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REPORT ON

ADDENDUM ENVIRONMENTAL AND SOCIAL IMPACT OF THE ISIMBA HYDROPOWER PROJECT ON THE KALAGALA OFFSET AREA

PROJECT ID NO.: P133312

CREDIT NO.: 5653

Submitted To:

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June, 2017

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We, the under listed are the Team that has conducted this Environmental and Social Impact Assessment (ESIA) Addendum of Isimba Hydropower Project on the Kalagala Offset Area in the districts of Kamuli, Kayunga, Jinja and Bukiwi. This Environmental and Social Impact Statement was therefore, conducted under our direction and supervision.

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ACKNOWLEDGEMENT

The Consultants would like to express their gratitude and appreciation for the support, valuable and close cooperation with the Ministry's officials, World Bank team and other stakeholders during the period of the study.

EXECUTIVE SUMMARY

The Government of Uganda (GOU) and the International Development Association (IDA) signed the "Bujagali Indemnity Agreement" on July 18th 2007. This agreement was an integral component for the financing of the Bujagali Hydropower Project (BHPP) by the IDA/World Bank to offset potential impacts of the Project.

The Bujagali IA required GoU to:

- Set aside the Kalagala Fall Site (KFS) exclusively to protect its natural habitat and environmental and spiritual values in conformity with sound social and environmental standards acceptable to the IDA.
- Carry out tourism development activities at the Kalagala Falls site only in a manner acceptable to the IDA and in conformity with sound social and environmental standards.
- Not to develop power generation projects that could adversely affect the ability to maintain the above-stated protection at the Kalagala Falls Site without the prior agreement of the IDA and GoU.
- Conserve through a sustainable management programme and budget the present ecosystem of Mabira CFR, Kalagala CFR and Nile Bank CFR on the banks of Kalagala Falls (as such Reserves are included within the Kalagala Falls Site).

GoU decided to develop Isimba Hydropower Project (IHPP) 12 km downstream of KFS. The objective was to meet the National Development Plan goals by 2019. The table below summarizes the basic features of the three alternatives considered for IHPP development.

The basic features of the IHPP development Alternatives considered

HPP Alternatives	Upper reservoir level (m amsl.)	Maximum head (m)	Maximum design discharge (m^3/s)	Installed capacity (MW)	Total annual Energy (GWh)	Impacted river length within KFS (km)
Alternative 1	1055	17.7	1375	183.2	1063	5.7
alternative 2	1048	10.7	1375	101.94	622.52	0.6
Alternative 3	1043	5.7	1375	42.92	301.89	0

Out of the three Upper Reservoir alternatives for the IHPP development, the highest reservoir level alternative (Alternative 1) has been selected for the development based on the environmental, social and economic analysis despite its implications on the geographical boundaries of KFS. The Project has been under construction since April 2015 under a joint funding of GoU (15%) and China's Export-Import (EXIM) Bank (85%). China International Water & Electric Corporation (CWE) is undertaking the construction of the Project. Excavation of the dam and powerhouse has been completed with 79.3% of concrete works. The Projects's resettlement and rehabilitation works are nearing completion.

The environmental, social and resettlement studies for IHPP were completed in compliance with the National Policies, sectoral and cross-sectoral National Legislative Frameworks, International Treaties and Conventions, and the Environmental Policies as required by the National Environmental Management Authority (NEMA). NEMA, after review of the IHPP Environmental Study reports, gave conditional approval for the development of IHPP. The conditional approval required an Addendum to the ESIA study within 5 years focusing on environmental, social, cultural and spiritual impacts of IHPP on KFS.

The Addendum to IHPP ESIA addresses key issues raised by NEMA. The study has evaluated the impacts of IHPP development on the physical, biological, socio-economic, cultural and spiritual values of KFS. The impact identification is based on the overlap of the IHPP footprints and activities on the KFS baseline. Pragmatic and cost effective mitigation measures have been prescribed to address the impacts of IHPP on KFS.

The key physical environmental impacts of IHPP on the natural habitats and environmental values of the KFS are:

- Loss of KFS geographical area by 22.62% (288.89ha);
- Loss of free flowing river length by 56.1% (5.7km);
- Loss of free flowing water body area by 58.41% (252.61ha) with corresponding increase in the lentic habitat by 1242% (288.89ha);
- Loss of the Nile Bank CFR by 1.68% (11.9 ha);
- Loss of rapids and falls by 28.6% (2 rapids);
- Loss of Island groups by 57.14% (4 groups of Islands);
- Inundation of 47.15% existing wetlands; (21.52 ha); and
- Inundation of 33.75% existing woodlands (2.15 ha).

Aquatic biodiversity

The Aquatic biodiversity baseline study included determination of:

i. Features of shoreline topography, dominant aquatic machrophytes, water-flow regimes and land use at the immediate hinterland.
ii. Water quality characteristics.
iii. Relative abundance of the major classes of algae.
iv. Species diversity of benthic macro-invertebrates.
v. Aspects of fish studies derived from pre-construction period of BHP plant, including:
   - Comparative perspective of fish species diversity and relative abundance in the Upper Victoria Nile in 2000 and 2006 (from literature) with that of the current status (2016) in the Zone likely to be inundated by the IHPP (current data derived from interactions with the local fishermen).
   - Fish species of conservation significance and national commercial importance.

- The preferred food of key-stone fish species in the Upper Victoria Nile including the reproductive behavior of selected fish species and species diversity of the Haplochromine cichlids.

These guided evaluation of likely impacts on the KFS and formulation of mitigation measures where applicable.

The following likely negative and positive impacts on the KFS attributable to the IHPP were identified.

Likely impacts on aquatic macrophytes

The inundation of the reservoir of IHP plant will extend laterally and upstream to the KFS. Aquatic macrophyte flora at low lying banks like those at Kirindi Islands within the range of the inundation will be partially or totally submerged. Aquatic macrophytes notably *Vossia cuspidata, Eichhornia crassipes and Pistia stratiotes* (Nile cabbage) are expected to re-establish along the previously dry low lying shores within the short term. Other aquatic macrophytes and emergent aquatic flora including: *Phragmites mauritianus* should recolonize in the medium term. Such low-lying river banks will nature diverse arrays of phytoplankton species including epiphytic algae which will inturn attract micro and macro invertebrates and young fish. The new expansive low lying zones of inundation will be exposed to potential proliferation of the noxious water hyacinth previously in small pockets along the shore. Fish species preferring shallow waters including species of Haplochromines and *Oreochromis* (tilapia) are expected to establish new breeding grounds there within the short term. Portions of the river with steep banks will lose most of the patches of indigenous aquatic macrophytes in the short and possibly medium term, in view of lack of suitable foothold for re-establishment.

The impacts on the KFS will not be significant given that the steep and rocky banks are devoid of aquatic macrophytes. The negative impacts of the likely proliferation of water hyacinth along low lying shoreline should be controlled through organized mechanical removal by the local communities.

Likely impact on water quality, phytoplankton, macro fauna and fish

Increased suspended solids from dam construction processes plus the soil and organic debris from land use activities upstream translocated in run are likely to lead to enhanced turbidity and hence reduced water clarity.in the reservoir area as well as downstream of the IHP plant. This impact could in turn lead to reduction in algal productivity and reduced quantity of algae required to optimally sustain aquatic life. The impact should wane during early project operation period. Sustained community sensitization about proper land use practices should lead to reduced loss of soil to run-off.

Reduced water flow rate expected to occur in the main reservoir in presence of decomposing organic debris especially that of water hyacinth is likely to lead to persistent reduced oxygen

levels in the bottom reaches of the reservoir and the adjoining portion of the inundated river channel. Semi anoxic conditions at the bottom of the reservoir would force a displacement of macro-fauna that prefer oxygen rich environments by taxa tolerant of oxygen deficiency such as Chironomids. Similarly, fish that require high oxygen levels are not expected to occupy the low oxygenated zones of the dam reservoir.

Control of the constant inflow of water hyacinth debris down River Nile into the Dam reservoir using a diversion mechanism, for example is essential. Fish cage-culture like that practiced on the BHPP reservoir should be based on demand driven feeding technologies that control food delivery to avoid excessive accumulation of decomposing organic debris and subsequent reduction in oxygen levels.

Likely impact on fish habitats

The impacts on the natural fish habitats within KFS are caused by: i) change in the water environment from lotic to lentic, ii) effects of the dam wall in river connectivity, and iii) water inflow and outflow regime alterations resulting in reservoir water level fluctuations. Obstruction to river connectivity by the dam wall is a potential impact on the fish population by isolating the fish population. The impact is likely to be highly significant to migratory fishes migrating upstream to spawn due to the loss of spawning grounds.

Haplochromine and other fish species usually found in the well oxygenated habitats including sections of the KFS will be affected by the inundation of the IHP plant reservoir. Fish species intolerant of low oxygen level in the water will vacate the low oxygen habitats and migrate further upstream. The magnitude of the anoxic effects due to the inundation will likely wane further upstream into the KFS Zone due to reducing depth of the reservoir, hence the value of suitable habitats of the Extension Area of the KFS as a mitigation zone. The recent survey by NaFIRRI (2016) reported presence of *Neochromis simotes*, an endemic fish species of very high conservation importance at Kirindi, Isimba, Mbulamuti and Kakindu. While Isimba and Kirindi lie within the zone to be inundated by the reservoir, Mbulamuti and Kakindu which are located downstream of the IHPP will not. This is good news for the conservation efforts for *N. simotes*.

The presumed impact of hydropower dams on the fisheries of the Upper Victoria Nile was a common discussion point during the interview with the fishers. They point out that fish are mobile in search of food and or spawning/nursery grounds. Fish like *L. victorianus*, (Ningu,) *C. mosambicus* (Male) and *M. kannume* (Kasulubana) migrate upstream over long distances to spawn in streams that drain into River Nile. The streams offer ideal conditions of food and shelter for young fish. *Oreochromis* species (Ngege) migrate over shorter distances to spawn and brood their young in specific environments of shallow water and mostly sandy substrate. The fishers argue that construction of Bujagali Hydropower plant without upstream and downstream passage for fish blocked the migration of Ningu and other fish to spawning and nursery grounds. They

request that construction of Isimba Hydropower Plant should allow for upstream migration for Ningu and other mandatorily migratory fish species.

The natural habitats of riverine and migratory fish species particularly *M*. *kannume, B*. *altianatis and Labeo victorianus* are likely to be impacted due to the change in the natural environment from lotic to lentic. Similarly, the fish species of *Haplochromine cichilids* are also very likely to be severely affected from the change in the habitat. The predicted impacts on the *Haplochromine cichilids* are expected to be higher for species preferring the riverine shallow water littoral and sub-littoral sandy and rocky substratum. As *Labeo victorianus* and *Astatotilapia brownae* (critically endangered), *Neochromis gigas* (vulnerable) and *Xystichromis nuchisquamulatus* species are listed in the IUCN Red List, the envisaged impact is of high magnitude.

The impacts of IHPP on the KFS aquatic flora are low to insignificant. The IHPP inundation provides a comparatively larger wetland area along the reservoir periphery to recuperate the initial losses incurred during reservoir filling. Similarly impacts on the terrestrial flora are also low to insignificant. The upland area inundated by the IHPP reservoir on the KFS, particularly the Nile Bank CFR, comprises of modified floral habitats with commonly occurring scattered vegetation only and is of low significance.

Impact on islands

Island inundation is likely to impact on the natural habitats for water birds as islands provide refuge to birds for food, rest and nest. The impacts are of low magnitude.

Impacts on herps

The impacts of IHPP on the thinly populated mammals and herpetofauna of KFS are insignificant. However, enlargement of the water habitat has a positive impact on *Hippopotamus amphibius* and herpetofauna such as *Crocodylus niloticus,* although these species rarely appear in the Upper Victoria Nile including the KFS.

Tourism impacts

The key socio-economic impact of the IHPP development is on the tourism business of the Upper Victoria Nile. The primary tourism business in the Upper Victoria Nile is white water rafting. The impacts on rafting are due to loss of free flowing river length and associated natural rapids and falls. The IHPP development proposal inundates the following rafting tourism assets of the Upper Victoria Nile.

- Out of the available 17 falls/rapids between BHPP and IHPP, 8 of the rapids will be inundated after IHPP development. Out of the 8 rapids inundated 2 lie within the KFS.
- Out of the available 36.5 km of free flowing river between BHPP and IHPP, only 16.5km will remain for the white water rafters after the IHPP development. Of the total free flowing river stretch inundated, 5.7 km lies within the KFS.

The loss of free flowing river and the associated rapids will have primary impacts on the tourism business in the upper Victoria Nile. Since white water rafting utilizes the river section from Bujagali downstream to Isimba, losses incurred to the tourism economy could not be isolated for a particular segment of the river. The envisaged white water rafting tourism business collective loss in the upper Victoria Nile is estimated to be 40% to 50%. The estimated loss is based on a scenario where no further tourism diversification, promotion and infrastructure development are undertaken prior to or posterior to the IHPP development.

Impacts on the cultural and spiritual values

IHPP does not impact on the cultural and spiritual values of the Kalagala and Itanda Falls within the KFS with respect to the Buganda and Busoga heritage. A few spiritual sites of local significance in the villages of Nsiima, Kibaati, Wabirongo, and Kitambuza, will be closer to the reservoir shoreline after the IHPP inundation.

The anticipated IHPP impacts on KFS can be avoided with Alternative 3 of the IHPP development or minimized with Alternative 2. But a hierarchical mitigation principle for the IHPP development is not a realistic solution since:

- It does not meet the project development goal of generating 1,063 GWh of annual energy with a peaking energy of 183 MW to fulfil the near future energy demand. The IHPP Alternative 3 which avoids IHPP impacts on KFS, has a potential installed capacity of only 42.92 MW with an annual energy output of 301.89 GWh. Similarly, IHPP Alternative 2 with leaser impacts generates about 622.52 GWh of annual energy with a potential of 101 MW installed capacity. Both of these alternatives fall short of the 2nd National Development Plan objectives;
- On-going IHPP construction works have been designed for the IHPP Alternative 1. Required excavation works for the IHPP dam and power house and nearly 79% of concreting works of the structures have been completed. Overall over 45% of the construction works have been completed. Selecting the IHPP Alternative 2 or 3 at present will incur loss on investments already made;
- Resettlement and rehabilitation works planned for the IHPP Alternative 1 have been completed. Choice of Alternative 3 or 2, at this stage of project development, is likely to incur a loss on investments already made. Further, it will create confusion and loss of trust on Government planning by the local stakeholders; and
- It will be difficult to close the existing gap between power demand and supply situation without the IHPP Alternative 1 development as envisioned in the 2nd National Development Plan.

So, it has been proposed to mitigate the predicted impacts either within the remaining KFS limits or beyond the designated KFS, the predicted impacts, particularly loss of natural habitats of *haplochromine cichilids*, is not possible to be mitigated within the remaining KFS limits in the

spirit of Bujagali IA. It is therefore, proposed to modify the KFS geographical area to accomodate the IHPP unaffected areas of similar species composition and natural habitats within the protection regiem of KFS.

Such an area for KFS boundry modification is the upstream section of the Victoria Nile above the southern limits of the remaining the KFS between KFS and Bujagali Dam. This KFS Extension Area has very similar faunal and floral natural habitats including physical environments of KFS to house the KFS impacted faunal and floral natural habitats and additional faunal and floral assemblages and spiritual sites. The lost natural habitats of the *Haplochromine cichilids* species including target riverine fish of the KFS will not only be housed in this modified area of KFS, but, also expected to house additional endemic species and species of conservation significance (*Haplochromine cichilids)* in the modified KFS.

It is therefore recommended to adopt the option of modifying the KFS boundaries incorporating the KFS Extension Area (Modified KFS) to ensure exclusive protection of the natural habitats and environmental and spiritual values of the KFS in compliance with the spirit of Bujagali IA.

In addition to the modified KFS, to further ensure the protection and conservation of the IUCN Red List Haplochromine cichlids species including the riverine target fish the following mitigation measures are recommended:

- Short term, midterm and long term fishery monitoring to generate a complete database on the target riverine and *Haplochromine* fish species for the design and application of adaptive fishery management strategy in the future, which will include the followings:
    - Fishing regulation and fish habitat management along the reservoir shoreline and in the modified KFS river stretch focusing on the target riverine species and the IUCN Red List conservation species of *haplochromines.*
    - The one fish species that might be most significantly affected by the Isimba project is the as yet scientifically undescribed *Neochromis* sp. “Red Pelvics”. This presumed new species has only ever been found to date from from within the future Isimba reservoir area, downstream of the existing KFS. Because this fish may be at risk of global extinction, it is recommended that NaFIRRI carry out additional survey work in the Upper Victoria Nile to search for additional individuals of this presumed new species before filling of the Isimba reservoir commences. If and when additional individuals presumed to be this species are captured during this survey work, they should be kept live and brought into captivity for breeding attempts and possible future re-introduction to the wild in potentially suitable habitat, upstream or downstream of Isimba.

To mitigate the impacts on the loss of tourism resources and business due to IHPP, inclusion of tourism diversification, infrastructure development, and tourism asset development programs are key in enhancing sustainable tourism development. The programs should be aligned with the

Kalagala Offset Sustainable Management and the Kalagala Ecotourism Development Plan - which are due for review and updating.

The protection of the natural habitats and environmental and spiritual values of the modified KFS is likely to impose some restrictions or regulations on the currently ongoing socio-economic activities. Similarly, the development of tourism infrastructures and facilities within the modified KFS is also likely to impact on the economic activites and assets of the communities. Taking into consideration the already approved environmental, social and resettlement reports of IHPP, it is recommended prior socio-economic studies are carried out to identify the impacts of restriction/regulation plans and Tourism Development Plans within the modified KFS to enable development and implementation of appropriate mitigation measures to safeguard the livelihood activities and assests of the communities.

LIST OF ABBREVIATIONS

amsl	Above Mean Sea Level
AP	Affected Person
BHPP	Bujagali Hydropower Project
CDO	Community Development Officer
CFR	Central Forest Reserves
CITES	Convention on International Trade in Endangered Species
CR	Contractor Representative
CWE	China International Water & Electric Corporation
CWE	China Water and Energy
DEA	Directorate of Environmental Affairs
DESS	Department of Environmental Sector Support
EHA	Environment Hazard Analysis
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ERA	Electricity Regulatory Authority
ESIA	Environmental and Social Impact Assessment
EXIM	Export - Import
FIRRI	Fisheries Resources Research Institute
GHG	Green House Gas
GOU	Government of Uganda
ha	Hectare
IA	Indemnity Agreement
IAR	Implementing Agency Representative
IDA	International Development Association
IHPP	Isimba Hydropower Project
IUCN	International Union for Conservation of Nature
JHA	Hazard Analysis
JICA	Japan International Cooperation Agency
KFS	Kalagala Fall Site
KHPP	Kiira Hydropower Project
km	Kilometer
KOA	Kalagala Offset Area
KO-SMP	Kalagala Offset Sustainable Management Plan
kV	Kilovolt

kWh	Kilowatt Hours
m	Meter
m^3/s	Cubic Meter per Second
mm	Millimeter
MoEMD	Ministry of Energy and Mineral Development
MoGLSD	Ministry of Gender, Labour and Social Development
MoLHUD	Ministry of Lands, Housing and Urban Development
MoTWA	Ministry of Tourism, Wildlife and Antiquities
MoWE	Ministry of Water and Environment
MW	Mega Watt
NDP	National Development Plan
NEA	National Environmental Act
NEMA	National Environmental Management Authority
NFA	National Forest Authority
NaFIRRI	National Fishery Resource Research Institute
NGO	Non-governmental Organization
NHPP	Nalubale Hydropower Project
PAP	Project Affected Person
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
SEIA	Social Environmental Impact Assessment
SIA	Social Impact Assessment
ToR	Terms of Reference
UBOS	Uganda Bureau of Statistics
UEGCL	Uganda Electricity Generation Company Limited
UETCL	Uganda Electricity Transmission Company Limited
UGX	Ugandan Schilling
USD	United States Dollar
UTB	Uganda Tourist Board
UWA	Uganda Wildlife Authority
WWR	White Water Rafting

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1. Introduction

This Addendum Environmental and Social Impact Assessment (ESIA) report has been prepared in compliance with the Terms of Reference (ToR) signed between the Client "Ministry of Energy and Mineral Development" (MoEMD), on behalf of the Government of Uganda (GoU) and the Consultants on May 17th, 2016 (***Appendix 1***).

1.1 Indemnity Agreement and Kalagala Offset Sustainable Management Plan

1.1.1 Indemnity Agreement

GoU and the International Development Association (IDA) signed an Indemnity Agreement dated July 18th 2007. This agreement was an integral component for the financing of Bujagali Hydro Power Project (BHPP) by the IDA/World Bank to mitigate the potential impacts of the Project.

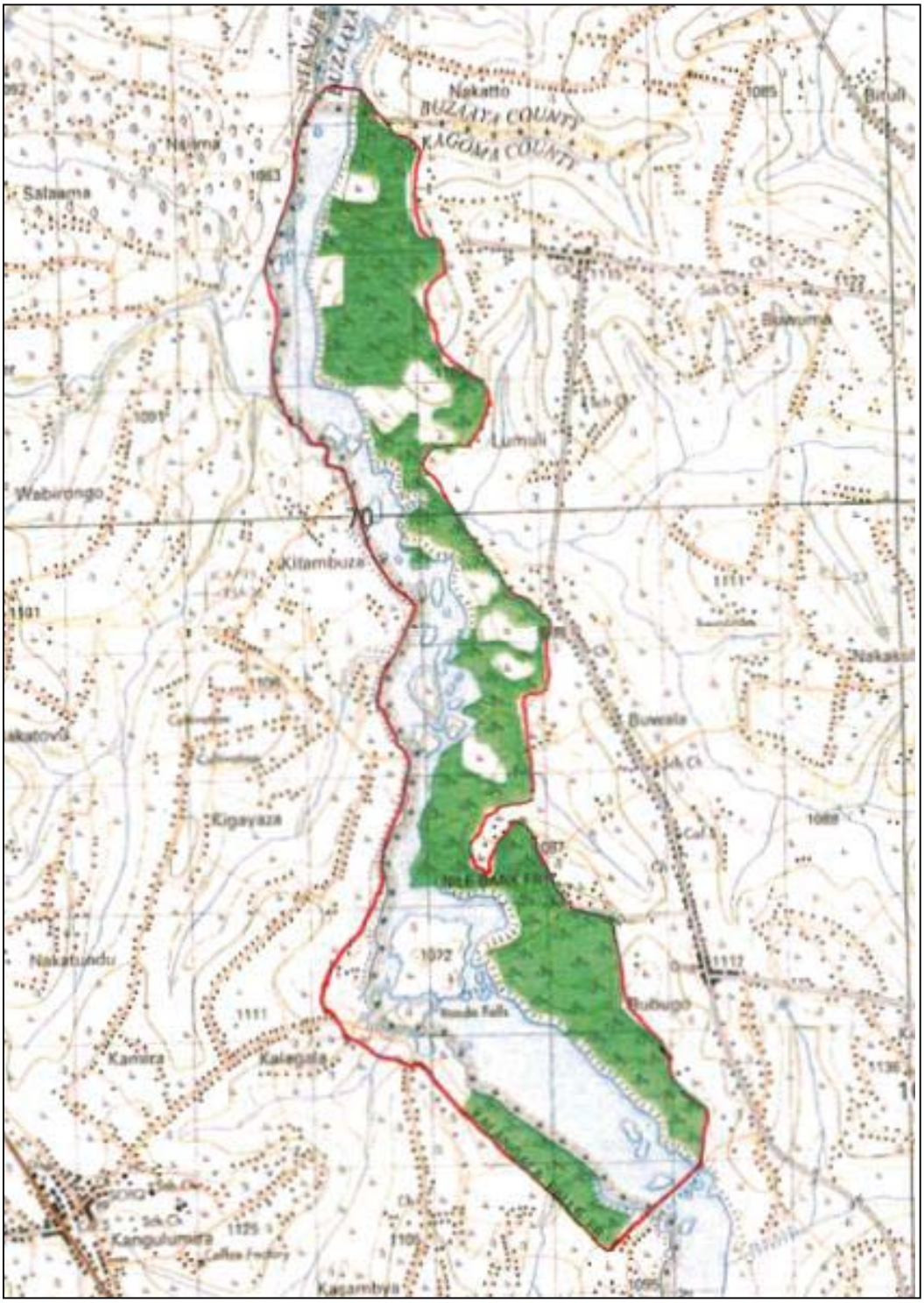
The Indemnity Agreement (IA) recognizes that the BHPP dam and reservoir would lead to significant irreversible negative impacts on the natural habitat and environment of the Bujagali area submerging the Bujagali Falls with associated islands, portions of the Jinja Wildlife Sanctuary and displace the several social, economic and cultural activities that were benefiting the communities of the area. In addition to the mitigation measures prescribed in the BHPP's Social and Environmental Action Plan, (2006), and Assessment of Past Resettlement Activities and Action Plan (2006), the IA included the Kalagala Falls Site (KFS) as an area set aside for the protection of ecologically similar areas lost as a result of BHPP (***Map 1***), which otherwise could not be mitigated within the BHPP affected area. The IA also included the Central Forest Reserve (CFR) of Kalagala and Itanda Falls (Kalagala Falls, and Nile Bank CFRs) within the KFS and the entire Mabira CFR close to KFS defined as the Mabira Ecosystem[1] as areas for sustainable management based on the sound social and environmental standards because of their ecological, social and economic values in the region.

The Indemnity Agreement under ***Section 3.06*** states "Uganda shall: **set aside the Kalagala Falls Site exclusively to protect its natural habitat and environmental and spiritual values in conformity with sound social and environmental standards acceptable to the Association**. Any tourism development at the Kalagala Falls Site will be carried out only in a manner acceptable to the Association and in accordance with the aforementioned standards. **Uganda also agrees that it will not develop power generation that could adversely affect the ability to maintain the above-stated protection at the Kalagala Falls Site without the prior agreement of the Association**. ***In addition, GOU undertakes to conserve through a sustainable management program and budget mutually agreed by the Government and the Association (no later than expiration of the prevailing sustainable management***

[1] *Follow up Kalagala Offset Sustainable Management Plan defines Mabira CFR as Mabira Ecosystem*

program or at such a later date as the Association may agree), the present ecosystem of the Mabira Central Forest Reserve, as well as the Kalagala Central Forest Reserve and the Nile Bank Central Forest Reserve on the banks of Kalagala Falls (as such Reserves are included within the Kalagala Falls Site)".

MAP 1: Kalagala Fall Site (KFS) Geographical Coverage as Annexed in the Indemnity Agreement 2007



The Bujagali IA geographically made clear distinction between KFS and the surrounding ecologically important sites, the Mabira CFR.

1.1.2 Kalagala Offset Sustainable Management Plan (KO-SMP)

The followup document of the Bujagali IA is KO-SMP. GoU prepared this Plan for the period 2010 - 2019[2]. The plan was prepared under the leadership of IUCN with the participation of key stakeholders such as: Government Ministries and Agencies, Local Governments, Communities, Civil Society Organizations, Private Actors and Cultural Institution.

The KO-SMP focuses on the goals, objectives, strategies and actions at the framework level for sustainable management and leaves the risk assessments of the intended management actions on the baseline of KFS and CFRs at a later stage prior to the implementation of the proposed management activities. It emphasizes the need for such assessment studies and their approval by the National Environmental Management Authority (NEMA) prior to the implementation of KO-SMP. At the framework level, the partnering institutions for KO-SMP implementation have been identified with details of their roles and responsibilities.

Ecologically, KO-SMP describes Kalagala CFR and Nile Bank CFR as highly modified forests once rich in trees and plants of *Celtis-chrysophyllum* and *Forest-Savanna Mosaic* comprising of *Maesopsis eminii, Milicia excelsa, Antiaris toxicaria, Acacia spp., Trichillia splendida, Ficus spp, Hallea stipulosa, Warbugia ugandansis,* etc. Agricultural encroachment is the key cause of the forest modification resulting up to 90 to 95 % loss of the original natural vegetation therby raising questions on the ability of the native floral species to primary ecological functions. However, the vegetation in the Itanda Island is described as relatively undisturbed but without supporting evidences.

The river bank ecology is also described as degraded due to agricultural encroachment. Discussions on the floral and faunal composition and their natural habitats are not provided except that fishing in the Victoria Nile is a key component of the socio-economic activities. In summary, the ecology of the KFS is stated to be fragile.

The key bio-physical features of environmental values in the KFS as per KO-SMP are Kalagala Fall, Itanda Fall, islands of Itanda and Muyanja and the associated waters of the Victoria Nile including the CRFs of Kalagala Fall and Nile Bank located on the western and eastern banks respectively. In other words, KO-SMP emphasizes the protection of Kalagala Fall, Itanda Fall, the interspaced islands of Itanda, and Muyanja between the falls and CFRs of Kalagala and the Nile Bank within KFS for the protection of environmental values.

[2] *Ministry of Water and Environment, 2010: Kalagala Offset Sustainable Management Plan, (2010 - 2019)*

The three sites: i) Kalagala CFR, ii) Muyanja Islands and iii) Itanda Fall, all located along the river banks, and islands of Kalagala Fall and Itanda Fall have been described as sites of cultural and spiritual values in the KFS. These sites are described as related to the historic heritage of Buganda and Busoga kingdom, its communities and tribes[3].

KO-SMP geographically does not make distinction between KFS and the Mabira CFR. Both of these areas have been compiled to one large area covering the villages between the KFS and Mabira CFR and includes other nearby CFRs namely: Namavundu, Namawanyi, Namananga, and Namakupa CFRs and natural or modified ecosystems lying approximately 3 km on either side of the River bank, (between Mabira, Nile Bank and Namavundu CFRs). ***MAP 2*** broadly outlines the geographical coverage of the KO-SMP implementation area. KO-SMP area coverage for sustainable management is much larger than envisaged in the Bujagali IA. KO-SMPalso came up with a new area known as the "Mabira Ecosystem" and defined it as the Kalagala Offset Area (KOA).

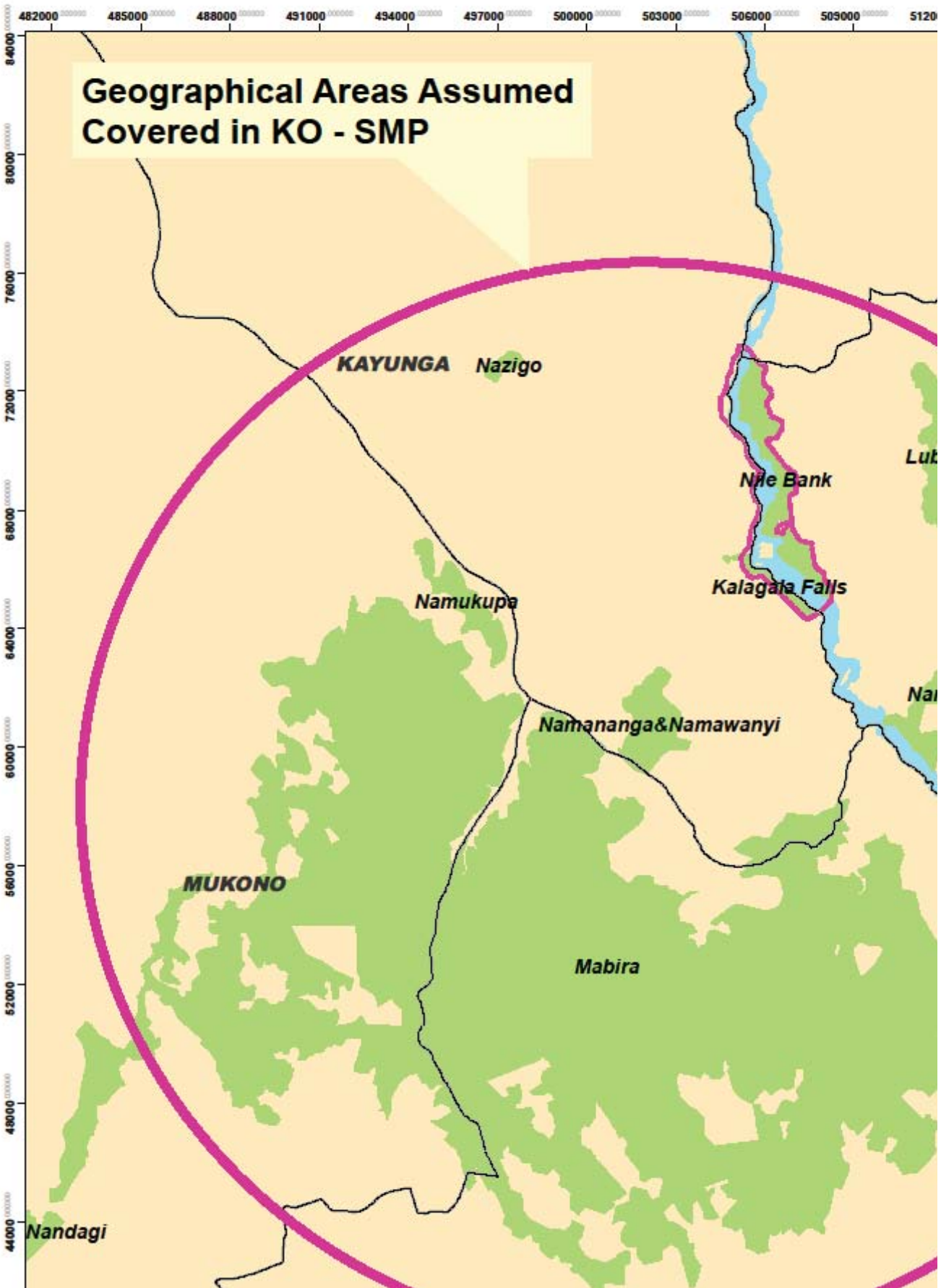
KO-SMP is designed to impart positive impacts on the environment and social wellbeing of the people of the Mabira ecosystem minimizing the adverse impacts, if any, through environmental governance with people's active participation. It is an ecosystem based plan which integrates the management of land, water and living resources to promote conservation and sustainable use in an equitable way.

The vision of KO-SMP is the sustainable development of the Mabira ecosystem by harnessing the natural, human and cultural assets associated with Kalagala and the Itanda Falls Site. The overall goal of KO-SMP is to transform KOA into a area for sustainable development in the Mabira ecosystem. To achieve the vision and goal KO-SMP has set the following 5 specific objectives.

- **Objective #1:** Protection of the natural habitat, environmental and spiritual/cultural values of Kalagala Falls and Itanda falls, and their environs;
- **Objective #2:** Promote sociol-economic and environmentally sound eco-tourism activities at the Kalagala Falls and Itanda Falls ;
- **Objective #3:** To promote the conservation of the ecological and social-economic values of the Mabira ecosystem;
- **Objective #4:** To integrate the Kalagala Offset into the social and economic development aspirations of the people nearby; and
- **Objective #5:** To harness the institutional capabilities for ensuring cost effective implementation of the Kalagala Offset sustainable management plan.

[3] *Ministry of Water and Environment, 2009. Kalagala Offset Sustainable Management Plan. Appendix 1: The Kalagala Itanda Eco-tourism Development Plan*

MAP 2: Geographical Areas Assumed Covered in KO-SMP



Each of the above objectives has outlined multiple outputs and activities of cross-sectoral nature which are to be implemented/executed by the cross-sector governmental and non-governmental lead agencies (***Table 1***).[4]

Table 1: KO-SMP Number of Objectives, Outputs, Activities and Lead Implementing Agencies

KO-SMP Objectives	No of Outputs	No of Activities	Lead Sector Agencies to be involved
Objective #1	7	25	MoWE, MoGLSD, NEMA, NFA, Districts, and Private sector.
Objective #2	6	15	MoTWA and NEMA
Objective #3	8	30	MoWE, NFA, NEMA, and Districts,
Objective #4	3	7	MoWE, MoTWA, NEMA, NFA and Districts
Objective #5	5	15	MoWE and NEMA
Total	**29**	**92**	**04**

Source: MoWE, 2010. Kalagala Offset Sustainable Management Plan (2010-2019), Popular Version.

The above objectives, outputs, and activities have been integrated in the following six autonomous development plans:

- Kalagala - Itanda Ecotourism Development Plan (2009)
- Framework for Integrating KO-SMP into the management of CFR.
- Management Plans for Mabira Forest Area.
- Management Plan for Nile Bank and Namavundu CFR.
- Management Plan for Kalagala Falls CFR.
- Framework for Integrating KO-SMP into District Development Plans

The Kalagala - Itanda Ecotourism Development Plan proposes the following developmental activities in and outside the KFS.

i) accessibility to KFS which includes opening and improvements existing of motorable roads from the touristic city centres of Uganda, opening and improvements of

[4] For details refer Table 2, Kalagala Offset Management Plan (2010-2019), Popular Version, MoWE, 2010.

motorable roads to the tourist centres within KFS, opening of foot trails, and walkways within the CFRs of KFS;

ii) establish and operationalize water based tourism facilities which include: construction and maintenance of the landing sites and take off facilities at various strategic locations within KFS, construction and maintenance of observatory towers and platforms at identified vantage points within KFS;

iii) Development of appropriate hospitality facilities in and around KFS, which includes construction and operation of accommodation facilities for all tourists, construction of leisure parks and picnic sites within KFS, construction and operation of public catering and hospitality centres in and around KFS, promotion and development of the Bujagali - Kalagala and Mabira CFR Kalagala corridors;

iv) Construction and management of the tourism information and interpretation centres in and around KFS;

v) Development and management of waste management facilities, which includes establishment and maintenance of public sanitation facilities within KFS, development and management of waste and sewerage management facilities in tourist areas, public hospitality centres and tourism information centres in and around KFS; and

vi) Development and maintenance of service facilities (electricity, water, communications medical and security) in and around KFS,

The primary objective of the above infrastructure facilities is to promote the tourism industry in the KFS and beyond whereas the secondary objective is to provide benefits to the communities living within the KFS administrative foot prints from the tourism industry.

Specifics on the protection activities within KFS are not listed in KO-SMP and are to be developed and designed after detailed baseline studies and assessment of the risks. Such plans, however, are proposed to be implemented only after the approval of NEMA.

Nonetheless, KO-SMP assumes no major impacts on to the natural and social resources. It further assumes that any untoward impacts will be mitigated through an adaptive management strategy. KO-SMP, as written, does not place additional legal restrictions on the use of natural resources within KOA.

The KO-SMP itself has not undergone the approval process as per the requirement of NEMA. However, it was adopted by the concerned Lead Ministry "Ministry of Water and Environment" (MoWE), Sector Ministries (MoTWA, and MoGLSD), independent Authorities (NFA and NEMA) and other stakeholder agencies for implementation. As KO-SMP has been under implementation since 2010, it is assumed that SES internalized in the plan is also acceptable to the parties of Association of the Bujagali IA.

Apart from the KO-SMP framework plan, no additional detailed plans, as proposed in KO-SMP have been developed and screened through the legal requirements of NEMA prior to the KO-SMP implementation. In other words, the outputs related to objectives 1 and 2 of KO-SMP have not been given due consideration in the study, design and NEMA approval prior to implementation.

1.1.3 Natural Habitats, and Environmental and Spiritual Values of KFS

The Bujagali IA and the follow- up document KO-SMP do not provide descriptions on the natural habitats and environmental and spiritual values of KFS. KO-SMP has a plan to protect the natural habitat and environmental and spiritual values of the Kalagala and Itanda Falls and their environs. Under this plan, it proposes a detailed study to document the environmental baseline and issues related to conservation/protection to design comprehensive management actions. From the available information, it appears that the responsible implementing agency has not conducted detailed studies to document the environmental baseline and describe the natural habitats and environmental and spiritual values of KFS.

Therefore the ambiguities with regard to the natural habitats and environmental and spiritual values of KFS are still subject to interpretation. Detailing out the natural habitats, environmental and spiritual values of KFS based on the detailed field surveys is out of the scope of this ToR. Nonetheless, the study has attempted to characterize the natural habitats, environmental and spiritual values of KFS based on secondary information and a limited level field surveys in conjunction with the statements made in the Bujagali IA and KO-SMP as mentioned in below.

1.1.3.1 Natural Habitats of KFS

The ecological descriptions of the Nile Bank and Kalagala Fall CFRs and the river bank areas provided in KO-SMP, as discussed in section 1.1.2, do not classify these sites to house a natural habitat for native floral and faunal species. The faunal and floral species presently housing KFS in CFR and river banks have been substantially modified by human activities and have lost the ability to carry out primary ecological functions. Limited field investigations and consultations with the local communities and concerned stakeholders also substantiate the findings.

The Atkins (2001)[5] and NaFIRRI (2016)[6] studies related to h*aplochromine cichilids* in the Upper Victoria Nile including the KFS shows a number of species with habitat specialization in the river stretch. Most of them are endemic species and some even included in the global conservation lists of IUCN (***refer section 4.1.2.2 E)***. Some of the species have a limited distributional range

[5] *Nile Power; W.S Atkins; and Fisheries Resources Research Institute, 2001. Haplochromine Habitats Study. Fisheries Resources Research Institute, Jinja*

[6] *National Fisheries Resources Research Institute (NaFIRRI), 2016. Habitat Characteristics and Haplochromine Fish Diversity of the Upper Victoria Nile: Towards the Development of Biodiversity Friendly Hydropower Projects. Draft Technical Report*

and are known to occur only in the Upper Victoria Nile. The natural habitats of these species formed of native communities in the river Victoria Nile are the natural habitats of the KFS.

For the purpose of this study, the riverine habitats housing the h*aplochromine cichilids* have been identified as the natural habitats of KFS.

1.1.3.2 Environmental Values of KFS

The Bujagali IA and the follow- up KO-SMP broadly identify the key component of the KFS environment as Kalagala Fall, Kalagala Fall CFR and Nile Bank CFR (refer section 1.1.1 and 1.1.2). KO-SMP in addition lists Itanda Fall, islands of Itanda and Muyanja and the associated waters and islands of the Victoria Nile as of environmental values of KFS.

The term "Environmental Value" has a wider meaning. The value is not only limited to the direct and indirect environmental services provided by the natural resources, but also includes the natural scenic beauty, aesthetics, and recreational use etc. The environmental values of the KFS are not explicitly defined in the Bujagali IA and subsequent KO-SMP. For the purpose for this study, all falls, rapids, free flowing river, islands and associated wetlands and woodlands of the Victoria Nile River apart from the Nile bank and Kalagala Fall CFR, attract a large number of tourists including water- based sport tourism.

1.1.3.3 Spiritual Value of KFS

KO-SMP lists the spiritual sites located on Kalagala Fall CFR adjacent to the Kalagala Fall on the west bank and on the Nile Bank CFR (east bank adjacent to the Itanda Fall) as sites of KFS spiritual values.

1.2 Isimba Hydropower Project Environmental and Social Impact Assessment

Feasibility studies including Environmental Impact Assessment (EIA), Social Impact Assessment (SIA) and Resettlement Action Plan (RAP) of the Isimba Hydropower Project's (IHPP) power plant, sub-station and transmission line were done in 2014 by the consortium of Consultants "Fichtner GmbH & Co. KG and Norplan AS and Air Water and Earth" for GoU.

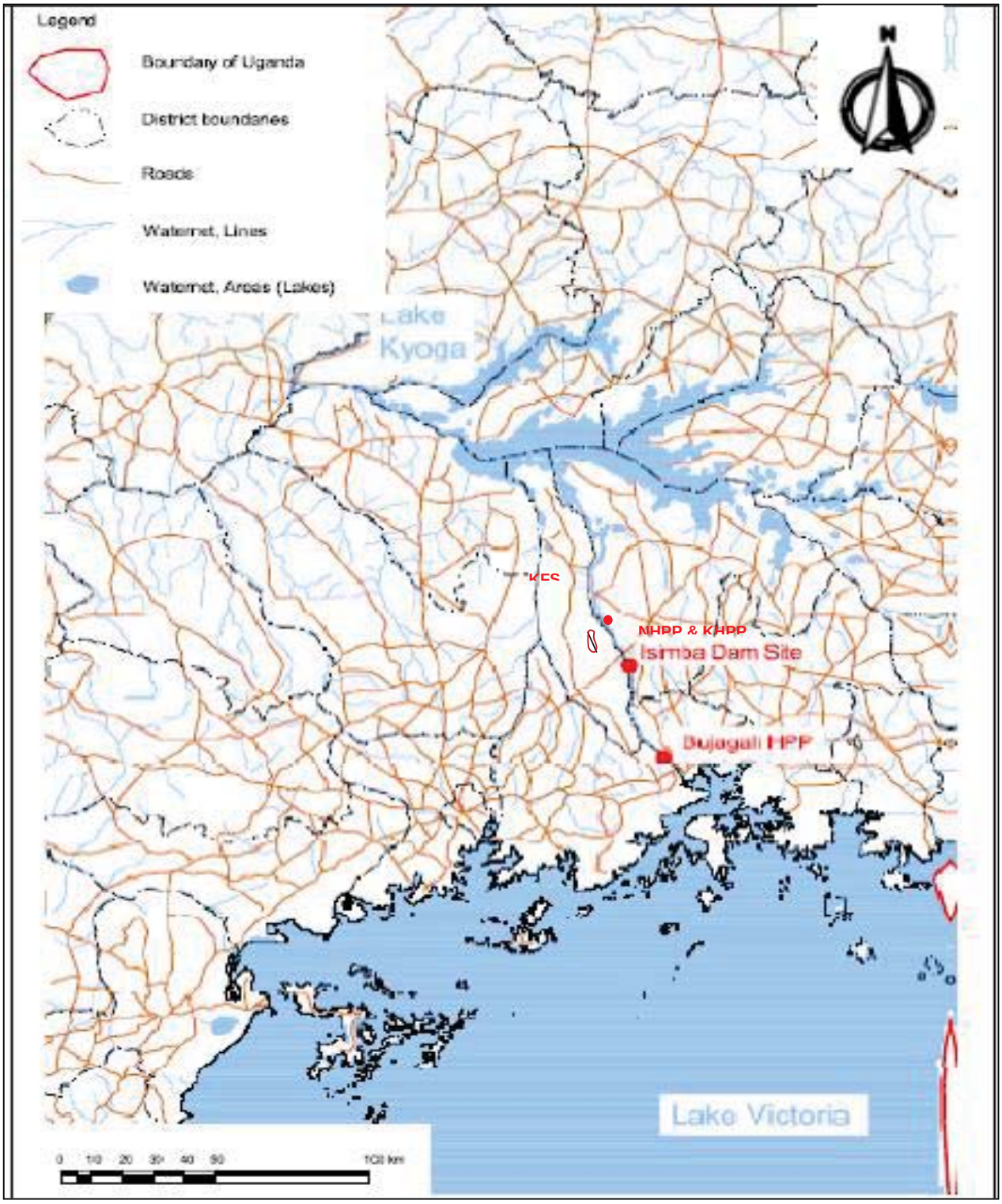
The IHPP power plant's dam is located some 36 km downstream of BHPP and about 12 km downstream of KFS (***Figure 1***). Prior to the final design of the power plant, a number of alternative dam site locations (location alternatives D1 to D4) and the reservoir's upper level boundary (upper reservoir level alternatives at 1055m amsl - Alternative 1, 1048m amsl - Alternative 2 and 1043m amsl - Alternative 3) were considered and discussed with GoUsoas to decide on the dam location, dam design and the upper reservoir level.

