Republic of Uganda

Ministry of Water and Environment

Irrigation for Climate Resilience Project - P163836

KABUYANDA IRRIGATION SCHEME

Environmental and Social Impact Assessment

September 30, 2019

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 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

[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.

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°C with a range of between 13°C and 26°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 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

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

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**.

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:

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***

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

[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.

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 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.

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

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.