and MTB Dental Services. Extract teeth and cementing Immunization Ultra Viral Therapy Counselling Ultra Sound Scan services Antenatal care Family Planning Nutritional Clinic Inpatient Department. Patients are admitted in wards Deliveries Postnatal care Operations Safe circumcisions Community Based (Direct Observed Therapy)	

	Out Reaches. Services are offered out sides like immunization Support plus supervision of lower facilities e.g. Health Center IIIs and IIs. Post Exposure Prophylaxis (PEP). Services are offered to people raped or bitten by HIV patients and Emergency systems
What are the major diseases affecting patients who visit this health facility?	The illness include: malaria, Respiratory Tract Infections, Diarrhea, Ear infections and HIV/AIDS
How many patients does the facility receive on daily basis?	Facility receives approximately 120 patients
How many beddings does the facility has as per ward?	Maternity ward has 24 beds General ward has 16 beds and Children's ward has 8 beds
What some of the challenges faced by the facility?	Staffing is still inadequate Water crisis especially during dry spell.
What is the HIV/AIDS prevalence in the area?	HIV/AIDS stands at 4.6%
What are your expectations from this project?	The health facility will expect support from the project because the facility will be overstretched by the increase in the number patients, project workers and the surrounding Districts like Ntungamo, Rwanda and Tanzania.
Do you have anything important that project would want to know?	Health facility is focused on preventing diseases. The health facility works with private partners such as Maririe Stops, Egg Puff, Mayanja Memorial Foundation, AIDS Information Center, Mellennium Village Project (closing December 2017).

Appendix 6: Minutes of second stage stakeholder engagement

Ministry of Water and Environment
REPUBLIC OF UGANDA

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MINUTES OF CONSULTATIVE MEETING

Project	**Finalization of Preparation of ESIA and RAP for Kabuyanda Irrigation Development and Watershed Management Project in Isingiro and Ntungamo Districts**
Subject	**Presentation of Final ESIA Report**
Date	**02/10/2018**
Time	**10.00 – 11.30 am**
Location	**Boardroom, NFA, Bugolobi**
Meeting no.	**02**
Taken by	**Juliet Kintu**

Date 02/10/2018

NEWPLAN LIMITED
Crusader House, 3 Portal Avenue
Tel: +256 414 340 243/4/5
Fax: +256 414 257 861
Email: info@newplan.ug

Participants **Mununuzi David** (Chairperson)

Gasana George	**NFA**
John Diisi	**NFA**
Obedmoth Aldous	**NFA**
Aheebwa Justine	**NFA**
Galima Stephen	**NFA**
Dr David Ogaram	**NEWPLAN**
Prof John Okedi	**NEWPLAN**
Juliet Kintu N	**NEWPLAN**

Copy to: **Participants +**

Lawrence Levy Omulen	**NEWPLAN**
Motram Mugabe	**MWE**
Lydia Kaboyo	**MWE**

Next meeting **TBD**

1/6

Agenda
1. **Opening remarks from Chairperson**
2. **Self Introductions**
3. **Presentation of Final ESIA Report**
4. **Open discussion**
5. **Way foward**
6. **Closing remarks**

1. Opening remarks from Chairperson

The chairperson welcomed the participants to the meeting and then requested participants for self-introductions (see attendance list attached) and then invited the Consultant (NEWPLAN LTD) team to give the agenda of the meeting since they requested for the meeting.

2. Self Introductions

Al Members present introduced themselves.

3. Presentation of Final ESIA Report

The Consultant explained the purpose of the meeting which was to present the Final ESIA Report as a requirement by World Bank and also discuss specific comments from the World Bank on the Final ESIA Report. He added that general comments, as well as specific comments were expected during the meeting. The Consultant was looking for specific comments related to Rwoho Central Forest Reserve, as a gazetted area and which is going to host irrigation infrastructure. NFA views on compensation for lost land and biodiversity in the reserve; advise on whether or not to degazette were also expected. NFAs alternatives for managing the uptake of the CFR (offset arrangement or degazettement, etc.); confirmation of project components that fall within the World Bank Supported CDM Projects were anticipated.

The Consultant presented the ESIA Findings using power point and summarised all major chapters in the report. He also mentioned that details are in the ESIA report which will be made available to NFA for review.

4. Open Discussion

Previous meeting with MWE and World Bank

NFA informed members that in the meeting of 24th August 2018, held with Ministry of Water and Environment (MWE) and World Bank, the following were agreed:

i. That 342 acres were to be taken by the project

ii. That MWE will share coordinates of all the project facilities
iii. That MWE receives consent FROM NFA to undertake the project in Rwoho Central Forest Reserve.
iv. A verification of the boundaries of the irrigation project sites and biomass inventory would be undertaken within two weeks
v. After sharing the project site coordinates and areas, NFA will determine and share information on how much area of the 5 World Bank funded CDM projects is to be affected.
vi. NFA would formally make an offer of the land from Rwoho that would be used for the project
vii. NFA would proceed to identify an equivalent area of degraded Rwoho Forest that would be rehabilitated and restored using Project funds

Compensation of private farmers in Rwoho CFR

One member wanted to know how the private farmers to be affected will be compensated.

It was agreed that this will be determined after the biomass inventory and completion of the RAP study.

Managing the uptake of the Rwoho CFR area

In regard to the offset arrangement, NFA is of the opinion that since the CFR is large (9100 ha) and with a number of degraded sections, these will be identified by NFA for restoration.

Inundation of the reserve

The World Bank team is concerned about inundation of the reserve, learning from the Isimba Dam and Kalagala offset area where the dam affected the Kalagala Falls.

It was agreed in the meeting that NFA be provided with coordinates of the extent of all the project components so that they simulate the extent of the inundation of the CFR by the project reservoir. NFA will use information in the current design of the project to determine the extent of the area to be flooded/inundated.

CDM projects to be affected

NFA confirmed based on the information received from MWE so far, that two (2) CDM projects are to be affected, on both sided of the dam (that is east and west). CDM block 3 and CDM block 4 are to be directly affected, while a section of River Mishumba passes through block 2 and 3. The latter will however be confirmed after coordinates for all project components are shared by MWE.

However, NFA requested the World Bank to clarify if they will accept to relocate the CDM projects to other areas of the CFR.

Whether or not to Degazette the CRF

NFA recommended that MWE restricts itself to constructing a dam and reservoir in Rwoho CFR. The management camp, workers camp and project office must be located outside the CFR. NFA added that, if only the reservoir and the dam are established in Rwoho CFR no degazettement will be required. If any other infrastructure such as camps, project office, etc. are put in the reserve, then degazettement will be a requirement. Reference to the National Forestry and Tree Planting Act, 2003 (section 7,8 and 13) must be made.

NFA Officials stated that 'Degazetting process" is very long and they discounted it. They proposed that NFA could offer the land for the project on condition that 'Funds be available for restoration and rehabilitation of equivalent existing degraded Rwoho Forest Reserve". The area to be considered as equivalent would take on board only the area for the construction of the Dam and the Reservoir. They put it quite clearly that other infrastructure such as Camps, Hospitals, Offices etc. must be located outside the CFR.

5. Closing Remarks by NFA

The Chairperson thanked the Consultant for the presentation and then concluded that, due to inadequate information on the project, NFA cannot confirm their position regarding the project. This information must therefore be provided first.

6. Closure of meeting

There being no other business to discuss, the meeting was closed at 11.20 am

Certification of minutes as a true record of the proceedings of the meeting:

Name: David Mununuzi Position: for Executive Director

Representative of National Forest Authority

Signature: _____ Date: 25/10/18

Name: Juliet Kintu Position: Project Coordinator/Secretary

Representative of the Consultant/NEWPLAN

Signature: _____ Date: 22nd October 2018

Ministry of Water and Environment
REPUBLIC OF UGANDA

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MINUTES OF CONSULTATIVE MEETING

Project	**Finalization of Preparation of ESIA and RAP for Kabuyanda Irrigation Development and Watershed Management Project in Isingiro and Ntungamo Districts**
Subject	**Presentation of Final ESIA Report**
Date	**04/09/2018**
Time	**11:00am – 12.30 pm**
Location	**DGSM Board room, Entebbe**
Meeting no.	**01**
Taken by	**Juliet Kintu**

Date 02/10/2018

NEWPLAN LIMITED
Crusader House, 3 Portal Avenue
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Participants	**Muheirwe Morris Tabaaro**	**DGSM** (Chairperson)
	Data Gabriel	**DGSM**
	Asiimwe Editor	**DGSM**
	George William Etucu	**DGSM**
	Ntale Malik Mansour	**DGSM**
	Florence Mangeni	**NEWPLAN**
	Juliet Kintu N	**NEWPLAN** (Secretary)
Copy to:	**Participants +**	
	Lawrence Levy Omulen	**NEWPLAN**
	Motram Mugabe	**MWE**

Next meeting **TBD**

1/7

Agenda
1. **Opening remarks from Chairperson**
2. **Self introductions**
3. **Presentation of Final ESIA Report**
4. **Open discussion**
5. **Closing remarks by the Team leader**
6. **Closing remarks by the inspector mines**
7. **Closure of meeting**

1. Opening remarks from Chairperson

The Inspector of Mines Mr Tabaaro Morris Muheirwe informed the meeting that he had been given the responsibility to Chair the meeting by the Director of the Directorate of Geological Surveys and Mines (DGSM) Mr Zachary Baguma. He emphasized that the attendees of the meeting were technical staff of the directorate who were willing to support the project. He then invited members present for self introductions.

2. Self introductions

All members present introduced themselves at the request of the Chairperson.

3. Presentation of Final ESIA Report

During the presentation, the Consultant explained the purpose of the meeting which was to present the Final ESIA Report as a requirement by World Bank and also discuss specific comments from the World Bank on the Final ESIA Report. The major comment was to verify if African Panther Resources (U) Limited (A mining company) had been granted a Tin Mining Lease to mine Base Metals, Cassiterite, Gold and Silver at Katanga along Isingiro-Kikagati Road, and if yes when is it expiring? The DGSM was also to advise on available alternatives for rock-stone supply.

The Consultant presented the ESIA Findings and summarised all major chapters in the report. She mentioned that a joint site was carried out on 17th August 2018 with World Bank, Ministry of Water and Environment, National Forest Authority and Isingiro District Local Government and hence the mentioned comments to be responded to by the DGSM.

4. Open Discussion

i. **A member inquired whether NEWPLAN has worked on similar projects before.**

NEWPLAN confirmed to the meeting that they had worked on a number of projects in the past, for example:

- Environmental and Social Impact Assessments (ESIA) and Development of Preliminary Resettlement Policy Frameworks for Four (4) Proposed Small Multipurpose Dams at Bigasha, Buyongwe, Karazi and Taba-Gakomeye in the Kagera River Basin Burundi, Rwanda, Uganda and Tanzania.
- Environmental and Social Impact Assessment (ESIA) and Development of a Resettlement Policy Framework (RPF) for the proposed Small Multipurpose Maira Dam in the Sio-Malaba-Malakisi Sub-Basin-Kenya.

ii. **There was a query on whether the available mines in the area would be able to get water from the project**

The meeting was informed that existing quarry at Katanga along Isingiro-Kikagati Road is outside the irrigation command area that will receive water for irrigation, and therefore would not be able to get water from the project.

iii. **On whether or not African Panther Resources (U) Limited (APRU) have a valid license**

DGSM confirmed that African Panther Resources (U) Limited has a valid license (ML1433 granted on 02nd of February, 2018 for a period of 21 years) for the area. They advised that this rock be avoided by the project to avoid conflicting with the licensee. DGSM confirmed that the licence awarded to APRU is a Mining Lease. They mentioned that some rocks are scotched and withered and not suitable for dam construction.

iv. **Availability of alternatives for rock-stone supply.**

In order to provide technical assistance to the project, DSGM advised that a letter should be written to the Director, DGSM for technical assistance to find fresh good quality rock for construction. The staff would require 5 working days and 1 week to carry out analysis and provide a report.

v. **Information to be shared**

It was agreed in the meeting that the following information be shared by DGSM

i. Information on comprehensive mining sites in the project area including area licensed by African Panther.
ii. Copy of the Mining Lease given to African Panther
iii. Uganda Mining Map

5. Closing remarks by the inspector Mines

Mr Tabaaro offered to provide all the necessary information about African Panthers and mining sites in the project area to the NEWPLAN team.

6. Closure of meeting

The meeting ended at 12.30 pm

3/7

MINUTES OF CONSULTATIVE MEETING

Project	**Finalization of Preparation of ESIA and RAP for Kabuyanda Irrigation Development and Watershed Management Project in Isingiro and Ntungamo Districts**
Subject	**Presentation of Final ESIA Report**
Date	**05/09/2018**
Time	**11.19 – 12.05 pm**
Location	**Boardroom, UNBS Annex, Bweyogerere Industrial Park Kyaliwajala**
Meeting no.	**01**
Taken by	**Juliet Kintu**
Participants	**Patricia B Ejalu (**Chairperson) **Dr David Ogaram NEWPLAN** **Florence Mangeni NEWPLAN** **Juliet Kintu N NEWPLAN**
Copy to:	**Participants +** **Lawrence Levy Omulen NEWPLAN** **Eng. Kimanzi MWE** **Motram Mugabe MWE**

Next meeting **TBD**

Agenda

1. **Opening remarks from Chairperson**
2. **Self Introductions**
3. **Presentation of Final ESIA Report by NEWPLAN**
4. **Open discussion**
5. **Closure of meeting**

1. Opening remarks from Chairperson

The Deputy Executive Director Standards welcomed the NEWPLAN team to the UNBS, and appreciated them for consulting them. She emphasised that all Ugandan standards, before publication, they go through UNBS system. Even before approval of pesticide residue standards, MAAIF engages with UNBS first. UNBS doesn't necessarily enforce that standard but it takes it through the process of becoming a Ugandan standard. She mentioned that it is a collaborative effort when it comes to the issues of pesticides and what can be used on the market. After these remarks, she introduced herself and then requested the Consultant for self introductions.

2. Self-Introductions

All Members present introduced themselves.

3. Presentation of Final ESIA Report

The Consultant explained the purpose of the meeting which was to present the Final ESIA Report as a requirement by World Bank and also discuss specific comments from the World Bank on the Final ESIA Report.

She mentioned that it is a requirement by the World Bank to have two stage consultations particularly for Category A projects (Environmental Assessment OP 4.01), such as the Kabuyanda Irrigation Development Project. She also added that under the Scope of Work, the Consultant was required to produce an ESMP as part of the ESIA, Pest management Plan, Dam Safety Management Plan and a Resettlement Action Framework

She mentioned that EIA is a requirement by law, and the National Environment Act, Cap 153 provides that projects including Dams, Rivers and Water Resources undertake an EIA before implementation.

4. Open Discussion

I. Ugandan Standards versus International Standards

The Deputy Executive Director Standards encouraged and emphasized that the project implementers, that is, Ministry of Water and Environment (MWE) ensure that all the construction materials are bought locally because majority of the material and available locally and up to standard. During project implementation, Ugandan standards take precedence. However, where local Standards are lacking, then international standards can be applied.

Ugandan standards must first and then international standards after and that UNBS is the one to recommend for the international standards.

II. Available standards for project construction materials

There was an inquiry about the available standards for the project materials. The Director informed meeting that standards for cement and reinforcing steel and concrete were available. However, rocks current have no set standards because they are a natural resource. She advised that construction materials should be got from Ugandan manufacturers since they go through the UNBS standards system and also mentioned that local content is KEY.

III. On whether or not UNBS provides permits to import materials

The Director stated that products must be based on the Ugandan standards and should be tasted. In case the products are not available on the local market then UNBS advises on the international standards to be used.

IV. On whether or not it's in the mandate of UNBS to provide standards for pesticides

Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is the one to advise on the pesticides to be used. MAAIF provides the entire list of pesticides to be used. However, most pesticides are not made in Uganda. Majority are imported. Therefore, few pesticides have standards. MAAIF is to request for the Development of these standards. In case they are not available on the Ugandan market, then UNBS would need to follow the international standards.

V. Pesticide Residue Limits

The Director emphasized that products approved by UNBS should be used, and they must be used in the right quantities. She mentioned that certain residue levels are not acceptable in Uganda, and if the right quantities of pesticides are not used, then they end up as residues in food.

VI. The Law section of the Revised Final ESIA Report

The UNBS Deputy Director Standards recommended that in the law chapter of the Revised Final ESIA Report, all applicable Uganda Standards must be included.

VII. Information to be shared by UNBS

It was agreed in the meeting that UNBS shares with the Consultant the list of Standards of pesticide and fertilizer residues currently available. These include the following:

i. Pesticide residue standards
ii. Fertilizer residue standards
iii. Product standards for use in agriculture

5. Closure of meeting

The meeting endedat 12.05 pm.

Certification of minutes as a true record of the proceedings of the meeting:

Name: Patricia B Ejalu Position: Deputy Executive Director Standards
Representative of UNBS

Signature: _____ Date: _____

Name: Juliet Kintu Position: Project Coordinator/Secretary
Representative of the Consultant/NEWPLAN

Signature: _____ Date:

MINUTES OF CONSULTATIVE MEETING

Project **Finalization of Preparation of ESIA and RAP for Kabuyanda Irrigation Development and Watershed Management Project in Isingiro and Ntungamo Districts**

Subject **Presentation of Final ESIA Report**
Date **17/09/2018**
Time **02:00 – 04.24 pm**
Location **MAAIF offices Entebbe**
Meeting no. **01**
Taken by **Juliet Kintu**
Participants **Eng. Dominic B Mucunguzi (**Chairperson)
Kitunga David MAAIF
Ollando Allan MAAIF
Dr David Ogaram NEWPLAN
Florence Mangeni NEWPLAN
Juliet Kintu NEWPLAN
Copy to: **Participants +**
Lawrence Levy Omulen NEWPLAN
Eng Gilbert Kimanzi NEWPLAN
Motram Mugabe NEWPLAN

Next meeting **TBD**

Agenda
1. **Opening remarks from Chairperson**
2. **Self introductions**
3. **Presentation of Final ESIA Report**
4. **Open discussion**
5. **Remarks by the Principal Engineer Irrigation and Drainage**
6. **Remarks by the Senior Agriculture Inspector**
7. **Closure of meeting**

1. Opening remarks from Chairperson

The Chairperson for the meeting, Eng. Dominic Mucunguzi who is also the Principal Engineer Irrigation and Drainage in the Department of Crop Protection welcomed the NEWPLAN team to the meeting. He informed the meeting that the department is responsible for crop inspection and certification and that there is a Dam Safety Committee responsible for monitoring the condition of the dams during project implementation. He then introduced himself and then confirmed that he is familiar with the project area. He then asked the Consultant for self introductions, and then to make the presentation.

2. Self introductions

All members present introduced themselves.

3. Presentation of Final ESIA Report

The Consultant explained the purpose of the meeting which was to present the Final ESIA Report as a requirement by World Bank and also to find out the available standards of pesticides and food products. She also added that any other comments on the ESIA were welcome to enable improvement of the report.

The Consultant presented the ESIA Findings and summarised all major chapters in the report.

It was mentioned that Newplan had been assigned to finalise the ESIA and RAP for the project. She also mentioned that the Kabuyanda Irrigation Development Project is a category A project in accordance with the World Bank Environmental and Social Framework. Under the National Environment Act, Cap 152 and the Guidelines for Environmental Impact Assessment in Uganda, 1997, Dams, Rivers and natural water resources are listed as projects that require EIA.

4. Open Discussion

I. Available publications

After the presentation of the ESIA findings by NEWPLAN, Eng Mucunguzi provided a list of available publications relevant to the project which included the following:

i. Draft National Agriculture Masterplan 2010-2035.
ii. National Irrigation Policy 2017, available at the MWE website
iii. Agriculture Sector Strategic Plan (ASSP) 2015/2016-2019/2020
iv. National Fertilizer policy
v. Climate Change Policy
vi. Fisheries and Aquaculture Policy 2018

II. The Consultant requested MAAIF to highlight any operation and maintenance challenges faced during irrigation projects

Eng Dominic mentioned the following challenges normally encountered:

The local people are not willing to pay for maintenance of e.g. blocked canals, silted pipes. They take water to be a free gift from GOD.

i. Currently, the Cooperative societies manage and maintain the schemes.
ii. Mis-use of water; the main purpose of irrigation schemes is to irrigate high value crops such as fruits, vegetables, citrus fruits, maize, sweet potatoes.

111. On the issue of operational life of a scheme

The schemes are normally designed for 25 years and they are normally rehabilitated.

1V. Number of schemes owned by the government

So far, the government has four functional irrigation schemes: Doho, Mubuku, Agoro, and Olweni. Some schemes such as Aleptong in Eastern Uganda were abandoned as a result of war.

V. Whether the project would be able to sustain crops that need a lot of water for example Matooke

This should be taken care of in the design of the irrigation system

VI. If water misuse would be prevented.

There should be officials on the ground to monitor the system in order to cub water misuse since people would use that water for other duties aside from farming since the area has water issues

6. Remarks by the Principal Engineer Irrigation and Drainage

Eng. Dominic Mucunguzi advised that there was need to have a plan to take care of the residual water and that there should be a soil and water conservation plan since it's a hilly area.
He also mentioned that we should consider how cattle keepers are to share the water with the farmers and that farmers may start using the irrigation water for other purposes.
He advised that there should be a plan for water users associations to minimise water misuse since they are bigger and can involve people both within and outside the scheme. He mentioned these associations have worked on the four irrigation schemes and that they are better than co-operative societies which are voluntary. He also advised that the fisheries and agriculture policy since the availability of water might prompt people to start fish farming.

7. Remarks by the Senior Agriculture Inspector

The Senior Agriculture Inspector Mr David Kitunga indicated that it's of recent that the ministry is taking into account pesticide residuals since most of the farmers produce their products naturally besides those grown for export. He mentioned examples of high value crops grown for export that include eggplant, okra and tomatoes, flowers, hot paper. These are sprayed to target high value yields for export. The Ministry of Trade and Industry and MAAIF are responsible for publicising the standards.
He mentioned that tomatoes are usually sprayed by a fungicide called Mancozeb. He mentioned that this fungicide increases the shelf life of the tomatoes
He advocated for cultural control and lesser use of pesticides since they are often misused and harmful and, integrated pest management. He mentioned that pesticides usually have directions for use and pre-harvest intervals that enable the residual to drop down to the lowest levels which is not followed by farmers. An example of cultural control is trapping the pests where the farmers put local brew in bottles and put the bottles in the gardens to trap the pests.
He also advocated for less destructive measures to control the weevils than chemicals. He mentioned a few crop diseases and ways of cubing them which included the following: -

I. There are bean aphids and that they are blackish small, and suck the beans then they get wrinkles and reduce yields. They appear in some seasons and in some they don't. They are cubed by use of systemic pesticide.
II. He mentioned that bronzbag in eucalyptus tree sucks the leaves even the young shoots and in some instances plants dry out or loose branches. He added that there was a biological control agent, a wasp from South Africa. The wasp lays eggs in the eggs of the bronzbag and eventually they phase out.
III. He mentioned that for cabbage moss, one should use cypomethyrine pesticide as a chemical ingredient.
IV. Fall army worms – Use of pyrethroids, but MAAIF is still looking for more sustainable measures.
V. Maize aphids – These are not usually stay sprayed by farmers.
VI. Fruit fly phyto sanitation where you monitor the signs of the fruit fly, prune to avoid suffocation, picking fruits that have fallen as a result of fruit flies and burry them, mass trapping using pheromone traps, and use of pesticides.
VII. Moral rats – trapping.
VIII. Weaver birds/Quelea Quelea - use of scare crews, employ children to chase them.

He mentioned that pesticide standards are dependent on international standards since for now there is no company that locally produces pesticides since they are all imported. He also pointed out that pesticide usage is on an increase nationally due to the need for high yields and quality.

As mitigation, he recommended that farmers should be trained and informed of how dangerous pesticides are because some of them even open them using their mouth.
He revealed that there is an Agricultural Chemical Control Act of 2006 that guides the standards of pesticides.

8. Closure of meeting

The meeting endedat 04.24 pm

Certification of minutes as a true record of the proceedings of the meeting:

Name: Engineer Dominic B Mucunguzi Position: Principal Engineer Irrigation and Drainage
Representative of MAAIF

Signature: _____ Date: _____

Name: Juliet Kintu Position: Project Team Leader
Representative of the Consultant/NEWPLAN

Signature: _____ Date: _____

MINUTES OF CONSULTATIVE MEETING

Project	Finalization of Preparation of ESIA and RAP for Kabuyanda Irrigation Development and Watershed Management Project in Isingiro and Ntungamo Districts
Subject	Presentation of Final ESIA Report
Date	17/09/2018
Time	03.20 – 04.32 pm
Location	Boardroom, NaFIRRI, Jinja
Meeting no.	01
Taken by	Juliet Kintu

Participants	Anthony Taabu Munyaho (Chairperson)	NaFIRRI
	Winnie Nkalubo	NaFIRRI
	Bwambale Mbilingi	NaFIRRI
	William Okello	NaFIRRI
	Dr David Ogaram	NEWPLAN
	Florence Mangeni	NEWPLAN
	Juliet Kintu N	NEWPLAN
	Jane Yawe	NEWPLAN
Copy to:	Participants +	
	Lawrence Levy Omulen	NEWPLAN
	Motram Mugabe	NEWPLAN

Next meeting **TBD**

Agenda

1. **Opening remarks from Chairperson**
2. **Opening remarks from the team leader Newplan**
3. **Presentation of Final ESIA Report**
4. **Open discussion**
5. **Closing remarks**
6. **Closure of meeting**

1. Opening remarks from Chairperson

Dr. Taabu Anthony Munyaho, the Director of Research at the National Fisheries Resources Research Institute (NaFIRRI), apologised for keeping the Newplan Team waiting for a long period of time. It was because of a number of other important meetings. He went ahead to introduce members of his team which comprised of Dr. Okello William, the Aquatic Ecologist, Mr. Wambale Mbiringi, a Socio-Economist and Dr. Nkalubo Winnifred, a Programme Leader and summarised by introducing himself. He mentioned that he received the meeting request from the NARO secretariat and he welcomed the Newplan team. He then invited NEWPLAN to make their presentation.

2. Opening remarks from NEWPLAN

Juliet Kintu introduced the Newplan team which comprised of Ms. Jane Yawe the Fish Specialist, Dr. Ogaram David, the Public Health Specialist, Ms. Florence Mangeni the Sociologist and ended with herself.

3. Presentation of Final ESIA Report

The Consultant explained the purpose of the meeting which was to present the Final ESIA Report as a requirement by World Bank and obtain comments on the report.

The Consultant presented the ESIA Findings using power point and summarised all major chapters in the report.

She introduced the project where she mentioned that the project was started in 2016 by another company that is for the ESIA and that Newplan is doing both the ESIA and RAP for the project and that that company did the scoping stage but at some point NELSAP gave Newplan a contract to finalise. They had done some reports an interim and scoping
She mentioned that the contract was given to Newplan last year 2017 and we were asked to do a draft final ESIA report to be presented to the different stakeholders for comments and the final ESIA report which we are presenting now.
She mentioned that we are supposed to produce an ESMP as part of the ESIA, pest management plan and dam safety management plan and a resettlement action plan report.
She mentioned that EIA is a requirement by law under the national environment act that projects like these which include Dams, Rivers and water resources go through an EIA.
She mentioned that it is a category A project according to the World bank standards. Category A projects have adverse impacts because of that they require a detailed environmental assessment. So under this scope we had to do the baseline studies we had to go back to the field and fill the gaps of what the other consultants had not done in terms of biological we looked at plants animals, water quality, social economic conditions agriculture conditions biophysical environment, social and economic aspects of the area
She mentioned there had to be impact assessment on all the environmental components and also looked at alternatives in terms of the location and design then developed the pest management plan, dam safety plan and the RAP report.
She mentioned that the project is located in two Districts; Isingiro and Ntungamo in South Western Uganda and covers three Subcounties of Kabuyanda, Nyakitunda and Kikagati(Isingiro) and Lukoni in Ntungamo. She the interpreted the Map to the Deputy Executive Director Standards.
She mentioned that the area has water issues and the main source of water is River Kagera
She mentioned that the project would require 600 employees for the construction phase and the locals and that locals would be prioritised on the side of employment.
She made it known that the project components included Hydrology, Flora and fauna, birds, mammals and amphibians. She also mentioned there was a plan to have 5 stored tanks, a workers camp and a management camp
She mentioned that there would be need to compensate the affected people. She informed the meeting that the project estimated worth would be 96 million US dollars, estimated land take is to be 84 Hectares, 1735 property owners and that the policy, legal and institutional frame work had already been drafted. And that the legislations used include the National Irrigation policy of 2018, the Agriculture sector strategic plan 2015/2016 – 2019/2020.

4. Open Discussion

The Director NaFIRRI appreciated the project and mentioned that they would have been given a copy of the report before such that the presentation would find them informed.
He mentioned that what had been established could stand as a baseline study and advised that there should be a monitoring plan for the project
He mentioned that the fish species that were identified are river line species and was interested in finding out their breeding area.
He informed the meeting that dam construction would put a barrier on the fish and that if their breeding was restricted to the lakes they would never breed again.
He wondered why they had not been consulted before because the comments might require the team to revisit the site.

He advised that different people in the communities would have different concerns which should be segregated.
He mentioned that government policies don't change and cautioned the team to state all the impacts that would come up as a result of the project by citing local examples and opened the floor for discussion.

If the local people welcomed the project.
The local people welcomed the project since they lack water and the project is going to bring water.

Whether in the assessment there was ability to disband.

Whether the fish distribution was married to the season

Whether River Mishumba is seasonal or permanent
River Mishumba is a permanent River

If there is an alternative livelihood aside from fishing
Fishing is not done for income and the few people that are engaged in it use basket traps.

Whether there was any value attached to the activities carried out by the people for example basket trap fishing
We are recommending that the breeding grounds of the fish should be conserved below the dam area so they will still have a breeding ground and migration area.

linkage between the breeding and migration ground
No linkage because the breeding area is in the thick papyrus.

Availability of stretches on the river
After R. Mishumba there is another river and there are swamps and wetlands in between
Identification of fish species
Seven (7) species were identified through observation and interviews

5. Closing Remarks by Newplan
He accepted the apologies from NaFIRRI director and thanked the NaFIRRI team for the technical picture they passed on to Newplan and informed them that their input was to be taken seriously
6. Closure of meeting
There being no other business to discuss, the meeting wasclosed at 04.32 pm

Certification of minutes as a true record of the proceedings of the meeting:

Name: Dr. Anthony Taabu Munyaho Position: Director
Representative of NaFIRRI

Signature: _____ Date: _____

Name: Juliet Kintu Position: Project Team Leader

Representative of the Consultant/NEWPLAN

Signature: _____ Date:

MINUTES OF THE STAKEHOLDER CONSULTATIVE MEETING BETWEEN NEWPLAN AND MINISTRY OF LANDS HOUSING AND URBAN DEVELOPMENT

VENUE : MLHUD

DATE : Thursday September, 06th, 2018
TIME : From 03:00Pm to 12:05Pm

ATTENDANCE. (List attached)

NO	RECORD OF PROCEEDINGS	ACTION
MIN 01	**SELF INTRODUCTION** The meeting started with introduction from all the members present.	**MLHUD**
MIN 02	**COMMUNICATION FROM THE CHAIRMAN** The chairman welcomed the NEWPLAN team present also introduced the rest of the members of his team for attending the meeting. He stated that the Ministry had received a letter from NEWPLAN requesting for a stakeholder consultative meeting regarding the Kabuyanda …..project they are implementing. He mentioned that other members of the ministry were engaged in other activities and that they had been represented by the few present from the directorate of Physical Planning and Urban Development. He then gave a go ahead to NEWPLAN to make a presentation of the project.	**MLHUD**
MIN 03	**COMMUNICATION FROM THE ESIA EXPERT** She thanked the chairman for the opportunity and gave apology for being late and also for other members not present and informed the meeting that NEWPLAN was contracted by NELSAP to finalise the ESIA and RAP for the Kabuyanda irrigation and watershed management project located in Ntungamo and Isingiro Districts. She stated that the project is located in two Sub Counties of Isingiro and one Sub County in Ntungamo. She mentioned that NELSAP handed over the project to Ministry of Water and Environment to review the design and implementation of the project. She mentioned that Newplan's assignment was to finalise the ESIA that had been started by another company but were terminated. They had submitted the Terms of Reference and a Scoping Report for the ESIA to NEMA but didn't include a detailed study stage that included RAP. She mentioned that it's a legal requirement of Uganda and World Bank who are funding the project to consult the stakeholders and mentioned that the project is an irrigation development project and that there is subsistence farming in the project area though the area is water stressed. The project is aimed at increasing water availability for agriculture, live stock and domestic use. The project components being the dam, reservoir project office, workers camp and management camp, the irrigation command area and the pumping stations.	**MLHUD**

NO	RECORD OF PROCEEDINGS	ACTION
	She further told the meeting that the project would employ 600 employees and that most of the materials would be bought from existing sites within or neighbouring the project area. She mentioned that water to be used for construction would be got from river Mishumba which is a subsidiary of River Kagera.	
MIN 04	**COMMUNICATION FROM NEWPLAN SOCIOLOGIST** She thanked the meeting for the opportunity to consult with them and informed them that the project is developing a Resettlement Action Plan (RAP) consistent with the laws and policies of Uganda as well as the world bank's policy on involuntary resettlement . The project objective was to lay down a framework for managing the loss of economic activities livelihood and assets of project affected people and all their resettlement from the site through monetary compensation and compensation in kind. The field work was done and a report prepared basing on the policies and the laws of Uganda and followed the NELSAP policies as well and international safe guard policies. She mentioned that public consultations and stakeholder engagements were made and identifications were made for the would be directly affected people, indirectly affected people and all the other stakeholders like international local government and all the institutions were met. It was noted actual field work was done through the land surveys that were conducted after which strip maps and survey report has been prepared. The Valuation Surveyors also identified and assessed the affected land and property. A valuation methodology was prepared and it is yet to be submitted to CGVs office for approval.	**MLHUD**
MIN 05	**QUESTION AND ANSWER** **QN.** **MLHUD**: Is potential affected person the same as project affected person? ANS. **Newplan**: Project Affected Persons are the ones in the identified corridor and potential affected persons are the ones that are not yet ascertained for example the surveyor may step on a person's beans in the garden such people are also affected by the project and are also considered for compensation. **MLHUD**: What is the capacity of R. Mishumba ? **Newplan**: In the rainy season, the river floods hence that water will be used for storage in the tanks which can be used later **MLHUD**: What is the population the project is going to serve?	MLHUD

NO	RECORD OF PROCEEDINGS	ACTION
	Newplan: At the moment the project is serving people of Isingiro, Kabuyanda district and Ntangamo districts. **MLHUD**: What are the benefits of the project? **Newplan**: They are som many benefits i.e. employment oppurtunities, controlling drought in the area **MLHUD**: What is the storage of the water tanks? **Newplan**: **MLHUD**: Is there an alternative area where these people are going to be resettled? **Newplan**:At the moment, relocation will still be around the project area **MLHUD**: Which specific section of vision 2040 supports this course? **Newplan**: **MLHUD**: Has the cut off date been set? **Newplan**: Not yet. This will come after the phase of Implementation is staring **MLHUD**: Is it a RAP or RAP framework? **Newplan**: This is a RAP framework **MLHUD**: How much has the community been involved **Newplan**: From the start of the project through engagements and meetings **MLHUD**: Packaging of the livelihood restoration program **Newplan**: This is already there in the implementation of the project **MLHUD**: Do you have a M& E plan for the RAP **Newplan**: Not really **MLHUD**: Identify the vulnerable groups and what kind of help they are going to be given **Newplan**: This will be done as they are priority **MLHUD**: We need to have the adverse impacts of the project **Newplan**: The impacts are both positive and negative. But the positivves outweigh **MLHUD**: Have you secured any land to replace the NFA trees **Newplan**: No. But NFA will handle that. They are aware **MLHUD**: Bring the whole spectrum of stakeholders who have been consulted **Newplan**: This can be shared after consultations with our colleagues **MLHUD**: Predominant land tenure **Newplan**: Customary, for cultivation **MLHUD**: Is there a physical development plan	

NO	RECORD OF PROCEEDINGS	ACTION
	Newplan:Yes there is **MLHUD**: Has the consultant met the Physical planner **Newplan**: Not yet but we will **MLHUD**: How long is the project going to run **Newplan**: At the moment we cannot determine since we are at the beginning phase.	
MIN 06	**COMMUNICATION FROM NEWPLAN SOCIOLOGIST** • She mentioned that there would be access to employment opportunities to the local people in the construction phase and that there would be financial literacy and financial management training would be carried out. • Since there usually grievances that surface during the project we would have grievance committee at the Kabuyanda Town council level and in case it fails to resolve the issue then it would be resolved by the District grievance committee and in case it fails then resolutions would be done by the courts of law • She mentioned that there would be physical displacement where 105 buildings would be affected since there would be irrigation pipes passing under buildings. She also mentioned that the town is over populated. • She mentioned that affected people would maintain their social status since they would shift the buildings behind to give way for the irrigation pipes. • She mentioned that land subdivisions and deceased project affected persons would be put into consideration	MLHUD
MIN 07	**REACTIONS** **Maria:** ***we have learnt that the catchment area is River Mishumba , where is it's source?*** **Newplan**: It's a tribute of river Kagera and it comes from Rwanda through the hills ***is it possible to tell its relative capacity because it passes through the cattle corridor relatively a semi-arid area a place which experiences longer periods of drought, is it going to be sustainable to have this river as the major catchment area and if so what is the population the project is going to serve? And you have told us the impacts but we would love to learn about the benefits*.** **Peter : *we would have loved to see the SWOT analysis of the project. Am wondering if the five storage water tanks do they have the capacity to run this vast area for about 4 to 6 months what is their storage capacity? Is there any alternative area where these people who are going to be displaced are going to be resettled because I heard you say that they will remain in the area?*** ***Is the employment going to be restricted?***	**MLHUD**

NO	RECORD OF PROCEEDINGS	ACTION
	Part of the affected assets was NFA forest, when we follow the world bank policy we see that a number of trees are going to be cut, is there a plan of transferring the lost trees to a different area? ***Can you please let us know of the stakeholders you consulted and the mode of communication?*** ***What was the predominant land tenure system in the area and its implication to the project?*** *Majority was customary land.* ***Will the project have a physical development plan and what is in that place for now to avoid conflict of land uses*** ***Have you interacted with the district planning committee?*** ***You have mentioned that this is a preliminary RAP, do we expect another detailed RAP?*** The main purpose of the RAP was to cost the project so it didn't require a details. ***Are there other alternative water sources in case the river dries? How can you make a decision for the PAPs to harvest and stop farming before you pay them?*** This will be done at the implementation stage.	
MIN 10	**MEETING ADJOURNED**	**MLHUD**

Confirmation of Records

…… **Charlotte Kabajulizi**
Sociologist

……. **Jackline Nassuna**
Sociologist

MINUTES OF THE STAKEHOLDER CONSULTATIVE MEETING BETWEEN NEWPLAN AND NTUGAMO DISTRICT LOCAL GOVERNMENT (DISTRICT ENVIRONMENT OFFICER)

VENUE : Ntugamo District Local Government
DATE : Thursday December, 13th, 2018
TIME : From 09:00am to 09:15am

ATTENDANCE (List attached)

N°	Record of Proceedings	Action
MIN 00	**AGENDA** **01** Self introductions **02** Presentation by Newplan **03** Open discussion **04** Meeting closure	**NDLG**
MIN 01	**SELF INTRODUCTIONS** Ms Anna Kisakye (Newplan team) introduced herself and requested for self-introductions from Ntugamo District Environment Officer.	**NDLG**
MIN 03	**PRESENTATION BY NEWPLAN** The team member from Newplan, Ms Anna Kisakye brought to attention and explained to the DEO that at first Ntugamo District (Rwoho Town Council previously part of Rukoni Sub County) was not considered as an area that would be affected by the proposed project during feasibility study. She mentioned that the project belonged to NELSAP but had been handed over to Ministry of Water She mentioned that the project involved an ESIA and a resettlement action plan. Anna Kisakye also mentioned that the project is located in Isingiro and Ntungamo districts. She also mentioned that the project would be tapping water from River Mishumba.	**NDLG**
MIN 04	**OPEN DISCUSSION** **NDLG:** *Advised that vegetation removal should be limited to control soil erosion* **Newplan:** Mitigation measures have been put in place and these were detailed in the Environment and Social Management Plan in this report **NDLG:** *What are the mitigation measures put in place for dust and noise pollution and also what are the mitigation measures in place to protect downstream areas to ensure water is not polluted* **Newplan:** Mitigation measures have been put in place and these were detailed in the Environment and Social Management Plan in this report **NDLG:** *How will women and youths be involved in this project?* **Newplan:** Local people will be given a priority during employment especially the youths **NDLG**: How will people in Ntugamo District benefit from this project **Newplan:** **NDLG**: *Sensitize communities and engage those along the catchment areas* ***Newplan****:* Community engagement has been done throughout all the communities that may be affected by the proposed project **NDLG:** *How will the ecology be protected not to affect the biodiversity* **Newplan:** Mitigation measures have been put in place and these were detailed in the Environment and Social Management Plan in this report	**NDLG**

N°	Record of Proceedings	Action
	NDLG: *Ensure Ntugamo and Isingiro districts are involved in monitoring compliance of the project.* **Newplan:** Ntugamo and Isingiro Districts will be involved in the all proposed project phases **NDLG:** *Water quality monitoring and soil testing should be done before the project implementation and after the establishment of the project to ascertain the project impact on the parameters***Newplan:** Water and soil analysis were done and analysis results were appended in this ESIA report **NDLG:** *Have in place a trans-boundary plan to have in harmony both districts on how to protect the environment* **Newplan:** *A trans-boundary plan will be put in place so as both Ntugamo and Isingiro districts are involved in all the project process*	
MIN 05	**MEETING CLOSURE** There being no other business to discuss, the meeting was adjourned at 09:15am	**NDLG**

Confirmation of Records

……
Anna Kisakye
Newplan Ltd

…….
Tumwebaze Dinnah
Senior Environment Officer
Ntugamo District Local government

MINUTES OF THE STAKEHOLDER CONSULTATIVE MEETING BETWEEN NEWPLAN AND KABUYANDA TOWN COUNCIL

VENUE : KABUYANDA TOWN COUNCIL OFFICES
DATE : Friday December, 14th, 2018
TIME : From 04:05pm to 06:30pm

ATTENDANCE (List attached)

NO	RECORD OF PROCEEDINGS	ACTION
MIN 00	AGENDA 01 Prayer 02 Self introductions 03 Opening remarks by the town clerk for Kabuyanda Town Council 04 Presentation by Newplan 05 Open discussion 06 Meeting closure	KTC
MIN 01	Prayer	KTC
MIN 02	SELF INTRODUCTIONS The town clerk for Kabuyanda Town Council introduced himself and requested everyone in the meeting to introduce themselves	KTC
MIN 03	OPENING REMARKS BY THE TOWN CLERK FOR KABUYANDA TOWN COUNCIL The town clerk let us know that they are aware of the proposed project and informed us that the area Local council committee and councillors, police were present.	KTC
MIN 04	PRESENTATION BY NEWPLAN Newplan's team member Anna Kisakye introduced the project and informed the committee about the changes in the project designs and project components and mentioned that the final ESIA report had been handed in but got comment from the world bank which need to be addressed She mentioned that the project involved an ESIA and a resettlement action plan. The project is located in Isingiro and Ntungamo districts Ms Anna Kisakye mentioned. She mentioned that there would be an emphasis of employing local people and that 600 people would be employed for the construction phase.	KTC
MIN 05	OPEN DISCUSSION KTC: *We expect to benefit a lot from the proposed project especially the road infrastructure, we want to know if the access roads will be tarmacked* Newplan: The access road will be improved as one of the project components KTC: *Would want to know how communities outside Kabuyanda will benefit from this project*	KTC

NO	RECORD OF PROCEEDINGS	ACTION
	Newplan: KTC: *Will compensation of small plots be the same as for the bigger farm lands?* Newplan: A Resettlement Action Plan was incorporated in the ESIA report. KTC: *We have noticed the on-going surveying and some people's land has been left out during the surveys, does it mean they will not benefit from the project?* Newplan: KTC: *The community would like to know and be informed what the surveyors are dong in their communities and also some cells within the command area have not been surveyed* *Newplan:* KTC: *Is the water for irrigation free?* Newplan: KTC: *During employment, priority should be given to local people* Newplan: Local people will be prioritised during recruitment KTC: *Does the government have plans for people living uphill because they have challenges like access to water* Newplan: KTC: *Train the task force on what to do since most people at the taskforce committee do not know their roles and what to do during project implementation* Newplan: KTC: *In case an individual refuses and project component to go through his/her land, won't this affect the project implementation and how will such situations be handled?* Newplan: A Resettlement Action Plan was incorporated in the ESIA report. KTC:*Will camp sites and project offices be handed over to NFA or town council after the construction phase?* Newplan: KTC: *We need a work plan for the proposed project so as we are aware on what will be done on a particular day*	
MIN 06	MEETING CLOSURE There being no other business to discuss, the meeting was adjourned at 06:30pm	KTC

Confirmation of Records

…… ……..

Anna Kisakye
Newplan Ltd

Town Clerk

MINUTES OF THE STAKEHOLDER CONSULTATIVE MEETING BETWEEN NEWPLAN AND KABUYANDA SUB COUNTY
VENUE :
DATE : Saturday December, 15th, 2018
TIME : From 12:10pm to 03:30pm

ATTENDANCE (List attached)

NO	RECORD OF PROCEEDINGS	ACTION
MIN 00	**AGENDA** **01 Prayer** **02** Self introductions **03** Opening remarks by the focal person **04** Presentation by Newplan **05** Open discussion **06** Meeting closure	**KSC**
MIN 01	**Prayer**	**KSC**
MIN 02	**SELF INTRODUCTIONS** The focal person from Kabuyanda Sub County introduced the members in the meeting and also Anna Kisakye, Newplan introduced herself	**KSC**
MIN 03	**OPENING REMARKS BY THE FOCAL PERSON OF KABUYANDA SUB COUNTY** The focal person of Kabuyanda Sub County mentioned that the communities in Kabuyanda Sub County are aware of the project proposed and been observing some people (Surveyors) taking measurements in their communities and wanted to know whether Newplan was aware of surveyors on ground	**KSC**
MIN 04	**PRESENTATION BY NEWPLAN** Anna Kisakye (Newplan) introduced the project and explained the change of designs of the proposed project and explained that the proposed project is an irrigation scheme. And explained that the project will emphasise employment of locals in all project phases	**KSC**
MIN 05	**OPEN DISCUSSION** **KSC:** *The government should increase awareness of this project through radios and Television networks* **Newplan:** All stakeholders are engaged to be informed and sensitized about the proposed project **KSC:** *What is an irrigation scheme?* **Newplan:** **KSC:** *During employment, priority should be given to the local people* **Newplan:** Priority will be given to the local community during recruitment **KSC**: *What is the compensation procedure?*	**KSC**

NO	RECORD OF PROCEEDINGS	ACTION
	Newplan: RAP was incorporated in the ESIA process and a RAP team will come to communities to sensitize the local people **KSC**: *What technology will be used during irrigation since farms are distant* **Newplan:** Water pipes will be connected from the dam area to different parts of Kabuyanda town council and Kabuyanda Sub County **KSC:** *During the feasibility study, communities were informed that hydro power was to be produced and water will be taken uphill, since designs have changed, how will communities in highlands benefit from this project?* ***Newplan****:* The developer is proposing to develop an irrigation scheme of which water will be supplied though gravity to the project area **KSC:** *Some villages were not surveyed; does it mean they will not benefit from this project?* **Newplan:** **KSC:** *Since water will be dammed, won't this affect those (communities) who use water downstream* **Newplan:** **KSC:** *Why was irrigation scheme prioritized yet people lack water from home consumption* **Newplan:** **KSC:** *In case someone has a plot of land along the access road, and wants to construct in it, will he/she be stopped* **KSC:** *Is the irrigation water free?* **Newplan:**	
MIN 05	**MEETING CLOSURE** There being no other business to discuss, the meeting was adjourned at 03:30pm	**KSC**

Confirmation of Records

…… …….

Anna Kisakye
Newplan Ltd

Focal person, Kabuyanda Sub County

MINUTES OF THE STAKEHOLDER CONSULTATIVE MEETING BETWEEN NEWPLAN AND RWOHO TOWN COUNCIL (FORMERLY UNDER RUKONI EAST SUB COUNTY)

VENUE : Rwoho Town Council

DATE : Saturday December, 15th, 2018
TIME : From 05:30pm to 06:00pm

Engaged the L.CIII of Rwoho Town Council on phone
He explains that the feasibility study captured Rukoni East Sub County as those upstream the river, but Rwoho Town Council was recently formed and started operation in 2018 hence Rwoho Town Council is located upstream the river.

Stakeholder engaged	Comments
Mr. Rukudebwa John Tel: 0774 855485 L.C III- Rwoho Town Council	During the feasibility study, Rukoni East sub county was captured but in 2017, Rwoho town council was formed and started operation in 2018.
	NFA gives out land to individuals, and they cultivate alog the steeps and valleys hence degrading the environment and endangering water sources, wont this affect the dam water by silting it
	There is a spring eye (source of water) of which Ntugamo district intends to develop, and pump it to communities uphill (Rwoho Town Council) upstream the proposed dam area in Lugorogoro. In future the water source may emerge with the proposed dam area, wont this affect the water quality

MINUTES OF THE STAKEHOLDER CONSULTATIVE MEETING BETWEEN NEWPLAN AND AFRICAN PANTHER RESOURCES (U) LIMITED

VENUE : African Panther Resources (U) Limited office
DATE : Sunday December, 16th, 2018
TIME :
Engaged African Panther Resources (U) Limited
African Panther Resources (U) Limited was licenced by DGSM to mine tin in the quarry area in Katanga Cell although operation has not fully started.

Stakeholder engaged	Comments
African Panther Resources (U) Limited	There are old tunnels that were used by previous mining companies
	Most people in the community depend on mining as a way of survival and also break stones into aggregates
	There are many minerals at the quarry i.e. precious minerals and development minerals but the company is only interested in tin as a precious mineral
	The artisans are not yet registered with the company but when operations start, the company shall employ all the artisans.