The details of these alternatives were included in the feasibility study reports[7], and EIA[8] study of the IHPP submitted to GoU. Based on the environmental, socio- economic considerations, Alternative D3 for dam location and Alternative 1 forthe upper reservoir boundary were selected for the final design. The selected upper reservoir boundary alternative i.e. Alternative 1, floods the KFS geographical areas impacting parts of its natural habitats environmental values. Under Bujagali IA, GoU has decided not to develop power generation projects that could adversely affect the ability to maintain the natural habitat and environmental and spiritual values of KFS without the prior consent of IDA and GoU.

[7] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.*

[8] *FITCHNER GmbH & Co. KG and NORPLAN AS, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir*

Figure 1: Location of the IHPP Dam and Power Plant



In view of the commitments of GoU in the Bujagali IA, the National Environmental Management Authority (NEMA), after detailed review of the EIA awarded a certificate (NEMA/EIA/6240) to

Ministry of Energy and Mineral Development on 19th May, 2015 approving the environmental and social aspects of the project (***Appendix 2***). To ensure compliance a number of conditions were attached to the certificate and one of them stated "Undertake a separate Environmental Impact Study of the Kalagala Off-set Area[9] taking into consideration the environmental and social impacts and the mitigation measures associated with the Isimba Hydropower Plant as it will impact on KOA[10]; and submit the ESIS Addendum for approval ". The Addendum ESIA was to be prepared prior to the validity period of five years from the time of conditional environmental approval for the development of the Isimba Hydropower Plant.

1.3 Purpose of the ESIA Addendum

The selected IHPP reservoir footprint extends beyond the northern boundary of KFS. Although the IHPP environmental and social studies have assessed the natural, social and cultural impacts comprehensively, the studies lack specific assessments of the IHPP impacts on KFS. Since protection of KFS from potential infrastructural development such as hydropower was one of the key responsibilities of GoU under the Indemnity Agreement, The World Bank (WB) raised concern on the IHPP development without additional specific environmental and social assessments of the IHPP development on the KFS. The concern was to ensure that the key objectives of the Indemnity Agreement are compiled within the needed revision on the KFS boundaries.

This study assignment "Environmental and Social Impacts of Isimba Hydropower Project on the Kalagala Offset Area (Addendum)" is designed to address the above concerns of WB owing to the development of IHPP. The assignment addresses one of the two key components: i) Addendum of the IHPP Environmental and Social Impact Assessment (ESIA) with focus on the KFS, and ii) design of a Long-term Conservation Options (LTCO) report to ensure the long term preservation of the KFS and the Mabira Forest Reserve. The IHPP Environmental and Social Impact Assessment (ESIA) focused on the KFS and is done in compliance with the Laws and Regulations of Uganda.

The specific purpose of the ESIA addendum study is to:

(a) assess the IHPP impacts (environmental and social) on KFS with particular focus on: i) alternative analysis, and ii) impacts associated with the hydropower plant including among others, inundation areas; aquatic biodiversity; spiritual values; tourism and recreation etc. but not limited to NEMA's conditional approval and GoU commitments under Bujagali IA; and

[9] *The Kalagala Offset Area to be understood as Kalagala Fall Site Area of Bujagali IA.*

[10] *The KOA to be understood as KFS of Bujagali IA*

(b) Addendum ESIA also intended to further strengthen the Environmental and Social Impact studies for IHPP to ensure that it (i) meets International Standards in addressing all impacts of the project on KFS.

1.4 Study methodology

Based on the ToR stipulations, the baseline environmental status of the study area have been mainly collected from the secondary information[11] available from the feasibility study reports, EIA, SIA and RAP reports of IHPP, SEIA report of BHPP, various maps published by the GoU line ministries and offices, and from FIRRI report 2001, NaFIRRI 2000, 2006, and 2016 and topographic maps and Google Earth images.

Additionally, field verification surveys were undertaken to document site specific environmental, social and cultural status and to understand the underpinning issues related to IHPP impacts on KFS natural habitats, and environmental and spiritual values.

Apart from stakeholder consultation meetings at Jinja and Kampala, Focus Group Discussions with the communities and the KFS Affected Persons (APs) were undertaken to solicit their views on the project. Key-informants were interviewed and consulted at local and institutional level (governmental and non-governmental) for feedback related to the project and its implications on the social and environmental areas specifically on the tourism industries operating along the Victoria Nile River.

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[11] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.; China International Water and Energy Corporation, 2014. Feasibility Study Report for the development of the 183 MW Isimba Hydro Power Plant & Isimba - Bujagali Interconnection Project; KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir; KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2014.Social Impact Assessment for Proposed Isimba HPP (Dam and Reservoir); KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2013.Resettlement Action Plan for proposed Isimba Hydropower Project (Flood Area); Burnside International Limited, 2006. Bujagali Hydropower Project Social and Environmental Impact Assessment; Baillie, JEM; Hilton-Taylor, C & Stuart, SN. (eds). 2004. 2004 IUCN Red Listof Threatened Species. A Global species Assessment. IUCN, Gland, Switzerland and Cambridge, UK; Carswell, M C. 1986. Birds of the Kampala Area. Scopus Special Suppl. 2, EANHS, Nairobi, Kenya; National Fisheries Resources Research Institute, 2000. Aquatic and Fisheries Survey of the Victoria Nile, Bujagali Hydropower Project, Final Report 1—8 August 2000. (Third quarter); National Fisheries Resources Research Institute, 2006. The First Quarter Survey of the Aquatic System and Fisheries of the Upper Victoria Nile, 6 to 13 April* 2006; Nile Power;W.S Atkins; and Fisheries Resources Research Institute, 2001. Haplochromine Habitats Study. Fisheries Resources Research Institute, Jinja; FIRRI, 2000. Report submitted to BHPP on the Third quarter survey 1st to 18th August 2000; Uganda Bureau of Statistics (UBOS), 2016. The National Population and Housing Census 2014 – Main Report, Kampala, Uganda; www.mwe.go.ug/index.php?option=com_docman&task=doc; Ministry of Finance, Planning and Economic Development, 2014. Poverty Status Report, 2014. Structural change and Poverty reduction in Uganda.; Kimbowa F., Nyakaana J.B., Ayorekire J. and Ahebwa W.M (2012) Environmental Implications of Tourism Development on River Nile, Uganda. MAWAZO Journal Vol. 11 (2) pp 69 - 80; Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa, E&D Consulting Services – Felixton, South Africa; Community Development Action Plan (2016) Draft Report. MoEMD Kampala; Department of Surveys and Mapping - 1: 50000 topographic maps; https://en.wikipedia.org/wiki/Geographyof Uganda; ttp://www.bestcountryreports.com/Precipitation_Map_Uganda.php; Department of Water Resources Management, Uganda; Water Resources of Uganda: An Assessment and Review. Journal of Water Resource and Protection, 2014, 6,1297-1315,http://www.scirp.org/journal/jwarp;http://dx.doi.org/10.4236/jwarp.2014.614120; http://www.scirp.org/journal/jwarp; http://dx.doi.org/10.4236/jwarp.2014.614120;

In KFS and its potential extension area, efforts were made to establish environmental and social baselines based on site specific measurements of water, air, and noise quality. Reconnaissance field visits and surveys were made to verify land use, and the status of the flora and fauna. Household's whose land and built-properties are located in KFS and KFS extension areas were identified. Structured questionnaire surveys of the sample households at KFS and KFS extension area were conducted separately to generate granular database to characterize the social, cultural and economic features.

Several maps were prepared for KFS and KFS extension area using Geographical Information System (GIS) tools for visual representation of the site conditions of KFS and KFS extension area, their environmental resources, and impacts of IHPP on KFS. The IHPP feasibility study maps, site verification information, topographic maps, Google images, KFS map as Annexed in the Indemnity Agreement, and published maps from various line Ministries, Departments and Agencies of GoU were used.

The significance impacts significance (adverse/ to beneficial) and ratings are based in three stage evaluation (negative-very large, large, medium and low, insignificant and positive-low, medium, large and very large) as explained below.

- *Impact severity*: how severe is the impact (negative, insignificant or positive) based on the functions of the followings:
    - impact magnitude;
    - impact extent;
    - impact duration; and
    - Receptor sensitivity.
- *Likelihood of occurrence*: how likely is the impact to occur; and
- *Identification of the impact significance*: how likely is the impact reversibility and irreversibility including the combination of the above two functions.

The process for stating the severity of the impact with the likelihood of the impact and its significance rating is shown as a matrix below (***Figure 2***).

Figure 2: Evaluation of impact significance and ratings

Impact Severity	Impact significance (Rating)								
	Negative					Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Positive very large									
Positive large									
Positive medium									
Positive low									
None									
Negative very large									
Negative large									
Negative medium									
Negative low									

1.5 Study limitation

Limited information specific to KFS in the earlier studies (contrary the to ToR stipulation) is the major limitation of the study for quality output. Despite the limitations, the team made significant efforts to generate primary level information to comply with international best practices and to meet the international standards in addressing the impacts of IHPP on KFS.

2. Policy, Legal and Institutional Framework

2.1 National Policy, Legal and Institutional Framework

The umbrella policy and legal instruments guiding the environmental and social assessment of the development projects in Uganda are the National Environment Management Policy, 1994 and the National Environment Act, 1995, framed and enacted within the policy and legal framework enshrined in the Constitution of the Republic of Uganda, 1995. Apart from these umbrella policies and legislation, environmental and social assessments are also required to comply with other sectoral policies and legislations of GoU framed and enacted from time to time to meet the development vis-a-vis environmental and social safeguards for sustainable development.

The National Environment Act (NEA), Cap. 153, stipulates the mandate of NEMA as "the principal agency in Uganda responsible for the management of the environment by coordinating, monitoring, regulating, and supervising all activities in the field of environmental. NEMA is a semi-autonomous regulatory Agency which draws the authority that is embedded in the National Environment Act Cap. 153, to:

- coordinate the implementation of Government policies and the decision of the Policy Committee on the Environment;
- ensure the integration of environmental concerns in the overall national planning through the coordination with the relevant ministries, departments and agencies of the government;
- liaise with the private sector, inter-governmental organizations, non- governmental and Government agencies of other states on issues relating to the environment;
- propose environmental policies and strategies to the Policy Committee;
- initiate legislative proposals, standards and guidelines on the environment in accordance with the law;
- review and approve Environmental Impact Assessments and Environmental Impact Statements submitted in accordance with the National Environment Act, Cap. 153;

Table 2 lists the key policies and legislative instruments including the National Environment Management Policy, 1994 and the National Environment Act, 1995, which need compliance for environmental and social assessments of development projects in Uganda.

Table 2: The Key Policy and Legislative Instruments for Environmental and Social Assessments of Development Projects

National Policies	National Laws and Regulations
• The National Environment Management Policy, 1994 • The Energy Policy, 2001 • The Renewable Energy Policy, 2007 • National Development Plan (NDP), 2010 • Master Plan Study on Hydropower Development in Uganda, 2010 • Uganda's Vision 2040 • National Gender Policy 1997 • HIV/AIDS Policy, 1992 • National Water Policy, 1999 • The Fisheries Policy, 2004 • Wildlife Policy, 1999 • The Forestry Policy, 2001 • Uganda Resettlement/Land Acquisition Policy Framework, 2002 • Wetlands Policy, 1995	• Constitution of the Republic of Uganda, 1995 • National Environment Act, Cap 153 1995 • Electricity Act, Cap 145, 1999 • Land Act, Cap 227, 1998, • Local Government Act, 1997 • Land Acquisition Act, 1965 • Historical Monuments Act, 1967 • The Mining Act, Cap. 148, 2003 • Employment Act, 2006 • Occupational Safety and Health Act, 2006 • The Physical Planning Act, 2011 • Public Health Act, Cap 281, 1964 • Workers' Compensation Act, 2000 • Petroleum Supply Act, 2003 • Water Act, Cap 152, 1997 • Road Act, Cap 358, • National Forestry and Tree Planting Act, 2003 • Environmental Impact Assessment Regulations, 1998 • National Environment (Noise Standards and Control) Regulations, 2003 • National Environment (Waste Management) Regulations, 1999 • National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001 • Draft National Air Quality Standards, 2006. • National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999

National Policies	National Laws and Regulations
	• National Environment (Wetlands, River Banks and Lakeshores Management) Regulations, 2000

Details of the sector specific key policies and legal provisions on the environment and sustainable development apart from the umbrella environmental policies and legislations are presented in ***Appendix 3.***

Within the framework of the umbrella and sector specific policies and legislation following governmental and non-governmental institutions and civil societies are mandated for participatory environmental planning and management for the development of hydropower projects. The key government institutions and their roles and responsibilities in the planning and development of hydropower projects are briefly summarized in ***Table 3***.

Table 3: Institutional Framework for Hydropower Development Projects, Roles and Responsibilities

Key Institutions	Roles and Responsibility
Ministry of Water and Environment (MoWE)	Responsible for setting national policies and standards, managing and regulating water resources and determining priorities for water development and management through its Directorates: • Directorate of Water Resources Management - for Water Quality Management and trans-boundary water management • Directorate of Environmental Affairs - for issues related to climate change, Environment Support Services, effective governance of the forestry sector, and protection of wetland resources
Ministry of Energy & Mineral Development, (MoEMD)	Responsible for the energy sector, dealing specifically with policy formulation, policy implementation and monitoring. Electricity Regulatory Authority (ERA) under this Ministry is charged with the mandate of regulating the energy sector, independent of the Ministry.
Uganda Electricity Transmission Company Limited, (UETCL)	UETCL is the proponent and is responsible for all activities involved with project construction and operation
Uganda Electricity Generation Company Limited, (UEGCL)	UEGCL is a corporate body incorporated under the Companies' Act (Cap 110), the Laws of Uganda and in conformity with the Electricity Act, 1999. The company is the implementing agency of the Government of Uganda for the development of Hydropower Stations and other renewable energy projects. It is also responsible for the overseeing and monitoring of operation and maintenance of energy projects including environmental effects of energy project development and operation. It is also responsible for the development of appropriate policies to safeguard the environment and social issues of the energy project in compliance to international standards. Thus it is involved in the EIA, SIA and RAP studies and their implementation.
Ministry of Lands, Housing and Urban	The mandate of MoLHUD is to ensure sustainable and effective use and

Key Institutions	Roles and Responsibility
Development, (MoLHUD)	management of land and orderly development of urban and rural areas as well as safe, planned and adequate housing for socio-economic development. The District Land Board under the Ministry has a duty to: i) Facilitate the registration and transfer of interests in land, (iii) Cause surveys, plans, maps, drawings and estimates to be made, (iv) Compile and maintain a list of compensations payable with respect to crops, building of a non-permanent nature after consulting the Technical Officer s of the district, (v) Review compensation rates every year. Thus, it is involved in the RAP study and fixation of compensation rates.
Ministry of Gender, Labor and Social Development, (MoGLSD)	Responsible for coordinating social development in Uganda including energy development. MoGLSD is responsible for inspecting the status of occupational safety, labor relations, community empowerment, protection and promotion of rights and obligations of vulnerable groups for social protection and gender-responsive development.
Electricity Regulatory Authority, (ERA)	Electricity Regulatory Authority (ERA) is a Statutory Body established in the year 2000 in accordance with the Electricity Act 1999 (Chapter 145 Laws of Uganda) to regulate the generation, transmission, distribution, sale, export & import of electrical energy in Uganda. The Electricity Regulatory Authority's Regulatory mandate is to supervise all licensed companies within the electricity sector to ensure they comply with the Electricity Act 1999 and Regulations thereto; It has a role to oversee the environmental and social safeguards of licensed projects.
Ministry of Tourism, Wildlife and Antiquities (MoTWA)	The Department of Monuments and Museums under the Ministry is responsible for the protection, promotion and safe guarding the cultural and natural heritage of Uganda through collection, conservation, study and information dissemination for enjoyment and education. The Department of Tourism Development under the Ministry is responsible for the planning, development and monitoring of the tourism sector with due regard to the economic, social, environmental and cultural development apart from formulating policies. The Wildlife Conservation Department is responsible for the formulation, monitoring and evaluation of implementation of policies, national plans, legislation, guidelines, and strategies on conservation and development of wildlife resources, and provides appropriate and timely advice to the Government.
Local Governments	The district governments (with administrative units in county, sub-county, Parish and villages) affected by the project as mandated by the Local Government Act are responsible to guide project implementation at a local level, land acquisition implementation requirements and make decisions regarding actions to solve problems and designate the following officers to solve problems. • Community Development Officer - community development

Key Institutions	Roles and Responsibility
	• Local Council Courts - responsible for grievance handling on land disputes, identifying customary hire, damage of property, trespass, contracts, assaults and debts • District Land Board - Facilitate the registration and transfer of land ownership, compile and maintain a list of compensation rates payable in respect of crops, buildings of non-permanent nature and any other thing that may be required • Village Land Committees - Responsible to manage and deal with social issues that arise out of resettlement

2.2 International Conventions and Treaties

The key international conventions and treaties, where GoU is a signatory and attracted by the hydropower project development are:

- Convention on Biological Diversity, 1992;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973 Convention (No.169) Concerning Indigenous and Tribal People in Independent Countries 1989; United Nations Framework Convention on Climate Change 1992;
- The Ramsar Convention, 1971;
- The African Convention on the Conservation of Nature and Natural Resources, 1968
- The World Heritage Convention, 1972;
- The Stockholm Declaration, 1972;
- Bonn Convention, 1979;
- East African Community Protocol on Environment and Natural Resources, 2006;
- The Convention on Wetlands of International Importance Especially as Waterfowl Habitats, 1975;
- The Nile Basin Cooperation Framework Agreement, 2010 (Replacing the Colonial era Nile Protocols of 1929 and 1959); and

The key provisions of the International Convention and Treaties related to hydropower development are briefly highlighted in ***Appendix 4***.

2.3 Bujagali Indemnity Agreement

The Bujagali IA as elaborated in Section 1.1 GOU should:

- Set aside the KFS exclusively to protect its natural habitat and environmental and spiritual values in conformity with sound social and environmental standards acceptable to IDA.
- Carry out tourism development activities at the KFS only in conformity with sound social and environmental standards and in a manner acceptable to IDA.
- Not to develop hydropower projects that could adversely affect the ability to maintain the Kalagala Falls Site without the prior agreement of IDA and GoU.
- Conserve through a Sustainable Management Programme and budget, the present ecosystem of Mabira CFR, Kalagala Fall CFR and Nile Bank CFR on the banks of Kalagala Falls (as such Reserves are included within the KFS).

In conformity with the Bujagali IA, GoU has prepared a Kalagala Offset Sustainable Management Plan (2010-2019), with the active participation of the concerned governmental and non-governmental agencies in the leadership of IUCN in 2010. KO-SMP is a multi-sectoral plan that addresses (i) ecotourism, (ii) forests, (iii) river banks, (iv) land use, (v) cultural resources, and (vi) community development with cross-sectoral objectives, outputs, and activities which are to be implemented under the purview of cross-sectoral environmental policies and legislative tools of GoU involving 3 Central Government Ministries, 2 Central Government autonomous Authorities, 4 District Governments and a host of private sector stakeholders.

KO-SMP has been under implementation since 2010/2011 under the leadership of the Ministry of Water and Environment (MoWE). The Department of Environmental Sector Support (DESS) under the Directorate of Environmental Affairs (DEA) of MoWE is co-coordinating the KO-SMP implementation.

The KO-SMP implementation is lagging behind its targeted activities and outputs as per the plan to meets its objectives. The key issues related to the slow pace of KO-SMP implementation are the complicated legal and regulatory mechanism governing KO-SMP apart from inadequate funds.

3. Isimba Hydropower Project description

IHPP is situated at the cross-junction of Central and Eastern Uganda across the Victoria Nile between the Victoria and Kyoga lakes. It lies approximately 61 km downstream of the source of theVictoria Nile i.e. Victoria Lake. There are three hydropower projects upstream of IHPP across namely i) 180 MW Nalubale Hydropower Project (NHPP), ii) 200 MW Kiira Hydropower Project (KHPP) and iii) 250 MW BHPP located approximately 3 km, 4 km and 25 km downstream from the lake Victoria, respectively (refer ***Figure 1***). IHPP is located about 36 km downstream of BHPP and about 12 km downstream of KFS.

IHPP has an installed capacity 183 MW as designed by Fichtner JV in 2012[12]. It is a run of river (RoR) Project for peak power generation in the morning and evening hours. ***Table 4*** depicts the salient features of IHPP.

Table 4: IHPP salient features (After Ficthner JV, 2012)

Particulars	Dimensions
Location	Central and Eastern Region of Uganda in the districts of Kayunga, Kamuli and Jinja
Source	Victoria Nile
Catchment at dam site	184,000 km^2 including Lake Victoria (68,800 km^2)
Long term average annual runoff	269.4*10^8 m^3
Long term average annual flow	854.1 m^3/s
Discharge for power generation	1375 m^3/s (Rated discharge of BHPP)
Normal water level	1054.5 mamsl
Minimum reservoir level	1052.5 m amsl
Tail water level (4 units in operation)	1039.1 m amsl
Maximum Reservoir (flood) level	1055 m
Reservoir capacity at normal water level	160,800,000 m^3
Reservoir capacity at flood water level	170,700,000 m^3
Reservoir area at normal water level	19.4 km^2
Reservoir length at normal water level	Approximately 17 km
Reservoir area at maximum flood Level	20.05 km^2
Reservoir Length at maximum flood level	Approximately 18 km
Dam Structure	Comprises of two dam structures. On the right hand side is a concrete gravity dam associated with the powerhouse and on the left side an earthern rock dam
Dam crest elevation	1057.5 m
Dam height from foundation level	Concrete gravity dam = 34.5 m, Earthen rock dam = 28.5 m
1000 years design flood level	1054.8 m (for Q=3500 m^3/s)
10000 years check flood level	1055.0 m (for Q=4500 m^3/s)
20 years construction/diversion flood	2200 m^3/s
Powerhouse	
Gross head	15.4 m

[12]*KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a*

Particulars	Dimensions
Net head (assuming loss of 0.3 m)	15.1 m = Rated head of turbine
Discharge for 1 turbine	343.75 m^3/s
Discharge for 4 turbines	1375 m^3/s
Assumed overall plant efficiency	0.9
Installed capacity (4 turbines)(4*45.8)	183.2 MW
Minimum discharge for power generation	343.75 m^3/s
Annual Energy	1039 GWh (FR CIWEC), 1063 GWh (FR Ficthner)

3.1 Project Rationale and Project Alternatives

3.1.1 Project Rationale

During the IHPP feasibility study the total installed capacity of the Ugandan energy system was about 575 MW[13]. The implementation of BHPP and other additional energy projects make up the total installed capacity to 895.5 MW by 2016. Although, the implementation of BHPP and other small projects have improved the current energy situation in Uganda, it still has a shortfall in the energy demand. The power demand in Uganda is projected to grow between 8 and 10% per year for the next decade and by 2023 the power demand is projected to reach above 1100 MW[14]. To fulfill this need of a sizable power project in the near future is necessary.

The Power Sector Investment Plan (PSIP) 2011 and Hydro Power Master Plan 2011[15] investigated different alternative sources and development options for the development of Uganda's power ggenerating system to meet the projected power shortages. Both of these studies identified hydropower as the most practical and prospective energy source in Uganda. Other energy soucres such as wind, solar etc were not recommended by these studies because of the economic and technical considerations.

Further, these studies analysed a whole range of potential hydropower project sites and ranked them according to various techno-economic as well as environmental and socio-economic criteria. Of the 7 potential hydropower projects evaluated in the Hydropower Master Plan 2011, IHPP ranked second on the overall ranking from the technical, economical, and environmental aspects. From the socio- environmental perspective, IHPP, however, was ranked as number one among the 7 potential hydropower projects. These studies, list IHPP as one of the most

[13] *KAGGA & PARTNERS LTD, FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a*

[14] JICA, 2011. Project for Master Plan Study on Hydropower Development in the Republic of Uganda and UETCL, 2010. Grid Development Plan 2009-2025

[15] Ministry of Energy and Mineral Development (Jan 2011). The Development of a Power Sector Investment Plan for Uganda – Final Report ; JICA, 2011. Project for Master Plan Study on Hydropower Development in the Republic of Uganda

promising to meet the near future needs of electrical energy in Uganda. Apart from this, GoU has also identified IHPP as one of the core hydropower project for priority development[16] .

3.1.2 Isimba Hydropower Development Alternatives

A number of IHPP development alternatives have been considered prior to the finalization of the project layout and design. Among these alternatives are: i) Alternative Dam Site Locations and ii) Alternatives of the Upstream Reservoir Levels.

The Alternative Dam Sites evaluation included assessment of 4 dam site locations (sites D1, D2, D3 and D4 as depicted in ***Map 3***) taking into consideration the general river slope, general morphological characteristics of the river including: length of the dam, economic placement of the powerhouse complex within the dam structure, geology of the dam location, site, and environmental and social features. Based on these evaluation, D3 alternative site was prioritized as the best site for development because of its sound geological and geomorphologic characteristics and least cost for development[17]. The location of the dam site has no direct implication on the KFS, but the lake it creates enters the KFS boundaries under some conditions of dam height and operating level and is of concern in the context of the Addendum ESIA Study.

Map 4 depicts the 3 alternatives in relation to the KFS delimited boundaries as stipulated in the Bujagali IA. Alternatives 1 and 2 have their foot prints within the delimited boundary of KFS while Alternative 3 does not interfere with the delimited boundaries. Alternative 1 has a larger foot print within KFS as compared to the Alternative 2.

These alternatives were evaluated based on the technical, environmental, and socio economic indicators during the Feasibility Study (refer Feasibility Study Report[18] and section 5 of this report for details) prior to the decision on the alternatives from Agencies of GoU.

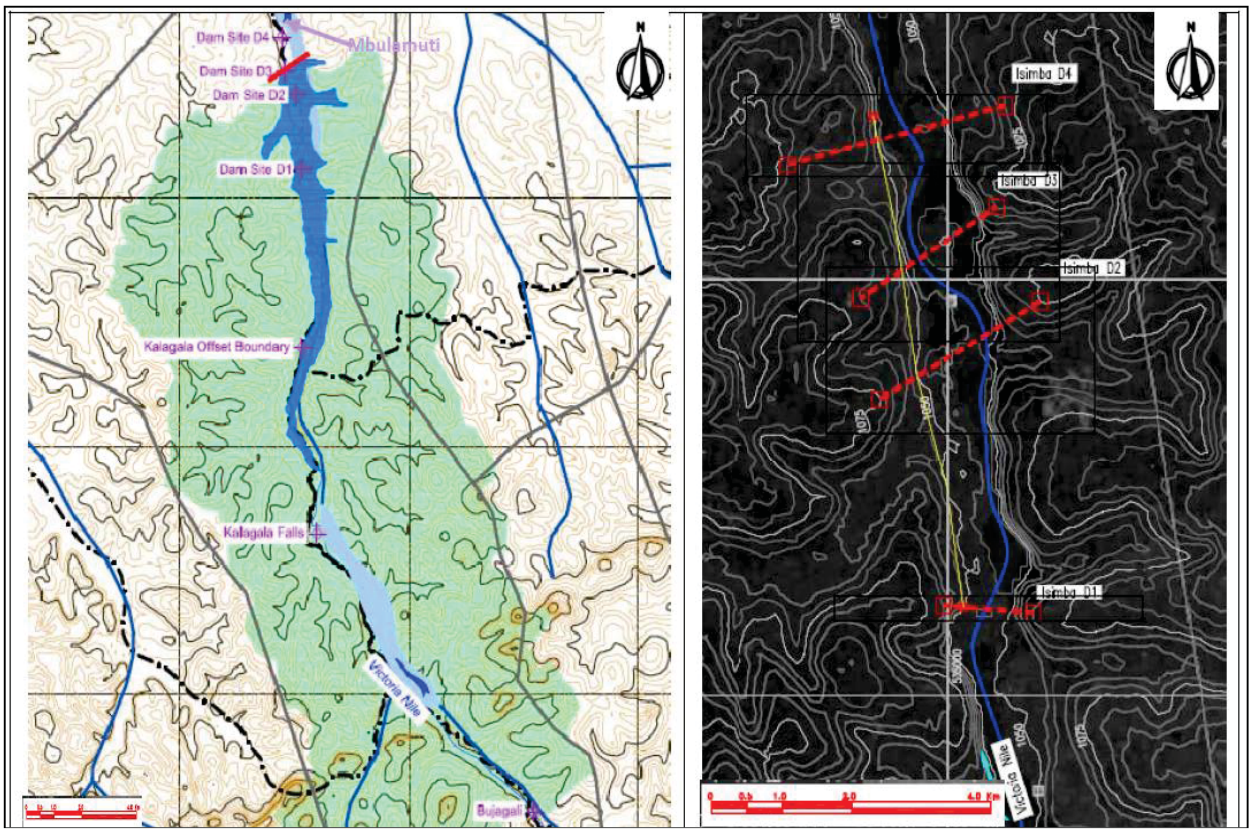
The un-weighted and weighted overall score for the alternatives in the feasibility study report was different for different evaluation criteria (***Table 5 and Table 6***). The study, however, concludes that Alternative 1 is promising compared to Alternative 2 and 3 on technical and socio-economic aspects.

[16] Government of Uganda, April 2010. The National Development Plan, 2010/11 - 2014 / 15

[17] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.*

[18] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.*

MAP 3: Alternative Dam Site Locations (after Feasibility Study, 2012)



MAP 4: Upper Reservoir Levels alternatives in relation to KFS delimited

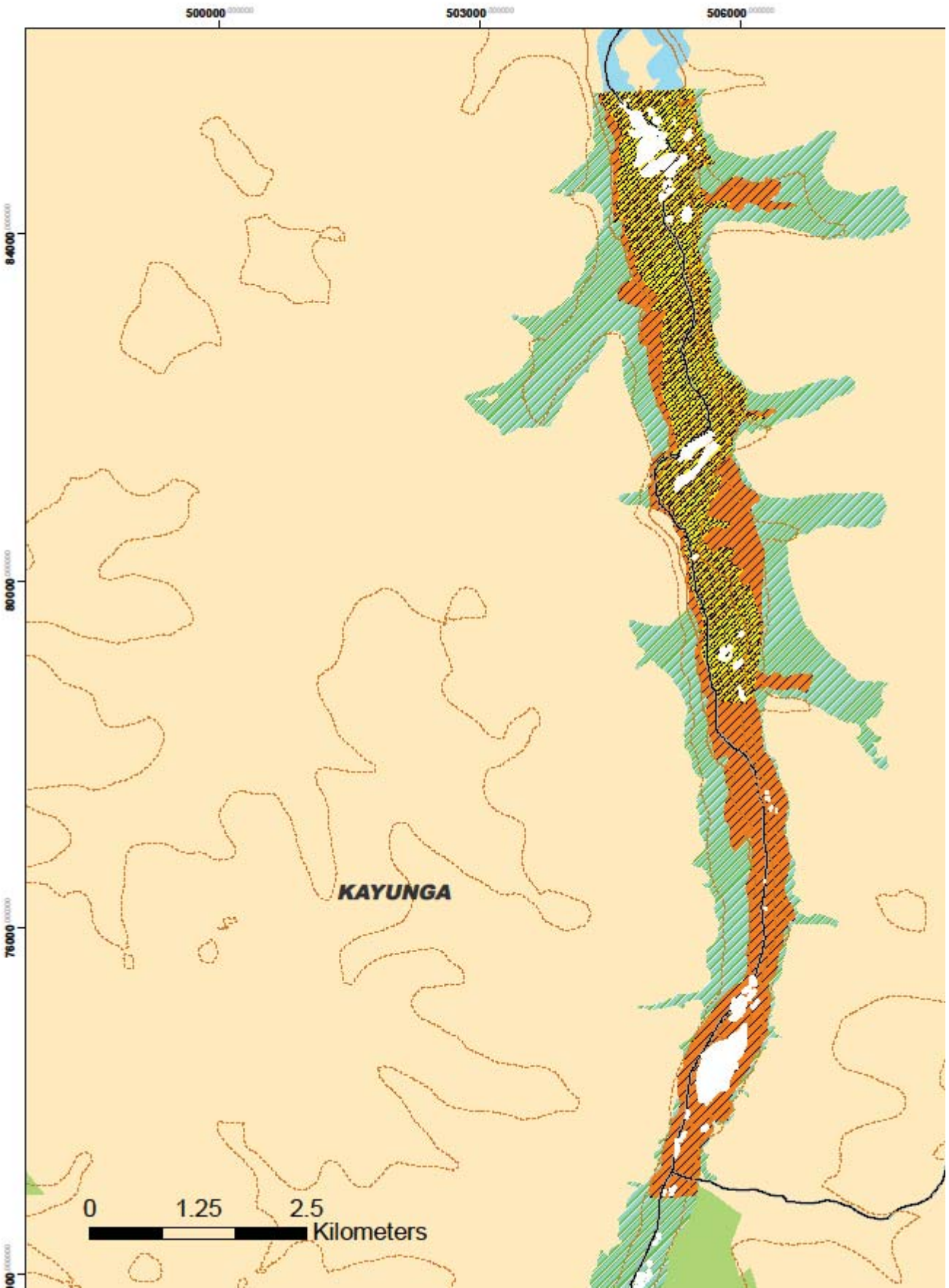


Table 5: Overall Un-weighted Score for Alternative Reservoir Upstream Levels

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Technical	57.50	55.00	40.00
Socio-economic	48.21	39.29	32.14
Environmental	31.25	40.63	50.00
Overall Total	45.65	44.97	40.71

Source: *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.*

Table 6: Overall Weighted Score for Alternative Reservoir Upstream Levels based on the Preferences of Decision Makers (After Feasibility Study, 2012)

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3	Weightage
Technical	57.50	55.00	40.00	25%
Socio-economic	48.21	39.29	32.14	50%
Environmental	31.25	40.63	50.00	25%
Total	**46.29**	**43.55**	**38.57**	

Source: *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.*

Alternative 1 has been therefore decided for development, even though it has larger foot prints on the natural habitats and environmental values of KFS.

3.2 The IHPP Activities on KFS

IHPP is not envisaged to carry out any construction activities within KFS during the construction and operation periods.

In view of the ecological importance of the partly submerged trees, the project is not going to undertake reservoir vegetation clearing operations within KFS prior to the flooding of the reservoir. Similarly, the project has not proposed any stabilization works against potential reservoir rim erosion and mass wasting owing to the geologically stable nature of the reservoir rim around KFS.

Private lands flooded by the IHPP reservoir within KFS will be acquired in compliance to the related policies and acts of the Government of Uganda. Private land and properties floodedduring the IHPP have already been identified in the IHPP RAP studysocio-economic

survey. Land and property acquisition is underway as per the stipulated compensation and resettlement policy and entitlement matrix of the IHPP RAP study.

3.3 Isimba Hydropower Project Status

Upon completion of the feasibility study of the IHPP in 2012, the contract for construction was awarded to China International Water & Electric Corporation (CWE). The contract agreement was signed between CWE and the Government of Uganda represented by MoEMD on 6th September, 2013.

The project is funded jointly by the GoU (15%) and China's Export-Import (EXIM) Bank (85%). China's Export–Import Bank provided a loan of USD 483 million under a bilateral agreement. The total project cost is estimated at USD 567.7 million. Of the total project cost, USD 550.8 million will be used for the construction of the dam while USD 11 million and 5 million will be used for the construction of the Isimba–Bujagali electricity transmission line and Isimba sub-station respectively. The project is expected to be completed by 30 August 2018.

The selected IHPP alternative for development is the dam site Alternative D3 and the Upper Reservoir Level Alternative 1. This alternative design of IHPP will impact the delimited geographical areas of KFS stipulated in the Bujagali IA.

Project construction started in April 2015 and is to be completed in August 2018, with the first turbine being commissioned in April 2018. Land acquisition, resettlement and rehabilitation works at the dam site have been completed. The resettlement and rehabilitation activities at the reservoir area are in progress and near to completion[19]. The Ministry of Energy and Mineral Development (MEMD) reported that by mid-September 2016 the number of compensation claims paid included 745 for the dam site (out of 766); 1,584 for the reservoir area (out of 1,717); and 691 for the transmission line route (out of 988). The establishment of camps and support facilities for dam construction havebeen completed including excavation activities. , 79.3% of concreting works has been accomplished and works on the transmission line have been initiated[20]. Overall, about 45 percent of the construction is already complete.

3.4 ESIA and Management of the Isimba Hydropower Project

Environmental Impact Assessment[21], Social Impact Assessment[22] and Resettlement Action Plan[23] for IHPP with the reservoir, dam, and powerhouse components and the transmission line

[19] Personnel Communication MoEMD

[20] Personnel Communication MoEMD

[21] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir; KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLA AS, 2013. Environmental Impact Assessment for proposed Isimba 132 kV Power Transmission Line.*

project (42 km long 132kV double circuit transmission) and Isimba sub-station components were carried out as per requirements of NEMA.

3.4.1 Summary of the Isimba Hydropower Project Environmental and Social Safeguard Documents

The environmental and social safeguard documents for the IHPP dam, reservoir, powerhouse, transmission line and substation components were prepared in compliance with the National Environmental Management Policy 1994; and legal provisions of the National Environmental Act 1995 including a host of cross-sectoral policies and legislative requirements of GoU.

3.4.1.1 Summary of Isimba Hydropower Project (Dam, Reservoir and Powerhouse Component) Environmental and Social Safeguard Documents

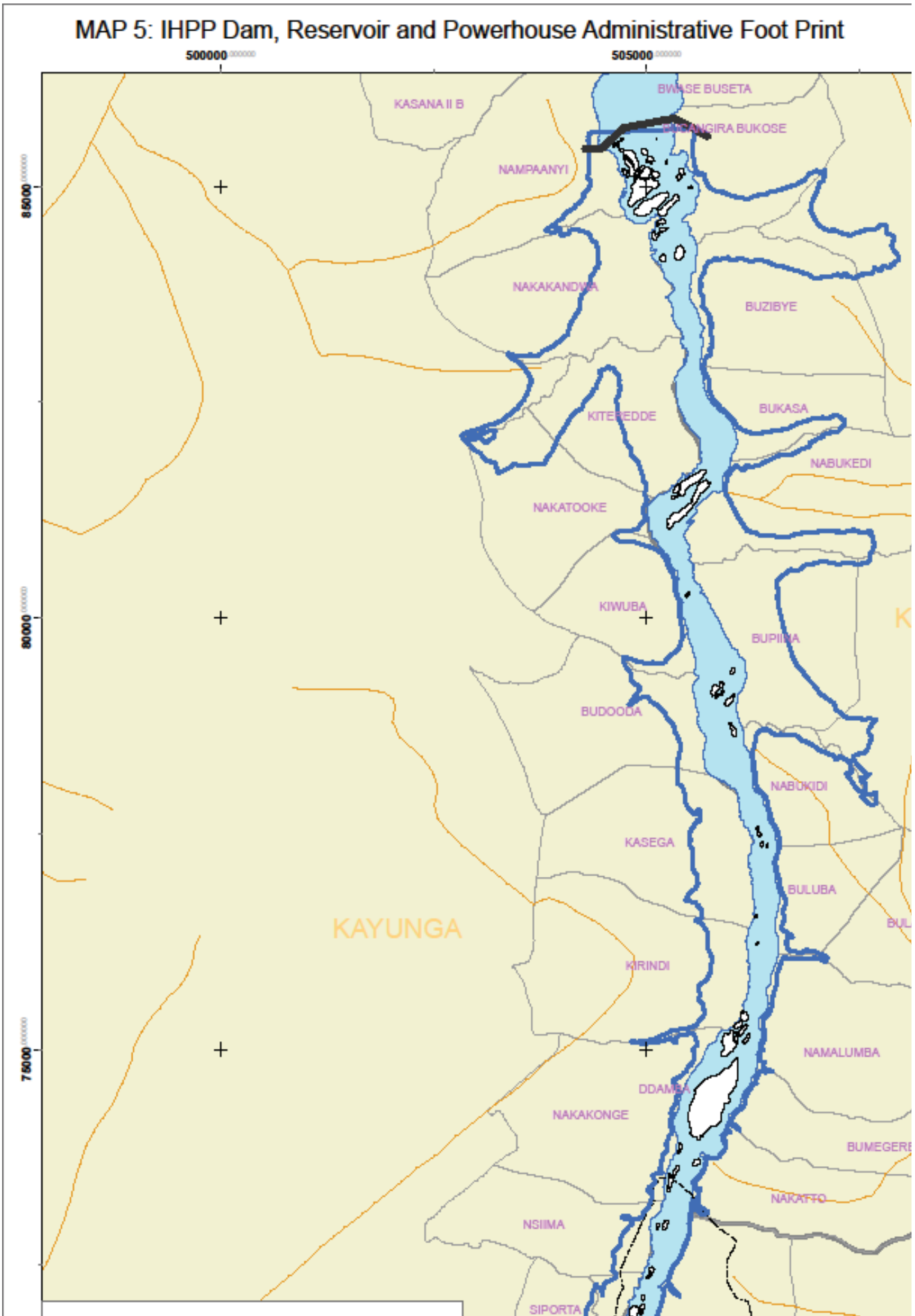
The footprints of the IHPP dam, reservoir and powerhouse components covers the geographical administrative areas of 3 Districts, 3 Counties, 4 Sub-counties, 10 Parish, and 29 Villages (***Map 5***) at the cross-junction of the Central and Eastern Region of GoU (***Table 7***).

Table 7: Administrative Areas falling within the IHPP Foot Print

District	Counties	Sub-Counties	Parish	Villages
Kayunga	Ntenjeru	Busaana	Nampanyi	Nampanyi, Kireku-Nampanyi, Nakandwa
			Lusenke	Kireku-Lusenke
		Nazigo	Kati-Kanyonyi	Kiteredde, Nakatooke, and Budooda
			Kirindi	Kiwuba, Nakakonge, Kirindi, Damba, Nsiima, Spotter
			Natteta	Wabirongo
		Kangulumi	Kangulumira	Kitambuza, Kalagala
Kamuli	Buzaya	Kisozi	Nankandulo	Mutumu-Nakaato, Bumegere, Namalumba,
			Namaganda	Isimba-Nabukiddi, Nababirye-Bukasa, Buzimbye, Bubwege, and Bulamuka
			Kiyunga	Bulangira, Busoke
Jinja	Kagoma	Butagaya	Nakakulwe	Buwala B, Lumuli B, Lumuli D

[22] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLA AS, 2014.Social Impact Assessment for Proposed Isimba HPP (Dam and Reservoir);KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPAN AS; 2012.Isimba 132 kV Transmission Line Project, Social Impact Assessment Report;*

[23] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2013.Resettlement Action Plan for proposed Isimba Hydropower Project (Flood Area); KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2013.Resettlement Action Plan for proposed Isimba 132 kV Power Transmission Line*


MAP 5: IHPP Dam, Reservoir and Powerhouse Administrative Foot Print
500000
505000
85000
80000
75000
KASANA II B
BWASE BUSETA
NAMPAANYI
NAKAKANDWA
BUZIBYE
BUKASA
NABUKEDI
NAKATOOKE
KIWUBA
BUDOODA
NABUKIDI
KASEGA
BULUBA
KAYUNGA
KIRINDI
NAMALUMBA
NAKAKONGE
NSIIMA
SIPORTA

Due to the location of the dam, reservoir and powerhouse on the landscape there is a range of physical, biological, socio-economic and cultural spiritual impacts of the project. The key impacts identified and mitigation measures prescribed for the project in the EIA, SIA and RAP reports are briefly highlighted in ***Table 8.***

Table 8: Key Impacts Identified and Mitigation Measures Prescribed for the IHPP dam and Powerhouse Components

Environmental and Social Impacts	Impact Magnitude and Significance		Mitigation Measures
	C	O	
Environmental Impacts - As per IHPP EIA, 2014			
Temporary Land-take	H/M/M		• Temporary land take areas will be reinstated to pre-project condition.
Permanent Land-take	H/M/M	H/M/M	• Land owners will be compensated for land and property.
Terrestrial Ecology	H/M/M	H/M/M	• Restoration of the wider Kalagala offset area affected by adopting the Kalagala Offset Management Plan as a way of compensating for ecological value of lost land.
Impact on Kalagala Offset Area		M/M/M	• UEGCL shall ensure that project implementation conforms to requirements of *Kalagala Offset Sustainable Management Plan 2009.*
Downstream flows during construction and reservoir filling	M/L/NM		• The reservoir will be filled in such a way that no more than 5 percent of the instantaneous flow downstream of Bujagali dam is retained in the Isimba reservoir.
Reservoir level fluctuation during operation	M/L/NM	M/L/NM	• Compensation flows should be designed to contribute as far as possible to meet downstream ecological and livelihood objectives.
Suspended solids during construction	H/M/M		• No digging or grubbing will be done during clearance of the reservoir.
Discharge of pollutants into the river during construction	L/L/M		• Provision for secure storage of substances such as oil, diesel fuel, concrete additives or solvents, including interceptors and sumps in case of spillage. • Provision for pollutant spill response plans.
Water quality and eutrophication of the reservoir	M/M/MM	M/M/MM	• Careful catchment management interventions
Impacts on aquatic ecology and fisheries	H/M/M	H/M/M	• Re-stocking programmes to be carried out in the reservoir • Instillation of fish screens before the intake
Air Quality	H/M/M		• Stockpiles of friable material will be grassed • Access roads will be wetted • Trucks containing friable material will be covered
Noise effects	H/M/M	H/M/M	• Project vehicles will have a restricted speed limit of 40 km/h through settlements • Onsite power generators will be sited with regard to the presence of sensitive receptors • Regular care and maintenance of vehicles and equipment will be undertaken

Environmental and Social Impacts	Impact Magnitude and Significance		Mitigation Measures
	C	O	
Aesthetics	H/M/M	H/M/M	No measures
Waste Management and Impact on Soil	M/M/MM	M/M/MM	• Workers will be sensitised about responsible litter control and waste management practices • All waste generated at a given construction location will be collected in appropriate containers and disposed of as required by NEMA guidelines • Closure of camps and equipment yards will ensure no waste is left behind and contaminated areas on sites are properly remediated • Fuel transport and storage facilities will be licensed by the Petroleum Supply Department
Social and Cultural Impacts as per IHPP SIA 2014			
Displacement of People			• All affected people will be compensated with options categorized according to the impacts (refer to the RAP report). • Those to be relocated will be assisted to move to their preferred locations in any way possible by UEGCL. • Those who are viewed as vulnerable will be provided with additional assistance. • Affected business may be entitled to income restoration compensation. • Compensation payments, will be monitored to ensure households remain in a similar socio-economic situation or better than pre-project levels. This will also monitor potential —squanderingǁ of financial compensations. • In kind settlement will be limited to those considered extremely vulnerable and unable to replace dwellings even if cash was given. • Asset-for-asset compensation will be provided to affected persons who choose this option for fear of inability to purchase equivalent assets they previously owned.
Loss of livelihood			• During compensation, UEGCL working with local leaders shall sensitize compensation recipients about careful financial discipline to avoid misuse and eventual impoverishment. • Project schedules shall be discussed prior to construction and during construction, in order for farmers to time their land-use activities to coincide with construction and not to unnecessarily suspend their activities.
Effect on Social Infrastructure			• UEGCL shall, as a contractual obligation require the contractor to use local labour (wherever feasible) to avoid impacts that would arise from increase in local population due to non-indigenous workers. This would also improve income opportunities and economic development of the local populations. • The contractor shall be required to minimize pressure on local resources. The contractor should endeavour to find water for construction activities when community sources are insufficient. • To reduce pressure on health care facilities, UEGCL's contractor shall have their own medical clinic and should negotiate a sub-contract with hospital facilities in order to deal with more serious health issues of the contractor employees.
Misuse of cash compensation			• PAPs shall be advised about the wise use of money to avoid misuse bringing destitution to their families.

Environmental and Social Impacts	Impact Magnitude and Significance		Mitigation Measures
	C	O	
			• Monitoring of how compensation payment is spent will need to be a part of the RAP internal and external monitoring.
Population Influx into village were construction camp are located			• To minimize population influx in the area, the contractor should give preference to employing local labour. • HIV/AIDS awareness programs shall be conducted in the project areas by the contractor.
Occupational safety and public risk			• The contractor will have a fully functional clinic at the project site and this can be used by local people who suffer from injuries associated with project workers. • Contractors shall provide all workers with requisite Personal Protective Equipment (PPE) appropriate to the job at hand. Foremen will be responsible for not permitting a worker on site unless they are wearing the appropriate PPE. The Contractor shall provide appropriate signage reminding use of PPE at appropriate locations in the project area including ancillary work sites. • Contractor shall ensure adequate fire safety at workers camp by ensuring presence of fire-fighting equipment. • Contractor shall provide on-site toilets and washing water for workers • Contractor shall provide —No smoking signs in office, communal places construction camps as well as high risk areas prone to fire hazards e.g. near fuel tanks. • Working with local leaders, the contractor will sensitise local people about safety near construction sites, possible accident risk and how they can be avoided. • The contractor will have a fully functional clinic at the project site and this can be used by local people who suffer from injuries associated with project workers.
Road traffic risks			• The contractor will control haulage speed especially in trading centres or near schools by placing requisite warning signs. • Drivers will be inducted at the start of the Project about road safety and due diligence to ensure safety of other road users.
In-migration into project area			• Implement health, STD and HIV/AIDS awareness/training for the workforce. • Contractor should ensure that the workplace has adequate access to medical facilities. • Sensitization of the local communications should be carried out to manage community expectations of the project. • The contractor should ensure preferential treatment is given to the local communities at the time of employment in order to combat conflicts/tensions in the project area.
Impact on religious and cultural resources			• At the community level, the sacred sites where traditional worship activities take place will have to be moved away from the area • Relocation ceremonies have to be conducted at the eight locations mentioned
Construction noise and vibration			• A grievance procedure should be put in place to enable communities in the project area report noise or vibration effects resulting from construction works. • Monitoring of noise in the project area should be undertaken to ensure it

Environmental and Social Impacts	Impact Magnitude and Significance		Mitigation Measures
	C	O	
			does not exceed regulatory limits. • Any damages caused by vibrations shall be compensated by the contractor.
Land take and associated socio-economic effects			• All affected people will be compensated as per the RAP report. Those to be relocated will be assisted to move to their preferred locations in any way possible by UEGCL. • Those who are viewed as vulnerable will be provided with additional assistance necessary at the time of their displacement. • Affected business may be entitled to income restoration compensation.
Impacts of camp and equipment yard operation			No measures
Impact on Tourism			No measures

Note: C = Construction, O= Operation, H/M/M = High/Medium/Moderate, M/M/MM = Medium/Medium/Minor Moderate, M/L/NM =Medium/Lw/ Negligible/Minor, M/M/M = Medium/Medium/ Minor, L/M = Low/Low/Moderate,

The impact significance is as per the safeguard reports. Impact significance is not assigned for the social and cultural impacts.

The Environmental Management Plan included in the EIA report entrusted the implementation of the prescribed mitigation measures on the natural environment to UEGCL through its contractor. For the supervision of EMP, UEGCL Project Manager should appoints an Environmental Manager and a Community Liaison Managers and other support staffs to assist Environmental Manager to supervise the mitigation measures in coordination with the contractor's Environmental Department. The Community Liaison Manager responsibility is to liaison with the local leaders, NGOs, communities and contractors. The Environmental Manager responsibility is to prepare the following plans: i) Public Consultation and Disclosure Plan, ii) Labor Force Management Plan, iii) Environmental Mitigation and Monitoring Plan, and iv) Emergency Response and Preparedness Plan apart from overseeing the management plans prepared by the contractors and supervise the implementation of mitigation measures and activities of the contractors.

The Contractor should establish an Environmental Department headed by a Site Environmental Officer and an Environmental Inspector to assist the Site Environmental Officer (SEO) as per EMP. SEO is responsible for the preparation of the following plans: i) Traffic Management Plan, ii) Waste Management Plan, iii) Labor Force Management Plan, iv) Environmental Mitigation and Monitoring Plan, v) Health and Safety Management Plan, vi) Pollutant Spill Contingency Management Plan and vii) Hazardous Material Management Plan and implementation of these plans and contractual mitigation measures. SEO is also to liaise and report to the Environmental Manager of UEGCL besides maintaining the Environmental Management System for the project.

A number of indicators for monitoring with monitoring methods and frequencies have been identified in the EMP to measure the project environmental performances and required corrective actions. The data for the monitoring indicators is collected by the site supervisors and foreman of UEGCL. These data will be cross-verified by the Environmental Manager on a regular basis and by other central government authorities (NEMA, NFA, UWA, etc) as and when required. On the recommendation of the Environmental Manager, the UEGCL site engineer will take the required corrective actions through the contractors' Site Environmental officers. A total of USD 850,000 is the estimated cost for monitoring equipment and facilitation of monitoring works.

The Environmental Manager is responsible for the preparation of UEGCL's quarterly environmental reports in consultation with the social team of the Project. At the end of the year an annual environmental report as required by NEMA is the responsibility of the Environmental Manager to be submitted to the UEGCL Project Manager.

Besides, EMP proposes internal and external audit of the environmental compliances. The Annual internal audit responsibility lies on the Environmental Manager of UEGCL. The external audit will be proposed as per the NEMA requirements and will be executed by UEGCL in the presence of a representative of NEMA.

A Social Management Program including the Community Development Plan is a part of the SIA report. The overall responsibility of these programs and plans lies with UEGCL. In order to establish communication links with the local communities and project APs, a Project Consultative Committee comprising of 5-6 representatives consisting of PAPs (selected from each affected sub-counties to work with UEGCL during the resettlement process) is proposed. This committee will convene a meeting at least every 3 months to discuss on issues and future plans and programs. UEGCL will establish a Social Team headed by the Social Manager and needed support staff apart from the Project Consultative Committee. The main responsibility is community engagement on a regular basis, implementation of the community programs and community development plans at the community level. The key community development programs and plans are i) business skill trainings, ii) HIV AIDS awareness and counseling, iv) farming skills training, v) Functional Adult Literacy (FAL) skills training, v) household health (e.g. malaria & waterborne diseases control) and sanitation (e.g. hand washing, proper latrine use) training, vi) assistance to district primary schools, and vii) assistance to district health care facilities.

RAP report establishes the compensation and entitlement framework (***Appendix 5***). For the implementation of RAP, UEGCL will establish a dedicated unit at a top level comprising of i) UETCL - represented by the unit headed by one of its managers, ii) political representative of the LC5 Office

(District Council Representative iii) technical representative of the CAO's Office (District Council Representative) and iv) Local council leaders (LC1 and LC3) of affected villages.

To assist the unit's implementation unit, a senior officer of UEGCL management committee and senior local government contact will be appointed. The implementation unit shall include: representative from i) the resettlement community, ii) the local government, iii) UEGCL and the senior management.

The RAP activities are proposed for monitoring against key indicators during various phases of the resettlement and rehabilitation activities. A Monitoring Officer from UEGCL will carry out the internal monitoring of each AP and prepare a consolidated monthly report to the RAP Implementation Unit at the top to rectify any conflict related issues. The external monitoring of RAP implementation will be undertaken by NGOs and academics appointed by UEGCL. External monitoring is proposed 3 times within the period of RAP implementation (3 to 6 months after resettlement, 18 months after resettlement and 24 months after resettlement). The RAP implementation schedule is proposed over a period of 1 year followed by 2 years of monitoring after the approval of RAP.

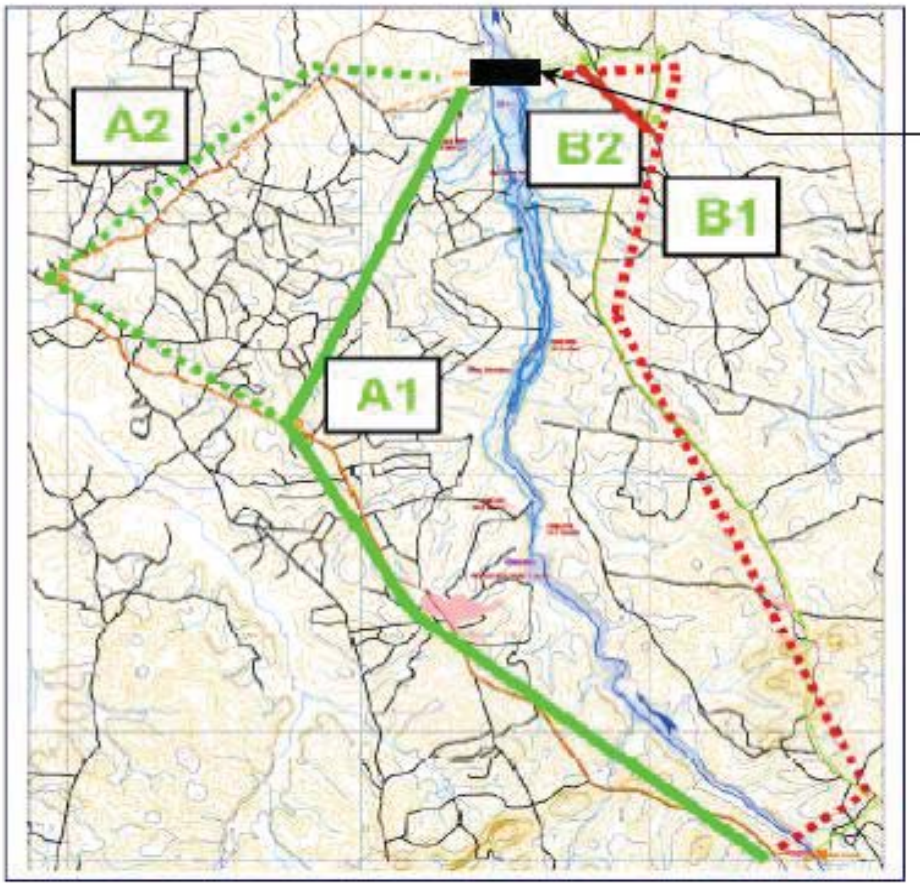
To ensure that the grievances of APs are addressed at the shortest possible time, a grievance management mechanism is inbuilt within the project management structure of UEGCL (***Appendix 6***).

The overall Social Program and Social Development and RAP implementation cost is estimated as USD 21.91 million.

3.4.1.2 Summary of Isimba Hydropower Project (Transmission Line and Substation Component) Environmental and Social Safeguard Documents

The 132 kV transmission line corridor with a 5m right of way and 25m way leave (total 30m) extends through the district of Kayunga and Biwke across 2 counties (Ntenjeru, and Wakisi), 4 sub-counties (Busaana, Nazigo, Kangulumira, and Wakisi) and 38 villages (Nampanyi, Nakakandwa, Kireku-Nampanyi, Kireku-Lusenke, Lusenke, Buguvu, Bukuta, Bunzibiride, Bukamba, Namirembe, Gayaza, Kirimantungo, Nakakonge, Kotwe A, Kotwe D, Nazigo H/Q, Kiremezi A, Kiremezi B, Nateeta, Kiribeda, Mbulakati, Kamuli, Kisega, Kangulumira, Kiwalasi, Kitabazi, Nakirubi, Namakandwa, Bukeka-Mirembe, Marigita, Nampanyi, Kirugu-Alimasi, Kirugu-Wakikoola, Wakikoola A, Wakisi Market, Wakisi Central, Nankwanga, and Kikubamutwe). ***Map 6*** presents the alignment of the transmission line route across the Kyoga and Buikwe districts.

MAP 6: Alignment of the IHPP Transmission Line



Note: A1 is the selected Transmission line alternative

Due to the location of this 30 m wide linear infrastructure and the sub-station nearly 126 ha of land area will be impacted directly by the Project. The proposed transmission line does not infringe on the geographical areas of KFS and passes outside the Mabira Central Forest Reserve boundary. .

4. Environmental and Social Baseline Conditions

The environmental and social baseline is based on the review of secondary information, particularly the IHPP Feasibility Study, 2012[24]; Updated IHPP Feasibility Study, 2014[25]; IHPP IEA 2014[26]; IHPP SIA 2014[27]; IHPP RAP 2014[28]; BHPP SEIA, 2006[29]; *National Fisheries Resources Research Institute (NAFIRRI), 2000[30];*NAFIRRI, 2006[31], 2016[32]; W.S Atkins; and Fisheries Resources Research Institute (FRRI), 2001[33]; and primary information derived from the environmental and social surveys on the natural, social and cultural environments of the area in consideration. The natural, social, cultural and spiritual environmental baseline discussed hereunder cover only those relevant aspects of the resources which are affected by IHPP implementation in the KFS geographical boundaries and KFS boundaries to characterize whether the extension area has physical, ecological, social, cultural and spiritual characteristics similar to the affected KFS areas.

4.1 Environmental and social baseline conditions - Kalagala Fall Site

The KFS footprint annexed in the Indemnity Agreement (2007) covers parts of the administrative geographical areas of 3 Districts, 3 Counties, 4 Sub-counties, 5 Parishes and 16 Villages (***Map 7*** and ***Table 9***).

[24]*KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.;*

[25]*International Water and Energy Corporation, 2014. Feasibility Study Report for the development of the 183 MW Isimba Hydro Power Plant & Isimba - Bujagali Interconnection Project;*

[26]*KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir*

[27]*KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2014.Social Impact Assessment for Proposed Isimba HPP (Dam and Reservoir)*

[28]*KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS 2013.Resettlement Action Plan for proposed Isimba Hydropower Project (Flood Area)*

[29]*Burnside International Limited, 2006. Bujagali Hydropower Project Social and Environmental Impact Assessment;*

[30]*National Fisheries Resources Research Institute, 2000. Aquatic and Fisheries Survey of the Victoria Nile, Bujagali Hydropower Project, Final Report 1—8 August 2000. (Third quarter)*

[31]*National Fisheries Resources Research Institute, 2006. The First Quarter Survey of the Aquatic System and Fisheries of the Upper Victoria Nile, 6 to 13 April* 2006

[32] *National Fisheries Resources Research Institute (NaFIRRI), 2016. Habitat Characteristics and Haplochromine Fish Diversity of the Upper Victoria Nile: Towards the Development of Biodiversity Friendly Hydropower Projects. Draft Technical Report.*

[33]Nile Power; W.S Atkins; and Fisheries Resources Research Institute, 2001. Haplochromine Habitats Study. Fisheries Resources Research Institute, Jinja; FIRI, 2000. Report submitted to BHPP on the Third quarter survey 1st to 18th August 2000

MAP 7: Administrative area of KFS

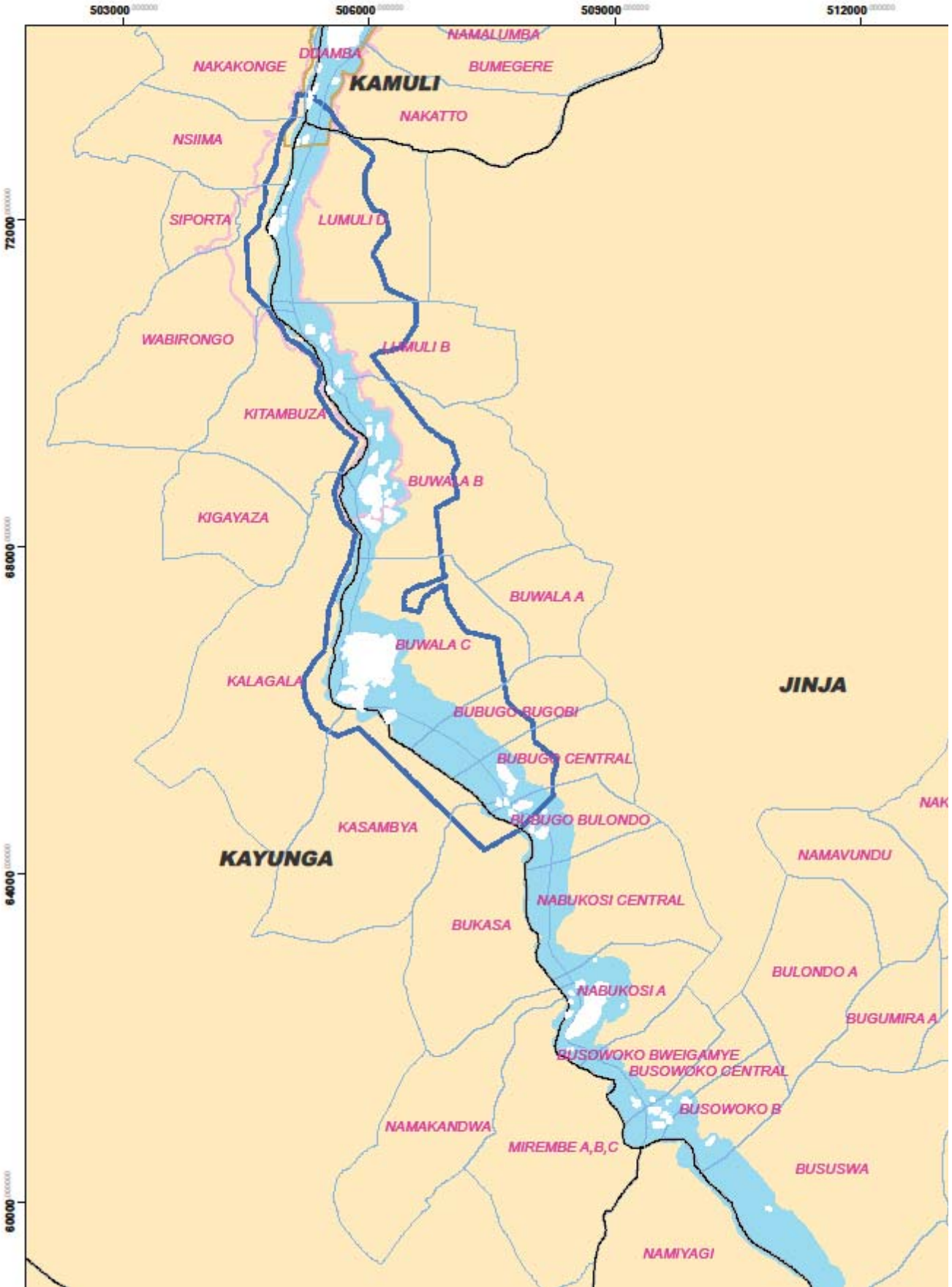


Table 9: Administrative areas falling within the KFS footprint

District	Counties	Sub-Counties	Parish	Villages
Kayunga	Ntenjeru	Nazigo	Kirindi	Nakakonge, Kirindi, Nsiima, Spotter
			Natteta	Wabirongo
		Kangulumira	Kangulumira	Kitambuza, Kalagala, Kasambya, Bukasa
Kamuli	Buzaya	Kisozi	Nankandulo	Mutumu-Nakaato
Jinja	Kagoma	Butagaya	Nakakulwe	Baluwa A, Buwala B, Baluwa C, and Lumuli B, Lumuli D, Bubugobugobi, Bubugo Central

The IHPP reservoir footprint overlapping the KFS footprint administratively cover parts of the areas of 3 Districts, 3 Counties, 4 Sub-counties, 5 Parishes and 8 Villages (***Table 10*** and ***Map 8***). The KFS areas falling within 8 of the villages are not overlapped by the IHPP reservoir footprint

Table 10: IHPP footprint overlapping the KFS administrative footprint

District	Counties	Sub-Counties	Parish	Villages
Kayunga	Ntenjeru	Nazigo	Kirindi	Nakakonge, Kirindi, Nsiima ,Spotter
			Natteta	Wabirongo
		Kangulumira	Kangulumira	Kitambuza, Kalagala
Kamuli	Buzaya	Kisozi	Nankandulo	Mutumu-Nakaato
Jinja	Kagoma	Butagaya	Nakakulwe	Buwala B, Lumuli B, Lumuli D

4.1.1 Physical Environment

4.1.1.1 Topography and Elevation

The Victoria Nile River is a unique feature within a gently rolling landscape. The River Nile is entrenched into a broadly U shaped valley. The river entrenchment is in the order of 15 to 30m from the surrounding landscape. The valley flanks incline at an angle of 15 to 30 degrees to the valley bottom. The disposition of the landscape is such that the River Nile could only be seen from the edge of the valley flanks of this overall rolling landscape.

The Victoria Nile is at the lowest elevation of the area. The KFS elevation of the valley floor varies from 1046 to 1068m. Floodplain flanking river wet channel is inconspicuous and occasionally bounded by wetlands. Downstream of the Kalagala and Itanda Falls, the river valley flanks rise abruptly from the wet river channel on both sides by 15 to 30m and connect with flatter rolling ground above the valley flanks. In the downstream areas of Kalagala, the valley flanks

exhibit a steeper landscape inclining at an angle of 20 to 30 degrees. The valley flanks are gentler in the upstream Kalagala and Itanda Falls,

4.1.1.2 Landscapes and Aesthetics

KFS is about 10.7 km long along the Victoria Nile River. The river wet channel width varies from less than 130 to over 750m. The river is widest upstream of the Kalagala/Itanda Falls and narrowest immediately downstream of the Kalagala/Itanda Falls. Further downstream it widens again up to 450m further downstream. The width of the river varies from 350m to above 1500m and is the widest at the Kalagala/Itanda Falls with an average valley width of about 500m.

There are 4 rapids and 3 falls in KFS. The four (4) rapids are: Bubugo, Vengeance, Hair of the Dog and Kulu Shaker (***Table 11***). The average drop in the river bed level across these rapids is around 1 to 2 m. The Kalagala and Itanda Falls have the highest drop in the river bed level elevation and is a combination of falls and rapids with an average drop of about 14 meters and a maximum drop of around 5 m.

Table 11: Sequence of rapids and falls along The Victoria Nile River - KFS

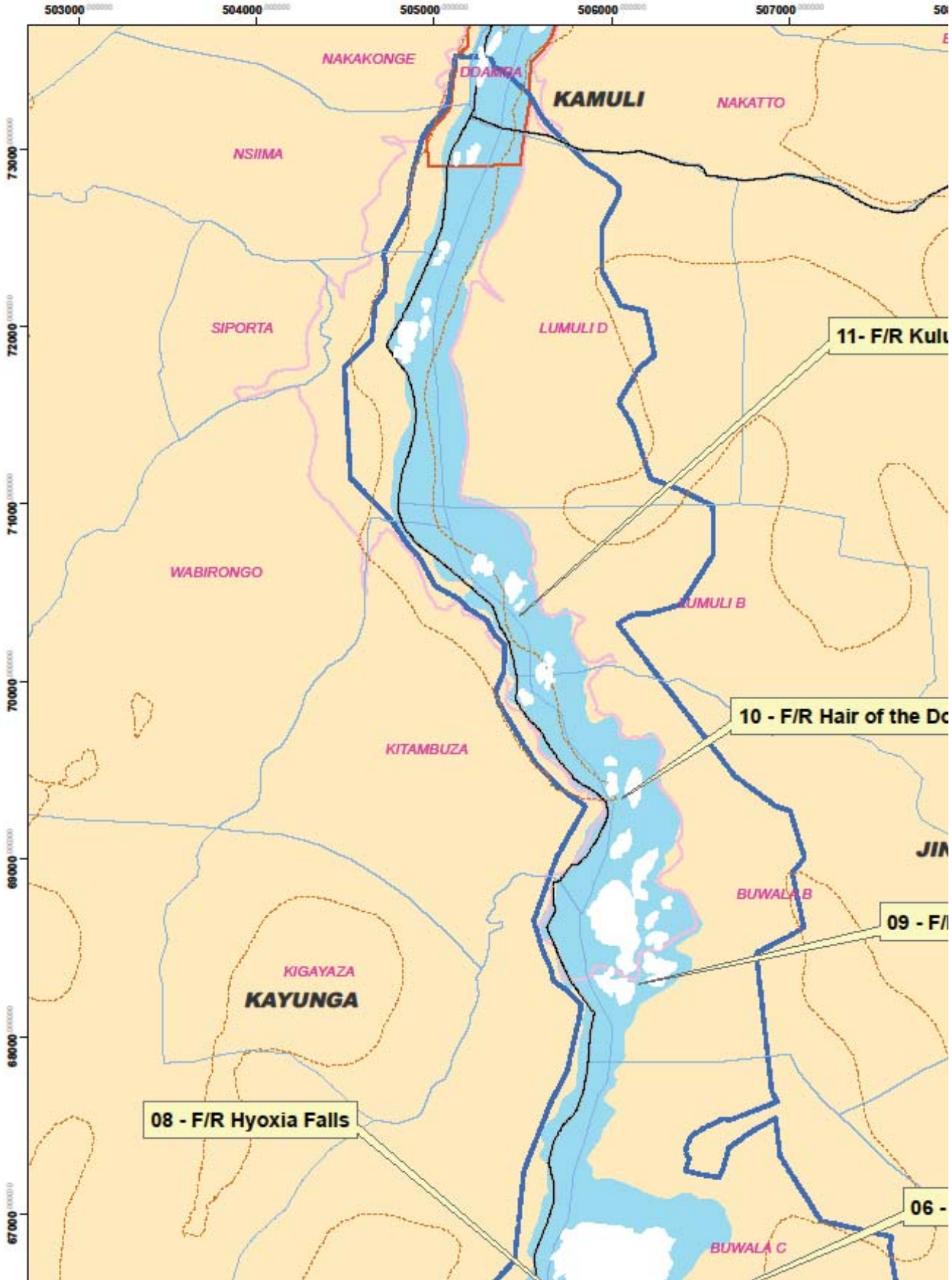
S.No	Name of rapid	Class	Distance from Bujagali (Km)	Length of Rapid (Km)	Total Area covering water waves across rapids and falls In (ha)
1	Super Hole Rapid	3	12.7	0.3	10
2	Itanda Fall	5-6	15	0.6	9.8
3	Kalagala Fall	5-6	15.1	0.5	2.4
4	Hyoxia Fall	5-6	15.1	0.6	3.8
5	Novocaine / Vengeance / Boulder Rapid (Three channels)	3-5	17.5	0.3	2.8
6	Hair of the Dog rapid (Three channels)	3-4	18.6	0.3	2.5
7	The Virgins / Kulu Shaker rapid (Two Channels)	4	19.8	0.3	4.7

Note: *Length, and water wave area estimated based on the Google image 2015*

There are five groups of islands partly covered with natural vegetation within the KFS stretch of the Victoria Nile River. One island group downstream of the Kulu Shaker Rapid, however, is associated with the run section of the river. Apart from the above island groups, there are small partially submerged rocky islands. There are more than 151 islands (The largest island the

Hyoxia /Itanda falls is about 34 ha. These islands provide refuge to a host of water birds in the area. Map 8 shows the rapids, falls and the island groups within KFS which are the features of environmental values. Bujagali IA and KO-SMP list the Kalagala Fall, Itanda Fall, and the islands in between as of special environmental values.

MAP 8: Rapids, falls and islands in the KFS



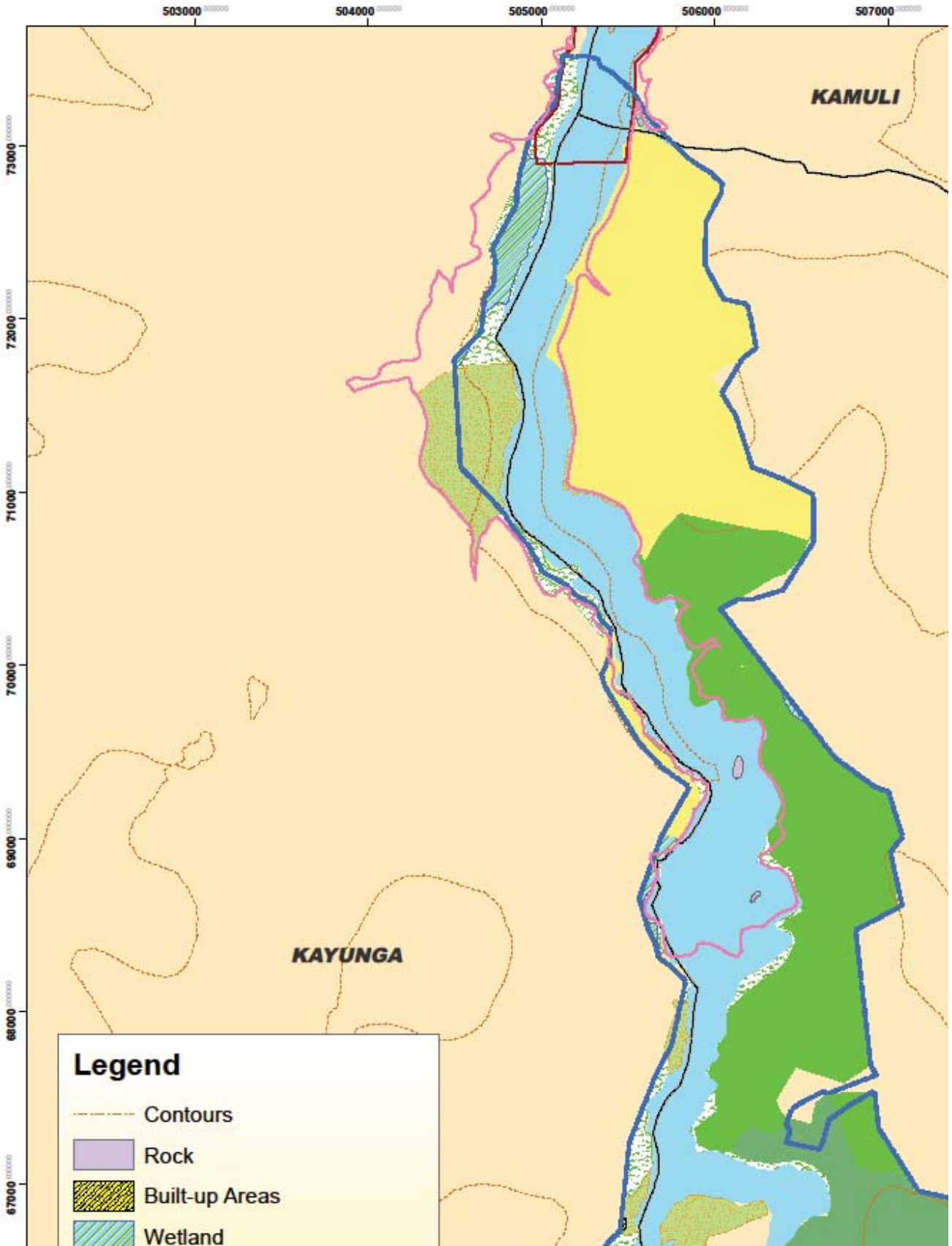
4.1.1.3 Land Use

Land use in KFS is mixed with nearly 33.62 % of the area being occupied by water, 35.7% by forests and woodlands and about 6.05 % by agriculture and the rest is of the land consists of rocks, grasslands and wetlands (***Table 12***, ***Map 9***). CFR consists of 17.33% dense forest, 40.18% sparse forest and about 37.98 % is under cultivation and the rest is grassland. The Encroachment of CFR areas cultivation and cattle grazing is one of the key issues related to the protection and conservation of the Nile Bank and Kalagala Fall CFR. Parts of Kalagala Fall CFR are better protected and natural than the Nile Bank CFR. The Nile Bank CFR mostly consists of planted pine and eucalyptus trees not native to the area.

Table 12: Landuse KFS (Based on google image, 2015)

Landuse category	Area (ha)		%
Cultivated	77.28	18	6.05
Built-up	0.37	0.01	0.03
NFA Forest Reserve	709.93	35.7	55.60
Dense Forest	*123.02*	6.19	*9.63*
Sparse Forest	*285.27*	14.3	*22.34*
Cultivated	*269.64*	13.5	*21.12*
Grassland	*32*	1.6	*2.51*
Other Forest (Dense)	5	0.25	0.39
Woodlands	6.37	0.32	0.50
Grassland	1.41	0.07	0.11
Wetland	45.64	2.29	3.57
Rocks	1.66	0.08	0.13
Water Body	429.31	21.6	33.62
Total	**1276.97**		**100**

MAP 9: Land Use-KFS



4.1.1.4 Water quality

Water quality analysis upstream of the Kalagala Fall was undertaken for the physical, chemical, and micro-biological parameters. Results of the water samples analysed in 2013 within KFS and attached in the IHPP EIA report are used for comparison in Table 1***3*** below.

Table 13: Results of water quality measurements in Victoria Nile in KFS

Water quality parameters	Unit	Year 2016*	Year 2013**		Maximum recommended US EAS 12:2014 for natural portable water
		Kalagala	Nsiima	Kitambuza	
pH		7.07	7.48	7.48	5.5-9.5
Turbidity	NTU	0.00	1.8	1.9	25
Total Suspended Solids	mg/l	22	0.00	3	Not Detectable
Total Hardness as Ca CO3	mg/l	73	48	56	600
Calcium	mg/l	2.862	8	11.2	150
Magnesium	mg/l	1.631	6.7	6.7	100
Chlorides	mg/l	12	1	0.5	250
Total Iron	mg/l	<0.001	0.075	0.062	0.3
Biochemical Oxygen Demand (BOD)	mg/l	37.2	8.1	5.4	Not specified
Chemical Oxygen Demand (COD)	mg/l	56.0	21	16	Not specified
Oil and Grease	mg/l	0.316	<1.0	<1.0	Not specified
Fluorides	mg/l	0.12	0.46	0.39	1.5
Sulphates	mg/l	0.01	1	1	400
Nitrates	mg/l	0.310	0.08	0.05	45
Nitrites	mg/l	0.008	0.06	0.02	0.003
Ammonia	mg/l	0.16	0.00	0.00	0.5
Total Coliforms in 100ml	Nos.	200	129	110	10
Fecal Coliforms in 100ml	Nos.	90	19	23	Absent

*Note: * Measurement 2016, Consultants; ** Measurement results, IHPP EIA report, 2013.*

All parameters such as: pH, turbidity, hardness, calcium, magnesium, iron, nitrate, nitrite, ammonia, chloride, oil and grease, etc are within the threshold limits for natural Potable Water. The BOD and COD values are low, but are higher values compared to the 2013 measurements indicating the Nile River is getting polluted over the years to some extent. The river is not polluted by the heavy metals. The levels of coliform and faecal coliform indicate that the water is not suitable for consumption without treatment. Discharge of household sanitary effluents or practice of open defecation may be responsible for the contamination.

4.1.1.5 Air quality

Measurements of ambient and point source air emissions were carried out using IBRID MX6 Multigas Monitor and for particulate matter by CEM DT-9881 at 3 locations in KFS. The Monitors were calibrated before use. Measurements were done for 10 minutes. ***Table 14*** presents the results of the monitoring.

Table 14: Ambient air quality - KFS

Parameters	Measurements 2016			Permissible limits
	Buwala Village (N 0032069, E 0336196)	Lumuti Village (N 0040478, E 03303307)	Kalagala Village (N 0037089, E 00303176)	
O_2 (%)	21.18	21.17	21.07	**9.5-23.5***
CO (ppm)	0.00	0.00	0.00	**9.0***
CO_2 (%)	0.03	0.04	0.04	-
SO_2 (ppm)	0.00	0.00	0.00	0.15*
H_2S (µg/m^3)	0.00	0.00	0.00	15*
LEL (%)	0	0	0	25*
RH (%)	33.1	39.2	52.4	50.4*
AT (^OC)	40.6	34.4	29	32.0*
PM 10.0 (µg/m^3)	0.31	0.07	0.05	50**
PM 2.5 (µg/m^3)	1.22	0.48	0.67	25**
PM 1.0 (µg/m^3)	4.38	2.28	3.89	

Note

**National Environment (Draft Air Quality Standard for Ambient Air, 2006), NEMA, GoU*

*** IFC general EHS guidelines recommend that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality*

The observed values for gaseous and particulate matter are well within the threshold limits of NEMA, and IFC - EHS Guideline values. The ambient air of the area is not influenced by industrial, vehicular and anthropogenic polluting sources.

4.1.1.6 Noise level

Background noise levels during the day were measured at 3 locations at KFS during 2016 field survey were using a Center™ Data Logger Sound Level Meter set at 30-130 dB (A) range. The meter was mounted on a stand with each spot measurement lasting approximately 10 minutes. Sound level data were then downloaded and analyzed to determine the noise levels according to the following parameters: LEQ, L90, L50 and L10 (***Table 15***).

Table 15: Noise levels, KFS

Location description	Duration minutes	Noise limit (dB(A) LEQ)*	Recorded noise level				Existing noise sources			
			LEQ	L10	L50	L90	L_{Min}	L_{Max}	Natural	Anthropogenic
Lumuti Village	5.00	**45**	**50**	54.4	50.3	49.2	43.6	70.4	Wind	
Buwala Village	5.00	**50**	**53.6**	54.4	43.1	38.9	36.6	68.7	Wind, cricket	Human conversation
Kalagala Village	5.00	**50**	49	54.5	46.6	39.9	36	65.5	-	Human conversation

Note: Noise limits are as prescribed in the National Environment (Noise Standards and Control) regulations, 2003.

LEQ levels are within the threshold of the permissible noise levels for natural areas. Noise created by gushing winds and water particularly at the fall site was high but gradually subsides as the distance increases from the river banks.

4.1.2 Biological Environment

4.1.2.1 Flora

The KFS including the Kalagala and Nile Bank CFRs are influenced by the human activity and show imprints of human activities in the surrounding flora. The KO-SMP states that nearly 90 to 95% of the natural trees and vegetation of the CFRs have been cleared for human activities, particularly encroachment of the forest areas and river banks for cultivation[34]. In the 1960s the KFS's CFRs were endowed with the natural trees and vegetation of *Celtis-chrysophyllum* and *Forest-Savanna Mosaic* comprising of *Maesopsis eminii, Milicia excelsa, Antiaris toxicaria, Acacia spp., Trichillia splendida, Ficus spp, Hallea stipulosa, Warbugia ugandansis* etc[35].

[34] *Ministry of Water and Environment, 2009. Kalagala Offset Sustainable Management Plan. Appendix 1: The Kalagala Itanda Eco-tourism Development Plan*

[35] Langdale - Brown et. al, 1964 (in the *Ministry of Water and Environment, 2009. Kalagala Offset Sustainable Management Plan. Appendix 1: The Kalagala Itanda Eco-tourism Development Plan document)*

The islands areas particularly surrounded by water bodies of the Victoria Nile around the rapids and fall sites show comparatively better natural conditions than the adjoining banks. The key species of plants in the islands within the KFS include: *Tapura fischeri, Alchornea cordifolia, Argomuellera macrophylla, Drypetes gerrardii, Albizia coriaria, Albizia grandibracteata, Artocarpus heterophyllus, Manilkara obovata, Cola gigantea, Sterculia dawei, Chaetacme aristata, Urera trinervis, Broussonetia papyrifera, Pseudosondias microcarpa, Ficus ovate* and *Lantana camara.*

The dense forests in the KFS's CFR are limited to only 17% of the CFR area. The rest of the CFRs area are either under cultivation or in highly degraded conditions represented by sparse trees and grassland. Most of the forest trees are planted species comprising of *Pinus callibea, Eucalyptus* and *Terminalia* not native to the area. The natural vegetation is limited and very sparse in distribution.

The list of floral species of the KFS is presented in ***Appendix 7*** based on the vegetation survey conducted during IHPP environmental study in 2013[36] at Nsiima, Wabirongo, and the CFRs of Kalagala and Nile Banks including the cultivated lands, wetlands and woodlands along the banks of the Victoria Nile within KFS. The floral species is represented by 88 species of herbs, 27 species of grass, 19 species of climbers, 25 species of shrubs, and 39 species of trees.

The *Eichhornia crassipes (*Water Hyacinth), B*roussonetia papyrifera, Mimosa pigra, Lantana camara, Pistiastra tiotes and Ricinus communis* (Castor Oil Plant) are the key invasive plant species in the KFS which are threatening the natural species proliferation in the area.

Only one species (*Milicia excels*) of global conservation concern was recorded within KFS. *Milicia excelsa* as per IUCN Red List 2016 is a near threatened species endemic to Uganda. This species is used for timber, especially for quality indoor and outdoor furniture, firewood and charcoal. Few of these tree species were observed within KFS at the cultivated lands of Nsiima and Wabirongo and in the Kalagala and Nile Bank CFRs.

A few of the species namely *Eclipta alba, and Mangifera indica* observed within KFS have not been evaluated globally for their threat category because due to data deficiency. Both of these species are not endemic to Uganda. The National Forestry Authority (NFA) listed *Markhamia lutea* observed within KFS as 'Reserve Species' for Uganda. However, it is not listed under the IUCN Red List for

[36]*KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir*

global conservation concern. The reason for including this species as Reserve Species for Uganda is based on its rapid decline in Uganda in the recent years.

The IHPP inundation within the KFS does not affect the above floral species of conservation significance. The floral species impacted by IHPP reservoir are the common species found within the KFS and in the adjacent landscape of Mabira Ecosystem.

4.1.2.2 Fauna

A. Mammal

The mammalian diversity for the KFS depicted here under is based on the IHPP EIA survey, 2013 and recent survey in 2016 by the consultants at Nsiima, Wabirongo, Nakatoke, Kitambuja, and Kalagala CFR located within KFS. A total of 17 mammalian species (***Table 16***) were accounted based on the present and past surveys.

Table 16: Mammalian diversity KFS

Mammalian species		2013 survey		2016 Survey		
	IUCN Red List, 2016	Nsiima	Wabirongo	Nakatoke	Kitambuza	Kalagala
Red-tailed monkey *Cercopithecus ascanius*	LC	p	p			p
Vervet monkey *Cercopithecus aethiops*	LC	p	p			p
Spot necked Otter *Lutra maculicollis*	NT	p		p	p	p
Large Grey Mongoose *Herpestes ichneumon*	LC	p	p			
Side tripped Jackal *Canis adustus*	LC	p	p			p
Leopard *Panthera pardus*	VU	p	p			p
Serverline Genet *Genneta servalina*		p				p
Banded Mongoose *Mungos mungo*	LC	p	p	p	p	
Serval cat *Felis serval*		p	p			p
Common Duiker *Sylivicapra grimmia*		p			p	p
Giant rat *Cricetomys gambianus*	LC	p			p	
Cane rat *Thryonomys gregorianus*	LC	p			p	p
Stripped ground Squirrel *Xerus erythropus*	LC	p	p	p	p	

Mammalian species		2013 survey		2016 Survey		
	IUCN Red List, 2016	Nsiima	Wabirongo	Nakatoke	Kitambuza	Kalagala
Gambian Sun Squirrel *Heliosciurus gambianus*	LC	p				
Crested Porcupine *Hystrix cristata*						p
Bushbuck *Tragelaphus scriptus*						p
Hippo *Hippopotamus amphibius*	VU			p		p
Total Species		**14**	**8**	4	**7**	**12**

Note: p = Present, LC = Least Concerned, VU = Vulnerable, NT = Near Threatened

The available natural habitats of the KFS are not adequate to support large population of large wild mammals such as *Hippopotamus amphibius, Panthera pardus,* and *Tragelaphus scriptus*. Accordingly, these species are of very rare occurrence in the area. Other smaller wild mammals are occasionally observed in the habitats. The observation made in the area reveals that wild mammalian population within the available habitats is very thin.

Among the species recorded in the KFS, *Lutra maculicollis,* and *Panthera pardus* are listed in the IUCN Red List 2016. The *Lutra maculicollis* (Spot-necked Otter) is a globally Near Threatened species. The population of this species in the area is threatened due to illegal hunting by the farmers for the fear of damage to the crops due to inadequate awareness. The other threats to spot-necked otters in the area are siltation due to erosion near the source of rivers, cultivation of bank side habitats, indiscriminate bushfires, competition for fish and hunting. The use of new nylon fishing nets is also reported as cause of otter deaths by tangling and drowning.

The *Panthera pardus* is a global vulnerable species listed in the IUCN Red List 2016. It is an opportunistic mammal capable to adjust to diverse habitats and is reported to visit the KFS area occasionally in search of food from the adjoining forest areas of Mabira CFR.