Appendix 7: Meeting Attendance Lists

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 6/11/2017 (17:00 hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
	J Byasi'gaba	Councillor	0703657960	M		[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 6/11/2017 (17:00 hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
	Twinomujuni	Kabuyanda	0751012296			[signature]
	Akampurira Emmy		0702757781			[signature]
	Mujuni Dens		0757729903			[signature]
	Niwamanya Joshua	kabuyanda	0706533798			[signature]
	Asiimwe Alex		075500776			[signature]
	Ndizeye Edward	Kabuyanda	0787668018			[signature]
	Mulema Jackisoni	Kabuyanda	0756927000			[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 6/11/2017 (17:00hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	Birimaana Justus	C/person L.C	Good	✓		[signature]
2	Ndungutse Hyol.			✓		[signature]
3	Tushabe Robert		0706300297	✓		[signature]
4	N Gaboba [illegible]			✓		[signature]
5	Musinguzi Innocent	Lugoro	0782205571	M		[signature]
6	Siraji Muhumuza		0701058102			[signature]
7	Ariwilwe Fuder		0757557214			[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 6/11/2017 (17:00hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
01	Tusingwire Robert	T/Agent	0782773199	✓		[signature]
02	Twinegomugisha Moses Tinka	SEDO	0754698914	✓		[signature]
03	Ngonzi Eldard	Councillor for Elderly	0750188028	✓		[signature]
04	Karomini Rwabujare	Councillor	0755338406		✓	Karomini
05	Birimaana Benon	V/c/person Kabuyanda Daily	0754102999	✓		[signature]
06	Bahati Juliet	O/m/A.	0703616487		✓	B. Juliet
07	Gabasiise Rugambwa	Ou	Kabuyanda	✓		[signature]
08	Habinrana Charia	Bugarama				[signature]
09	Rumusiime Lilian	C/Person	Kashaka			Rumusiime
10	Kamanuno Alice	UC/Person	Kashaka			Alice
11	muhwezi John		nyakitunda			muhwezi
12	Amomugisha Rimah	Sec. Social Services Isingiro	0750068307		✓	[signature]
13	Tumwesigye Edward	Farmer	0757415997	✓		[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: ISINGIRO
Sub County: KABUYANDA TOWN COUNCIL
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 6/11/2017 (17:00 hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1.	MUGABE ROBERT	COUNCILLOR LCIII CENTRAL	0701870512	✓		[illegible]
2.	S-Karugaba	CM	0772[illegible]	✓		[illegible]
3	Sempongu	P.				
4	Mqnezezo M	M	0758128[illegible]			
5	Ngabirano Asaph	TAILORS	07060099			[illegible]
6	Hiwagaba SAM	ENG	0750080846	✓		Sam.
7	Nabaasa Julius	Technician	07543[illegible]	✓		[illegible]
8	Akansasira Jotham		07007893[illegible]	✓		Akansasira
9	Semwe Sadi	-				[illegible]
10	Tumuteggyereize Fred	Omuhingi	0757710448	✓		[illegible]
11	Turinawe wilson	omuhingi	0701060034			[illegible]
12	Muguzi JEFFERE	Muriro	0751677333			[illegible]
13	Kamwebaze	omuhingi				
14	Gumushabe Sofia	Farmer				G.
15	mbarebasi	[illegible]				[illegible]
16.	BYARUGABA VICENT	For Town Clerk	0758816686	M		[illegible]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

KYISOKO & NORTHER WARD

District Kingoro

Sub County Kabuyanda Town Council

Village Kabuyanda Central

Venue Kabuyanda T/C

Date/Time 6/11/2017 (17:00 hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1-	ATHUMBISIBWE WILBER	C/MAN LCI	0753634336 0788152297	M		[signature]
2-	TWINOMUJUNI GEORGE	NATIVE WARD	0782190298 0753404300	M		[signature]
3	Oyesigye Abbott	NORTHER	0756486236	M		Oyesigye
4	Kanyesigye Justus	Ama LCI	0778943972 0751931028	M		[signature]
5-	Kasabanga John	Rwandwera I	0755271340	M		Jukas
6	Sandey Elikod	Omuhingi	0754994364	M		Sandey
7	Musinguzi Stephen	Omuhingi	0754886762	M		[signature]
8	Sunday Asaph	omuhinji	0754517054	M		Asaph
9	Ihiiza daniel	omuhinji	0750976587	M		[signature]
10	Nyabukom/ [illegible]	M		M		Sake
11.	KARUURU JOHNSON	PEASANT	0757165710	M		[signature]
12	Rubungo Yosam	omuhigi	0750682743	M		[signature]
13	Kwehagana Godfrey	omuhigi	0758912289	M		[signature]
14	MBIGHE Benard	omuhingi	=	M		Benardi
15	Mubangi Z.	Amos		"		[signature]
16	ASO BAKUNDINE D.	O/C Kabuyanda	0750064245	M		[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Rugarama/Kabuyanda Central
Venue: Kabuyanda T.C
Date/Time: 6/11/2017 (17:50hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	Mishar Kogezamu	Elder	0785881589	M		[illegible]
2	Nyinamuhe Sata	Elder			F	Nyinamuhe
3	Akankwatsa Chant				F	Akankwatsa
4	Asiimwe Joy Shilling	Elder	0785577351		F	[illegible]
5	Ngabirano Asaph		0756601838	M		[illegible]
6	Tukahirwa Jovita	Woman	075219066		F	Tukahirwa
7	Muhairwe Nauce	"			F	Muhairwe
8	Nyamukobwa Longida	Elder Woman			F	Nyamukobwa
9	Twinomujuni Jennifer	Elder	—		F	Jennifer
10	Kebirungi Macline	Woman			F	Kebirungi
11	Tumusime Sharon	Woman			F	Tumusime
12	Nyiramugisha Jerurina	P.W.DS	0750135634		F	Nyira
13	Turuhairwe Lidya	Woman			F	Turuhairwe
14	Kediss Tindiwensi	Farmer	0774349		F	Tindiwensi
15	Tumushabe Elinah	Member			F	Tumushabe
16	Nabaasa Julius	member	0754364173	M		[illegible]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T.C
Date/Time: 6/11/2017

No.	Name	Designation	Contact	Sex M	Sex F	Signature
20	Bagyenda	Apollo	0703069895	M		[illegible]
21	J. Bayambana	KS III	0756654759		F	J.B
22	Kabugude Yeremu	Kisyoro I	0772306100	M		[illegible]
23	KANYESIGYE PEACE	RWEMBWERA	—		F	Peace.

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 6/4/2017 (17:00hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	Kanyoga Sephirak	C/man LCII Nothern	0756849406	m		Sek
2	Kabagyire Rubijone	Counseler of Eldery	0755338406		F	Kabagyire
03	BYARUHANGA GEDEON	LC II Flag Bearer Norther ward	0754162473	M		[illegible]
04	Mbabazi Fred	Kisyoro I	0756418558	M		[illegible]
5	Muhoozi Nasan	Rwembwera	077892435	M		[illegible]
6	Elinayinda [illegible]	Kisyoro	0756[illegible]		F	
7	MUSINGUZI ALEX	Rwembera	0759706507	M		[illegible]
8	MBABAZI ELIAS	RWEMBWERA I	0753124837	M		M. Elias
9	TUMWESIGYE [illegible] Enock	Kisyoro I	0757706733	M		Enock
10	TUMUHEBIRE VALENTINE	KISYORO III	0788797296	M		[illegible]
11	RWAKATOO CHARLES	Rwembwera I	0757705587	M		[illegible]
12	David Bizimana	Rwembwera	0705991[illegible]			[illegible]
13-	MARTIN [illegible]	Rwembwera I	070105796	M-		M.T. [illegible]
14	Nkunzingoma Bob	Rwembwera	0706258[illegible]	M		[illegible]
15-	Sabiiti Eric	Kisyoro II	0759882551	M.		
16	NKWASIBWE	KISYORO II	075527[illegible]	M		[illegible]
17	Ndanderebi Marko	Rwembwera I	0754546617	M		[illegible]
18	Niwabaine Richard	Kisyoro I	0755441131	m		Niwe Richard
19	Muhanguzi Benard	KISYORO III	0750157151	m		Muhanguzi

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: ISINGIRO
Sub County: KABUYANDA T/COUNCIL
Village: KABUYANDA TOWN CELL
Venue: Kabuyanda T/c
Date/Time: 06/11/2017 (11:00hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1-	NSIMIRE GEOFFREY	c/man LCII Central ward	0757515356	M		[signature]
2-	AIZABANKWIKIZA BENON	c/man LCI Kabuyanda	0757149014	M		[signature]
3	Muhwezi F.	Kisyoro II	070597812	M		[signature]
4	SERINA KIBGTEN GA	KABUYANDA	0782462826		F	[signature]
5	Peter D. R. Buhacha	Kabuyanda	07520 5900	M		[signature]
6	Ngunize Mulondo	Kisyoro II	0758059978	M		[signature]
7	Uwediyonine	Rwebwera I	0757899960	M		[signature]
8	Sebale	Kabuyanda	078289727	M		[signature]
9	Kataniyda Naris	Kabuyanda T/c	0754400880	M		[signature]
10	Amumpaire Nicodemus	Kabuyanda T/c	0705381355	M		[signature]
11	Tuongyirwe Ericka	Kabuyanda	[illegible]	m		[signature]
12	Tumukwiline	Kabuyanda	0757260082			[signature]
13	NKWOSIIBWE MOSES	Kabuyanda	0759645408	M		[signature]
14.	AGABA FRANCIS	KABUYANDA	0705526891	M		[signature]
15	Turyasingura Jackson	Kabuyanda	0757804955	M		[signature]
16	BYARUHANGA G	Kabuyanda	0751779638	M		[signature]
17	HAKIRI Ambrose	Kabuyanda	0756042400	m		[signature]
18	Byabatinto M	Peasant	0774841880	F		MB
19	CHAMPION B	Kagoto	0787656321			

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ...Isingiro...
Sub County ...Kabuyanda Town Council...
Village ...Kabuyanda Central...
Venue ...Kabuyanda T/C...
Date/Time ...6/11/2017 (17:00 hrs)...

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	Rumanyika Joseph	Speaker	0750171743	L		Rus.
2	Kabinga Peter	B.M	0773510081			[signature]
3	Birushe Juma B.	Land B. Member	0752769941			[signature]
4	Asiima Merod	L/C/person III	0753221596			[signature]
5	Akanangira Johna	Personell	0755615427	M		[signature]
6	Byarubanga Henry	Peasant	0706469605	M		[signature]
7	Amos Ariwye	Parish Chief	0757822828	M		[signature]
8	Diina Kabinga	Peasant.	0754814740			Diina
9.	Ndumu Fosie F.	C/person	0750068392	M		[signature]
10	Ndenzi Gideon	Peasant				NDENZI
11	Musasha Thomas		0750577241	M		Musasha Thomas
12	Batiati . G.	Boda	0751105023	M		Batiati
13	Binyabareme	Driver	0772819224	M		[signature]
14	Asaph Rwebaija	Plumber	0755428615	M		[signature]
15	Muhangire. Abel	Asgiro II	0704859608	M		[signature]
16	Atuhairire Ernesta	Veterani	0755832805		F	Ernesta
17	Wariziima Susan	veterani	0759832418		F	Susan
18	Tumukunde Nicholas		0756262125	M		
19	Muhwezi Lawrence	Student	0704269468	M		[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ...ISINGIRO...
Sub County ..KABUYANDA TOWN COUNCIL
Village .KABUYANDA CENTRAL VILL
Venue ...KABUYANDA T/C...
Date/Time ...6/11/2017 5PM...

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1.	TUSINGWIRE PATRICK	GISO	0755225761	M		[signature]
2	BARIHAMUSHURA CHARLES	Omukuze	0753004348	M		[signature]
3	MUJ-MSERE	Kanyegenza	0782520266	M		[signature]
4	HABIMAANA CHARLES	VHT MEMBER	0751105453	M		[signature]
5	BYARUHANGA GODFREY	TAX DRIVER	0751779638	M		Byaruhanga
6	ARINAITWE ALONE	Omutuze	0758595799	M		[signature]
7	KYOMUGISHA LOY				F	[signature]
8	Binomugisha	PATRICK	0775296933		P	[signature]
9	VHT Cultat	RAfuyera	omeshabiri			[signature]
10	Ssendago Appolo	Bodaboda	0756641971	M		[signature]
11	Beinomugisha Annet	plant	0755707310		F	[signature]
12	Tindimwebwa Vasta	Farmer			F	Tinsta
13	NGABIRANO Elias		0758314627	M		[signature]
14	Kwizera ERICK		0759421542	M		[signature]
15	Ndagije Johnson.	Farm	0750559236	M		[signature]
16	THEMBO RICHARD	PHN	0752485243	M		[signature]
17	Kyoki Fiosisi		0757676473			[signature]
18	ATWIJUKIRE JOSEPH	boda boda	0704060073			[signature]
19.	SOWED BAHATI	Peasant	0750068292			SB

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 8/11/2017 (17:00hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
29	ORISHABA ADSON.K	Student				[signature]
30	Mukiza willson	omubyi	0782779428	M.		[signature]
31	Atwijukye JACK	boll	0701060020			[signature]
32	Owakuburibo Johnbosco		0703072600	M		[signature]
33	ARIHO WAN	Builder	0704669683	M		wan
34	ANYUWAIRE NUETHAN	student	0754287604	M		[signature]
35	Agaserkiike Ba[illegible]	sohen	0753905512			[signature]
36	Ukwasibwe William	Teacher	0782596661	M		[signature]
37	Nakafero meloo		0759514821	M		meloo
38	Soalorgo	JOS(PH)	0785583802	M		[signature]
39	Tumwiine Innocent	Student	0754438582	M		[signature]
40	Akampurira Jonan	Electral Eng	0705582746	M		[signature]
41	Ahumuza Hillary	student	0782572351	M		[signature]
42	Ankwasa Joe C	produce	0753676315	M		[signature]
43	Binyatunta C	M/Nurse	0750068257	M		[signature]
44	Marebe B TB	Peasant		M		Imalebes
45	Foresiyana Twongirire	Peasant		F		[signature]
46	Tugyezebwa Kavere	Carpenter	0756301554	M		Tugyezebwa K.
41	MUGISHA Zaph		0704436[illegible]	M		[signature]
42	NIKURUNGI ZIA Edson	Electrician	0754402968	M		[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kabuyanda Central
Venue: Kabuyanda T/C
Date/Time: 6/11/2017 (17:00 hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
20	NIWABIINE F CHAMPION		0754786944	M		Niwabiine F
21	Kansiime Wellen		0751052458	M		[signature]
22	MURUSA ELIASAPH	Sec Lcii	0702433967	M		[signature]
23	Mwebembezi Albert	Businessman	[illegible]	M		[signature]
24	Sande Joseph	popcorn	—	M		Sande
25	Ndyanuhaki Jonans		0757515847	M		[signature]
26	kiviri rwaga	Boda	0757706345	M		[signature]
27	AGABA RONALD	DJ	0701014138	M		[signature]
28	MUGISHA SAMUEL	KTC	0782753688	M		[signature]
29	MUSINGUZI DERRICK	[illegible]	0789735735	M		[signature]
30	Kiviri Justus	B/man	07515750[illegible]	M		[signature]
31	Tumwebaze Fred	Tailor	0758626258	M		Tumwebaze
32	Nimwesiga Julius		0757546664	M		[signature]
33	Twesiime STEPHEN		0700199699	M		[signature]
34	FRIDAY BENON		0750939108	M		[signature]
35	TUMWEBAZE GOSPEL		0750081014	M		[signature]
36	Mukamusu Paskario	B/man	0756301585	F		[signature]
37	TWESIGAMUKAMA MOSES	CAMERA MAN	0704187495	M		[signature]
38	ARINU JOLLAM		0754165466	M		A Jollam

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda S/C
Village: Kyamazinga, Kagera, Ruyabuno, Nyamiyaga
Venue: Kigabagaba COU
Date/Time: 5/11/2017

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	Mushabe George	Farmer	0754190474	✓		[signature]
2.	Pr Kahimbise Jack	V/chman	0750080848	✓		Kahimbise
3	AKANKWASA MEDARD	Clman	0759683821	✓		[signature]
4	Ntegyereize James	Afande	0785542430	✓		James
5	Nabaasa Unity		075043264		✓	Unity
6	Tumwebaze Jeneroza	Farmer		F	✓	Jeneroza
7.	Kyoheirwe Lydia	Farmer	0752015958		✓	Lydia
8	Twijukye Evasi		0751275337		✓	EVASI
9.	Odiriya Tukahirwa	Farmer			F	odiriya
10.	Tukamushaba Christine	Farmer	0756959149		✓	christine
11	Zarabugire John	Driving		✓		[signature]
12	Mugabirwe William	Farmer	075676205	✓		M.William
13	Milton Twebanze	Farmer	075726693	✓		
14	Mucungwa. Benon	Farmer	0757053047	✓		[signature]
15	Kato Nkey Felix	Farmer		✓		Kato
16	Mbabazi Lydia	Farmer	0751223160		✓	Mbabazi
17	Musimenta Fureba	Farmer	0706559780		✓	Furebesi
18	Ahimbisibwe	Farmer			✓	MERCY.
19	Atinaitwe P.	Farmer				

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ...Kyegegwa.......................................
Sub County ....Kabuyanda S/C.......
Village ..Kyamazinga, Kagera, Rwabano, Nyamiyaga
Venue ...Kigabagaba..
Date/Time ....5/11/2017..............................

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	KEDRESS ATEGYEREIZE	Vice chair Person LC III	0754404889		F	Kategyereize
2	NIGHT MURANGIRA	Famer Member	0705844128		F	Night
3	RESTER KYOMUHANGI	Famer			F	Kyomuhangi
4	SLIVIA NIWAGABA	Famer			F	Niwagaba
5	Peace Katureebe	omuhingi	0751693644			P. Katureebe
6	tumuHise Didaze	omuHigi	0756663966	✓		
7	kitaringwa bawala	omuHigi	0747596644	✓		
8	bangezaki Ngarami	omuHigi	0757973852	✓		
9	mbabazi Fausta	omuhingi			✓	mbabazi
10	Ainembabazi	omuhingi	0752240611		✓	agines.
11	Tindyebwa catherine	farmer	0785374719		✓	catherine
12	Turyabahika vitor	Farmer	0755541520		✓	vitor
13	Nabireba ENOCK	Omuhingi	0753339092	✓		Nabireba
14	Timbabwine B	omuhingi			✓	BTUPGI
15	GUMBIRE TADEO	Kiringu	0756968563			TGB
16	Tusingwire David	omuhingi				TDB
17	Nkubito Aron	omuhingi				[illegible]
18	Kyokuzeeriza	omuhingi	0754390069	✓	✓	[illegible]
19	Bagamba Juliet	omuhingi				[illegible]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ISINGIRO
Sub County KABUYANDA S/C
Village Kyamazinga, Kagara, Rukyabano, Nyamiyaga
Venue KIGABAGABA COU
Date/Time 5/11/2017

No.	Name	Designation	Contact	Sex		Signature
				M	F	
1-	NKwase Louse	Obubuliri	0750700630		F	
2-	ACAYO DOREEN	Sic/vice chairPers	0755947704		✓	
3-	TUSIIME EUNITY	Farmer	0704432934		✓	
4-	AKankwasa Hope	Farmer	0757885703		✓	
5-	Tumusiime Annet	Farmer			✓	Annet
6	NKwase Francis	Laybader	0753959152	✓		
7	Kyinihiremu	Farmer			✓	
8	Tugumisirize Solivia	Farmer	0703038859		✓	
9	NAMARA puruda	Farmer	0705642648		K	
10	Charity Byekwaso	Farmer	0706888498		✓	Charity
11	Karwegyema jovet	Farmer	0754764865		✓	jovent
12	Annet Gumisiriza	FAMAR			✓	Annet
13	Siajari Odofah	V.Co-ordinator	0753314059		✓	Siajari
14	Kafuruwire Sekondine	Councal			✓	Kafuruwire
15	Nosal. Judith	Farmer	0750343159		✓	Nosali
16	Nshemereirwe Wire	Farmer	0753789047		✓	Nshemereirwe
17	ANNET NIGWASE		0751271142			
18	Byaruhanga Henry	CDO	0700469605	✓		
19	Akankungwa Josna	Business	0755615427			

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: ISINGIRO
Sub County: Kabuyanda S/C
Village: Byamazina, Kagara, Rugabano, Nyamuyaga
Venue: Kyabahagaza COU
Date/Time: 15/11/2017

No.	Name	Designation	Contact	Sex M	Sex F	Signature
01	AKANKWASA G.W	EV-Focal Pnt-Rep S/c/chief	0758333262	✓		[signature]
02	MUTABEMWA JUSTUS	o/c CID	0751332137	✓		[signature]
03	Bwisiriz E	C/man LCI	0757554024			[signature]
04	Tumyasingura Abraham	VHT	0753404413	✓		[signature]
05	Karehi Benard	Omushubazi	0758234073	✓		Karehi
06	AHIMBISIBWE OBADIAH	PLUMBER	0757053104	✓		Alie
07	ORIKIRIZA BENSON	c/man	0757902828	✓		[signature]
08	DAMARI KEDRES	Peasant	0756563452		✓	Dauri
09	MOLLY NZAARO	Peasant	0758695186		✓	Molly
10	AKAMPURIRA EDALYNE	Peasant	0757145273		✓	Evalyne
11	KAREYYESA GRACE	Peasant				Grace
12	NABAHIMBO AGNES	Peasant				Agnes
13	KATABAZI TEREZA	Peasant				Tereza
14	NDYABAHIKA FAHOSITA	Peasant	0756514520			Fahosta
15	Orishaba mauda	Peasant				mauda
16	Penina Kwomwaka	Peasant				Penina
17	NINYESIGA AGNES	Peasent	07052 8436			Agnes
18	NIWAGABA GRACE	Peasent				Grace
19	BIRUNGI JACLINE	Peasant				Jackline

20 BAGWEZEZEZI ELIJAH PEASANT 0757413480✓ Bagwenezi
21 HAREMAIMANA CHARLES C/man LCI 0755011176✓ Harimana
NUWEBESA JUSTUS peasant 0758033580 F
23. TWESIGYE JUNIAS PEASANT 0752504354 M. [signature]
24 TUMUHAIRWE PADDY PEASANT 0756183059 [signature]
25 Rwakabale Matsyo Peasant. 0758093585. M [signature]
26 [illegible]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ..... ISINGIRO
Sub County ..... KABUYANDA
Village ..... KASHOTO II, Kagyuto I & Katema
Venue ..... KASHOTO C.O.U
Date/Time ..... 5/11/2017 (13:30 hrs)

No.	Name	Designation	Contact	Sex		Signature
				M	F	
1.	ABAHO Jonan		0780908762	M	F	
2.	AMUTUHAIRE EMILY				F	
3	OWAMANI CAROLINE				F	
4	ANYIJUKIRE CRISPUS			M	M	
5	AINEBYOONA OSBART			M	M	Osbart
6	ATUHAIRE Praise				F	Praise
7	BRENDAH AMPEIRE		0701926725		F	Ampeire
8	ORISHABA JOAN				F	Joan.
9	NAREEBA BRENDAH				F	Brendah
10	NATUKUNDA MACKLINE				F	mackline
11	AMPURIRE CAROLINE				F	caroline
12	TUMWORDBERE MEDARD			M		
13	KAKURU DEBORAH			F		Deborah
14	HYERABLE SUCCESS					
15	AINGWASE CLAIRE				F	CLAIRE
16	mwebembezi ISAAC			M		ISAAC

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ...ISINGIRO.....
Sub County .....KABUYANDA.....
Village .....KAGATO I & Katema
Venue .....KAGATO C.O.U.....
Date/Time ...5/4/2017 (13:00 hrs).....

No.	Name	Designation	Contact	Sex		Signature
				M	F	
1.	MUGISHA WILSON	TEACHER	0772862249	M		
2	Ninsiima Adella		0780666804	F	F	Adella
3	Elias Kato	Lay Reader	0757015944	M		Kato
4.	TWEBAZE ROBERT	TEACHER	0782895340	M		
5	Bagyenda Festo	Peasant		M		
6	NIWAGABA Amos	ASTUDENT		M		
7	TURYAMUKURATIRA	Peasant	0757494298	M		
8	TIBEBWA ISRAEL	Student	—	M		
9	KEMBABAZI Edith		—	F	F	
10	KEBIRUNGI GIFT	YOUTH	0705584820	F	F	
11	KANSHABE MELLON	YOUTH	—	M	M	
12	Kyohirwe ALICIOUS	youth	—		F	
13	Kakuru GIFT	youth	—		F	
14	TWINOMUJUNI VICTOR	YOUTH		M		Victor
15	Ninsiima Grace	teacher	0750653457	F	F	
16	ABINITWE JUDI		0700464266	M	F	
17	KYOGABIRWE OBVIOUS		0754796400		F	Kyogabirwe
18	ANNAMWESIGWA				F	

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Subcounty
Village: Kaguto I, Kaguto II & Kagoma
Venue: Kaguto church of Uganda
Date/Time: 5/4/2017 (13:00 hrs)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	Tumuhimbise R.		0757030013	M	F	Robert
2	MBABAZI			F	F	Naomi
3	Kyompire			F	F	Penina
4.	AHIMBISIBWE FERESTA		0705878686	F	F	[illegible]
	NUWAGABA ANGEL		0757442045	F	F	Angel
5	yamuremya			M	-	
6	Ainembabazi Judith			F	F	Judith
7	Nsenga mirton					[illegible]
8	Rwabwera . Ageyety	Kabuyanda	07826575	F		[illegible]
9	KYAKUNZIRE DINAVERE				F	
10	Kyomuyama Horera				F	
11	BETHELINE NAAU		0772852098		F	[illegible]
12	MBANGANA. D		0789176316			
13	Mukunzi D		0773731967		F	[illegible]
14	Judith. NATUKUNDA		0706007613		F	Judith
15	BWakyeyem.				F	Bwakyeye
16	Kampiza E.				F	Kampiza
17	Kyandabire Keti		0774409972		F	K.K.
18	Rovina Nyakato					Nyakato

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ....Kingina....
Sub County ..Kikabagande(?)....
Village ..Kaguto I, Kaguto II & Katoma
Venue ......Kaguto church of uganda
Date/Time ..5/11/2017..(13:00 hrs)....

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	DWOMUGISHA RUTH	farmer			F	Ruth
2.	Peminah. Tindiziraira	Farmer			F.	Pemina
3.	MDIDAH KEDRETH	Farmer			F	Keddreth
4.	KESIIME JACKLINE	✓			✓	Tusiime
5	Fouli Banzi	Farmer			F	Fouta
6	Joventa kasigire	former	0778499547		F	Jove
7	Aimi MBaasa	Famer			F	Aimi
8	Meri Ntuyahe	Famer			F	Meri
9	Ayebare purovia	former			F	meri
10	Norah. Byarubanga	Famer				
11	Kyavimpa. erikana	Famer				
12	Keti. Kasaba	Famer				
13	Kellen Mukwezi	Famer				
14	Tusiime Edward	Famer		M		Tusiime
15	Kyomugisha James	F.	0781679290			[illegible]
16	Tiberinga Mariya				F	Tiberiga
17	Apuri penina				F	penina
18	MUZAANI Justus					
19	Mwesigwa Patrick		0782414269	M		[illegible]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ...Isingiro...
Sub County ...Kabuyanda ... Kampamanzi Subcounty
Village ...Kagota I...
Venue ...Kagota church of uganda...
Date/Time ...5/11/2017 (13:00 hrs)...

No.	Name	Designation	Contact	Sex M	Sex F	Signature
.	Loy Kambari			F	F	Loy Kambari
2	Kedress Sabena				F	Sabena
3	Patience Nsenga				F	P. Nsenga
4	Fausta Bukabeba				F	F. Bukabeba
5	Tumusiimire M				F	macline
6.	Apophia Nyakato				F	Nyakato
7	peace Kahara				F	peace
8	Tukoreki Vett				F	Tukoreki.
9	Nimusiima Charity				F	Charity
10	Asimwe Scovia				F	Scovia
11	Vanisi Rukyogoza				F	Vanisi
12	Merylinda precious		0777216604		F	precious
13	melodie martin				F	melodie
14	Joy Kamari					
15	Jovia Kakazi				F	Joy
16	Orishaba Gezi					
17	Nkwasibwe Jaoyi					
18	Kekimuri Bonny					
19	Ngabarano Vagi		0779539629		F	Kekimuri

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kagota, Kateera, Iryango & Kashaka
Venue: Iryango Village
Date/Time: 4/11/2017 (4:45 pm)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1.	Mugabe Isaac	Famer		✓		[signature]
2.	Tushabe Benon	Famer		✓		[signature]
3	Mujuni Tomas	FARMER	0752291887 0782291887	✓		[signature]
4.	Wilson Tumukunde	Farmer	0754623140 0752293064	✓		[signature]
5	Turyakyira Ezra	Farmer	07503540	✓		[signature]
6	Akimbisibwe Yosam	—	0757277645	✓		[signature]
7	Mbarimu Erika	—		✓		[signature]
8	Mujuni Geoffrey	Chair	0757693164	✓		[signature]
9	ABAINE ASAPH	Pl chief	0782962197	✓		[signature]
10	Kanonir	Famer	0754785415	✓		[signature]
11	Muchunguzi .G.	Farmer	0752079918	✓		[signature]
12.	Musinguzi Nathan	Guardian	0704023063	✓		[signature]
13	Tumuhimbise PETER	F	—			[signature]
14	Kakuru Daniel	Peasant	0757654233	✓		[signature]
15	Owoyesigire Osibert	F	—	✓		[signature]
16	Tibayeta Asaph	F	0756157864	✓		[signature]
17	Rev Edward Ikiriza	e	0774222431	✓		[signature]
18	Tusiime Yosia c/man LCI	Farmer	0757649596	✓		[signature]
19	RWAMAFA		0783002768			

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council
Village: Kagoto, Kakooma, Inyango & Kashaka
Venue: Inyango Village
Date/Time: 4/11/2017 (4:45pm)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
20	Nyabutono Jov.	omuhingi	-		F	Jolent
21	Kyarimpa. merox	- --	0754280637		F	meroN
22	Mugume Kellen	Peasant	0757508865		F	Kmugume
23	Joventa Kastigeirayo	Omuhingi			F	IGJ
34	ANNET Komugisha	omuhingi	0756835689		F	
35	Komugisha monika					
36	mellon Kirabo	omuhingi	0758648831		F	
37	NAMBUZA EVALYNE	TERRAKING	0701044804		F	EvaLyne
38	KATUSIIME EVALYNE	Peasant	0759608831		F	EVALIN
39	minendo	omuhingi			F	minendo
40	J Twesyatukayo	omuhingi			F	mutazi
41	Kiconco. Enid	peasant	0756227536		F	[illegible]
42	Twinemasiko . Annet	Peasant	- -		F	T.A
43	Karungi Naume	Peasant	0701922117		F	-Naume
44	KYOGABIRWE ALLEN		0770692753		F	
45	KYOGABIRWE PRECIOUS	DIGGING			F	
46	Musiime Joseline	Peasant	0777834100		F	[illegible]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ..Isingiro.....
Sub County ..Kabuyanda Town Council.....
Village ..Kagasha, Katooma, Irungo & Kashaka.....
Venue ..Irungo village.....
Date/Time ..4/11/2017 Hi: 45pm.....

No.	Name	Designation	Contact	Sex		Signature
				M	F	
39	Atuhaire Emmanuel	Councillor	0754229507	M		
40	Muhangazi Simeo	Omukungu	0750628712	M		
41	NANKWANDA ELLY	IT Consultant	0752466513	V		
42	Kasiisi . M		0752530842	V		
43	Twinomugisha Robert	Farmer	0755404522	✓		
44	NANKWANDA M	Teacher	0756701462	✓		
45	Atuhaire ALex	Farmer	0750080540	✓		Atuhaire

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District ...Isingiro...
Sub County ...Kabuyanda Town council
Village ...Kagata II, Kagata II & Katoma, Iryango, Kashaka
Venue ...Iryango village...
Date/Time ...11/4/2017 (4:45pm)...

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1	Agnes Mujuni	Omuhingi	0782243361		F	A.Mujuni
2	Kyoshabire Betty	Omuhingi	0778384228		F	KB
3	Noreda Nyamwegyendaho	" "			F	Noreda
4	Kyampire Keti	" "			F	Keti
5	EVELYNE KAMUGISHA	"	0755182444		F	Evelyne
6	Jolly Kyarimire	"	0779804356		F	[illegible]
7	Kyampire Jane	" "	0778066087		F	K-ampire
8	JOVANICE NANKUNDA	omuhingi	0751959846		F	[illegible]
9	Jsuenta katsgaweyo	"	0777294449		F	Jkatsgaweyo
10	Dinah Turyakira	"			F	M.Turyakira
11	Nyabutono Janesa	"	0750860256		F	J.Nyabutono
12	Ninsima mauda	"			F	M.Ninsima
13	Dinah karafiri	"			F	D.Karafiri
14	Kedures. T'	"			F	
15	Tigita	omuhingi			F	Tigita
16	peace bengambage	omuhingi			F	peace
17	hoyce.m	omuhingi	0750171924		F	Loyce
18	PROUIA	omuhingi			F	PROUIA
19	Bahati Juliet	omuhingi	0702614487		F	Bahati

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District Isingiro
Sub County Kabuyanda Town council
Village Kagota, Kateoma, Inyango & Kashaka
Venue Inyango Village
Date/Time 14/11/2017 (4:45 pm)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
20	Kinyaho Milton	Famer	0758233022 Chum. LC	✓		[signature]
21	FRED NYERWEKI		0785936164	✓		[signature]
22	Byamu fisho T.	Farmer	—	✓		[signature]
23	Bwengye	Farmer		✓		[signature]
24	Tibahweshoggero	" "	0771695731	✓		[signature]
25	Tushabe Francis	P/Farmer	0752216730	✓		[signature]
26	KAKAMA SEDRICK	FARMER	0753792373	✓		[signature]
27	Ngonzi Eldard	Councillor LCIII	0750188028	M		[signature]
28	Kamanyo Henry	Famer.	0775101491	✓		[signature]
29.	Murebomwe Van	Farmer	075797407	✓		[signature]
30	Rev Tushemereirwe	Parish Priest	0774216154	M		[signature]
31	S Kambarale	Farmer		✓		[signature]
32	Mugisha Geoffrey	Teacher	0777168946	M		[signature]
33	Mugisha Deo	Teacher	0782727117	M		[signature]
34	Komukanga F	OMUHITI	0779630631	✓		[signature]
35.	Nathan Byakagaba	Farmer	—	✓		[signature]
36	Turinawebaze Eridad	Farmer	—	✓		[signature]
37	ASIIMWE J	Farmer	—	✓		[signature]
38	MASIKO Medard	Farmer	—	✓		[signature]

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro
Sub County: Kabuyanda Town Council / KABUYANDA SUB COUNTY COUNCIL
Village: Kisyoro, Bugarama, Nyampikye
Venue: Kisyoro Church
Date/Time: 4/11/2017 (2:00 pm)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1.	LIMANYIKA JOSEPH	SPEAKER	0750171743	L		[signature]
2	HOPE BUKOGA	COUNCILLOR	0759452404		F	[signature]
3	Byamukama Yoramu	Defence	0757266951	M		[signature]
4	Ndyabahika Gadi			M		Ndyabahika
5	Kamari G		0751841805	M		
6	ASiimwE YOSAmu					
7	DEDNT G					
8	Businge Noreda	-	0772665697	M	F	[signature]
9	ANUNG T		0754309272	M	F	
10.	Joyi mujenje			M	F	
11	Nassanga Joy	VHT Co-ord	0751383886		F	[signature]
12	Tibahumira Ne.	Farmer	0757890671	M.		[signature]
13	Nyinabirusha J		.		F	
14	Kiiza D	farmer	0750976537		m	[signature]
15	Sadey A	farmer	0754517054		m	ASaPh.
16	Sandey	Elikadi	0754994364		M	Sandey
17	Nyabahire Yosamu	M				Kisoro
18	Musinguzi Stephen	Farmer	0754886762	m		[signature]
19	Nsengiyumva E	omushomesa Kwehereziya				Edmund

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

District: Isingiro KABUYANDA
Sub County: Kabuyanda Town council COUNTY COUNCIL
Village: Kisyoro, Bugarama, Nyampikye
Venue: Kisyoro Church
Date/Time: 4/11/2017 (3:00 pm)

No.	Name	Designation	Contact	Sex M	Sex F	Signature
1-	Ahimbisibwe W	Chairman LC1	0753634330	M		[signature]
2	BIRIJA WILLSON	DG LCII Kisyoro	075344 3088	m		[signature]
3	Diiah Bmja	Kisyoro		F		[signature]
4	Nkurasibwe Rorizi	KISYORO	0755027179	M		[signature]
5	Eric Kamimondi	KISYORO	0759885051	M		[signature]
6	Tuhiseomwe magret	KISYORO	—	F		
7	KATUSHABE MONIC	KISYORO	0753394069		F	[signature]
8	RUGYENDO geo	KISYORO	0784[illegible]	M		[signature]
9	Semugoore Pascal	Kyoro	0752533234	M		[signature]
10.	Emily muhumuza	KISYORO	0784808904	F		[signature]
11.	MUGAKURA PAUSON	KISYORO	0752154776	M		Pauson
12.	AMTUKUNDA JUDITH	VHT	0750141069		F	[signature]
13.	ASIIMWE YOSAM	KISYORO	0757136277	M		[signature]
14	Sabuniri Charles	KisyoroII	0751846873	M		[signature]
15	Rev. Aaron Tuyamyomuk	Kisyoro	0782571848	M		[signature]
16	Jacklini Byaruha	Kisyoro II	0787711094	J.B		JB
17.	Sabiyunva Ngga Rhoda	Kisyoro II	0772297774	F		Rhoda
18	Karubu moses	KISYORO II	0759903035	M		MK
	Kyomugabe Nausi	Kisyoro II	0751686946		F	Nausi

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
1	Tukamuhabwa K	VHT	07583485	Kedress	
2	Kyogabirwe Felisa	Peasant	0759360447	Felisa	
3	Furida Vakweira	Peasant		Furida	
4	KYARISIIMA RUTH	Teacher	0750073552	[illegible]	
5	KWARIKUNDA EDRONAH	Teacher	0758818025		
6	Akiriza Meron	Ass/Nurse		Meron	
7.	Kyarikunda Fannt	Peasant		Fiant	
	Juliet Benane	Peasant		Benane	
	Tugumisirize Penenah	Peasant		Penenah	
	Evalyne Rutanana	Peasant		Evalyne	

Bakeiboro Getrurida Peasant

Akakwasa Jakyline Teacher Jacoline

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
1.	ESWILU DONATH	CAO	0772440682	[signature]	3/11/2017
2.	Rwezahura Francis	Water officer	0704142233	[signature]	"
3	TUMWESIGYE PATRICK	District Agric. off	0776551008	[signature]	"
4.	Benson Rwegeshora Bahunga	APO – Kagera RBM	+255752614225	[signature]	3/11/2017
5	Francois-Xavier NDEKEZI	Kagera PO	+250788610295	[signature]	3/11/2017
6.	NIWAMANYA BOAZ	E/A/DFPP KRBMP	0782695284	[signature]	03/11/2017
7.	Prof. John Okedi	Team Leader	0772 462855	[signature]	03/11/17
8	MOSES BASOOSI	Sociologist	0774408608	[signature]	3/11/17
9.	Jerome K. Mugambi	Flora Ecologist	077337892G	[signature]	3/11/17
10.	BWENEYE EMMANUEL	ANRO/APO-ISINGIRO	0772377050	[signature]	3/11/17.

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
11	KAMOGA ABDU	EO/IBCG	0752581409	[signature]	3rd/11/017
	TUMWESIGYE PATRICK	District Agric. Offr	0776551008	[signature]	"
	AYEBAZIBWE FREDRICK	DISTRICT FISHERIES OFFICER	0772-498223	[signature]	3/11/2017
	Maj Topher Agaba	OWC Isingiro Dist	0752167502	[signature]	3/11/17
05	Nuwenyonga Helen	RDC	0701551728	[signature]	3/11/2017

Kabuyanda TOWN COUNCIL

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
11	HOPE BWOGI	LADY COUNCILLOR LCIII	0759452404	HB	3/11/2017
12	BYARUHANGA GEDION	LCII C/MAN NORTHERN WARD	0774094842	[signature]	3/11/2017
13	Oyesigye Nabott	Kabuyanda	0756486236	Oyesigye	3/11/2017
14	MUGISHA ABERT	KAARO I LCI	0753978462	[signature] A	3/11/2017
15	Nuwamanya Gumisiriza	KABUYANDA TWN	0703853586	[signature]	3/11/2017
16	Matsiko Vicent	for Town Clerk KTC	0701-448604	[signature]	3/11/2017
17	Habaasa God	KAARO I CELL	0753461200	[signature]	3/11/2017
18	Mutesigesi Fungyesi	Katembo Cell	0750941203	Mutesigesi	3/11/2017
19	Ainamani Banabasi	Kabuyanda T/C	0753722289	[signature]	3/11/2017
20	Arinaitwe Geoffrey	Kabuyanda	0791839804	Arinaitwe	3/11/2017
21	Muhanguzi Gerald	Kabuyanda	0753813951	[signature]	3/11/2017

Kabuyanda TOWN COUNCIL

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
22	ASP BAKUNDINE RONALD	O/C KABUYANDA P/STN	0750-064295	[signature]	03/11/017
23	NIZABAKUNDA KITEMBEZI	C/MAN L.C KABUYANDA	0757149019	[signature]	03/11/017
24	Moses Kakasi	Sociologist	0774408608	[signature]	3/4/17
25	Prof. J. Okedi	Newplan	0772462857	[signature]	3/4/17

Kabuyanda TOWN COUNCIL

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
1	AMPEKUKIRE ONESIMU	KABUYANDA TC LC III CHAIRPERSON	0759155006 & 0782873045		03/11/2017
2	Julius Rwabujere	GISO KTC	0773552142 0751534368		03/11/2017.
3	RUMANYIKA JOSEPH	SPEAKER	0750171743		-do-
4	ASIIMA MERCY	VC/person LC III	075521596		03-11-2017
5	BYABIGARAHO JOHN	PWD	0703657964		-do-
6	ATUHAIRE [illegible]	COUNCILLOR	0754229507		-do-
7	MBABAZI Emmy	C/PERSON LC II	0757937090		03-11-017
8	NDUMU YOSIA Bimpama	C/person LC1 [illegible]	0750068372		03/11/2017
9	TUSHABE [illegible]	DIST councillor	0756225661		11'
10	NKURUNGIZA [illegible]	OPINION LEADER	0754407968		3/11/17

KABUYANDA SUB COUNTY

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List Kabuyanda Sub county

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
1	MOSES BAKEBWI	Sociologist	0774408608		3/11/2017
2.	ARINATIWE SILVER	Community Development Officer	0781943776	Silver	3/11/2017
3	MUTAREMWA JUSTUS	O/C CID KABUYANDA	0751332137		03/11/17
4	GUMISIRIZE FARED	KIRINJU	0756968563		03/11/2017
5	Kahimbisa Jack	Kausse	0750050848		3/11/2017
6.	Ndyomugyenyi Joh	Councillor	0753560270		3/11/2017
7	Kyomukama Sam	Councel	0756437507		3/11/2017
8	Nuwagaba	Kirinju		Nuwagaba	3/11/2017
9	Nkwase Francis	Lay leader	0753959452		3/11/2017
10	Annet Nkwasa		0751271142		3/11/2017

KABUYANDA SUBCOUNTY

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
	Tibabalwire B	Councillor LCIII	0750321234		
	More Zoro	Publicity		More	
	Hope Bananuka	Business Woman	0782194113	Hope	
	Nkwasa Loice	Lay leader Kig	0750700630	Nkwaso L	3/11/017
	Gaudo Nkunimza	Dist Councilor	0756225661	[illegible]	"
	Kakwenza J	Elder	0759073380	[illegible]	
	Irine Rwabujere	GISO KIC	0751534368	[illegible]	"
	AKANKWASA G.W	S/c/chief.	0758333262	[illegible]	"
	Kedress Ategyereize	Vice C/person LCIII	0751404889	Kategyereize	3/11/2017
	Prof. J. Okot	Newpla	0772462858	[illegible]	

Kabuyanda Subcounty

newplan Consulting Engineers & Planners

KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
	Akankwasa Hope	0757883703	C.m	Akankwasa	3/11/17
	Odeta Siyalari	0758314529	Councillor	Siyalari	3/11/17

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
1.	Hamirembe Anthony	Sociologist	0776700524	Hamanda	15/11/17
2	Moses Lakasi	Sociologist	0774408688	[illegible]	15/11/17
3	KABOYO LYDIA	Senior Sociologist	0757910972	[illegible]	15/11/17
4.	Nuwagaba Paul	Sociologist	0772422606	[illegible]	15/11/17
5.	Prof John Okedi	EIA	0772 466 754	[illegible]	15/11/17
6-	Julius Wamala	PEO/Generation	0776204021	Wamala	22/11/17
7	ANIO JULIUS	M&E NFA	0782306100		20/11/17

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KABUYANDA WATER RESOURCES DEVELOPMENT PROJECT

Attendance List

NO	NAME	DESIGNATION	CONTACT	SIGNATURE	DATE
1	Nomibembe Anitah	Sociologist (Head)	0776700524	[signature]	30/11/17
2	Prof. John Okedi	Environmentalist	0772462-857	[signature]	30/11/17
3	Robert Charles Aguma	Environmental Specialist (UABAL E-ATAAS/ACE)	0772380340	[signature]	30/11/17

Ministry of Water and Environment

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ATTENDANCE REGISTER

NILE BASIN INITIATIVE

ESIA AND RAP FOR KABUYANDA IRRIGATION DEVELOPMENT AND WATERSHED MANAGEMENT PROJECT IN ISINGIRO AND NTUNGAMO DISTRICTS

newplan

ATTENDANCE REGISTER

Date:	02/10/2018	Venue:	NFA Offices, Bugolobi
Meeting Title:	Stakeholder Consultation meeting on ESIA findings for Kabuyanda (Draft Report)		

	Name	Institution	Designation / Position	Contact Information	Signature
1	[illegible]	NewPlan	Health, Safety & Environmental [illegible]	Telephone: [illegible] Email: [illegible]	[signature]
2	Juliet Kuria	Newplan	ESIA Specialist	Telephone: [illegible] Email: [illegible]	[signature]
3	[illegible]	NFA	[illegible]	Telephone: [illegible] Email: [illegible]	[signature]
4	John Diisi	NFA	Coordinator GIS	Telephone: Email: [illegible]	[signature]
5	[illegible]	NFA	Coordinator Plantations	Telephone: [illegible] Email: [illegible]	[signature]
6	[illegible]	NFA	[illegible]	Telephone: [illegible] Email: [illegible]	[signature]
7	[illegible]	NFA	[illegible]	Telephone: [illegible] Email: [illegible]	[signature]
8	[illegible] Stephen	NFA	[illegible]	[illegible] 0772-[illegible]	[signature]

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ATTENDANCE REGISTER

NELSAP-CU
NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

ESIA AND RAP FOR KABUYANDA
IRRIGATION DEVELOPMENT AND
WATERSHED MANAGEMENT PROJECT
IN ISINGIRO AND NTUNGAMO DISTRICTS

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ATTENDANCE REGISTER

Date:	06/01/2018	Venue:	MAAIF
Meeting Title:	STAKEHOLDER CONSULTATIVE MEETING FOR ESIA		

Name	Institution	Designation / Position	Contact Information	Signature
Florence Mangeni	Newplan	Sociologist	Telephone: 0775585530 Email: mangeni@newplan[illegible]	
DR EGARAM D	NewPlan	Health and Safety	Telephone: 0772 433090 Email: david@newplan	
ENG. DOMINIC B. MUGUNGUZI	MAAIF	Principal Engineer Irrigation & Drainage	Telephone: 0772337337 Email: [illegible]@yahoo.com	
Juliet Kinhu	NEWPLAN	ESIA SPECIALIST	Telephone: 07[illegible]400485 Email: juliet@newplan[illegible]	
OLLANDO ALLAN	MAAIF - DRAINAGE	Engineer	Telephone: 0[illegible] Email: ollando[illegible]	
Kitinga David	MAAIF	Senior agricultural inspector	Telephone: 0[illegible]2160521 Email: [illegible]david@[illegible].co	
			Telephone: Email:	

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WATERSHED MANAGEMENT PROJECT
IN ISINGIRO AND NTUNGAMO DISTRICTS

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ATTENDANCE REGISTER

Date:	17/01/2018	Venue:	NaFIRRI JINJA
Meeting Title:	STAKEHOLDER CONSULTATIVE MEETING FOR ESIA		

Name	Institution	Designation / Position	Contact Information	Signature
Florence Mangeni	NewPlan	Sociologist	Telephone: 0775585530 Email: mangeni.@newplan[illegible]	
Bwambale Mbilingi	NaFIRRI	Socio-Economist	Telephone: 0772444752 Email: [illegible]@yahoo.com	
Winnie Nkalubo	NaFIRRI	Fish Biologist	Telephone: 0772671216 Email: [illegible]@yahoo.[illegible]	
Anthony Taabu Munyaho	NaFIRRI	DIRECTOR / FISH STOCK ASSESSMENT	Telephone: +256 772517524 Email: [illegible]@yahoo[illegible]	
Wilson Okello	NaFIRRI	Aquatic Ecologist / Senior Research Officer	Telephone: +256 782435956 Email: wiokello@gmail[illegible]	
Jane Yawe	Newplan	Fisheries & Aquatic Ecologist	Telephone: 0789115863 Email: jnagayi@yahoo.co[illegible]	
Dr EGARAM D	NewPlan	HSE Manager	Telephone: 0772433090 Email: davidegaram@yahoo.com	
Juliet Kinhu	NEWPLAN	ESIA Specialist	0[illegible]400485	

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ESIA AND RAP FOR KABUYANDA IRRIGATION DEVELOPMENT AND WATERSHED MANAGEMENT PROJECT IN ISINGIRO AND NTUNGAMO DISTRICTS

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ATTENDANCE REGISTER

Date:	06/09/2018	Venue:	MLHUD
Meeting Title:	STAKEHOLDER CONSULTATIVE MEETING FOR ESIA		

Name	Institution	Designation / Position	Contact Information	Signature
Maria Nanteza	MLHUD	Ag-ED	Telephone: 0772553424 Email: maria.nanteza	[signature]
PETER WANDERA	MLHUD	GIS OFFICER	Telephone: 0782649222 Email: [illegible]	[signature]
LATIM PAMELA	MLHUD	PHYSICAL PLANNER	Telephone: 0706454827 Email: [illegible]	[signature]
Jacqueline Nakatumba	MLHUD	Sociologist	Telephone: 0772464874 Email: Jnnaga...@gmail.com	[signature]
MUBBALE BRIAN	MLHUD	Physical Planner (T)	Telephone: 0704420161 Email: lonyuzmubbale@gmail.com	[signature]
Lunama Abel K.	MLHUD	PP	Telephone: 0774561309 Email: lunamaabel@gmail.com	[signature]
MOTHAIRWE	MLHUD	Senior Physical Planner	Telephone: 0772185687 Email: mtekanga@gmail.com	[signature]
HENRY James F Kaguta	MLHUD	Senior Physical Planner	0772391713 kaguta...@gmail	[signature]