The Hippopotamus (*Hippopotamus amphibius),* a Global Vulnerable Red Listed species is also reported to visit the area occasionally. Once it used to be a common mammal of the Victoria Nile. Since 1950 with the expansion of agriculture along the upper Victoria Nile section, it declined due to loss of feeding ground. Now, it is reported to come to the area occasionally from the Kyoga lake

area. The local community, with the assistance of the UWA trans-locate such visitors for the safety of the local community[37] when they come close to the settlement areas.

B. Birds

The mix of land use with wide expanse of water body, vegetated islands on the middle of the Victoria Nile, associated woodlands, wetlands along the Nile banks and the high standing trees in parts of the Nile Bank and Kalagala Fall CFR render a suitable habitat for a range of avian species.

Bird survey based on total count and time species count recorded a total of 57 species at Kitambuza, Buwala, and Kalagala sites. ***Appendix 8*** lists the birds' species with details of the conservation status, habitat code, and time species count in an hour for each survey locations.

The previous studies in the IHPP EIA, 2013 recorded over 88 species. The recorded number is composed of terrestrial and aquatic species. Of the common ones included for water birds are Long-Tailed Cormorant (*Phalacrocorax africanus*), Little Egret (*Egretta garzetta*), African fish Eagle (*Haliaeetusvocifer*) and terrestrial species were Lizard Buzzard (*Kaupifalco monogrammicus*), Blue-spotted Wood Dove (*Turtur afer*), Laughing Dove (*Streptopelia senegalensis*), Eastern grey plantain Eater (*Crinifer zonurus*), Didric cuckoo (*Chrysococcyx caprius*), Common bulbul (*Pycnonotus barbatus*), Trilling Cisticola (*Cisticoila woosnami*), and Bronze Mannikin (*Lonchura cucullata*).

Of the species recorded none is included in the IUCN Red List of 2016 as being of global conservation significance. Some of the species, however, have been considered on regional basis as threatened. These species include: Grey Heron (*Ardea cinerea*), African marsh Harrier (*Circus ranivorus*), Red-chested Sunbird (*Cinnyris erythrocerca*), Violet-backed Starling (*Cinnyricinclus leucogaster*), Grey-headed Sparrow (*Passer griseus*), and Red-billed Firefinch (*Lagonosticta senegala*).

C. Herpetofauna

Information on herpetofauna is lacking for the KFS, However, the Nile River banks, and rocky islands with grass cover have potentials to provide good habitats for the herpetofauna including lizards and frogs.

The crocodile (*Crocodylus niloticus*), once common in the Victoria Nile is non-existent due to hunting and killing by human. The UWA authority personnel reported occasional presence of juvenile crocodiles in the KFS section. These crocodiles are reported to have been migrated downstream

[37] UWA personnel communication, 2016

and upstream from the Lake Victoria or Lake Kyoga and reported in some areas scantily. A fisherman in the Kalagala Fall site reported to have seen the crocodile some years ago. The UWA on the information from the community trans-locate these crocodiles to the national park areas for the safety of the common people.

D. Butterfly and Dragon Fly

Butterfly and dragon fly survey conducted in 2013 for the IHPP EIA lists a total of 39 butterfly species and 9 species of dragon fly. The 2016 survey in the KFS was carried out at three sites Kitambuza, Kalagala and Nakatoke and 35 species were recorded. 23 species were recorded in Kalagala, 35 species in Kitambuza and Nakatoke 16 species respectively. ***Appendix 9*** shows the butter fly species recorded during the survey according to their ecotypes.

There are 7 forest dependent butterfly species, 2 forests edge/woodland species, 9 migrant species, 2 open habitat species, 15 widespread species. Three butterfly species *Eurema brigitta*, *Junonia oenone* and *Zizina antanossa* have been evaluated for the IUCN Red List and all are categorized as being of least concern, while the other species have not yet been evaluated.

E. Fish

I. Upper Victoria Nile

The literature on diversity and population density of fish in the Victoria Nile is limited. The existing literature ofscientific value is that of National Fisheries Resources Research Institute (NaFIRRI) conducted in 2000[38] and 2006[39] during the course of BHPP environmental studies.

The surveys cover the geographical areas of KFS as well as upstream and downstream portions of the Upper Victoria Nile, between Lake Victoria and Lake Kyoga. The upstream and downstream locations sampled for fish indicate that the KFS stretch of the Victoria Nile is also endowed with a range of fish species (***Appendix 10***). It is to note that some of the fish species are confined only to the upper section of Victoria Nile, while some are confined only to downstream section. The middle section has a mix of the species composition of the upstream and downstream section (refer ***Appendix 10***) showing three distinct stretches of the river in terms of fish assemblages. The KFS

[38] *National Fisheries Resources Research Institute, 2000. Aquatic and Fisheries Survey of the Victoria Nile, Bujagali Hydropower Project, Final Report 1—8 August 2000. (Third quarter)*

[39] *National Fisheries Resources Research Institute, 2006. The First Quarter Survey of the Aquatic System and Fisheries of the Upper Victoria Nile, 6 to 13 April 2006.*

section of the river lies on the middle, reflecting a mixture of fish species of the upstream and downstream areas.

Total fish diversity richness observed in the 2000 survey was 18, while in 2006, it was 17. Four new species (*Bracings jackstone, Oreochromis. leucostictus, Oreochromis. variabilis,* and *B. paludinosus)* were recorded in 2006, while three species *(namely Clarias gariepinus, Mormyrus. Macrocephalus* and *Schilbe intermedius)* recorded in 2000 were not recorded in 2006. Thus the total fish species recorded from the two fish survey seasons was 22 species (refer ***Appendix 10***) for the Upper Victoria Nile.

The 2016 survey based on the interaction with the local fisherman at three locations reveals that 13 fish species observed in 2000 and 2006 by NaFIRRI are regularly fished by the fisherman in the Upper Victoria Nile. The fisherman added additional two species (namely *Rastrineobola argentea* and *Protopterus ethiopicus)* on the list of fish species assemblages recorded by NaFIRRI.

The species of fish that have been encountered along the Upper Victoria Nile can be classified in two groups. The typical riverine species M. *kannume,* B. *aftianafis* and *Labeo victorianus* and others that appear in Lake Victoria upstream and Lake Kyoga downstream. Keystone species of the Upper Victoria Nile are *L. niloticus* and O. *niloticus*, M. *kannume,* and S. *afrofischeri,* while other species such as *Bagrus docmak, Barbus altianalis* and several other mormyrids are also found in appreciable numbers including various species of haplochromine cichilids[40].

The discussions and interaction with the fishery experts of NaFIRRI[41] clearly indicate that the fish study at the Victoria Nile is still incomplete to characterize fish diversity richness. Most of the fishery surveys discussed above treated Haplochromine Cichilids as one species. But these *Cichilids* are represented by a wide range of species, which are even more diverse than the total fish species presented in ***Appendix 10***.

Atkins, 2001, reports 35 species of haplochromine cichilids from the Upper Victoria Nile. ***Appendix 11*** presents the haplochromine cichilids diversity richness and range of occurrence across the Victoria Nile based on the study of Atkins 2001[42]. From the species diversity richness point of view the Upper Victoria Nile is divided by Atkins into three distinct sections namely Victoria Zone,

[40] *National Fisheries Resources Research Institute, 2000. Aquatic and Fisheries Survey of the Victoria Nile, Bujagali Hydropower Project, Final Report 1—8 August 2000. (Third quarter)*

[41] Personnel communication with NAFIRRI, 2016.

[42] *Nile Power; W.S Atkins; and Fisheries Resources Research Institute, 2001. Haplochromine Habitats Study. Fisheries Resources Research Institute, Jinja*

Transition Zone and Kyoga Zone from upstream to downstream, which is similar to the findings of NaFIRRI study of 2000 and 2006. The Victoria Zone is stated to show similarity with the Lake Victoria in its haplochromine *assemblages,* whereas the Kyoga Zone shows similarity with the Lake Kyoga assemblages. The Transitional zone is a mixture of two and also has few species which are specific to this zone. These species are *Pundamilia "yellow-multispot"* and *Pyxichromis orthostoma* (refer ***Appendix 11***).

Recent survey by NaFIRRI (2016)[43] on the haplochromine cichilids of the upper Victoria Nile reported a total of 61 species (***Appendix 12***). Out of the 35 species reported in the 2001 survey only 18 species of the earlier survey were reported in 2016, while 17 species reported in 2001 were not reported in the survey of 2016. Additional new species reported in 2016 survey is 43 (***Appendix 13***), these species were not recorded in the earlier 2001 survey.

From the survey findings of 2001 and 2016, there is no denial on the richness of Haplochromine cichilids species in the upper Victoria Nile. Interesting to note is the very poor commonality in the species composition for specific survey locations between the 2001 and 2016 (***Table 17*** and ***Appendix 13***). The wide difference in the species composition of the Haplochromine cichilids between the 2001 and 2016 survey and poor overlapping in the species composition also indicate that the *Haplochomine cichilds* species diversity richness in the upper Victoria Nile is yet not fully explored. Seasonal differences in the species composition are very likely which necessitates monthly as well as seasonal surveys for the full exploration of the Haplochromine diversity richness in the upper Victoria Nile for a long term period. The observed differences between 2001 and 2016 surveys in the species composition may be related to these seasonal differences.

[43] *National Fisheries Resources Research Institute (NaFIRRI), 2016. Habitat Characteristics and Haplochromine Fish Diversity of the Upper Victoria Nile: Towards the Development of Biodiversity Friendly Hydropower Projects. Draft Technical Report .*

Table 17: Haplochromine cichilid species overlap across survey locations (2001 and 2016)

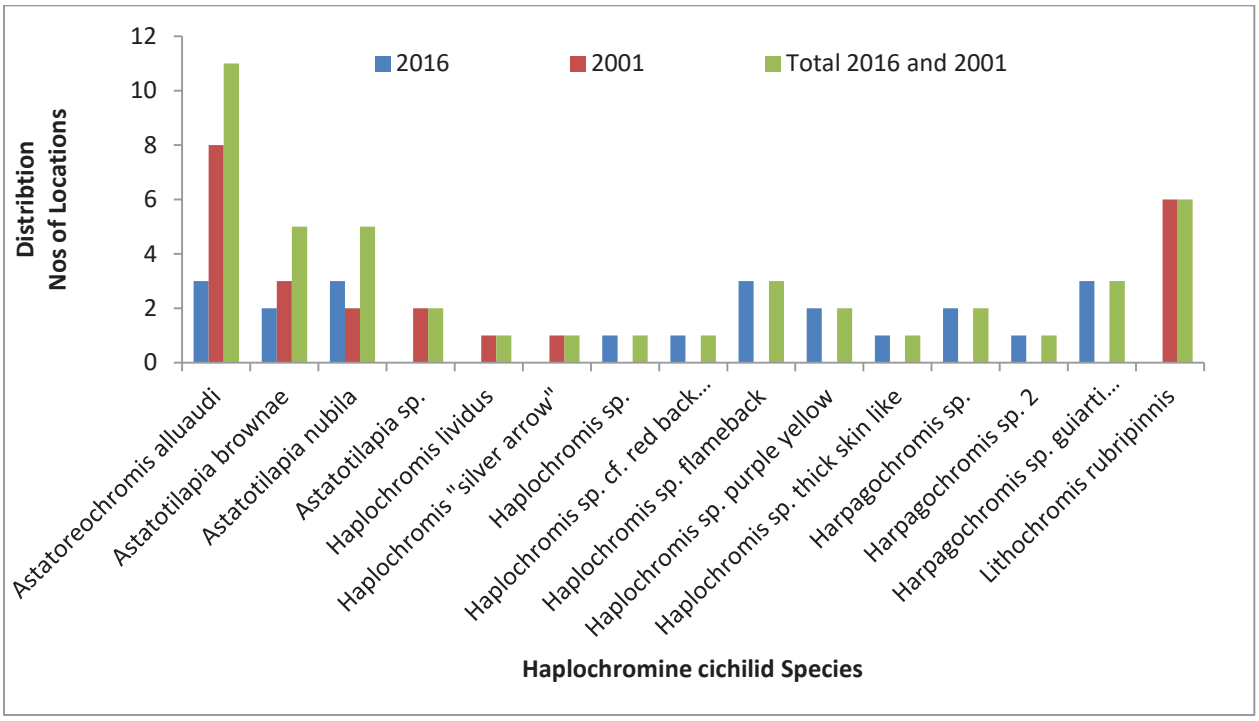
Survey Location	Survey Year	Total Species composition for the survey period	Total Species composition for the combined survey period	Numbers of common species in both surveys	Common species in both surveys
Ripon falls	2016	11	22	2	*Paralabidochromis sauvagei (rockkribensis)*
	2001	12			*Mbipia mbipi*
Kalange	2016	13	22	3	*Pundamilia pundamilia*
	2001	11			*Pundamilia igneopinis_Nile*
					Neochromis greenwoodi
Bujagali	2016	4	10	0	
	2001	6			
Buyala	2016	12	22	0	
	2001	10			
Busowoko	2016	13	28	2	*Neochromis greenwoodi*
	2001	17			*Mbipia mbipi*
Itanda	2016	9	20	2	*Neochromis greenwoodi*
	2001	13			*Mbipia mbipi*
Kirindi	2016	11	20	4	*Neochromis simotes*
	2001	13			*Neochromis greenwoodi*
					Mbipia mbipi
					Astatoreochromis alluaudi
Isimba	2016	7	19	1	*Neochromis greenwoodi*
	2001	13			
Mbulamuti	2016	7	14	2	*Neochromis simotes*
	2001	9			*Neochromis greenwoodi*
Kakindu	2016	12	18	1	*Xystichromis nuchisquamulatus*
	2001	7			

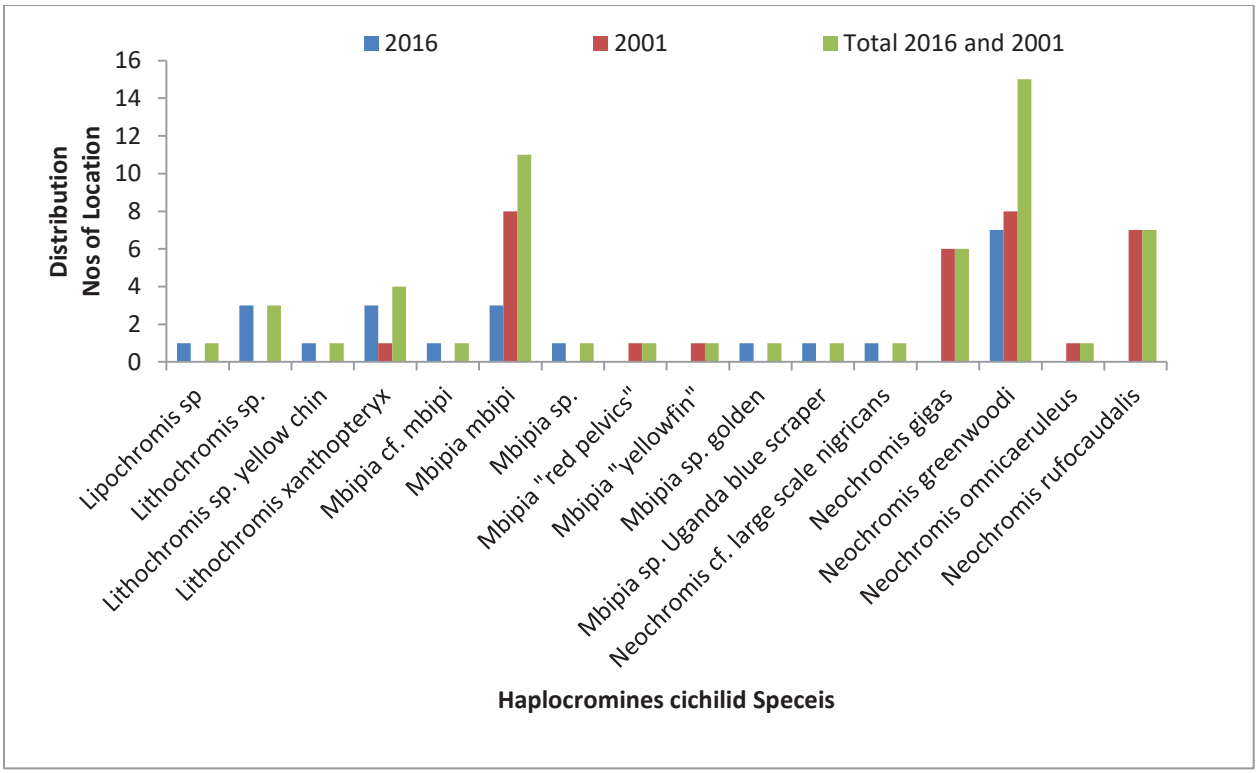
The species numbers of the Bujagali location in the table above is quite conspicuous. In 2001, construction works of BHPP at Bujagali have already started and in 2016 the Bujagali Reservoir has been created. The lower number of species in the Bujagali location is potentially a reflection of the impacts of dam construction and reservoir on the haplochromine cichilids both during construction and after the formation of reservoir. A similar reflection of the impacts due to construction works at Isimba may be resulting lower species numbers in 2016 surveys compared to 2001. Since species composition is not similar between the surveys the above observations should be taken with caution.

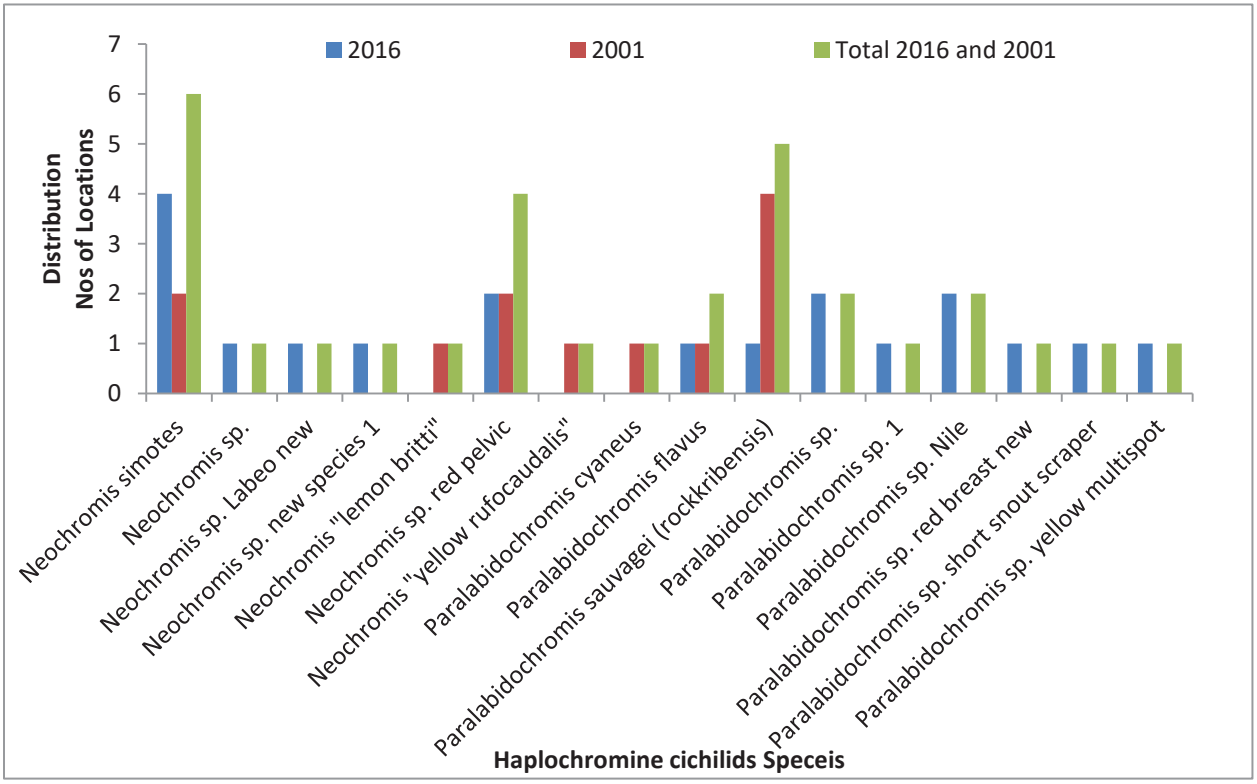
Many of the species recorded across Victoria Nile are endemic species of the region having global conservation value. The IUCN Red List (2016) categorizes 12 fish species including 9 haplochromine cichilids species of the Upper Victoria Nile under global conservation category and four of the haplochromine cichilids are in the data deficient category (***Appendix 10*** and ***11 and 13***).

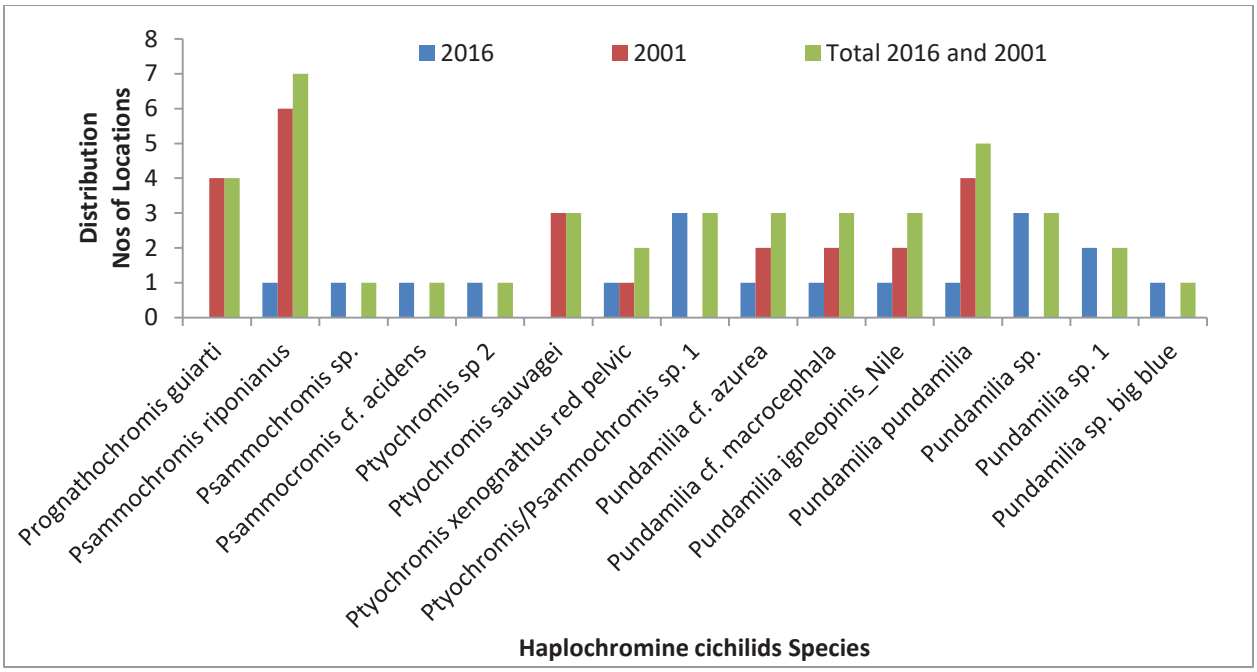
Distribution of the haplochromine cichilid species along the upper Victoria Nile reveals the fact that the species are confined to few specific habitats. Only few species have some range of distribution across the survey locations, while others are confined to specific locations only (***Figure 3***).

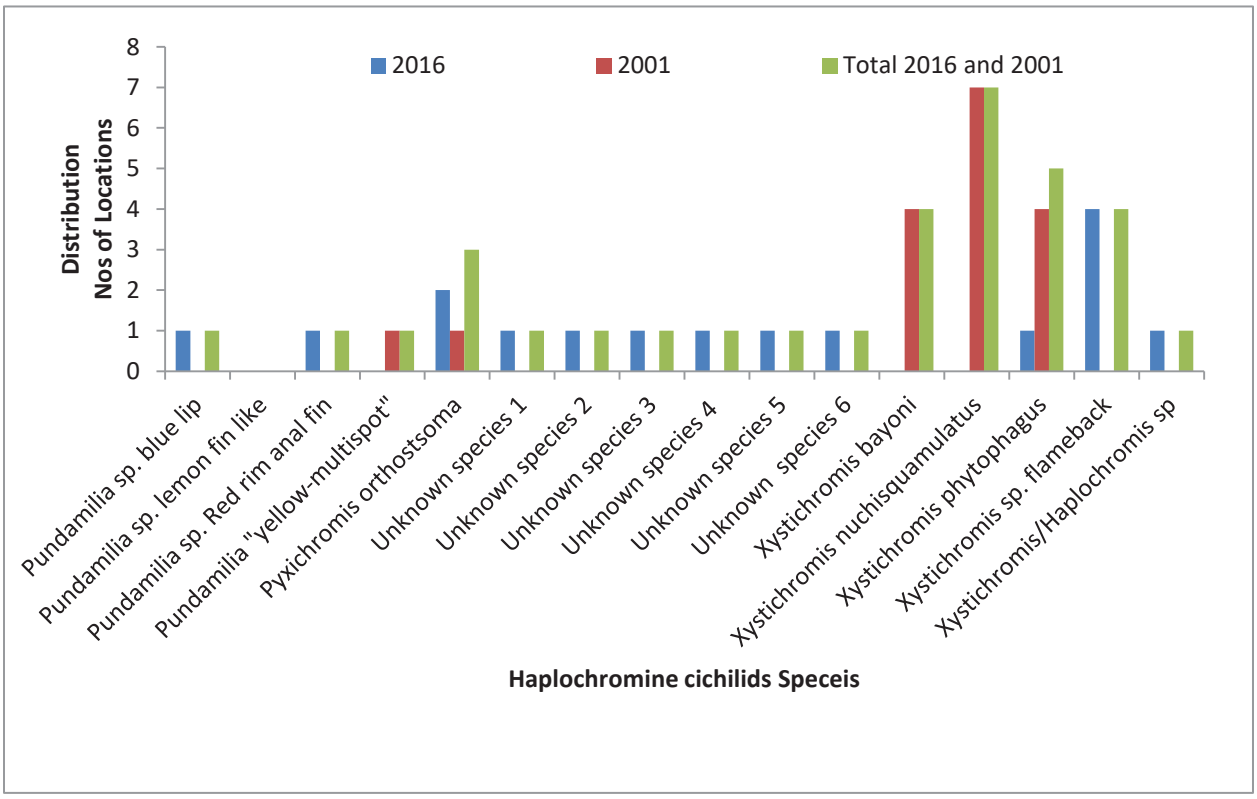
Figure 3: Distribution of the haplochromine cichilids along Upper Victoria Nile based on the survey findings of 2016 (NaFIRRI) and 2001 (Atkins)




2016
2001
Total 2016 and 2001
Distribution
Nos of Location
16
14
12
10
8
6
4
2
0
Lipochromis sp
Lithochromis sp.
Lithochromis sp. yellow chin
Lithochromis xanthopteryx
Mbipia cf. mbipi
Mbipia mbipi
Mbipia sp.
Mbipia "red pelvics"
Mbipia "yellowfin"
Mbipia sp. golden
Mbipia sp. Uganda blue scraper
Neochromis cf. large scale nigricans
Neochromis gigas
Neochromis greenwoodi
Neochromis omnicaeruleus
Neochromis rufocaudalis
Haplocromines cichilid Speceis


2016
2001
Total 2016 and 2001
Distribution
Nos of Locations
7
6
5
4
3
2
1
0
Neochromis simotes
Neochromis sp.
Neochromis sp. Labeo new
Neochromis sp. new species 1
Neochromis "lemon britti"
Neochromis sp. red pelvic
Neochromis "yellow rufocaudalis"
Paralabidochromis cyaneus
Paralabidochromis flavus
Paralabidochromis sauvagei (rockkribensis)
Paralabidochromis sp.
Paralabidochromis sp. 1
Paralabidochromis sp. Nile
Paralabidochromis sp. red breast new
Paralabidochromis sp. short snout scraper
Paralabidochromis sp. yellow multispot
Haplochromine cichilids Speceis





In other words, the observed haplochromine cichilids have adapted to some specific natural habitats of the Victoria Nile and potentially have limited distribution except for few species which have wide range of habitat adaptation characteristics.

Most of the haplochromine cichilids are reported to occur in the shallow water habitats (less than 1.5m) with rocky, sandy and muddy substrate[44]. Some species prefer riffle and run sections of the river while others are confined to nearly pool type habitats. The floating and submerging aquatic vegetation also is reported to play an important role in the habitat types for some of the species.

Of the conservation species, one of the haplochromine species is specifically confined to the section of the upper Victoria Nile only. This species is the *Neochromis simotes* and was thought to be extinct and had not been reported since a catch at Kakindu (52km downstream of the proposed BHP site) in 1911 till 1999.

The 2000 survey reported the species at Kirindi, just downstream of the KFS. Again in 2001, Atkins reported the species from two locations at Kirindi and Mbulamuti downstream of the KFS. The 2016 survey also reported this species from four locations namely Kirindi, Isimba, Mbulamuti and Kakindu all located downstream of the KFS. This species later is updated and categorized under data deficient category by IUCN.

The haplochromine species *Xystichromis bayoni* is categorized as a globally extinct species since 1996 by IUCN. This species was reported in the 2001 Atkins survey on upper Victoria Nile at four locations namely: Kirindi, Isimba, Mbulamuti and Kakindu all located downstream of the KFS. The species, however, is not reported in the 2016 survey but is potential to be present in the Upper Victoria Nile and need updating of its global conservation category through further surveys.

Other haplochromine species of global conservation category in the upper Victoria Nile are: i) Vulnerable category among haplochromine cichilids - *Pyxichromis orthostsoma, Pundamilia cf. azurea, Pundamilia cf. macrocephala, Ptyochromis sauvagei, Neochromis gigas, and Lithochromis xanthopteryx*; ii) Endangered category among haplochromine cichilids - *Pundamilia igneopinis Nile;* iii) Endangered Category among other fish species - *Brycinus jacksonii;* iv)Critically Endangered Category among haplochromine cichilids - *Astatotilapia brownae*; v) Critically Endangered Category among other fish species - *Oreochromis. variabilis;* vi) Nearly Threatened Category among other fish species - *Synodontis victoriae;* and vii) Data Deficient category among haplochromine cichilids - *Haplochromis lividus, Xystichromis nuchisquamulatus* and *Xystichromis phytophagus*. These species are also endemic to the area but are also endemic to other regions of Uganda, Tanzania,

[44] *National Fisheries Resources Research Institute (NaFIRRI), 2016. Habitat Characteristics and Haplochromine Fish Diversity of the Upper Victoria Nile: Towards the Development of Biodiversity Friendly Hydropower Projects. Draft Technical Report; and Nile Power;W.S Atkins; and Fisheries Resources Research Institute, 2001. Haplochromine Habitats Study. Fisheries Resources Research Institute, Jinja*

Kenya, Congo, etc (refer ***Appendix 11***), where these species are also reported in specific environmental habitats.

Of the surveyed sites for the haplochromine cichilids, Kirindi; and Isimba will be affected by the IHPP reservoir flooding, while the sites Mbulamuti and Kakindu are likely to be affected by the flow variation related to water regulation from IHPP dam. The potential effects will be high at Mbulamuti compared to Kakindu because of the closeness of the Mbulamuti site to the IHPP Dam.

II Fish Species - Kalagala Fall Site

The fish species within the KFS limits presented here are based on the Fisherman interaction at Itanda Fall area, as earlier surveys did not cover the KFS area for fishery survey other than haplochromine cichilids. Observations made at various times since 2000 reports the presence of 12 fish species apart from the haplochromine cichilids *(**Table 18**).*

Table 18: Fish Species Reported from Itanda Falls (Fisher's Survey 2016)

Family Name	Species Name	Local Names	IUCN Red List 2016
Bagridae	*Bagrus docmak*	Semutundu	LC
Centropomidae	*Lates niloticus*	Mputa	LC
Cichlidae	*Oreochromis niloticus*	Tafu, Abuku	NYA
	Oreochromis leucostictus	-	LC
	Oreochromis variabilis	Mpongo	CE
	Tilapia zillii	Katerega	LC
	Haplochromine species		
Claridae	*Clarias gariepinus*	Mmale	LC
Cyprinidae	*Barbus altianalis*	Kisinja, Nkukutu	LC
	Labeo victorianus	Nningu, Nsuku	CE
Lepidosirenidae	*Protopterus ethiopicus*	Mamba	NYA
Mormyridae	*Mormyrus kannume*	Kasulubana	LC
	Mormyrus macrocephalus		LC

IUCN Red List Category:

CE = Critically Endangered; LC = Least Concern; NYA = Not Yet Accessed but in the list of catalogue of life;

Among the Haplochromine cichilids, Atkins survey of 2001 and NaFIRRI survey 2016 reported 20 species from the Kalagala and Itanda Falls areas of the KFS[45] (***Table 19***). Of the total species reported 9 species were reported in the survey of 2016, while 13 species were reported in 2001. Between the surveys only 2 species are common. The reason for the wide variation in species composition between the surveys is difficult to evaluate and might be related to the difference in survey seasons and methods employed for the fish capture?

Table 19: Haplochromine cichilids Species in the KFS

Haplochromine cichilid Species	IUCN Red List 2016	Survey year	
		NaFIRRI (2016)	Atkins (2001)
Astatoreochromis alluaudi	LC		
Astatotilapia brownae	CE		
Astatotilapia nubila	NYA		
Astatotilapia sp.	NYA		
Haplochromis sp. flameback	NYA		
Lithochromis rubripinnis	LC		
Lithochromis sp.	NYA		
Mbipia mbipi	LC		
Neochromis gigas	V		
Neochromis greenwoodi	LC		
Neochromis rufocaudalis	LC		
Neochromis "lemon britti"	NYA/NC		
Neochromis sp. red pelvic	NYA/NC		
Paralabidochromis sp. Nile	NYA		
Psammochromis riponianus	NYA		
Pundamilia pundamilia	LC		
Pundamilia sp.	NYA		
Pundamilia sp. 1	NYA		
Pundamilia "yellow-multispot"	NYA/NC		
Xystichromis nuchisquamulatus	DD		
Total Species Survey Period		9	13
Total Species Combined		20	
Species Common in both the Surveys		2	

Note :

[45] *Nile Power; W.S Atkins; and Fisheries Resources Research Institute, 2001. Haplochromine Habitats Study. Fisheries Resources Research Institute, Jinja*

	Species absent		Species present

IUCN Red List Category:

CE = Critically Endangered; VU = Vulnerable; DD = Data Deficient, LC = Least Concern; NYA = Not Yet Accessed but in the list of catalogue of life; NYA/NC = Not Yet accessed also not in the catalogue of Life.

Of the reported fish species in the KFS stretch of the Victoria Nile two (*Oreochromis variabilis,* and *Labeo victorianus*) are listed in the IUCN red list as species of global conservation conservation significance. Among haplochromine: *Astatotilapia brownie, Neochromis gigas,* and *Xystichromis nuchisquamulatus* are alos recorded as species of global conservation concern.

The *Oreochromis variabilis*is and *Labeo victorianus* are critically endangered species native to Lake Victoria, Kyoga, Kwania and Salisbury and their tributary streams[46] in Uganda. The *Neochromis gigas, a* haplochromine cichilid, is a vulnerable species native to Uganda and Tanzania, while the *Astatotilapia brownae* is a critically endangered native species with distributions in Lake Victoria in Uganda and Tanzania. One of the haplochromine species, namely *Xystichromis nuchisquamulatus* is categorized as data deficient due to inadequate information to enable evaluation of the species threat category. The major threat to these species is hybridization, predation by exotic fish Nile perch and over fishing.[47] ***Table 20*** presents the distribution range of these global conservation fish speceis across the Upper Victoria Nile River in the locational context of the KFS.

Table 20: Distribution of the IUCN Red List Species with reference to KFS

Species	IUCN Red List 2016	Upstream KFS	KFS	Downstream KFS
Brycinus jacksonii	E			
Oreochromis. variabilis	CE			
Labeo victorianus	CE			
Synodontis. victoriae	NT			
Haplochromines Cichilid Speceis				
Astatotilapia brownae	CE			
Haplochromis lividus	DD			
Lithochromis xanthopteryx	V			
Neochromis gigas	V			
Neochromis simotes	DD			
Ptyochromis sauvagei	V			
Pundamilia cf. azurea	V			
Pundamilia cf. macrocephala	V			

[46]http://www.iucnRed List.org/search

[47]http://www.iucnRed List.org/search

Pundamilia igneopinis_Nile	E			
Pyxichromis orthostsoma	V			
Xystichromis bayoni	Ex			
Xystichromis nuchisquamulatus	DD			
Xystichromis phytophagus	DD			

	Species absent		Species present

It is to note that the IHPP reservoir is not affecting this survey location due to flooding.

4.1.3 Socio-economic environment

The KFS area lies within the key settlement villages of: Nakakonge, Kirindi, Nsiima, Spotter, Wabirongo, Kitambuza, Kalagala, Mutumu-Nakaato, Buwala B, Lumuli B, and Lumuli D within the administrative foot prints of the KFS. The entire area is mostly open and not affected by settlements and built structures. Creation of KFS under the Bujagali IA did not consider land acquisition and land use restriction within the KFS, as part of the management plan for the protection of natural habitats, environmental and spiritual values. Land within KFS has been utilized for the purpose of cultivation and other resource use by the settlers of the villages adjoining the KFS. The land use map shows KFS to comprise of 62.31% (795.65 ha) of terrestrial land area. Of this area nearly 43.64% (347.29ha) is under some form of cultivation. Of the cultivated land only 22.36% (77.65ha) lies outside the Kalagala and Nile Bank CFRs most of which is probably privately owned.

There are 73 land owners (APs) within the KFS affected by IHPP Alternative 1. These are listed in ***Appendix 14***. The RAP for IHPP was carried out, property valuation dones and payments have been effected to the PAPs. Out of the 73 APs five APs will lose their residential structures (refer ***Appendix 14, cadastral Maps***).

Baseline information on the social and economic profile of the people owning land within KFS do not exist in the earlier surveys related to IHPP and KO-SMP undertakings. The IHPP Social Impact Assessment and Resettlement Action Plan do provide some data on the social and economic characteristics of people residing or owning property within IHPP foot print, but this is compiled in a manner that cannot be used for the characterization of KFS affected households socio-economic profile.

The socio-economic database presented in this section, represents the database of the communities mostly living outside the KFS limits owning land and utilizing the resources of the KFS in various forms based on the sample survey conducted using structured questionnaires (***Appendix 15***) and

Focus Group Discussions. A total of 109 households were randomly surveyed from the surrounding villages of KFS for the purpose of deriving key demographic and economic characteristics of the HHs owning or using the resources of KFS. The households covered as per the village settlements are presented in ***Table 21***.

Table 21: Numbers of households covered for the KFS socio-economic survey

Side of River	District	Sub county	Village	No.HH covered by survey
Buganda side (West Bank)	Kayunga	Nazigo	Nakakonge	03
			Nsiima-Spoota	00
			Nsiima-Kibaati	05
			Wabirongo	09
			Kitambuza	03
			Kalagala	14
			Kasambya	22
Total Buganda side (West Bank)	**1**	**1**	**7**	**56**
Busoga side (East Bank)	Kamuli	Magogo	Namalumba	24
			Bumegere	05
			Ddamba	4
			Nakaato	08
			Lumuli D	04
			Lumuli B	5
			Buwala B	03
Total Busoga side (East Bank)	**1**	**1**	**7**	**53**
Grand total	**2**	**2**	**14**	**109**

Similarly, FGD at five locations with a total of nearly 60 participants provided insight on the economic activities of the adjoining villages related with the KFS (***Appendix 16.C. 12***).

4.1.3.1 Demographic characteristics

The surveyed households had a total head count of 861 comprising of 50.06% males and 49.94% (***Figure 4***). Of the total population, nearly 58.87 percent are children below the age of 18 (***Figure 5***).

Figure 4: Male - Female population distribution

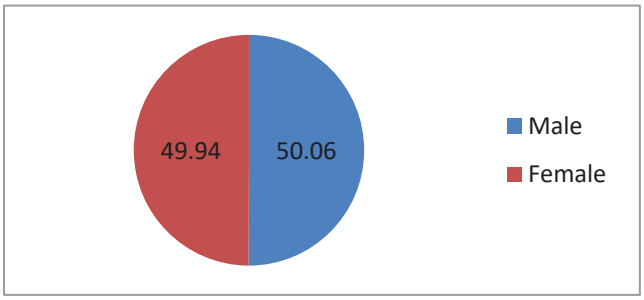
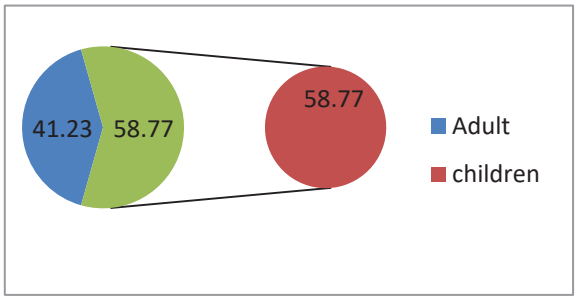


Figure 5: Distribution of adult and children population



The composition of family members is not equal across the households. It varies from a maximum of 21 to a minimum of 1 in the household's family. Compared to the national household size of 4.7[48], the KFS surroundings have nearly doubled the size of household. Male/female ratio in the KFS area is around 1:1, which is marginally lower than the national average of 1:1.2[49].

The household head is male dominated (***Figure 6***). Female household head is rare and is seen only in case when the husband is deceased. Age distribution of the household head reflects that early marriage in the society exists. More than 6% of the household heads are below 25 years of age (***Figure 7***). Majority of the household's head are between 26 to 55 years of age constituting nearly 70% of the households. Families with household's head above 56 years of age are limited to 22.94% indicating the general lower life expectancy rates.

Figure 6: Household head by gender

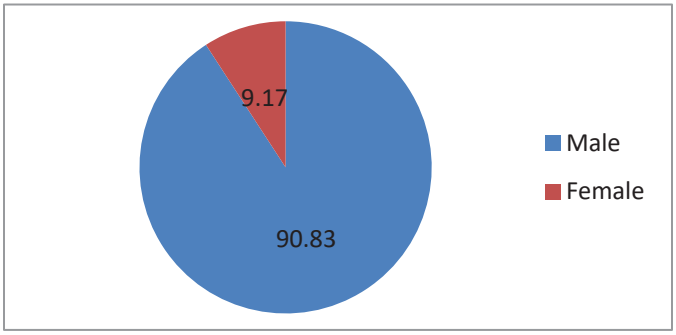
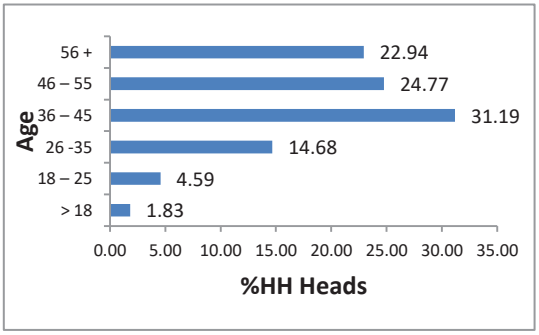


Figure 7: Household head by age



There are more than 8 tribal groups residing in the KFS surroundings (***Figure 8***). The dominant tribal groups are Musoga, followed by Muganda, Mugisu, Musamia, Iteso, Mugwere, Jopadhola and others. Similarly, the households follow more than 5 religions (***Figure 9***). Christianity as religion is

[48] *Uganda Bureau of Statistics (UBOS), 2016. The National Population and Housing Census 2014 – Main Report*, Kampala, Uganda

[49] *Uganda Bureau of Statistics (UBOS), 2016. The National Population and Housing Census 2014 – Main Report*, Kampala, Uganda

dominant. Protestant constitute more than 33.03% of households and Catholic make up around 31.19%. Muslim households are around 26.61% followed by Pentecostal, SDA and others.

Figure 8: Tribal Composition of KFS

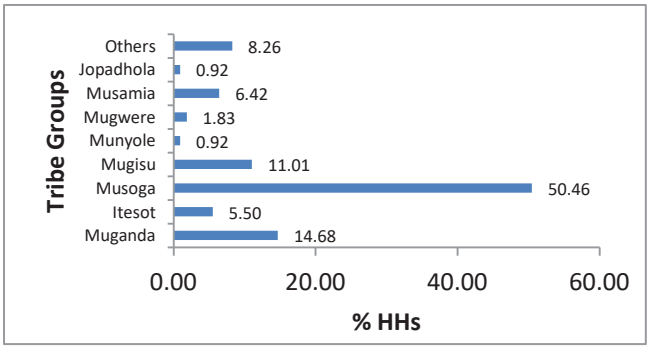
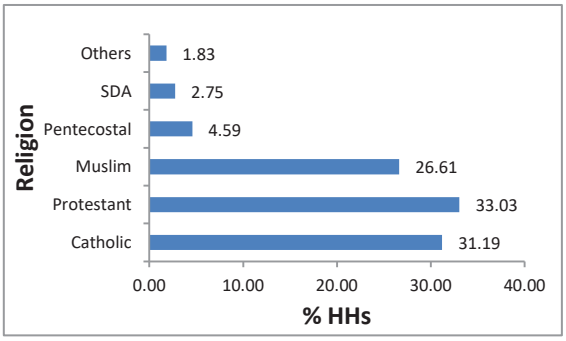


Figure 9: Religions Observed in KFS



4.1.3.2 Quality of life

Across the household heads, the literacy rate is very poor (***Figure 10)***. More than 40% of the household heads are illiterate, while about 35% could only read and write. Only 19% have completed their primary education. The numbers of household head with education above primary level is limited to less than 6%. This indicates that the household heads have very limited livelihood skills other than the traditional economic activities for livelihood of the family.

There is a growing awareness among the households for health care. When sick, more than 95% visit the modern health care facilities available in the public domain or at private domain. People visiting public domain is higher than those visiting the private clinics (***Figure 11***). Less than 2% of the population visit traditional healers. The high level of awareness seems to be related to the decade long awareness programs on HIV/AIDS, which is one of the fatal diseases that affected the area. Water borne diseases particularly diarrhoea, and malaria are the other common diseases in the area.