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	ISINGIRO DISTRICT LOCAL GOV
Meeting Title:	DISCLOSURE TO DISTRICT LOCAL GOVERNMENT / ENV COMMITTEE (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
TWEREBEE JACK	Isingiro District	Water officer	Telephone: 0782873675 Email: jtwerebee@yahoo	[signature]
TUMWESIGYE PATRICK	ISINGIRO DLG	AG. DISTRICT AGRIC OFFICER	Telephone: 0776551008 Email: paddytumwesigye@	[signature]
ABESIGYE FLORENCE	Dist. Councillor	Works Committee member	Telephone: 0772729461 Email: abesigyeflorence@yahoo.com	[signature]
Maj. Topher Agaba	OWC Isingiro Dist.	Co-ordinator	Telephone: 0752167502 Email: agaba.topher@gmail.com	[signature]
Ndeweere Bernard	ISINGIRO	Environmental Officer	Telephone: 0774558155 Email:	[signature]
Byamazima Innocent	Senior Planner	Works Committee DISTRICT DPU	Telephone: 0701-581134 Email:	[signature]

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date: 13/12/2018		Venue:	NTUNGAMO DISTRICT
Meeting Title:	DISCLOSURE MEETING		LOCAL GOVT

Name	Institution	Designation / Position	Contact Information	Signature
TUMUSABE BRIAN	NTUNGAMO DLG	SENIOR ENVIRONMENT OFFICER	Telephone: 0772 645021 Email: [illegible]	[illegible]
			Telephone: Email:	
			Telephone: Email:	
			Telephone: Email:	
			Telephone: Email:	
			Telephone: Email:	

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA & RAP DISCLOSURE OF PROJECT		

(DISCLOSURE OF DRAFT ESIA REPORT)

Name	Institution	Designation / Position	Contact Information	Signature
Julius Rwabujere	ISO	GISO - KTC	Telephone: 0751534366 Email: 0773532142	[illegible]
MUGABE ROBERT	Central ward C/person SOC	Councillor C/person Social [illegible]	Telephone: Email: 0701570812	[illegible]
RUMANYIKA JOSEPH	KASTORO WARD	SPEAKER	Telephone: Email: 0750171745	[illegible]
RUBAKE AMIS	Councillor Ntundu [illegible]	Vcperson LC [illegible]	Telephone: Email: 0782887317	[illegible]
TUMUSHABE BENON	NYAMPIKYE II	CHAIRPERSON LCI	Telephone: 0701058163 Email:	[illegible]
ACAYO DOREEN	Kabuyanda Sub-county	VC/Person TASK FORCE Kabuyanda S/C	Telephone: 0705809791 Email: 0755947704	[illegible]

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA DISCLOSURE (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
ARINEITWE JOHNSON	CHAIRMAN LCI MBARARA I	NTUNDU PARISH	Telephone: 0756795062 Email:	[signature]
Kiiza Sliva	Rubinge cell	Rwamwijuka	Telephone: 0757827438 Email:	Kiiza
Mugagi Jeam	Rudgi Cell	Ntunda parish	Telephone: Email: 0756483074	[signature]
TIBESIGWA BERNARD	Kijubwa COI	Ntunda parish	Telephone: 0751562705 Email:	[signature]
Babona charles	chman LCI Kaburara II	Rwamwijuka PARISH	Telephone: 0787489,44 Email:	[signature]
Twesiime Jameson	Chman Kagwaga LC	NTunda parish	Telephone: 0756917093 Email:	Twesiime

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA & RAP DISCLOSURE MEETING (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
Florence Kanyange	Kab/TC Councillor	Councillor	Telephone: Email: 0782[illegible]	[signature]
Fayiomugisha	Centralward	Councillor	Telephone: Email:	[signature]
			Telephone: Email:	
			Telephone: Email:	
			Telephone: Email:	
			Telephone: Email:	

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA - TOWN COUNCIL
Meeting Title:	ESIA & RAP MEETING (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
MUZUMBA JOSEPH	Rwamwijuka Parish	C/man LCII	Telephone: 0757218822 0772668820 Email:	Muzumba
MUSINGUZI SATURDAY CHAIRMAN I	KABUYANDA TRAINING CENTRE	CHAIRMAN LI	Telephone: 0757637840 Email: 0759646693	[illegible]
Tumwine CHARLES	Rwamwijuka LC	CHAIRMAN OF LCI	Telephone: Email: 0755079776	[illegible]
KORUBAGO JULIUS	KABUYANDA HC IV	NURSING ASSIST	Telephone: 0752371570 Email:	Julius
Mwesiiga Isiah	Ryamugo ward Chairman	Chairman LCII	Telephone: 0757165206 0782244524 Email:	[illegible]
Byarutlaanga Bwengye	Karo III C/man LCI	C/man LCI	Telephone: 0759553464 Email:	Byarutlaanga

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA & RAP DISCLOSURE (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
Byomulongo obed	All saints church Kabuyanda	Omubuizi	Telephone: Email: 0754300746	[illegible]
Basiimire Godet	Ryabosno	C/Man	Telephone: Email: 070588254	GLCB
T. Lamosi	Ndemi	LC Pus	Telephone: Email: 0758190857	Lamosi
BYARUHANGA GIDEON	NORTHERN WARD	LCII CHAIRPERSON	Telephone: 0754162473 Email: 0774094842	[illegible]
TUSIIME YOSIA	Kinyara II cell	CHAIRPERSON	Telephone: 0757649596 Email:	[illegible]
KIRYAHO MILTON	Kinyara I chair Kinyara cell	LCI chair.	Telephone: 0758233022 Email:	[illegible]

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA & RAP DISCLOSURE MEETING (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
AMUSHIRE CHRISANS	KABUYANDA T/C	LCIII C/PERSON	Telephone: 0759550064 Email: [illegible]	[signature]
AINOMUGISHA PRIMAH	ISINGIRO	SEC SOCIAL SERVICES ISINGIRO	Telephone: 0750068307 Email: aprimah38@gmail.com	[signature]
NDINDIRWE JOHN MUTONDO	Kabuyanda T/C	C/person Task Force - Multipurpose Dam	Telephone: 0704992196 0775745211 Email: ndimutonda@gmail.com	[signature]
KAFUREEKA GEREVASE	LCII GANDO RWAMWIJUKA KIKAGATI	C/PERSON LCI	Telephone: 0754828262 Email:	[signature]
MUGISHA FABIANO	MIRAMA-RWAMWIJUKA-KIKAGATE	C/PERSON LCI	Telephone: 0785460343 Email:	[signature]
TWESIGYE DENIS	Kabuyanda T/C	member of Task force committee	Telephone: 0704439192 Email:	[signature]

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	PROJECT DISCLOSURE FOR KABUYANDA PROJECT (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
Birusha Juma Badru	Area land co. Kabuyanda T/c	land comittee member.	Telephone: Email: 0752769941	[signature]
Atwebembeire Merabu	Kabuyanda T/C	Deputy speaker	Telephone: 0759829061 Email:	Atweb
MUSIIMIRE Joseline	Inyangowood	Councellor Inyaga	Telephone: 0757322526 Email:	[signature]
Calorine Rwabujere	Kabuyanda T/c	elder	Telephone: 0755335404 Email:	Kalorine
Kyomuhendo Primah	Rwomwijuka	elder	Telephone: Email: 0756368844	Kyomuhendo
Safari Elias	C/man L.C.I Rwamwijuka		Telephone: Email: 0754329474	[signature]

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA & RAP DISCLOSURE OF KABUYANDA IRRIGATION SCHEME (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
Musimire Florah	Kabuyanda T/c	c/person W/c	Telephone: Email: 0756696517	Florah
ASP Bakuwine Ronald	POLICE	O/c Kabuyanda	Telephone: Email: 0750004495	[signature]
Asiima Merod	KABUYANDA TOWN CELL	V/c/person LC III	Telephone: Email: 0753221596	[signature]
D/SGT Nshakirane Alfonse	POLICE	O/c CID KABUYANDA	Telephone: 0782 885114 Email: 0755100118	[signature]
Natuagwasi Simon	II	Kikagate	Telephone: Email: 0751073757	[signature]
Bonabana Lidia	Mbarara II	Kikagate	Telephone: Email: 0752602632	Lidia

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA DISCLOSURE MEETING DISCLOSURE OF DRAFT ESIA REPORT		

Name	Institution	Designation / Position	Contact Information	Signature
Tubencwe Diana	Kabuyanda Town Council	Procurement Officer	Telephone: Email: 0757507162	Tubenowe D
Muhoozi Charles	Kabo I	C/man LCI	Telephone: 0750992622 Email:	[signature]
Tushabe Christopher	Kamwosya	C/man LCI	Telephone: Email: 0758974232	[signature]
Nduwu Tosia Gibimpana	C/Person LCI Kabuyanda Town	C/person LCI	Telephone: 0750068372 Email:	[signature]
Biremaane dagas	C/person LCI Kabuyanda Town	C/person LCI	Telephone: 0751659120 Email:	[signature]
Asaph Ausiga	Kisyoro I	Water Tech	Telephone: 075542815 Email:	[signature]

ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	ESIA & RAP CONSULTATION		

(DISCLOSURE OF DRAFT ESIA REPORT)

Name	Institution	Designation / Position	Contact Information	Signature
NAZOORA WILLIAM	C/PERSON LCI AKATIZIMBO	C/PERSON	Telephone: 078597364 08 Email:	[signature]
AIZABBIHURIKIZA BENON	KABUYANDA VILLAGE	C/PERSON LCI	Telephone: 0757144019 Email:	[signature]
Kanyesigye Justus	KAHAZO II CELL	C/Person LCI	Telephone: 0751954598 Email: 0778943770	[signature]
TWESIGYE PATRICK	C/PERSON LANDS Ndamicell	C/Person Lands	Telephone: 0751004441 Email:	[signature]
GACHARO GEOFREY	BUGARAMA II	C/PERSON LCI	Telephone: 0756555351 Email:	[signature]
Bakami Emmanuel	Kabuyanda Village Adviser	Adviser	Telephone: 0769829009 Email:	[signature]

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ATTENDANCE REGISTER

Date:	14/12/2018	Venue:	KABUYANDA TOWN COUNCIL
Meeting Title:	PROJECT DISCLOSURE		

DISCLOSURE OF DRAFT ESIA REPORT

Name	Institution	Designation / Position	Contact Information	Signature
TWESIGOMWE DENIS B	RWEMBOGERA II	V/C/PERSON	Telephone: 0753871656 Email:	[signature]
Jack Muzee	Nyakabingo Rwamijaka	C/man	Telephone: 07542316 92 Email:	[signature]
AHUMAIZA BLUE WILBERT KAKURU	KIZYOKO II CELL KIZYOKO WARD	LCII C/man	Telephone: 0753634336 Email: 0788152297	[signature]
Pastor Mukama Edward	Seventh day Adventist church	Pastor	Telephone: 0782 568575 Email: 0752317289	[signature]
CHARLES BIKORWOMUHANGI	Opinion leader	Central ward	Telephone: Email: 0751649744	[signature]
Ngonzi Eldard	Kashaka	Councillor LCII	Telephone: 0774678586 Email: 0750188028	[signature]

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ATTENDANCE REGISTER

Date:	14/12/2018	**Venue:**	KABUYANDA TOWN COUN
Meeting Title:	ESIA & RAP DISCLOSURE MEETING		

DISCLOSURE OF DRAFT ESIA REPORT

Name	Institution	Designation / Position	Contact Information	Signature
Dunday Emmanuel	Councillor	Sec For Production	Telephone: Email: 0752735777 0774167226	[signature]
Atuhaire Emmanuel	Councillor	Cperson Finance Comm	Telephone: 0754229507 Email: 0772677151	[signature]
HOPE Bwogi	Councillor Kagarama	Sec for Finance	Telephone: 0759452404 Email:	[signature]
[illegible] Sozana	[illegible]	Kagarama T/Council	Telephone: Email: 0757554188	[signature]
[illegible]	[illegible]	[illegible]	Telephone: Email: [illegible]	[signature]
Atthimbisibwe Danson	Kabumba	Clman LCI	Telephone: Email: 0755011318	[signature]

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ATTENDANCE REGISTER

Date:	15/12/2018	**Venue:**	KABUYANDA S/C
Meeting Title:	CONSULTATIVE MEETING		

DISCLOSURE OF DRAFT ESIA REPORT

Name	Institution	Designation / Position	Contact Information	Signature
Turyasiima Robert	C/man LCI	Rwotabyemera	Telephone: Email: 0757053226	[signature]
Gorsi Rukara		Kabaare	Telephone: Email: 0700731605	[signature]
[illegible]	C/man L.C.I	Nyakashamaire I	Telephone: 0759449241 Email:	[signature]
Mugabe Geoffrey	Clman LCI	Daragon	Telephone: 0755827464 Email:	[signature]
Kasso Begumanya		Muchangara	Telephone: Email: 0774602057	[signature]
KANGUME DEUS	Sec for Defence	Ekisinga	Telephone: Email: 0700477164	[signature]

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ATTENDANCE REGISTER

Date:	15/12/2018	Venue:	KABUYANDA S/C
Meeting Title:	CONSULTATIVE MEETING (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
EDWAH TUMWESIGYE	Sec	edinah Kobugyi I	Telephone: Email: 0757296824	edinah
Muhwezi Griffin		Rwabigyemano	Telephone: Email:	
Buesi Siyawenda		Rwengwe	Telephone: Email:	
BENON ORIKIRIZA	C/man LCI	Rwengoro	Telephone: Email: 0757902828	[illegible]
Muhereza Dennis	C/Person Youth	Akyempango	Telephone: Email: 0774644498	Dennis
AKANKWASA MEDARD	C/man LC I	Rwendongo	Telephone: 0754683824 Email:	[illegible]

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ATTENDANCE REGISTER

Date:	15/12/2018	Venue:	KABUYANDA S/C
Meeting Title:	CONSULTATIVE MEETING (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
Nyomwigisa Jimmy	Kyabagyenyi II	LCI c/Person	Telephone: Email: 0753560270	[illegible]
Kaffiyulire Silivano	Kigabagamba II		Telephone: Email: 0759844760	[illegible]
Rwakabale M	Kyabagyenyi II	V/chair	Telephone: Email: 0758093580	[illegible]
Hakena Imaue C	Ekisinga	C/man LCI	Telephone: Email: 0755011176	Hayes
Rubarema Charles	Kampumaiza IV	LCI representative	Telephone: 0753763343 Email:	[illegible]
Gumisiriza Amos	Kigabagambi I	C/man LCI	Telephone: 0757554172 Email:	[illegible]

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ATTENDANCE REGISTER

Date:	15/12/2018	Venue:	KABUYANDA S/C
Meeting Title:	CONSULTATIVE MEETING (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
Annet Mubeme	Kigabagaba II	Member	Telephone: Email: 0751287425	Annet
Sekandiru Kafuguire	Kigabagaba II	Kiri'ngo	Telephone: Email: —	Sekandiru
Kamagara Peace	Kanyuruhura III	E/Person L.C Women	Telephone: Email: 0700461315	Kamagara
Izongoza Bernard	Kigabagaba II	omuchandiki	Telephone: 0706179617 Email:	Izongoza
Mbabazi Dalson	Kanyuruhura III	A.C.man	Telephone: 0779928970 Email:	[signature]
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Republic of Uganda
MINISTRY OF WATER AND ENVIRONMENT

ESIA AND RAP FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	15/12/2018	Venue:	KABUYANDA S/C
Meeting Title:	CONSULTATIVE MEETING (DISCLOSURE OF DRAFT ESIA REPORT)		

Name	Institution	Designation / Position	Contact Information	Signature
ORISHABA JULIET	NYAMIYAGA	MEMBER	Telephone: Email: 0788789403	[signature]
Ziribichi Charles	KANYUMWAMWA IV	MEMBER	Telephone: Email: 0757611024	[signature]
Nyamwoha John	Kabugu II	C/PERSON	Telephone: Email: 0753527886	[signature]
Kanyamucule Joseph	KANYUMWAMWA III	C/PERSON L.C	Telephone: 0783703479 Email:	Kanyamucule
Annet Agambe	Kabeshekyere	member	Telephone: Email: 0750008929	Agambe
TUSHANGWIRE B. BERNARD		Opinion Leader	Telephone: 0757648492 Email:	[signature]

(DISCLOSURE OF KABUYANDA 15/12/2018 IRRIGATION SCHEME DRAFT ESIA REPORT)

CONSULTATIVE MEETING KABUYANDA S/C

	NAME	VILLAGE	POSITION	TEL	SIGN
1	Mwesigwa Patrick	Kagoto I	C/man LC I	0782414269	
2	Tumwomujuni Boaz	Kanyamaizi II	C/m LC I	0755604571	
3	TWAHIRWA JACKSON	KABESHEKYERE	Secretary	0757944578	
4	AHIMBISIBWE GLORY	NYAMIYAGA	WOMEN C/MAN	07[illegible] 0701[illegible]	
5	Kabireba Enock	Rwendongo	C/person youth	0755583982	
6	Byamugisha Natalio	MUHANGA	U C/man	0783264489	
7	Katusiime Willy Edward	KATOOMA I	Individual	0706107412	
8	Tindyebwa Bakunzaya	Kabuga II	Kiningu	0757153712	
9	Tusiime Edward	Katooma I	C/man LC	0753812823	
10	Kabagambe Milton	Kigabirigaba I	V/P/LC I	0757416753	
11	Ndarere Omar Jake	Kagito II	Sec LC I	0774989246	
12	MONDAY ALOYSIOUS	KAGOTO II	BIPANA LC	0759281[illegible]	
13	Kabegambire	PARARONI	MOBISI	07500[illegible]	
14	Nyebirweki Francis	Kigabirigaba I	C/F/PWD	0758035320	
15	Bitungukyeho Pasikali	Kabeshekyere	V/C/man	075797[illegible]	
16	Kamwesiga Moses	Kanyamaizi II	Defence	0706411545	
17	Tukamwise Edmund	Kanyamaizi II	C/man LC	0757732[illegible]	
18	Tukahirwa Benny	Kanyamaizi II	Afomen	0755[illegible]	
19	Muhumuza Apollo Kanuma	Kyabagabo I	Secretary	0752340636	
20	Kwehangana J.B.	Kabeshekyere	Omukuru	0756700548	
21	KWIRIKAGIYE DAUSON	Kabeshekyere	C/man	0702735189	
22	TUMWESIGYE JOHN	KABUGA I	C/MAN LC I	0750411038	
23	KAMUKAMA ALEX	EKISINGA CELL	INDIVIDUAL	0751964761 0776462[illegible]	
24	Bagyenuka Ejuaf	Rwemanga	Ctaka	0751348223	
25	TURINKAHE ZAVERIO	Nyamiyaga	LC I C/P	0787997540	
26	BANYENZAKI ANDREW	KAHOTO I	C/man LC	0784561152	
27	KATEERA FRANCIS	MUHANGA	C/m LC I	0775142[illegible]	
28	KYOMUKAMA - MULHEAYI	RWABIEMERA	INDIVIDUAL	0782441967	
29	Muzaagalira Pamle	Kabuga P/S	Cadet	0[illegible]	
	Rogers Mutenema	Rusungiro	Sec for women	0783581[illegible] 0758514791	

DISCLOSURE OF KABUYANDA IRRIGATION SCHEME - DRAFT ESIA REPORT

	NAME	VILLAGE	POSITION	TEL	SIGN
1	Mwebembezi [illegible]	Kabuyu I		0755426479	MMG
2	Mutaahi Amos	Rwendongo	C/person PWD	0753921063	Mutaahi
3	Kyomuhangi Sam	Mishorishozi	C/person LCI	0756457507	[illegible]
4	Sande Vicent	Mishorishozi		0754897411	[illegible]
5	Muhumuza Gidion	Rwenkuyege	Member	0754149257	/
6	Anim Kisakye	NEWPLAN	Envital Scientist		Kisakye
7	Muhumuza BRIGHT	Kanyamwaizi	B/c mobilizer	0758059537	[illegible]
8	Ndyomugyenyi [illegible]	Kigabagaki	C/Person LCI	0753560270	[illegible]
9	Kakyebeha Silvano	Kigabagabe	[illegible]	0759544760	[illegible]
*	Twinomugisha Benon	Kigabagaba II	Opinion leader	0757648492	[illegible]
*	Annet Agambe	Kabeshekyere		0750080929	Agambe
*	Peace Kanagyera	Kanyamwaizi II	C/Person LCI (women)	0700464505	Kanagyera
*	Sikodina Kajungure	Kigabagaba	Kiranju		Kajungure
*	Annet Muhereza	Kigabagaba II	C/Person'S	0751287485	Muhereza
12	Kyomukama Rwomushana	Kigabagaba II	V/C. person	0758093585	[illegible]
13	Harerimana [illegible] Charles	Ekisinga	C/man LCI	0753604176	[illegible]
14	Kuburora Charles	Kanyamwaizi II	Opinion leader	0753768343	[illegible]
15	Gumisiriza [illegible]	Kigabagaba I	C/man LCI	0757554172	[illegible]
16	Tumusiime Asumpta	Kanganam	C[illegible]	0753264492	
17	TWEBAZE ROBERT	Kagaba I	C/man Task Force	0782895340	[illegible]

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ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	13/12/2018	Venue:	PAC offices
Meeting Title:	INQUIRY		

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			Telephone: Email:	

Republic of Uganda
MINISTRY OF WATER AND ENVIRONMENT

ESIA AND RAP FOR FOR KABUYANDA IRRIGATION SCHEME UNDER THE IRRIGATION DEVELOPMENT AND CLIMATE RESILIENCE PROJECT IN ISINGIRO DISTRICT

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ATTENDANCE REGISTER

Date:	16/12/2018	Venue:	KATANGA QUARRY SITE
Meeting Title:	CONSULTATIVE MEETING ~~DISCLOSURE OF ARA~~		

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TUMWESIGYE [illegible]	Katanga west	C/Person LCI	Telephone: Email: 0774353707	[signature]
			Telephone: Email:	
			Telephone: Email:	
			Telephone: Email:	
			Telephone: Email:	

Appendix 8: Summary of health status in selected Health Centers within Project Area

SUMMARY OF HEALTH STATUS OF KABUYANDA HEALTH CENTRE IV FOR THE MONTHS OF OCTOBER, NOVEMBER AND DECEMBER (AVERAGE)					
Item	**Disease**	**0-4 Years**		**5 Years and above**	
		Male	Female	Male	Female
Epidemic Prone Diseases					
01	Acute flaccid paralysis	00	00	00	00
02	Cholera	00	00	01	00
03	Dysentery	01	00	01	02
04	Guinea worm	00	00	00	00
05	Bacterial Meningitis	00	00	00	00
06	Measles	00	00	00	00
07	Tetanus (neonatal) 0-28 days	00	00	00	00
08	Plague	00	00	00	00
09	Rabies	00	00	00	00
10	Yellow fever	00	00	00	00
11	Other Viral Haemorhagic Fevers	00	00	00	00
12	Severe Acute Respiratory Infection (SARI)	00	00	00	00
13	Adverse Events Following Immunisation (AEFI)	00	00	00	00
14	Other emerging Diseases (e.g. small pox, SARS)	00	00	00	00
Other Infectious/Communicable Diseases					
15	Diarrhoea – Acute	07	05	06	08
16	Diarrhoea – Persistent	00	00	00	00
17	Ear Nose and Throat (ENT) conditions	01	03	07	09
18	Opthalomia neonatorum	00	00	00	00
23	Other Sexually Transmitted Infections	00	00	01	05
24	Urinary Tract Infections (UTI)	02	01	25	29
25	Intestinal Worms	05	04	20	31
29	No pneumonia – Cough or Cold	35	31	79	114
30	Pneumonia	03	05	04	03
31	Skin Diseases	04	06	07	10
32	Tuberculosis (New smear positive cases)	00	00	00	00
33	Other Tuberculosis	00	00	02	05
34	Typhoid Fever	00	00	03	04
35	Tetanus (over 28 days old)	00	00	00	00
36	Sleeping Sickness	00	00	00	00
37	Pelvic Inflammatory Disease (PID)	00	00	00	36
Maternal and Perinatal Conditions					
38	Abortions due to Gender based Violence (GBV)	00	00	00	00
39	Abortions due to other Causes	00	00	00	00
40	Malaria in Pregnancy	00	00	00	03
41	High Blood Pressure in Pregnancy	00	00	00	00
Non Communicable Diseases/conditions					
42	Asthma	00	01	07	12
43	Hypertension	00	00	12	21
44	Diabetes Mellitus	00	00	10	16
46	Epilepsy	00	00	09	11

SUMMARY OF HEALTH STATUS OF KABUGU HEALTH CENTRE II FOR THE MONTHS OF OCTOBER AND NOVEMBER (AVERAGE)					
Item	Disease	0-4 Years		5 Years and above	
		Male	Female	Male	Female
Epidemic Prone Diseases					
01	Acute flaccid paralysis	00	00	00	00
02	Cholera	00	00	00	00
03	Dysentery	01	00	00	00
04	Guinea worm	00	00	00	00
05	Bacterial Meningitis	00	00	00	00
06	Measles	00	00	00	00
07	Tetanus (neonatal) 0-28 days	00	00	00	00
08	Plague	00	00	00	00
09	Rabies	00	00	00	00
10	Yellow fever	00	00	00	00
11	Other Viral Haemorhagic Fevers	00	00	00	00
12	Severe Acute Respiratory Infection (SARI)	00	00	00	00
13	Adverse Events Following Immunisation (AEFI)	00	00	00	00
14	Other emerging Diseases (e.g. small pox, SARS)	00	00	00	00
Other Infectious/Communicable Diseases					
15	Diarrhoea – Acute	05	06	02	04
16	Diarrhoea – Persistent	00	00	00	00
17	Ear Nose and Throat (ENT) conditions	00	00	01	02
18	Opthalomia neonatorum	01	00	00	00
19	Other eye conditions	00	00	00	00

20	Urethral Discharges	00	00	05	00
21	Genital Ulcers	00	00	00	04
22	Sexually transmitted Infections due to SGBV	00	00	00	00
23	Other Sexually Transmitted Infections	00	00	07	07
24	Urinary Tract Infections (UTI)	00	00	10	09
25	Intestinal Worms	00	00	02	01
29	No pneumonia – Cough or Cold	03	11	83	83
30	Pneumonia	03	02	00	00
31	Skin Diseases	05	03	00	00
32	Tuberculosis (New smear positive cases)	00	00	00	00
33	Other Tuberculosis	00	00	00	00
34	Typhoid Fever	00	00	00	00
35	Tetanus (over 28 days old)	00	00	00	00
Maternal and Perinatal Conditions					
38	Abortions due to Gender based Violence (GBV)	00	00	00	00
39	Abortions due to other Causes	00	00	00	01
40	Malaria in Pregnancy	00	00	00	01
41	High Blood Pressure in Pregnancy	00	00	00	00
Non Communicable Diseases/conditions					
42	Asthma	00	00	00	00
43	Hypertension	00	00	00	00
46	Epilepsy	00	00	02	00

Appendix 9: Water resources assessment

This assessment evaluates aspects of the project relevant for determining its expected impact on water resources in the area.

ASSESSMENT METHODOLOGY

The assessment included extraction of data from the feasibility study and design reports that are relevant for estimation of environmental flows and related assessments. The adopted methodology was as follows:

1) Document review

Review of existing reports from the client and other sources to establish the baseline data required for the study. The collected information included, but were not limited to,

i) Existing designs, proposed scheme, data and reports;
ii) Design basis including population to be served, water abstraction amounts, likely stressors on the system including urban centers, large scale water users, pollution sources etc;
iii) Regulations, legal frameworks especially national (NEMA) statutes for water abstraction, use and pollution control. Regional/ trans-boundary water use protocols;
iv) Earlier water resources and hydrology studies related to the project and all information collected so far;
v) Any other documents and data that may be relevant to successful implementation of the project.

2) Historical data collection

The data collected included;

i) Climate and hydrological datasets available at NBI/NELSAP and within the relevant agencies of Uganda Government;
ii) Catchment data including land-use and land cover, soils and geology, terrain;
iii) Water use for the various purposes including amounts and spatial and temporal distribution;
iv) Other datasets that may be available as guided by the above document review.

3) Field inspections

The inspections were aimed at creating an appreciation of the water resources situation on ground and enhancing the data collected above. In particular the field inspections were useful for crosschecking and updating of the database for catchment characteristics, drivers of water use (locations and characteristics) and improvement in understanding the inter-linkage between water availability and water use.

4) Projections of water demands

These were based on assessed unit water demands for irrigation. Analysis was carried out at a monthly time-step.

5) Environmental flow estimation

The following approach has been adopted for estimating environmental flows in the area

a) Review of existing documentation for the preliminary ESIA report
b) Review and characterization of various ecosystems in the vicinity of the project area
c) Review and update of the hydrology data of the design report for the site as shown above

d) Review of the methods for carrying out environmental flow studies. Application of the selected method to the study area
e) Recommendations for project operations to meet environmental flow requirements

6) Assessment of project risks and impacts

The assessment of the catchment water resources risks and potential impacts was carried out in consultation with stakeholders within the overall assignment framework. It included assessment of likelihood of risk occurrence and assignment of a risk score to signify severity of impact of the risk. The process also involved identification of a principle owner of each risk that will be responsible for its monitoring, management and mitigation. Impacts were divided into short term (at construction stage), medium- to long- term impacts (during operation).

7) Impact mitigation measures

Measures were proposed for minimising the impacts of the proposed project on water resources of the area. These were classified into measures to be implemented at construction, operation and during decommissioning. The categorisation system was agreed with the client at commencement of the study.

HYDROLOGY AND WATER RESOURCES

Climate

According to the Uganda Hydroclimatic Study (2001), the project is located in Climatic Zone CW. The zone receives 1120 mm of rainfall annually, spread over 2 rainy seasons. About 330 mm of rainfall is received during the first rainy season lasts from March-May the long rains of March to May. The second rainy season receives more rainfall on average, i.e. 450 mm but it is more variable and may start as early as September or even August and may continue until December. Temperature averages 19°C but ranges between 13°C and 26°C. Evaporation averages around 1350 mm per annum but may be a factor of 3-4 times the rainfall amount during the dry season. This suggest a significant amount of water is diverted towards irrigation during the dry season will be lost.

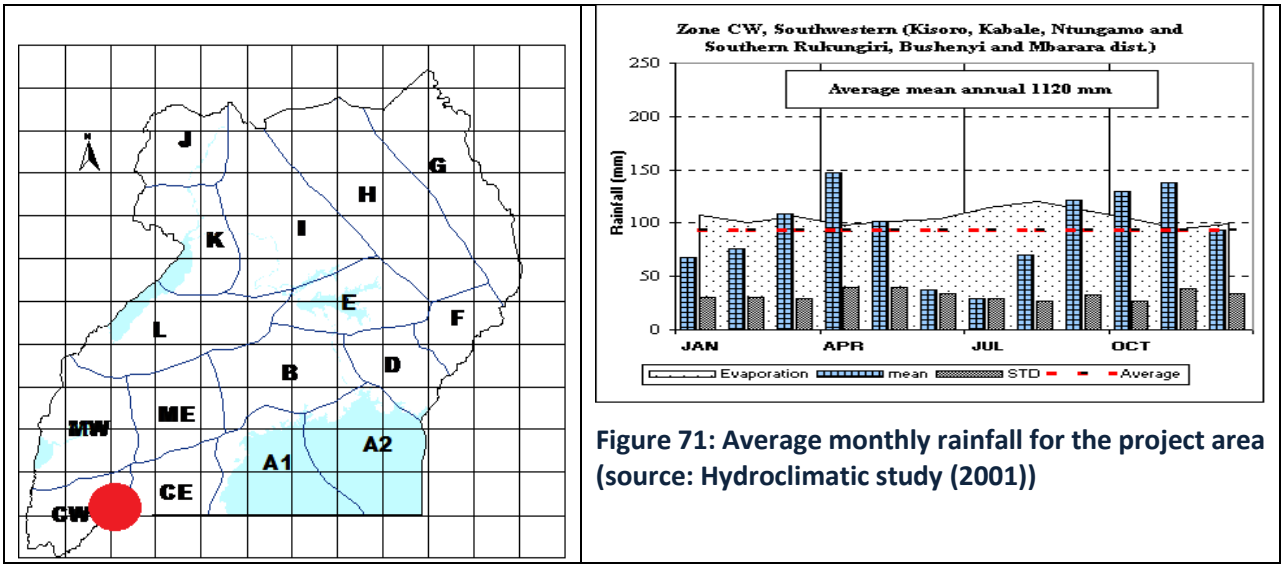
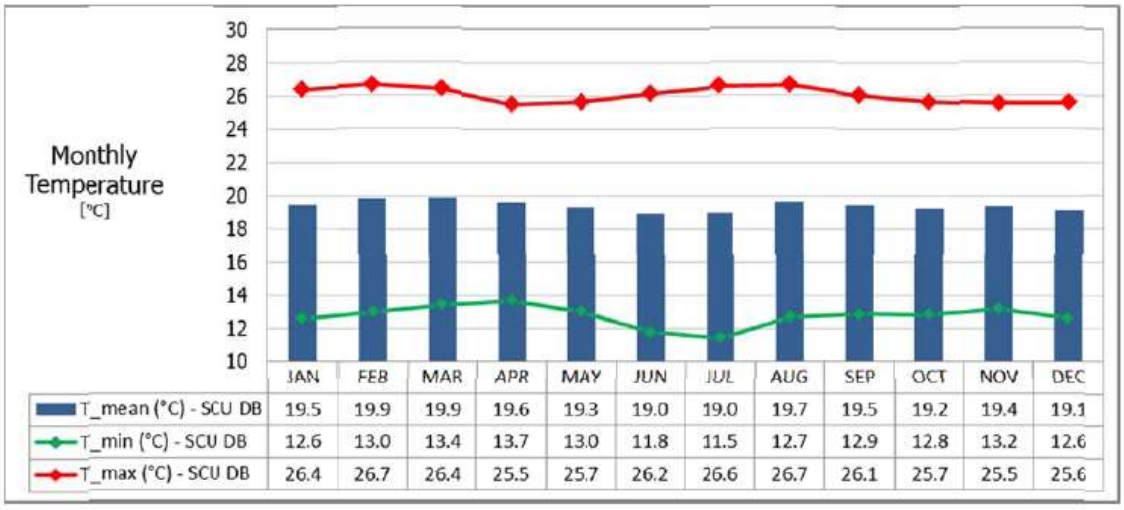


Figure 71: Average monthly rainfall for the project area (source: Hydroclimatic study (2001))

Figure 70: Hydroclimatic zones in Uganda (source: Hydroclimatic study (2001)	

Table 70: Climate characteristics in project area (source: Hydroclimatic study (2001))

Zone	Annual Rainfall and its zonal variability	Main rainy seasons	Main dry seasons	Evaporation verses rainfall
CW	Average of 1120 mm.	Two rainy seasons, main season September to December with peak in October/ November and secondary season March to May with a peak in April.	Main dry season June to August, secondary dry season is January and February.	Evaporation > rainfall by a factor of ~ 3 during the dry months, June to August. During the rainy seasons rainfall is greater and or equal to evaporation.



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
T_mean (°C) - SCU DB	19.5	19.9	19.9	19.6	19.3	19.0	19.0	19.7	19.5	19.2	19.4	19.1
T_min (°C) - SCU DB	12.6	13.0	13.4	13.7	13.0	11.8	11.5	12.7	12.9	12.8	13.2	12.6
T_max (°C) - SCU DB	26.4	26.7	26.4	25.5	25.7	26.2	26.6	26.7	26.1	25.7	25.5	25.6

Figure 72: Mean, maximum and minimum temperature.

HYDROLOGY

Introduction

Hydrological analysis forms a key part of any water resources development and management project. A detailed hydrological analysis was carried out as part of the Feasibility Study and Detailed Design of the project by Studio Ing. G. Pietrangeli S.r.l., the Design Consultant.

Estimated river runoff

River Mishumba does not have a long term gauging station so there are no measured runoff records. A gauging station was established on the river following a decision to carry out detailed assessment of the project but it has only about 2 years of record. The river runoff was therefore estimated using a rainfall-runoff model using HEC-HMS software. The model inputs included rainfall, temperature and other relevant catchment data like land cover, soils, etc. Model calibration was carried out using parameters generated for the nearby R. Ruizi catchment which has long term flow records.

The estimated monthly runoff for R. Mishumba for the period 1950-1995 at the proposed dam location is shown in figure below while the flow statistics are shown in table below. The monthly exhibits a bimodal

variation with two peak flows in April and October of 0.8m3/s and 0.89 m3/s, respectively. The mean annual flow is 0.51 m3/s. The month with the lowest flow is July with a flow of 0.12 m3/s. June, July and August record flows representing 24% of the mean annual flow. Based on the data series, the river sometimes dries up in the dry months of July and August, and February and September. Flow in the months of September-November is more variable than during the other months. The maximum flows, that lead to flooding, are most likely to occur during the months of September - December.

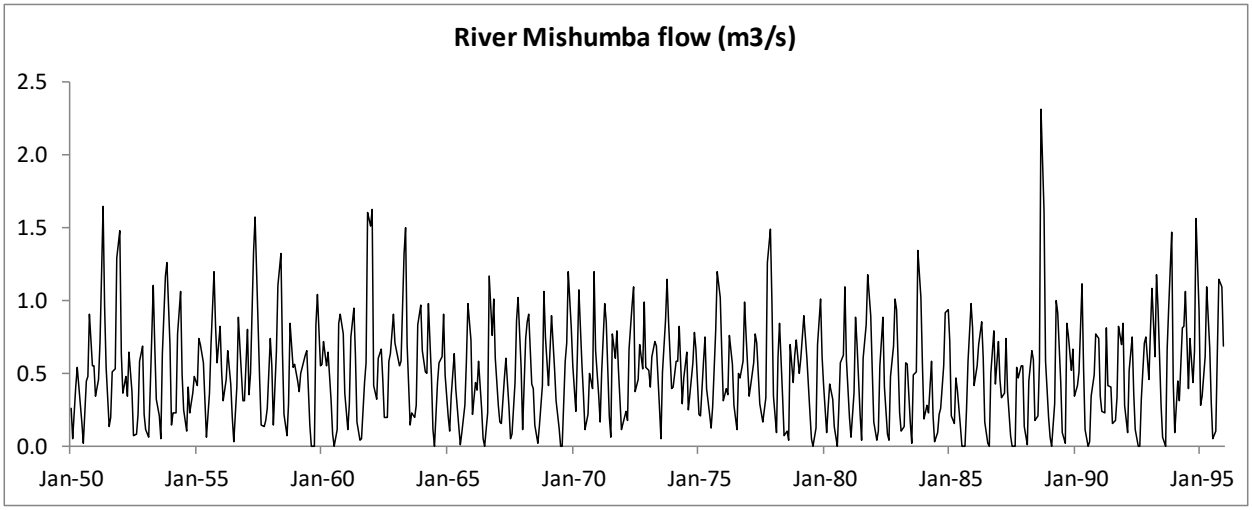


Figure 73: R. Mishumba discharge for 1950-1995

Table 71: Flow statistics for monthly dataset

Month	Mean	Median	Standard Deviation	Min	Max	Range (max-min)
Jan	0.39	0.34	0.27	0.06	1.63	1.56
Feb	0.34	0.32	0.23	0.00	1.09	1.09
Mar	0.48	0.50	0.20	0.10	0.90	0.80
Apr	0.81	0.76	0.27	0.35	1.65	1.30
May	0.63	0.60	0.31	0.21	1.58	1.37
Jun	0.33	0.25	0.27	0.04	1.20	1.16
Jul	0.12	0.08	0.14	0.00	0.65	0.65
Aug	0.22	0.16	0.22	0.00	0.78	0.78
Sep	0.55	0.50	0.37	0.00	2.32	2.31
Oct	0.74	0.70	0.30	0.17	1.62	1.44
Nov	0.89	0.91	0.32	0.26	1.61	1.35
Dec	0.67	0.66	0.27	0.12	1.51	1.39
Annual	0.51	0.50	0.10	0.37	0.74	0.37

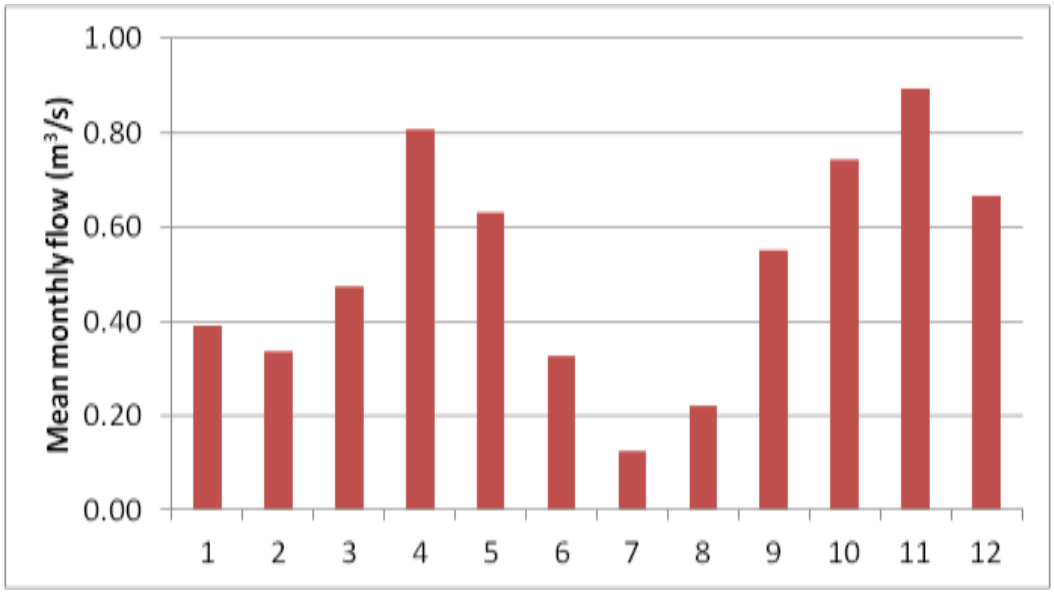


Figure 74: Kabuyanda mean monthly flows

1. Runoff ratio

A key variable in assessing the yield of a catchment is the runoff ratio, which is the long term ratio of river runoff to catchment rainfall. It represents the long-term water balance separation between water being released from the catchment as streamflow and as evapotranspiration, assuming no net change in storage. A high runoff ratio identifies a catchment from which a large amount of water exits as streamflow (streamflow dominated), whereas a low value of runoff ratio identifies a large amount of water exiting the catchment as evapotranspiration (ET dominated). At annual timescale, the runoff averages about 177 mm (spread over the 90km2 catchment). The catchment rainfall is 1013 mm per year giving a runoff ratio of about 18%. This implies a relatively dry catchment in which catchment outflow is dominated by evapotranspiration. At monthly timescale, the runoff ratio varies from lows of 10% and 13% for August and March and highs of 23% and 37% for December and June. The driest months of July and August account for less than 6% of the annual runoff. The wettest months of October-December and March-May account for 37% and 31% of the annual runoff.

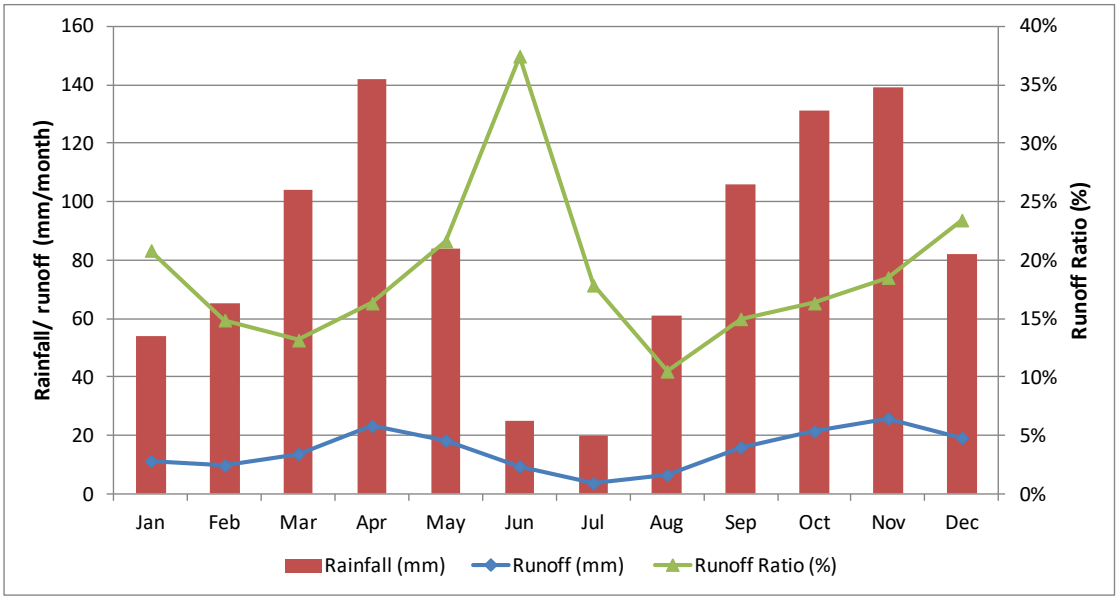


Figure 75: Runoff ratio.

2. Flow frequency analysis

A frequency analysis of monthly flows is shown in the figure below while exceedance probabilities of flows having various magnitudes for monthly data are shown in table below. The figure in the following page shows the flow exceedance probabilities of monthly data (as a percentage of mean annual flow). As a percentage of mean flow, the flows corresponding to the various exceedance probabilities are 1.38m3/s, 0.84m3/s, 0.49m3/s, 0.23m3/s and 0.11 m3/s for exceedance probabilities of 1%, 10%, 50%, 90% and 99% respectively. The dry months of July and August have a frequency of over 10% when the river completely dries up. In July, the river dried up in at least 6 years of the 46 years of record while for August, it dried up in at least seven of the years. For the two months (August and July) the flows were less than 10% of the mean flows in at least 16 and 13 years respectively of the 46 years on record.

Table 72: Exceedance probabilities of flows of various magnitude (m3/s)

Month	Mean flow	Exceedance probability										
		1%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Jan	0.39	1.63	0.66	0.56	0.46	0.42	0.34	0.29	0.23	0.19	0.12	0.06
Feb	0.34	1.09	0.66	0.55	0.42	0.38	0.33	0.24	0.21	0.11	0.06	0.00
Mar	0.48	0.90	0.73	0.63	0.59	0.52	0.50	0.41	0.36	0.29	0.18	0.10
Apr	0.81	1.65	1.12	1.07	0.91	0.82	0.76	0.72	0.64	0.59	0.54	0.35
May	0.63	1.58	0.97	0.89	0.69	0.63	0.61	0.54	0.42	0.38	0.31	0.21
Jun	0.33	1.20	0.66	0.47	0.39	0.29	0.27	0.20	0.17	0.13	0.07	0.04
Jul	0.12	0.65	0.36	0.21	0.15	0.11	0.09	0.06	0.04	0.01	0.00	0.00
Aug	0.22	0.78	0.59	0.46	0.26	0.22	0.17	0.10	0.05	0.02	0.00	0.00
Sep	0.55	2.32	0.87	0.79	0.64	0.57	0.51	0.44	0.36	0.29	0.20	0.00
Oct	0.74	1.62	1.18	0.95	0.83	0.76	0.70	0.62	0.58	0.54	0.42	0.17
Nov	0.89	1.61	1.29	1.10	1.03	0.99	0.92	0.83	0.76	0.58	0.53	0.26
Dec	0.67	1.51	0.94	0.82	0.75	0.71	0.67	0.60	0.55	0.49	0.36	0.12
Annual	0.51	1.65	0.98	0.77	0.66	0.58	0.51	0.40	0.28	0.18	0.09	0.00

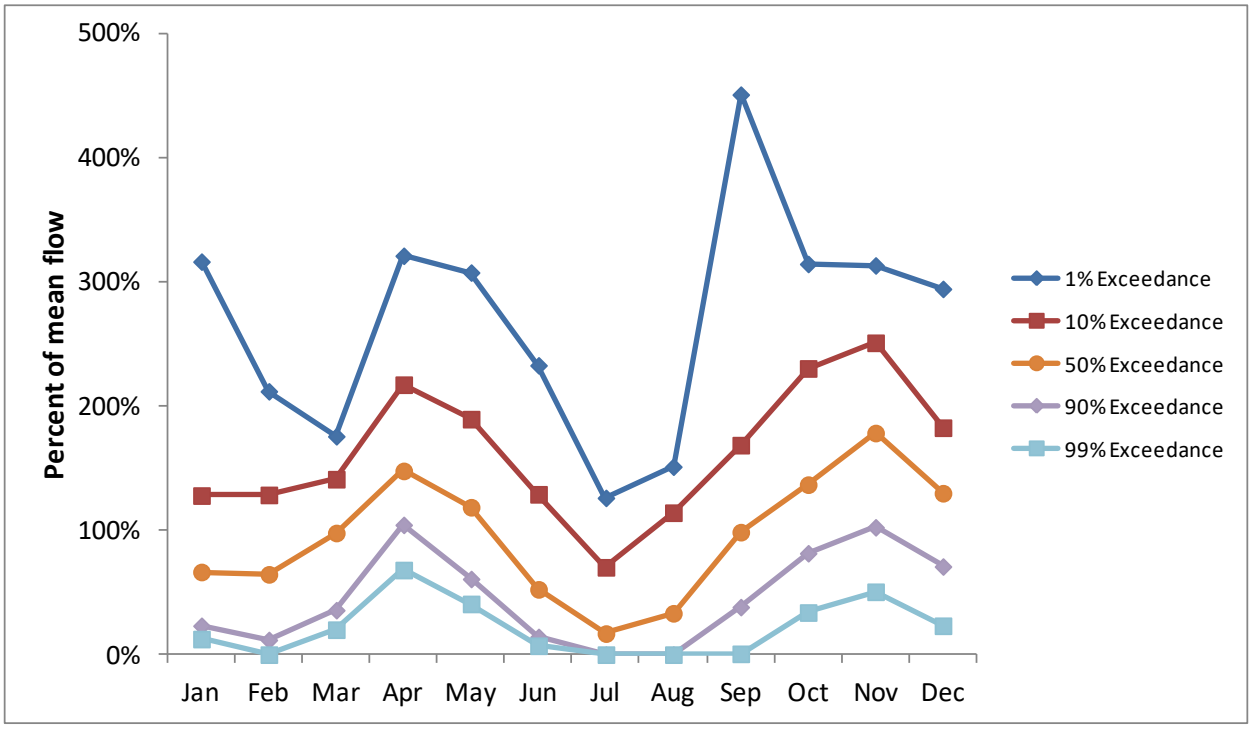


Figure 76: Flow exceedance probabilities

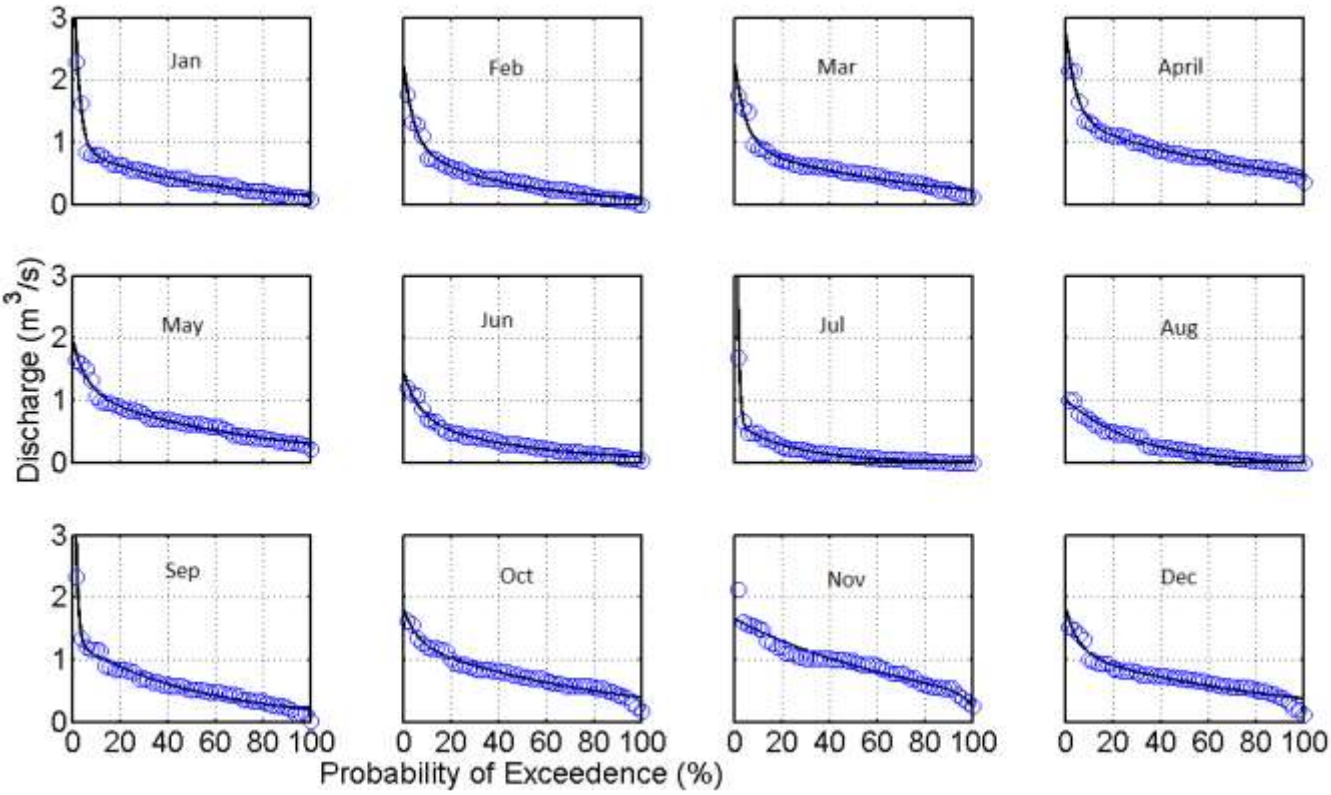


Figure 77: Flow duration curves of monthly data

To quantify an index of flow variability, the slope of the flow duration curve (S_{FDC}) is calculated between the 33rd and 66th streamflow percentiles, since at semi-log scale this represents a relatively linear part of the FDC. A high slope value indicates a variable flow regime, while a low slope value means a more damped response. Damped response can arise as a result of a combination of persistent and wide-spread rainfall, diffusion and/or the dominance of groundwater contribution to streamflow.
The equation for computing S_{FDC} is shown below while the monthly variation in S_{FDC} is shown in the figure below

$$S_{FDC} = \frac{\ln(Q_{33\%}) - \ln(Q_{67\%})}{0.67 - 0.33}$$

It is clear that the wet months also have more variable flow regimes while drier months have more damped response. This is consistent with a catchment in which there is considerable baseflow which contributes most of the stream flow during the dry season. The annual coefficient S_{FDC} is 2.1.