Figure 10: Literacy Status of KFS HH Heads

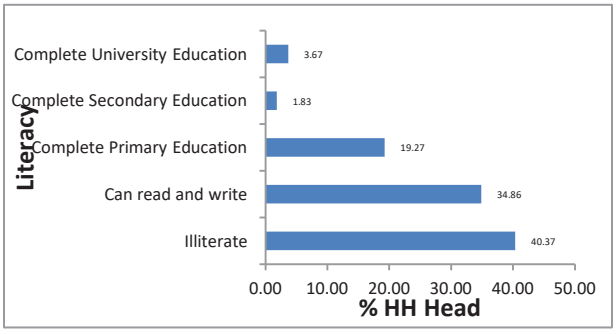
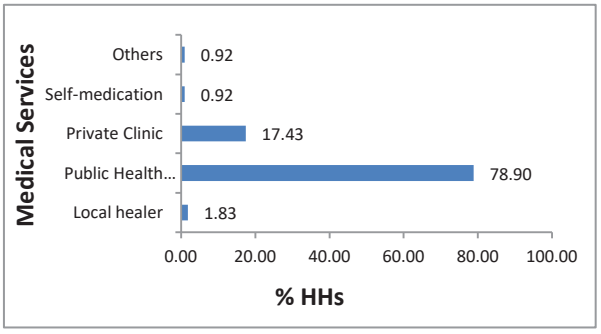


Figure 11: Preference to Medical Services



Most of the families have their own residential dwellings and only less than 4% own no residential structures (***Figure 12***). About 75% of those not having residential structures of their own live in the rentals while 25% do not specify their residential arrangements (***Figure 13***).

Figure 12: Families with and without residential structure

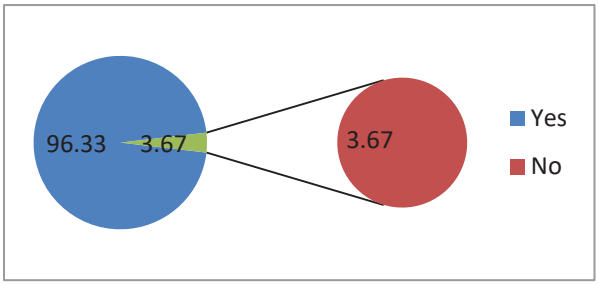
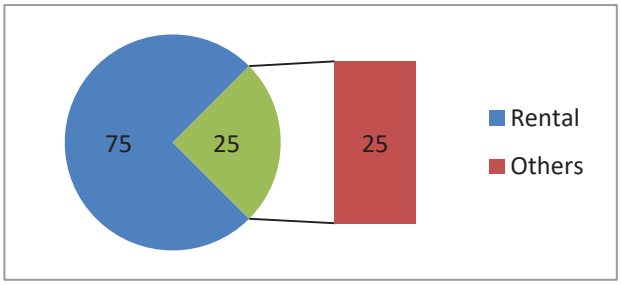


Figure 13: Copping strategy of families without residential structures of their own



A majority of the Households (62.39%) source their household drinking water from Bore Holes, while a sizable household (23.85%) source their drinking water from the river directly. Households sourcing waters from the community and private tap is less than 5% only (***Figure 14***). Though majority of the households have water sources close to the house, they still lack quality drinking water for healthy living.

Majority of the households (98.71%) have toilets of their own close to the house while only a small number of households (1.83%) do not have toilet of their own and defecate at the community or neighbor's toilet (***Figure 15***). In terms of household sanitation, the KFS surroundings seem to have better living conditions because of toilet facilities at the homestead. Nonetheless, the toilets need to be improved to uplift the overall sanitation.

Figure 14: Source of drinking water

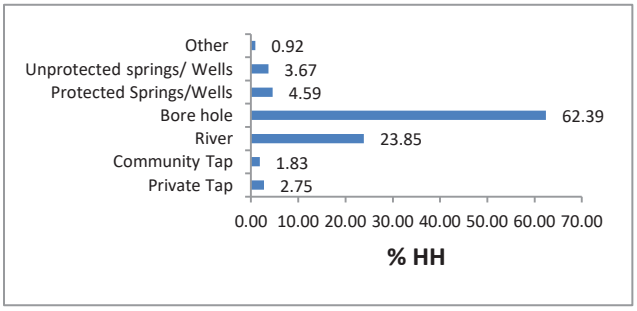
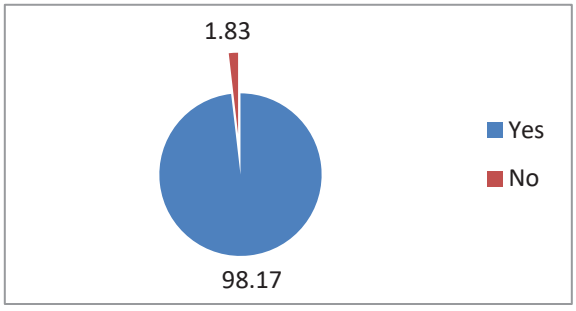


Figure 15: Toilet at the HHs



Fire wood (98.17%) is the dorminant form of Energy for household cooking. Clean energy for cooking (Electricity) is limited to less than 1% of the households depicting the status of indoor air quality and related health status of the households (***Figure 16***). Similarly, oil and kerosene are the dorminant sources of energy used for lighting at the household). Nearly 70% of the households use either an oil lamp using kerosene as the lighting energy. About 30% of the households have access to cleaner energy (Solar light and Electricity) (***Figure 17***).

Figure 16: Source of cooking energy

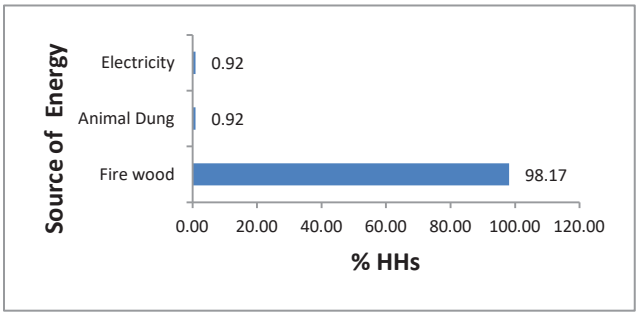
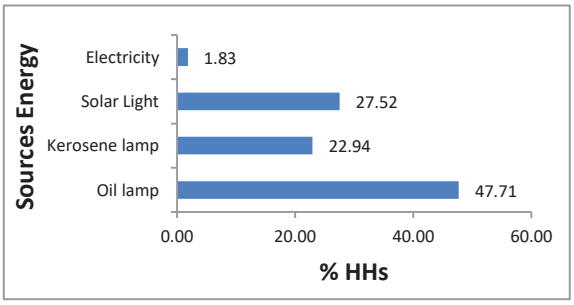
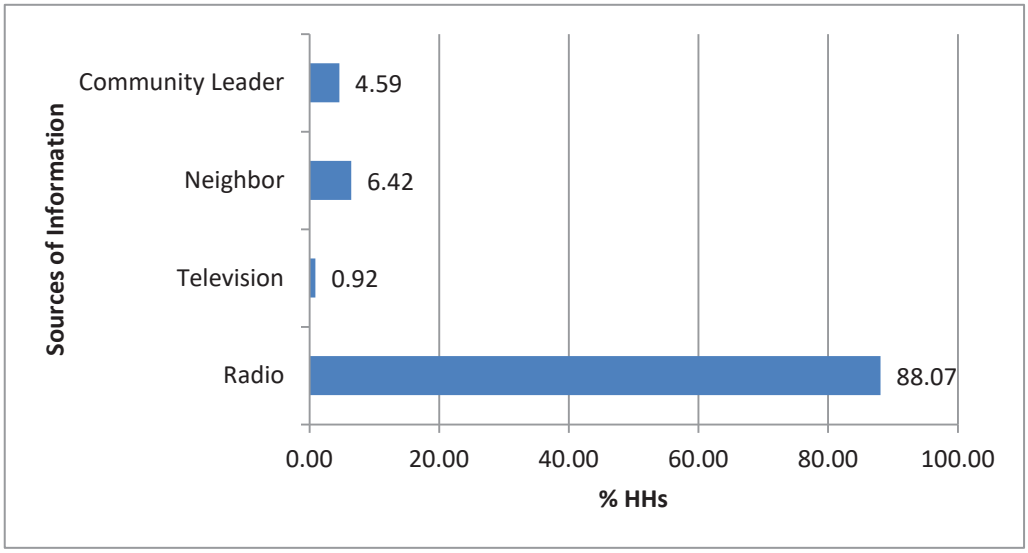


Figure 17: Source of lighting energy



The radio is the primary source of information. More than 88% of the people get the information from the radio (***Figure 18***). Nearly 11% of the people get their information from the community leaders and neighbors. Television as a source of information and entertainment is limited to less than 1% of the people. Newspaper and internet facilities are almost non-existent revealing the quality of the life of the communities in relation to the modern world facilities.

Figure 18: Source of information at the household level



The literacy levels, access to health services, access to the clean energy for cooking and lighting, household's sanitary conditions and access to the quality drinking waters apart from the ownership of the residential structures are key indicators of the quality of life the communities in an area. An evaluation of these indicators reveals the fact that the households have a poor quality of life and are deprived of the opportunities or have little access to human and physical capital that are potential in the area to improve the quality of life.

4.1.3.3 Economic activities

In the rural parts of the KFS neigbourhood, agriculture is one of the key economic activities among households. The other economic livelihood activities is fishing in the Victoria Nile and extraction of non-timber forest products for various household uses. Tourism is the other potential economic activity, but involvement of HHs in the tourism industry is very limited. Tourism industries are operated by foreigners who provide limited job opportunities to the local households.

Focus group discussions reveal that nearly all of the households are involved in agricultural activities irrespective of the status of land ownership. Nearly 92% of the households own land, while about 8% have no land of their own (***Figure 19***). Two types of agriculture related economic activities exist.

- The self employed farmer working on their own land and;
- The wage laborer engaged in agriculture and employed by the big land owners.

Indirectly, the status of the land ownership determines how households are involved in the economic activities. It is to be noted that land ownership is highly skewed across the households (***Figure 20***).

Figure 19: HH's with or without land

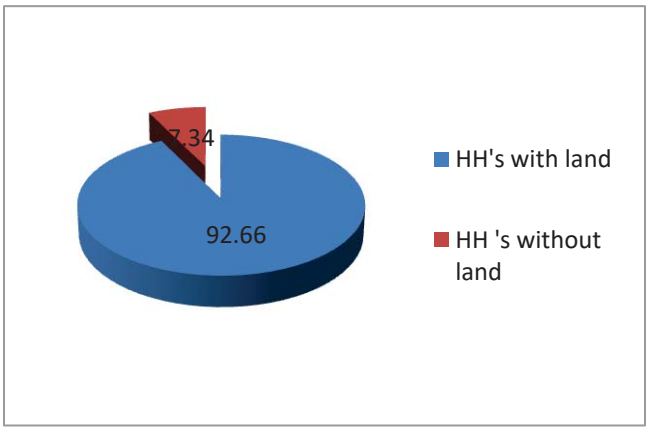
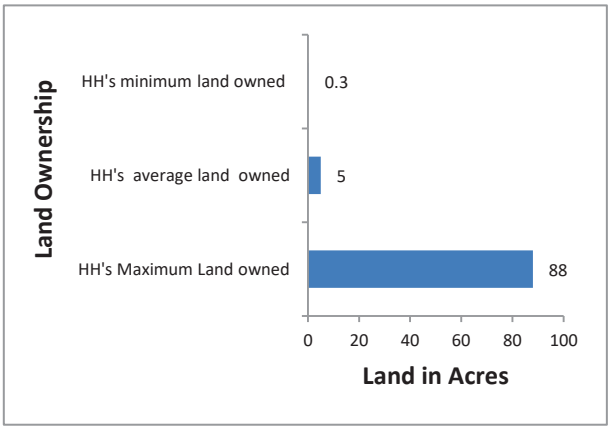
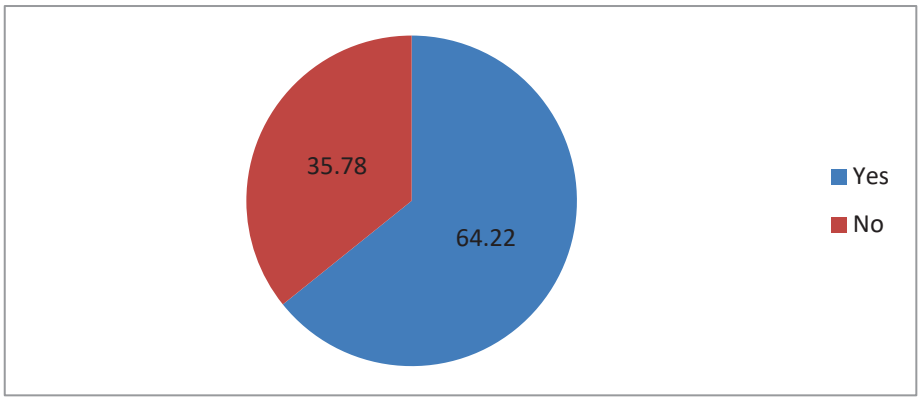


Figure 20: HH's land ownership variations



Nearly 20 percent of the households own more than 60% of the land, while more than 45% of the households own only 5% of the land. This is also reflected in the food sufficiency status of the households. More than 35% of the households reported food deficiency from the land owned and used for agricultural production (***Figure 21***).

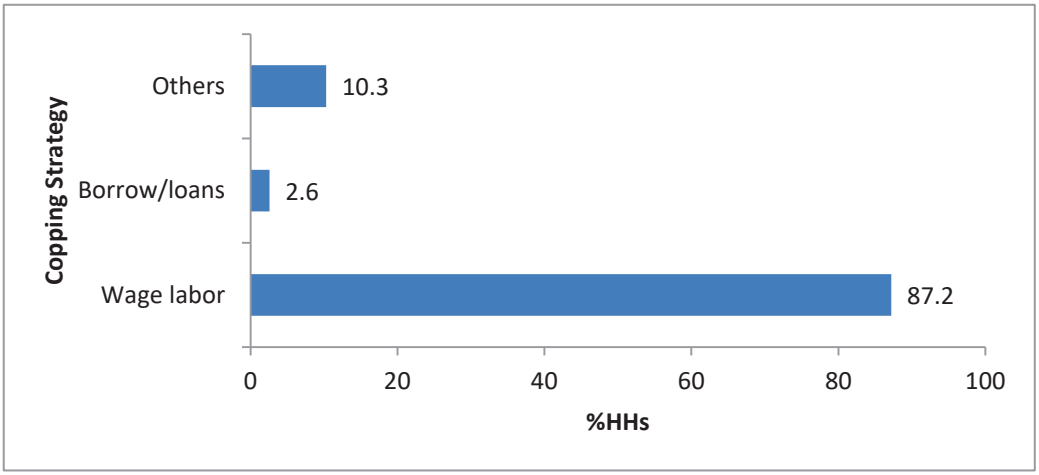
Figure 21: Food sufficiency status of the households



The food deficiency situation varies from over a month to round the year - averaging around six months in a year for the households who report food deficiency.

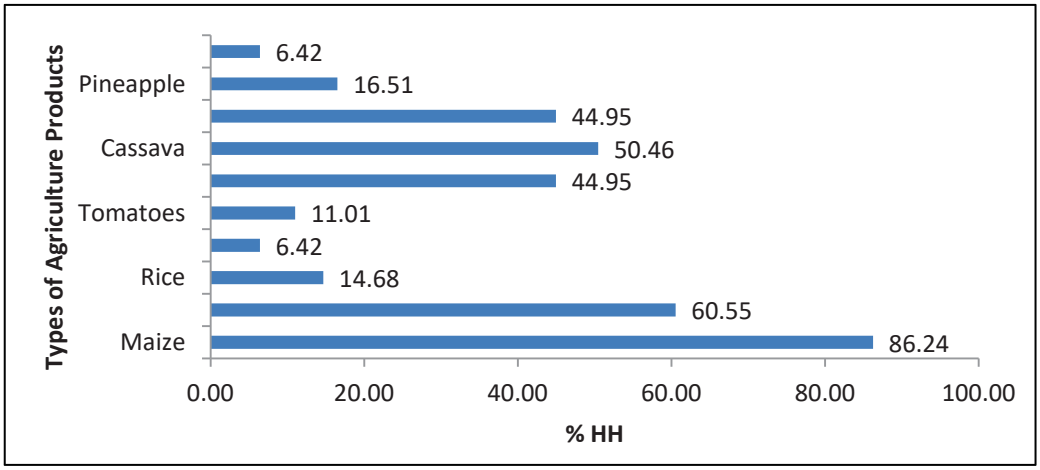
What is interesting to note is the copping strategy adopted to meet the food deficiency. Nearly 87% of the households report wage labor as the key coping strategy (***Figure 22***). About 10% report wage jobs outside their place of residence (remittance), while a few obtain loans for this purpose. It appears wage jobs in the agricultural farm is the only job available locally around the KFS.

Figure 22: Copping strategy to meet food deficiency



As stated earlier, agriculture is the main economic activity of the area. A number of crops, vegetables and horticultural value products are grown in the area. These are maize, bean, rice, cabbage, tomatoes, coffee, cassava, banana, pineapple and sugarcanes. Households harvesting various agricultural products vary across the land owners depending on the quality of land that they own (***Figure 23***).

Figure 23: Households producing agricultural products

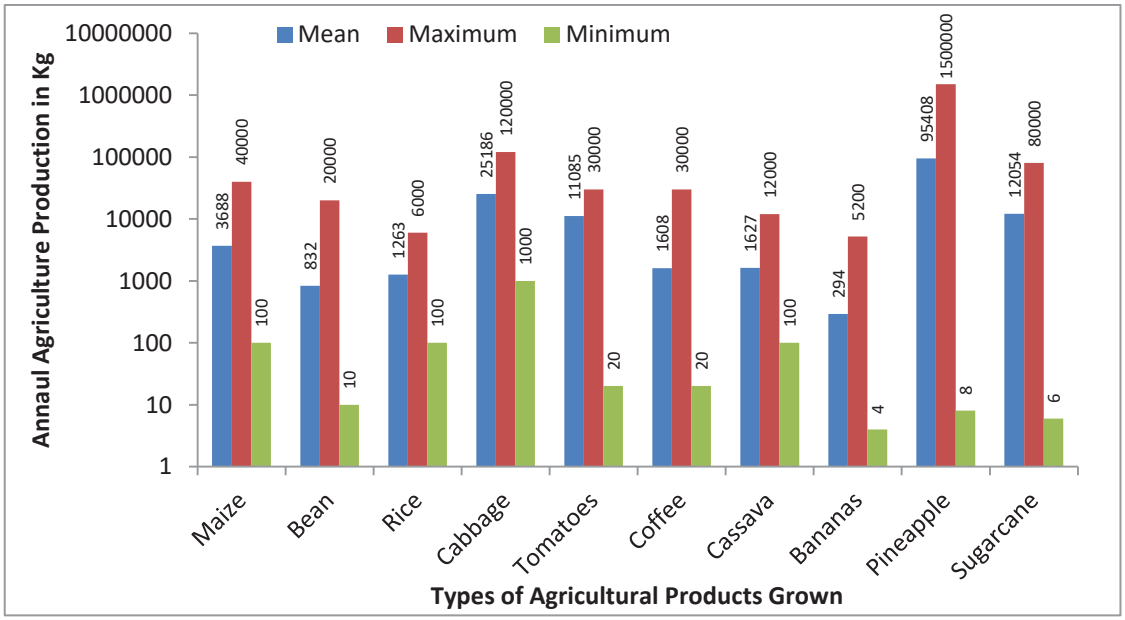


A majority of the households produce maize followed by beans, cassava, banana and coffee (***Figure 23***), while agricultural production of rice, cabbage, tomatoes, pine apple and sugarcane is limited to less than 17% of the households.

Household production among the producing households, the production of different types of agricultural product annually is summarized in ***Figure 24*** below. It is noted that not all households produce equal quantity of agricultural products. Agricultural production varies across the households

involved in agriculture. The annual agricultural production variation is quite wide across the producing households.

Figure 24: Variation in agriculture production across the households involved in agriculture



All the agricultural products annually harvested are not consumed by the producing households. Only a small percentage of the households consume all the agricultural products they harvest. While a majority sell their surplus products. Particularly the cash crops such as: tomatoes, cabbage, and sugarcane are sold in the market by almost all households involved in crop agriculture. ***Figure 25*** presents the percentage of agricultural dependent households consuming and selling their agricultural products.

Like the variation in production across households, the consumption and sale of the agriculture products also varies widely across the households (***Figure 26*** and ***Figure 27***). Only a small number of households who own large agricultural farm sale their agricultural product in the open market, while most sale a little with or without surplus only to meet their domestic needs.

Figure 25: Households consuming and selling their agricultural products

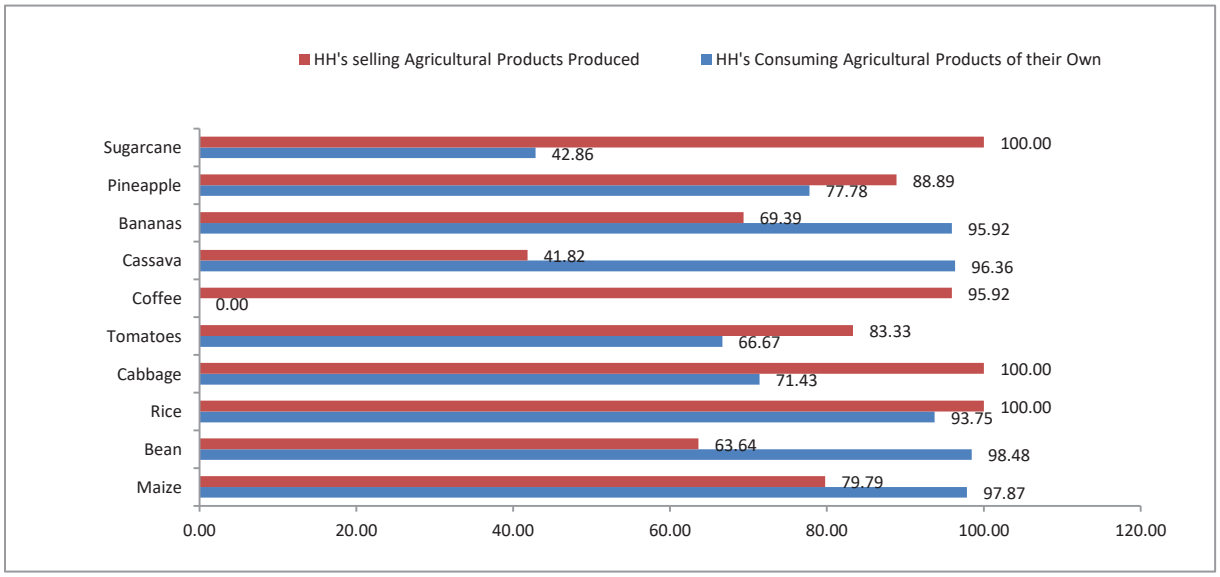


Figure 26: Variation across the consuming households in the consumption of agricultural products harvested

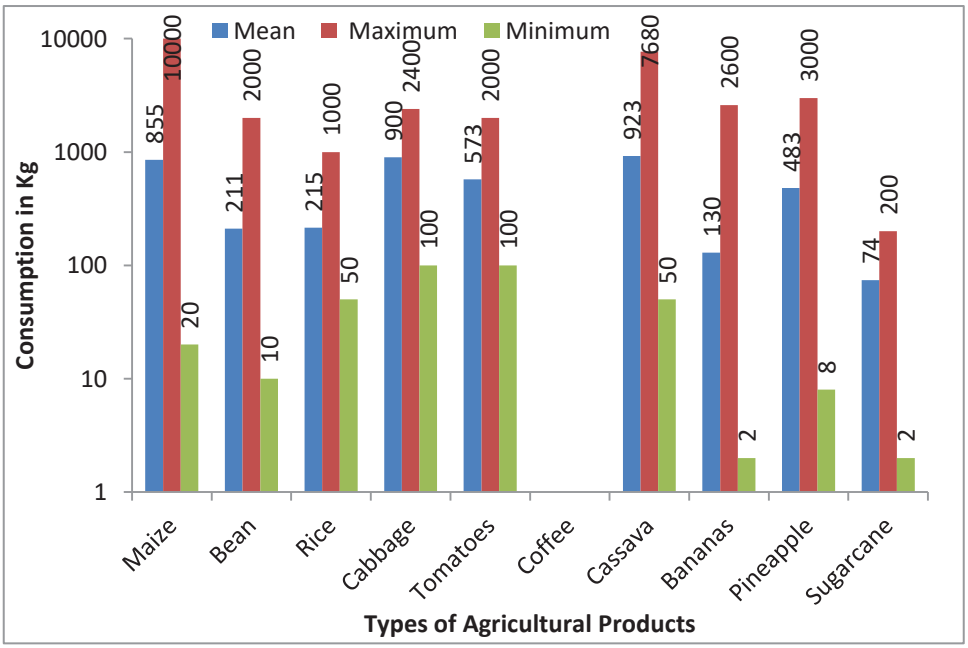
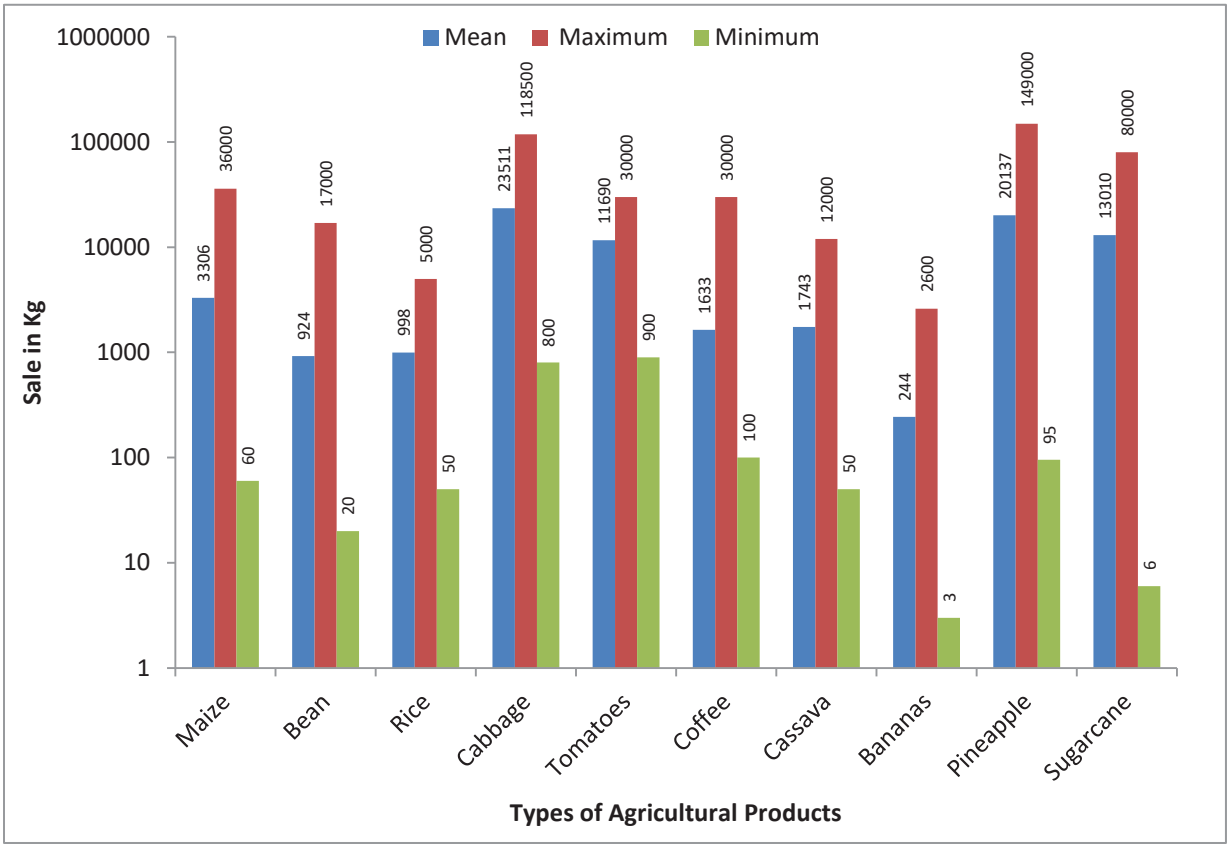


Figure 27: Variation across selling households in the sale of agricultural products harvested

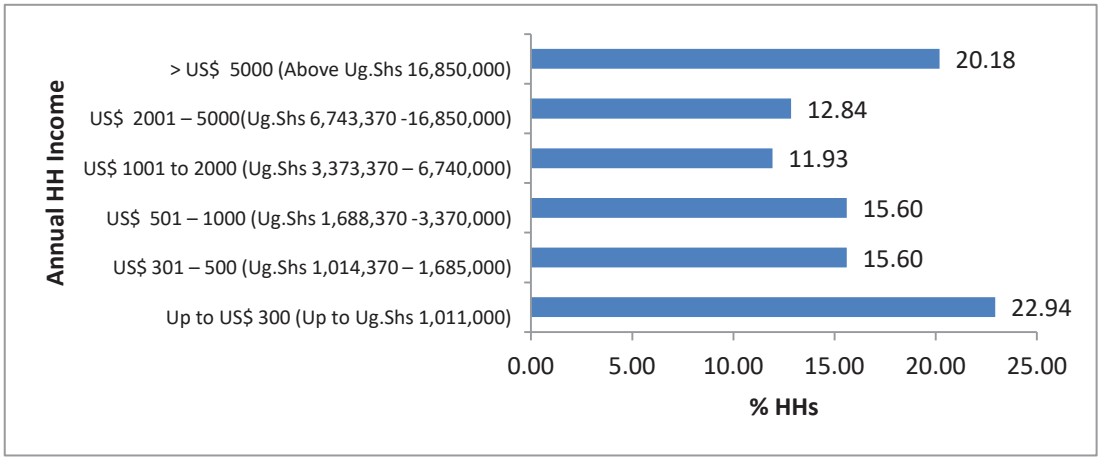


To date, the only gateway for economic activity for livelihood around KFS is agriculture. Access to the land is highly skewed and as a result, all households do not have equal access to land and facilities that enhance agricultural production. Available job opportunities are on the farm and inclined to agriculture. The households in the area are exposed to very low rates for the labor they offer to agricultural and have limited options to maximize the value of labor for livelihood.

Very limited information is available on fishing income. Not all the households are involved in fishing activities. Focus group discussions selected community members reveal that only 15 to 20% of the households rely on fishing for partial livelihood. A similar percentage of HHs extract NTFP resources for the fulfillment of the household needs only.

Annual income of the household's relying on KFS presented in Figure 28 also reflects the economic situations of the households. A little over 79 percent of the households have annual income less than USD 5,000.

Figure 28: Annual income of the KFS households



There is a dire need for the diversification of the economic activities in the KFS. The area has great potential for white water sports tourism, eco-tourism and cultural tourism. Only a fraction of this potential is so far exploited. Involving local communities in these tourism opportunities (which is very insignificant to date) through capacity building, skill enhancements and financial support apart from development of tourism infrastructures (particularly roads and communication) will have unprecedented impacts on the quality of life and economic situation of the KFS communities. The KO-SMP developed in 2010 by the MoWE with the technical support of IUCN has many components to this end. Its implementation with the vision and objective as envisioned in the KO-SMP is yet not late to improve the quality of life and economic status of KFS communities.

4.1.4 Cultural and spiritual environment

A total of 7 cultural / spiritual sites are located along the banks of Victoria Nile within KFS. ***Table 22***, presents the details of site location and spiritual or cultural values of the sites. ***Map 10*** graphically presents the location of cultural sites in reference to IHPP reservoir and KFS geographical limits. All the sites lies outside the reservoir flood limits and are not affected by the IHPP construction and operation activities.

Of the 7 sites located within the KFS, Kalagala Cultural site at the west bank at Kalagala Fall CFR and Walumbe (death god) at the East Bank of Itanda Fall in the Nile bank CFR have been listed as the sites of spiritual values in the KO-SMP.

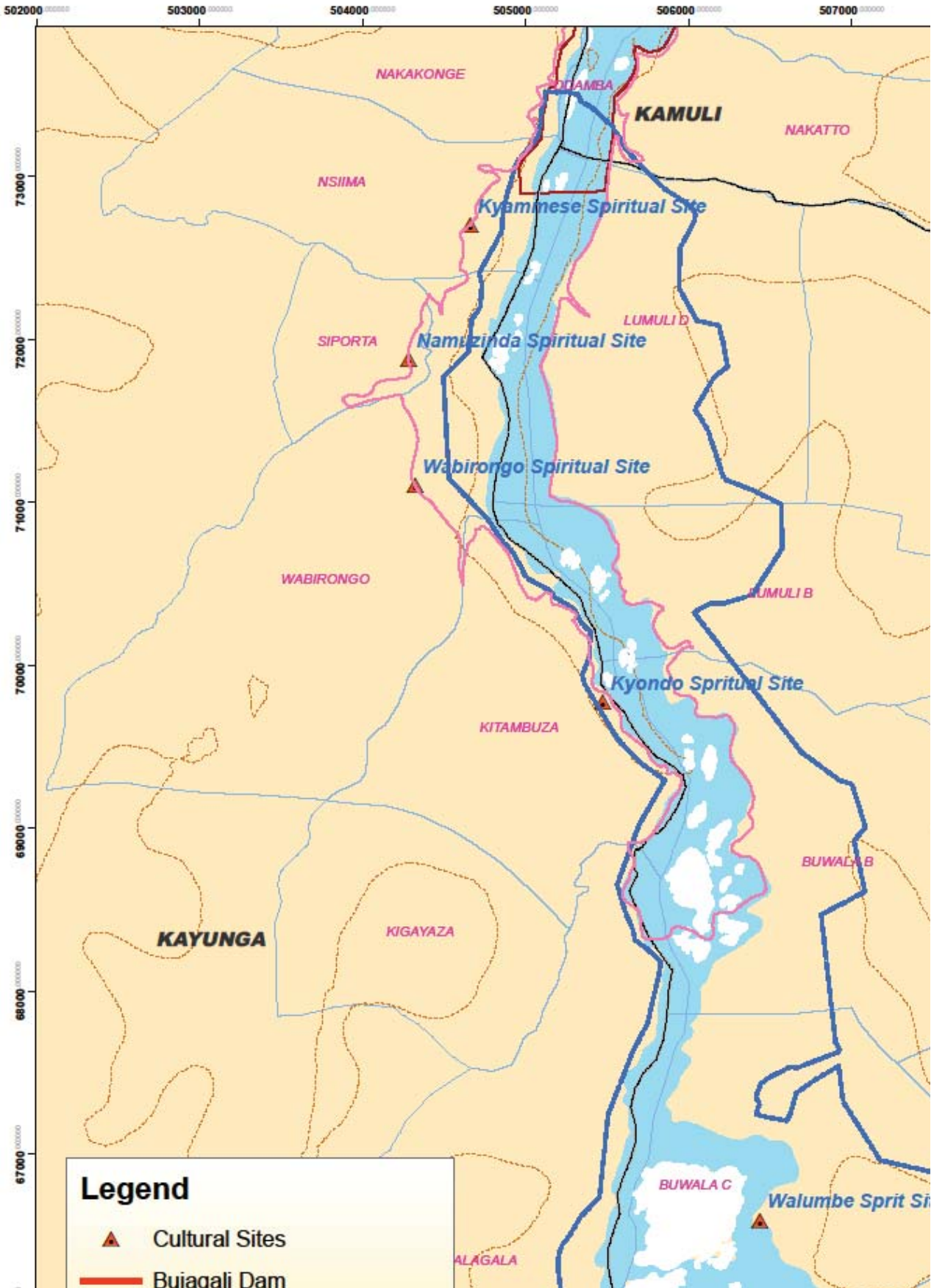
Table 22: Cultural spiritual sites of IHPP reservoir and KFS

SIDE OF RIVER BANK	VILLAGE	NAME OF SITE/ SITE LEADER	DISTANCE FROM THE RIVER BANK	CULTURAL/SPIRITUAL VALUE

SIDE OF RIVER BANK	VILLAGE	NAME OF SITE/ SITE LEADER	DISTANCE FROM THE RIVER BANK	CULTURAL/SPIRITUAL VALUE
Buganda side Buganda side	Nsiima Kibaati	Kyammese spiritual site Leader: Kayondo Robert	Within 100m (not affected by flooding)	People visit this site when they have problems like infertility, need to boost their business fortunes, uncertainty in how to go about any undertaking in life.
	Nsiima Sipoota	Namuzinda spiritual site Leader: Kaddu Godfery	Within 100m (not affected by flooding)	It is believed that the spirits here have healing powers to treat people who have run mad or are epileptic, and also help heal what is locally referred to as "*Ebizibu byabalongo*" (literally meaning "*the problems of having twins*" - it is believed that there some people on giving birth to twins, get possessed by some power and to get cured/healed from this condition, one has to get treatment from this site) Also cured people who have been possessed by Night dancing spirits (okukwata ekitambo)
	Wabirongo	Wabirongo spiritual site Leader: Kiribwa John	Within 100m (not affected by flooding)	Gives blessings (varied), fertility for women, heals the bewitched and other diseases that other healers have failed to cure
	Kitambuza	Kyondo spiritual site Leader: Juma Masaba	Within 100m (not affected by flooding)	With the help of spirits, he is believed to be able to offer treatment for: • Heart disease, • Women who have complications with their reproductive systems and are unable to conceive and mental sickness (madness). He also offers treatment for any other health condition(s) that other healers have failed to treat.
	Kalagala	Kalagala Cultural site/Agatha	Within 100m (not affected by flooding)	A site sacred to Buganda Kingdom being attributed to Kabaka Nakibinge who reigned around 1500A.D is located. Cultural ceremonies are undertaken by Kabakas at the site. Buganda kingdom designated the Empindi clan as the custodians of this cultural site. People visit to ask/ pray for wealth, fertility (for women) cleansing after bad omen to an individual or family and appeasement of the spirits after

SIDE OF RIVER BANK	VILLAGE	NAME OF SITE/ SITE LEADER	DISTANCE FROM THE RIVER BANK	CULTURAL/SPIRITUAL VALUE
				receiving what one had asked for.
	Kasambya	Kasambya cultural Centre Leader: Mulumba	Within 100m (not affected by flooding)	At this site, a person can request for various kinds of help/support from the gods. These range from wealth, fertility and consultations for any challenge one may be faced with. Preservation and promotion of different cultural practices like dance
Busoga side	Buwala C	Walumbe (death god) spirit of Lubaale Musoke and the Itanda spirit	Within 100m (not affected by flooding)	On the eastern side of the river Nile adjacent to Itanda falls, a site in Busoga mythology where Walumbe (death god) descended into the earth to escape from Kayikuzi who had come to remove him from the earth for killing humans. Worship for the spirit of Lubaale Musoke and the Itanda spirit take place at this shrine on the river bank at Itanda. A cultural center is planned to be constructed on the east bank at this place managed by Busoga Kingdom.

MAP 10: Cultural and Spiritual Sites of KFS Area



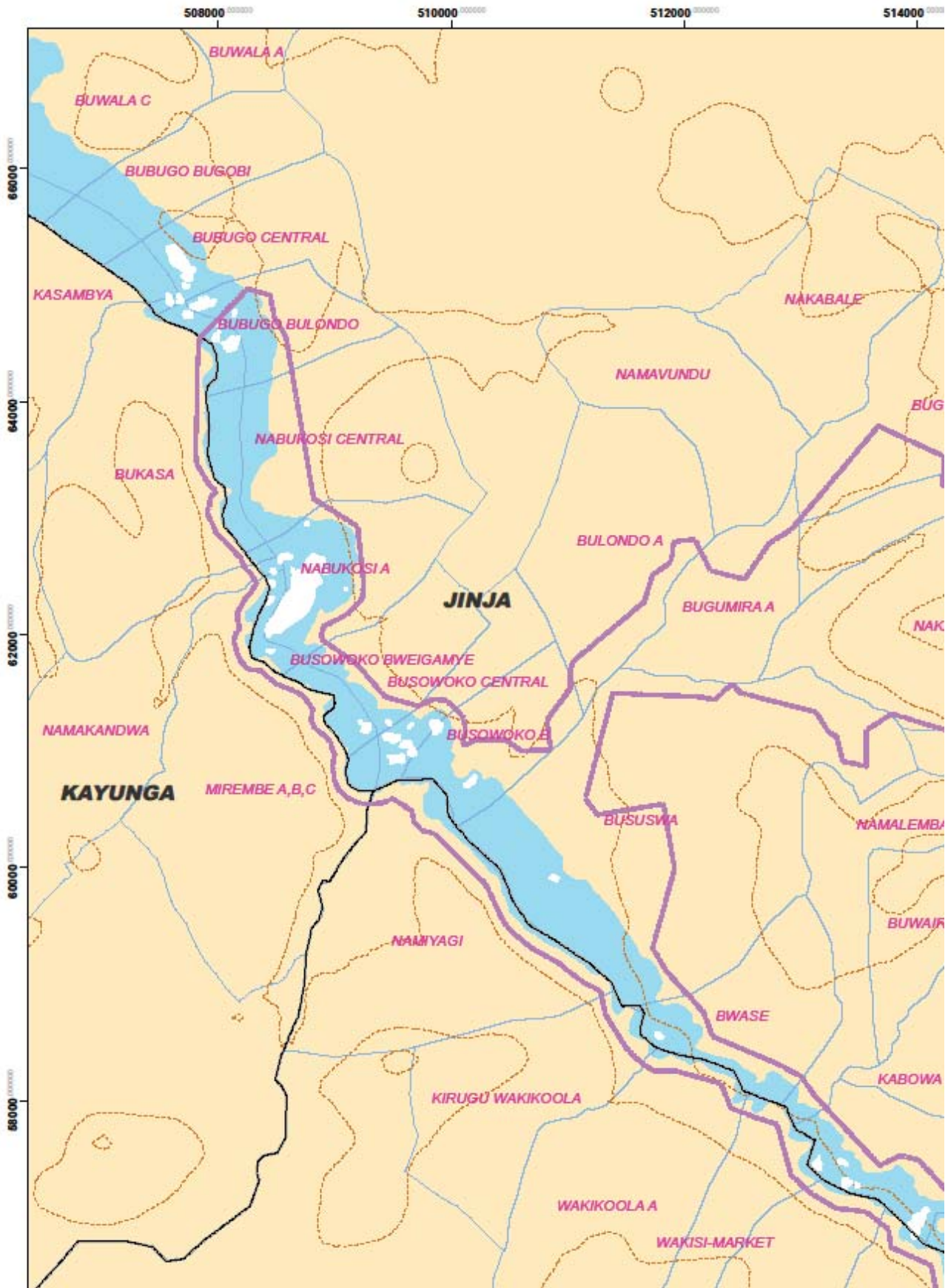
4.2 Environmental and social baseline conditions KFS Extension Area

The proposed KFS Extension Area is an environmental offset site that is expected to house the affected KFS natural habitats and environmental values that could not be restored or mitigated onsite within the remaining KFS.The delineated area extends 12.04 km south along Victoria Nile continuously upstream of the KFS. Approximately 100 meters of the land above the highest flood level on both banks of the river, including the entire area of the Namavundu CFR, has been included within the proposed KFS Extension Area. The KFS Extension Area geographical footprint covers parts of 3 Districts, 3 Counties, 4 Sub-counties, 8 Parishes and 20 Villages (***Table 23 and Map 11***).

Table 23: Administrative foot print of KFS Extension Area

District	County	Sub-county	Parish	Village
Kayunga	Ntenjeru	Kangulumira	Kangulumira,	Bukasha, ,
			Seetanyizze	Mamakwanda
			Kawomya	Mirembe,
Buikwe	Buikwe	Wakisi	Nakalanga,	Namiyagi, Budoda,
			Wakisi	Wakikoola Ä", Wakisi Market, Wakisi Central, Nakawanga,
Jinja	Kagoma	Butagaya	Nawapanda	Bubugo Budondo, Nabukosi Central, Nabukosi Ä", Busowoko Buweigamie, Busowoko Central, Busowoko "B",
		Budondo	Kibibi	Bukosse, Bwasse,
			Namizi	Buyala "C", Buyala Ä", Namizi west,

MAP 11: KFS Extension Area Administrative Foot Print



4.2.1 Physical Environment

4.2.1.1 Topography and elevation

The 12 kilometer long free flowing Victoria Nile River in the KFS extension area is the lowest ground of the area. It continues to the south from the KFS up to the dam wall of BHPP. The valley bottom elevation rises from 1068 mamsl at its northern extremity to about 1085m amsl at the bottom of the Bujagali Dam. Like in KFS, the Nile River is entrenched in a U shaped valley, which lies 10 to 20m below the general rolling landscape on either flank. The valley flanks are gentler and incline at an angel of 10 to 15 degrees.

4.2.1.2 Landscapes and aesthetics

The landscape and aesthetics of the KFS extension area are similar to KFS in the south. The free flowing river stretch has a length of about 12.04 km. The river wet channel width varies from less than 85m to over 550m. The river width is widest just upstream Dead Dutchman's rapid and narrowest in the middle section between Dead Dutchman's rapid and Bujagali Dam. The width of the river from valley flank to valley flank varies from 250m to above 800m. On an average valley width is about 350m. Compared to the KFS stretch the River Nile valley at the KFS extension area is narrow.

Within the KFS extension limits there are rapids at 4 locations (***Table 24***). Average drop in the river bed level across these repaid is around 1 to 2 m. Unlike KFS, there are no falls like Kalagala and Itanda in this section. The river, in much of its upper halves section is dominated by run with intervening rapids and pool. In the lower halves of the section it is mostly pool dominated with only one rapid and few stretches of run.

Table 24: Sequence of rapids and falls along Victoria Nile River - KFS

Fall/Rapid (F/R) No, Starting from BHPP	Name of Rapid/Fall (R/F)	Class	Distance from Bujagali (Km)	Length of Rapid (Km)	Total Area In (ha)	Remark
F/R 1		1-2	0.8	0.5	6.2	Downstream of the BHHP/KFS Extension
F/R 2	Point break (two channels)	3	1.6	0.6	2.4	Two channels/ KFS Extension
F/R 3		3	2.2	0.2	2.8	KFS Extension
F/R 4	Dead Dutchman	4	7.7	0.4	11.5	KFS Extension

Note: Length, and water wave area estimated based on the Google image 2015.

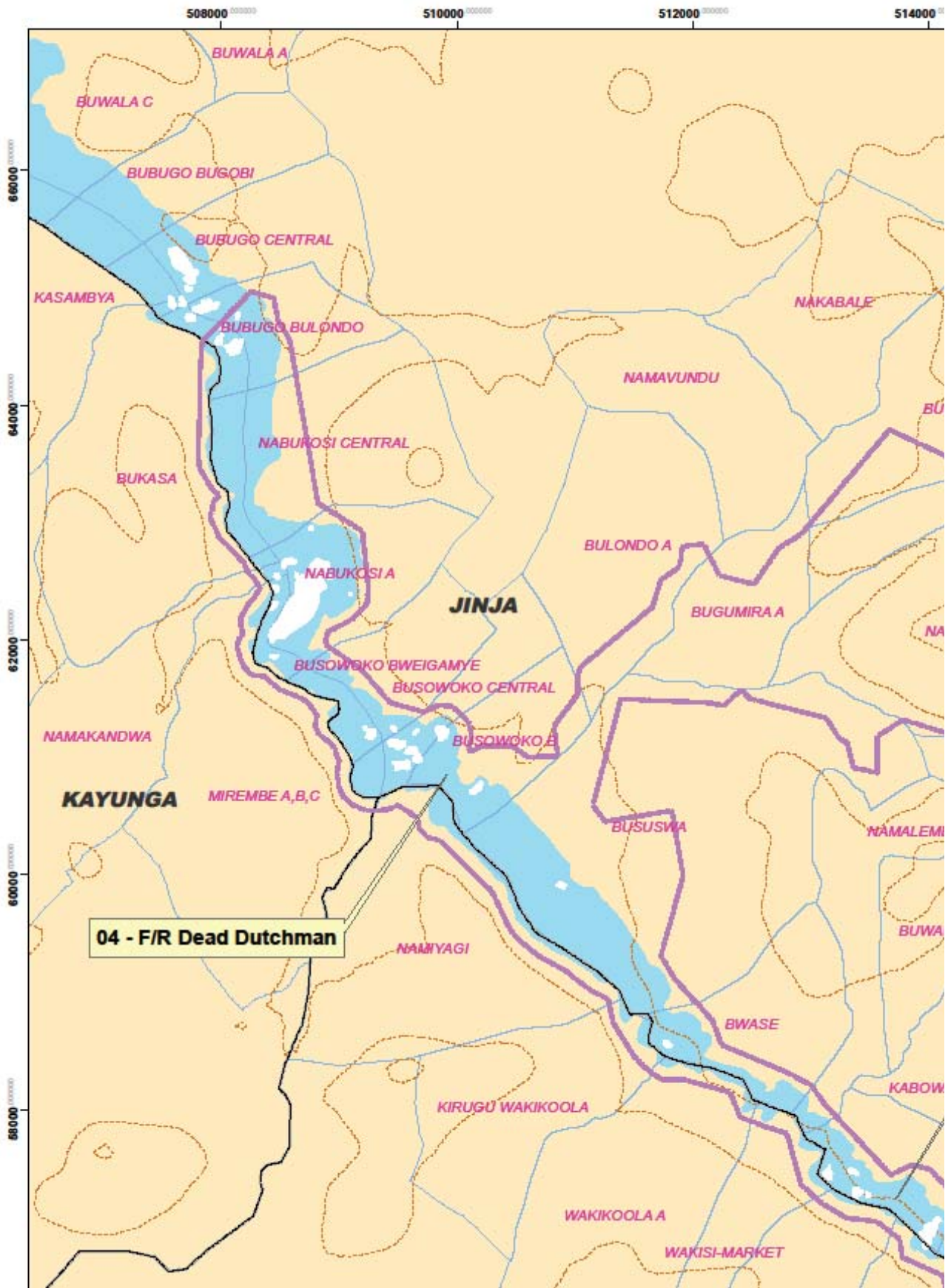
There are four groups of islands partly covered with natural vegetation within the KFS extension stretch. Most of these island groups locate on the rapid and fall sections of the river. Apart from the above island groups, small rocky islands partially submerged could be seen elevating from the river water surfaces as in the KFS. There are more than 70 islands (small and big counted in the recent Google Image of the area) The largest of the island in the middle section of the river between Dead Dutchman rapid and the Super hole rapid (about 14 ha). These islands as in KFS provide refuge to a host of water loving birds in the area. ***Map 12*** depicts the rapids and the island groups within the KFS extension area.

The rolling landscape above the river is characterized almost entirely by farming and intercropping of timber and fruit trees, field and horticultural crops, in small plots and gardens. The landscapes offer longer views towards the Nile, but the River, due to its steep banks, is not easily visible until the valley crest is reached. The riverbed, characterized by large boulders with no sand deposits, presents a dramatic contrast to the intensively farmed plains above it. The valley flank slopes often support a cover of crops and trees. In terms of scenic quality, the farmland within the KFS extension area is attractive similar to the KFS and is comprised of free flowing river with rapids and islands exhibiting identical aquatic natural habitats and landscape of environmental values which are additional to the lost areas of natural habitats and landscape of environmental values in the KFS.

4.2.1.3 Landuse

The land use in KFS Extension Area is mixed type. Nearly 46.14 % of the land area is occupied by the forest; the water body constitutes about 31.26 % of the land area followed by grassland 11.50%. About 5.23 % is made up of wetland. The woodland makes about 2.03% and rest is made up of agricultural land, and rocks (***Table 25***, ***Map 13***).

MAP 12: Rapids and Islands KFS Extension Area



MAP 13: Land Use MAP KFS Extension Area

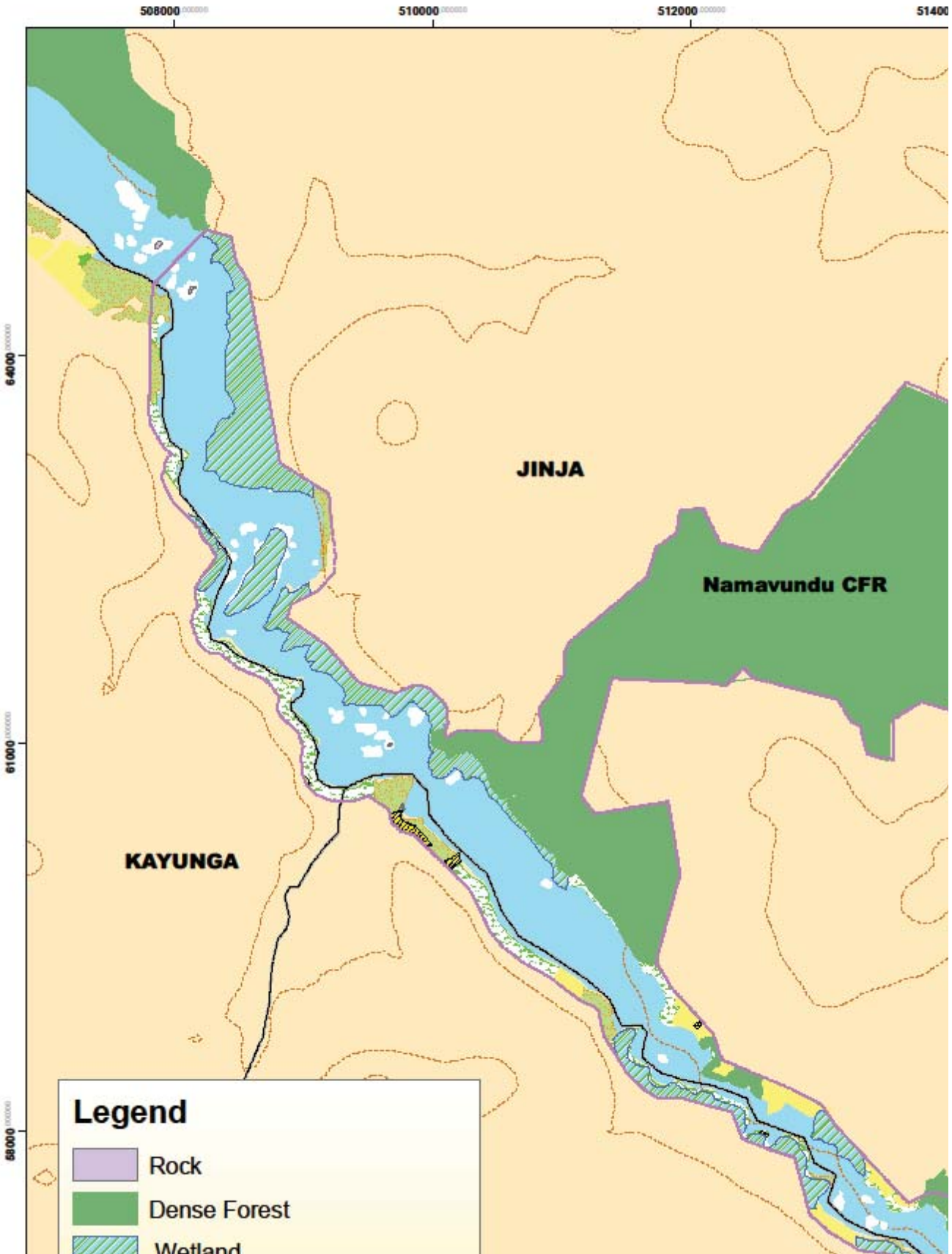


Table 25: Landuse KFS Extension Area (Based on google image 2015)

Land Use Category	Area (ha)	%
Cultivated	18.1	1.22
Built-up	7.03	0.47
NFA Forest Reserve	683.69	46.14
Dense Trees	*666.52*	44.98
Grassland	*17.17*	1.16
Other Forest (Dense)	31.71	2.14
Woodlands	30.01	2.03
Grassland	170.36	11.50
Wetland	77.45	5.23
Rocks	0.23	0.02
Water Body	463.19	31.26
Total Area	**1481.77**	100

The area demarcated as CFR (Namavundu CFR) comprises 46.14% of the total land of KFS extension area. It includes the entire CFR which comprises of mixed grassland and forest. The Namavundu CFR mostly represents the planted pine and eucalyptus forest.

The land use in the KFS extension area is dominated by the forests of the Namavundu CFR followed by the water body of the free flowing Nile. A comparative land use by percentile for KFS and KFS extension area is depicted in ***Table 26*** to show their similarity.

Table 26: A Comparative KFS and KFS Extension Area Land Use

Land Use Category	% KFS	% KFS Extension
Cultivated	6.05	1.22
Built up	0.03	0.47
NFA Forest Reserve	55.6	46.14
Dense Forest	*9.63*	44.98
Cultivated	*22.34*	1.16
Sparse Forest	*22.34*	0
Cultivated	*21.12*	0
Grass land	*2.51*	0
Other Forest (Dense)	0.39	2.14
Woodlands	0.5	2.03
Grass land	0.11	11.50

Land Use Category	% KFS	% KFS Extension
Wetland	3.57	5.23
Rocks	0.13	0.02
Water Body	33.62	31.26
Total	**100**	100

4.2.1.4 Water quality

Water samples were collected for water quality analysis downstream of Bujagali dam and analyzed for the various physical, chemical, and micro-biological parameters. Apart from this, water samples analyzed during the course of BHPP EIA in the year 2000 and 2006 from Buyala downstream from the Bujagali dam in the NaFIRRI reports for comparison[50]. ***Table 27*** is the water quality analytical results for both 2016 and 2000 and 2006 measurements.

Table 27: Results of Water Quality Measurements in Victoria Nile in the KFS Extension Area

Water Quality Parameters	Unit	Year 2016*	Year 2000 and 2006**		Maximum recommended US EAS 12:2014 for natural potable water
		Bujagali Downstream	Buyala 2000	Buyala 2000	
pH		7.09	7.5	7.4	5.5-9.5
Turbidity	NTU	0.00	3	2.2	25
Total Suspended Solids	mg/lt	18	1.8	2	Not Detectable
Harness Total as Ca CO3	mg/lt	41			600
Calcium	mg/lt	2.94			150
Magnesium	mg/lt	1.77			100
Chlorides	mg/lt	7			250
Total Iron	mg/lt	<0.001			0.3
Dissolved Oxygen			8.6	6.3	
Biochemical Oxygen Demand (BOD)	mg/lt	1			Not specified
Chemical Oxygen Demand (COD)	mg/lt	38			Not specified
Oil and Grease	mg/lt	13.01	0.001		Not specified

[50] *National Fisheries Resources Research Institute, 2000. Aquatic and Fisheries Survey of the Victoria Nile, Bujagali Hydropower Project, Final Report 1—8 August 2000. (Third quarter); National Fisheries Resources Research Institute, 2006. The First Quarter Survey of the Aquatic System and Fisheries of the Upper Victoria Nile| 6 to 13 April 2006*

Water Quality Parameters	Unit	Year 2016*	Year 2000 and 2006**		Maximum recommended US EAS 12:2014 for natural potable water
		Bujagali Downstream	Buyala 2000	Buyala 2000	
Fluorides	mg/lt	0.06			1.5
Sulphates	mg/lt	<0.01			400
Nitrates	mg/lt	0.26	0.047	0.013	45
Nitrites	mg/lt	0.006	0.004	0.008	0.003
Ammonia	mg/lt	0.14	0.077	0.029	0.5
Total Coliform in 100ml	Nos	260			10
Fecal Coliform in 100ml	Nos	6			Absent

*Note: * Measurement 2016, Consultants; ** Measurement results, NAFIRRI Reports 2000 and 2006.*

All quality parameter such as: pH, turbidity, hardness, calcium, magnesium, iron, nitrate, nitrite, ammonia, chloride, oil and grease are within threshold limits for the natural Potable Water. The BOD and COD values are low. Compared to 2000 and 2006, the oil and grease pollution of the water increased substantially, probably related to the coolant oil leaking from the BHPP powerhouse area. The river is not seen polluted with heavy metals. The concentrations for coliform and faecal coliform show microbial contamination and water are not suitable for direct consumption without treatment. Discharges of household sanitary effluents or practices of open defecation may have resulted in such microbial contamination.

4.2.1.5 Air quality

Measurement for ambient air is carried out using an IBRID MX6 Multigas Monitor and for particulate matter by CEM DT-9881 at one location in the KFS extension area. The Monitors are calibrated before use. Measurements are done for ten minutes. ***Table 28*** presents the results of the monitoring.

The observed values for the gaseous and particulate matters are well within the threshold limits of NEMA, and EFC-EHS Guideline values. The ambient air of the area is not influenced by the industrial, vehicular and anthropogenic polluting sources.

Table 28: Ambient Air Quality - KFS Extension Area

Parameters	Measurements 2016	Permissible limits
	Bujagali Village N 0032069, E 0336196	
O_2 (%)	21.08	**9.5-23.5***
CO (ppm)	0	**9.0***
CO_2 (%)	0.03	-
SO_2 (ppm)	0	0.15*
H_2S (µg/m^3)	0	15*
LEL (%)	0	25*
RH (%)	70.1	50.4*
AT (^OC)	25.7	32.0*
PM 10.0 (µg/m^3)	0.1	50**
PM 2.5 (µg/m^3)	1.28	25**
PM 1.0 (µg/m^3)	8.67	

Note

**National Environment (Draft Air Quality Standard for Ambient Air 2006), NEMA, GoU*

*** IFC general EHS guidelines recommend that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality*

4.2.1.6 Noise level

Background noise levels (day time) are measured at one location at the KFS extension area during the 2016 field survey through instantaneous spot measurements using a Center™ Data Logger Sound Level Meter set at 30-130 dB (A) range. The meter is mounted on a stand with each spot measurement lasting approximately 10 minutes. For each sampling point, existing noise sources measurement were noted. Sound level data is then downloaded and analyzed to determine noise levels according to the following parameters, LEQ, L90, L50 and L10 (***Table 29***).

Table 29: Noise levels, - KFS Extension Area

Location description	Duration minutes	Noise limit (dB(A) LEQ)*	Recorded noise level				Existing noise sources			
			LEQ	L10	L50	L90	L_{Min}	L_{Max}	Natural	Anthropogenic
Bujagali Village	5.00	50	50	52.4	44.9	38.9	35	67.9		Human conversation

Note: Noise limits are as prescribed in the National Environment (Noise Standards and Control) Regulations, 2003.

The measured LEQ levels are within the threshold of the permissible noise levels for the natural areas.

4.2.2 Biological environment

4.1.2.1 Flora

The floral baseline study of the KFS extension area is based on the reconnaissance survey of the following sites (***Table 30***).

Table 30: Sites surveyed for floral baseline Assessment

Number	Location (Village)	Sub county	District	Status
1	Kikubamutwe	Wakisi	Buikwe	Degraded island
2	Namiyaji	Wakisi	Buikwe	Plantation
3	Bukasa village	Kangulumira	Kayunga	Tropical Forest

The tropical forests in the KFS extension and in the adjoining areas are the remnants of the riverine forest patches. Natural forests are very limited as some of the islands and in Namiyaji village (Wakisi Sub-county, Buikwe District) next to a forest plantation. Most of the forests patches on the Jinja side are plantation forests mostly of pine.

Generally, much of the area within one kilometer from river is being subjected to high human activity. There is hardly any natural vegetation left in much of the area. Limited areas covered with vegetation are found between plots/gardens as well as in a few areas close to the river banks. Some of the tree species are seen as protected tress at the crop fields for household use to make charcoal or use as timber such as Mvule (*Milicia excelsa)* and Musizi *(Maesopsis eminii).*

The common tree species of the KFS extension area are *Acacia species, Albizia coriaria, Albizia zygia*, *Annona senegalensis, Cordia Africana, Dombeya bagshawei, Milicia excelsa, Sapium elipticum, Terminalia superba etc.* ***Appendix 17*** presents the lists of tree species recorded in the KFS extension area during the survey.

Out of 29 tree species of the KFS extension area 15 species are common to KFS while 14 tree species are additional species not recorded in the IHPP 2013 survey in the KFS. Thus in terms of floral diversity, the extended KFS area, if integrated with the KFS will add to the floral diversity of the modified KFS. Further the tree species of global conservation significance, the *Milicia excelsa,* is also present in the KFS extension area.

4.2.2.2 Fauna

A. Mammal

The available natural habitats in the KFS extension area as in the KFS are not suitable to support large population of wild mammals. The mammal diversity for the KFS extension area depicted

hereunder is based on the recent survey in 2016 by the consultants. A total of 15 mammal species (***Table 31***) are accounted based on the present survey.

Table 31: Mammalian diversity KFS Extension Area

Mammalian Species	IUCN Red List, 2016	Occurrence Status
Cercopithecus ascanius	LC	Common
Cercopithecus aethiops	LC	Common
Felis serval	LC	Rare
Lutra maculicollis	NT	Common
Canis adustus	LC	Rare
Panthera pardus	VU	Rare
Genneta servalina	LC	Common
Mungos mungo	LC	Common
Hippopotamus amphibius	VU	Rare
Tragelaphus scriptus	LC	Rare
Sylivicapra grimmia	LC	Common
Cricetomys gambianus	LC	Frequent
Thryonomys gregorianus	LC	Frequent
Xerus erythropus	LC	Frequent
Hystrix cristata	LC	Rare

LC = Least Concerned, Vu = Vulnerable, NT = Near Threatened

The species recorded in the KFS extension area, *Lutra maculicollis, Panthera pardus* and *Hippopotamus amphibius* are listed in the IUCN Red List 2016.

All of the mammal species recorded in KFS extension area were also recorded in the KFS. Three of the species recorded in the KFS have not been recorded in KFS extension area. These species are Large Grey Mongoose (*Herpestes ichneumon);* Side tripped Jackal (*Canis adustus)* and Gambian Sun Squirrel (*Heliosciurus gambianus).* Thus in terms of mammalian diversity, the KFS extension area do not add value addition to the KFS, but add the area of habitats of the mammals common to both KFS and KFS extension area, if the KFS extension area is integrated to remaining KFS.

B. Birds

The reconnaissance survey of birds in the KFS extension area recorded a total of 57 species. Eleven species of birds recorded in the KFS area not recorded in the KFS extension area (***Appendix 18).***

All the birds of the regional and local conservation significance recorded in the KFS extension area also found in the KFS. In addition, there are few bird species which are different in these two areas. The KFS extension area comprises of additional 12 bird species which are not reported in the KFS. These bird species are: *Tockus nasutus*, *Cypsiurus parvus*, *Eurystomus glaucurus, Dyphorophyia castanea, Lanius excubitoroides, Dryoscopus gambensis, Cinnyris erythrocerca, Musophaga rossae, Lamprotornis purpuropter*, *Colius striatus*, *Pogoniulus scolopaceus, and Pogoniulus subsulphureus.* Thus in terms of bird diversity richness the KFS extension area brings additionality in the value of the KFS, if the KFS extension area is included in the modified KFS area.

C. Hepetofauna

The UWA authority personnel reported occasional presence of juvenile crocodiles (*Crocodylus niloticus*) in the KFS extension section of the Victoria Nile. These crocodiles as in the KFS stretch of the Victoria Nile are reported to have been migrated downstream and upstream from the Lake Victoria and Lake Kyoga, where they are reported in some areas, but in a small population. The UWA, on the information from the community, trans-locates the crocodiles to the national park areas for the safety of the common people. Very recently personnel of the UWA have trans-located one of the juvenile crocodile from downstream Bujagali Dam. There are recent reports that two of such juvenile crocodiles are still in the Victoria Nile River in the KFS extension area section. Personnel from UWA have located them and are planning to trans-locate them in near future[51].

D. Butterfly

A total of 26 butterfly species were recorded during the reconnaissance survey of the KFS extension area. All of these butterfly species are recorded in the KFS extension area also recorded in the KFS area. ***Appendix 19*** lists the butter fly recorded during the survey according to their ecotypes in the KFS extension area. From the butterfly diversity point of view, the KFS extension area is very much similar to the KFS but less diverse than the KFS area.

E. Fish

Fish species distribution and abundance in a given environment are, on the whole, determined by the other biodiversity components that characterize the environment notably food items. For this report the essential components of the environment and the food chain are described in the above chapters, based on available relevant literature. The section will focus on fish species

[51] UWA personnel communication, 2016.

composition, distribution, food habits and aspects of reproductive strategies in the KFS. Significant fund of information was contributed by the fisher community through interviews.

Fish species composition and relative abundance

A comparative perspective of fish species diversity in the Upper Victoria Nile in 2000 and 2006 with that of the current status in the zone likely to be inundated by the IHPP derived from interactions with the local fishermen is presented in (Table 32). A total of 24 and 21 fish species were recorded in NaFIRRI, 2000 and FIRI, 2006, respectively. The Table includes data for fish species diversity recorded

Table 32: Fish species diversity and relative abundance in the Upper Victoria Nile with fishers' input

Family Name	Species Name	Local Names	FIRRI 2000 Survey	FIRRI 2001 Survey	BHPP (NAFIRRI) 2006 Survey	Fisher survey 2016 (Kirindi)	Fisher survey 2016 (Itanda Falls)	Fisher survey 2016 (Kikuba -Mutwe)
Bagridae	*Bagrus docmak*	Semutundu	P		P	P; C	P; F	P; F
Centropomidae	*Lates niloticus*	Mputa	P		P	P; C	P; F	P; F
Characidae	*Brycinus jacksonii*	Nsoga	P		P			
	Brycinus. sadleri	-	P		P			
Cichlidae	*Oreochromis niloticus*	Tafu, Abuku	P		P	P; C	P; F	P; F
	Oreochromis. leucostictus	-	P		P	P; F	P; R	P; F
	Oreochromis. variabilis	Mpongo	P		P	P; R	P; R	P; R
	Tilapia zillii	Katerega	P		P	P; F	P; R	P; F
	Haplochromines	Nkejje	P	P	P	P,C	P; C	P;C
Claridae	*Clarias mossambicus*	Mmale	P		P	P; F	P; R	P; F
Cyprinidae	*Barbus altianalis*	Kisinja, Nkukutu	P		P	P; C	P, F	P; F
	Barbus. paludinosus		P		P			
	Labeo victorianus	Nningu, Nsuku	P		P	P; S	P, S	P; S
	Rastrineobola argentea	Mukene	P		P			P; C
Cyprinodontidae	*Aplochelichthys pumilus*		P		P			
Lepidosirenidae	*Protopterus*	Mamba	P		P	P; F	P; R	P; R

	ethiopicus							
Mochokidae	*Synodontis afrofischeri*	Nkolongo	P		P	P; F		P; F
	Synodontis. victoriae	Nkolongo	P		P	P; F		
Mormyridae	*Marcusenius grahami*		P		P			
	Mormyrus kannume	Kasulubana	P		P	P; F	P. C	P; C
	Mormyrus. macrocephalus		P			P; R	P, R	
	Gnathonemus victoriae		P		P			
	Gnathonemus. *longibarbis*		P					
	Petrocephalus catastoma		P					

Key: P = Recorded; C = Commonly caught; F = Frequently caught; R = Rarely caught.
Source: NaFIRRI, (2006); and interviews with experienced fishermen in 2016

in rapid assessment interviews with local fishermen at Kirindi, Itanda Falls and Kikuba-Mutwe landing sites during August 2016. The respective species diversity of 15, 13 and 13, were recorded, excluding Haplochromines. The data indicated significant decline in species diversity over the period of about 10 years in the zone that includes the KFS.

Diversity and relative abundance of Haplochromine cichlids in the KFS

Haplochrpmines of the Uppers Victoria Nile are the most speciose taxon of fishes in the upper Victoria Nile due to their high taxonomic radiation to suit wide range habitats in aquatic environments. Atkins, *et. al*, 2001 identified 31 Haplochromine cichilids in the Upper Victoria Nile in 2001 but a recent study by NaFIRRI (2016) in a preliminary, report recorded 61 species astride the IHPP area. The species included the endemic Neochromis simotes found at widely spaced locations on either side of the IHPP.

Fish species of conservation significance and commercial importance

Fish species of conservation significance and national commercial importance are listed in Table 33. *Oreochromis esculantus* and *Oreochromis variabilis* apparently mainly restricted to the lower Victoria Nile are both indicated as critically endangered. Commercially important fish species in the Upper Victoria Nile are also included in Table i: to highlight the urgent need to manage commercial fisheries in the Upper Victoria Nile sustainably

Table 33: Fish species of conservation significance and commercial importance

Family Name	Species name	Endemic species	IUCN Redlist species category (NT, V, E etc)	GoU conservation category – (commercial significance)	Remarks (Reported section of the Nile River)
Cichlidae	*Neochromis simotes*		CR	√	
	Oreochromis esculentus		CR	√	**Upper Victoria Nile**
	Oreochromis. variabilis		CR	√	
Characidae	*Brycinus jacksonii*		EN		
Mormyridae	*Marcusenius victoriae*		EN		
Bagridae	*Bagrus docmac*			√	
Centropomidae	*Lates niloticus*			√	
Cichlidae	*Oreochromis niloticus*			√	
Claridae	*Clarias mossambicus*			√	
Cyprinidae	*Barbus altianalis*			√	
	Labeo victorianus			√	
	Rastrineobola argentea			√	
Lepidosirenidae	*Protopterus ethiopicus*			√	
Mormyridae	*Mormyrus kannume*			√	
	Mormyrus. macrocephalus			√	

Biological and fishery aspects

The preferred food of selected key-stone fish species in the Upper Victoria Nile including the KFS were recorded as follows. *Mormyrus. Kannume,* was possibly the most successful fish species in the Upper Victoria Nile. Its preferred food comprises a range of aquatic macro-invertebrates – mostly larval stages of insects, and chironomids, but it was known to feed on fish as well, based on the unidentified fish remains found in its guts. *Lates niloticus* was another key-stone species of the Upper Victoria Nile, known to ingest mostly fish prey dominated by Haplochromines and *Clarias sp.* The main food of *Synodontis afrofischeri*: included chironomids. Odonata larvae, chaoborids and Ephemeroptera. *Bagrus. docmac* cherished fish prey and Ephemeroptera. Oreochromis *niloticus while O. variabilis and T. zillii* were reported to feed on algae.

Interviews with local fishers at Kirindi, Itanda Falls and Kikuba-Mutwe fishlandings confirmed that some fish species notably *L. victorianus, C. gariepinus* and *M. kannume* make annual long range

migrations upstream the Upper Victoria Nile to spawn in streams affluent to the river (Table: 34) The fishers also related the spawning behavior of some fish in the Upper Victoria Nile to specific seasons and habitats as listed in (Table 35). The distribution of various fishes relative to the strength of the water current in the Upper Victoria Nile, based on the fishing experience of a professional fisher is given in Table 35, Through experience the fisher claimed to know what gear to use and in what macro habitat to capture a given fish species.

Table 34: Fish migration behavior in the Upper Victoria Nile with input from local fishers to local fishers

Family Name	Species name	Migratory Behaviors upstream, downstream, long range mid-range, short range	Migration season	Reason for migration (feeding, spawning etc)
Bagridae	*Bagrus docmac*	Short to medium range	Unknown	Feeding; spawning
Centropomidae	*Lates niloticus*	Short to medium range	Unknown	Feeding; breeding
Characidae	*Brycinus jacksonii*	Unknown		
	Brycinus. sadleri	Unknown		
Cichlidae	*Oreochromis niloticus*	Short to medium range	Rainy season	Spawning in shallow inshore waters
	Oreochromis. leucostictus	-do-	-do-	-do-
	Oreochromis. variabilis	-do-	-do-	-do-
	Tilapia zillii	-do-	-do-	-do-
	Haplochromines	-do-	-do-	-do-
Claridae	*Clarias gariepinus*	Upstream and downstream; short and long range	Rainy season	Spawning/ Feeding
	Clarias carsonii	Short range	Rainy season	Spawning
Cyprinidae	*Barbus altianalis*	Short range; to stream deltas	Rainy season	Spawning
	Barbus. paludinosus	Not known	Rainy season	spawning
	Labeo victorianus	Short & long range, upstream; downstream after spawning	Rainy seasons - April & August	Spawning
	Rastrineobola argentea	Unknown	Unknown	Unknown
Mochokidae	*Synodontis afrofischeri*	Unknown	Unknown	Unknown
	Synodontis. victoriae	Unknown	Unknown	Unknown
Mormyridae	*Marcusenius grahami*	Unknown	Unknown	Unknown
	Mormyrus kannume	Short & long range, upstream;	Rainy season	Spawning/feeding

		downstream after spawning		
	Mormyrus. macrocephalus	Short & long range, upstream; downstream after spawning	Rainy season	Spawning
	Gnathonemus victoriae	Unknown		
	Gnathonemus. *longibarbis*	Unknown		

Table 35: Spawning season and spawning habitat with input from local fishers

Family Name	Species name	Spawning Season	Spawning habitat Type	
			(sandy bottom, clayey bottom, depths, along banks, run area, riffle area, pool area, etc)	**Remarks if any**
Bagridae	*Bagrus docmak*			**Not known**
Centropomidae	*Lates niloticus*		**Open water**	
Characidae	*Brycinus jacksonii*			**Not known**
	Brycinus. sadleri			**Not known**
Cichlidae	*Oreochromis niloticus*	**Rainy season**	**Sandy bottom, along banks**	
	Oreochromis. leucostictus	**Rainy season**	**Sandy bottom, along banks**	
	Oreochromis. variabilis	**Rainy season**	**Sandy bottom, along banks**	
	Tilapia zillii		**Sandy bottom, along banks**	
	Haplochromines		**Sandy bottom, along banks**	
Cyprinidae	*Barbus altianalis*			**Not known**
	Barbus. paludinosus			**Not known**
	Labeo victorianus	**Rainy season**	**Likely pool clayey habitats of a stream**	
	Rastrineobola argentea			**Not known**
Mochokidae	*Synodontis afrofischeri*			**Not known**
	Synodontis. victoriae			**Not known**
Mormyridae	*Marcusenius grahami*	**Rainy season**		
	Mormyrus kannume	**Rainy season**	**Pool area of stream with clayey/muddy bottom?**	
	Mormyrus. macrocephalus	**Rainy season**	**Pool area of stream with clayey/muddy**	

			bottom?	
	Gnathonemus victoriae	**Rainy season**	**Pool area of stream with clayey/muddy bottom?**	
	Gnathonemus. *longibarbis*	**Rainy season**	**Pool area of stream with clayey/muddy bottom?**	

Table 36: Spatial fish distribution in various water flow regimes in the Upper Victoria Nile

Name of Fisherman	**Profession**	**Transect of River Nile**	**Fish spp caught at Falls**	**Fish spp caught in fast smooth running water**	**Fish species caught in moderate running water**	**Fish species preferring pools**	**Catch per day (kg)**
Okware Joseph	**Professional Fisherman: uses longlines & hook & line;** **2. Invests in gardening**	Kirindi Fish landing	*Mature Lates niliticus Barbus altianalis, Bagrus docmak*	*L. niliticus; B. altianalis, B. docmak; large Oreochromis niloticus, Protopterus aetiopicus*			Average 30 kg /day for four days/ week
Owino Zerubaberi	**1. Professional Fisherman: uses gillnets**	Kilindi fishlanding			Juveniles of most fish spp; *Mormyrus kannume*, *Mormyrus machrocephalus*, *Haplochroines Labeo victorianus, Clarias gariepinus, O. niliticus; Oreochromis leucostictus, Oreochromis variabilis,* *Tilapia zillii,*	Fry of most fish spp; *Clarias carsonii,* *O. leucostictus, O. variabilis, Tilapia zillii, P. aethiopicus, Synodontis afrofisherie, Synododontis victoriae&* several small mormiridis	Average 30 kg /day for four days/ week

4.2.3 Socio-economic environment

The KFS extension area covers 100m above the highest water level on either banks of the Victoria Nile. It is situated south of the KFS up to Bujagali dam wall including the entire Namavundu CFR which is a landscape mostly devoid of settlements and built structures. The landscape, however, comprises of cultivated lands and small units of built areas (at places along the banks of the River). Of the total KFS Extension Area (1481.77 ha), the cultivated and built up land constitutes 1.7% (25.23ha). Of the total land area, terrestrial land area makes up 48.85% (723.86ha). The cultivated and built up land is about 3.47% of terrestrial land.

Nearly 25.23 ha of the land area in the KFS extension area is under agriculture and partially built. Apart from this, parts of the grass lands, forested areas and water bodies are also used by local communities for various other resource uses. Cadastral survey along KFS Extension Area reveals presence of 281 land operators (LOs) in the 20 villages using lands for various agricultural and settlement purposes (***Table 37***).

Table 37: Summary of Land Operators in the KFS Extension Area

DISTRICT	VILLAGE	NO. OF LAND OPERATORS
KAYUNGA	BUKASA VILLAGE	19
	NAMAKWANDA VILLAGE	10
	MIREMBE VILLAGE	14
BUIKWE	NAMIYAGI	21
	BUDODA	5
	WAKIKOOLA "A' VILLAGE	15
	WAKISI MARKET VILLAGE	7
	WAKISI CENTRAL	7
	NAKWANGA	23
JINJA	BUBUGO BUDONDO	19
	NABUKOSI CENTRAL	16
	NABUKOSI "A"	30
	BUSOWOKO BUWEIGAMIE	11
	BUSOWOKO CENTRAL	7
	BUSOWOKO B	1*
	BUKOSSE	7
	BWASSE	27
	BUYALA "C"	12
	BUYALA "A"	25
	NAMIZI WEST	6

*Note: * National Forest Authority (Central Forest Reserve)*

Appendix 20 presents the cadastral maps of the KFS extension area with the respective name of the Land operators whose lands and properties falls within the demarcated area for KFS extension. A number of built structures are also located within the KFS extension boundary (refer ***Appendix 20, Cadastral Maps***).

Since the area is an open landscape with few built structures, the socio-economic characteristic presented in this section represents the data of the households who own or use the resources of the KFS Extension Area. These households are scattered in the villages that includes the parts of village administrative boundaries of 20 villages lying adjacent to the Victoria Nile within KFS extension area.

Documented database on the social and economic indicators of the 20 villages that are crossed by the KFs Extension Area are not available. The database presented hereunder is based on the sample survey of the households from across the 20 villages who own or use the resources of the KFS Extension Area (***Table 38***) obtained randomly using the structured questionnaire (refer ***Appendix 15***).

Table 38: Distribution of the sample surveyed HHs across adjoining Villages who own or use the resources of KFS Extension Area

Side of river	District	Sub county	Village	No. covered by census survey
Buganda side (West Bank)	Kayunga	Kangulumira	Bukasa	05
			Namakandwa	01
			Mirembe	02
	Buikwe	Wakisi	Namiyagi	02
			Kirugu-Wakikoola	01
			Wakikoola A	03
			Wakisi Market	01
			Wakisi Central	01
			Nankwanga	02
			Kikubamutwe	02
Buganda side (West Bank) Total	**2**	**2**	**10**	**20**
Busoga side (East Bank)	Jinja	Budondo	Namizi West	03
			Buyala A	06
			Buyala C	05
			Bukosse	03
			Bwasse	6
	Jinja	Butagaya	Busowoko Central	08
			Busowoko-Bweigamye	04

Side of river	District	Sub county	Village	No. covered by census survey
			Nabukosi A	05
			Nabukosi Central	07
			Bubugo-Bulondo	04
Busoga side (East Bank) Total	**1**	**2**	**10**	**50**
	3	**4**	**20**	**71**

4.2.3.1 Demographic characteristics

The surveyed households had a total head count of 554 comprising of 50.90% males and 49.10% (***Figure 29***). Of the total population nearly 58.84 percent are children below the age of 18 (***Figure 30***).

Figure 29: Male - Female population distribution

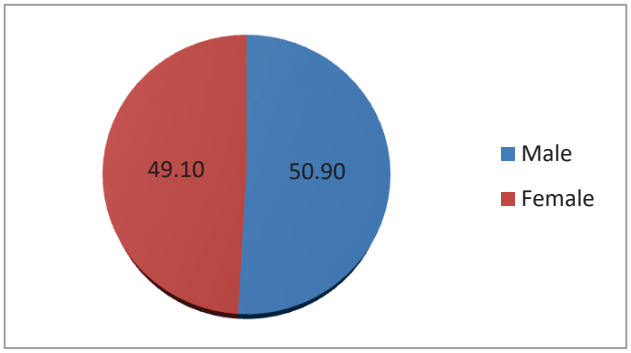
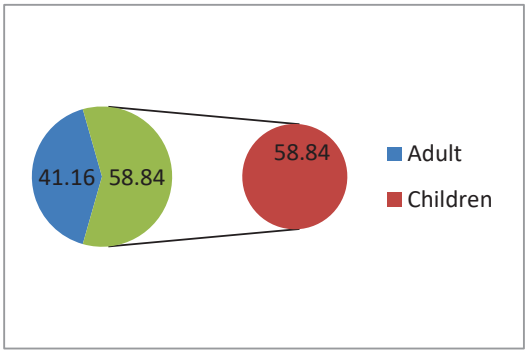


Figure 30: Distribution of adult and children population



Distribution of family members is not equal across the households. It varies from a maximum of 15 to a minimum of 1 in the household's family. The KFS, the maximum number of family size was 21.

Compared to the national household size of 4.7[52], as like KFS, the KFS extension area has nearly double the size of household. Male to female ratio in the KFS Extension Area is around 1:0.96, which is marginally lower than the national average of 1:1.2[53].

[52] *Uganda Bureau of Statistics (UBOS), 2016. The National Population and Housing Census 2014 – Main Report*, Kampala, Uganda

[53] *Uganda Bureau of Statistics (UBOS), 2016. The National Population and Housing Census 2014 – Main Report*, Kampala, Uganda

The household head is male dominated (***Figure 31***). Female household head is rare and is seen only in cases where the husband is deceased. More than 2% of the household heads are below 25 years of age (***Figure 32***). Majority of the household's head are between 26 to 55 years of age constituting nearly 74% of the households. Families with household's head above 56 years of age are limited to 21.13% indicating the general lower life expectancy rates.

Figure 31: Household Head by Gender

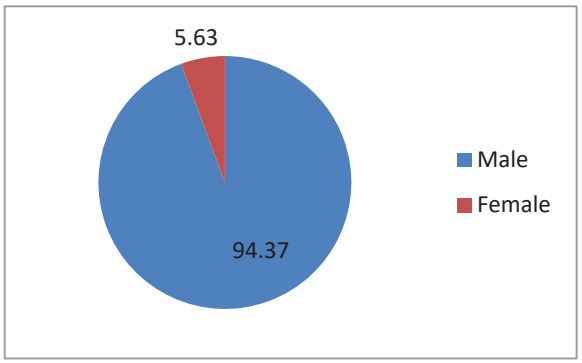
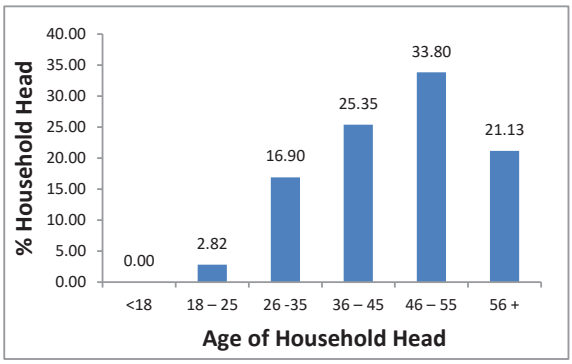


Figure 32: Household Head by Age



There are more than 9 tribal groups residing in the KFS extension area surroundings (***Figure 33***). The dominant Tribal group is Musoga, followed by Muganda, Iteso, Munyole, Jopadhola, Musamia, Mugwere, Mugisu, and others. Similarly, the households follow more than 5 religions (***Figure 34***). Christianity as religion is dominant. Protestant constitute more than 35.21% of households and Catholic make up around 30.99%. Muslim households are around 29.58% followed by Pentecostal, SDA and others.

Figure 33: Tribal composition

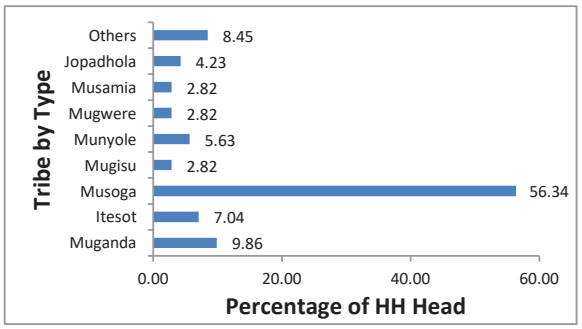
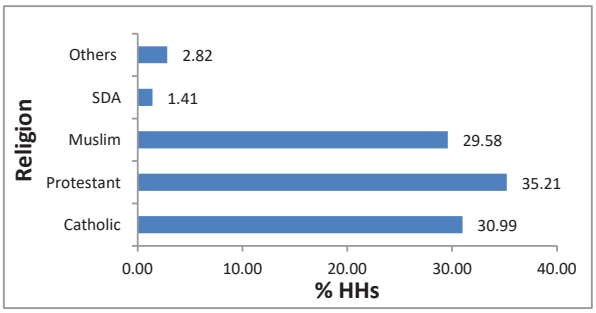


Figure 34: Religions observed



4.2.3.2 Quality of life

Across the household heads, the literacy rate is very poor (***Figure 35***). Nearly 21% of the household heads are illiterate, while about 26.76% could only read and write. About 32.39% have completed their primary education. The numbers of household head with education above primary level is above 19%. This indicates that the household heads of KFS extension area surroundings have better livelihood skills than the households of KFS surroundings.

There is awareness among the households for health care. More than 98% visit the modern health care facilities available in the public domain or at private domain. People visiting the public domain are higher than those visiting private clinics (***Figure 36***). This high level of awareness seems to be related to the decade long awareness programs on HIV/AIDS, which is one of the fatal diseases of the area. Water borne diseases particularly diarrhea, and malaria are the other common diseases of the area.

Figure 35: Literacy status of HH heads

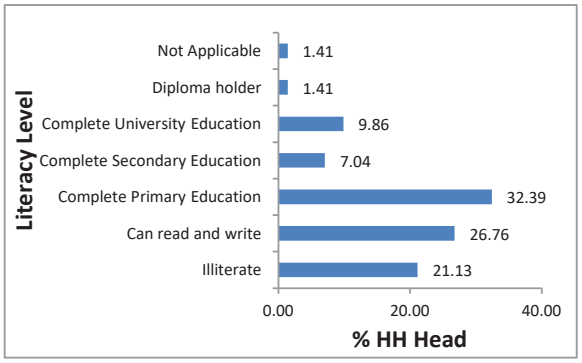
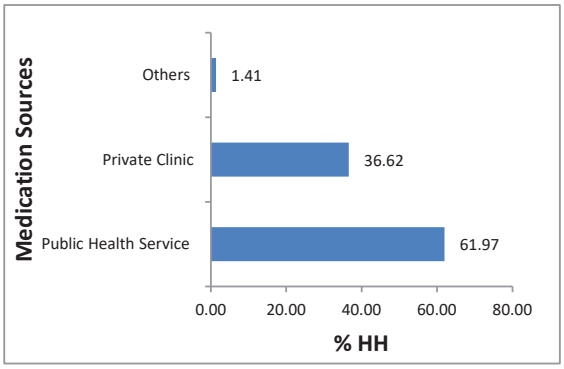


Figure 36: Preference to medical services



Most of the families in the surroundings of the KFS extension area have their own residential dwellings and only less than 3% have no residential structure of their own (***Figure 37***). About 50% of those not having residential structures of their own live in the rentals while other 50% live in the free residential arrangements (***Figure 38***).

Figure 37: Families with and without residential structure

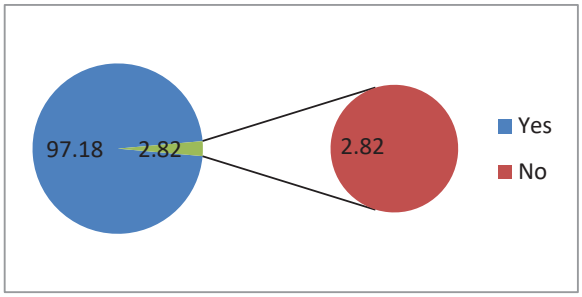
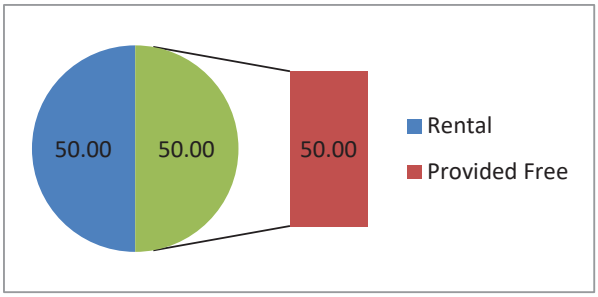


Figure 38: Copping strategy of families without residential structures of their own



A majority of the households (54.93%) in the surroundings of the KFS extension area source their household drinking water from Bore Holes, while a sizable number of households (25.35%) source their drinking water from the river directly. Households sourcing waters from the community and private tap are less than 6% (***Figure 39***). Though majority of the households have water sources close to the house, they still lack quality drinking water for healthy living.