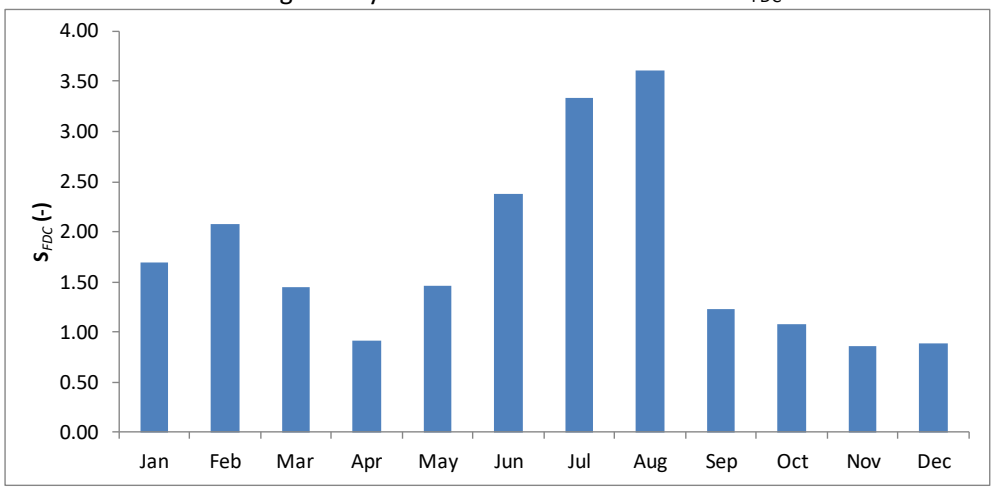


Figure 78: Slope of the flow duration curve (S_{FDC})

3. Flow trends

Water resources systems are historically designed and operated on assumption of stationary hydrology. Existence of trends and other changes in the data invalidates th assumption of stationarity, and detection of the changes in hydrological time series should help us revise the approaches used in assessing, designing and operating our systems. In the context of the Mishumba River, the runoff was modelled using rainfall as the main input. Therefore, the trend analysis was used to check for any changes in runoff over time due to changes in rainfall variability.

A check on linear trend was carried out by performing a linear regression test. In this test, a check was made on the slope of a trendline of the annual flow data over time. The significance of any detected trend was checked for statistical significance at 5% confidence level. Figure below shows that the flow data shows a slight negative trend with a line slope of 0.998 which is not significant at a significance level of 5%. Tests using other methods for detecting trend and step changes also did not reveal any significant changes in the flow data. Therefore, the modelled flow series is statistically stationary with respect to monotonic trends.

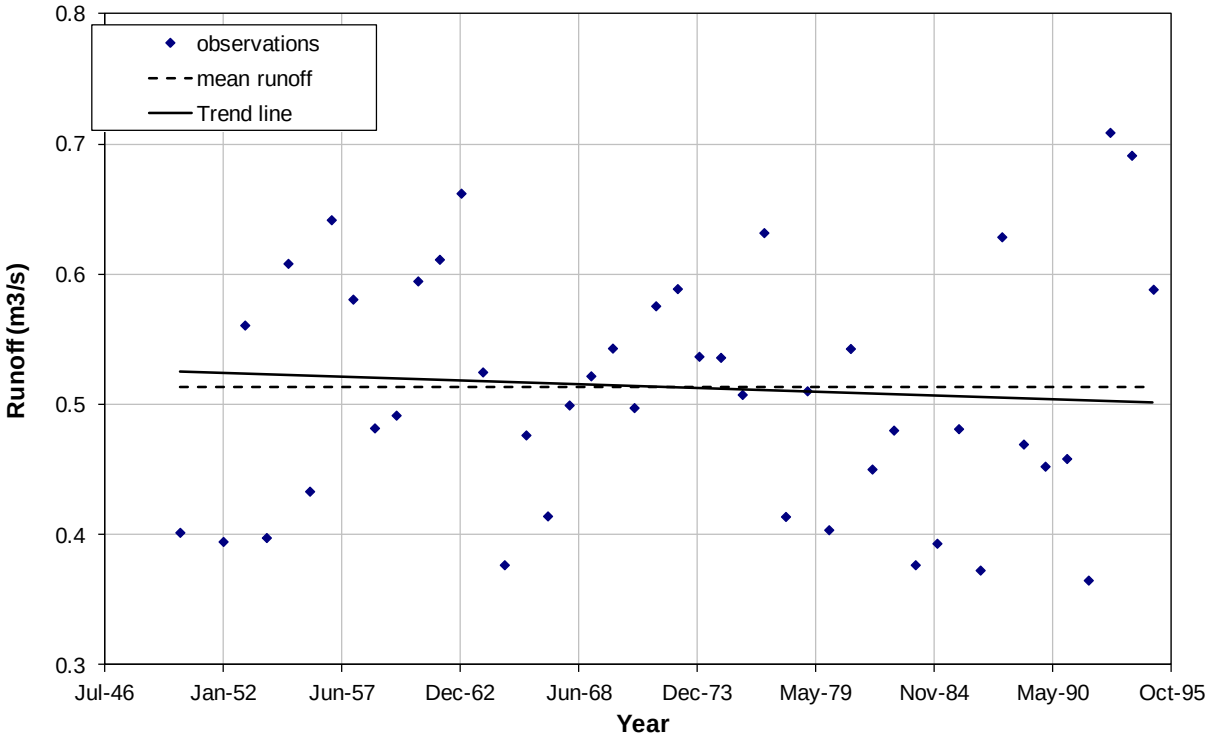


Figure 79: Linear regression trend test

4. Low flow analysis

Low flow assessment was aimed at determining the historically low flows, which is key to determine the scale of the required environmental flows for supporting basic ecological functions. The flow in the stream is considered a bottleneck for many species and habitats. The assessment was carried out on a dataset minimum monthly flows. When analysis is carried out on daily data, a common approach is the 7Q10 approach (i.e. the 7-day low flow with a 10-year return period). However, this analysis was performed on monthly data. Therefore, the data used for the analysis was the annual minimum flow data generated as the lowest monthly runoff in each calendar year of record.

Low flows of 0 m^3/s (i.e. instances when the river completely dried up) were registered in at least 10 years of the 46 years for which runoff was modelled. For year with no zero low flows, the amounts varied between 0.003 m^3/s in 1959 and 0.255 m^3/s in 1974 with a mean of 0079 m^3/s, median of 0.058 m^3/s and standard deviation of 0.062 m^3/s. Frequent zero flow in the river often gives rise to low biodiversity in the stream.

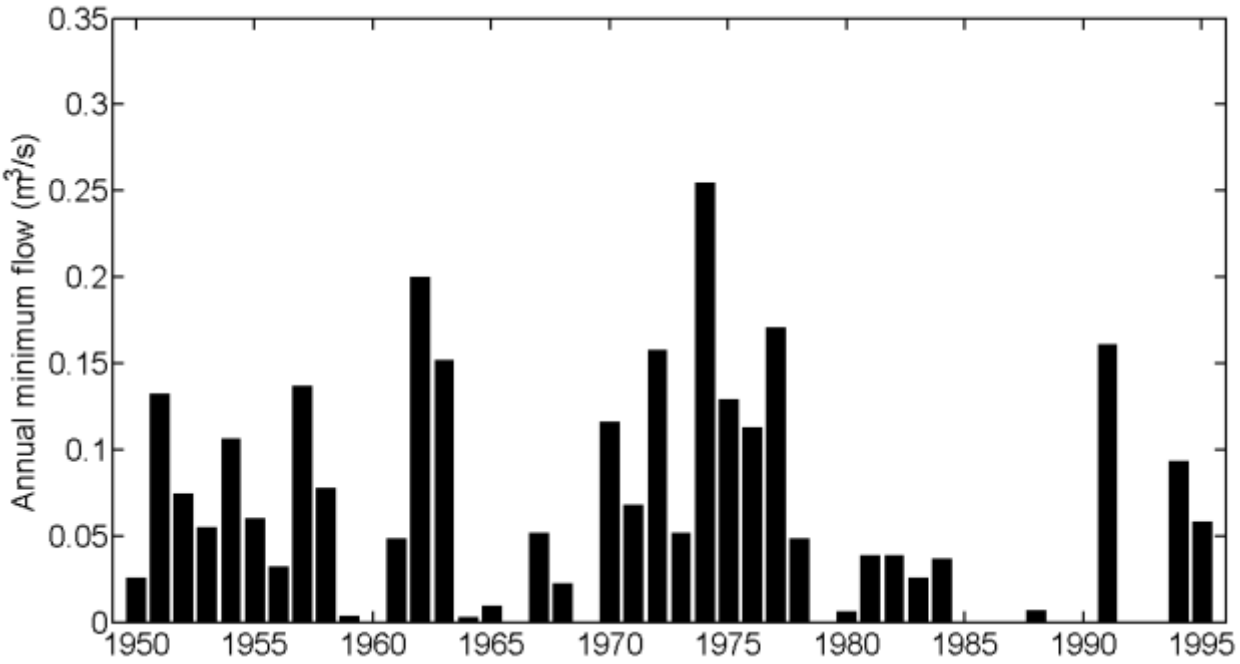


Figure 80: Annual low flow variation

The figure above shows the variation of the monthly low flows while the table below shows the statistics of the dataset. Dry months also happen occassionaly in the rest of the months apart from April and November. The mean monthly low flows vary between 0.05 m^3/s for July to 0.56 m^3/s in November with an average of 0.3 m3/s. The low flows for July exhibit the lowest variability (Std = 0.07 m^3/s) while those for September exhibit the highest variability (std = 0.25 m^3/s). Therefore, the low flow variation follows the discharge pattern with drier months experiencing lower flows compared to the wetter months. April, October and November have the highest low flows while July and August have the lowest low flows.

Table 73: Statistics of monthly low flow dataset (m^3/s)

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	-	-	-	0.10	-	-	-	-	-	-	0.10	-
Maximum	0.80	0.80	0.60	1.10	1.00	0.80	0.30	0.40	1.10	1.10	1.20	1.10
Mean	0.19	0.15	0.21	0.50	0.36	0.16	0.05	0.05	0.22	0.43	0.56	0.38
Median	0.20	0.10	0.20	0.45	0.30	0.10	-	-	0.10	0.40	0.60	0.30
Standard dev	0.14	0.15	0.17	0.23	0.24	0.18	0.07	0.09	0.25	0.25	0.25	0.20
Frequency of zero values	5	12	9	-	1	10	30	29	11	2	-	1

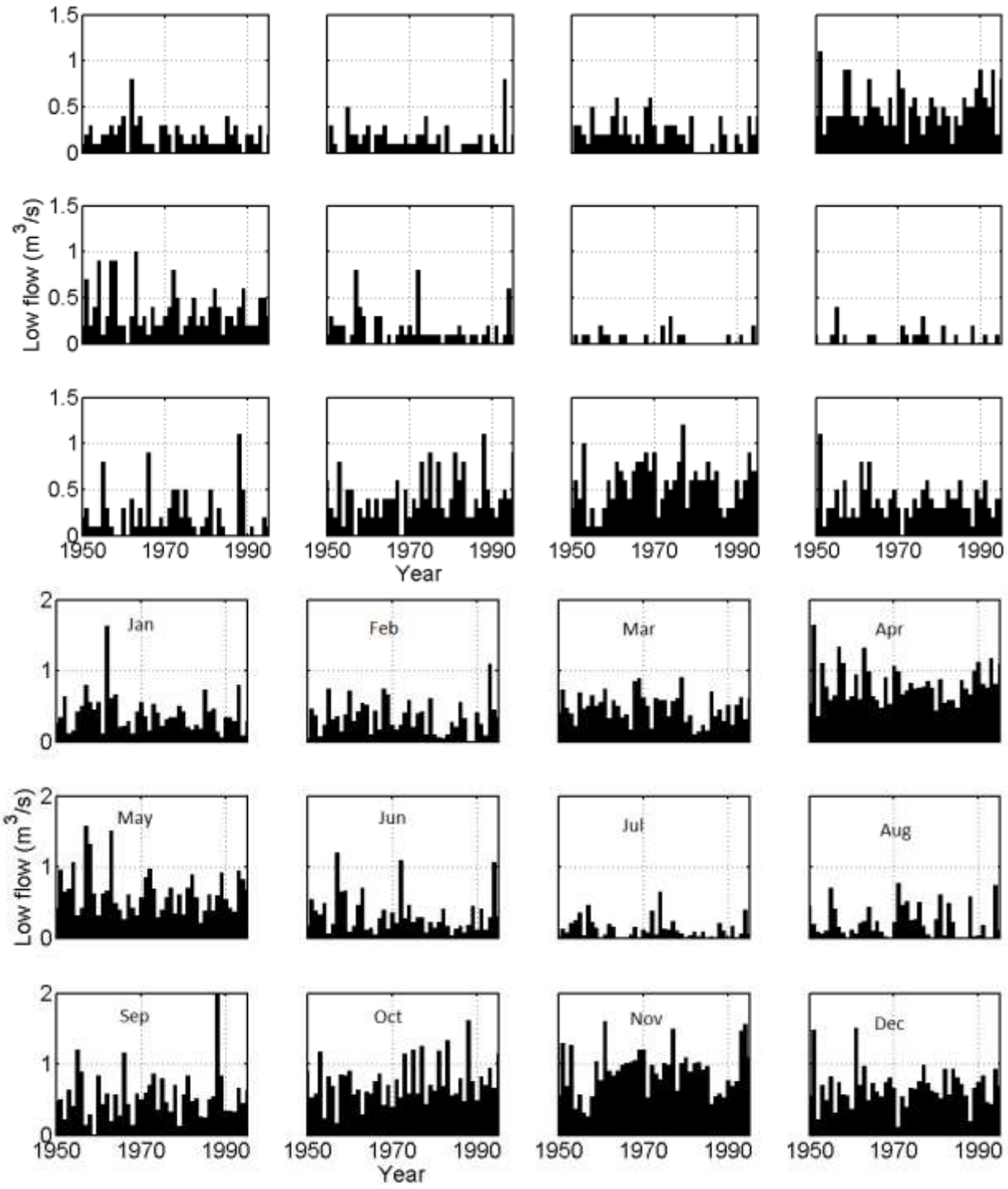


Figure 81: Monthly low flow variation

A lognormal distribution provided acceptable fits for both annual and monthly low flows. Figures below show the annual low flow estimates (for years with above zero values) with a lognormal distribution superimposed and the monthly low flows. Table below shows the computed low flows corresponding to various return periods. The following can be noted:

(a) The low flows for 6 months (February, March, June, July, August and September) are practically zero, even for a 2-year recurrence interval. These are periods of water stress in the region and are critical in the operation of the proposed reservoir.
(b) Low flows during the drier months exhibit flatter variations compared to low flows during the wetter months. This means that low flows tend to persist longer in the dry months compared to wet months.

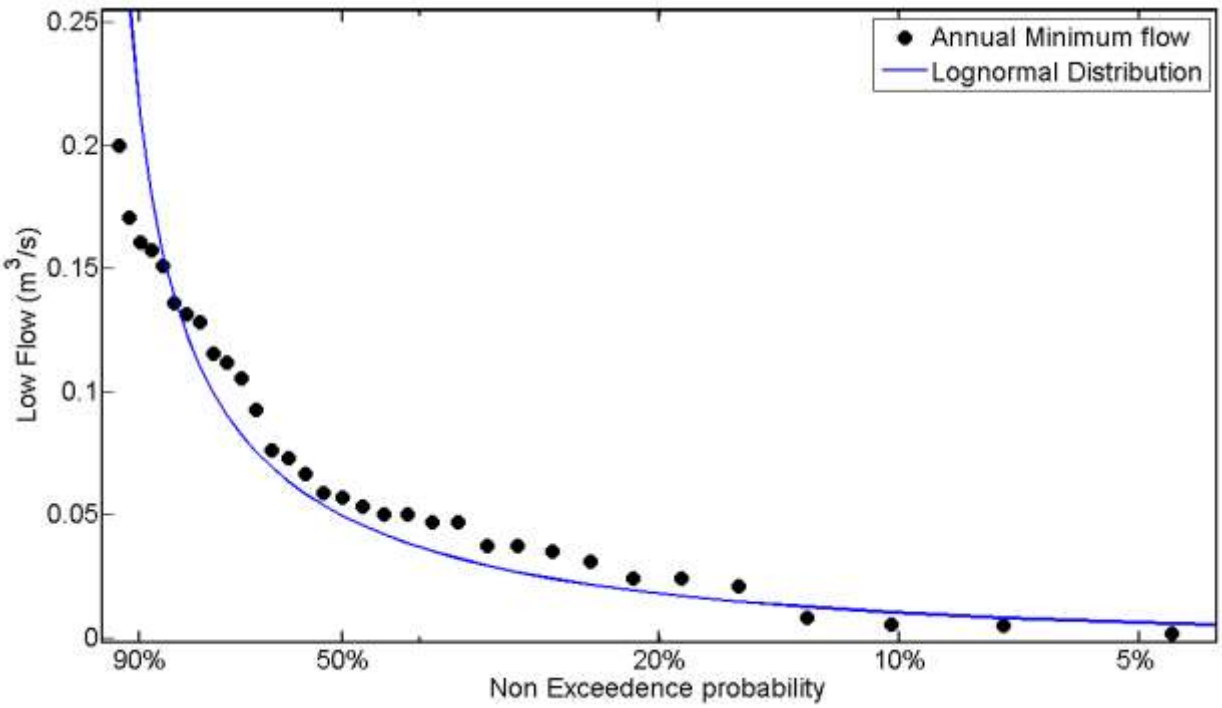


Figure 82: Flow duration curve for annual minimum flows with lognormal fitting

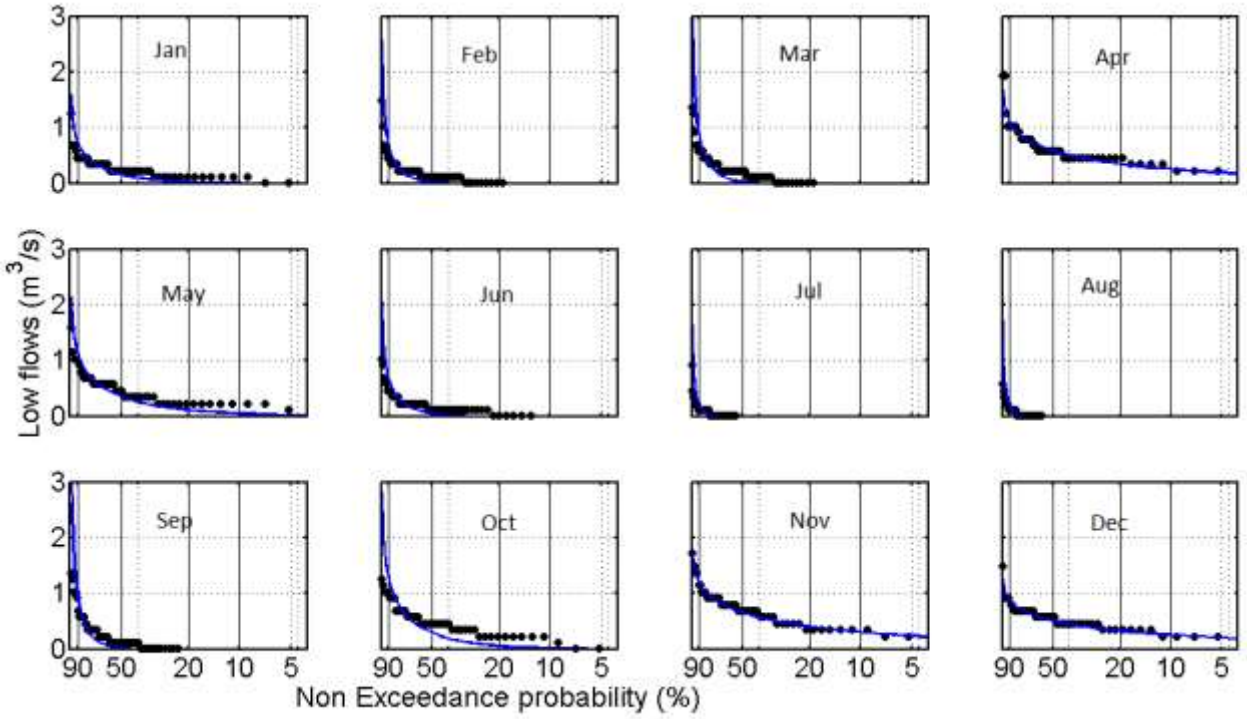


Figure 83: Monthly low flows with a lognormal distribution fitted

Table 74: Low flows corresponding for various recurrence intervals for dam site

Recurrence interval (years)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2	0.15	0.02	0.03	0.54	0.33	0.05	0.00	0.00	0.01	0.27	0.65	0.49	0.051
5	0.03	0.00	0.00	0.35	0.11	0.00	0.00	0.00	0.00	0.06	0.42	0.32	0.020
10	0.01	0.00	0.00	0.27	0.05	0.00	0.00	0.00	0.00	0.02	0.32	0.25	0.012
25	0.00	0.00	0.00	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.24	0.19	0.007
50	0.00	0.00	0.00	0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.20	0.16	0.005
100	0.00	0.00	0.00	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.16	0.13	0.004

Base flow separation

Base flow is the portion of stream flow that is contributed from shallow subsurface flow and from groundwater storage. Base flow analysis helps in understanding the runoff generation processes and it is also essential for assessing the impacts of changes (e.g. land use changes, climate change) on the hydrological response of a catchment. Base flow separation is useful for determining the proportion of runoff that is attributable to direct runoff in response to rainfall input and the proportion that is attributed to subsurface sources. The Two Parameter Digital Filter (Eckhardt, 2005) method for base flow separation was used. Figure below shows the mean monthly base flow estimates relative to the mean monthly flows and the monthly low flows. During July and August, all flow is almost made up of base flow. For other months, base flow is about 50% of the runoff. The relatively high proportion of base flow may be because of the wetlands located just upstream of the proposed dam location which store some of the runoff and then release it slowly.

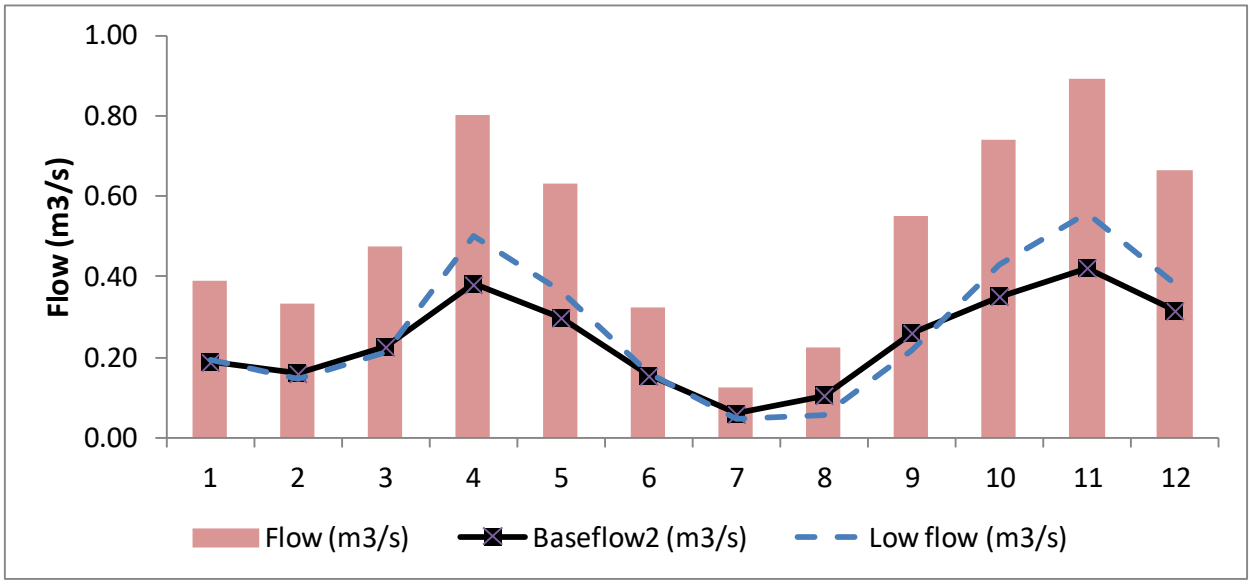


Figure 84: Mean monthly base flow

Peak flood assessment

Peak floods were derived for two rainfall-runoff based methods namely SCS peak flood assessment and Snyder's UH method for the 20, 100, 1,000 and 10,000 year return periods. The probable maximum flood (PMF) was also estimated which is the greatest flood physically possible for the catchment of interest. The hourly rainfall peak intensities are shown in while peak flow results are summarised in the figure below. The following figure shows the peak flow hydrographs estimated using the SCS UH method. The whole flood lasts from 8 hours to 17 hours depending on return period with the estimated peak flow occurring after 5-6 hours. The probable maximum flood (PMF) is higher than expected, about 5 times the 10,000 year flood.

Table 75: Peak flood from rainfall-runoff modelling

Tr [yrs]	P(X) [-]	SCS peak floods [m3/s]	Snyder's UH peak flood [m3/s]
20	0.950	4.6	3.6
100	0.990	16.5	13.0
1.000	0.999	42.8	33.7
10.000	1.000	76.9	60.9
PMF	-	382.1	316.1

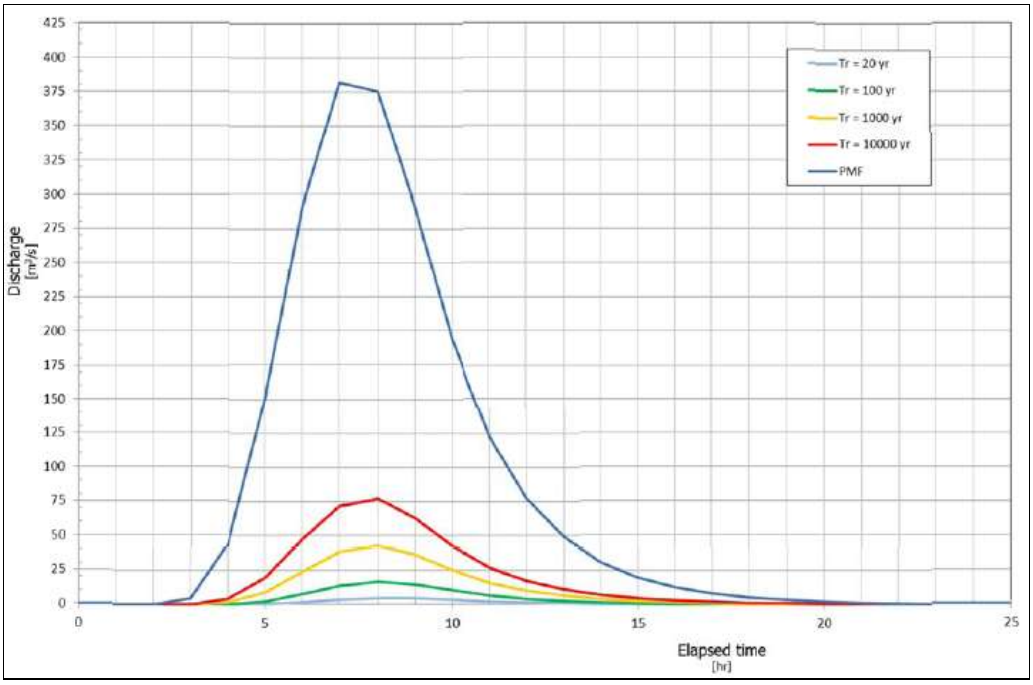


Figure 85: SCS Peak flood hydrograph

Sediment analysis

An assessment of the watershed sediment yield is one of the main issues when evaluating the lifetime of the dam as well as downstream impacts. There are no consistent reliable sediment transport data for the catchment. The 'Revised Universal Soil Loss Equation (RUSLE) erosion model, a standard method to calculate the average risk of erosion on arable land, was applied to estimate the sediment yield. The method combines the effects of the environmental factors mainly governing soil erosion on a single parametric equation.
According to RUSLE, annual soil loss is expressed as:

$A = R \times K \times L \times S \times C \times P$

where:

- A= specific mean annual soil loss;
- R= index expressing the erosivity power of the rain;
- K= pedologic factor expressing soil erodibility;
- L= topographic factor related to slopes length;
- S= topographic factor related to slope steepness;
- C= correction coefficient accounting for land cover;
- P= correction coefficient accounting for control practices;

A is expressed in terms of mass per unit area of soil loss in the unit time (tons/km2/year or tons/hectare/year). The figure shows the spatial distribution of the soil loss in Kabuyanda catchment based on RUSLE model. The classification (frequency analysis) of the erosion values/ soil loss in Mishumba catchment is shown in the following figure. The figure illustrates that large part of the catchment has low estimated erosion rate, and a smaller number of localities have a higher erosion rate. Based on the RUSLE model, the frequency distribution is determined and the median erosion rate of the Kabuyanda catchment is seen to be 2.9 Ton/ha/year which is equivalent to 290 Ton/km2/year. The sediments generated depend on the upstream catchment characteristics i.e. soils, topography and vegetation cover. The ecological environment of river flood plains is dependent on deposition of silt from the catchments upstream that brings with it nutrients and minerals. Retention of silt in Kabuyanda Dam over duration of time will effectively reduce the overall silt loading as well as the overall flood areas. Construction of the dam will

result in high retention and storage capacity and ability compared to the transportation speed. From the hydrology studies of the project catchment area, the sedimentation rate estimated that 290 Ton/km2/year equivalent to 26,100 tons/year of sediments will be moved per year into the dam from the catchment. Considering the expected residence time (reservoir volume / inflow) of the reservoir, the ratio of deposited sediment to the total sediment inflow (trap efficiency) is expected to be approximately 50 percent (%).

The assessment of sediment transport used a simplified model to describe the soil erosion and expected sediment transport. The assessment is simplified, however commonly used, especially in combination with remote sensing data and it can be reliable when the parameters are adequetly estimated and validated. The sediment transport assessment will be elaborated and confirmed during project implementation.

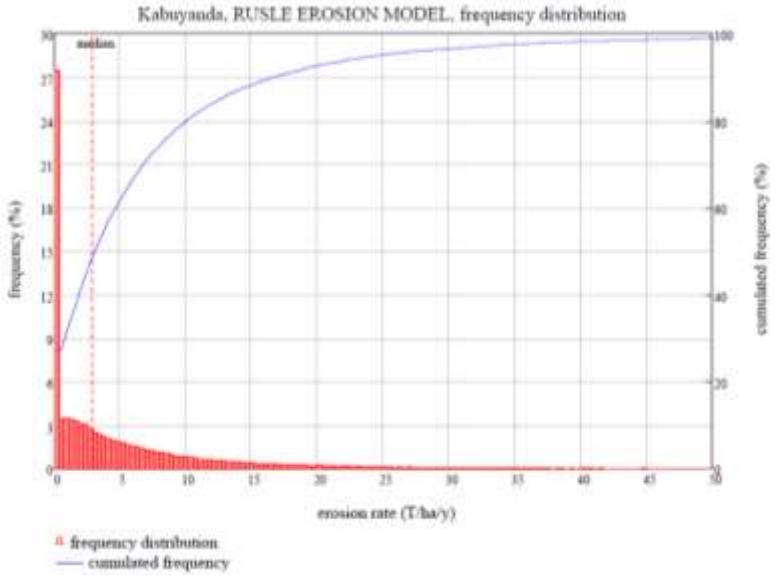


Figure 86: Frequency distribution of erosion rates in R. Mishumba catchment

WATER RESOURCES

Introduction

Isingiro is located within the dry belt know as the cattle corridor. Droughts frequently occur and can last 4-6 months causing stress on water resources, failure of crop yields resulting in famine. Given that 87.6% (*National Housing and Population Census, 2014*) of the population is dependent on agriculture, with matooke as the main crop grown, frequent droughts and famine exacerbate poverty in the district. Most of the population depends on ground water sources and water from the many (seasonal) streams. Depending on location, however, some of the streams have hard water which cannot be used for domestic purposes.

According to the Uganda Water Supply Atlas (http://wateruganda.com/index.php/reports/district/18), Isingiro has a population of 543,379 of with an average access to safe water sources of only 40%. Areas around the vicinity of the proposed project of Kabuyanda and Kikagate have access of 69% and 37% respectively. Access to safe water in Kabuyanda Town stands at 54%.

Surface water

Surface water resources include rainwater, stream and river flows, and some wetlands. The figure shows the rainfall over the catchment, runoff (as direct runoff and base flow) and the "losses" which represents the amount of water that evaporates and the amount that infiltrates. On average 82% of the rainfall either evaporates or infiltrates into deep aquifers.

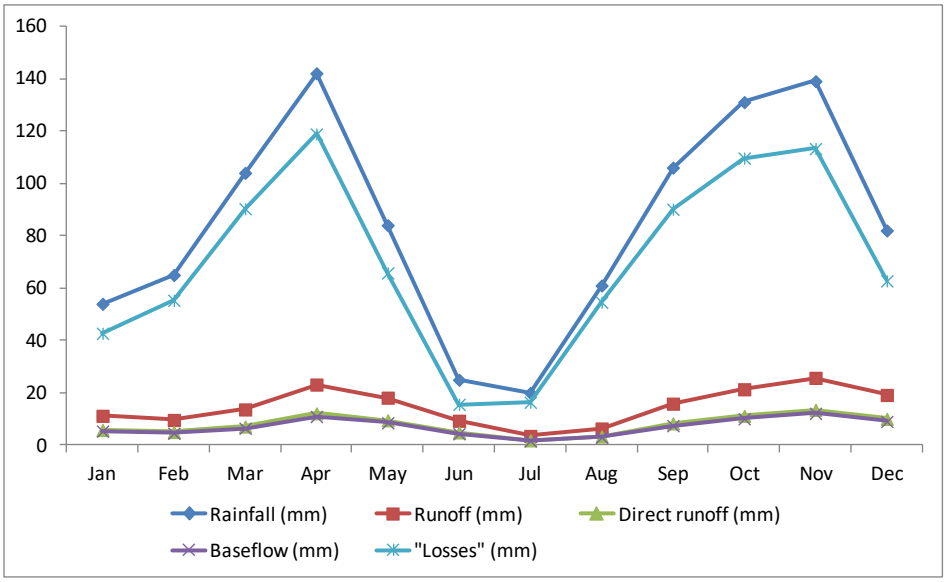


Figure 87: Surface water sources

The proposed Kabuyanda Dam is located at a point where there is limited human activity upstream apart from agriculture. The dam is designed for water storage that will then release progressively downstream during the dry conditions. The gradual release will act as a balancing phenomenon for the river flows downstream and also decrease variations in the quality of the water moving downstream. The tributaries of R. Mishumba downstream include R. Rweibara (Kasharira) which joins Mishumba about 1 km downstream of the dam; R. Rwamango and Kyabayanda join R. Mishumba about 5 km downstream of the dam.

The figure below shows the confluence and flow of the tributaries of river Mishumba below the dam. River Rweibara (also known as Kasharira) joins Mishumba about 1 Km downstream of the dam. From this point onwards, the tributaries contribute to the flow of Mishumba. River Rwamango and Kyabayanda join river Mishumba about 5 km downstream of the dam site. The flows available downstream of the dam from the free catchments are presented in table below.

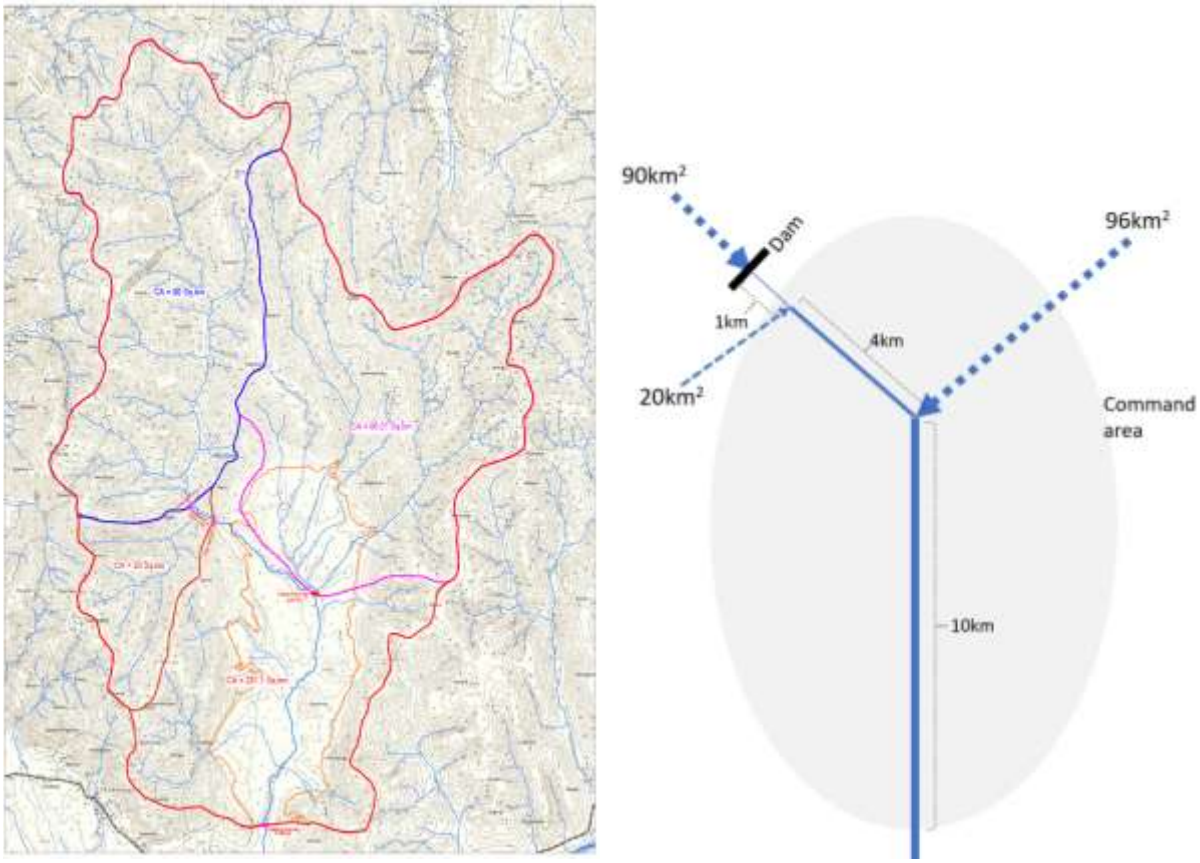


Figure 88: Confluence and flow of the tributaries of river Mishumba below the dam.

Table 76: Flows from the free catchments downstream of the dam

Sl.no	Location	Free Catchment Area (Sqkm)	Annual Average flows (cumec)	Distance from Dam site (km)
1	Dam site	90	0.5	
2	Rweibara confluence	20	0.11	1
3	Rwamango and Kyabayanda confluence	96	0.53	5
4	Tail of command area	191	1.06	15

The catchment area of river Mishumba that will contribute flow for the dam reservoir is less than 30% (90 km2) of the total catchment area (301 km2) of the river at its confluence with Kagera river as can be seen from figure below.

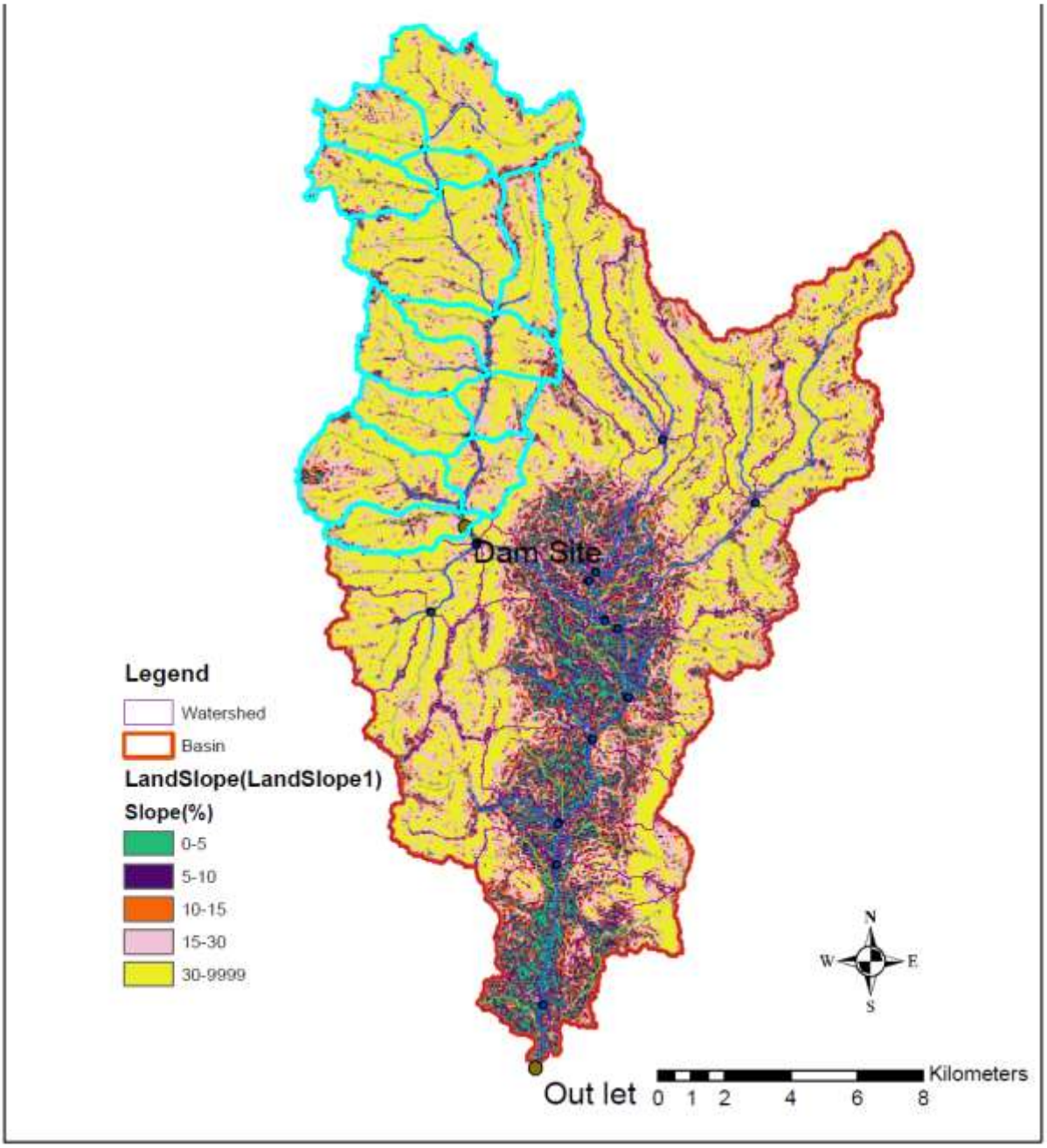


Figure 89: R. Mishumba catchment (301 km^2) at confluence with river Kagera and above dam site

Groundwater

According to the Uganda Water Atlas, the majority of the population in Isingiro currently depends on groundwater sources for their water supply. The percentage of population served by groundwater is up to 65%. The different technologies for water supply include protected springs that serve 7% of the population, shallow wells that serve 34% of the population and deep boreholes that serve 24% of the population. As such groundwater is a major source of water, a situation that is likely to persist even after implementation of the project. However, groundwater sources are susceptible to contamination and depletion due to overexploitation. Groundwater quality is influenced by potential infiltrating agrochemical residuals, nutrients

from cattle pens and application of animal manure on farms as well as discharge into the ground of human wastes from pit latrines. Measures should be put in place to protect groundwater sources during the project operation. Proposed mitigation measures are detailed in Chapter 7.

ENVIRONMENTAL FLOWS

The State of the Environment Report for Uganda (2014) identifies some of the main threats to biodiversity in Uganda as habitat loss, modification and alteration along with unsustainable resource harvesting, pollution and introduction of alien species. The implementation of the Kabuyanda Multi-Purpose Water Resources Development Project is expected to cause modification of ecosystem habitats within the project area. Of particular concern in this study is the storage and diversion of water at the dam which will imply that the flow amount and the flow regime in the natural channel will be modified with less water available for channel and ecosystem maintenance.

There has been strong recognition internationally over the past decades that, while implementation of projects of water for human development, use and diversion are important, ensuring the health and vitality of the river and ecosystems it supports are also as important (World Commission on Dams, 2001). Rivers and other aquatic ecosystems need water and other inputs like debris and sediment to stay healthy and continue providing benefits to people and the price of not providing environmental flows cannot be underestimated. The river flow regime influences the water quality, energy cycles, biotic interactions, and habitat and any modification of the flow regime has implications on these and organisms/species that depend on them for their livelihoods. For the Kabuyanda Multi-Purpose Water Resources Development Project the major impacts will potentially be on water quality, riverbank vegetation, birds, fish populations and other aquatic life.

The tool that is used to address these emerging challenges is the prescription of environmental flows. Environmental flows are described as flows of water in rivers that are necessary to maintain aquatic ecosystems. In otherwords, a flow regime in the river, capable of sustaining a complex set of aquatic habitats and ecosystem processes. Provision of environmental flows is aimed at ensuring that the river has sufficient quality, quantity, and timing of water flows that are required to sustainably maintain the components, functions, processes, and resilience of aquatic ecosystems which provide goods and services to people. Environmental flow assessment (EFA) is an assessment of how much of the original flow regime of a river should continue to flow down it and onto its floodplains in order to maintain specified, valued features of the ecosystem hydrological regimes for the river (Tharme, 2003). This assessment involved estimation and justification of the environmental flows for the proposed Kabuyanda project. The analysis was carried out on monthly data. The choices made were based on the findings of the biological and ecological studies and requirements of the selected environmental flow methodology.

There has been strong recognition internationally over the past decades that, while implementation of projects of water for human development, use and diversion are important, ensuring the health and vitality of the river and ecosystems it supports are also as important (World Commission on Dams, 2001). Rivers and other aquatic ecosystems need water and other inputs like debris and sediment to stay healthy and continue providing benefits to people and the price of not providing environmental flows cannot be underestimated. The river flow regime influences the water quality, energy cycles, biotic interactions, and habitat and any modification of the flow regime has implications on these and organisms/species that depend on them for their livelihoods. For the Kabuyanda Project the major impacts prior to implementation of mitigation measures will potentially be on water quality, riverbank vegetation, birds, fish populations and other aquatic life.

Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems (Brisbane Declaration). Environmental Flow Assessments (EFAs) consists of determining how much of the flow regime of a river should be preserved to maintain specified, valued features of the ecosystem hydrological regimes for the river (Tharme, 2003). There is a wide literature concerning the methodologies to use for the EFA in a specific situation (Water Resources and Environment, Technical Note C.1 of the World Bank, 2003).

In the case of Kabuyanda, an initial assessment of the Environmental Flow was carried out using the Tennant method (1976), the most widely known across the low-resolution historic flow methods, which rely solely on the (recorded or estimated) flow regime of the river. The Tennant method assumes that some percentage of the mean annual flow is needed to maintain a healthy stream environment. Based on literature data from the project area (Okori, 2010), the environmental flow requirement at Kabuyanda was initially determined as 10% and 20% of Average Annual Flow (AAF) in the dry and wet seasons, respectively.