Majority of the KFS extension area surrounding households (98.59%) have toilets of their own close to the house while only a small number of households (1.41%) do not have toilet of their own and defecate at the community or neighbor's toilet (***Figure 40***). In terms of household sanitation, the KFS extension area surroundings seem to have better living conditions because of toilet facilities at the homestead. Nonetheless, types of toilets are yet to be improved to uplift the overall sanitation.

Figure 39: Source of drinking water

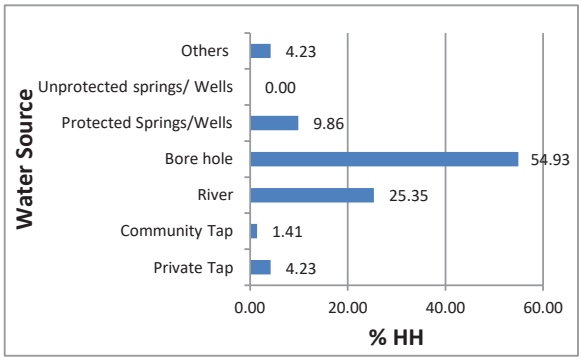
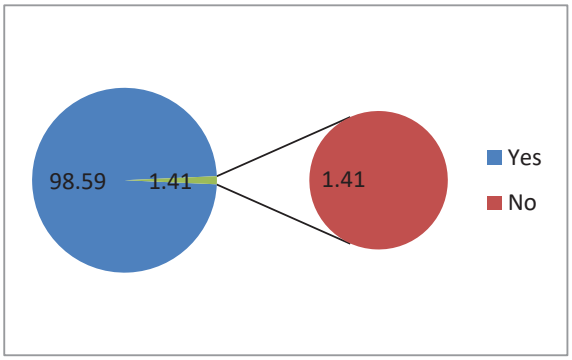


Figure 40: Toilet at the HHs



Household cooking energy is still dominated by traditional dirty fuel "fire wood" (93%). Clean energy for cooking (LPG) is limited to less than 6% of the households, which speaks of the status of indoor air quality and related health status of the households (***Figure 41***). Similarly, reliance on dirty fuel (oil and kerosene) is the bais for energy for lighting at the household level. Nearly 68% of the households use either oil lamp or kerosene as the lighting energy. About 32% of the households have access to the clean energy (Solar light and Electricity) (***Figure 42***).

Figure 41: Source of cooking energy

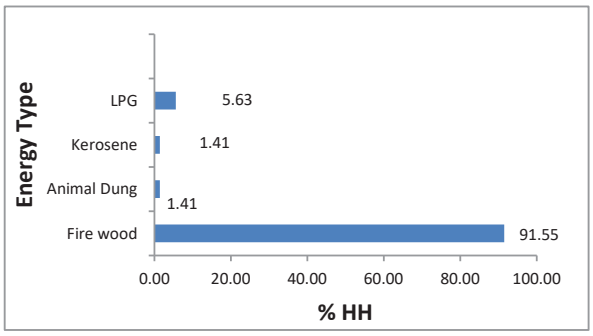
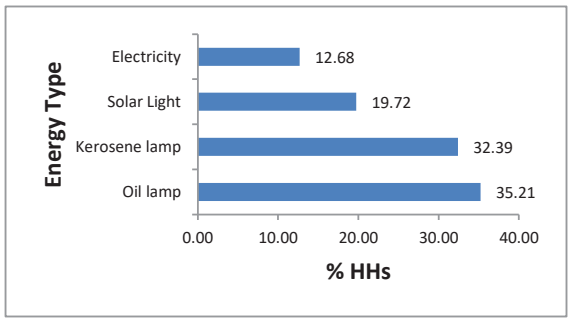
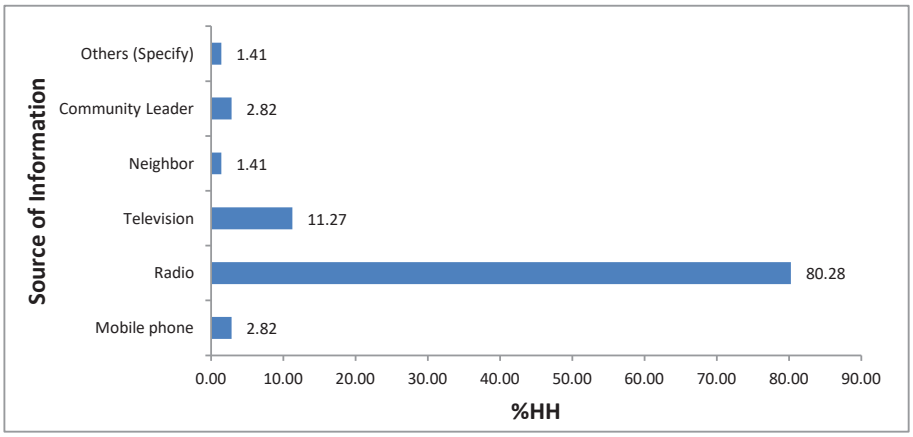


Figure 42: Source of lighting energy



Radio is the primary source of information in the KFS Extension Area surroundings. More than 80% of the people get the information from the radio (***Figure 43***). Nearly 4% of the people get their information from the community leaders and neighbors. Television as a source of information and entertainment is limited to less than 11% of the people. Newspaper and internet facilities are almost non-existent revealing the quality of the life of the communities in relation to the modern world facilities.

Figure 43: Source of information at the household level



The literacy levels, access to health services, access to the clean energy for cooking and lighting, household's sanitary conditions and access to the quality drinking waters apart from the ownership of the residential structures are key indicators of the quality of life the communities of an area. An evaluation of these indicators reveals the fact that the KFS extension area surrounding households have a better quality of life compared to KFS surroundings. Nonetheless many households are still deprived of the opportunities or have low level of access over the human and physical capital that is potential in the area to improve the quality of life.

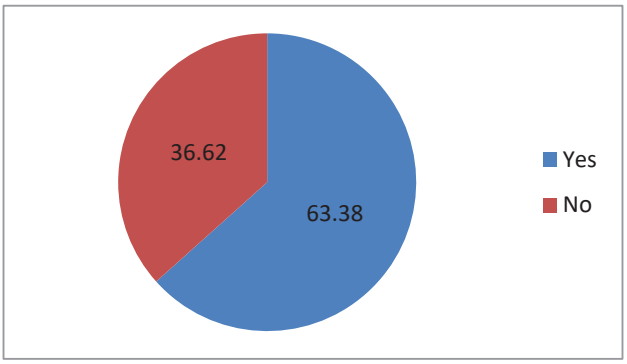
4.2.3.3 Economic activities

In a rural setting as is in KFS Extension Area surroundings, agriculture is one of the key economic activities of the households. The other economic activities for the livelihood are fishing in the Victoria Nile and extraction of non - timber forest products for various household uses.

Tourism is the other potential economic activity, but involvement of HHs in the tourism industry is very limited. Tourism industries are operated by outsiders and provide limited job opportunities to the local households.

Focus group discussions reveal that nearly all of the households are involved agricultural activities, irrespective of the status of land ownership. Nearly 20 percent of the households own more than 60% of the land, while more than 45% of the households own only 5% of the land. This difference in land ownership is clearly reflected in the food sufficiency status of the households. More than 35% of the households report food deficiency from the agricultural production of the land owned (***Figure 44***).

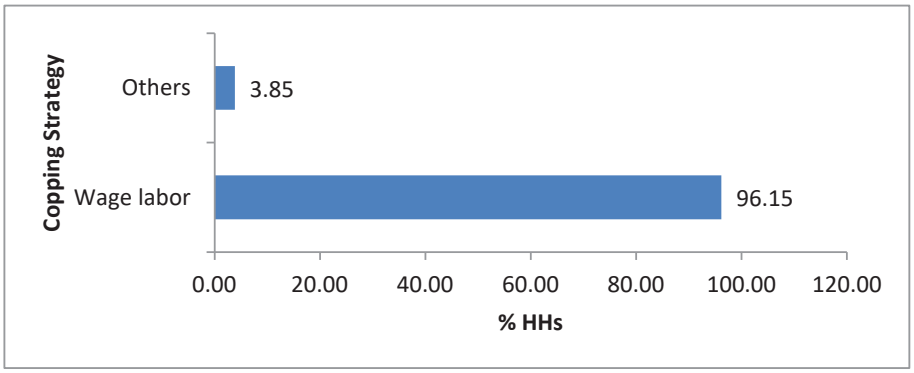
Figure 44: Food sufficiency status of the households



The food deficiency varies from over a month to round the year averaging around seven months in a year for the households who report food deficiency.

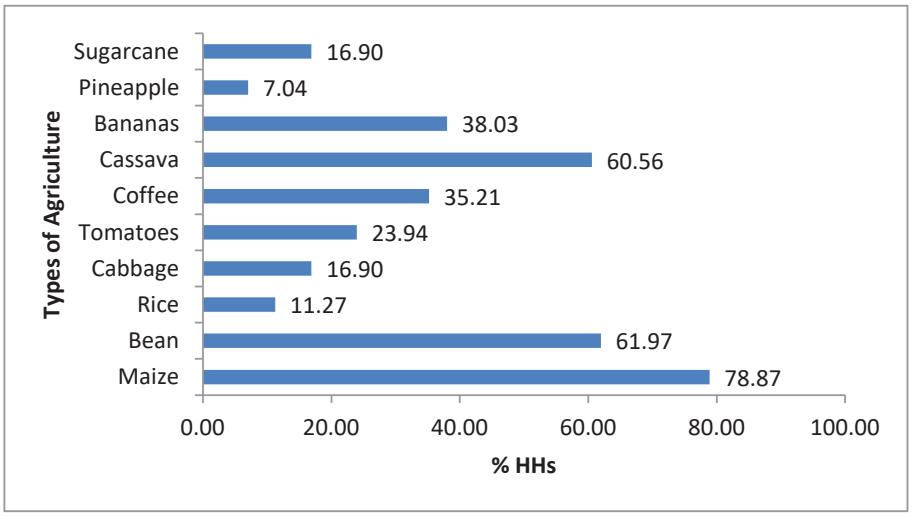
Interesting to note is the copping strategy to meet the food deficiency. Nearly 96 % households report wage labor as the key coping strategy (***Figure 45***). About 3% report wage jobs outside their place of residence (remittance). It appears wage jobs in the agricultural farm is the only job available locally in the proposed KFS extension area surroundings.

Figure 45: Copping strategy to meet food deficiency



As stated before, agriculture is the main economic activity of the area. A number of crops, vegetables and horticultural value products are grown in the area as in the KFS surroundings. These are maize, bean, rice, cabbage, tomatoes, coffee, cassava, banana, pineapple and sugarcanes. Households harvesting various agricultural products vary across the land owners depending on the land quality they own (***Figure 46***).

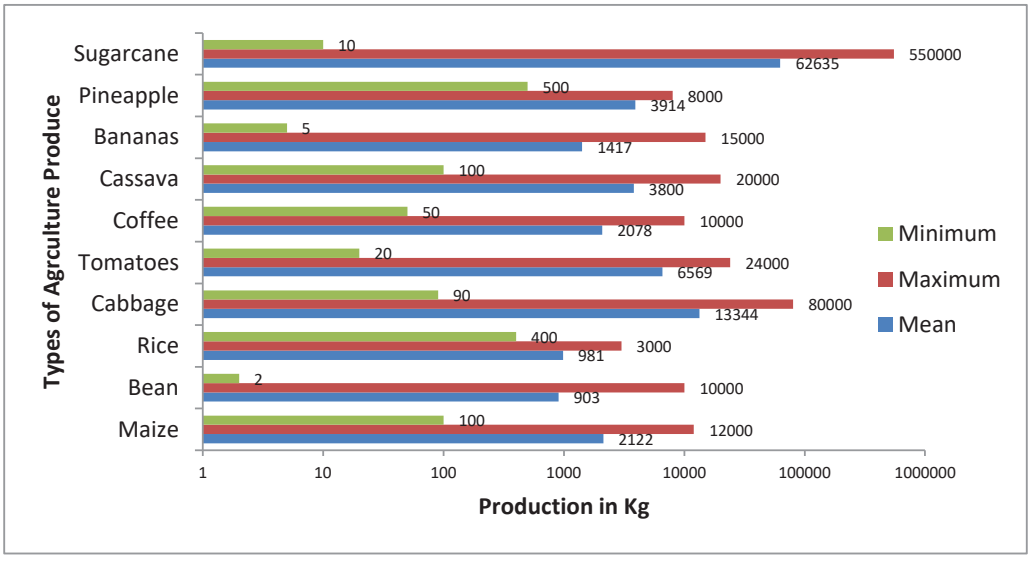
Figure 46: Households producing agricultural products



A majority of the households produce maize followed by beans, cassava, banana and coffee (***Figure 47***), while agricultural production of rice, cabbage, tomatoes, pine apple and sugarcane is limited to less than 17% of the households. Among the producing households, the production of different types of agricultural products annually is summarized in ***Figure 47*** below.

It is noted that not all households produce equal quantities of agricultural products. The agricultural production vary across the households involved in agriculture (***Figure 47***).The variation in annual agricultural production is quite wide across the producing households.

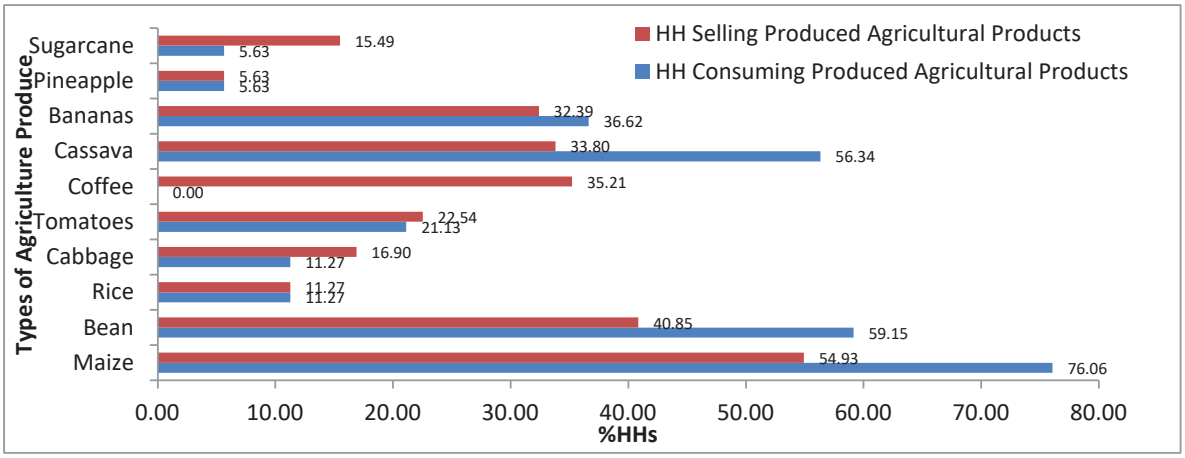
Figure 47: Variation in agriculture production across the households involved in agriculture



All the agricultural products annually harvested are not consumed by the producing households. Particularly the cash crops such as tomatoes, cabbage, and sugarcane are sold in the market by

almost all households involved in the production of these agriculture crops. ***Figure 48*** presents the percentage of agricultural households consuming and selling their agricultural products.

Figure 48: Households consuming and selling their agricultural products



Just like the production variation across households, the consumption and sale of the agriculture products also varies widely across the households (See ***Figure 49*** and ***Figure 50***). Only a small number of households who own large agricultural farm sale their agricultural products in the open market, while most sale a little with or without surplus only to meet their other needs.

Figure 49: Variation across the consuming households in the consumption of agricultural products harvested

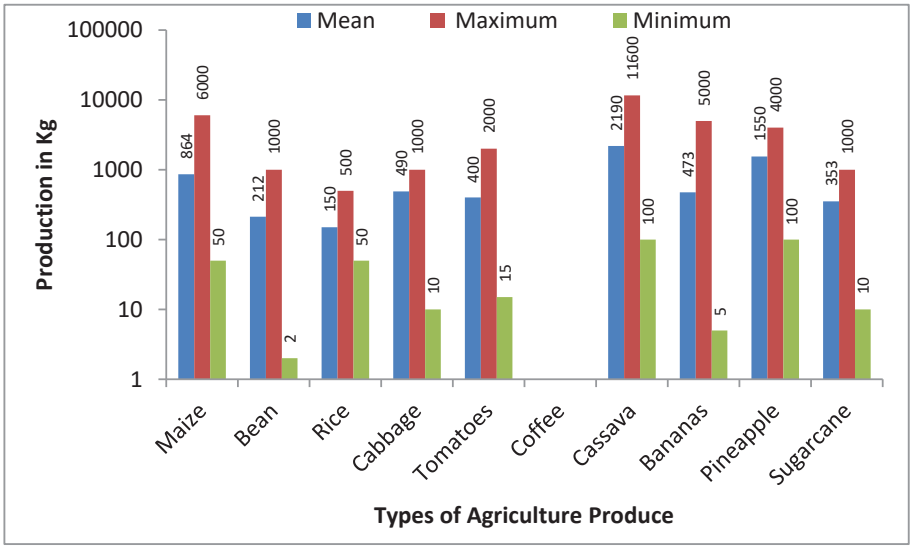
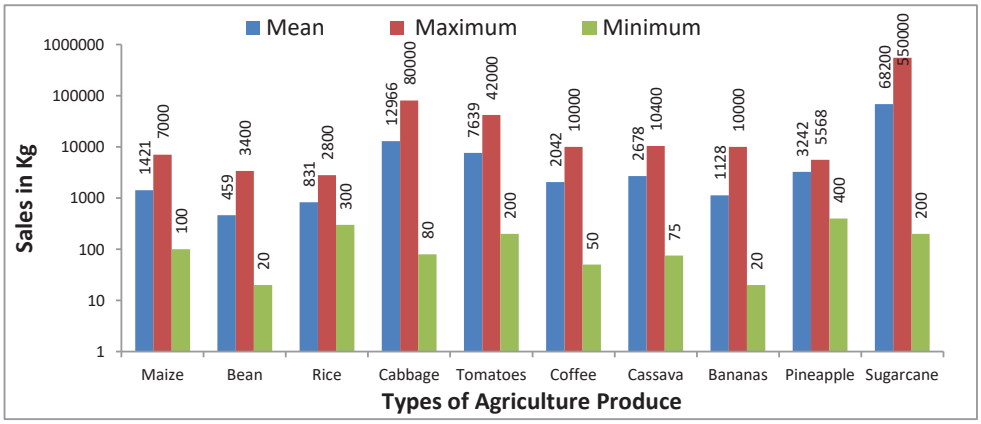


Figure 50: Variation across selling households in the sale of agricultural products harvested

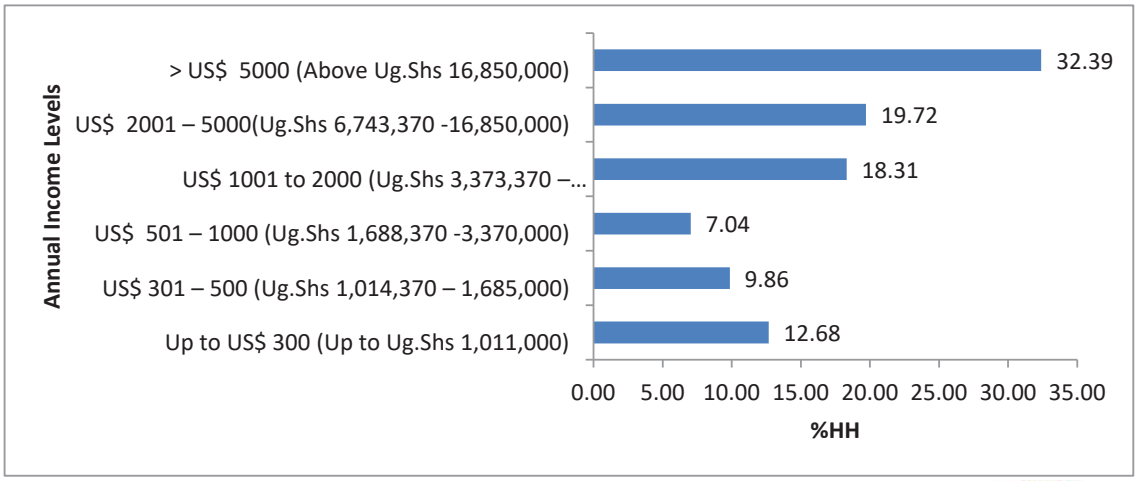


To date, the only economic activity for livelihood in the area surroundings the KFS extension is agriculture. Available job opportunities are on the farm agriculture only. There are very low rates provided for agricultural labor in the area and yet there are limited options available to maximize the value of labor for livelihood.

Very limited information is available on fishing income. Again not all the households are involved in fishing activities. Focus group discussions with some members of the community reveal that only 10 to 15% households rely on fishing for their partial livelihood. A similar percentage of HHs extract NTFP resources for the fulfillment of their household needs only.

Annual income of the household's in surroundings of the KFS extension area is presented in ***Figure 51*** reflecting the economic situation of the households. A little over 67 percent of the households within the surroundings of the KFS extension area have annual income less than USD 5000.

Figure 51: Annual income of the KFS Extension Area surrounding households



Given the average family size of 8, the per capita income of the households with annual income less than US$ 5000 is about USD 625 which is equivalent to US$ 1666 at purchasing power in parity with US$ for Uganda[54]. This means that the 67% of the households in KFS extension area surroundings whose income is below USD 5000 per annum live below the poverty line[55]. There is Itherefore, a dire need for diversification of the economic activities in the KFS extension area surroundings as in the KFS surroundings.

4.2.4 Cultural and spiritual environment

Similar to the KFS, the river bank sides in the KFS Extension Area are sites with many traditional cultural and spiritual values. A total of 6 cultural and spiritual sites have been identified in the KFS Extension Area river side. ***Map 14*** presents the location of this cultural and spiritual sites. While ***Table 39*** presents the site village, name of the spiritual site and its spiritual and cultural value.

Table 39: Cultural and spiritual sites and their significance-KFS Extension Area

SIDE OF RIVER BANK	VILLAGE	NAME OF SITE/ SITE LEADER	DISTANCE FROM RIVER BANK	CULTURAL/ SPIRITUAL VALUE
Buganda side	Mirembe	No specific names but identified by name of the 3 site Leaders: Kyambadde; Zachariah; and Mwajuma	Within 100m	In all cases the sites serve the purpose of healing for all kinds of ailments that people get If one desires to get rich they come here for blessings
Busoga side	Buyala A	Okimait spiritual site Leader: Tukei Paulo	Within 100m	People go to this spiritual site to ask for wealth, become fertile (for women who have failed to conceive or would like to give birth to twins)
	Buyala C	Munghemba site Leader: Abu Hulaira Higenyi	Within 100m	Helps people who have difficulty getting their property sold, Pray for wealth and Vari ous other prayer requests.
	Busowoko-Bweigamye	Busowoko-Kiira Leader: Ailtulosi Namwase Within 100m from the bank	Within 100m	Depending on what one wants to request for in life, the spirits here help one get their prayers answered.
	Bubugo-	Bwakedde site	Within 100m	Healing various ailments and casting out bad

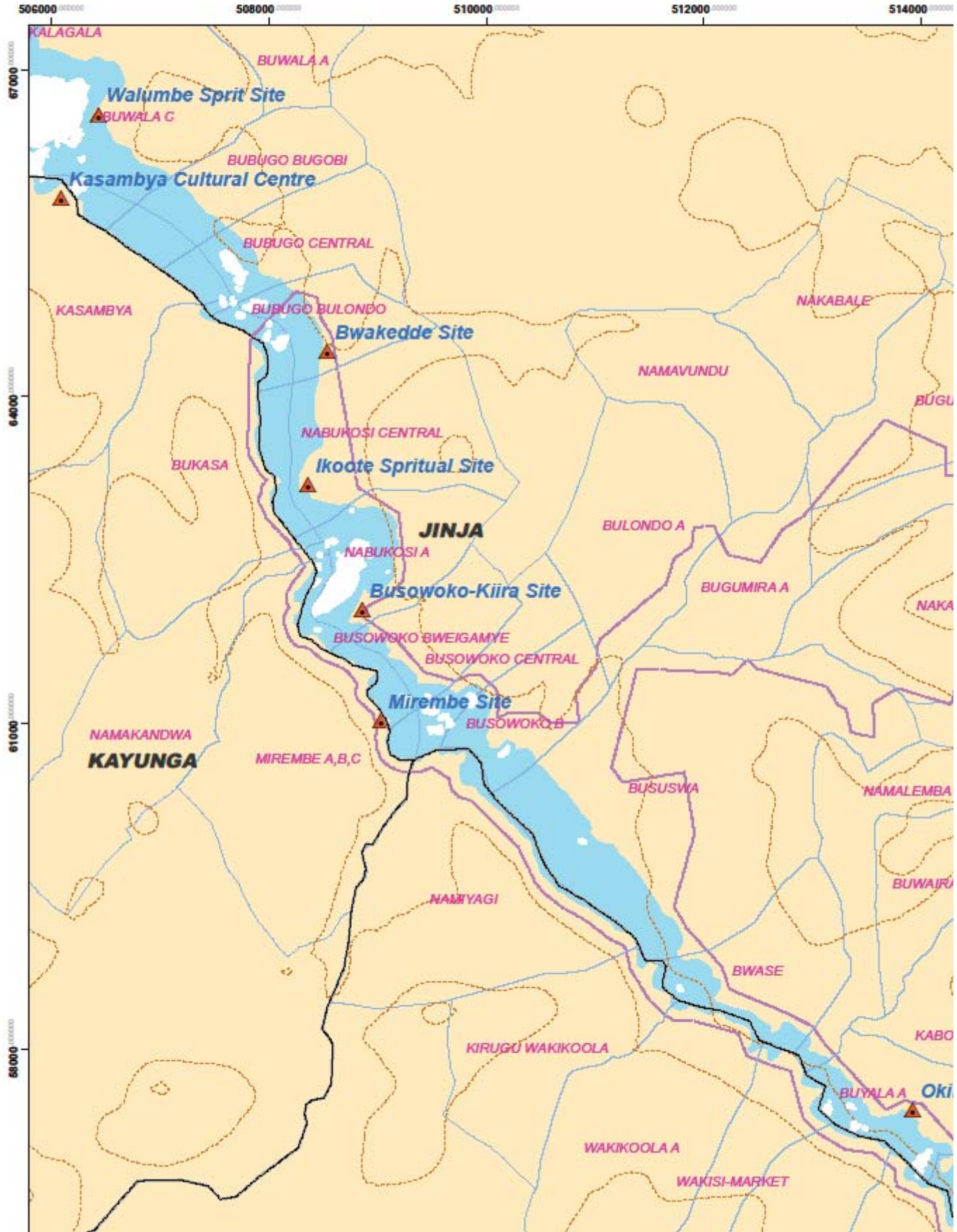
[54]https://www.gfmag.com/global-data/country-data/uganda-gdp-country-report

[55]https://www.google.com.np/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=threshold+of+poverty+in+PPP

SIDE OF RIVER BANK	VILLAGE	NAME OF SITE/ SITE LEADER	DISTANCE FROM RIVER BANK	CULTURAL/ SPIRITUAL VALUE
	Bulondo	Leader: Bazaale Ali		omens People can also go here to request for blessings to get twins.
	Nabukosi central	Ikoote spiritual site Taalame Robert	Within 100m	When one has a case or other types of cases, they can pay homage to this site to ask the spirits for victory In case a woman has failed to conceive she can visit any one of these sites to ask for a child Fertility Helps fishermen get blessings for good fish catch Also helps farmers by blessing them during the planting season so they are able to get good harvests

From the cultural point of view, the cultural sites of the KFS Extension Area is value addition to the KFS.

MAP 14: Cultural and Spritual Sites KFS Extension Area



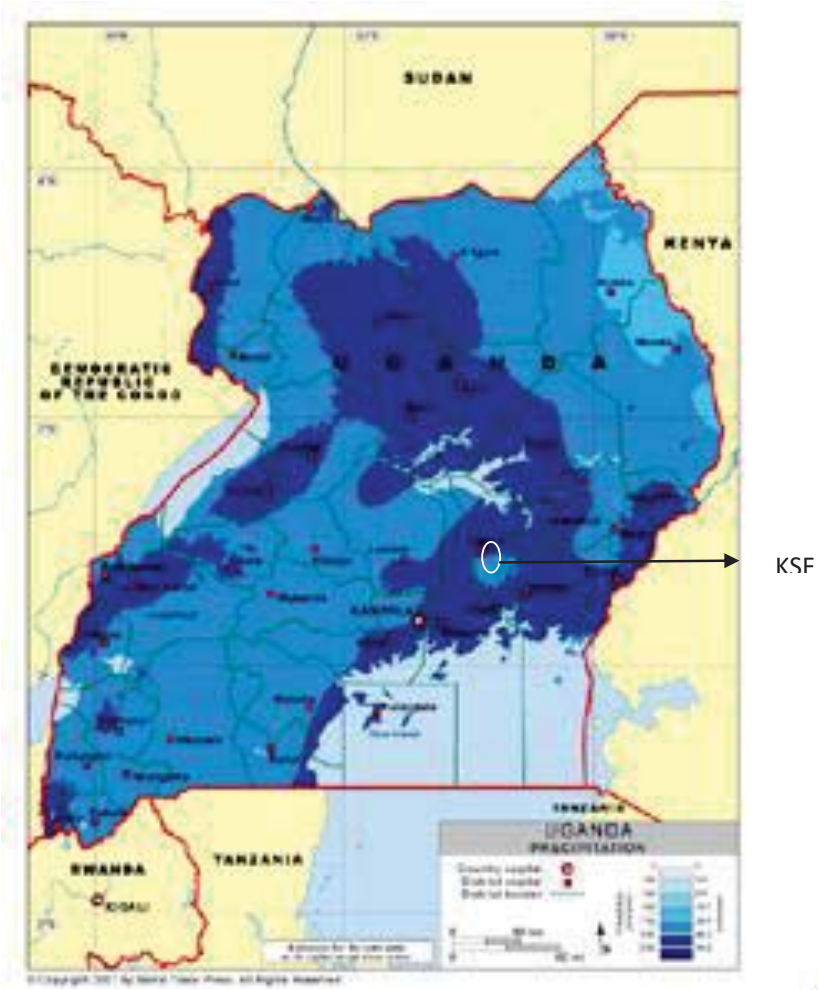
4.3 Environmental baseline common to KFS and the KFS Extension Area

4.3.1 Climate

Both KFS and the KFS Extension Area lie on the equator. Owing to the elevated plateau characteristics of these sites, the climate is warm rather than hot. Temperatures vary little throughout the year fluctuating between 17°C (63°F) to 27°C (81°F) with an annual mean of around 23°C (73°F).

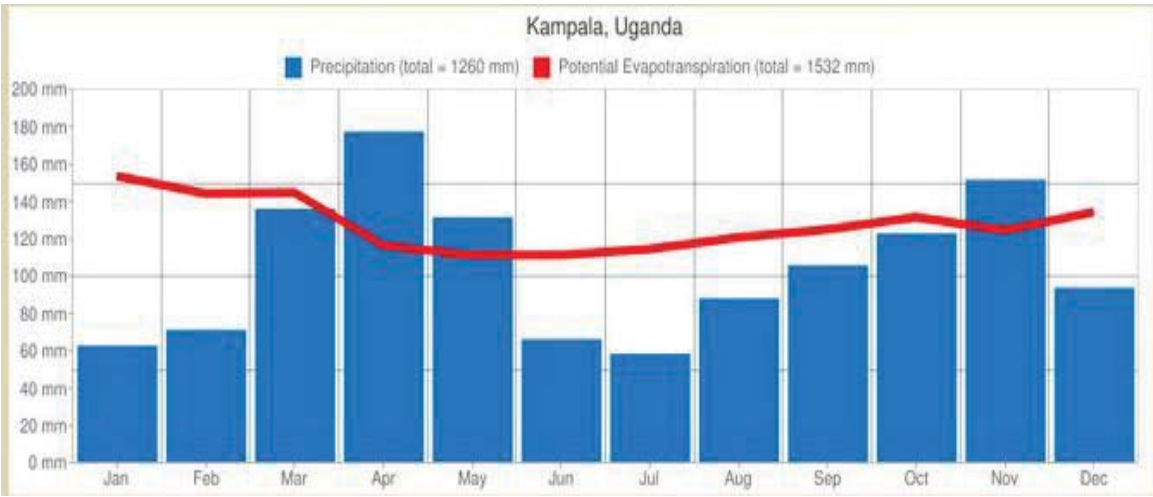
The rainfall distribution in this part of Uganda is bimodal which allows two crops to grow annually supporting grazing grounds for livestock throughout the year. Around Lake Victoria (about 25 km to the south of the KFS Extension Area) the annual rainfall averages 1200 - 1500 mm, and is well distributed***. Figure 52*** depicts the generalized rainfall distribution map of Uganda with the Victoria Nile corridor housing KFS and the KFS Extension Area, while ***Figure 53*** shows the distribution of rainfall across the year as recorded at the Victoria Lake.

Figure 52: Rainfall distribution map of Uganda



Source:http://www.bestcountryreports.com/Precipitation_Map_Uganda.php

Figure 53: Rainfall distribution and evapo-transpiration across the year



Source::http://www.bestcountryreports.com/Precipitation Map Uganda.php

4.3.2 Soil

Soils in the region are loamy, (locally called Nakabango soils) which are rich in nutrients and vary between 15 to 100 cm in depth[56]. A variety of clay, ferrisol (red) and sandy loamy soil are also common in the valley of the Victoria Nile on well-defined but shallow alluvium beds.

The top soils, especially horizon A, are fertile and nutrient rich. The other horizons show slightly lower nitrogen and organic matter than the critical values. The Soil pH is moderately acidic and favors a wide range of crops. The exchangeable bases (calcium, magnesium and potassium) are above the critical levels in all the horizons. The trace elements (iron, manganese, copper and zinc) and sodium are above the critical levels and non-toxic to crops. The soils are dominantly fine loose to loose and occasionally compact. Soil consistency varies widely between firm to loose. These dominantly granular soils are usually porous and exhibit perfect to imperfect drainage characteristics depending on the clay content[57].

4.3.3 Erosion and sedimentation

The region is dominated by raindrop, sheet and gully erosion. Soil erosion due to animal grazing and agriculture in the steep valley flanks in KFS and the KFS Extension Areas is an issue of concern in terms of land degradation. These activities during the field survey were ongoing

[56]Burnside International Limited, 2006. Bujagali Hydropower Project Social and Environmental Impact Assessment. KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir

[57]KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir

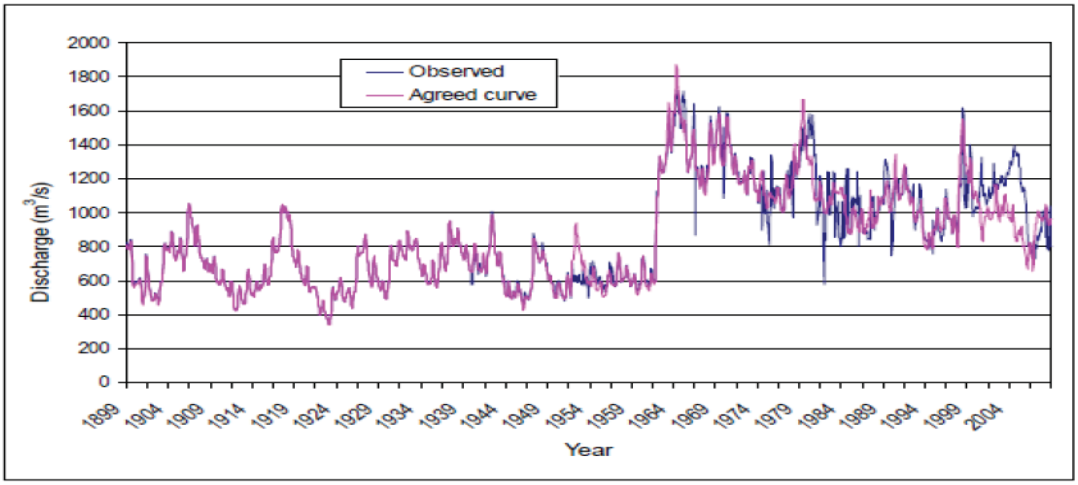
unabated causing an impact on the natural beauty of the landscape along the Nile River especially along the valley flanks.

Despite legal restrictions on the agricultural activities in the 100m zone on either flank of the Nile River for the protection of wetlands[58], agricultural and animal grazing activities are ongoing. The NFA and Local Government's afforestation efforts in this protected zone to stabilize soils against erosion were mostly found to be disregarded by the local communities. This is an issue of serious concern in the protection of the vegetated zone on either flanks of the Nile River to minimize soil erosion and land degradation and to establish an undisturbed natural ecosystem.

4.3.4 Hydrology

The flow in the Victoria Lake from 1899 to 1963 has been more or less consistent but from 1964 to 1967 there has been a sudden increase in the flow (***Figure 54***). Since then it has shown a decreasing tend. The possible reason for the sudden rise in flow may be due to heavy rainfall in the catchment or hydro-geological changes at the mouth of the Nile River in Victoria.

Figure 54: Lake Victoria releases to Nile River (observed vs agreed curve)[59]



The long term monthly discharges for IHPP (***Table 40*** and ***Figure 55***) estimated during the feasibility study shows a consistent rate of flow from December to March. From April to June the flow increases and then decreases till November. Uganda has two rainy seasons: March-April and September-October. The rainfall effect of March-April is seen up-to June, however the December flow increased and the November flow values should increase due to the rainfall.

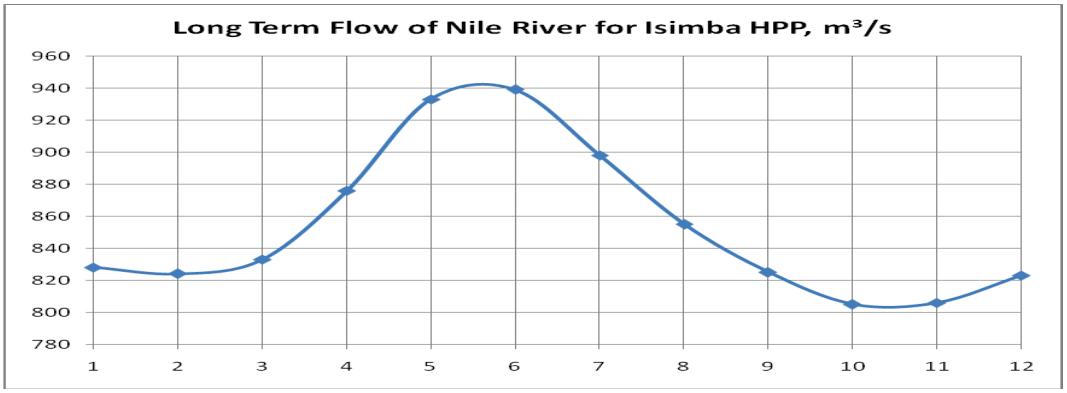
[58]National Environment (Wetland, Riverbanks and Lakeshore Management) Regulations 2000

[59]*China International Water and Energy Corporation, 2014. Feasibility Study Report for the development of the 183 MW Isimba Hydro Power Plant & Isimba - Bujagali Interconnection Project.*

Table 40: Long term monthly discharges of Nile River for IHPP[60]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Long term Flow, m^3/s	828	824	833	876	933	939	898	855	825	805	806	823	**853.75**

Figure 55: Monthly Hydrograph of the Nile River for Isimba HPP



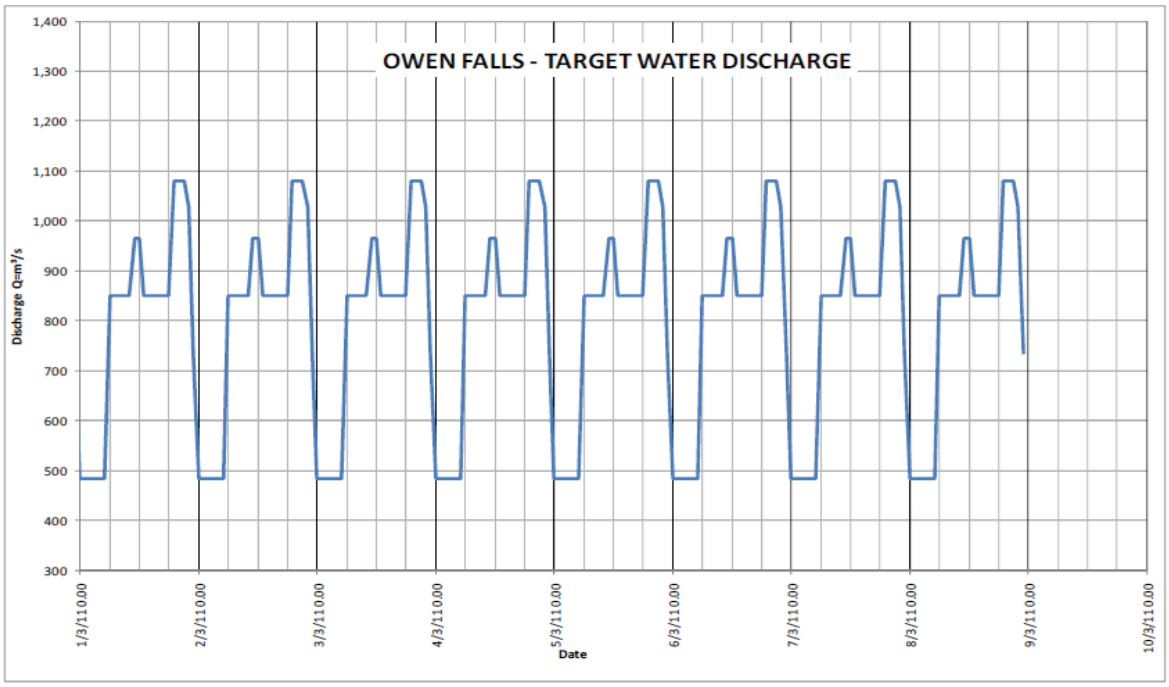
The hydrologic regime on a monthly or annual basis remains unchanged. But the ground reality is that the discharge of the Nile is first regulated by the Owen Falls dam complex at Jinja and the Bujagali Dam which receives this regulated discharge. Obviously, the Isimba Dam will receive the regulated discharge from Bujagali. Hence for accurate estimation of the river hydrology downstream Bujagali, the daily regulated flows of the Owen Falls Dam and Bujagali are important.

The available water regulation data from the Owen Dam Complex upstream of Bujagali shows high degree of discharge fluctuation in a day (***Figure 56***). Water discharge at the peak operation period for the Owen Dam is around 1100m^3/s and is around 500m^3/s during the least operation period

This pattern of water regulation translates to hydrological variations in the downstream areas of the Owen Falls in the Victoria Nile 4 times daily. Immediately downstream of the Owen Falls in the Victoria Nile, the river hydrology will be minimum (i.e. 500m^3/s) twice daily between 22 to 2 hours and 10 to 17 hours and maximum (i.e.1100m^3/s) twice daily between 6 to 10 hours and 18 to 22 hours. The evaluation of the water release pattern from the Owen Dam Complex shows water release to be very abrupt, meaning that within 30 to 60 minutes the water release would increases and decrease from 500m^3/s to 850m^3/s and to 1100m^3/s and vice versa (***Figure 56***).

[60] *China International Water and Energy Corporation, 2014. Feasibility Study Report for the development of the 183 MW Isimba Hydro Power Plant & Isimba - Bujagali Interconnection Project.*

Figure 56: Typical daily water regulations from the Owen Fall Hydropower Complex



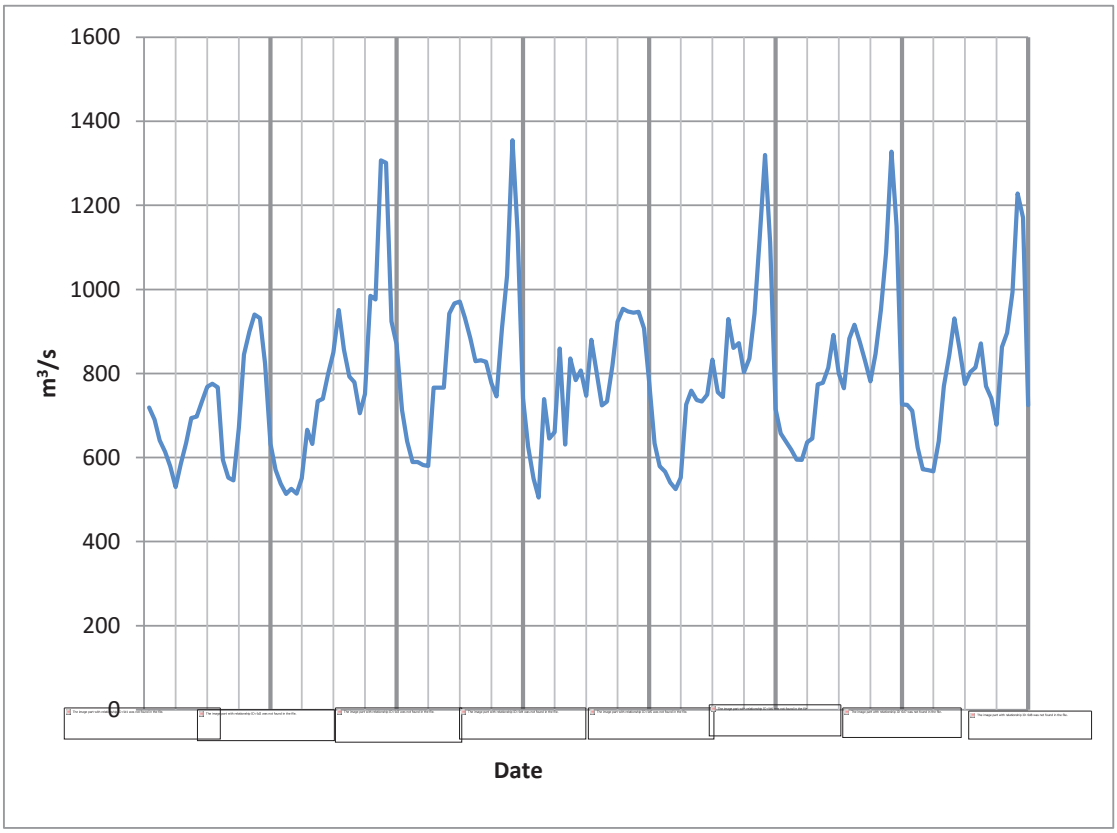
Such a pattern of water regulation from the dam during the peaking and non-peaking periods brings changes in the river hydrology downstream 4 times a day. The water level on the river banks will rise and fall according to the water regulation volume. The velocity of the river water will also change correspondingly (high in high discharge and low in low discharge periods). The rise of the water level on the river banks will depend on the valley morphology particularly its width and roughness. The consequence is on the river bed and river shorelines stability which could translate into multiple ecological levels, particularly habitats of fish and Planktons.