Noting there is a potential for impacts on the downstream environment on the water quality, riverbank vegetation, birds and aquatic life, additional surveys and assessments of the downstream environment were conducted to confirm/amend the proposed environmental flow requirement. The surveys and consultation were conducted in the primary area affected by the project, i.e. the 1 km immediately downstream the dam before additional tributaries complement the rivers water, in regards to the biodiversity of the area and water needs. The flows from the tributaries contribute significantly to satisfy the downstream water demands. One km downstream, Rweibara River contributes about 18% of the 0.61 m3/s Average Annual Flow (AAF) of Mishumba River at the confluence and 5 km downstream the combined flow of Rweibara and Rwanago Rivers is about 56% of the total flow at the confluence.

Within the 1km stretch downstream of the dam and the confluence of river Rweibara (also known as Kasharira) and Mishumba, there are no tributaries. The river valley is covered with patches of papyrus vegetation and slow moving clear water. The surrounding land is under crop cultivation and forest plantation. Figure below shows river Mishumba valley covered with patches of papyrus vegetation and slow moving water down stream of dam site.

Review of Environmental Flow methods

Methods for quantification of minimum environmental flows are generally divided into three major categories: (1) hydrological or historic flow regime, (2) hydraulic rating, and (3) habitat simulation. Methods within these categories tend to be based on similar principles and assumptions. Although all three categories aim to maintain the stream environment, they focus on different aspects of the stream, such as flow, wetted perimeter or physical habitat. In terms of ease of application (time, resources and expertise required) hydrological methods are the easiest followed by hydraulic rating methods and habitat simulation methods. But as discussed below, habitat methods are founded on biological principles and may be more reliable and defensible than the other two.

Hydrology/ historical based methods

As the name implies, historic flow methods rely solely on the recorded or estimated flow regime of the river. The Tennant (1976) method (also known as the 'Montana' method) is the most widely known of these methods. The Tennant method assumes that some percentage of the mean flow is needed to maintain a healthy stream environment. Tennant examined cross-section data from 11 streams in Montana, Nebraska and Wyoming. He found that stream width, water velocity and depth all increased rapidly from zero flow to 10% of the mean flow, and that the rate of increase declined at flows higher than 10%. At less than 10% of the mean

flow, he considered that water velocity and depth were degraded and would provide for 'short-term' survival of aquatic life. He considered that 30% of the average flow would provide satisfactory stream width, depth and velocity for a 'baseflow regime'. Tennant's assessment of the environmental quality of different levels of flow was based on the quality of the physical habitat that they provided. At 10% of average flow, average depth was 0.3m and velocity 0.25 m/s, and Tennant considered these to be lower limits for aquatic life. He showed that 30% of average flow or higher provided average depths of 0.45-0.6m and velocities of 0.45-0.6 m/s and considered these to be in the good to optimum range for aquatic organisms. Fraser (1978) suggested that the Tennant method could be extended to incorporate seasonal variation by specifying monthly minimum flows as a percentage of monthly mean flows.

Other historic flow methods recommend flows based on the flow duration curve or an exceedance probability of a low flow, where the level of protection is implicit in the magnitude of the percentage. For example, both a percentage (30–75%) of the 1 in 5 year low flow, and the flow equalled or exceeded 96% of the time have been used to assess 'minimum' flows in New Zealand. In Australia, Arthington *et al*. (1992) suggested an approach that 'rebuilds' a natural flow regime, where monthly minimum flow would be based on either a percentage exceedance for each month or a low flow that occurs 'often'. This is similar to Fraser's (1978) suggestion, but with added requirements for wet season flows and floods to preserve the pattern of natural variability.

Hydraulic methods

Hydraulic methods relate various parameters of the hydraulic geometry of stream channels to discharge. The hydraulic geometry is based on surveyed cross-sections, from which parameters such as width, depth, velocity and wetted perimeter are determined. Because of the field and analytical work involved in this, they are more difficult to apply than historical flow methods. Variation in hydraulic geometry with discharge can be established by measurements at different flows, prediction from cross-section data and stage–discharge rating curves, Manning's or Chezy's equations, or calculation of water surface profiles.

The most common hydraulic method considers the variation in wetted perimeter with discharge. Two criteria have been suggested for specifying minimum flow requirements using hydraulic methods. Wetted perimeter usually increases with flow, sometimes showing a point of inflection. Tennant (1976) used the inflection point criterion when he found that depth and width began to decline sharply at flows less than 10% of the mean in his study rivers. The other criterion, percentage habitat retention, retains a percentage of the width or wetted perimeter of the river at mean flow. For example, Bartschi (1976) suggested that a 20% reduction in wetted perimeter at mean flow might be the maximum allowable degradation. If flow requirements are based on retaining a percentage of the wetted perimeter at mean flow and there is a linear or near linear relationship between wetted perimeter and flow, the criterion is, in effect, the same as a percentage of the mean flow. Hydraulic methods are not usually used to assess seasonal flow requirements.

Habitat methods

Habitat is an encompassing term used to describe the physical surroundings of plants and animals. Some habitat features, such as depth and velocity, are directly related to flow, whereas others describe the river and surroundings. Habitat methods are a natural extension of hydraulic methods. The difference is that the assessment of flow requirements is based on hydraulic conditions that meet specific biological requirements rather than the hydraulic parameters themselves. Hydraulic models predict water depth and velocity throughout a reach. These are then compared with habitat suitability criteria to determine the area of suitable habitat for the target aquatic species. When this is done for a range of flows, it is possible to see how the area of suitable habitat changes with flow. Because habitat methods are quantitative and based on biological principles, habitat methods are considered to be more reliable and defensible than assessments made by other methods. The most widely known method is the physical habitat simulation component (PHABSIM) of the

instream flow incremental methodology. When using habitat methods, there are more ways of determining flow requirements than for either historic flow or hydraulic methods.

Habitat methods are more flexible than either historic flow or hydraulic methods. It is possible to examine the variation of the habitat utilized by many species and life stages throughout the year and to select flows that provide this habitat. However, this means that it is necessary to have a good knowledge of the stream ecosystem and some clear management objectives in order to resolve potential conflicting habitat requirements of different species or life stages. Habitat methods are particularly suitable for 'trade-off' situations, where incremental change in habitat can be compared with the benefits of resource use. Habitat/flow relationships can be used to evaluate alternative flow management strategies and are part of the information base used in the process of choosing appropriate flow rules for river management.

Holistic methods

Holistic methodologies consider the condition of the entire river ecosystem, including individual species in the channel, the riparian zones, floodplains etc. These methodologies are often connected to societal, resource, and economic issues. These are comprehensive and holistic, accounting for the seasonal and inter-annual flow variation needed to support the whole range of ecosystem services that healthy rivers provide. Common methodologies are the Downstream Response to Imposed Flow Transformation (DRIFT) and the Building Block Methodology (BBM). The methodologies require substantial amount of data of the habitats, species and water users. For example, DRIFT uses indicators of the specific habitats, species and water uses in the downstream area and provides a detailed assessment of the project impact on the individual indicators. Stakeholders are involved in the determination of the final environmental flow requirement to ensure agreement on the future operating regime. In general, hydrological and hydraulic methods are inherently low-resolution methods; habitat-simulation methods are of medium resolution; and holistic methods are high-resolution.

Figure 90: River Mishumba downstream of dam with patches of papyrus vegetation and slow moving water.

Downstream water use

The first major domestic water abstraction point is about 1km downstream of the dam site at river Rweibara (also known as Kasharira) and Mishumba confluence. There is also some limited fishing activity using traditional fishing gear as mentioned under Section 4.4.4.3. It further states that fishing activities in Isingiro District are carried out on L. Nakivale, Rwamurunga and Rivers Kagera and Rwizi. The major types of fish caught include; tilapia, miller caps, lung fish and claris. In the project command area, commercial fish farming is practiced using fish ponds. Fish farming is mainly practiced in the downstream area (irrigation command area). The major fish farmer in the project area is Tukundane Fish Farm Limited, approximately 10Km from the reservoir area. The fish farm abstracts water from three tributaries downstream of the reservoir and these include Rusharira, Kasharira and Kasworo.. The main water use is downstream of the Rweibara and Mishumba confluence up to River Rwamango, Kyabayanda and Mishumba confluence, and it includes the following; domestic supply, alcohol distillation, vehicle and motorcycle washing and fishing. This section is not used for livestock watering. The domestic water supply points are found at Kagoto I, Kagoto II, Karo I-IV villages. The number of people depending on river Mishumba and Rweibara confluence is estimated to be about 300-500. This population is the same expected to benefit from the development of a water supply project by MWE, from groundwater, which would thus not depend anymore from the river.

Interviews with local farmers, LC1 chairpersons and civil servants gave estimated number of persons depending on river Mishumba downstream of the Rweibara and Mishumba confluence up to River Rwamango, Kyabayanda and Mishumba confluence for domestic water supply. The interviews also indicate that during the dry season, river Mishumba flow reduces to minimum but it does not dry completely.

Table 77: List of persons interviewed

Name	Village	Occupation	Contact
Julius Rwabujere	Kabuyanda	Public servant	0751534368
Agrey Banyanzaki	Kagoto II	LC1 C/M	0784561152
Ssenga Milton	Kagoto I	Farmer	078459073
Mwesigwa Patric	Kagoto I	LC1 C/M	0782414269

Figure 91: *Domestic water supply points (upper left) Rweibara and Mishumba conluence (upper right) Kagoto I village (lower left) Kagoto II village (lower right) Karo IV village (e) Karo I village.*

Downstream herpetofauna rapid survey and assessment

The same methods used for the rest of the ESIA study were employed. The methods include literature review, community informal consultations, and use of scientifically tested standardized field sampling. Literature was reviewed to collate information on how reduced water flow or dried rivers can affect herpetofauna. Informal discussion / interview were held with local people encountered in the field to establish which herpetofauna species are encountered by the people (in the section of the river after the dam) as they conduct their day to day activities in the project area. Information provided by the community was cross examined by reviewing distribution literature and publication to confirm their existence.

Three main sampling methods were employed in a rapid survey in March 2019, as described by Heyer et al, 1994; Fellers and Freel, 1995; Halliday, 1996; and Olson, et al, 1997. The methods include:

- Visual Encounter Surveys (VES): Visual encounter surveys were conducted along the transect from the dam location down the Mishumba River. The method involved moving through the area in and around the river, watching out for and recording surface-active species. VES were complimented by visual searches, by examining under logs, leaf litter, and in vegetation.
- Audio Encounter Surveys (AES): This method uses the species specific calls made by breeding males. The identity of the amphibian species heard calling and their numbers were recorded.

- Opportunistic Encounters: Herpetofauna species encountered outside the sampling points but within the project area / surrounding were recorded. The opportunistic encounters complemented the amphibians and reptiles recorded for the river section.

Apart from individuals heard calling, species encountered were handpicked, identified, and where possible photographed and released at the point of capture. Identification followed field guides by Spawls, S. et al. (2002), and Bill Branch (2005).

To assess the Red List and / or protected status of species recorded or potentially occurring in the study area, two sources were consulted: a) The latest Red List of Threatened Species of the International Union for the Conservation of Nature (IUCN); and/or b) The National Red List for Uganda, published by Wildlife Conservation Society (WCS) January 2016.

Sampled Areas

The survey was conducted along one transect established along the river from the dam location, down the river for the length of 1 km. In total the sampling was carried out in 11 points. Eight of the points were within the stretch of 1 km from the Dam access (white, yellow and light blue Markers).

Figure 92: *Location of sampling points along the river (White mark is the Alternative 1 dam location. Yellow marks are the sampling points. Light blue mark is the Confluence of Rivers Mishumba and Rusharira. Red marks are additional points down the river).*

Survey Results

The rapid survey and assessment covered: i) amphibians; ii) reptiles; iii) fish; and iv) other aquatic species.

v. Amphibians

Eight Amphibian species were recorded in the stretch of 1 kilometer of River Mishumba from the dam site area down the river in table below. All are classified as frogs. Six of the species are categorized as water specialists and these are found in and around water sources. Two of the species encountered are non water specialists (still require water for spawning and normal life functions), the species can resist desiccation and can be encountered distances away from water sources. Thenone water specialists include the Mascarene Rocket Frog Ptychadena mascareniensis and Anchieta's Rocket Frog Ptychadena anchietae.

Table 78: *Amphibian Species encountered in the 1 kilometre stretch of River Mishumba from the Dam site area down stream*

Family Name	Scientific Name	Common Name	IUCN Red List Status	National Red List Status	Numbers found
Pyxicephalidae	Amietia angolensis	Angola River Frog	LC	DD	17
Phrynobatrachidae	Phrynobatrachus natalensis	Natal Puddle Frog	LC		2
	Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC		5
Ptychadenidae	Ptychadena mascareniensis	Mascarene Rocket Frog	LC	DD	19
	Ptychadena anchietae	Anchieta's Rocket Frog	LC		4
Hyperoliidae	Hyperolius kivuensis	Kivu Reed Frog	LC		5
	Hyperolius cinnamomeoventris	Cinnamon-bellied Reed Frog	LC		28
	Hyperolius viridiflavus	Common Reed Frog	LC	DD	6

Limitations: It should be noted that the numbers found do not translate into estimated population density, which could be done through a capture/recapture methodology or to compare it to densities in other locations.

Under the National Red List, Data deficient describes species for which sufficient data is not available to allow it to be assessed (but are highly likely to be threatened). Least Concern for species widespread and whose numbers are not declining significantly or lastly not applicable where the species is considered never to have occurred in Uganda (misidentification, change of nomenclature for the species, or a vagrant). (Source: National Red List for Uganda for the following Taxa: Mammals, Birds,

Reptiles, Amphibians, Butterflies, Dragonflies and Vascular Plants, Wildlife Conservation Society, January 2016 OR [https://www.google.com/search?q=Uganda+Fisheries+red+list)](https://www.google.com/search?q=Uganda+Fisheries+red+list)

vi. Reptiles

Hyperolius cinnamomeoventris was the most abundant specie with twenty-eight individuals recorded. This was followed by Ptychadena mascareniensis and Amieta angolensis with nineteen and seventeen individuals recorded respectively. Phrynobatrachus natalensis was the least abundant with only two individuals encountered. Ptychadena anchietae was second least abundant with only four individuals recorded. Only one individual of the reptile (Striped Skink Trachylepis striata) was recorded in the stretch belonging to the group of Skinks.

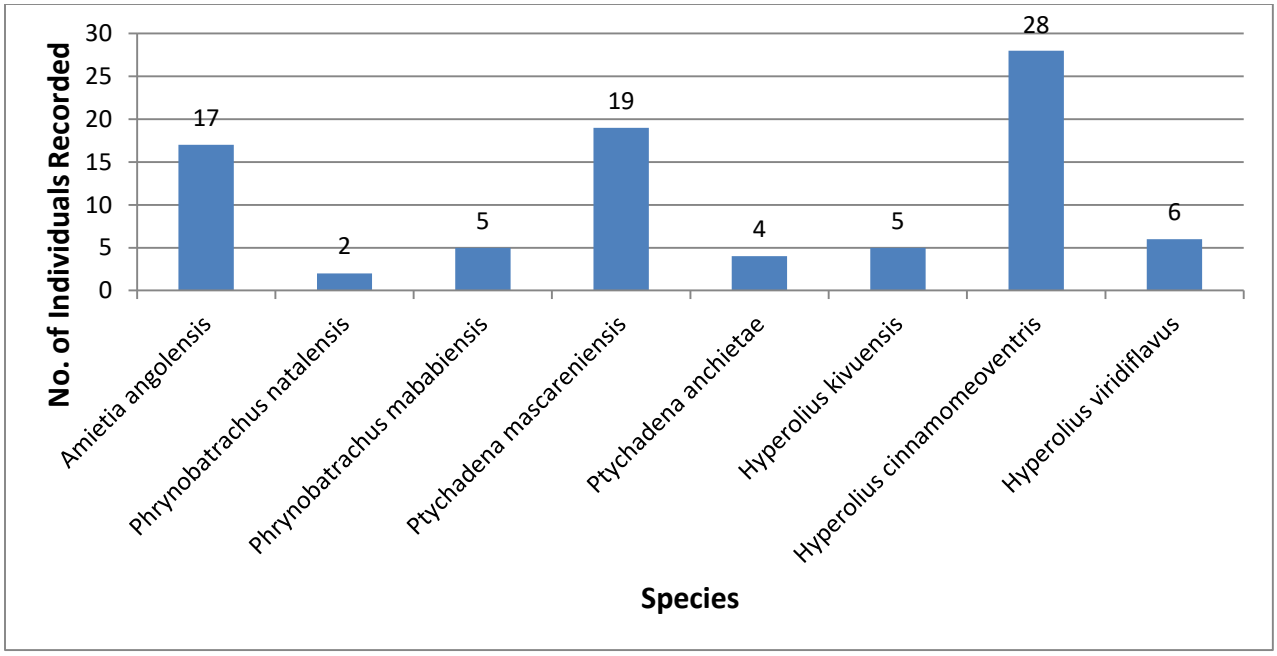


Figure 93: *Abundance of reptile species encountered.*

Conservation status of identified species: Based on the IUCN 2014 Red List none of the species recorded is of conservation concern, all are listed as of Least Concern. Three of the amphibian species however, are listed as Data Deficient according to the National Red List for Uganda 2016. The three species include Common Reed Frog Hyperolius viridiflavus, Mascarene Rocket Frog Ptychadena mascareniensis, and Angola River Frog Amietia angolensis. Striped skink Trachylepis striata is listed as being Least Concern by the IUCN Red List 2014.

Estimate of the water demand of the identified biota: The Amphibian species require moisture for survival so as not to desiccate due to hot weather. Water is required during breeding periods. Two of the species encountered are not water species (still require water for spawning and normal life functions) and can be encountered away from water sources. The two (Mascarene Rocket Frog Ptychadena mascareniensis and Anchieta's Rocket Frog Ptychadena anchietae) can utilize ephemeral water pools for breeding that form during rainy

seasons, while the rest of the species require water sources. IUCN lists their habitat type as: Forest, Wetlands (inland), Grassland, Shrubland, Savanna, Artificial/Aquatic & Marine, Artificial/Terrestrial. Individuals of the different species are capable of moving the distance downstream to find water. It should be noted that although individuals can move around, this does not mean the project would not be leading to loss/reduction of habitat and probably reduction in populations, e.g. territorial animals cannot move into areas already occupied by other individuals of their species.

vii. Fish

Methods of fish data collection: Due to the fact that this area is covered with patches of papyrus vegetation, and therefore no big expanses of open water, fishing was mainly done by use of baited fish traps, plus scooping using basins. When the fish catches of the only fisher group which was got there was observed, the fish species they had were similar to our experimental catches and mainly comprised of the small sized fish species that is Clarias casonii, Barbus apleurogramma and Barbus jacksonii. When these fishermen were interviewed, they reported that there are some fish species which they catch sometimes but were not among the catches for that time. Such species include *Oreochromis leucostictus* (IUCN lists as least concern) and some Haplochrimine species (primary habitat in Lake Victoria). Based on field survey and interviews with fishermen, fishing activities exist in the area although very limited.

Fishing was carried out at four selected sites within the one kilometer stretch from the dam axis to River Kasharira, plus one point downstream. The experimental catch comprised of mainly 3 fish species belonging to two families; Cyprinidae and Clariidae.

Table 79: The coordinates and description of sampled points, species composition, numbers and conservation status according to IUCN red list

Data point	Coordinates	comments	Fish Family	Fish species	numbers	The IUCN Red list 2017-1
Pt1	36M 0232601 9899879	Area with papyrus vegetation	Clariidae	*Clarias casonii*	12	Benthonic Cat fish sp. not covered/identified in the IUCN Red list. This species is also not reported in the GBIS. It is also possible that this fish species name was either wrongly reported/identified/ changed – However, it is a common Cat Fish species found in most of the lakes and rivers in

						Uganda and air breathing
			Cyprinidae	*Barbus apleurogramma*	7	Least Concern
Pt 2	36M 0232623 9899808	Area patches of papyrus vegetation	Clariidae	*Clarias casonii*	15	Least Concern
			Cyprinidae	*Barbus apleurogramma*	49	Least Concern
			Cyprinidae	*Barbus jacksonii*	1	Also known as Enteromius Jaksoni is found in IUCN Red list – categorized as of Least Concern – Plz refer to the link below and others at the bottom of this table.
Pt 3	36M 0232720 9899691	Area Covered by papyrus	Clariidae	*Clarias casonii*	1	See description above.
			Cyprinidae	*Barbus apleurogramma*	4	Least Concern
Pt 4	36M 0232874 9899579	Open water	Cyprinidae	*Enteromius jacksoni*	20	Least Concern Please see description above

Limitations: It should be noted that the numbers found do not translate into estimated population density, which could be done through a capture/recapture methodology or to compare it to densities in other locations.

(1). Link to confirm Barbus jacksonii as IUCN Red List species: https://www.iucnredlist.org/species/61311/126424450

(2). Search Links for Clarias casonii

https://www.fishbase.se/identification/SpeciesList.php?class=Actinopterygii&order=Siluriformes&famcode=139&subfamily=&genus=Clarias&areacode=1&c_code=800&depth=&spines=&fins=&TL=&BD=&resultPage=1&sortby=species

https://www.fishbase.se/identification/SpeciesList.php?class=Actinopterygii&order=Siluriformes&famcode=139&subfamily=&genus=Clarias&areacode=1&depth=&spines=&fins=&TL=&BD=&resultPage=1&sortby=species

https://www.fishbase.se/identification/SpeciesList.php?class=Actinopterygii&order=Siluriformes&famcode=139&subfamily=&genus=Clarias&areacode=1&depth=&spines=&fins=&TL=&BD=&resultPage=1&sortby=species

Catfish (Clarias)

More than 100 different species of the Genus Clarias were first described in Africa. However, following a systematic revision based on morphological, anatomical and biographical studies was conducted by Teugels (1982), this was reduced to recognizing 32 valid species. All the large African Catfish species now belong to the subgenus Clarias. Clarias species are the amongst the commonest

fish species in rivers, lagoons and estuaries. IUCN lists Clarias species as 'least concern' (or has not been assessed) in the Lake Victoria basin.

East African Red Finned Barb (Enteromius apleurogramma)

The East African Red Finned Barb is known to inhabit temporary and permanent streams, as well as in marginal water-lily swamps (Greenwood 1962), pools near papyrus vegetation (Okedi 1971), in smaller bodies of water or near the margins of rivers between the vegetation (Seegers 1996) and in fast-flowing water. It feeds on insect larvae (Greenwood 1966), but also aquatic vegetation, molluscs and fishes are taken (Welcomme 1969). Spawning occurs in temporary streams when they are flooded during the rainy season (Greenwood 1962). Seegers (1996) reports spawning activities all year round with a maximum at the beginning of the rainy season. The maximum size is 5.4 cm Standard Length (SL) (De Vos and Thys van den Audenaerde 1990).

Jacksons Barb (Enteromius jacksoni)

The Jacksons Barb is found in lakes and in streams, both permanent and temporary (Greenwood 1966). It feeds on insect larvae and bottom debris (Greenwood 1966). Upstream spawning migrations have been reported for individuals in the Lake Rukwa drainage (Seegers 1996). The maximum size is 11.6 cm SL (Greenwood 1962).

Conservation status of identified species: The International Union for Conservation of Nature (IUCN) holds a worldwide-recognized database of species with special status called the IUCN Red List. Searches on IUCN Red List were carried out in September 2019 to identify potential fish species with special status. Search results indicated that the fish species present in the basin are common in the Lake Victoria basin. The IUCN red list rates all the encountered fish species as least conservation concern.

Estimate of the water demand of the identified fish: The encountered fish species are accustomed to temporary streams and require a seasonal variation in flow for spawning activities.

viii. Other aquatic species

Phytoplankton data collection: Water samples for phytoplankton species identification were collected using a water sampler. Twenty (20) ml samples were separated and preserved using Lugol's solution in brown glass bottles for further analysis in the laboratory (Not yet analyzed in the laboratory)

Zooplankton data collection: Water samples were collected using a water sampler and were immediately filtered using cellulose acetate membrane filters (pore size 0.45µm) and preserved in labeled sample bottles with ethanol (50 %). (Not yet analyzed in the laboratory)

Macro-invertebrate (benthic) fauna data collection: The Ekman-Birge-grab 15x15x15cm was used to get samples for the benthic fauna. The samples were sieved using benthic net of 0.5 mm mesh in order to remove fine sediments and other extraneous materials and were preserved in 50 % ethanol for later analysis in the laboratory. (Not yet analyzed in the laboratory)

Downstream ecological and other water demand

The main water demand downstream of the dam is irrigation, domestic, livestock, ecological and other uses. The project has been designed for supply of water for irrigation for the sub county of Kabuyanda as discussed in section on water demand above. The main concern for the environmental flow remains the ecological aspect especially the 1km section downstream of the dam where reduced flow is expected after the dam construction.

Recommendation of Environmental Flows

A critical element in the determination of the environmental flow in the case of the Kabuyanda dam is the minimum flow. As reported in the low flow assessment, the river dried up over at least 10 years out of the 46 years for which runoff was modelled. The years with no zero flows, the amounts varied between 0.003m3/s and 0.255m3/s with a mean of 0.079m3/s. With the construction of the dam, the dry-season low-flows are expected to increase, while the seasonal variability is expected to reduce. As the river will no longer register zero flow, downstream conditions will improve for some plant species, as well as for the small community relying on the river for domestic uses.

However, the ecological habitat is not only dependent on the minimum discharge. Though a minimum discharge is required, it is not sufficient for establishing a sustainable aquatic environment downstream the dam. Species are accustomed to the apparent hydrological variability in the area and the lifecycle triggers and behaviors are often tied to the seasonal flows (high-low). Floods trigger migration while also moving sediments and contributing to the ecosystems of the littoral zones. For some animals, with the construction of the dam, hydraulic and thermal conditions can become mismatched with life-cycle requirements, thus the need to ensure that operating rules of the dam allow for sufficient variability in flow to avoid decrease in numbers and abundance of some species. A natural flood event will be allowed to pass the dam, mitigating the impact of the dam on the hydrological variability. The natural flood hydrographs carry a significant amount of sediments, allowing for the replenishment of the downstream environment and floodplains with the sediments and nutrient.

Using a low-resolution hydrological methodology, the environmental flow was initially determined as 10% and 20% of Average Annual Flow (AAF) in the dry and wet seasons, respectively. The environmental flow during the dry season is 0.05m3/s and during the rainy season is 0.1 m3/s (Table 80). It is indicated that the proposed environmental flow requirement is adequate to satisfy the fish species that are accustomed to temporary streams and reduced water volumes in the area. The flow is also adequate for the amphibian species which require moisture for survival so as not to desiccate due to hot weather and those that require water can get it from the environmental flow and move either up or downstream if necessary.

The flows from the tributaries contribute significantly to satisfy the downstream water demands. One km downstream, Rweibara River contributes about 18% of the 0.61 m3/s Average Annual Flow (AAF) of Mishumba River at the confluence and 5 km downstream the combined flow of Rweibara and Rwanago Rivers is about 56% of the total flow at the confluence. The recommended 10% EFR for the dry season and 20% (Tennant method) for the rainy season of the AAF (0.5m3/s) will increase these flows to 26% and 65% respectively. Given the biota and water demand in this section as described above, these flows are expected to be adequate.

The applied methodology is applicable for degraded habitats. Following the initial proposal for an environmental flow requirement, rapid surveys were conducted of the aquatic and riparian

environment immediately downstream the project dam site. Although there were signs of degradation of the downstream environment, the complexity of the seasonality in river flow and the habitat health are not fully known. It is recognized that additional assessment of the environmental flow using more comprehensive methodology and continuous monitoring will be needed prior to dam construction to confirm the adequacy of the mitigation measure. If needed, appropriate adjustments to dam design and/or operation will be introduced prior to dam construction in a manner satisfactory to the World Bank.

Table 80: *Monthly distribution of environmental flows*

Month	Inflow (m3/s)		Q_{eco} (m3/s)
January	0.32	10% of AAF (0.50 m3/s)	0.05
February	0.31	10% of AAF (0.50 m3/s)	0.05
March	0.51	10% of AAF (0.50 m3/s)	0.05
April	0.88	20% of AAF (0.50 m3/s)	0.10
May	0.55	20% of AAF (0.50 m3/s)	0.10
June	0.23	10% of AAF (0.50 m3/s)	0.05
July	0.09	10% of AAF (0.50 m3/s)	0.05
August	0.18	10% of AAF (0.50 m3/s)	0.05
September	0.55	10% of AAF (0.50 m3/s)	0.05
October	0.75	20% of AAF (0.50 m3/s)	0.10
November	0.89	20% of AAF (0.50 m3/s)	0.10
December	0.68	20% of AAF (0.50 m3/s)	0.10

9.1.1.1 *Monitoring*

Since the Ministry of Water and Environment (MWE) is mandated to monitor the quality and flow of rivers in Uganda, the Ministry should be responsible for monitoring and ensuring the environmental flow. The district water officer and the regional management zone staff should take this responsibility. For monitoring purposes, the downstream flow and quality should be measured at a number of points:

- immediately after the dam;
- at the pour points of all major drains from the irrigated area;
- the final out flow from the irrigated area.

Monitoring of the water flow and quality should be carried out on a continuous basis. Additional measurements should be done at the beginning and middle of the two rainy seasons or the beginning and middle of the cropping seasons when we expect minimum and maximum use of agricultural chemicals and soil erosion. The water quality monitoring during the dry season is critical to ensure adequate management.

WATER DEMANDS AND RESERVOIR ROUTING

Introduction

The water demands to be satisfied by the project are classified into the following users:

(a) water demand for irrigation of 3,300 ha;
(b) ecological flow.

Reservoir routing was used to compare available water resource and potential demands in order to identify the main reservoir operating levels and their variations. The available water resources were used (in the form of mean monthly flow into the reservoir), together with future irrigation demands as an input for the reservoir regulation simulations aimed at estimating the reservoir operation for the water resource allocation. The aim of carrying out the reservoir operation simulation was to provide a level of assurance and service guarantee that water demand for irrigation and ecological release will be met based on the modelled river runoff at the site. The following aspects were considered

- Application of the continuity equation on a step-by-step monthly basis, while regulating reservoir storage. Reservoir storage is computed according to the difference between inflows and outflows and the reservoir area-volume curves;
- Simulations carried out using monthly time steps for a period of 46 years;
- Monitoring of different reservoir parameters (inflows, outflows, evaporation losses, reservoir water level and volume).

Satisfaction of environmental flow and irrigation demand were considered in assessing the required reservoir volume. Environmental flow assessment was presented in the previous section. The monthly distribution of water abstracted from the reservoir and released downstream for irrigation purposes is shown below.

Table 81: Monthly distribution of water demand for irrigation

DAM ALT. #1	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Q [m³/s]	*0.86*	*0.60*	*0.24*	*0.03*	*0.08*	*0.45*	*0.92*	*1.03*	*0.19*	*0.16*	*0.08*	*0.27*	***0.41***
V [Mm³]	*2.30*	*1.44*	*0.64*	*0.09*	*0.21*	*1.18*	*2.46*	*2.76*	*0.50*	*0.43*	*0.20*	*0.71*	***12.9***

RESERVOIR ROUTING

Reservoir volume curve

This was derived from DTM obtained from processing survey and satellite images as

$$V(z) = \left(\frac{z - 1346.8}{11.2} \right)^{1/0.38}$$, and

$$z(A) = 44.3 * A^{0.37} + 1329.4$$

Where:

Z (m a.s.l) = elevation of the reservoir
V (Mm³) = reservoir volume
A (Mm³) = reservoir area

The resulting reservoir area-volume curve is shown in figure below

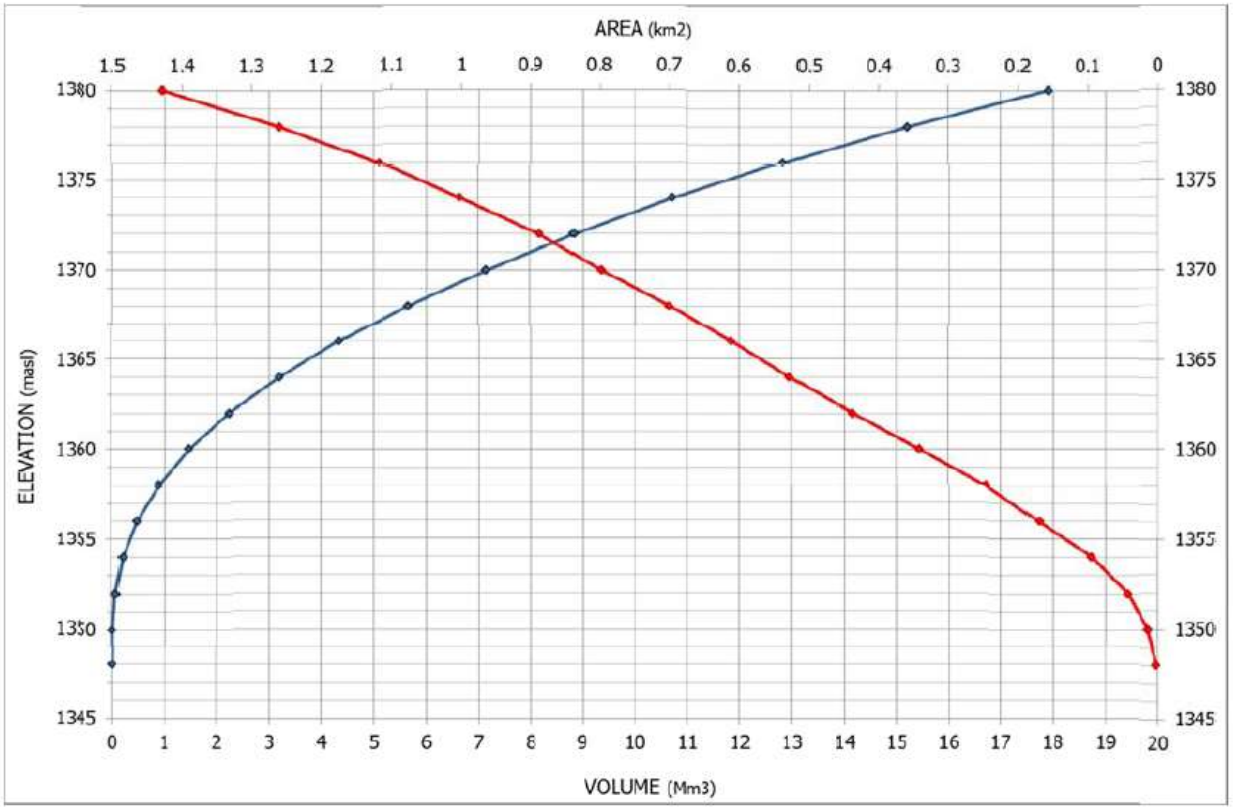


Figure 94: Reservoir area-volume curves

Reservoir routing model

The reservoir operation modelling and water release studies were based on the following parameters

i) INFLOWS: data series evaluated from the HEC-HMS hydrological model records Chapter 2;
ii) OUTFLOWS: being the sum of water demand for irrigation and ecological flow (Chapter 0);
iii) RESERVOIR MODEL: modelling of the relationship between elevation and storage capacity.

The evaporation was estimated on the basis of data included in the previous study "Detailed Identification of Studies for Potential Large Dams in the Kagera Basin", Ntale, 2012 as detailed in table below. In the model, the monthly evaporation was converted into monthly volumes by accounting for the reservoir surface area calculated for each month on the basis of the reservoir balance.

Table 82: Evaporation losses in mm (Ntale, 2012)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Ev. [mm]	103	100	113	90	84	94	104	109	108	113	97	104

Reservoir *operating* rules

The characteristic elevations of the reservoir are listed in the following table:

Table 83: Reservoir levels

Description	Level (m)	Storage (MCM)

Minimum Operating Level (MDDL)	+ 1347.00	1.512
Maximum Operating Level (FRL)	+ 1359.00	8.801
Flood Level @ 10,000 yrs	+ 1359.80	9.53
Extreme Flood Level @ PMF	+ 1361.25	10.945

Table 84: Ecological releases levels

S.No	Month	Inflow (cumecs)	Criteria	Ecological Release	
				Cumecs	MCM
1	Jan	0.32	10 % of AAF (0.50 cumecs)	0.05	0.13
2	Feb	0.31	10 % of AAF (0.50 cumecs)	0.05	0.12
3	Mar	0.51	10 % of AAF (0.50 cumecs)	0.05	0.13
4	Apr	0.88	20 % of AAF (0.50 cumecs)	0.10	0.26
5	May	0.55	20 % of AAF (0.50 cumecs)	0.10	0.27
6	Jun	0.23	10 % of AAF (0.50 cumecs)	0.05	0.13
7	Jul	0.09	10 % of AAF (0.50 cumecs)	0.05	0.13
8	Aug	0.18	10 % of AAF (0.50 cumecs)	0.05	0.13
9	Sep	0.55	10 % of AAF (0.50 cumecs)	0.05	0.13
10	Oct	0.75	20 % of AAF (0.50 cumecs)	0.10	0.27
11	Nov	0.89	20 % of AAF (0.50 cumecs)	0.10	0.26
12	Dec	0.68	20 % of AAF (0.50 cumecs)	0.10	0.27
				Total	2.24

The following simulation strategy was adopted

a) In all simulations the required ecological flow has been released, except in case of a natural inflow less than the required ecological flow. In this case, coincident with a low flow period, a release equal to the occurring inflow has been assured downstream the dam.
b) For each monthly time-step, 100% of the water demand for irrigation has been assured if available in the reservoir. If the available volume into the reservoir was less than the required one, all the available volume has been released for irrigation purposes.

Table 85: reservoir operating rules

RESERVOIR OPERATING RULES

ECOLOGICAL FLOW Q_{eco} = 100% Q_{eco}, required ; if Q_{in} > Q_{eco}, required Q_{eco} = 100% Q_{eco}, required ; if Q_{in} < Q_{eco}, required & $V_{reservoir}$ available Q_{eco} = Q_{in} ; if Q_{in} < Q_{eco}, required & $V_{resvoir}$ not available Qeco = Qin , required; if Qin = Qflood (at least once per year)	The ecological release is always released as per requirements, except when the natural inflow is less than the requirement and no storage in reservoir. In this case the occurring natural inflow is released. The ecological release shall include allowing a natural flood to pass the dam. The event shall coincide with a natural flood event during the wet season.
WATER DEMAND FOR IRRIGATION Q_{irr} = 100% Q_{irr}, required ; if $V_{reservoir}$ > Q_{irr}, required & Q_{eco}, required Q_{irr} = $V_{reservoir}$ - Q_{eco}, required ; if $V_{reservoir}$ < Q_{irr}, required	The water demand for irrigation is released entirely when the reservoir storage is more than the irrigation and ecological flow required. In case the storage is less than the irrigation and ecological flow required, part of the irrigation requirement will be released among releasing ecological flow required on priority.

Reservoir routing results

Table shows the results of the reservoir routing simulations. The reservoir volume is able to guarantee the irrigation water demand with a service guarantee of about the 96% of the time in both scenarios.

Table 86: Reservoir routing results

Inflow	16.2	MCM
Irrigation Demand	12.82	MCM
Irrigation Release	11.6	MCM
% Guarantee for Irrigation	90.5	%
Ecological Flows	2.24	MCM
Ecological Release	2.2	MCM
% Guarantee for Ecological Flows	98.2	%
Spill	1.55	MCM

WATER RESOURCES RISKS, IMPACTS AND MITIGATION MEASURES

General

The hydrology of Mishumba River will change significantly. A large proportion of the mean flow will be stored in the reservoir and diverted for meeting the various project uses. Retention of water during the wet season (including flood flows) and abstraction of the water of the same for supply to the beneficiary areas implies none-availability of the equivalent flow for social and ecological requirements downstream the river. However,

the dam can be used to moderate low flows downstream for supporting socioeconomic and ecological functions during the extended dry periods that are a common occurrence in the area.

Water Resources Risks

The likely risks faced by stakeholders in the project were assessed by New Plan for impact effect (using temporal, spatial and severity indices), likelihood of occurrence and overall impact. The water resources risks are summarised in the table below together with impact scores and commentary on the risks.

Table 87: Water resources risks

Risk	Details
Risk of inaccurate analysis due to incorrect data being used for assessment of available water resources	River Mishumba is ungauged. The estimation of water resources was based on hydrological modelling using parameters of a sub catchment of Rwizi River. A gauging station was set up as part of the project but it contains limited records of less than 3 years. This uncertainty on the actual river flow regime has potential significant negative impact on the viability of the project
Insufficient seasonal river flows, especially in the dry months of June-August and January-February	Analysis of rainfall patterns demonstrates that the period from June-August receives very little rainfall in the catchment, implying low water yield. January-February receives some rainfall but below monthly averages. These are also the months with the highest water demands, especially for irrigation
Deterioration in surface and ground water quality	This risk occurs due to a combination of hydrogeological factors affecting the groundwater quality, and catchment activities adversely influencing the surface water quality. Long-term risk faced by all users due to limited water resource alternatives. Some streams within the irrigation command area have hard water which is likely to be exacerbated drainage of irrigation water
Limited alternatives for water supply	Groundwater would normally be considered to provide an alternative to the river. Some streams within the irrigation command area have hard water which cannot be used for domestic use.
Lack of supply due to competing and changing water needs.	Current water needs are for domestic and livestock water use. The development of the project will impose additional irrigation water needs. In addition, it can be expected that once irrigation is developed, the socioeconomic changes might result in development of industries that might also impose additional water needs.
Lack of sufficient environmentalassessment of components of the project	While EIA guidelines exist (Environmental Guidelines for Water Resources Projects (2011)), they are sometimes not enforced and they exclude manyof the smaller types of projects that are likely to be implemented in the project area. Therefore, monitoring of environmental state of the area pre- and post project implementation may be a challenge
Population growth	There are significant demands on the catchment resources and these will grow when the project is implemented. Migration of farmers to the area because of available water for irrigation will put additional strain on resources.
Industrial growth	The potential for industrial growth in the area is not high but, should it happen, then issues of pollution could be significant. Of considerable concern is the risk that excessive pollution in R. Mishumba might become a major problem in R. Kagera, an international river. However, this risk is considered low owing to the low contribution of R. Mishumba runoff to Kagera mean flow
Projected impacts of climate change	Increased temperatures are likely to lead to greater water demand, while increased rainfall could potentially increase total runoff (flow). However changes in water resources variability and increased frequency of extremes (floods and

Risk	Details
	drought) can cause major planning challenges and limit the potential benefits of the project
Flooding	Heavy and intense rainfall on bare slopes, draining of wetlands (buffer zones) and soil erosion/ sedimentation all increase the risk of floods. Vegetation is lost through clearing for farming, bush burning and charcoal burning and other poor agricultural practices. However, floods in the catchment are less common than droughts, although this may change in the future.
Landslides and slope failures	The reservoir water level variations will result in cycles of wetting/drying of hill slopes with a risk of landslides and slope failures

Positive project impacts

The project will impound up to 8.8 Million m3 to supply water for irrigation of 3,300 ha. The areas that will benefit from the project including Kabuyanda and Kikagate are part of the dry belt, known as the cattle corridor, that can experience more than 4 months of little or no rain in a year. The project will improve water availability through the created storage, food security through increased agricultural production. More reliable water supply will spur agricultural activities in the area leading to increases in income and overall livelihood development of the area. The project will also reduce the vulnerability of area communities to climate variability and change.

An indirect benefit of the project will be control of flooding that happens during the rainy season. The rivers and streams generally flow from the hills of Rukoni, Mwizi and Nyakitunda to the flat low lands of Kabuyanda and Kikagate where most economic activities occur. Seasonal flooding results in water stagnation, crop loss and other impacts on livelihoods of communities. Being the largest river in the area, damming of Mishimba River will result in significant flood mitigation and reduction of associated losses.

Appendix 10: Stakeholder engagement plan

Structure of this Stakeholder Engagement Plan

This Stakeholder Engagement Plan (SEP) is organized as follows:

- Chapter 1: Introduction
- Chapter 2: Stakeholder Engagement
- Chapter 3: Methodology for Stakeholder Engagement

STAKEHOLDER ENGAGEMENT PLAN (SEP)

Introduction

Stakeholders are defined in this plan as people, groups or communities that may be directly or indirectly affected by the Project or have an interest in it. These will comprise of locally affected communities or individuals and their formal and informal representatives, national or local government authorities, political leaders, religious leaders, civil society organizations and groups with special interests, etc.

Stakeholder engagement is regarded as an ongoing process throughout the different phases of a project. Priority will be given to stakeholders who are directly affected by Project activities but will not exclude those that fall within a broader sphere of influence, or whose legitimate interests define them as stakeholders. This Stakeholder Engagement Plan (SEP) will assist NELSAP and the implementing agency with managing and facilitating future engagement through the various stages of the Project's life cycle from the planning phase through to construction operation, and maintenance.

General Objectives of SEP

The goal of this SEP is to improve and facilitate decision making and create an atmosphere of understanding that actively involves Project Affected Persons and other stakeholders in a timely manner, and that these groups are provided sufficient opportunity to voice their opinions and concerns that may influence Project decisions. The Stakeholder Engagement Plan (SEP) is a useful tool for managing communication between NELSAP and its stakeholders.

Specific Objectives of the SEP

a. To provide guidance for stakeholder engagement such that it meets the standards of International Best Practice;
b. To identify key stakeholders that are affected, and/or able to influence the Project and its activities;
c. To identify the most effective methods and structures through which to disseminate project information, and to ensure regular, accessible, transparent and appropriate consultation;
d. To guide NELSAP and the implementing agency to build mutually respectful, beneficial and lasting relationships with stakeholders;
e. To develop a stakeholders engagement process that provides stakeholders with an opportunity to influence project activities;
f. To define roles and responsibilities for the implementation of the SEP;
g. To define reporting and monitoring measures to ensure the effectiveness of the SEP and periodical reviews of the SEP based on findings.
h. To build and maintain transparent trust from the stakeholders.

Stakeholder Engagement Considerations

The following considerations should be made when planning for stakeholder engagement:

i. **It takes time and resources:** It takes time and resources to develop and build trust based relationships with stakeholders. From the outset, relationships with stakeholders should develop and grow, and these relationships should be nurtured and fostered not to fade. Additional stakeholders might be identified during the course of implementing project activities that will also need to be engaged. No willing stakeholder should be excluded from the process of engagement.

ii. **It raises expectations:** Stakeholders can have unrealistically high expectations of benefits that may accrue to them from a project. As such, project proponents from the outset must be clear on what they can and cannot do, establishing a clear understanding of their roles and responsibilities.
iii. **Securing stakeholder participation:** Cultural norms and values can prevent stakeholders from freely participating in meetings. Often there are conflicting demands within a community, and it can be challenging for a project to identify stakeholders who are representative of common interests. This can be avoided by working closely with the local people and leaders who are knowledgeable and sensitive to local power dynamics.
iv. **Consultation fatigue:** There is evidence to suggest that stakeholders can easily tire of consultation processes especially when promises are unfulfilled, and their opinions and concerns are not taken into consideration. Often stakeholders feel their lives are not improving as a result of a project and this can lead to consultation meetings being used as an area to voice complaints and grievances about the lack of development. This might be avoided by ensuring that the stakeholder engagement teams do not make promises to stakeholders, but rather use the public consultation process as an opportunity to manage expectations, clear misconceptions, disseminate accurate project information, and gather stakeholder opinions which are feedback to the client and other project stakeholders.

Project Activities during the Different Phases

Below are the different activities through which the different stakeholders will be involved during the planning, implementation and monitoring of project activities.

Preparation Phase

- Prefeasibility and Feasibility studies
- Environmental and Social Impact Assessment, Resettlement Policy Framework / Preliminary RAP.
- Preparation of detailed Resettlement Action Plans

Implementation of the RAP and Construction Phases

- Disclosure of compensation packages.
- Signing of compensation agreements.
- Compensation payments.
- Grievance resolution.
- Issue notice to affected persons to vacate premises and/or agricultural lands.
- Relocation of affected communities to replacement sites (if any).
- Finalizing sign-off on property transfer documentation.
- Initiation of development and livelihood restoration projects.
- Monitoring the ability of affected communities and vulnerable groups in particular to adapt to displacement.
- Monitoring performance of implementation of RAP, community development and livelihood restoration projects.
- Clearing of the construction sites.
- Construction of the irrigation, water supply, dam, and other associated infrastructure.
- Implementation of Environmental, Social, Health and Safety mitigation measures.

Operation and Maintenance Phase

- Ongoing consultation with and monitoring of affected households post displacement.
- Monitoring of project infrastructure operation and safety.

Stakeholder Identification, Roles and Responsibilities

Stakeholder identification is based on issues related to the project scope of works, relevance and influence of the stakeholders and administrative and traditional setting of the project area among others.

METHODOLOGY FOR STAKEHOLDER ENGAGEMENT

Methods

Different methods will be used to engage the different levels of stakeholders as described below. The method of engagement will be based on factors such as convenience, availability etc.

- Official Meetings and Workshops
- Community meetings
- Focus Group Discussions
- Key Informant Interviews
- Sensitization brochures
- Use of the local media
- Print media where found necessary and practical
- Through Grievance Resolution Committees
- Notices in appropriate areas at districts, sub counties and villages

a) Official Meetings and Workshops: Official meetings will be held with the different categories of stakeholders at a higher level as deemed necessary during the different phases of the project. These meetings are targeted for the national stakeholders, local government officials, institutions and civil society etc. Appointments will be made with stakeholders and an appropriate date and venue for the meetings confirmed. The implementing agency will also prepare some workshops for the stakeholders if deemed necessary during the different phases of the project to solicit comments, advice and feedback on the project progress and documents.

b) Community meetings: Community meetings will be held with both directly and indirectly affected communities during the planning and implementation phases. Mobilisation of the participants, selection of meeting venues and confirmation of appropriate times for the meetings will be made with the help of local authorities.

c) Focus Group Discussions: Group discussions will be held with different stakeholders at different levels. Focus groups are group discussions involving 6 to 10 persons, led by a facilitator. Group members speak freely and spontaneously about issues introduced by the facilitator. Focus groups trigger further discussions on specific topics and provide the opportunity for participants to interact and discuss issues in depth. Focus group discussions are particularly important as some issues not discussed during large meetings may be raised. Furthermore, these groups offer the opportunity to those less keen to speak in public to voice their concerns.

d) Key Informant's Interviews: These will include semi-structured questions to explore specific categories of information. The Key informant interviews will mainly be intended for people with specialized knowledge at the different levels.

All issues raised in meetings will be recorded, photographs will be taken and attendance lists will be filled by the participants.

e) Sensitization Brochures: Sensitization brochures are another means of stakeholder engagement. These will be prepared and disseminated to different stakeholder groups.

f) Local media: The local media such as local radio stations will be used as much as possible to disseminate information to the communities.

g) Print media: The print media will only be used as and when found necessary.

h) Grievance Resolution Committees: During the different phases of the project especially implementation, grievances are expected to arise from affected communities. The aggrieved communities or persons will be engaged through grievance resolution committees set up for the project.

i) Notices in appropriate areas: Notices about project events and activities will be put up in appropriate areas at the district, Sub County and villages as advised by the local leaders.

Engagement with Vulnerable Groups

The Project will further consult vulnerable or marginalized groups such as women, child heads of families, the chronically ill, the landless and the disabled and any other that will be identified during the course of the project. Local leaders will advise on the appropriate times and venues for

engagements with vulnerable groups. The decision whether to hold separate meetings for women and other vulnerable groups will be based on the sensitiveness of the issues to be discussed, social setup of the villages and the distances involved.

Appendix 11: Inventory and Economic Assessment of the 302 ha in Rwoho CFR initially identified as to be inundated

Background

Under the Irrigation for Climate Resilience Projects, the Kabuyanda dam will inundate part of the Rwoho CFR. The activities relating to construction of the dam were initially estimated to cover an area of 302.47 ha of the Rwoho CFR. In part of this area (51.5 ha), the National Forestry Authority (22.77ha), as well as the forest adjacent community under Collaborative Forest Management (CFM) (28.28ha), have established plantations under Climate Development Mechanism (CDM), as a strategy to mitigate against extremes of weather and climate but also to benefit from the CDM financing mechanisms aimed at sustaining the developments and for resilience to climate. Other members from adjacent communities have also established commercial plantations of trees under licence from NFA. It was against this background that in December 2008 the Ministry of Water and Environment (MWE) requested NFA to undertake an inventory of the trees within the dam embankment site and reservoir located within the Rwoho CFR. **To be noted that, in the first half of 2019, the optimization of the project design allowed to substantially reduce the inundated area to 100 ha only, limiting the inpact to 15.1 ha of the CDM project.**

Objective

Objective was to assess the impact of the irrigation scheme on the part of Rwoho CFR to be inundated by the proposed dam and generate economic value for this impact.

The specific tasks were:

1. To delineate and demarcate the area of CFR to be affected by the dam (302.468 ha.)
2. To establish sample plots equal to 1% of the impact area (200 plots of area 0.02 ha)
3. To enumerate and quantify all the trees in the 200 plots.
4. To quantify natural trees, poles/saplings in the wetland that will be submerged by dam water.
5. To determine the standing volume of trees and take census of seedling, saplings and poles.
6. Take stock of the forest resources including volume of trees and number poles/sapling.
7. To determine the ecological and economic values of the impact of the development.

Materials and Methods

I. Demarcation of dam area

The map of area was produced using GIS software, exported as a PDF format, and uploaded into Avenza map installed in the tablets. The outline of the dam area was traced using the Avenza map and was marked by red paint.

II. Sampling, demarcation and enumeration of sample plots

Systematic sampling was done along transects on either side of the wetland. Sample plots were established and demarcated along transects at an interval of 100m. The area of sample plot was 200m^2, with radius of 8m. All the trees in the plots were enumerated and the data booked using field forms.

Assessment of the amount of carbon sequestered by CDM Project

Generic equation with in-built formulae have been used to assess the amount of carbon sequestered. The equations described shall only serve to compute from the derivatives provided in the report and shall ignore the derivation of the said formulae. The derivation used can however be viewed by highlighting the table in its top –left (of the soft or digital copy as one is directly facing the computer), and placing the cursor on the individual valued in table below.

Table 88: Generic values used to Compute Carbon Stock in Forest Plantations (IPCC GPG, 2006)

Tree Species	BEF	WD	RSR	dm-C	tCO2e
Eucalyptus	3.4	0.75	0.2	0.5	3.67
Pines	1.32	0.51	0.23	0.5	3.67
Broadleaved Species (Musizi)	3.4	0.41	0.27	0.5	3.67

Table 89: Biomass Conversion Generic Values by Land Use/Cover (IPCC GPG, 2006)

Land Use/Cover	Shoot-Root Ratio	Dry matter to Carbon	Carbon to tCO2e
Cropland/woody perennials	0.42	0.5	3.67

Equation: Estimation of Above Ground Biomass (Baseline)……1

$$B_{A(t)} = M_{(t)} * 0.5$$

Where:

$B_{A(t)i}$ = Carbon Stocks in above ground biomass at time *t* in the absence of the project activity (t C/ha)

$M_{(t)}$ = above ground biomass at time *t* that would have occurred in the absence of the project activity (t dm/ha) [1]

0.5 = carbon fraction of dry matter (t C/t dm)

Equation: Estimation of Below Ground Biomass (Baseline)……2

$$B_{B(t)} = 0.5 * (M_{(grass)} * R_{grass} + M_{woody} + R_{woody})$$

Where:

$B_{B(t)}$ = Carbon Stocks in below ground biomass at time *t* that would have occurred in the absence of the project activity (t dm/ha)

M_{grass} = Above ground biomass in grass on grassland at time *t* that would have occurred in the absence of the project activity (t dm/ha)

$M_{woody\,(t)}$ = Above ground biomass at time *t* that would have occurred in the absence of the project activity (t dm/ha)

R_{woody} = Root to shoot ration of woody perennials (t dm/t dm)

R_{grass} = Root to shoot ration of grassland (t dm/t dm)

Equation: Estimation of above and below ground Biomass in Forest Plantations……3

$$C_{AB,ijt} = A_{ijt} * V_{ijt} * D_j * BEF_{2,j}$$

Where:

$$C_{BB,ijt} = C_{AB,ijt} * R_j$$

$C_{AB,ijt}$ = Carbon Stocks in above ground biomass for stratum *i*, species *j* at time *t*; tC

$C_{BB,ijt}$ = Carbon Stocks in below ground biomass for stratum *i*, species *j* at time *t*; tC

A_{ijt} = Area of stratum *i*, species *j* at time *t*; hectares

V_{ijt} = Average merchantable volume of stratum *i*, species *j* at time *t*; m

D_j = Basic wood density of species *j*; t d.m. m^{-3}

BEF_{2j} = Biomass expansion factor for conversion of merchantable volume to above ground tree biomass for species *j*; dimensionless

R_j = Root-shoot ration for species *j*; dimensionless

3.4: **Assessment of the environmental impacts of economic development**

Economic valuation of environmental impacts be based on a careful identification and measurement of the biological and physical changes by a project to guide conformation or development of alternative project designs.

Natural systems like the "green belts" of Rwoho CFR are holistic and interconnected forming a nexus of relationships of dependency and interdependency in the environment. It is thus essential that from the very beginning of the planning process to be able to determine which one and how much of each of the natural systems is to be impacted by the project .

Field Findings

Systematic quantification of the issues in the impact area and the ecological and financial analyses of the environmental impacts including the landscape analysis, measurements of trees seedlings, saplings and pole and other benefit streams form the CFR are as illustrated in this chapter.

1. General

The portion of the Rwoho CFR affected includes: the portions of NFA CDM blocks 3 and 4, two CFM groups (KADA and BEKA) under CDM, the private tree farmers and the natural forest belts along the rivers and unplanted areas. Details of the affected planted portions are in Table below. Specifically;

- Assessed plantations were owned by NFA, CFM groups and private tree farmers
- Natural belts still exist especially the areas along the stream banks
- Indigenous trees such *Parinari species, Erythrina abysinica, Prunus Africana* among others were seen in both natural bets and area under plantations
- Taugya practice (unsystematic planting of food plants with trees with tree crop) was also visible in both mature and young plantations within the project affected area.
- Approximately 60.52 ha categorized as natural belt comprises the natural belts, nursery site, unplanted areas and areas of crop failures.

Table 90: Organizations/Individual that will be affected by the proposed project and area planted in hectares

Licensee	Area (ha)	Remarks
Ankole Wood and Timber Works Ltd	1.61	
CFM-CDM	28.28	
Hon. Alex Byarugaba Bakunda	0.01	
Hon. Ngabirano Charles	7.14	
Kaddugala	54.16	
Kyalimpa Lilian/Hon. Ngabirano Charles	38.07	
Mutahunga Livingstone	4.30	
Nabimanya Robert	17.09	
Ndyanabo Cipiriano	5.68	
NFA Unplanted (Natural Belt & Nursery)	60.52	
NFA-CDM	22.77	
Rutasikwa Gordon	0.60	
Takwesire	0.25	
Twinomugish Benon	5.85	Has patchy *Maesopsis* and Pines for NFA
Twinomugisha Benon	55.71	Has patchy *Maesopsis* and Pines for NFA
Twinomugisha Benon/Noida	0.45	
Total	**302.47**	

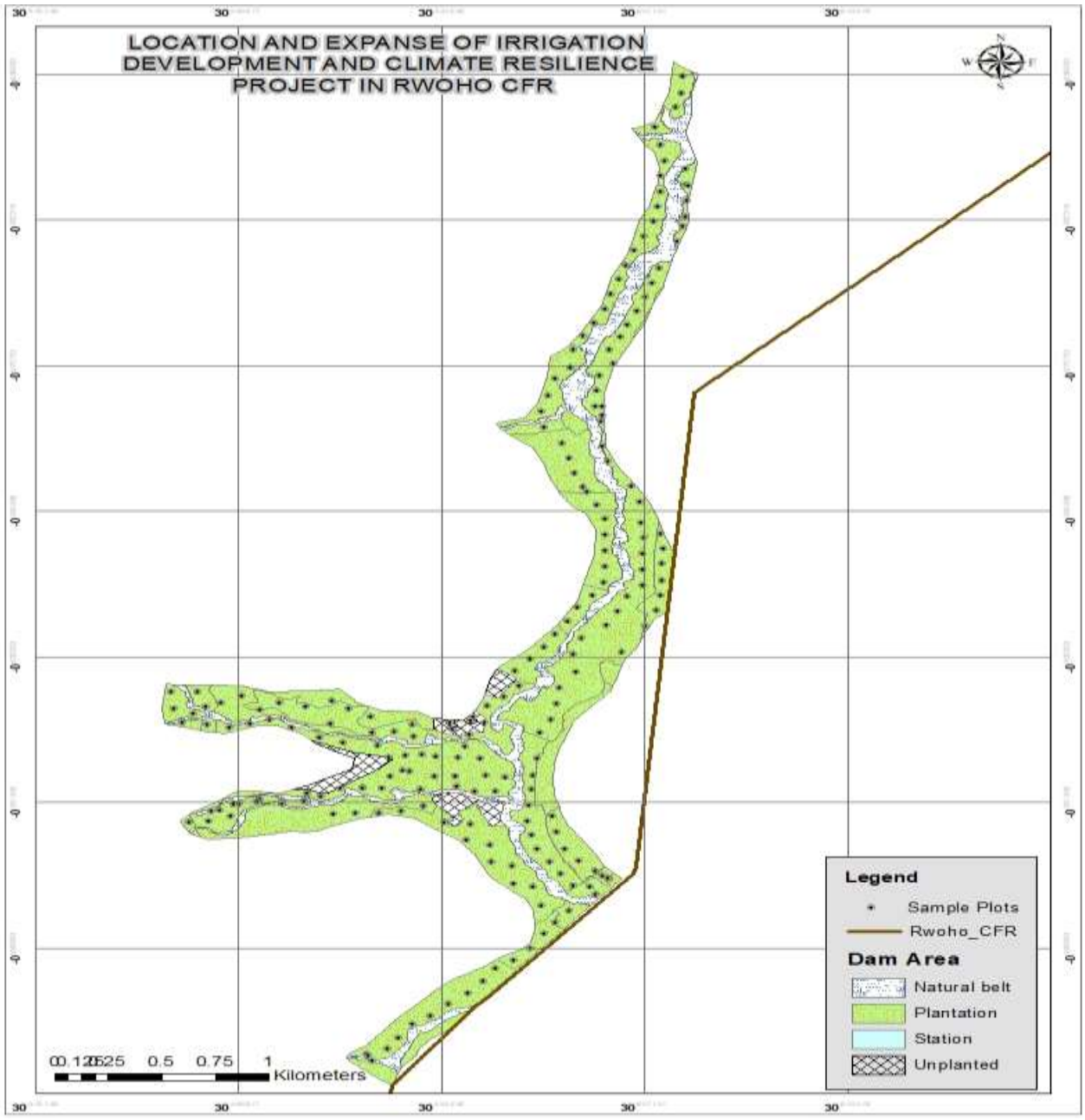


Figure 95: Inundated area within Rwoho CFR

Table 91: Current standing volume of the plantations within the 302 ha initially identified to be inundated in Rwoho CFR

Tree Farmer	*Tree Species*	Age	No of P	Area (ha)	Stems /h	Total Stems	Mean (cm)	Mean Ht	Vol/ha (m3)	Total Vol (m3)
Ankole Woods	*Eucalyptus grandis*	3	4	1.61	575	926	13.3	12.5	67.86	109.25
BEKA – CDM	*Pinus caribaea*	5	7	4.32	629	2,715	13.7	10.0	43.19	186.58
Hon Ngabirano Charles	*Eucalyptus grandis*	3	5	4.59	480	2,203	14.4	15.7	57.98	266.12
Hon Ngabirano Charles	*Eucalyptus grandis*	4	3	2.55	650	1,658	16.7	19.7	124.79	318.22
KADA-CDM	*Eucalyptus grandis*	3	1	3.82	700	2,674	9.6	14.6	33.81	129.16
KADA-CDM	*Pinus caribaea*	3	11	14.53	541	5,916	9.8	5.6	16.29	61.97
KADA-CDM	*Pinus caribaea*	6	5	4.99	763	3,783	10.5	7.0	22.80	90.63
KADA-CDM	*Pinus caribaea*	11	1	0.59	550	325	21.5	15.5	132.74	78.32
Kaddugala	*Eucalyptus grandis*	2	4	11.59	538	6,230	11.3	13.2	35.85	415.52
Kaddugala	*Eucalyptus grandis*	3	33	42.31	629	25,675	12.3	16.5	59.75	2,440.08
Kaddugala	*Pinus oocarpa*	8	2	0.27	975	262	13.4	11.7	71.98	18.40
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	1	3	2.58	200	516	0.0	0.0	0.0	-
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	2	6	4.44	567	1,864	8.4	9.8	15.82	52.03
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	3	16	20.85	615	13,927	14.3	15.5	66.57	1,300.50
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	4	4	10.2	588	5,993	16.8	19.5	108.03	1,101.94
Mutahunga Livingstone	*Eucalyptus grandis*	3	4	4.3	438	1,881	15.8	18.1	67.60	290.67
Nabimanya Robert	*Eucalyptus grandis*	2	7	17.07	386	6,584	2.9	3.0	2.70	46.07
Ndyanabo Cipiriano	*Eucalyptus grandis*	1	1	0.54	500	270	0.0	0.0	0.0	-
Ndyanabo Cipiriano	*Eucalyptus grandis*	3	6	5.14	767	3,941	13.2	15.7	74.69	383.91
NFA-CDM/Twinomugisha Benon	*Pcaribaea/Eucalyptus*	5	3	5.85	400	2,340	17.2	10.6	42.82	250.50
NFA-CDM	*Pinus caribaea*	12	5	5.59	510	2,851	21.5	17.9	142.37	795.85
NFA-CDM	*Pinus caribaea/oocarpa*	11	17	18.22	426	6,853	20.3	16.1	111.05	1,784.61
Twinomugisha Benon	*Eucalyptus grandis*	3	34	44.7	688	29,158	12.0	13.2	48.86	2,148.48
Twinomugisha Benon	*Pinus caribaea*	5	10	10.44	240	2,506	13.3	9.5	24.45	255.30
Hon. Alex Byarugaba Bakunda	*Eucalyptus grandis*	1	1	0.01	500	5	0.0	0.0	0.0	-
Rutasikwa Gordon	*Eucalyptus grandis*	2	1	0.5977	550	329	8.4	9.8	15.82	9.45
Takwesire	*Eucalyptus grandis*	2	1	0.2454	620	152	8.4	9.8	15.82	3.88
NFA Natural Belt	*Natural trees*	0	0	60.52	-	1,595	24	6	0.00	338.09
Grand Total			**195**	**302.46**		**133,131**	**12.3**	**11.3**	**54.78**	**12,876**

Table 92: Stand Volume and Value of the individual plantations within the 302 ha initially identified to be inundated in Rwoho CFR

Tree Farmer	Tree secies	Ag	Area (ha)	Ste /ha	Survi	Mean (cm)	Mean H	Site Inc	First thir (m3)/ha	Second Vol (m3)/	Final ha Vol (m3)/	Vol/ha (m	Total Vol.	Econ value at Av price (UGX) /M³= 120,000
Ankole Woods	*Eucalyptus grandis*	3	1.61	575	52	13.3	12.5	26.0	0.00	30.11	220.42	250.53	403.35	48,402,000
BEKA – CDM	*Pinus caribaea*	5	4.32	629	57	13.7	10.0	16.0	0.00	47.55	414.12	461.67	1,994.41	239,329,200
Hon Ngabirano Charles	*Eucalyptus grandis*	3	4.59	480	43	14.4	15.7	28.0	0.00	0.00	289.22	289.22	1,327.51	159,301,200
Hon Ngabirano Charles	*Eucalyptus grandis*	4	2.55	650	59	16.7	19.7	30.0	0.00	46.85	314.51	361.36	921.47	110,576,400
KADA-CDM	*Eucalyptus grandis*	3	3.82	700	63	9.6	14.6	28.0	0.00	47.63	271.40	319.03	1,218.69	146,242,800
KADA-CDM	*Pinus caribaea*	3	14.53	541	49	9.8	5.6	16.0	0.00	42.46	368.42	410.88	5,970.06	716,407,200
KADA-CDM	*Pinus caribaea*	6	4.99	763	69	10.5	7.0	14.0	0.00	48.43	356.66	405.09	2,021.37	242,564,400
KADA-CDM	*Pinus caribaea*	11	0.59	550	50	21.5	15.5	14.0	0.00	32.27	296.03	328.31	193.70	23,244,000
Kaddugala	*Eucalyptus grandis*	2	11.59	538	48	11.3	13.2	32.0	0.00	50.20	323.32	373.52	4,329.10	519,492,000
Kaddugala	*Eucalyptus grandis*	3	42.31	629	57	12.3	16.5	30.0	0.00	46.06	309.20	355.27	15,031.29	1,803,754,800
Kaddugala	*Pinus oocarpa*	8	0.27	975	88	13.4	11.7	18.0	22.13	47.67	415.24	485.04	130.96	15,715,200
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	1	2.58	200	18	0.0	0.0	30.0	0.00	0.00	216.56	216.56	558.73	67,047,600
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	2	4.44	567	51	8.4	9.8	28.0	0.00	42.91	244.54	287.45	1,276.27	153,152,400
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	3	20.85	615	55	14.3	15.5	30.0	0.00	45.26	45.26	90.52	1,887.28	226,473,600
Kyalimpa Lilian/Hon. Ngab Charles	*Eucalyptus grandis*	4	10.2	588	53	16.8	19.5	30.0	0.00	44.44	298.30	342.74	3,495.95	419,514,000
Mutahunga Livingstone	*Eucalyptus grandis*	3	4.3	438	39	15.8	18.1	30.0	0.00	0.00	317.13	317.13	1,363.64	163,636,800
Nabimanya Robert	*Eucalyptus grandis*	2	17.07	386	35	2.9	9.8	28.0	0.00	0.00	261.29	261.29	4,460.24	535,228,800
Ndyanabo Cipiriano	*Eucalyptus grandis*	1	0.54	500	45	0.0	0.0	30.0	0.00	33.81	285.41	319.22	172.38	20,685,600
Ndyanabo Cipiriano	*Eucalyptus grandis*	3	5.14	767	69	13.2	15.7	28.0	0.00	49.81	283.86	333.67	1,715.07	205,808,400
NFA-CDM/ Twinomugisha Ben	*Pinus caribaea/Eucalyptu*	5	5.85	400	36	17.2	10.6	14.0	0.00	0.00	320.40	320.40	1,874.34	224,920,800
NFA-CDM	*Pinus caribaea*	12	5.59	510	46	21.5	17.9	14.0	0.00	24.99	293.91	318.90	1,782.66	213,919,200
NFA-CDM	*Pinus caribaea/oocarpa*	11	18.22	426	38	20.3	16.1	14.0	0.00	0.00	334.01	334.01	6,085.65	730,278,000
Twinomugisha Benon	*Eucalyptus grandis*	3	44.7	688	62	12.0	13.2	28.0	0.00	47.25	269.27	316.52	14,148.48	1,697,817,600
Twinomugisha Benon	*Pinus caribaea*	5	10.44	240	22	13.3	9.5	14.0	0.00	0.00	217.90	217.90	2,274.89	272,986,800
Hon. Alex Byarugaba Bakunda	*Eucalyptus grandis*	1	0.01	500	45	0.0	0.0	30.0	0.00	28.15	248.05	276.22	2.76	331,200
Rutasikwa Gordon	*Eucalyptus grandis*	2	0.5977	550	50	0.0	0.0	30.0	0.00	29.6	261.2	290.95	173.90	20,868,000
Takwesire	*Eucalyptus grandis*	2	0.2454	620	56	0.0	0.0	30.0	0.00	44.9	256.08	301.02	73.87	8,864,400
NFA Natural Belt	Natural trees		60.52	-	-	-	-	-	-	-	-	-	-	osee table 5 next p
Grand Total			**302.46**	**536**		**12.6**	**12.2**					**317.94**	**74,888.06**	**8,986,562,400**

Table 93: Standing table of Natural trees within the 302 ha initially identified to be inundated in Rwoho CFR

S/N	*Tree species*	No of st	Mean di (cm)	Mean Height	Volume (m3)	Reserve price/ Unit / vol (UGX)	Value (UGX)
1	*Acacia sieberiana*	11	31	5	3.07	107,965	331,453
2	*Acacia spp*	17	17	5	1.78	107,965	192,178
3	*Alangium chinensis*	1	16	5	0.06	215,929	12,956
4	*Albizia spp*	20	30	6	6.92	215,929	1,494,229
5	*Allophyllas dumeri*	1	18	2	0.05	107,965	5,398
6	*Blighia unijugata*	1	16	2	0.04	107,965	4,319
7	*Bridelia micrantha*	37	24	6	10.17	107,965	1,098,004
8	*Canthium vulgaea*	3	36	7	1.34	215,929	289,345
9	*Celtis Africana*	1	60	8	1.36	215,929	293,663
10	*Combretum molle*	6	23	5	1.19	107,965	128,478
11	*Cordia Africana*	126	29	5	32.22	215,929	6,957,232
12	*Croton macrophylla*	9	26	5	2.01	107,965	217,010
13	*Ehretia cymosa*	4	29	5	0.84	107,965	90,691
14	*Erythrina abysinicca*	237	32	4	72.84	53,982	3,932,049
15	*Euclea divinorum*	3	22	3	0.34	53,982	18,354
16	*Ficus spp*	12	32	7	4.87	53,982	262,892
17	*Flocoutia indica*	1	55	8	1.14	107,965	123,080
18	*Halea stipulosa*	3	35	7	1.23	53,982	66,398
19	*Kigelia Africana*	3	14	2	0.09	107,965	9,717
20	*Macaranga schweinfurthii*	7	14	6	0.38	53,982	20,513
21	*Maesa lancealata*	20	16	5	1.82	107,965	196,496
22	*Maesopsis eminii*	764	20	6	108.34	158,836	17,208,292
23	*Markhamia lutea*	20	23	4	2.51	188,938	474,234
24	*Newboutonia macrocalyx*	1	23	5	0.12	215,929	25,911
25	*Parinari sp.*	28	33	5	8.17	107,965	882,074
26	*Phoenix reclinata*	10	19	5	1.01	53,982	54,522

27	*Phyllanthus discoides*	1	33	6	0.31	107,965	33,469
28	*Premna angolense*	3	28	4	0.73	107,965	78,814
29	*Prunus africana*	24	41	7	16.01	215,929	3,457,023
30	*Pseudospondias macrocarpa*	1	16	7	0.08	100,000	8,000
31	*Rhus natalensis*	5	10	4	0.31	107,965	33,469
32	*Sapium ellypticum*	55	39	5	26.38	53,982	1,424,045
34	*Un identified species*	95	17	5	10.46	53,982	564,652
35	*Vangueria apiculata*	1	30	2	0.14	53,982	7,557
36	*Vernonia amagyadalina*	18	24	4	2.96	53,982	159,787
Total		**1595**	**24**	**6**	**338.09**		41,061,583

Table 94: Current economic value of the carbon dioxide sequestered by the Rwoho CFR under CDM

Tree Farmer	*Tree Species*	Age	Area (ha)	Mean DBH (cm)	Mean Ht (m)	Vol/ha (m3)	Total Vol (m3)	Biomass	Carbon	tCO2e	Value (US$) (@US$3/tCO2e)	Value (UGX)	Base line Value of carbon generated by
Ankole Woods	*Eucalyptus grandis*	3	1.61	13.3	12.5	67.86	109.25	334.3	167.2	613.4	1,840.3	6,809,291	
BEKA - CDM	*Pinus caribaea*	5	4.32	13.7	10	43.19	186.58	585.20817	292.60409	1073.857	3,221.6	11,919,813	11,919,813
Hon Ngabirano Charles	*Eucalyptus grandis*	3	4.59	14.4	15.7	57.98	266.12	814.3	407.2	1494.3	4,482.9	16,586,624	
Hon Ngabirano Charles	*Eucalyptus grandis*	4	2.55	16.7	19.7	124.79	318.22	973.8	486.9	1786.8	5,360.5	19,833,892	
KADA-CDM	*Eucalyptus grandis*	3	3.82	9.6	14.6	33.81	129.16	395.2	197.6	725.2	2,175.7	8,050,234	8,050,234
KADA-CDM	*Pinus caribaea*	3	14.53	9.8	5.6	16.29	61.97	20.859102	4.7975935	76.552904	229.7	849,737	849,737
KADA-CDM	*Pinus caribaea*	6	4.99	10.5	7	22.8	90.63	30.506058	7.0163933	111.95723	335.9	1,242,725	1,242,725
KADA-CDM	*Pinus caribaea*	11	0.59	21.5	15.5	132.74	78.32	26.362512	6.0633778	96.750419	290.3	1,073,930	1,073,930
Kaddugala	*Eucalyptus grandis*	2	11.59	11.3	13.2	35.85	415.52	1271.5	635.7	2333.2	6,999.6	25,898,369	
Kaddugala	*Eucalyptus grandis*	3	42.31	12.3	16.5	59.75	2,440.08	7466.6	3733.3	13701.3	41,103.9	152,084,355	
Kaddugala	*Pinus oocarpa*	8	0.27	13.4	11.7	71.98	18.4	6.19344	1.4244912	22.729925	68.2	252,302	
Kyalimpa Lilian/Hon. Ngabirano Charles	*Eucalyptus grandis*	1	2.58	0	0	0	-	0.0	0.0	0.0	-	0	
Kyalimpa Lilian/Hon. Ngabirano Charles	*Eucalyptus grandis*	2	4.44	8.4	9.8	15.82	52.03	159.2	79.6	292.2	876.5	3,242,906	
Kyalimpa Lilian/Hon. Ngabirano Charles	*Eucalyptus grandis*	3	20.85	14.3	15.5	66.57	1,300.50	3979.5	1989.8	7302.4	21,907.3	81,057,057	
Kyalimpa Lilian/Hon. Ngabirano Charles	*Eucalyptus grandis*	4	10.2	16.8	19.5	108.03	1,101.94	3371.9	1686.0	6187.5	18,562.5	68,681,287	
Mutahunga Livingstone	*Eucalyptus grandis*	3	4.3	15.8	18.1	67.6	290.67	889.5	444.7	1632.1	4,896.4	18,116,766	
Nabimanya Robert	*Eucalyptus grandis*	2	17.07	2.9	3	2.7	46.07	141.0	70.5	258.7	776.1	2,871,433	
Ndyanabo Cipiriano	*Eucalyptus grandis*	1	0.54	0	0	0	-	0.0	0.0	0.0	-	0	
Ndyanabo Cipiriano	*Eucalyptus grandis*	3	5.14	13.2	15.7	74.69	383.91	1174.8	587.4	2155.7	6,467.1	23,928,193	

NFA-CDM/Twinomugisha Benon	*Pinus caribaea/Eucalyptus*	**5**	**5.85**	**17.2**	**10.6**	**42.82**	**250.5**	**84.3183**	**19.393209**	**309.44816**	**928.3**	3,434,875	3,434,875
NFA-CDM	*Pinus caribaea*	**12**	**5.59**	**21.5**	**17.9**	**142.37**	**795.85**	**267.88311**	**61.613115**	**983.13101**	**2,949.4**	10,912,754	10,912,754
NFA-CDM	*Pinus caribaea/oocarpa*	**11**	**18.22**	**20.3**	**16.1**	**111.05**	**1,784.61**	**600.69973**	**138.16094**	**2204.568**	**6,613.7**	24,470,705	24,470,705
Twinomugisha Benon	*Eucalyptus grandis*	**3**	**44.7**	**12**	**13.2**	**48.86**	**2,148.48**	**6574.3**	**3287.2**	**12063.9**	**36,191.8**	133,909,624	
Twinomugisha Benon	*Pinus caribaea*	**5**	**10.44**	**13.3**	**9.5**	**24.45**	**255.3**	**85.93398**	**19.764815**	**315.37771**	**946.1**	3,500,693	
Hon. Alex Byarugaba Bakunda	*Eucalyptus grandis*	**1**	**0.01**	**0**	**0**	**0**	-	**0.0**	**0.0**	**0.0**	-	0	
Rutasikwa Gordon	*Eucalyptus grandis*	**2**	**0.5977**	**8.4**	**9.8**	**15.82**	**9.45**	**28.9**	**14.5**	**53.1**	**159.2**	588,996	
Takwesire	*Eucalyptus grandis*	**2**	**0.2454**	**8.4**	**9.8**	**15.82**	**3.88**	**11.9**	**5.9**	**21.8**	**65.4**	241,831	
NFA Natural Belt	*Natural trees*	**0**	**60.52**	**24**	**6**	**0**	**338.09**	**480.0878**	**240.0439**	**880.96111**	**2,642.9**	9,778,668	9,778,668
Grand Total			**302.46**	**12.3**	**11.3**	**54.78**	**12,876**	**29774.809**	**14584.26**	**56697.032**	**170,091.1**	629,337,057	71,733,441

Table 95: Economic Value of the Carbon dioxide Sequestered by the Rwoho CFR under the CDM at full maturity (25 years)

Tree Farmer	Tree secies	Age	Area (ha	Mean DB	Mean Ht	Site Ind	First thin Vol	Second Thin	Final harvest	Vol/ha (m3	Total Vol. (m3)	Biomass	Carbon	tCO2e	Value (US$) of tCO2e	Value (UGX)	carbon Value of the CDM
Ankole Woods	Eucalyptus	3.	1.6	13.	12.	26.	0.0	30.1	220.	250.	403.4	1,234.	617.1	2,264.	6,794.6	25,139,8	
BEKA - CDM	Pinus caribaea	5.	4.3	13.	10.	16.	0.0	47.6	414.	461.	1,994	6,255.	3,127.	11,47	34,436.3	127,414,	127,414,
Hon Ngabirano Charles	Eucalyptus grandis	3.0	4.6	14.4	15.7	28.0	0.0	0.0	289.2	289.2	1,327.5	4,062.2	2,031.1	7,454.1	22,362.3	82,740,526	
Hon Ngabirano Charles	Eucalyptus grandis	4.0	2.6	16.7	19.7	30.0	0.0	46.9	314.5	361.4	921.5	2,819.7	1,409.8	5,174.1	15,522.4	57,433,023	
KADA-CDM	Eucalyptus grandis	3.0	3.8	9.6	14.6	28.0	0.0	47.6	271.4	319.0	1,218.7	3,729.2	1,864.6	6,843.1	20,529.2	75,958,035	75,958,035
KADA-CDM	Pinus caribaea	3.	14.	9.8	5.6	16.	0.0	42.5	368.	410.	5,970	18.72	9,362.	34.36	103,081.6	381,402.	381,402.
KADA-CDM	Pinus caribaea	6.	5.0	10.	7.0	14.	0.0	48.4	356.	405.	2,021	6,340.	3,170.	11,63	34,901.8	129,136,	
KADA-CDM	Pinus caribaea	11	0.6	21.	15.	14.	0.0	32.3	296.	328.	193.7	607.5	303.8	1,114.	3,344.5	12,374,6	12,374,6
Kaddugala	Eucalyptus	2.	11.	11.	13.	32.	0.0	50.2	323.	373.	4,329	13,24	6,623.	24,30	72,925.0	269,822,	
Kaddugala	Eucalyptus grandis	3.0	42.3	12.3	16.5	30.0	0.0	46.1	309.2	355.3	15,031.3	45,995.7	22,997.9	84,402.2	253,206.6	936,864,381	
Kaddugala	Pinus oocarpa	8.0	0.3	13.4	11.7	18.0	22.1	47.7	415.2	485.0	131.0	410.8	205.4	753.7	2,261.2	8,366,484	
Kyalimpa Lilian/Hon.	Eucalyptus	1.	2.6	0.0	0.0	30.	0.0	0.0	216.	216.	558.7	1,709.	854.9	3,137.	9,412.0	34,824.3	
Kyalimpa Lilian/Hon. Ngabirano Charles	Eucalyptus grandis	2.0	4.4	8.4	9.8	28.0	0.0	42.9	244.5	287.5	1,276.3	3,905.4	1,952.7	7,166.4	21,499.2	79,546,859	
Kyalimpa Lilian/Hon. Ngabirano Charles	Eucalyptus grandis	3.0	20.9	14.3	15.5	30.0	0.0	45.3	45.3	90.5	1,887.3	5,775.1	2,887.5	10,597.3	31,791.8	117,629,652	
Kyalimpa Lilian/Hon.	Eucalyptus	4.	10.	16.	19.	30.	0.0	44.4	298.	342.	3,496	10,69	5,348.	19,63	58,890.3	217,894,	
Mutahunga Livingstone	Eucalyptus	3.	4.3	15.	18.	30.	0.0	0.0	317.	317.	1,363	4,172.	2,086.	7,657.	22,970.9	84,992.4	
Nabimanya Robert	Eucalyptus	2.	17.	2.9	9.8	28.	0.0	0.0	261.	261.	4,460	13,64	6,824.	25,04	75,134.1	277,996,	
Ndyanabo Cipiriano	Eucalyptus	1.	0.5	0.0	0.0	30.	0.0	33.8	285.	319.	172.4	527.5	263.7	967.9	2,903.8	10,744.0	
Ndyanabo Cipiriano	Eucalyptus grandis	3.0	5.1	13.2	15.7	28.0	0.0	49.8	283.9	333.7	1,715.1	5,248.1	2,624.1	9,630.3	28,890.9	106,896,214	
NFA-CDM/Twinomugisha Benon	Pinus caribaea/Eucalyp	5.0	5.9	17.2	10.6	14.0	0.0	0.0	320.4	320.4	1,874.3	5,878.9	2,939.4	10,787.7	32,363.2	119,743,711	119,743,711
NFA-CDM	Pinus caribaea	12	5.6	21.	17.	14.	0.0	25.0	293.	318.	1,782	5,591.	2,795.	10,26	30,780.2	113,886,	113,886,
NFA-CDM	Pinus	11	18.	20.	16.	14.	0.0	0.0	334.	334.	6,085	19,08	9,543.	35,02	105,077.5	388,786,	388,786,
Twinomugisha Benon	Eucalyptus grandis	3.0	44.7	12.0	13.2	28.0	0.0	47.3	269.3	316.5	14,148.5	43,294.3	21,647.2	79,445.1	238,335.4	881,840,944	
Rutasikwa Gordon	Eucalyptus grandis	2.0	0.6	0.0	0.0	30.0	0.0	29.6	261.2	291.0	173.9	532.1	266.1	976.5	2,929.4	10,838,771	

Takwesire	Eucalyptus grandis	2.0	0.2	0.0	0.0	30.0	0.0	44.9	256.1	301.0	73.9	226.0	113.0	414.8	1,244.4	4,604,141	
NFA Natural Belt	Natural trees	0.0	60.5	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0	
Grand Total			**302.5**	**12.6**	**12.2**					**317.9**	**74,888.1**	**230,865.4**	**115,432.7**	**423,638.1**	1,270,914.2	**4,702,382,638**	**1,219,566,247**

Table 96: Seedlings/Saplings derived from belts of natural belts

Ser. No.	*Species*	Number	Price (UGX)	Value4
1	*Albizia spp*	21,267	3,000	63,801,000
2	*Celtis aficana*	2,836	2,000	5,672,000
3	*Clausena anistata*	35,444	3,000	106,332,000
4	*Combretum molle*	4,253	2,000	8,506,000
4	*Dovyalis abyssinica*	21,267	1,000	21,267,000
4	*Erythrina abbysinicca*	5,671	3,000	17,013,000
5	*Erythrina abyssinicca*	4,253	3,000	12,759,000
5	*Eucles divinorum*	9,924	2,000	19,848,000
6	*Maesa lanccalata*	5,671	2,000	11,342,000
7	*Markhamia lutea*	46,787	2,000	93,574,000
8	*Parinari sp.*	17,013	2,000	34,026,000
9	*Prunnus Africana*	2,836	3,000	8,508,000
10	*Rhus vulgaris*	2,836	3,000	8,508,000
11	*Sapium elipticum*	2,836	3,000	8,508,000
12	*Vernonia amagyadalena*	17,013	2,000	34,026,000
13	*Alangium chinensis*	7,089	2,000	14,178,000
14	*Bridelia micrantha*	21,267	2,000	42,534,000
15	*Blighia unijugata*	8,507	3,000	25,521,000
16	*Cordia Africana*	8,507	2,000	17,014,000
17	*Croton macrostachys*	12,760	2,000	25,520,000
18	*Halea stipulosa*	55,293	3,000	165,879,000
19	*Macaranga schweinfurthii*	283,556	500	141,778,000
20	*Phoenix reclinata*	42,533	1,000	42,533,000
21	*Un Identified species*	266,542	500	133,271,000
Summary		905,960		1,061,918,000

APPENDIX 12: Biodiversity Management Plan (BMP)

Objectives

This biodiversity management plan (BMP) aims at putting in place mitigation, monitoring and capacity building and training as an enhancement mechanism for project cumulative effects on terrestrial and aquatic biodiversity as proposed in the Environmental Management Plan. The specific objectives of the plan are to:

a. Specify mitigation actions to reduce the impact of the project on biodiversity, especially in the reservoir inundation area and the irrigation command area.
b. Set suitable parameters for monitoring during construction and operation stages;
c. Monitor key species during construction and operation stages; and
d. Train and create awareness among the construction workers and the communities regarding the protection of plants and wildlife.

Steps in preparation of Biodiversity Management Plan

Step 1: Mitigation Actions

- Undertake restoration/reforestation of 500 ha of Rwoho CFR to mitigate the impact for inundation of 100 ha, as guided by NFA and MWE. Restoration/reforestation of 500 ha shall be undertaken using indigenous tree species to promote ecological restoration and/or restoration of ecosystem services which were lost when Rwoho was converted into a Production/Plantation Forest.
- Under Project Sub-Component 1.3, undertake integrated catchment management interventions upstream of the proposed project, and these shall include activities identified and prioritized by host communities through a bottom-up participatory planning to ensure ownership and sustainability. The development of the plans and the formation of the committees will follow the MWE Catchment Planning Guidelines. The micro-catchment plans will identify priority watershed management measures to be implemented by the project. The measures are expected to include ***soil and water conservation measures such as construction of stone bunds, soil bunds, infiltration pits, gully plugs, terracing of steep slopes, check dams; environment management measures that include tree planting, conservation and demarcation of wetland systems, and restoration of river banks using trees, control of water pollution; and livelihood improvement activities including apiary, natural resources based businesses such as mat and basket making, growing of fruit trees etc.***

Step 2: Monitoring and Assessments during Construction

Prepare an integrated reporting plan, during construction to provide systematic monitoring and assessment of the progress/results of all components, identifying the content, format and timing of monitoring and assessment reports. The proposed reporting plan will be reviewed, commented on and approved by relevant stakeholders before commencement of monitoring activities.

Step 3: Capacity Building in Biodiversity Management

Design, conduct, and assess results of the following capacity building programs:

a. Training of construction workers
b. Training of local communities for community based wildlife monitoring including sensitization on species with conservation significance in the project impact area

Step 4: Follow-up Monitoring and Assessments during Operation

Prepare an integrated reporting plan during operation to provide systematic monitoring and assessment of the progress/results of all components, identifying the content, format and timing of monitoring and assessment reports. The proposed reporting plan will be reviewed, commented on and approved by relevant stakeholders before commencement of monitoring activities.

Time Frame

The consulting services for baseline monitoring will be a total of 42 months to cover the entire construction period, about 4 months for capacity building and training for the construction workers and communities, and follow-up monitoring for 3 years of operation.

Reporting Requirements/Deliverables

The Consultant will prepare and submit the following reports and deliverables during the course of the project:

a. Half Yearly Monitoring/Progress Report – every six months (one for the rainy season and one for the dry season each year)
b. Annual Monitoring Report
c. Capacity Building and Training Plan
d. Draft Final Report on Capacity Building and Training Plan
e. Final Report Capacity Building and Training Plan

It will be important that, MWE, NFA, UWA, NEMA and Contractor work closely with relevant district and national agencies and community representatives in ensuring that, this Action plan is operational and effective.

The Biodiversity Management Plan will be implemented and overseen by a local biodiversity consultant recruited as part of the project to ensure the plan is operational as per its obejctives.

Table 97: Summary of Biodiversity Management Plan

Purpose	Expected Outcome
Objective	Establish mitigation measures where species of conservation significance, , and, special biodiversity areas, are located within the project impact area for various seasons. a. Set suitable parameters for monitoring during construction and operation stages. b. Develop buffer zones within the project boundary, to support/protect nursing grounds of relevant animal species with conservation significance in the project area. c. Implement appropriate mitigation measures for the protection of flora and fauna during construction activities. d. Monitor any species during construction and operation stages. e. Train and create awareness among the construction workers and the communities regarding the protection of plants and wildlife with international and national conservation significance.

Purpose	Expected Outcome
Performance criteria	Increase in number of species of conservation significance, their habitats, and designated biodiversity areas (biodiversity survey in Rwoho contained in Appendix 14). a. Designated buffer zones for species of conservation significance in the project area. b. Monitor the presence of any species during construction and operation stages. c. Low incidence of invasive species. d. Training on awareness among the construction workers and the communities regarding the protection of plants and wildlife with international and national conservation significance are delivered and number of people trained.
Targets	a. Increase in number of species. b. Increase in designated buffer zones. c. Increased area of forests, and people trained in biodiversity management.
Establishment of a safe buffer zone around the dam set up.	Establishment of a buffer zone will be a significant undertaking, requiring careful coordination and integration of a number of institutions and technical expertise. The buffer zone will comprise of a belt of forest stretch along the river and its catchment. The work will be supervised by the Project Management Staff. Specialist advice and assistance will be provided by the NFA. a. Planting trials to be undertaken prior to construction to determine the optimum conditions for establishing forest woodland and riverine vegetation. b. The Ecologist will prepare a detailed planting and management Plan in accordance with advice from the NFA. This will include information on species composition, suitable areas for establishing riparian vegetation, a staged planting program, propagation requirements, security, plant maintenance and access provisions to the reservoir. c. Plant nurseries will be established with an emphasis on community involvement and local employment. d. Planting is to commence at the beginning of construction and undertaken in accordance with the stage planting program. e. Monitoring and maintenance. f. Progress reports to be submitted on a quarterly basis to District and Ministry responsible for forestry.

Table 98: Biodiversity Management Action Plan

Impact/Issue	Mitigation/enhancement measures/Activities	Responsibility for implementation	Responsibility for supervision	Timing	Monitoring
Loss of 100 ha of Rwoho CFR	Restore 500 ha of degraded part of Rwoho CFR using indigenous tree species	MWE, NFA	MWE, Project Management Team-PMT, Isingiro DLG	Commence after project effectiviness, and managed by the project for 3 years after establishment	500 ha restored and handed over to NFA 3 years after establishment
Catchment Management Plan	Soil and water conservation measures; environment mgt measures e.g. tree planting, conservation and demarcation of wetland systems, and restoration of river banks using trees, control of water pollution; and livelihood improvement activities including apiary, aquaculture, natural resources-based businesses such as mat and basket making, growing of fruit trees.	MWE, MAAIF, Isingiro DLG	MWE, Project Management Team-PMT, Isingiro DLG	Commence after project effectiviness	Catchment Mgt Plans Developed, Measures Implemented
Survey	Prior to construction, undertake additional fauna survey during the wet season to add to information collected during the ESIA.	MWE	Project Management Team-PMT	Prior to construction	Existence of paths for wildlife etc.
Mammal species of conservation significance	Avoid construction during the rainy season if possible. a. Restrict clearing of riverine vegetation especially reeds to the required area during construction. b. During operation, protect riverine vegetation (especially reeds) clearing along the river banks. c. During construction avoid obstruction of animal paths and create suitable bypasses.	Site Engineer of the Contractor during construction. MWE	MWE, Project Management Team-PMT, District Environment Officer	Construction and operation	Prepare and submit monthly monitoring during the rainy season and assessment reports stating hippos sited and mitigation measures taken.

	d. Implement a capture and release procedure, if necessary.				
Bird species of conservation significance	During construction restrict clearing of forests to areas needed. a. Relocate any bird nests to nearby trees during construction or wait till hatching before clearing; b. Restrict clearing of forests/woodlands during operation stage. **c.** Implement a capture and release procedure, if necessary**.**	Contractor and the local community in collaboration with the Village Natural Resources Management Committees, The District Environment Officer.	MWE, NEMA Project Management Team-PMT, District Environment Officer	Construction and Operation	Prepare and submit monthly monitoring during the rainy season and assessment reports stating nests sited and mitigation measures taken during the breeding season. Measures taken to protect riverine and forest woodland habitats.
Reptile species with conservation significance	Avoid clearing of riverine vegetation during construction. a. Avoid activities within 5-10m from the river bank, where possible. b. Put in place wire mesh shields on unattended open trenches during construction to prevent trenches acting as pitfall traps. c. Provide training to the construction workers in the protection of wildlife. d. Implement a capture and release procedure, if necessary.	Site Engineer of the Contractor during construction MWE Environmental Officer during operation	MWE, NEMA Project Management Team-PMT, District Environment Officer	Construction and operation	Monitor whether the contractor erects animal screen over trenches. Prepare and submit monthly monitoring during the rainy season and assessment reports stating nesting sites sited and mitigation measures taken during the breeding season.
Amphibians, reptiles and small mammals	a. Avoid clearing of riverine vegetation during construction. b. Avoid activities within 5-10m from the river bank, where possible.	Site Engineer of the Contractor during construction Projectand District	MWE, NEMA Project Management Team-PMT, District Environment Officer	Construction and operation	Monitor that screens have been erected to protect amphibians, reptiles and small mammals

	c. Put in place wire mesh shields on unattended open trenches during construction to prevent trenches acting as pitfall traps. d. Provide training to the construction workers in the protection of wildlife. e. Implement a capture and release procedure, if necessary.	Environmental Officer during operation			from falling into trenches
Fish and macro invertebrates	Avoid clearance of vegetated river banks during construction. a. Avoid siltation of waterways during construction. b. Intake structures to be designed with screen/mesh to minimize entrainment or impingement. **c.** Velocity caps that produce horizontal intake/ discharge currents will be employed, and intake velocities across the intake screen will generally not exceed 0.15 m/s.	Site Engineer of the Contractor during construction Projectand District Environmental Officer during operation	MWE, NEMA Project Management Team-PMT, District Environment Officer	Construction and operation	Monitor that vegetation along waterways is not being cleared. Monitor that there is no siltation into waterways during construction. Monitor that fish fingerlings and fish are not being sucked in at the new water intake site. Monitor performance of the fish screen.
Management of Invasive pest species including aquatic weed	a. Not allow introduction of non-endemic species and ensure any pest species are quickly removed from the project; b. Implement system to manage pest species including treating infestations as soon as they are noticed. c. People from the local community should be employed on a part time basis to patrol the dam and upstream areas, and any detection of pest	Project and District Environmental Officer during operation			Daily visual monitoring for pest species. Employ local community to assist. Community, particularly fishers, encouraged to report pest species.

	species immediately reported to the Project Environment representative. d. Local community can also be employed to clear weed infestations. Collected weed should be appropriately disposed of by burial or incineration. e. All boats and equipment used on the dam should be regularly inspected and cleared of weed fragments.				

APPENDIX 13: Consultations with Biodiversity Experts on Rwoho CFR

Background

The project will entail the construction of a dam to provide water for the development of a 3,300 ha irrigated command area. The dam and related reservoir will cover an area of 100 ha within Rwoho CFR. To mitigate the impact, restoration/reforestation of an area five times larger (500 ha) within the same Rwoho CFR will be undertaken It should be noted that the National Forest Authority (NFA) has a designated an area where the proposed 500 ha can be replanted with indigenous species (Appendix 14). The restoration/reforestation will have the following benefits:

a. Increase vegetation cover of the natural forest to ensure sustainability of its proper function – ecological, cultural and socio-economic.
b. Increase the stock of indigenous species in Rwoho CFR that have been severely reduced in the past.
c. Involve the local communities in the restoration/reforestation and subsequent management of the forest.

Stakeholder Consultations

In July 2019, the World Bank recommended that a stakeholder consultation be conducted to get views of other players concerning Rwoho Central Forest Reserve Status. Consultations were conducted with three Institutions:

a. The World Conservation Union (IUCN) – International membership NGO with national forestry programmes;
b. The Environmental Conservation Trustee of Uganda (ECOTRUST). A Uganda conservation NGO which supports community-based forest conservation projects (incl. PES) and may provide a suitable financing mechanism; and
c. Department of Environment and Natural Resources Management in the College of Agriculture, Forestry and Nature Conservation of Makerere University. The Department houses the National Biodiversity Data Bank.

Information Gathered on Rwoho CFR from the consultations

The information picked from the stakeholder consultation clearly indicate that Rwoho CFR is of low conservation importance based on the following.

IUCN - Meeting with IUCN Senior Program Officer in–charge of Forests & Natural Resources Governance (Ms. Cotlida Nakyeyune) established that IUCN has conservation programme in Isingiro District. Further clarification by MWE with IUCN-Kampala office established that IUCN carried out a Biodiversity Assessment of Rwoho and Kijanabolola Forest Reserves in 1996, and that they have no ongoing conservation program in the forest. It further indicated that the ecosystem is least studied by IUCN but in case any offset is to be undertaken, it should follow the best practices enshrining sustainability and, enhancing aspects of ecosystems values and uses.

ECOTRUST – Representative Robert Senkungu (Program Manager) indicated that ECOTRUST has no activities associated with Rwoho CFR. However, at the request of Clarkson University, ECOTRUST conducted a feasibility assessment for the extension of their Trees for Global Benefit program to Isingiro District specifically at a place known as Kyabirikwa. During that assessment, it was established that, the land in the area is steep with numerous gentle sloping and rocky/stony hills with less vegetation. In addition, only the valleys that have thick vegetation with naturally growing trees especially *Albizia* spp.

Above all, much as the survey was done during the rainy season, the hills were largely bare with occasional patches of tall grass in some spots. Despite these, Clackson University planted about 3,000 trees of *Grevillea* and *Mangifera indica* on part of the land but after 2 years and with good tree husbandry, the trees remained stunted hardly 0.25m high. The project concluded that, indigenous tree species they were trying to pilot under their Trees for Global benefits program will not survive on these bare hills. The only trees that could try to survive will be *Grevillea* but it will obviously get stunted because of hash weather conditions. This implies, ventures to plant natural/indigenous trees on bare hills are likely not to be viable due to harsh weather conditions prevailing. In short, ECOTRUST did not proceed with the project.

Makerere University - Meeting with Makerere University Data Bank Manager Herbert Tushabe PhD indicated to the Team that the information in their possession is over 16 years old and it is on Rwoho and Kijanabolola Forest Reserves Biodiversity Reports, for the biodiversity inventories done in 1993 and reports published in 1996.

According to their report, Rwoho and Kijanabolola were surveyed in June and October 1993, as part of the National Forestry Biodiversity Inventory Programme. The main body of this report provides detailed accounts of work carried out on the trees and shrubs; birds; small mammals; and butterflies of the reserves. The report also carried out some preliminary analysis of the results from all 65 forests investigated under the programme, so as to provide an indication of the importance of Rwoho and Kijanabolola for biodiversity conservation relative to other Ugandan forests.

Compared with other Ugandan forests, Rwoho is not particularly biodiverse, with species diversity (an index of species richness per unit area, as recorded by the current inventory and then adjusted for sampling intensity) being in the top 10% of sites for small mammals, the remaining taxa being average or below average. In terms of the 'conservation value' of the species represented (based on knowledge of their world-wide distributions and occurrence in Ugandan forests), Rwoho is average or below average for all taxa with the exception of the small mammals which are above average.

Table 99: Summary of biodiversity and conservation importance of the four indicator taxa surveyed in Rwoho CFR

	Trees and Shrubs	Birds	Small Mammals	Butterflies
No. of species now known from forest	92	63	13	103
No. of restricted-range species (known from £5 forests)	5	0	1	8
No. of regional endemics	-	0	2	1
No. of species recorded by current inventory	92	63	13	103
Species diversity	*	**	****	**
Species conservation value	**	**	***	**

Star ratings indicate values relative to the other 64 Ugandan forests investigated under this programme:

a. **** top 10% of sites; *** top 11-25% of sites; ** mid-ranking 26-74% of sites; * bottom 25% of sites.
b. Regional endemics refer to species restricted to Uganda, the Albertine Rift and/or the Somali-Masaai region.

In rating the importance of forests compared to others, they used the following Criteria:

Biological Indicators

Assessing the relative importance of forest reserves in terms of species conservation, must involve the study of taxa whose survival is linked closely to the existence of natural forest habitats. For the purposes of this programme, a number of taxa were selected for investigation, based largely on their suitability as biological 'indicators'. The purpose of sampling each of the indicator taxa was to compile as complete a species list as possible for each site, to enable comparison between sites and the identification of conservation needs and priorities.

Ecological Characteristics

Once species lists have been compiled it is important that they are considered qualitatively as well as quantitatively, such that the forests may be judged on their individual conservation merits and compared with other sites. A great diversity of habitat types and levels of human disturbance were surveyed across the country during this programme.

As far as possible, all species within each of our indicator taxa was assigned to one of a number of 'ecological type' categories. These types are defined largely in terms of habitat preference and three major divisions are used:

a. ***Forest-dependent species*** (designated as F-species) are those characteristic of closed-canopy forest habitats, which are rarely encountered elsewhere;
b. ***Forest non-dependent species*** (designated as f-species) are those which may occur in closed-canopy forests but are not dependent upon it, and are more often encountered in a variety of forest-edge, degraded forest and woodland habitats; and
b. ***Non-forest species*** are those which occur in a variety of more open habitats including grasslands, savannas, arid habitats and wetlands.

By considering species in this way it becomes possible to make broad comparisons across taxa and across sites, in terms of their importance for certain groups of species which may be of particular concern.

Threatened, rare, endemic, and restricted range species

The research team was drawn to species which are known to be threatened internationally, or may be of concern because they are rare. Species which were encountered infrequently during surveys, were referred to as "restricted-range" species, defined as any species that is known from no more than five of the 65 forests investigated.

Report Analysis

Rwoho and Kijanabolola together host 130 tree and shrub species representing about 10% of the Uganda total. Nine of these species were uncommon and recorded from no more than five of the reserves covered by the inventory programme. Nonetheless, the majority (seven species) were not forest-dependent species and hence, they may be abundant in non-forest habitats. *Terminalia laxiflora* was mainly recorded in Rwoho, but it is not a typical forest species and it may be abundant in other suitable habitats. Moreover, this species is widespread in Africa.

In terms of Bird fauna, Rwoho CFR was found to support moderately diverse bird communities. Thirteen small mammal species were recorded in Rwoho. These species also appear to be forest specialists in Uganda, but it is evident that they are not confined to relict montane forests. Species accumulation rates were plotted indicating that the asymptote was not reached. Rwoho was found to support a species rich shrew fauna with comprised of species more commonly associated with closed canopy forest than savanna woodland.

Of the Butterfly species, no fewer than 12 members of the sub-family *Charaxinae* were taken, from a wide range of ecological characteristics (F,FH,FL,f,W,O). Two are particularly worthy of note. *Charaxe*s *acuminatus* is a montane butterfly limited to dense evergreen forest and otherwise recorded during the programme only in Mafuga and Echuya forests. The semi-montane forest butterfly *Charaxes baumanni*, meanwhile, is represented by three sub-species in Uganda. This particular population, *interposita*, is restricted to areas around Lake Victoria in Kenya, Tanzania and Uganda (Henning, 1988). The disturbed status of Rwoho is reflected in two further records. *Neptis occidentalis* is limited to sub-montane and highland forests only in Kenya and Uganda, with a separate race in Cameroon. *Spialia diomus,* meanwhile, actively avoids closed forest (Larsen, 1990) and is an open habitat specialist. Rwoho is not to be considered rich in terms of their butterfly fauna. It does not accommodate many species recognized as uncommon and/or of restricted-range in Uganda. The Rwoho data are consistent with a medium-rich, moist highland forest environment with patches of disturbed and undisturbed forest.
In summary the report points out two main things on Rwoho CFR:

a. The forest is of low conservation value compared to other forests that were sampled at that time
b. By 1993, disturbance of the forest was already going on.

The above was situation as of 1993 when the inventories were done. However, since then encroachment of Forest Reserves as been increasing. As pointed out in the report following the visit of Rwoho CFR in June 2019, the forest has been invaded by local community who are doing cultivation within the forest reserve. NFA also at some stage gave away parts of the forest to Private tree growers who have cleared indigenous vegetation to plant exotic tree species especially Eucalyptus and Pine.

Uganda Forestry Nature Conservation Master Plan

A master plan for the conservation of Rwoho as a nature reserve was published in 2002. The master plan proposed zonation of the forest. The report proposed that Strict Nature Reserve of approximately 20km^2 be located in the valleys in the middle and south-eastern parts of the reserve which contains most of the natural forest. The rest of the area will act as a buffer zone and is expected to be planted with conifers. The publishers recognized the reserve to have potential for plantation development, with a score of 4. The strict nature reserve had been selected to encompass a wide range of both plants and animals, both in savanna grasslands on the hills, and the forest in valleys. Most of the steep slopes are included in the strict nature reserve. The zonation for a strict nature reserve overlaps with the areas proposed for restoration/reforestation following the recent visit to the forest.

Conclusions and recommendation

a. The reports clearly show that Rwoho CFR is of low conservation importance. In the Master Plan produced by the Forest Department in 2002, it recommended Rwoho CFR for zonation for setting up a strict nature reserve and also for plantation development which would provide a buffer. Some of the area recommended for restoration/reforestation by the field visit team in June 2019 overlaps with the area identified for establishment of the strict nature reserve as such, the proposal to undertake restoration/reforestation on identified zone as in Ministry's Biodiversity Survey Team is consistent with the Master Plan for Rwoho;[27]

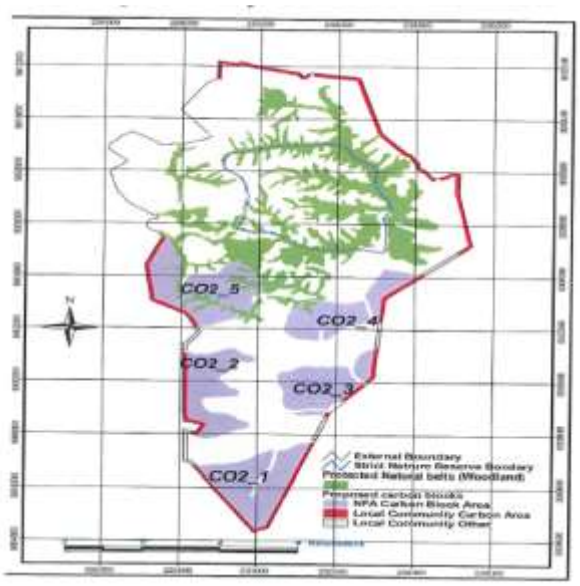
[27] This information seems however in contrast with the 2012 Forest Management Plan for Rwoho, which reports the strictly natural reserve in the central-northern part of the CFR.

b. On stony bare hills, it's best to consider implement exotic tree species planting particularly, the *Pinus* ssp rather than indigenous species; and
c. Isingiro being a hot and dry area with long spells of drought, vegetation survival is critical especially for livestock as well as water scarcity. In this case, sustainable water availability is key for both human survival and livestock. This implies, the planned water project would go a long way to address the question of water scarcity and agricultural productivity, which should be done on a sustainable basis.

With the facts at hand, it is recommended that restoration/reforestation be conducted as a trade-off for the project area to be inundated. This will be in-line with the recommended zonation and will support the idea of turning the identified place into a strict nature reserve.

Reference

Davenport, T., Howard, P. and Baltzer, M. 1996. Rwoho and Kijanabolola Forest Reserves Biodiversity Report. Forest Department.
Uganda Forestry Nature Conservation Master Plan, Report No. 32. Forest Department, 2002.



ATTENDANCE LIST

Project Name: KABUYANDA BIODIVERSITY STUDY

Location: ....

Date: 11/07/2019

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5.						
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7.						
8.						
9.						
10.						

APPENDIX 14: Biodiversity Surveys in Rwoho CFR, within the 100 ha to be inundated and the area identified for restoration/reforestation activities

Study Methods

To study the vegetation structure and composition of the dam and inundation area (100 ha) and of the area for restoration/reforestation activities within Rwoho CFR, a combined methodology of field observations, A Global Positioning System (GPS Garmin 60CSx) unit was used to locate quadrats within the sampled areas. A diameter tape was used to record tree diameters at 1.3 m or breast height, a pair of tape measures and stick poles where used to demarcate the quadrats along transects. Measuring tree heights was made by using yardstick and estimates. A number of regional flora keys were used in the field for better species identification.

Quantitative Sampling

Inventories of demarcated plots have been widely used in floristic sampling and ecological studies in recent years (Poulsen 1997) however the results of species richness depend on the size, shape and number of the plots being used and the choice of the shape depends on the scope of the study (Grieg Smith, 1983). Circular plots are easier to measure and have fewer edge errors because edge length is minimized (Grieg Smith, 1983). Circular nested quadrants of 20 m radius were used during the field visit to make estimates comparable with previous surveys of researchers in the region.

Transect and random quadrant sampling techniques were applied for biological surveys of the flora of the proposed dam and inundation area (100 ha) and of the area for restoration/reforestation activities within Rwoho CFR. Four transects of 1.5, 1.5, 3, and 0.5 km were established in the restoration/reforestation area with quadrants overlaid at an interval of 250 m. Random quadrants were overlaid across wetland and plantations in the dam area, with minimum distance apart of 200 m. A Global Positioning System (GPS) device was used to locate the points and to lay nested quadrants with the largest quadrat totaling 0.1256 ha for sampling trees, 0.0314 ha for shrubs/saplings and 0.001256 ha for herbs. A total number of 29 quadrants accumulating to 3.6424 ha were using for vegetation sampling in the restoration/reforestation area and 13 quadrants accumulating to 1.6328 ha were used for sampling along wetland area in the inundation area. All plants encountered rooted within the quadrant were recorded in their respective lifeforms. Lianas were recorded by the presences or absence mechanism in the same plot as the trees. The data have been used to show the relative distribution and diversity of the species within the case study areas. Daubenmire method of canopy cover ranking, and frequency was employed for herbaceous canopy cover estimates.

Table 100: Management of the Sampling Methods and quadrant sizes

	Vegetation height (m)	Size (m)
	< 0.02	2 × 2
	<0.5	5 x 5
	< 2	10 × 10
	< 2.5	10 × 10
	> 6	20 × 20

The Table above reveals quadrant dimensions used during the vegetation assessment of the dam and inundation area and of the restoration/reforestation area in Rwoho CFR.

Opportunistic Records
Although quadrants registered reasonable data on the distribution, diversity, and abundance of the various plant stratums according to the land use types of the area, a cumulative list was compiled from both the plots and opportunistic encounter that were recorded as they were encountered in the case study areas.

Voucher Specimens
Plant species that could not be instantly identified were collected and photographed for further confirmation at Makerere University herbarium.

Analyses
A plant species lists (species richness) have been compiled from the plot data and additional opportunistic observations and presented in tables and graphs.

General Vegetation Description
Vegetation of an area can be influenced by landform, soils, climate and anthropogenic factors such as fire, logging, mining, settlements, agriculture, grazing etc. All these factors operate jointly to influence the existence of a certain habitat. There are interrelated and interdependent whenever there is a change in any of the environmental factors, such a change is accompanied by alteration in plant species both in composition and structure. Consequently, a new vegetation type forms gradually. The vegetation of the proposed restoration and irrigation areas can be classified as primary:

Dam area

- **Wetland:** The wetland is divided into two major vegetation classes; - (i) The lower area with altitude range of 1,328 and 1,340 m in the study area, and characterized by *Cyperus papyrus* 85% associated with *Melanthera scandens*, *Lepistemon owariense*, all climbers, *Polygonum strigosum, Ludwigia abyssinica* (herbs), and *Thelypteris dentate* (fern) with *Cordia millenii*, *Ehretia cymosa*, and *Dombeya quinqueseta* trees growing at the wetland edges.
- **Upper end of the dam area**, is located at an elevation of range between 1,328 and 1,400 m and dominated by *Typha domingensis* (55%), *Cyperus dives* (20%) sedges, *Melanthera scandens* (17%), *Thelypteris dentate* (10%), *Pouzolzia denudate* (3%) with patches of *Aframomum angustifolium* (herb) and associated with *Syzygium cordatum*, *and Bridelia micrantha* trees in the wet places as well as *Erythrina abyssinica* and *Shirakiopsis elliptica* trees growing at the edges.

Figure 96: (a) Shows the ecotone, 1-Typha domingensis and *Cyperus papyrus* at the background of the wetland of Dam area. The wetland is in between plantations as shown in background. (b) shows *Typha domingensis* and *Cyperus dives* zone of the upper wetland surrounded by Eucalyptus plantation. The wetland measures between 20-60m wide.

Restoration/Reforestation Area

The area is composed of several prominent vegetation mosaics distributed across the area. The vegetation mosaics have been influenced by mostly soil depth and the moisture index of the area.

- ***Loudetia Grassland***: The summits and slopes characterized by rocky soils in the south, are dominated by *Loudetia kagerensis* (85%), *Cymbopogon nardus* (5), *Hyparrhenia newtonii* (10%), and *Andropogon schirensis* (5%) all grasses, and associated with trees such as Parinari curatellifolia as the largest, *Albizia adianthifolia*, *Protea gaguedi*, *Acacia abyssinica* and *Catha edulis* (mairungi tree). **Most of the fairly-large trees have been destroyed and replaced by Eucalyptus plantations, the remnant trees are cleared for charcoal production among other.**
- **Forest.** The valleys or riverine in the South-East is located at an elevation of 1,480 m, are characterized by Tropical High Forest, the upper canopy is dominated by *Macaranga schweinfurthii, Hallea stipulosa, Prunus africana, Alangium chinense, Ehretia cymosa*, and *Alangium chinense* all trees. The ground cover is dominated by *Piper umbellatum, Asplenium elliotii*, and *Dicliptera laxata* herbs. *Gouania longispicata*, *Adenia bequaertii, Toddalia asiatica*, *Peponium vogelii*, and *Motandra guineensis* are frequently encountered species of lianas.
- The Northern forest or the neck is located at an elevation range between 1,700-1,800 m above, dominated by *Vepris nobilis* by 72%, *Catha edulis* 15%, *Celtis africana* as trees of high canopy, the second strata is dominated by shrubs such as; *Dovyalis macrocalyx, Pittosporum mannii,* and *Ehretia cymosa*. The forest floor is dominated by *Dicliptera laxata, Achyranthes aspera, Oplismenus hirtellus* and *Doryopteris kirkii* herb. The forest is associated with some species of vines which makes it hard to wade through the thick vegetation. *Pterolobium stellatum, Jasminum abyssinicum, Uvaria angolensis*, and *Grewia pubescens* are frequently encountered species of lianas in area.

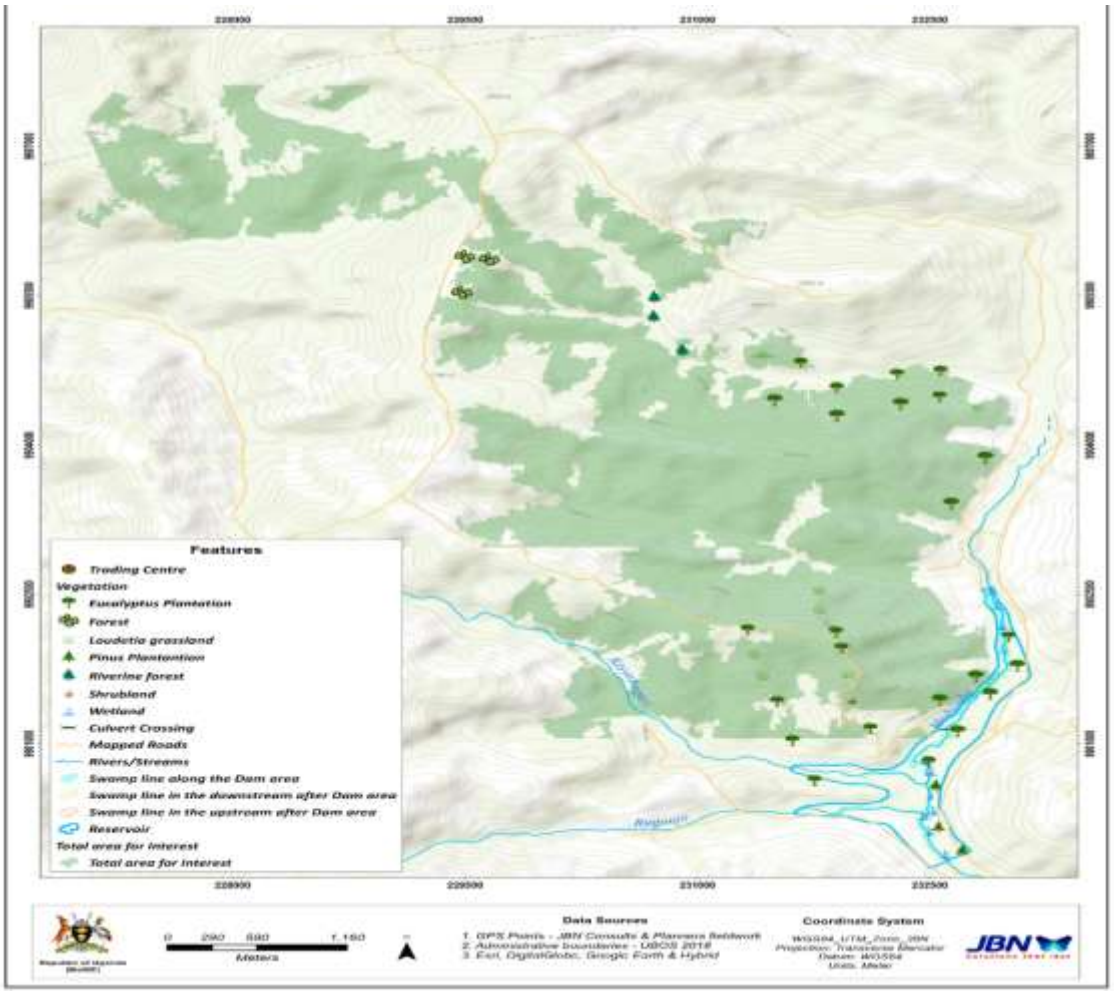


Figure 97: Floristic Composition, Distribution, Density and Diversity of Vegetation of the Restoration/reforestation area and inundation area

A total of 382 species were recorded from the study areas. Out of those, 123 plant species were recorded from dam and inundated area, while 352 were recorded from the restoration/reforestation area. Figure below presents the breakdown.

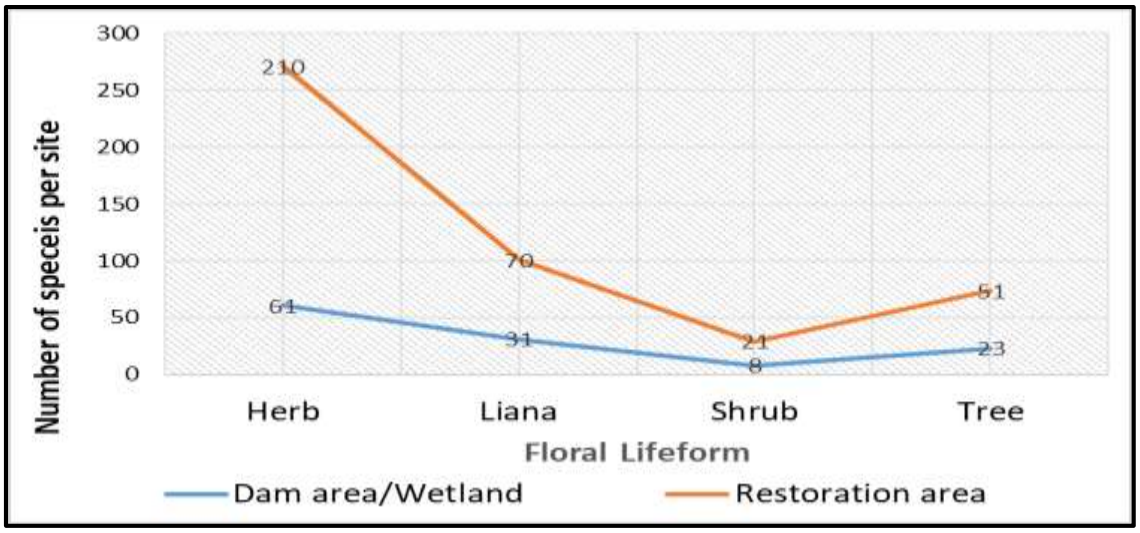
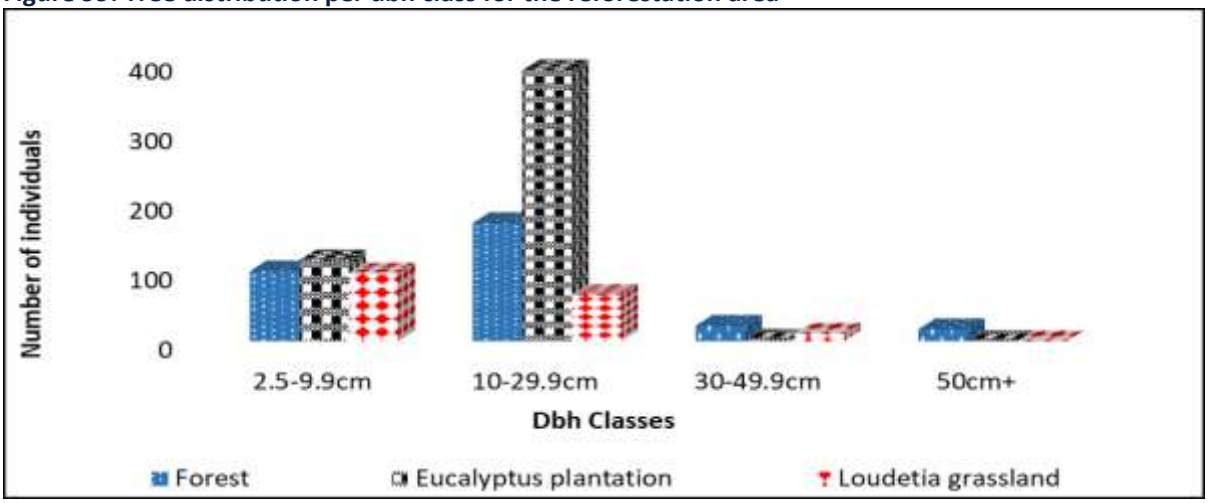


Figure 98: Species diversity and life forms in the dam area and in the restoration/reforestation area

Loudetia karengensis was the dominant grass on hilltops and slopes of the open rocky soils areas, *Bidens pilosa* in plantations and fallows, *Bidens grantii* in fallows of the slopes, *Dicliptera laxata* in the natural forested restoration areas as *Cyperus papyrus* and *Typha domingensis* dominated the swamp. The most frequently encountered tree species were: *Parinari curatellifolia, Protea gaguedi*, and *Albizia adianthifolia* on hill tops, *Macaranga schweinfurthii*, *Hallea stipulosa*, and *Shirakiopsis elliptica* dominated the riverine tropical high forest, *Vepris nobilis* and *Catha edulis* dominates the short forest patches in the northern part of the restoration area as *Syzygium cordatum, Macaranga schweinfurthii*, and *Bridelia micrantha* dominated the wetland vegetation of the dam area.

Figure 99: Tree distribution per dbh class for the reforestation area



The figure above reveals tree stem abundances from different habitats, large tree in Dbh class ≥50cm were very few in the restoration area, *Macaranga schweinfurthii, Shirakiopsis elliptica*, and *Prunus africana* recorded the largest trees in the natural forested area. All the Eucalyptus trees range between the Dbh class of 10-29.9cm. The nature forest in the north was dominated *Vepris nobilis* in Dbh class ≤ 29.9cm. *Parinari curatellifolia* recored the largest stem in the *Loudetia* habitat of the hill summits.

Species abundance

Abundance is measured by presence/absence. As the name suggests, with presence/absence data, only a species within a quadrant is considered. This method is the simplest form of vegetation data analysis. Density is the count of individual plants, and not species within a quadrant. Density is calculated by using the number of individual trees to the area covered. In this study, the calculations are not uniform because the sampled quadrants per habitat were not uniform too. The natural forest had only six quadrants which accumulated to 0.7536 ha, Eucalyptus plantation with 14 accumulated to 1.7584 ha, and *Loudetia* grassland with nine (1.1304 ha).

Table 101: Individuals tree stems recorded per each habitat in the respective study sites

Site	Habitat	Individuals per habitat	Density (No. of trees / ha)
Restoration/reforestation Area	Natural Forest	308	408.705
	Eucalyptus plantation	506	287.762
	Loudetia grassland	174	153.928
Dam and inundation Area	Eucalyptus plantation	175	696.66
	Pinus plantation	99	394.108
	Wetland	139	92.224

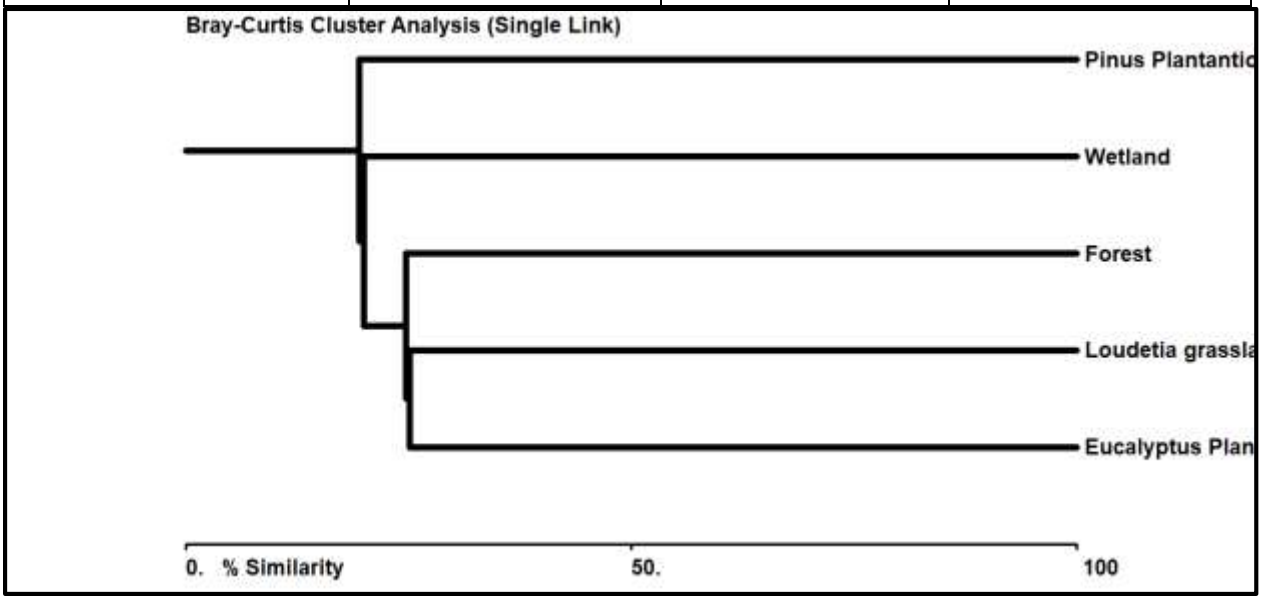


Figure 100: Similarities in species composition from different habitats of the two study sites, Loudetia grassland and Eucalyptus plantations on the slopes were the most similar by 20%, and almost similar to natural forest a difference of 1% at 19%. The dissimilar in terms species composition were the wetland and Pinus plantation at 15%.

Table 102: Eleven categories to consider when carrying out global, regional, and national Red List assessment

EX	Extinct
EW	Extinct in the Wild
RE	Regionally Extinct
CR	Critical in the region
EN	Endangered in the region
VU	Vulnerable in the region
NT	Near-threatened in the region
LC	Least Concern
RR	Regional Responsibility
DD	Data Deficient
NE	Not Evaluated

Conservation status of the species

Out of 382 plant species recorded from the dam and inundation area and in the restoration/reforestation area, five species have been listed under the IUCN red data list at the national level and globally. The IUCN recorded plant species are all categorized as trees/shrubs, and they include; (i) *Fagaropsis angolensis*, VU, A2acd (ii) *Prunus africana* tree, VU A2ad; (iii) *Fleroya stipulosa* (tree), VU, A2cd, (iv) *Cordia millenii*, globally, LC and nationally as ENA2ad, and lastly (V) *Pavetta intermedia* (shrub) CR B1+2ab.

Table 103: Identified IUCN plant species in the restoration/reforestation area of Rwoho CFR

N/S	Species	Common Name	IUCN Global Status	National Threat Status
1	*Pavetta intermedia*		VU	CR B1+2ab(iv)
2	*Cordia millenii*	Drum Tree/West African Cordia	LC	EN A2ad
3	*Fleroya stipulosa*		VU	VU A2cd
4	*Prunus africana*	Red Stinkwood	VU	VU A2ad
5	*Fagaropsis angolensis*		NE	VU A2acd

Figure 101: (a) Fagarapsis angolensis (Rutaceae) reprouting in Eucalyptus plantation. The tree species can hardly be seen at maturity all forests apart from Budongo. (b) *Prunus africana* existing in Eucalyptus plantation in the restoration/reforestation area. The area was dominated by *Prunus africana*, Macaranga schweinfurthii, *Fagaropsis angolensis*, and *Hallea stipulosa*. (c) Debarking of *Prunus africana*. The species contains high medicinal values. (d) Destruction of *Hallea stipulosa* of the reiverine forest in the restoration/reforestation area towards the northern sector.

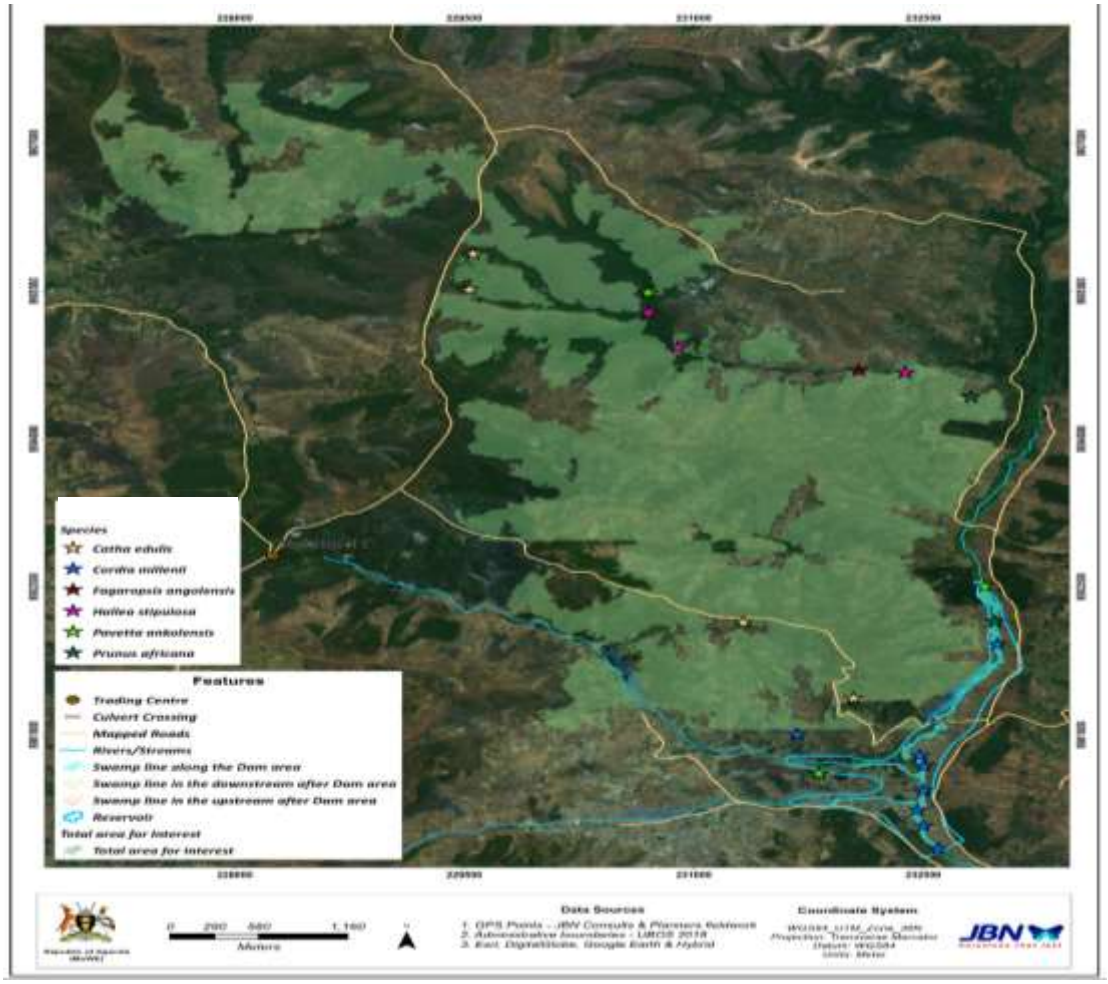


Figure 102: Map with distribution of IUCN Endangered plant species in the restoration/reforestation area in Rwoho CFR.

Table 104: Shannon-Wiener and Alpha diversity values for plants from the restoration/reforestation and dam sites in Rwoho CFR

Index	Eucalyptus Plantation	Forest	Loudetia grassland	Pinus Plantantion	Wetland
Shannon H' Log Base 10.	2.223	2.016	2.045	1.744	1.726
Shannon Hmax Log Base 10.	2.33	2.068	2.14	1.756	1.851
Alpha	223.18	152.361	145.631	343.422	62.588

With 382 plant species over 5.652 ha sampled area (Table 101), Rwoho CFR reserve is not highly diverse comparing it with the Miombo woodland in Tanzania where 600 species can be recorded from 4.2704 ha. The number of plant species would have exceeded the records but due to land use change as observed during field survey, several Eucalyptus plantation and crop gardens (maize, bean seed, cassava, sweet potatoes and Irish potatoes), were observed to exist in the proposed restoration/reforestation area, such factors could have led to the decline of the habitat quality hence reducing the plant communities.

Table 105: Plant species recorded per each family in the dam and inundation area and in the restoration/reforestation area of Rwoho CFR

N/S	Family	No. of Species	N/S	Family	No. of Species
1	Asteraceae	118	39	Oleaceae	6
2	Poaceae	99	40	Pittosporaceae	6
3	Fabaceae	93	41	Pteridaceae	6
4	Euphorbiaceae	60	42	Asparagaceae	5
5	Malvaceae	32	43	Onagraceae	5
6	Acanthaceae	28	44	Pinaceae	5
7	Rubiaceae	27	45	Rhamnaceae	5
8	Cyperaceae	24	46	Zingiberaceae	5
9	Myrtaceae	24	47	Anacardiaceae	4
10	Amaranthaceae	22	48	Cornaceae	4
11	Commelinaceae	21	49	Myrsinaceae	4
12	Boraginaceae	20	50	Passifloraceae	4
13	Sapindaceae	20	51	Piperaceae	4
14	Verbenaceae	17	52	Proteaceae	4
15	Celastraceae	15	53	Typhaceae	4
16	Convolvulaceae	14	54	Apiaceae	3
17	Aspleniaceae	13	55	Dioscoreaceae	3
18	Cucurbitaceae	13	56	Dracaenaceae	3
19	Rutaceae	13	57	Melastomataceae	3
20	Capparaceae	12	58	Melianthaceae	3
21	Bignoniaceae	11	59	Orchidaceae	3
22	Moraceae	11	60	Oxalidaceae	3
23	Chrysobalanaceae	10	61	Phytolaccaceae	3
24	Urticaceae	10	62	Colchicaceae	2
25	Flacourtiaceae	9	63	Dennstaedtiaceae	2
26	Polygalaceae	9	64	Loganiaceae	2
27	Polygoniaceae	9	65	Ranunculaceae	2
28	Combretaceae	8	66	Blechnaceae	1
29	Lamiaceae	8	67	Hypericaceae	1
30	Menispermaceae	8	68	Arecaceae	1
31	Thelypteridaceae	8	69	Balsaminaceae	1
32	Vitaceae	8	70	Chenopodiaceae	1
33	Apocynaceae	7	71	Crassulaceae	1
34	Polypodiaceae	7	72	Dryopteridaceae	1
35	Rosaceae	7	73	Ebenaceae	1
36	Solanaceae	7	74	Iridaceae	1
37	Ulmaceae	7	75	Primulaceae	1
38	Annonaceae	6	76	Scrophulariaceae	1

Invasive plants

Invasive alien species are defined as plants, animals, pathogens and other organisms that are non-native to an ecosystem, and which may cause economic or environmental harm or adversely affect human health and the invasive plants fall into at least two categories; native and non-native species (Benjamin D, 2016). Most of the difficulties associated with invasive plants involve plants that are non-native or aliens. It is important to point out that not all non-native plants are invasive (Sarah J. 2001). Most have been intentionally introduced into agricultural or horticultural environments, and many are unable to reproduce outside of these intensively managed environments. Invasive species may be used to mean an alien species which becomes established in natural or semi-natural ecosystems or habitats, is an agent of change, and threatens native biological diversity (IUCN, 1999). Invasive alien species are species introduced deliberately or unintentionally outside their natural habitats where they have the ability to establish themselves, invade, out-compete natives and take over the new environments (CBD News, 2001).

A total of 22 plant species were identified as invasive from the two study sites. The plantations recorded the highest number of invasive with 19, followed by *Loudetia* grassland with 11, wetland six and least were recorded in the natural forest with only two.

Table 106: Invasive plant species recorded from restoration/reforestation area in Rwoho CFR

N/S	Family	Invasive species	Plantation	Forest	Loudetia grassland	Wetland	Status
1	Asteraceae	Bidens grantii	1		1		Invasive
2	Asteraceae	Bidens pilosa	1	1	1	1	Invasive
3	Asteraceae	Conyza simentrensis	1		1		Invasive
4	Asteraceae	Tagetes minuta	1			1	Invasive
5	Euphorbiaceae	Ricinus communis	1				Invasive
6	Commelinaceae	Commelina benghalensis	1		1		Invasive
7	Fabaceae	Acacia hockii			1		Invasive
8	Fabaceae	Caesalpinia decapetala	1			1	Invasive
9	Fabaceae	Glycine wightii	1		1	1	Invasive
10	Lamiaceae	Leonotis nepetifolia	1		1		Invasive
11	Poaceae	Cymbopogon nardus	1		1		Invasive
12	Poaceae	Cynodon dactylon	1			1	Invasive
13	Poaceae	Digitaria abyssinica	1				Invasive
14	Poaceae	Eleucine indica	1				Invasive
15	Poaceae	Imperata cylindrica	1				Invasive
16	Poaceae	Melinis minutiflora	1		1		Invasive
17	Poaceae	Melinis repens	1		1		Invasive
18	Pteridaceae	Pteridium aquilinum	1		1		Invasive
19	Rhamnaceae	Maesopsis eminii	1				Invasive
20	Sapindaceae	Cardiospermum grandiflorum	0			1	Invasive
21	Sapindaceae	Cardiospermum halicacabum	0	1			Invasive

22	Verbenaceae	Lantana camara	1				Invasive

Figure 103: (a) Bidens grantii invaded area in the restoration/reforestation area. Species colonies an area after cultivation. (b) Charcoal burning on the slopes of the restoration/reforestation area. Parinari and Albizia are the species harvested to serve the purpose.

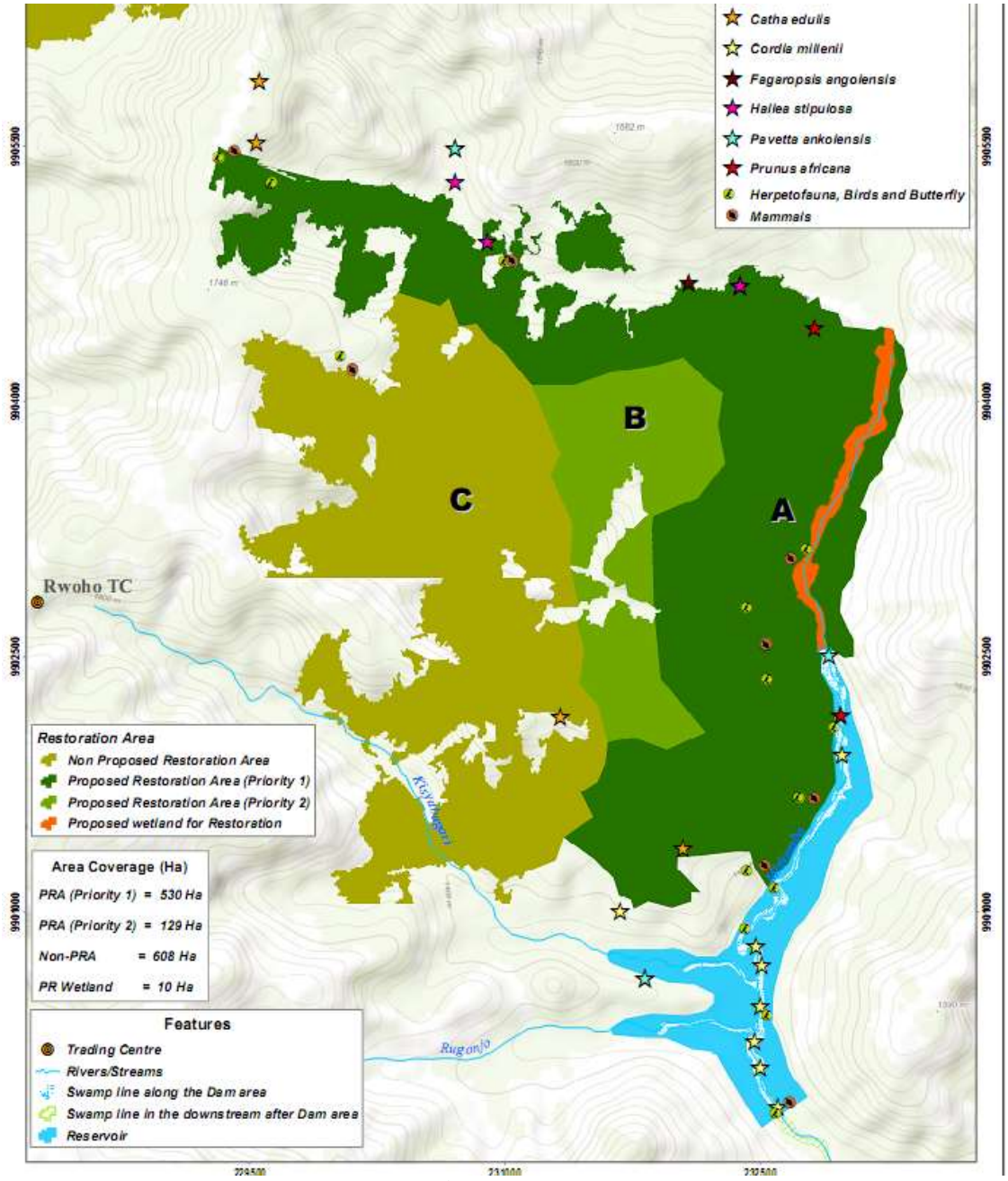


Figure 104: Prioritization of restoration/reforestation area in Rwoho CFR

The priority Area A

1. The Selected suitable site or landscape for the restoration program, was done by the involvement several stakeholders. The forest reserve is currently managed by NFA with multiple land uses which includes; monoculture forestry and agroforestry on additional to conservation of nature.

The selection of the restoration area within Rwoho CFR, was based on the critical habitat selection. An area with five (5) IUCN threatened plant species should be considered a “CRITICAL” habitat, therefore the area immerged to be most suitable for the enrichment because it holds higher concentration of native species communities of both the herbaceous and woody plants which have known to exist in other areas before the change of the Forest Management Plan.

The selection of the restoration area was based on:

a. The only remaining area with pockets of natural forest and was ranked highly in terms of biodiversity as compared to other areas within Rwoho CFR bearing in mind the level of forest cover depletion in the recent years;
b. Exhibits suitable soil characteristics (dark fertile soils from outlook);
c. Existence of higher plant communities/diversity i.e. the location and the presence of species of conservation concern, out of the 382 plant species described from the entire forest, five (5) of them have been listed under the IUCN Red list data of threatened floral species and one of them was categorized as Endangered (EN), therefore restoring such an area would help to maintain and compensate for loss of the two (2) IUCN species recorded from the proposed dam site;
d. It is the only remaining forested area that can support the several species of faunas as such as the blue and Red tailed monkeys as observed during the field survey;
e. It is least subject to anthropogenic forces such as cultivation, grazing, and tree cutting for charcoal as compared to the un selected area, and
f. Its size is fairly large (slightly 500 ha) hence, able to hold good/sizeable biodiversity.

Protection of the watershed and micro-habitats: The proposed area within Rwoho CFR, will help to maintain the watershed upstream to balance the water floor for the river, rather than restoring the lower river areas. Also restoring the north-eastern part will help to close the gap of the lost wetland vegetation of the expected immerse area due to the damming.

Presence of a fairly large numbers of native trees: The proposed section in area A, still has fairly large number of surviving native plant species, as is capable of self-regeneration to minimize the costs for raising tree seedlings and replanting.

Priority Area B

The area was described as rocky, with more of *Loudetia kagerensis* grassland with shrub, fallows and dominated by *Bidens grantii* herb and remnant *Parinari* trees on rocky soils. The area is prone to wild fires, livestock grazing, and subsistence farming. Priority area B as hinted, has low biodiversity mix and with pronounced rocky outcrops which has impacted on plant growth hence, its biodiversity being lower. Above all, this section of the CFR has evidently, fairly more pronounced cultivation with large section of tree plantations with Pines and Eucalyptus.

Priority Area C

Although the area lies with the proposed restoration entire area of over 1,000 ha, it has been heavily encroached in terms of loss/degradation of its natural forest cover through agro-forestry, therefore is has low biodiversity composition by comparison to forest conservation for the floral and faunal.

Choice of Potential Optimal Restoration area

a. The restoration/enrichment area will strategically help to conserve the two endangered species that were recorded from the dam area to be inundated. According to the IUCN National Red list for Uganda, only two plant species have been listed under the IUCN Red Data List in the proposed dam immerse area. The two species are *Cordia millenii* with ten locations and *Prunus africana* with a single location. Another strategy will be to focus on relocation of seedlings/propagules of these species if any is found within the expected dam area;
b. Twenty-two invasive alien plant species were registered in the proposed restoration area (Critical Area) and therefore, a program should be developed to eradicate them before onset of any

enrichment planting starts. The existence of invasive species could have been due to a host of anthropogenic activities conducted in the entire forest reserve such as; monoculture or agro-forestry, agriculture, lumbering and charcoal burning among others. As such, such invasive species eradication program should be incorporated in the restoration program;

c. The second optional area has pronounced rock out-crops and is dominated largely by primary colonizes especially *Loudetia kagerensis* grass with few isolated species of remnant tree species. Therefore, it is considered as an area of low plant species diversity.

The objective of this survey was to establish baseline information for identification of potential restoration area, as such, it is proposed that, restoration should be followed by a program monitor trend or changes on biodiversity overtime and such as a plan/program should take into account:

i. Baseline study on regeneration in two different weather conditions, that is dry and wet season to determine on whether there is self-regeneration or a replanting program will be needed. If replanting, then a tree nursery bed will be establishing within the restoration area to avoid unnecessary costs.
ii. A monitoring program may be designed and conducted periodically (annually or every two years).

FAUNAL BIODIVERSITY

2.0 Herpetofauna (Reptiles and Amphibians)

2.1 Methodology

Three main sampling methods were employed, as described by Heyer et al, 1994; Fellers and Freel, 1995; Halliday, 1996; and Olson, et al, 1997. The methods include:

- ✓ **Visual Encounter Surveys (VES):** The method constitutes moving through a habitat watching out for, and recording surface-active species. VES were complimented by visual searches, by examining under logs, leaf litter, in vegetation, and crevices. Species encountered were recorded. Surveys were conducted using this method along the river valley which was taken as transect, and in the forest areas were transects were also established.
- ✓ **Audio Encounter Surveys (AES):** This method uses the species specific calls made by breeding males. The identity of the amphibian species heard calling and their numbers were recorded.
- ✓ **Opportunistic Encounters:** Herpetofauna species encountered outside the sampling points but within the project area / surrounding were recorded. Because of the herpetofauna mobility the opportunistic encounters complemented the amphibian and reptile lists compiled for the area.

Identification followed field guides by Spawls, S. et al. (2002), and Branch. B. (2005).

To assess the Red List and / or protected status of species recorded or potentially occurring in the study area, two sources were consulted:

- ➢ The latest Red List of Threatened Species of the International Union for the Conservation of Nature (IUCN), and;
- ➢ The National Red List for Uganda, published by Wildlife Conservation Society (WCS) January 2016.

2.2 Results

2.2.1 Amphibians

2.2.1.1 Number of species

Nine Amphibian species were recorded during the survey of the project area to be inundated by the dam. All are frogs. With the exception of the Mascarene Rocket Frog *Ptychadena mascareniensis* the rest of the frogs are wetland specialists. They occur around permanent water sources.

Table 107: Amphibian Species encountered in the project site

Family Name	***Scientific Name***	**Common Names**	**IUCN Red List Status**	**National Red List Status**	**PW**	**FP**	**GL**	**NF**
Hyperoliidae	*Hyperolius viridiflavus*	Common Reed Frog	LC	DD	*			*
Hyperoliidae	*Afrixalus quadrivittatus*	Striped Leaf-folding Frog	LC	DD	*			
Hyperoliidae	*Hyperolius kivuensis*	Kivu Reed Frog	LC		*			*
Hyperoliidae	*Hyperolius cinnamomeoventris*	Cinnamon-bellied Reed Frog	LC		*			
Phrynobatrachidae	*Phrynobatrachus natalensis*	Natal Puddle Frog	LC		*	*		*
Phrynobatrachidae	*Phrynobatrachus mababiensis*	Dwarf Puddle Frog	LC		*			*
Pyxicephalidae	*Amietia angolensis*	Angola River Frog	LC	DD	*			*
Ptychadanidae	*Ptychadena mascareniensis*	Mascarene Rocket Frog	LC	DD	*	*		*
Pipidae	*Xenopus victorianus*	Lake Victoria Clawed Frog	**LC**		*			
		Total No. of Species			**9**	**2**	**0**	**6**

Nine species of amphibians were recorded in the Papyrus wetland along the river and two species recorded in the Forest plantation. None was recorded in the grassland, while six were recorded in the natural forest patches. No species of conservation concern was recorded based on the IUCN 2014 Red List; all are listed as of Least Concern. Amphibian species listed as Data Deficient according to the National Red list include Mascarene Rocket Frog, Angola River Frog, Striped Leaf-folding Frog and Common Reed Frog.

2.2.1.2 Impact of inundation on Amphibians

No negative impact is anticipated. As already indicated eight out of nine species are wetland specialists, so they will just be pushed to the periphery and as long as vegetation grows on which they patch, they will be able to adopt themselves to the new environment.

2.2.2 Reptiles

2.2.2.1 Number of species

Six species of reptiles were recorded in the dam site to be inundated and the restoration/reforestation area. They include one skink, one lizard and four snakes. Three of the reptiles were reported as occurring in the dam site to be inundated, including the Central African Python, Forest Cobra and Nile monitor. Two reptiles were recorded in the forest plantation (the Olive House Snake was seen in the Pine Plantation), three in the grassland and all the six were recorded in the Natural Forest Patches. The Monitor Lizard was

reported to occur in the area to be inundated by the dam. The Striped Skink was common in the restoration/reforestation areas and on the tree stamps along the river.

Table 108: Reptiles Species encountered in the restoration/reforestation area in Rwoho CFR.

Family Name	Scientific Name	Common Name	IUCN Red List Status	National Red List Status	PW	FP	GL	NF
Scincidae	*Trachylepis striata*	Striped Skink	LC			*	*	*
Elapidae	*Naja melanoleuca*	Forest Cobra	LC		*		*	*
Viperidae	*Bitis arietans*	Puff Adder	LC					*
Colubridae	*Lamprophis olivaceus*	Olive House Snake	LC			*		*
Pythonidae	Python sebae	Central African python	LC		*		*	*
Varanidae	*Varanus niloticus*	Nile Monitor	LC		*			*
		Total No. of Species			**3**	**2**	**3**	**6**

None of the reptile species recorded in the restoration area and area to be inundated by the dam is of conservation concern, according to the IUCN Red List 2014 and the National Red List for Uganda 2016. All are of least conservation concern. The Nile Monitor *Varanus niloticus* is also listed under CITES Appendix II. However, in Uganda, the Nile Monitor was down listed because it is still common and widely distributed in the Country.

2.2.2.2 Impact of inundation and restoration/reforestation on the Reptiles

No negative impact is anticipated. Reptiles are mobile and inundation will be gradual and not overnight. Reptiles will be able to move away as the water takes over their niches along the river and other areas to be inundated. During restoration, the displacement will be temporary. As the area is cleared for restoration, the reptiles will take refuge in and around the rocks which are common in the areas to be restored. Care must be taken during the restoration process by avoiding unnecessary clearance.

3.0 Birds (Avifauna)

3.1 Methodology

Four Timed Species counts (TSC) were conducted covering the study areas/. At each of the sites, birds were recorded using Timed Species Counts (Bibby *et al* 2000). Each TSC lasted one hour, during which time all bird species seen or heard were listed in order of detection. Any bird species seen or heard whilst walking at a slow pace through the surveyed area were also recorded. A few additional records were made of species found to be present in the area outside the time of the count. The observations were made between 07.00am and 12.00 pm, as well as between 3.00pm and 6.00pm. All Identifications, were made by reference to Stevenson and Fanshawe (2002) and supported by the Uganda Bird checklist (Nature Uganda 2012). The threat categories and the habitat type of the birds noted using the following denominations:

Threat Categories

- ✓ G-CR-Globally Critical
- ✓ G-EN-Globally Endangered
- ✓ G-VU-Globally Vulnerable

- ✓ G-LR/nt-Globally Lower Risk, near threatened
- ✓ G-DD-Globally Data Deficient
- ✓ G-RR-Globally Range Restricted
- ✓ R-CR-Regionally Critical
- ✓ R-EN-Regionally Endangered
- ✓ R-VU-Regionally Vulnerable
- ✓ R-NT-Regionally Near-threatened
- ✓ R-RR-Species of regional responsibility

Habitat

- ✓ PM- Regular Passage Migrant
- ✓ AM-Intra-African Migrant

3.2 Results

3.2.1 Number of species

Forty-five bird species were recorded in the project site. Out of the 45, 32 species were recorded in and around the area to be inundated by the dam; 21 species recorded in the forest plantations especially on the edges, 33 recorded for the grassland, and 28 species recorded for the natural forest patches, also along forest edges.

Ninety Eight percent of the birds recorded are categorised as being of Least conservation concern (LC). Only the Grey Crowned Crane *Balearica regulorum*; is list as endangered (EN) on global scale but regionally near threatened. Two species of water birds were recorded in the valley along the river (area to be inundated). These were the black crake and the Grey Crowned Cranes. ***The two Grey Crowned Crane are reported to be common visitors in the area.*** The swamp along the river that will be inundated is a narrow stretch and has been interfered by the local community who harvest papyrus for crafts e.g. for mats and baskets, have water collection points at several places along the` river. Because of the level of human influence on the ecosystems, local people report that, they have never encountered any breeding sites for the Crested Cranes in the proposed project areas.

Table 109: Bird species recorded during the survey

No.	English name	Scientific name	IUCN Red List Status	National Red List status	No. seen	PW	FP	GL	NF
1	African grey hornbill	*Tockus nasutus*			1	*	*	*	*
2	African Harrier Hawk	*Polyboroides typus*			2			*	*
3	African Hawk Eagle	*Hieraaetus spilogaster*			2	*	*		*
4	African Moustached Warbler	*Melocichla mentalis*			1	*	*		*
5	African Paradise-flycatcher	*Terpsiphone viridis*			4	*	*	*	
6	African shrike flycatcher	*Megabias flammulatus*			1	*			
7	African Thrush	*Turdus pelios*			3	*	*	*	*
8	Black Coucal	*Centropus grillii*			1				*
9	Black crake	*Amaurornis flavirostris*			5	*			
10	Black-headed Heron	*Ardea melanocephala*			1	*		*	
11	Black-headed weaver	*Ploceus cucullatus*			14	*		*	*
12	Bronze Mannikin (swam)	*Lonchura cucullata*			15			*	
13	Bronze sunbird	*Nectarinia kilimensis*			1			*	*
14	Common Bulbul	*Pycnonotus barbatus*			7	*	*	*	*
15	Common fiscal	*Lanius collaris*			2	*	*	*	*
16	Common stonechat	*saxicolatorquata*			2			*	*
17	Crowned hornbill	*Tockus alboterminatus*			6	*	*	*	*
18	Eastern Grey Plantain-eater	*Crinifer zonurus*			4	*	*	*	*
19	Forest Robin	*Stiphrornis erythrothorax*			1				*
20	Great Blue Turaco	*Corythaeola cristtata*			4	*	*		*
21	Grey Crowned Crane	*Balearica regulorum*	EN, R-NT	EN A2b	2	*			
22	Grey headed sparrow	*Passer griseus*			1	*	*		*
23	Grey-backed camaroptera	*Camaroptera brachyura*			4	*		*	*
24	Grey-backed Fiscal	*Lanius excubitoroides*			1	*	*		
25	Hadada Ibis	*Bostrychia hagedash*			2	*	*	*	*
26	Hamerkop	*Scopus umbretta*			1			*	*
27	Lesser Masked Weaver	*Ploeceus intermedius*			10	*		*	
28	Long-crested Eagle	*Lophaetus occipitalis*			1			*	
29	Narina trogon	Apaloderma narina			1				*

30	Red chested cuckoo	Cuculus solitarius			1			*	
31	Red chested sunbird	Cinnyris erythrocerca			2	*		*	
32	Red-eyed Dove	Streptopelia semitorquata			2	*	*	*	*
33	Red-headed Malimbe	Malimbus rubricollis			1		*	*	*
34	Ring-necked Dove	*Streptopelia capicola*			7	*	*	*	
35	Scarlet-chested Sunbird	*Chalcomitra senegalensis*			5		*	*	*
36	Speckled Mousebird	Colius striatus			3			*	
37	Swamp Flycatcher	*Muscicapa aquatic*			1	*	*	*	
38	Tambourine dove	Turtur tympanistria			8	*	*	*	*
39	Variable sunbird	Cinnyris venusta			2			*	
40	White Browed Robinchat	Cossypha heuglini			1	*	*	*	
41	White-browed coucal	Centropus superciliosus			4		*	*	*
42	Yellow-fronted Canary	*Serinus mozambicus*			3	*		*	
43	Yellow-mantled widowbird	Euplectes macrourus			1			*	*
44	Yellow-whiskered greenbul	Andropadus latirostris			4				*
45	Black Kite	*Milvus migrans*			4	*		*	*
		Total Number				**27**	**21**	**33**	**28**

3.2.2 Impact of inundation and restoration/reforestation on the Birds

No negative impact is anticipated. Birds are mobile and as already pointed out, inundation and restoration will be gradual and not overnight. The Black Crake which is a wetland specialist, will be able to move upstream where they will find other wetland areas to live. Other birds will fly off to suitable areas for them to live.

4.0 Mammals

4.1 Materials and Methods

The mammals were surveyed in the project area using four survey methods as indicated below:

a. Direct enumeration: All mammals that were seen were identified to species level and the numbers of each species counted and recorded;
b. Identification of footprints and/or dung or calls; Footprints and dung of large and medium sized herbivores and carnivores are easily recognizable; footprints provide a relative index of the number of animals that use each specific site, and;
c. *Opportunistic encounters*: These include all opportunistic sightings while moving through the project area. These records are ideally not from designated sampling site but within the larger project area. They are essential in enriching the species list of the project area.
d. *Use of Traps*: Rodent traps were set up in the study area and small mammals caught were identified and recorded.
e. Local people and NFA staff were also consulted as they provide a valuable source of information. Some local people informed the study about the availability of some species of mammals.

Mammal identifications were based on Kingdon (1974), Delany (1975) and Kingdon *et al.* (2013).Elephant shrew short snoted senge

4.2 Results

4.2.1 Number of species

Ten mammal species were recorded during the survey. They included three rodents, one shrew, two carnivores, and four primates. These were recorded in different areas of the project site. In areas to be inundated by the dam none was recorded. In the grassland habitats six species were recorded, three in forest plantation, and five in the natural forest patches. The carnivores were only recorded in the grassland parts of the restoration area (barehills), while the primates were recorded in the North Eastern side of Rwoho CFR (restoration area) where a bit of natural forest exists.

Table 110: Mammal species encountered in the project site

Order	Scientific Name	English Name	IUCN Red List Status	National Red List Status	Remarks	PW	FP	GL	NF
Rodentia	*Aethomys hindei*	Hinde's Rock Rat	LC		Areas to be inundated by the dam		*	*	
Rodentia	*Lemniscomys striatus*	Striped Grass Mouse	LC		Recorded in the restoration/reforestation area		*	*	
Macroscelidea	*Elephantulus brachyrhynchus*	Short-snouted Elephant shrew	LC		One dead individual encountered in the study area		*	*	*
Rodentia	*Rattus rattus*	House Rat	LC	LC	Reported by farmers		*	*	
Carnivora	*Ichneumia albicauda*	White Tailed Mongoose	LC		Dung / Faecal material observed in restoration/reforestation area in the grass patch			*	
Carnivora	*Civettictis civetta*	African Civet	LC		Dung / Faecal material observed in restoration/reforestation area in the grass patch			*	
Primate	*Cercopithecus mitis*	Blue Monkey	LC		Seen in the western side of the restoration/reforestation area				*

Primate	*Cercopithecus ascanius*	Red Tailed Monkey	LC		Reported by NFA staff in the western side of the restoration/reforestation area				*
Primates	*Chlorocebus pygerythrus*	Vervet Monkey	LC	LC	Reported in western side of the restoration/reforestation area				*
Primate	*Papio anubis*	Olive Baboon	LC		Reported by NFA staff in the western side of the restoration/reforestation area				*
			Totals			**0**	**3**	**6**	**5**

None of the mammal species recorded are of conservation significance, according to the IUCN Red List. The species are listed as Least Concern (LC).

4.2.2 Impact of inundation and restoration/reforestation on the mammal
It was observed that the primates are in the north-eastern part of the proposed restoration area where natural forest patches occur. Since restoration is going to target use of indigenous tree species, then the patches should be left intact. The rodents will leave their niches as and when the water reaches their areas of abode in the areas that will be inundated by the dam. They have the capacity to move into agricultural landscape or into other refugia within the restoration areas. It is therefore anticipated that there will be no negative impact on the mammals. Any disturbance will be very minimal and temporary.

5.0 Butterflies

5.1 Methods
Transect counts were conducted covering the study areas. Any butterfly species seen while walking at a slow pace were listed as and when encountered. By use of a butterfly net any butterfly species seen is caught identified and recorded.

5.2 Results
5.2.1 Number of species
Four butterfly species were common in the study areas. The species were encountered in all the four habitat types i.e. along edges of the river in the areas to be inundated, in the forest plantation forest edges, in the grassland areas and in the natural forest patches.

Table 111: Butterfly species occurring in the project area

Scientific Name	English Name	IUCN Red List Status	National Red List Status	Numbers encountered
Neptidopsis ophine	Scalloped Sailer	LC		Abundant
Junonia tereo	Soldier commodore	LC		Abundant
Byblia ilithyia	Common Joker	LC		Abundant
Dixeia orbona	Small whites	LC		Abundant

None of the species recorded is categorised as of conservation concern by IUCN Red List of threatened species. They are all Least Concern (LC). All the four species are abundant in the project area.

Neptidopsis ophine

Junonia terea

Byblia ilithyia

Dixeia orbona

Figure 105: Some butterfly species common in the project areas

5.2.2 Impact of inundation and restoration/reforestation on the butterfly species

None is anticipated. Restoration will not be done overnight but will be a process.

6.0 Priority Areas for restoration/reforestation

Table 112: Number of species of each taxa recorded in each habitat type

Habitat Type	Butterfly	Amphibian	Reptiles	Birds	Mammals	Total
Papyrus Wetland	4	9	3	27	0	43
Forest Plantation	4	2	2	21	3	32
Grassland	4	0	3	33	6	46
Natural Forest Patches	4	6	6	28	5	49

The natural forest patch has the highest species richness, followed by the grassland area, and the area to be inundated. It should be noted that forest plantation goes parallel to the river so most species recorded in the forest patches were also recorded in the area to be inundated by the dam. Natural forest patches are more sensitive followed by the grassland habitat.

7.0 Recommendation

In terms of fauna, natural habitats have been reported to be rich in species richness, compared to area that have been altered. Since the natural forest shows the species richness, the species there should be used to colonize the areas that have been altered by community through cultivation and also forest plantation.

For restoration purpose, the natural forest should be given priority, including parts of the grassland habitat. Some grassland habitats are rocky but given time natural regeneration can take place. Areas for restoration therefore should be those running along side the river curving north east towards the natural forest patches.

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Plant species composition and distribution

No.	Family	Row Labels	Eucalyptus Plantation	Forest	*Loudetia* grassland	Pinus Plantantion	Wetland	Status
1	Blechnaceae	*Histiopteris orientalis*	1					Least Concern
2	Hypericaceae	*Psorospernum febrifugum*			1			Least Concern
3	Acanthaceae	*Acanthus pubescens*	1				1	Least Concern
4		*Asystasia gangetica*	1		1			Least Concern
5		*Brillantaisia cicatricosa*		1				Least Concern
6		*Dicliptera laxata*	1	1				Least Concern
7		*Dyschoriste radicans*	1					Least Concern
8		*Dyschoriste trichocalyx*			1			Least Concern
9		*Hypoestes triflora*	1	1				Least Concern
10		*Hypolepis sparsisora*		1				Least Concern
11		*Justicia matammensis*		1				Least Concern
12		*Monechma subsessile*			1			Least Concern
13		*Ruellia patula*			1			Least Concern
14	Amaranthaceae	*Achyranthes aspera*	1	1		1	1	Least Concern
15		*Aerva lanata*	1				1	Least Concern
16		*Amaranthus caudatus*	1					Least Concern
17		*Amaranthus hybridus*	1					Least Concern
18		*Amaranthus lividus*	1			1		Least Concern
19		*Amaranthus spinosus*				1	1	Least Concern
20		*Cyathula uncinulata*	1					Least Concern
21	Anacardiaceae	*Rhus natalensis*	1					Least Concern
22		*Rhus vulgaris*	1		1			Least Concern
23	Annonaceae	*Monanthotaxis ferruginea*	1					Least Concern
24		*Uvaria angolensis*	1	1	1			Least Concern
25	Apiaceae	*Apium leptophyllum*			1			Least Concern

26		*Diplolophium africanum*			1			Least Concern
27		*Diplolophium buchananii*			1			Least Concern
28	Apocynaceae	*Carrisa edulis*	1					Least Concern
29		*Ectadiopsis oblongifolia*	1					Least Concern
30		*Gongronema angolense*		1				Least Concern
31		*Motandra guineensis*		1				Least Concern
32		*Pentarrhinum gonoloboides*			1			Least Concern
33		*Secamone africana*			1			Least Concern
34	Arecaceae	*Phoenix reclinata*	1					Least Concern
35	Asparagaceae	*Asparagus africanus*			1			Least Concern
36		*Asparagus racemosus*	1				1	Least Concern
37	Aspleniaceae	*Asplenium abyssinicum*			1			Least Concern
38		*Asplenium aethiopicum*			1			Least Concern
39		*Asplenium buettneri*	1	1	1			Least Concern
40		*Asplenium elliotii*		1				Least Concern
41		*Asplenium erectum*		1	1			Least Concern
42		*Asplenium friesiorum*		1	1			Least Concern
43		*Asplenium holstii*		1				Least Concern
44		*Asplenium theciferum*			1			Least Concern
45	Asteraceae	*Ageratum conyzoides*	1		1	1		Least Concern
46		*Anisopappus abercornensis*			1			Least Concern
47		*Aspilia africana*			1	1		Least Concern
48		*Berkheya spekeana*	1					Least Concern
49		*Bidens grantii*	1		1	1		Invasive
50		*Bidens pilosa*	1	1	1	1	1	Invasive
51		*Conyza simentrensis*	1		1	1		Invasive
52		*Crassocephalum montuosum*	1	1		1		Least Concern
53		*Crassocephalum vitellinum*	1				1	Least Concern

54		*Dichrocephala integrifolia*	1			1		Least Concern
55		*Elephantopus scaber*			1			Least Concern
56		*Emilia abyssinica*	1			1		Least Concern
57		*Garbera scandens*			1			Least Concern
58		*Gynura scandens*					1	Least Concern
59		*Helichrysum appendiculatum*			1			Least Concern
60		*Helichrysum odoratissimum*	1		1			Least Concern
61		*Helichrysum schimperi*	1					Least Concern
62		*Laggera crassifolia*	1					Least Concern
63		*Melanthera scandens*	1				1	Least Concern
64		*Microglossa densiflora*	1		1		1	Least Concern
65		*Microglossa pyrifolia*	1	1			1	Least Concern
66		*Mikania chenopodifolia*					1	Least Concern
67		*Mikania cordata*	1					Least Concern
68		*Sonchus bipontini*	1					Least Concern
69		*Tagetes minuta*	1				1	Invasive
70		*Tridax procumbens*			1			Least Concern
71		*Vernonia adoensis*					1	Least Concern
72		*Vernonia amygdalina*	1			1		Least Concern
73		*Vernonia auriculifera*	1	1				Least Concern
74		*Vernonia biafrae*	1					Least Concern
75		*Vernonia brachycalyx*	1					Least Concern
76		*Vernonia karaguensis*	1		1			Least Concern
77		*Vernonia kirungae*	1					Least Concern
78		*Vernonia smithiana*			1			Least Concern
79		*Vernonia ssp*			1			Least Concern
80		*Vernonia syringifolia*	1					Least Concern
81	Balsaminaceae	*Impatiens burtonii*		1				Least Concern

82	Bignoniaceae	*Markhamia lutea*	1	1	1	1	1	Least Concern
83	Boraginaceae	*Cordia africana*		1				Least Concern
84		*Cordia millenii*	1				1	EN
85		*Ehretia cymosa*	1	1			1	Least Concern
86		*Markhamia lutea*	1					Least Concern
87	Capparaceae	*Capparis erythrocarpos*	1		1			Least Concern
88		*Capparis fascicularis*	1					Least Concern
89		*Capparis subtomentosa*	1	1				Least Concern
90		*Capparis tomentosa*	1					Least Concern
91		*Ricinus communis*	1					Invasive
92		*Ritchiea albersii*	1					Least Concern
93	Celastraceae	*Catha edulis*	1	1	1			Least Concern
94		*Loeseneriella apocynoides*		1				Least Concern
95		*Maytenus arbutifolia*	1					Least Concern
96		*Maytenus gracilipes*					1	Least Concern
97		*Maytenus heterophylla*	1	1			1	Least Concern
98		*Maytenus undata*	1					Least Concern
99		*Salacia elegans*	1					Least Concern
100		*Salacia erecta*	1					Least Concern
101	Chenopodiaceae	*Chenopodium foetidum*	1					Least Concern
102	Chrysobalanaceae	*Parinari curatellifolia*	1		1			Least Concern
103	Colchicaceae	*Gladiolus laxiflorus*			1			Least Concern
104		*Gloriosa superba*	1					Least Concern
105	Combretaceae	*Combretum molle*	1		1			Least Concern
106		*Combretum paniculatum*		1			1	Least Concern
107	Commelinaceae	*Aneilema aequinoctiale*	1					Least Concern
108		*Commelina africana*	1		1			Least Concern
109		*Commelina benghalensis*	1		1	1		Invasive
110		*Commelina diffusa*	1					Least Concern

111		*Commelina erecta*			1			Least Concern
112		*Commelina foliacea*			1			Least Concern
113		*Commelina latifolia*	1			1		Least Concern
114		*Commelina purpurea*	1					Least Concern
115		*Commelina subulata*			1			Least Concern
116		*Murdannia simplex*			1			Least Concern
117	Convolvulaceae	*Dichondra micrantha*	1					Least Concern
118		*Hewittia puccioniana*					1	Least Concern
119		*Hewittia scandens*	1		1			Least Concern
120		*Ipomoea tenuirostris*				1		Least Concern
121		*Lepistemon owariense*	1		1	1	1	Least Concern
122	Cornaceae	*Alangium chinense*	1	1				Least Concern
123		*Asparagus racemosus*			1			Least Concern
124	Crassulaceae	*Kalanchoe densiflora*	1					Least Concern
125	Cucurbitaceae	*Coccinea mildbraedii*	1	1				Least Concern
126		*Diplocyclos palmatus*			1			Least Concern
127		*Momordica foetida*	1	1		1		Least Concern
128		*Peponium vogelii*		1				Least Concern
129		*Zehneria scandens*	1			1	1	Least Concern
130		*Zehneria thwaitesii*				1		Least Concern
131	Cyperaceae	*Bulbostylis ugandensis*			1			Least Concern
132		*Cyperus alternifolius*	1					Least Concern
133		*Cyperus articulatus*	1					Least Concern
134		*Cyperus dichroostachyus*					1	Least Concern
135		*Cyperus difformis*		1				Least Concern
136		*Cyperus dives*	1				1	Least Concern
137		*Cyperus papyrus*					1	Least Concern
138		*Cyperus ssp*	1		1			Least Concern
139		*Kyllinga appendiculata*		1				Least Concern

140		*Kyllinga brevifolia*		1				Least Concern
141		*Kyllinga bulbosa*		1				Least Concern
142		*Kyllinga elatior*	1					Least Concern
143		*Mariscus sumatrensis*	1		1			Least Concern
144	Dennstaedtiaceae	*Blotiella natalensis*		1				Least Concern
145		*Pteridium aquilinum*		1				Least Concern
146	Dioscoreaceae	*Dioscorea bulbifera*	1					Least Concern
147		*Dioscorea quartiniana*			1			Least Concern
148	Dracaenaceae	*Dracaena laxissima*		1				Least Concern
149		*Dracaena steudneri*					1	Least Concern
150	Dryopteridaceae	*Dryopteris inaequalis*		1				Least Concern
151	Ebenaceae	*Diospyros abyssinica*	1					Least Concern
152	Euphorbiaceae	*Acalypha bipartita*				1		Least Concern
153		*Acalypha cordata*	1					Least Concern
154		*Acalypha ornata*	1					Least Concern
155		*Acalypha psilostachya*				1		Least Concern
156		*Acalypha volkensii*			1			Least Concern
157		*Bridelia brideliifolia*		1	1			Least Concern
158		*Bridelia micrantha*				1	1	Least Concern
159		*Bridelia scleroneura*			1			Least Concern
160		*Clutia abyssinica*	1					Least Concern
161		*Croton macrostachyus*		1		1		Least Concern
162		*Drypetes gerrardii*	1	1				Least Concern
163		*Erythrococca atrovirens*	1	1				Least Concern
164		*Flueggea virosa*	1	1		1		Least Concern
165		*Macaranga schweinfurthii*	1	1			1	Least Concern
166		*Phyllanthus amarus*			1	1		Least Concern
167		*Phyllanthus fischeri*	1					Least Concern
168		*Phyllanthus ovalifolius*	1	1		1		Least Concern

169		*Phyllanthus pseudoniruri*	1		1			Least Concern
170		*Ricinus communis*					1	Invasive
171		*Shirakiopsis elliptica*	1	1	1		1	Least Concern
172		*Tragia brevipes*	1				1	Least Concern
173	Fabaceae	*Acacia abyssinica*	1		1			Least Concern
174		*Acacia hockii*			1			Invasive
175		*Acacia montigena*	1					Least Concern
176		*Albizia adianthifolia*	1		1	1		Least Concern
177		*Albizia coriaria*			1			Least Concern
178		*Albizia gummifera*	1	1			1	Least Concern
179		*Caesalpinia decapetala*	1				1	Invasive
180		*Cassia didymobotrya*				1		Least Concern
181		*Cassia mimosoides*			1			Least Concern
182		*Crotalaria brevidens*			1			Least Concern
183		*Crotalaria goreensis*		1			1	Least Concern
184		*Crotalaria incana*					1	Least Concern
185		*Crotalaria orthoclada*					1	Least Concern
186		*Dalbergia lactea*	1					Least Concern
187		*Desmodium hirtum*	1		1			Least Concern
188		*Desmodium repandum*		1				Least Concern
189		*Dolichos sericeus*			1			Least Concern
190		*Entada africana*	1					Least Concern
191		*Eriosema montanum*	1					Least Concern
192		*Eriosema psoraleoides*			1			Least Concern
193		*Erythrina abyssinica*	1	1		1	1	Least Concern
194		*Glycine wightii*	1		1	1	1	Invasive
195		*Indigofera arrecta*	1					Least Concern
196		*Indigofera asparagoides*	1		1			Least Concern
197		*Indigofera atriceps*			1			Least Concern

198		*Indigofera brevicalyx*	1					Least Concern
199		*Indigofera garckeana*	1		1			Least Concern
200		*Kotschya africana*			1			Least Concern
201		*Macrotyloma axillare*	1		1			Least Concern
202		*Pseudarthria hookeri*	1		1			Least Concern
203		*Pterolobium stellatum*		1				Least Concern
204		*Rhynchosia densiflora*	1		1			Least Concern
205		*Rhynchosia goetzei*				1		Least Concern
206		*Tephrosia rhodesica*			1			Least Concern
207		*Trifolium rueppellianum*		1				Least Concern
208		*Zornia setosa*			1			Least Concern
209	Flacourtiaceae	*Dovyalis macrocalyx*		1				Least Concern
210		*Oncoba spinosa*	1	1				Least Concern
211		*Trimeria grandifolia*	1	1				Least Concern
212	Iridaceae	*Gladiolus laxiflorus*	1					Least Concern
213	Lamiaceae	*Hoslundia opposita*					1	Least Concern
214		*Leonotis nepetifolia*	1		1	1		Invasive
215		*Pycnostachys goetzenii*	1					Least Concern
216		*Solenostemon monostachyus*		1				Least Concern
217	Loganiaceae	*Anthocleista vogelii*		1				Least Concern
218		*Nuxia congesta*	1					Least Concern
219	Malvaceae	*Abutilon mauritianum*			1	1		Least Concern
220		*Dombeya kirkii*		1				Least Concern
221		*Dombeya quinqueseta*	1	1		1	1	Least Concern
222		*Grewia pubescens*		1				Least Concern
223		*Grewia similis*	1					Least Concern
224		*Hibiscus corymbosus*				1	1	Least Concern
225		*Hibiscus diversifolius*					1	Least Concern
226		*Hibiscus fuscus*	1					Least Concern

227		*Pavonia ruwenzoriensis*	1	1				Least Concern
228		*Sida rhombifolia*	1		1	1		Least Concern
229		*Sida ternata*	1					Least Concern
230		*Trimeria grandifolia*		1				Least Concern
231		*Triumfetta pilosa*	1					Least Concern
232		*Triumfetta rhomboidea*	1		1			Least Concern
233		*Triumfetta trichocarpa*	1	1	1			Least Concern
234	Melastomataceae	*Dissotis brazzae*			1			Least Concern
235	Melianthaceae	*Bersama abyssinica*	1	1		1		Least Concern
236	Menispermaceae	*Cissampelos mucronata*	1		1	1		Least Concern
237		*Cissampelos truncata*	1					Least Concern
238		*Stephania abyssinica*			1			Least Concern
239		*Tiliacora dinklagei*		1				Least Concern
240	Moraceae	*Ficus asperifolia*	1					Least Concern
241		*Ficus barteri*		1				Least Concern
242		*Ficus natalensis*		1				Least Concern
243		*Ficus ovata*		1			1	Least Concern
244		*Ficus ssp*		1				Least Concern
245		*Ficus sur*	1					Least Concern
246		*Ficus thonningii*					1	Least Concern
247	Myrsinaceae	*Maesa lanceolata*	1	1		1		Least Concern
248	Myrtaceae	*Eucalyptus grandis*	1		1		1	Least Concern
249		*Euclea racemosa*	1					Least Concern
250		*Eugenia capensis*		1	1			Least Concern
251		*Syzygium cordatum*					1	Least Concern
252		*Syzygium guineense*	1					Least Concern
253	Oleaceae	*Jasminum abyssinicum*	1	1		1		Least Concern
254		*Jasminum pauciflorum*	1					Least Concern
255		*Jasminum schimperi*		1				Least Concern

256	Onagraceae	*Ludwigia abyssinica*	1				1	Least Concern
257	Orchidaceae	*Aerangis ugandensis*		1				Least Concern
258		*Tridactyle tridentata*		1				Least Concern
259	Oxalidaceae	*Oxalis corniculata*	1				1	Least Concern
260	Passifloraceae	*Adenia bequaertii*		1			1	Least Concern
261		*Adenia cissampeloides*		1				Least Concern
262	Phytolaccaceae	*Hilleria latifolia*	1					Least Concern
263		*Phytolacca dodecandra*	1			1		Least Concern
264	Pinaceae	*Pinus patula*	1		1	1		Least Concern
265	Piperaceae	*Peperomia fernandopoiana*		1				Least Concern
266		*Peponium vogelii*	1					Least Concern
267		*Piper umbellatum*		1				Least Concern
268	Pittosporaceae	*Pittosporum mannii*		1	1			Least Concern
269	Poaceae	*Andropogon schirensis*			1			Least Concern
270		*Brachiaria brizantha*			1			Least Concern
271		*Brachiaria documbens*			1			Least Concern
272		*Brachiaria platynota*			1			Least Concern
273		*Cymbopogon caesius*			1			Least Concern
274		*Cymbopogon nardus*	1		1			Invasive
275		*Cynodon dactylon*	1				1	Invasive
276		*Digitaria abyssinica*	1			1		Invasive
277		*Digitaria velutina*	1			1		Least Concern
278		*Eleucine indica*	1					Invasive
279		*Eragrostis exasperata*		1				Least Concern
280		*Eragrostis mildbraedii*	1					Least Concern
281		*Eragrostis racemosa*			1			Least Concern
282		*Eragrostis tenuifolia*			1			Least Concern
283		*Hyparrhenia cymbaria*			1			Least Concern
284		*Hyparrhenia diplandra*	1					Least Concern

285		*Hyparrhenia filipendula*	1		1			Least Concern
286		*Hyparrhenia newtonii*			1		1	Least Concern
287		*Imperata cylindrica*	1					Invasive
288		*Leersia hexandra*					1	Least Concern
289		*Loudetia kagerensis*	1		1			Least Concern
290		*Melinis minutiflora*	1		1			Invasive
291		*Melinis repens*	1		1			Invasive
292		*Microchloa kunthii*		1				Least Concern
293		*Oplismenus hirtellus*		1				Least Concern
294		*Panicum brevifolium*	1					Least Concern
295		*Panicum deustum*	1		1	1		Least Concern
296		*Panicum maximum*	1					Least Concern
297		*Panicum nervatum*	1					Least Concern
298		*Panicum trichocladum*				1		Least Concern
299		*Paspalum scrobiculatum*			1			Least Concern
300		*Pennisetum purpureum*					1	Least Concern
301		*Pennisetum unisetum*			1			Least Concern
302		*Setaria incrassata*	1		1			Least Concern
303		*Setaria kagerensis*	1		1	1		Least Concern
304		*Setaria poiretiana*	1	1				Least Concern
305		*Setaria sphacelata*	1		1			Least Concern
306		*Sporobolus africanus*	1					Least Concern
307		*Themeda triandra*	1		1			Least Concern
308	Polygalaceae	*Carpolobia goetzei*	1					Least Concern
309		*Polygala albida*	1					Least Concern
310		*Polygala elliotii*			1			Least Concern
311		*Polygala ruwenzoriensis*	1					Least Concern
312		*Polygala sphenoptera*			1			Least Concern
313		*Securidaca longipedunculata*			1			Least Concern

314		*Securidaca welwitschii*		1	1			Least Concern
315	Polygoniaceae	*Polygonum strigosum*	1				1	Least Concern
316		*Rumex bequaertii*					1	Least Concern
317	Polypodiaceae	*Doryopteris kirkii*	1	1	1			Least Concern
318		*Loxogramme lanceolata*			1			Least Concern
319	Primulaceae	*Lysimachia ruehmeriana*	1					Least Concern
320	Proteaceae	*Protea gaguedi*			1			Least Concern
321	Pteridaceae	*Pteridium aquilinum*	1		1			Invasive
322		*Pteris catoptera*	1	1				Least Concern
323		*Pteris dentata*	1	1				Least Concern
324	Ranunculaceae	*Clematis simensis*	1				1	Least Concern
325	Rhamnaceae	*Gouania longispicata*	1	1				Least Concern
326		*Maesopsis eminii*				1		Invasive
327	Rosaceae	*Prunus africana*	1		1		1	VU
328		*Rubus apetalus*				1		Least Concern
329		*Rubus pinnatus*	1					Least Concern
330		*Rubus volkensii*	1					Least Concern
331	Rubiaceae	*Coffea eugenioides*	1					Least Concern
332		*Hallea stipulosa*	1	1				VU
333		*Pavetta intermedia*	1	1			1	VU
334		*Pavetta oliveriana*		1	1			Least Concern
335		*Pentas bussei*	1	1	1			Least Concern
336		*Pentas decora*			1			Least Concern
337		*Psychotria penduculiformis*		1				Least Concern
338		*Psydrax parviflora*		1				Least Concern
339		*Psydrax schimperianum*			1			Least Concern
340		*Rubia cordifolia*					1	Least Concern
341		*Rytigynia beniensis*		1				Least Concern
342		*Rytigynia bugoyensis*		1				Least Concern

343		*Rytigynia kigeziensis*			1	1		Least Concern
344		*Spermacoce princeae*	1		1			Least Concern
345	Rutaceae	*Clausena anisata*	1	1				Least Concern
346		*Fagaropsis angolensis*	1	1				VU
347		*Toddalia asiatica*		1				Least Concern
348		*Vepris nobilis*	1	1				Least Concern
349	Sapindaceae	*Allophylus abyssinicus*	1	1				Least Concern
350		*Allophylus africanus*	1					Least Concern
351		*Allophylus chaunostachys*	1	1				Least Concern
352		*Allophylus macrobotrys*		1	1			Least Concern
353		*Cardiospermum grandiflorum*					1	Invasive
354		*Cardiospermum halicacabum*		1				Invasive
355		*Dodonaea viscosa*	1		1			Least Concern
356		*Helinus mystacinus*	1	1			1	Least Concern
357		*Paulinia pinnata*	1	1				Least Concern
358	Scrophulariaceae	*Alectra sessiliflora*			1			Least Concern
359	Solanaceae	*Discopodium penninervium*	1					Least Concern
360		*Physalis peruviana*			1	1		Least Concern
361		*Solanum anguivi*				1		Least Concern
362		*Solanum macrocarpon*		1				Least Concern
363		*Solanum terminale*		1				Least Concern
364	Thelypteridaceae	*Pneumatopteris oppositifolia*		1				Least Concern
365		*Thelypteris dentata*					1	Least Concern
366	Typhaceae	*Typha domingensis*					1	Least Concern
367	Ulmaceae	*Celtis africana*	1	1			1	Least Concern
368		*Trema orientalis*	1	1				Least Concern
369	Urticaceae	*Droguetia iners*	1					Least Concern

370		*Laportea ovalifolia*					1	Least Concern
371		*Obetia radula*			1			Least Concern
372		*Pilea rivularis*		1				Least Concern
373		*Pouzolzia denudata*	1				1	Least Concern
374	Verbenaceae	*Clerodendrum myricoides*			1			Least Concern
375		*Clerodendrum rotundifolium*	1			1		Least Concern
376		*Clerodendrum sylvanum*	1	1				Least Concern
377		*Lantana camara*				1		Invasive
378		*Lantana trifolia*			1			Least Concern
379		*Lippia javanica*			1			Least Concern
380		*Premna angolensis*	1					Least Concern
381	Vitaceae	*Cissus oliveri*			1		1	Least Concern
382		*Cissus petiolata*					1	Least Concern
383		*Cyphostemma adenocaule*				1		Least Concern
384		*Cyphostemma bambuseti*	1				1	Least Concern
385		*Cyphostemma cyphopetalum*			1			Least Concern
386		*Rhoicissus tridentata*		1				Least Concern
387	Zingiberaceae	*Aframomum angustifolium*	1	1			1	Least Concern
388		*Aframomum singulariflorum*	1					Least Concern

APPENDIX 15: Signed minutes of the meeting between MWE and NFA on restoration/reforestation of Rwoho CFR (July 17, 2019)

MINUTES OF THE MEETING ON RESTORATION PLANTING FOR RWOHO CENTRAL FOREST RESERVE HELD ON THE 17/07/2019 AT NFA BOARDROOM

1. **Participants (see attached list)**

2. **Agenda**

    1) Prayer
    2) Communication from chair
    3) Communication from MWE
    4) Communication from the World Bank
    5) Discussions
    6) Way forward

The meeting was chaired by the Executive Director National Forestry Authority.

Agenda Item 1: Prayer

The prayer was led by Mr. Paul Buyerah Musamali, the Director Policy and Planning at the National Forestry Authority (NFA)

Agenda Item 2: Communication from the Chair

In his communication, the Chair welcomed the team from the Ministry of Water and Environment and the World Bank Group. Noted that several meetings have been held with the same team on the Irrigation project in Rwoho, he acknowledged recently receiving a set of ToR on the preparation of micro-catchment plans for Kabuyanda and Matanda and proposed meeting discussion points from MWE.

Agenda Item 3: Communication from MWE

This agenda item was led by the Commissioner – Water for Production Department (WfP) in the Ministry of Water and Environment (MWE).

The Commissioner thanked the Executive Director NFA for his continued cooperation with MWE on the Kabuyanda Irrigation Project, and noted that the Project appraisal is being finalized but there are outstanding issues that needed to be discussed with NFA. It was against this background that MWE requested for a meeting with the National Forestry Authority (NFA) to discuss the outstanding issues and to get confirmation on the processes and timelines to proceed with outstanding project activities.

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Agenda Item 4: Communication from the World Bank

This Agenda Item was led by the Senior Environmental Safeguards Specialist from the World Bank who highlighted the key issues the World Bank would like to be clarified by the meeting.

Agenda Item 5: Discussions

a. **(Discussion on issue no. 1 -PAPs within the 100 ha)**

MWE and NFA should jointly undertake ground truthing, i.e. marking out the reservoir area, verification of PAPs within the 100 ha to be inundated by the dam and undertake a biomass inventory for the plots which will only be partly inundated after the design review which resulted into reduction of the area from 302 ha to 100 ha.

The meeting resolved that NFA with support from MWE should come up with a joint team to prepare and agree on a reasonable budget and work plan for facilitating verification of the affected PAPs and revising the biomass inventory within the reduced 100 ha. The final inventory report to be ready by 15th, August, 2019.

b. **(Discussion on issue no. 2 - Licensing for the Dam and update of the Forest Management Plan)**

The Executive Director NFA confirmed that a license is required before implementation of any activities within the CFR, he quoted sections of the National Forestry and Tree Planting Act of 2003, Part V Section 41 Licenses 1) *"A responsible body may, subject to the management plan, grant a license to an interested person for (a) the cutting, taking, working or removing of forest produce from a forest reserve or community forest; or(b)the sustainable utilization and management of the forest reserve or community forest.*
(2) A responsible body shall in accordance with regulations, prescribe the terms, conditions, rights and fees for a license granted under this section."

The meeting was informed that since the License is issued in line with a Forest Management Plan, the existing Rwoho Forest Management Plan (2006 – 2026) will have to be revised to include Kabuyanda dam. In addition, the revised plan shall clearly indicate that the area to be restored/reforested under the project shall be planted with indigenous tree species and shall remain intact as a natural forest for biodiversity conservation in line with the Environment and Social Impact

Assessment (ESIA). The license for the project shall incorporate catchment management interventions that may fall within Rwoho CFR.

NFA is to carry out the revision of the Management Plan. The meeting was informed that the License can only be effective after approval of the ESIA by the National Environment Management Authority (NEMA).

The meeting noted that although the process of updating the Forest Management Plan requires stakeholder consultation, MWE has already carried out extensive consultation, as part of the project preparation, with different stakeholders, including communities and district and local government leadership and there is documented evidence of these consultations. NFA will use the outcome of these consultations to inform the revision of the Forest Management Plan, and will only carry out further consultations to address any identified gaps in the stakeholder consultation. Since the Forest Management Plan is critical to the start of the implementation, MWE and NFA agreed to fast track the revision of the Rwoho Forest Management Plan – following the following steps:

- Consultation and revising the Management Plan.
- Submission of the Management Plan to the NFA Board (by 30th September 2019).
- Review of the revised Management Plan by the NFA Board and submission to the Minister of MWE.
- Approval and signing of the revised Forest Management Plan by Minister **(by 30th October 2019).**
- Printing of the revised Plan (if there are no funds for printing, the revised Plan could be printed under the project, since once it is signed by the Minister it can be used to issue a license for construction of the dam).

MWE does not have to wait for the revision of the Management Plan before officially submitting a request for the License. Thus, MWE will submit the request for the license by August 15th, 2019.The meeting estimated that the License could be issued within one month of approval of the Management Plan by the Minister of MWE (potentially by 30th November 2019).

MWE and NFA agreed that procurement for construction works can be launched before acquisition of a license, thus following project Negotiations (expected in September 2019).

Mr. Paul Buyera, the Director Policy and Planning at NFA is the Focal Person for the updating of the Forest Management Plan. In order to expedite the Forest Management Planning process, NFA agreed to develop a budget proposal for facilitating the Planning to be discussed with MWE by 19/07/2019.

c. (Discussions on issue 3- Terms for reference for Restoration Planting

The meeting was informed that NFA will engage a contractor to raise the tree seedlings/saplings for the reforestation. The meeting was informed that although it is possible to engage one contractor to raise and supply the seedlings as well as carry out the reforestation, most firms would struggle to complete the assignment and it is advisable to have two separate contracts, one or raising the seedlings and another to carry out the replanting. The project shall maintain the restored area for a three (3) year period after which management shall revert back to NFA.

NFA noted that the ToR for the reforestation will have to be revised. The Bank requested that the revised TOR should show details of restoration activities with an implementation schedule and should also include the site species matching report prepared by NFA for the restoration area. The two ToR, for raising and supplying the seedlings, and for the reforestation are to be prepared by NFA and shared with MWE by 19th July 2017.

The meeting agreed that the procurement for the restoration activities, at least for raising the seedlings, will be launched right after negotiations (expected in September 2019) but the contract will only be signed once the project is effective (expected in April 2020).

The meeting noted that the best planting season in the Rwoho CFR is in September and that the seedlings need at least six months before they are replanted. Therefore, the replanting activities need to take into consideration seasonality and when the project becomes effective. The Financing Agreement should leave flexibility for the replanting to start within two years after Project effectiveness, or to consider preparatory activities including raising seedlings within one year after effectiveness.

d. Discussion on issue no. 4- Implementation arrangements for restoration

It was clarified in the meeting that all project fiduciary responsibilities (including procurement and ,financial management) is the responsibility of MWE. Therefore, the procurement for the reforestation activities, under Project Sub Component 1.3 will be undertaken through MWE; NFA will be responsible for preparing the terms of reference and will nominate representatives to the evaluation committee. NFA will also be responsible for the technical oversight for all the reforestation activities and thus will nominate representatives for the contract management committee.

NFA nominated the Director Natural Forests Mr. Mununuzi David as the Focal Point Person for reforestation planting activities under the project.

The Executive Director of NFA will be part of the Project Steering Committee, while the Director Natural Forest will be a member of the Technical Steering Committee.

f. Discussion on issue no. 6- ToR for micro catchment management plans

The NFA had not yet reviewed the ToR for the preparation of the Micro catchment Management Plan, and the meeting requested that in case of any comments on the ToR, NFA should share them with MWE by 19th July 2019.

g. Discussion on issue no. 7- roads within Rwoho CFR

MWE informed the meeting that part of the existing road will be inundated. NFA agreed for the affected road to be re-designed and re-routed within Rwoho CFR, as along as MWE compensates PAPs for the lost trees within the inundated area.

NFA also agreed for the road to be re-designed and re-routed by the works Supervising Engineer and the construction works to be carried out by the contactor for dam construction.

h. Discussion on issue no. 8- operating costs /COSTAB

Operating costs for restoration planting: NFA agreed to provide a detailed breakdown of the restoration planting activities, including the operational costs for NFA so that they can be included in the overall project cost. The costs should be detailed for each year of implementation. The detailed costs are to be shared with MWE by 19th July 2019.

i. Discussion on issue no. 9-MoU between MWE and NFA

It was resolved in the meeting that there is no need for an MoU between MWE and NFA, but that all conditions for the reforestation activities will be included in the Agreement to be signed between MWE and NFA as part of the conditions of the License.

Agenda Item no. 6- way forward

a) MWE/NFA to undertake ground truthing, verification of PAPs and tree inventory for the plots which were divided into two (2) by the revised design that reduced the inundated area to 100ha. This should be done before 15th/08/2019.

b) NFA to prepare a budget for the revision of the Rwoho CFR Management Plan, to be shared with MWE by 19th July 2019. The Forest Management Planning process shall use the existing data within the ESIA report, the final Forest Management Plan to be prepared before 30th/10/2019.

c) MWE should formally initiate the license application process by August 15, 2019.

d) As part of the reforestation ToR, NFA to prepare a detailed work plan laying out various restoration activities over a three year period indicating key milestones and timelines for achieving them. The project shall maintain the restored area for a three (3) year period after which management shall revert back to NFA. The revised ToR to be shared with MWE by 19th July 2019.

e) NFA will be responsible for raising planting materials required for restoration planting because of their technical expertise in tree planting and management of forests, but will use the services of a contractor to maintain the planted area. NFA will prepare ToR for the engaging the contractor for maintaining the planted area, either as part of the reforestation activities or separate. The ToR to be shared with MWE by 19th July 2019.

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Tom Okello Obong

Executive Director
National Forestry Authority

Date: 01/08/2019

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Eng. Gilbert Kimanzi

Commissioner
Water for Production Department
Ministry of Water and Environment

Date: 01/08/2019

List of participants

MINISTRY OF WATER AND ENVIRONMENT

ATTENDANCE REGISTER

Date: 17/07/2019 Venue: NFA BOARDROOM

Meeting Title: REFORESTATION OF RWOHO CFR UNDER THE (ICRP)

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MINISTRY OF WATER AND ENVIRONMENT -

ATTENDANCE REGISTER

Date: 17TH/07/2019 Venue: NFA BOARDROOM

Meeting Title: REGISTRATION OF RWOOD CFR UNDER THE (ICRP)

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