Since there are no re-regulating structures to taper off the discharges from the Owen Dam Complex, it appears that the Victoria Nile River has been experiencing daily fluctuations at least since 2003 with the commissioning of the Kiira Hydropower of the Owen Dam Complex. A similar but of lower level regulation affecting the daily hydrology of the Upper Victoria Nile may have existed with the operation of the Nalubaale Hydropower of Owen complex since 2014.

Figure 57 presents the water regulation pattern of the Bujagali Dam between 10.6.2016 to 10.23.2016.[61]The Water regulation pattern of the Bujagali Dam is similar to the Owen Dam Complex. It operates in tandem with the Owen Dam Complex. Increase or decrease in water regulation starts after 35 minutes of the water regulation of the Owen Dam Complex power projects.

[61] Personnel communication with the Operators of Bujagali Dam

Figure 57: Typical daily water regulations from Bujagali Dam



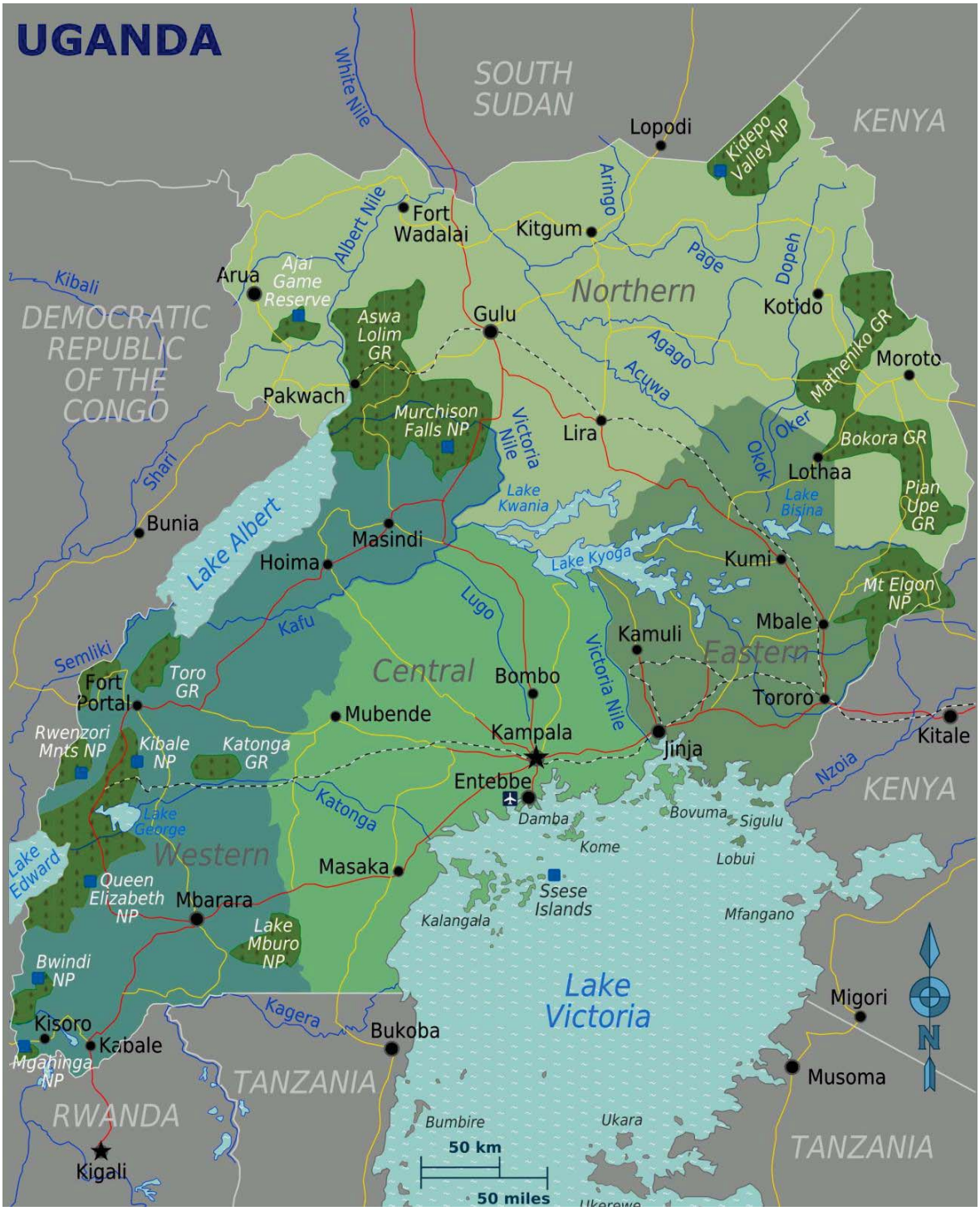
The major difference between the Owen Dam Complex and the Bujagali Dam water regulation are: i) on the water regulation (slow rate of increment in water discharge in the morning peak hours and evening peak hours, but an abrupt drop in water discharge after the morning and evening peak hours for BHPP), ii) on the water discharge volumes (the evening water discharge volume from Bujagali is about 275 m^3/s higher than the Owen Dam Complex), and iii) on the pattern of water discharge (no consistency in the water discharges, which fluctuate a few hundred m^3/s over the morning peak hours and evening peak hours for BHPP).

The rise in water level and water velocity is higher than the Owen Dam Complex for the Bujagali Dam in the downstream areas of the Victoria Nile including the KFS extension area and the KFS area. The KFS extension area is more affected by water fluctuations due to the regulation at BHPP than the KFS due to its location immediately downstream of the Bujagali Dam after the operation of BHPP. Nonetheless, the pattern of water level fluctuations 4 times a day remained almost similar prior to and after BHPP except for the water volumes and velocity.

4.3.5 Geographical relationship with the Natural Conservation Areas of Uganda

Map 15 presents the relationship between KFS and the KFS Extension Area in relation to the National Parks, Game Reserves and Ramsar Sites.

MAP 15: KFS geographical location in relation with the Conservation Areas of Uganda



Legend

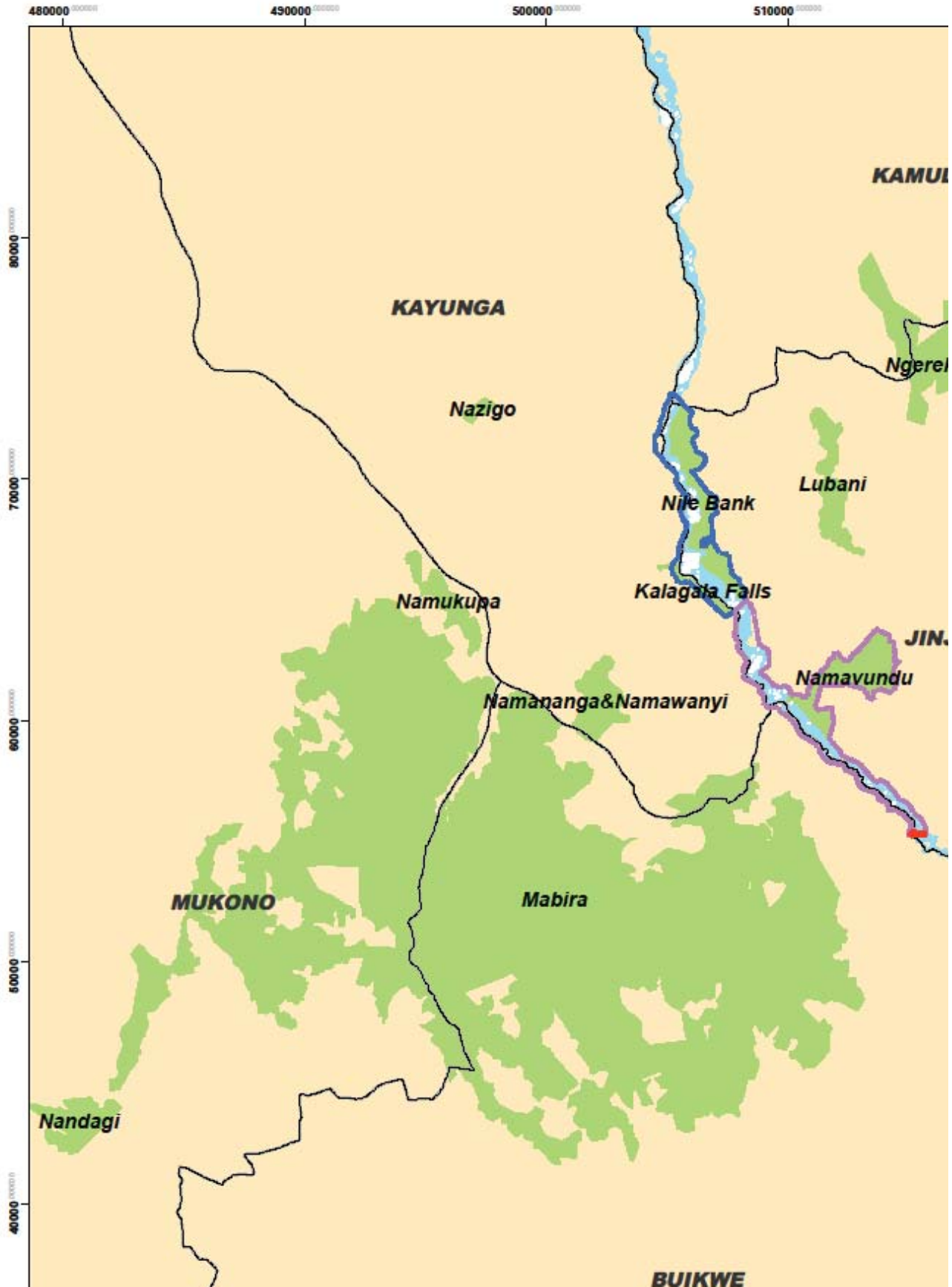
National Park and Game Reserves	Ramsar Sites	KFS and KFS extension Area	

The nearest National Park to KFS is the Mount Elgon National Park, which is about 150 km to the east. The nearest Ramsar Site is the Lake Nakuwa which is about 70 km to the north-northeast of KFS. The Lutumbe Bay Ramsar Site is located about 110 km to the southwest of KFS. Because of its nearness to the Ramsar sites, KFS and the KFS Extension Area is a good bird watching site in Uganda.

Apart from this, KFS and the KFS Extension Areas are surrounded by a number of Central Forest Reserves (***Map 16***). The Nile Bank Central Forest Reserve and the Kalagala Fall Central Forest Reserves are located within the geographical boundaries of KFS. Similarly, the Namavundu Central Forest Reserve lies within the delineated boundary of the extended KFS.

The Mabira Central Forest Reserve located about 10 km to the South West of the KFS Extension Area is included in the KO-SMP Management Area for the conservation of the Mabira Ecosystem of Central Uganda. The other nearby Central Forest Reserves are :i) Lubani Central Forest Reserve, ii) Namananga and Namawanyi Central Forest Reserve, iii) Ngereka Central Forest Reserve, iv) Nazigo Central Forest Reserve and v) Namukupa Central Forest Reserve. Of these Central Forest Reserves, the Mabira Central Forest Reserve is the largest extending over 30,000 ha of land area. It is a rainforest and has been protected as Mabira Forest Reserve since, 1932.

MAP 16:KFS and KFS Extension Area and surrounding Central Forest



4.3.6 Tourism

The Victoria Nile section (between Lake Victoria and Lake Kyoga) including the river stretch section of KFS and its extension area has a variety of tourist attractions and has over the years experienced steady growth in tourism[62] contributing to the national economy. This growth has been characterized with increasing number of visitors, diverse tourist activities and increasing number of accommodation facilities. Most of the tourism developments are concentrated along both sides of the river banks between Nalubale dam area and Kalagala/Itanda falls. However, tourism industry contribution in the livelihoods of the local commuinity of the area has never been fully ascertained but is generally considered to be very miniscule. Most of the tourism industry operations are managed by 'outsiders' and the involvement of local community in the industry is very limited.

The adventure water-based tourism activities are the main thrust for tourism development along Victoria Nile. This river offers unique and high quality water sports tourist experiences provided by the different levels of rapids. The all-year-round large water volumes, the sequence of rapids provide an excellent White Water Rafting (WWR) and Kayaking experience. Some rapids of the Nile River are considered among the best large waves rapids in the world competing with those on Ottawa River in Canada during summer[63].

Other tourism adventure related activities are in the infancy stage in the Victoria Nile River corridor. These are bungee jumping, horse riding, bird watching, nature walks, quad biking along the river banks, tubing, boat/canoe rides, recreational/sport fishing, scenery viewing, cycling/ mountain biking, community walks etc. The river corridor has a potential of cultural tourism which is yet to be exploited.

The development of Jinja Town is greatly attributed to the socio-economic opportunities provided by the adventure tourism along the Victoria Nile River since 1990's. Based on the adventure tourism activities, Jinja town has developed as an East Africa's premier adventure tourism center[64]. As of the date, Jinja region provides competitive and diversified tourism product in Uganda which no any other country can match in the Eastern African region.

The water tourism industry along the Nile River corridor is not confined to a particular geographical site but it rather covers the whole stretch of the free flowing Nile River starting from Bujagali Dam downstream to Lake Kyoga. Since rapids and water falls are confined within the

[62]Kimbowa F., Nyakaana J.B., Ayorekire J. and Ahebwa W.M (2012) Environmental Implications of Tourism Development on River Nile, Uganda. MAWAZO Journal Vol. 11 (2) pp 69 - 80

[63].Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa,E&D Consulting Services – Felixton, South Africa

[64] Community Development Action Plan (2016) Draft Report. M0EMD Kampala

stretch between Bujagali and Bugumira, the main water based tourism activities are are conducted within this section of the Nile. The main water sports (rafting and Kayaking) operations are confined between Bujagali and Hairy Lemon Islands. This 10.16 km free flowing stretch of the Victoria Nile includes the KFS area with 7 rapids/falls out of the total 18 between Bujagali and IHPP dam.

Thus the operations of the water based tourism activities are not confined only to KFS, but also utilize the rapids and falls outside of the KFS stretch. It is therefore difficult to delineate tourism business for a given geographical area such as KFS. Therefore, KFS and KFS Extension Area should be holistically viewed as part and parcel of the tourism industry in the Victoria Nile River corridor and related economic turnovers and local contributions. Tourism in KFS cannot be viewed as an isolated entity of its own in order to make comparisons with other related economic turnovers along the Victoria Nile.

Tourism industry in the Victoria Nile was initiated even before the Bujagali IA and declaration of KFS as one of the condition of the Agreement. Prior to BHPP, two-day package was the general arrangement but after start of the BHPP construction, it is said to have been limited to one day package[65]. Despite this shortening of the WWR packages for tourists due to loss of rapids above Bujagali dam, the area has experienced increase in tourism activities with numbers of tourist packages increasing (more than19336 trips to rafters) with total turnover of the rafting and kayaking companies reaching USD 1.7 million in the year 2012[66]. This reflects that the number of rapids and duration of WWR packaging is not the only factor that influences turnover of the operators but it is also determined by the diversification, packaging and marketing of the of the existing products and facilities. However, with more rapids to be lost with the completion of IHPP, the Tourism Operators total turnover may drastically decline. Some operators have projected that they may fail to break even and close their operations since selling half day trips will not be viable. Nonetheless, even when more rapids are lost, there are other multiple opportunities for tourism activities for economic gains but this can only be attained by fully exploiting the existing tourism opportunities.

This also reflects that the number of rapids and duration of WWR packaging is not the only fact that affects the turnover of the operators and number of trips, but is also determined by the diversification of packaging and marketing with various other facilities. Nonetheless, with the rapids unaffected, there are other multiple opportunities for tourism activities for economic gains.

[65] Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa,E&D Consulting Services – Felixton, South Africa

[66] Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa,E&D Consulting Services – Felixton, South Africa

4.3.6.1 Tourism resources

There are various tourism assets along the Nile River bank and they can be grouped into two major categories – (a) natural assets and (b) cultural assets. The natural assets are further grouped into aquatic (rivers, rapids, fish, birds etc.), and terrestrial (river banks, vegetation, islands, birds etc.) tourism assets. The cultural assets include: spiritual shrines, worship centers/ sites, cultural norms and customs, cultural institutions and their respective regalia.

The natural aquatic assets are the Victoria Nile and the associated rapids/falls that have been utilized for water sports mainly for White Water Rafting (WWF) and Kayaking. Rapids are graded internationally based on a standard system (***Table 41***) on the level of river difficulty.

Table 41: International scale of river difficulty[67]

Grade	Description
Grade 1	Waves small; passages clear; no serious obstacles.
Grade 2	Rapids of moderate difficulty with passages clear. Requires experience plus suitable outfits and boats.
Grade 3	Waves numerous, high, irregular; rocks; eddies; rapids with passages clear though narrow, requiring expertise in maneuvering – scouting usually needed. Requires good operators and boats.
Grade 4	Long rapids; waves high, irregular; dangerous rocks; boiling eddies; best passages difficult to scout; scouting mandatory first time; powerful and precise maneuvering required. Demands expert boatmen, excellent boats and good quality equipment.
Grade 5	Exceedingly difficult, long and violent rapids, following each other almost without interruption; riverbed extremely obstructed; big drops; violent current; very steep gradient; close study essential but often difficult. Requires best persons, boats, and outfits suited to the situation. All possible precautions must be taken.
Grade 6	Extremely dangerous, classified as un-trafficable. All previous difficulties increased to the limit of practicability. Very violent, exploding and folding water so difficult that controlled navigation by raft is virtually impossible. Swimming this grade of rapid is considered suicidal. Requires extreme luck or skill to finish.

The Victoria Nile section from the Bujagali Dam to IHPP Dam site (approximately 36.5 km) has a sequence of rapids of various grades (***Map 17, Table 42***), making it a favorite water-based adventure tourism destination in Uganda.

[67] Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa,E&D Consulting Services – Felixton, South Africa

MAP 17: Map showing rapids and falls along Vitoria Nile – Bujagali Dam t

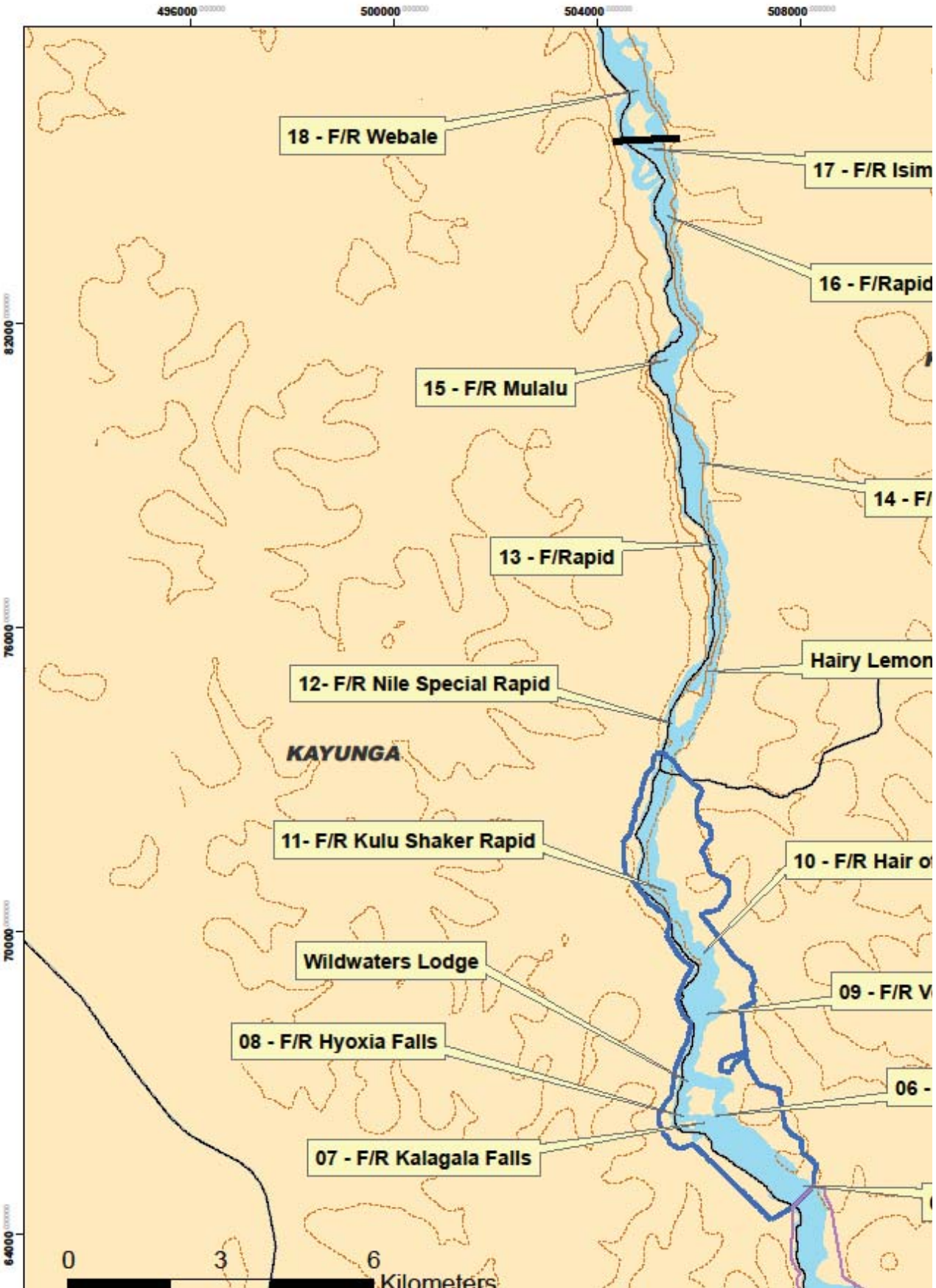


Table 42: Sequence of rapids and falls along the Nile River - Bujagali Dam to IHPP Dam site

Fall/Rapid (F/R) No, starting from BHPP	Name of Rapid/Fall (R/F)	Class	Distance from Bujagali (Km)	Length of rapid (Km)	Total Area In (ha)	Remark
F/R 1	Big Brother/Silverback	1-2	0.8	0.5	6.2	Downstream of the BHHP/KFS Extension
F/R 2	Point break* (two channels)	3	1.6	0.6	2.4	Two channels/ KFS Extension
F/R 3	Overtime	3	2.2	0.2	2.8	KFS Extension
F/R 4	Dead Dutchman**	4	7.7	0.4	11.5	KFS Extension
F/R 5	Super Hole***	3	12.7	0.3	10	Retrospect/ within KFS
F/R 6	Itanda****	5-6	15	0.6	9.8	within KFS
F/R 7	Kalagala****	5-6	15.1	0.5	2.4	within KFS
F/R 8	Hyoxia****	5-6	15.1	0.6	3.8	within KFS
F/R 9	Novocaine / Vengeance / Boulder rapid (three channels)	3-5	17.5	0.3	2.8	within KFS
F/R 10	Slippery when wet / Hair of the Dog / Easy now (three channels	3-4	18.6	0.3	2.5	within KFS
F/R 11	The Virgins / Kulu Shaker (two channels)	4	19.8	0.3	4.7	within KFS
F/R 12	Lemon approach Nile Special	3-4	23.9	0.2	1.5	Approach to Hairy Lemon/Within IHPP
F/R 13		2-3	26.6	0.6	15.1	Within IHPP
F/R 14		2-3	28.0	1.6	64.4	Within IHPP
F/R 15	Mulalu	4	30.9	2.0	62	Two channels/Within IHPP
F/R 16	Malalu Channel?	2-3	34.2	0.4	5.8	Within IHPP
F/R 17	Isimba	2-3	36.0	0.2	5.4	Within IHPP

Fall/Rapid (F/R) No, starting from BHPP	Name of Rapid/Fall (R/F)	Class	Distance from Bujagali (Km)	Length of rapid (Km)	Total Area In (ha)	Remark
F/R 18	Webale	3	36.5			Downstream of IHPP

*Note: * named as Overtime in the Scherzer's (2013) report, *** named as Bubugo in the Scherzer's (2013) report, **** grouped as one fall (Itanda/Bad Place) in the Scherzer's (2013) report[68] as they locate on a line in the same river section.*

The Fish is the other aquatic natural resource base of the Victoria Nile. It is an important tourism resource especially in sport fishing. A total of 22 fish species out of which *Lates niloticus* (Nile perch), *Oreochromis niloticus* (Nile tilapia), *Mormyrus kannume* and *M.macrocephalus* are the key species of sporting interest. The h*aplochromine cichilids* comprising of tiny colorful fish species of household aquarium interest endemic to the Victoria Nile are the other marketing products for tourism which are yet to be explored. As of the date, sport fishing trips are arranged by some tourism operators including: Haven Lodge, and Holland Park, among others. The number of local community fishermen also practice fishing along the Victoria Nile which provides an opportunity for the tourists to be involved in fishing with the community as a recreational activity.

Apart from the Victoria Nile rapids and falls, the island swarms (covered with lush green undisturbed natural vegetation and rock out crops) closes to the rapids are the tourism assets of interest. Wide river sections (200 to 1000m wide) and river banks associated with wetlands and terrestrial vegetation is the other aesthetic aspect of the Victoria Nile that attracts local as well foreign tourists. Slightly elevated surrounding undulating and rolling terrain dotted with traditional African style houses in the middle of farmlands enslaved within the household garden gives a scenic topography which supports aesthetic based tourism activities such as picnicking, scenic viewing, among others.

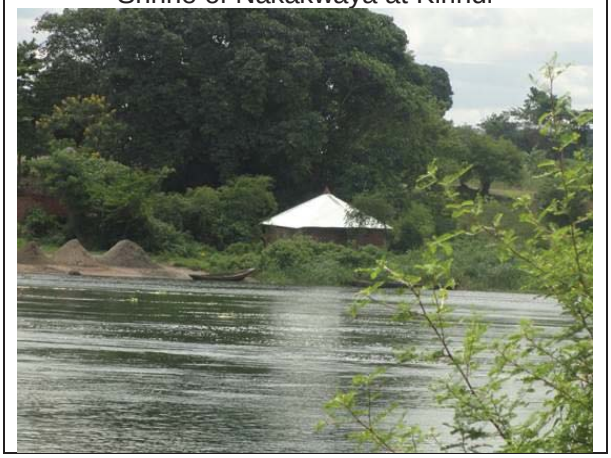
The river Nile with associated wetlands and islands is a home for a number of water loving birds of east and central Africa. More than 200 bird species have been reported from the region with over 40 water loving birds of various sizes and colors. The islands and wetlands of the Victoria Nile provide safe habitats for water loving birds for feeding, nesting and breeding. Birds have

[68] Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa,E&D Consulting Services – Felixton, South Africa

been seen to use the islands as breeding grounds since they are secure and isolated from predators. These characteristics of the Victoria Nile have attracted and have the potential to attract bird watchers across the globe. Some of the tourism operators of the area have already exploited this tourism potential of bird watching but only to a limited extent.

The caves, tangible and intangible spiritual shrines along the Victoria Nile River are the other assets of cultural tourism which has the potential of tourism attraction. As of date there is no structured and formal cultural tourism.

Shrine of Nakakwaya at Kirindi



4.3.6.2 Tourism infrastructure

Since 1994, Victoria Nile has been promoted as a tourism destination. To maximize the tourism potential of the area tourism infrastructures such as transport networks, communication facilities, electricity, water supply, accommodation facilities (hotels, lodges, camp sites), food and beverage facilities (restaurants, cafes), and other support/accompanying facilities (such as signage/interpretation points) have been developed along and around the Victoria Nile River course.

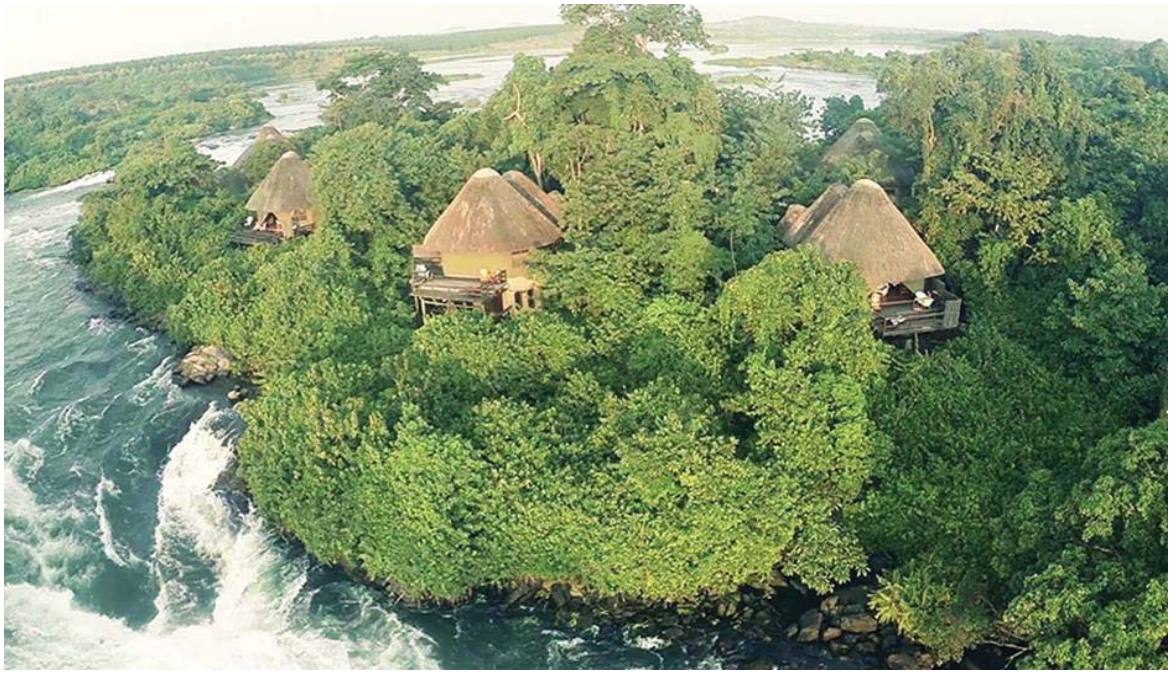
The accommodation facilities (usually also have restaurant facilities) are mainly found along the Nile to take advantage of the scenic topography and accessibility to the Nile for water based activities. Field survey revealed that there are several facilities including the high end facilities such as Wild Waters Lodge in island between the Kalagala and Itanda falls, Hairy Lemon Eco-lodge in the Hairy Lemon Island, Haven, Holland Park, Jinja Nile Resort, Nile Porch, and Nile River Camp. The list of the hotels and facilities along the Nile River is presented in ***Table 43***.

Table 43: List of high facility accommodation facilities along Victoria Nile

Company	Location	Website
The Hairy Lemon Eco-lodge	Outside KFS	http://www.hairylemonuganda.com/
The Haven Uganda	KFS Extension area	http://www.thehaven-uganda.com/
Wild waters Lodge	Within KFS	http://www.wild-uganda.com/
Holland Park	Outside KFS	http://www.hollandparkuganda.com/home.htm
Jinja Nile Resort	Outside KFS	http://www.madahotels.com/jinjanile/index.php
Kingfisher Resort	Outside KFS	http://www.kingfisher-uganda.net/en/jinja-en/
The Nile Porch	Outside KFS	http://www.nileporch.com/
Eden Rock resorts	Outside KFS	http://www.edenrocknile.com/
Nile River Camp	Outside KFS	http://www.camponthenile.com

With regards to the transport facilities on either side of the Victoria Nile,a fairly developed road network exist at an approachable distance to the Victoria Nile from the main city centers of Uganda such as Kampala, Jinja, Kayunga, and Entebbe.

Wild Waters Lodge in the Island between Kalagala (Hypoxia) and Itanda Falls



Transport Vehicle carrying rafting equipments

Most of the tourism facilities are accessible by non-graveled (murram) roads that connect to other village road networks with the area. There is no reliable means of public transport in the area and visitors to the main tourism sites have to use private means or either cars or commuter motor cycles (Boda Boda).

Accommodation facilities especially located on islands use boats/canoes to connect to the main land, but apart from that there is no established public water transport system that the community and visitors can use. The communication network in the Nile River corridor is relatively reliable – private telecommunications companies in Uganda have established wireless networks that provide both voice and data services. Most homesteads in the villages are not connected to the main electricity grid and there is limited/no piped water connection. Most tourism accommodation facilities thus have invested in private power, water and sewerage systems.

Put-in facility where the raft free slides onto the River

Sign posts for facilitating visitors movement around in KFS is very limited and where it exists it is mostly in poor condition apart from a few that have been put up by private individual sites.

Other tourism support facilities include rafters put-in and take-out/landing points - some have reception/changing/washroom areas. These have been constructed by individual rafting companies on the river banks where the rafters get in or out of the river at the starting point or at the end of the rafting trip.

There are no visitor information centers at key tourism sites such as at Itanda Falls. Interpretation facilities and signage are lacking. Most sites having improvised walkways and open scenery viewpoints

Directional sign to Itanda Falls

4.3.5.3 Tourism Operators

The main tourism operators along the Victoria Nile are those who are engaged in the WWR and kayaking. Investment in rafting adventures on the Victoria Nile began in the mid-1990 when overseas whitewater rafters became aware of the high quality series of Grade 4 and 5 rapids. Adrift is the first company to operate whitewater rafting in Uganda, commencing operations in 1996, followed by Nile River Explorers (NRE) in 1997[69]. Since then, adventure tourism has grown steadily, and today, the major tourism operators in the Victoria Nile engage in a number of water based sports (rafting, kayaking, and tubing, fishing among others). The key operators are Adrift, River Nile Explorers; Kayak the Nile (U) Ltd, Nalubale Rafting, White Nile Rafting, Nile Horseback Safaris and All Terrain Adventures. ***Table 44*** lists the key operators in the Victoria Nile River.

Table 44: List of Tourism Operators in the Victoria Nile

Company	Contact person	Website
Nile River Explorers	Jon Dahl	http://raftafrica.com/
Kayak the Nile	Jamie Simpson	http://www.kayakthenile.com/
Adrift	Brad McLeay	http://adrift.ug

[69] Community Development Action Plan (2016) Draft Report. MEMD Kampala

Company	Contact person	Website
Nalubale rafting	Frazer Small	http://www.nalubalerafting.com/
Gorilla Jet River Adventures	Geoff McComb	http://raftafrica.com/site/other-river-activities/gorilla-jet/
Wild Nile Jet	Gavin Fahey	http://adrift.ug/gavin-fahey/
Love It Live It	Sam Ward	http://www.loveitliveit.co.uk/
Adventure X		http://www.adventurex.co.uk/uganda.asp
Zen Tubing	Pete Merdith	http://en-gb.facebook.com/pages/Zen-Tubing/181016401917227?v=info
Equator Rafts	Hitesh Vorra	http://www.equatorrafts.com/
White Nile Kayaking	Prossy Mirembe	http://whitenilekayaking.com
Jinja Fishing	Rob Jones	
Garuba Adventures	Pete Meredith	
Explorers mountain biking	Nash Karanja	http://www.raftafrica.com/mountainbiking.htm
Nile Horseback Safaris	T.J. Lonsdale	http://www.nilehorsebacksafaris.com/nhs_about_us.asp
All Terrain Adventures	Peter & Shirray Knight	http://www.atadventures.com/ata/index.html

The other support services facilitating tourism operations in the region include accommodation/restaurant facilities, transportation (commuter motor cycles, boat/canoe riding), and tour guiding, making and selling of crafts/ceramics among others. Operators who provide support services include hotel operators (who provide accommodation services), tour and travel companies (that book and sale adventure tourism products), and airlines (that fly in international tourists especially rafters and kayakers). These operators are however mainly located outside the Victoria Nile region especially in the city centers of Kampala and Jinja.

4.3.5.4 Tourist statistics over the year

According to the Uganda Bureau of Statistics (UBOS) 2015, the tourist visiting for leisure and holiday purpose was 220,000 in 2014 showing an increase of nearly 17.2% of the preceding year. The increase can partly be attributed to increased marketing and diversification on the tourism products, one of such being water sports along Nile River.

Tourism statistics in Uganda are mainly collected at a national scale mainly at border entry points by the Uganda Bureau of Statistics (UBOS) and at key destinations such as at National Parks entry gates. There is no formal mechanism to collect data at district, regional and individual site levels. As such there are no official records of how many tourists visit Jinja, Kayunga and Kamuli districts or specific destinations visited. In the same light there are no official records of the number of tourists who visit the Victoria Nile corridor and the activities they engage in.

Information from individual tourism establishments is mainly descriptive. For instance, Hairy Lemon Eco Lodge indicates that they mostly handle international kayak community who frequent the Victoria Nile River corridor for short and long stay holidays.[70] The kayakers are citizens of English, American, Slovakian, Russian, Czechoslovakian, German, Scandinavian and many other countries. Domestic tourists especially Kampala residents visit the site for weekend recreation including WWR along Victoria Nile corridor.

The available data of tourists on the Victoria Nile corridor is mainly based on estimates from tourism operators and accommodation establishments. In 2010 six tourism companies operating in the Jinja/Victoria Nile region reported handling a total of 34,040 visitors translating in an average of 473 visitors per month per company. Individual tourism operators such as Kayak the Nile (U) Ltd reported handling an average of 600 clients per month. Some tourism operators (Hairy Lemon, Nile River Explorers and Nalubaale Rafting) in collaboration with Brussels Airlines indicated that they are able to fly in over 500 kayakers a year to Uganda[71]. If all these figures are added together, in 2010 nearly 72,000 visitors were serviced by these operating companies.

An overview of the latest report[72] Nile River attracts at least 19,000 water-sport related tourists each year who mainly include international tourist kayakers and rafters. Records of overland tour operators in Uganda reveals Jinja to be a major 'tour highlight' destination for tourist travelling by road from Nairobi and Rwanda. Considering that the tourist visit in the Nile River corridor correlates with the tourist visiting Uganda[73], The tourist visit in the Nile River corridor based on the base figure estimated in 2010[74] will be around 116,000 for the year 2015 with an estimate

[70] Personnel communication, 2016

[71] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II b.*

[72] *Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa, E&D Consulting Services – Felixton, South Africa*

[73] *Uganda Bureau of Statistics, 2015. Statistical Abstract for Uganda – 2015*

[74] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba hydropower Plant and associated Transmission line. Main Report. Vol. II b.*

annual increment rate of 10% a figure which is higher than the estimates of Scherzer 2012[75] study.

4.3.5.5 Income from the Tourism Industry

The total value and revenue generated from tourism businesses operating in the Victoria Nile section is not fully know in absence of comprehensive information. The feasibility study report (2012) reveals that information from 9 tourism related companies had an annual turnover close to USD 3.6 million in 2010. These values could not be validated from official records due to lack of comprehensive data.

Based on an estimated total of serviced tourists at 72,000 in 2010 and based on the assumption that all tourist operators serviced similar number of tourist, an individual tourist on an average contributed about 66.67 US$ in the turnover of the tourist operator. With the above assumption total turnover of 12 tourist operators in 2010 is estimated to be USD 4.8 million. Assuming turnover of other support service provider as additional amount (about 33% of the tourism operator's turnover), turnover from the Victoria Nile River tourism is estimated to be around USD 6.4 million in 2010. If the tourist number increased 10% annually at inflation rate of 7%, the turnover in 2015 is estimated is USD 14.46 million.

4.3.5.6 Contribution of the Tourism Industry to the local economy

The turnover figures explicitly show that the tourism industries operating at the Victoria Nile corridor has significantly contributes to the regional and national economy. The question as to whether this contribution is equally shared within the local economy is a subject of interest that needs to be further investigated. As highlighted in the KO-SMP, enhancement of environment friendly economic activities (such as tourism) that contribute to the economy of local community is a key factor in ensuring sustainable management of the KOA ecological system.

Eight major tourism businesses that operate in the Nile region employ an estimated total of 179 people and with an average of 22 staff per business. This figure is lower than the 2012 estimates made by Scherzer, which were 289. Although employment information is not fully available, data from four companies indicate more than 80% of the staff are employed on an informal (part time basis) and they are engaged as drivers, freelance rafting guides, kayakers, porters, and in preparation of meals among others. The few staff who are employed on a formal (permanent) basis are usually the Managers, some technical staff and chefs who are mostly come from outside the Victoria Nile corridor area.

[75] *Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa, E&D Consulting Services – Felixton, South Africa*

There is no official record on the amount of money paid to the different categories of staff. Interviews with some of staffs revealed that different establishments pay differently. But there was general consensus that the informal staff were paid far less than the formal staff. They mentioned that on average the informal staff are paid between UGX 200,000 to 300,000 (USD 60-90) per month. This figure is much lower than estimated in the Scherzer's report[76].

Although there is lack of empirical data on local community participation in tourism, observations on the ground suggest that there is limited participation and benefit sharing between the tourism operators and the local communities. Analysis of the various records/reports revealed that none of the local community members owned or had shares in any of the major businesses operating in the upper Victoria Nile region.

The main avenue of community engagement in the existing tourism business is through employment. Field survey revealed that only handful community members (< 20%) were employed as informal staff (porters, cooks etc). Those employed indicated that the engagement did not significantly improve their livelihoods due to low payments and the seasonal nature of the business. Interviews with youth groups at Itanda falls revealed that they have tried to make in-roads in the tourism business in the region but with limited success due to inadequate training, limited financial resources and management skills. The youth are mainly engaged as 'self-taught' tour guides, cultural dance performers and in craft and ceramic making.

The overall contribution to the local economy in the form of employment from the tourism industry is miniscule compared to the total annual turnover by the industry. Scherzer[77] estimated a total of USD 45,000/per annum to the Ugandan staffs by the tour operators. Current estimates are USD 50 to 100,000 per year.

Tourism also contributes to the local economy through business tax levied on tourism operators that is paid to the sub county treasury. The tax is utilized to finance community development projects such as repair of roads, provision of water sources among others which the tourism operators also benefit from. On average a rafting/kayaking operator pays an average tax amount of UGX 60 million (Approximately USD 18,200) annually to all the sub counties where they operate. With an average of six rafting tourism companies operating in the Victoria Nile, the local governments on average collect UGX 360 Million (approximate USD 109,100) in taxes annually.

Apart from the direct and formal contributions, the tourism industry also contributes to the local economy through their social responsibility initiatives. Some tourists have over the years participated in a number of volunteer based community development initiatives and donated funds to support community education and health initiatives. More so tourism operators have

[76] *Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa, E&D Consulting Services – Felixton, South Africa*

[77] *Scherzer, P. (2013) Independent Tourism and Economic Assessment of the proposed Isimba Hydropower Project, Nile River Uganda, Felixton South Africa, E&D Consulting Services – Felixton, South Africa*

carried out fund raising drives to support conservation organisations operating within The Victoria Nile corridor and in other parts of the country. Since 2004 tourism operators in the Victoria Nile region have raised about USD 60,000 that has been handed over to conservation organisations such as Rhino Fund Uganda, Jane Goodall Institute, Uganda Wildlife Education Center, Uganda Conservation Foundation, Chimpanzee Sanctuary and Wildlife Conservation Trust.

5 Analysis of alternatives

The primary objective of IHPP is to estalish a power generation project with an installed capacity of 183.2 MW generating 1063 GWh of annual energy. The Feasibility Study for the development of Isimba Hydro-power Plant and associated Transmission Line and Sub-station, Revision 1, prepared by Fichtner-Norplan in 2012 have detailed the various alternative analysis for the project in Volume IIA and in Annex 5 and Annex 6[78]. However, the IHPP EIA and SIA reports did not adequately address the various IHPP alternatives including their implications on KFS. As per the study ToR a requirement, analysis of alternatives was indicated and it includes the following:

- No Project Alternative
- Alternatives for Power Production
- Alternative Analysis of the IHPP Dam site and Upper Reservoir Levels
- Alternative Analysis of the IHPP Dam site and Upper Reservoir Levels on KFS
- Alternative Analysis of the Environmental Offset sites on KFS

5.1 No Project alternative

The Government of Uganda has adopted Vision 2040 as the country's economic development driver for the period 2013-2040. In the energy sector, Vision 2040 envisages the generation of 8,601 MW electrical energy by 2020, increasing to 14,670 MW by 2025 and 41,738 MW by 2040. The objective is to transform the national population income from low to a competitive upper middle income with an average electricity consumption per capita averaging 3,668 kWh by 2040.

As of 2016 the total installed and licensed electrical energy capacities in Uganda was 895.5 MW and 746 MW, respectively. The Uganda electricity energy mix in 2016 comprised of (i) hydropower: large hydropower - 630 MW installed and 630 MW licensed; small hydropower - 65 MW installed and 65 MW licensed; (ii) thermal: 136 MW installed and 14 MW licensed; and (iii) cogeneration/bagass: 64.5 MW installed and 37 MW licensed. The Ugandan electricity grids in 2016 serviced nearly 18.16 % of the national population covering 55% of the urban and about 10 % of the rural population. The per capita electricity consumption is one of the lowest in the region limited to 87 kWh.

In the above context the development of the energy sector to meet the targets of Vision 2040 is very crucial. Therefore, GoU has accorded high priority for the development of the energy sector wih number of projects in the pipeline. IHPP with an installed capacity of 183.2 MW generating 1063 GWh of annual energy is among the energy projects currently under development in Uganda.

[78] *Annex 5: Alternative Dam Site Locations and Annex 6: Reservoir Upstream Boundary*

5.2 Alternatives for power production

The potential alternative energy sources for GoU are renewable energy (large scale hydro, mini-hydro, solar, wind, biomass, peat and geothermal) fossil fuel, nuclear power and energy import. The renewable energy source make up a major share of the energy potential in Uganda and comprises of large scale hydro (2980MW)[79], biomass (1650MW), peat (800MW), geothermal (450MW), solar (200MW), and mini hydro (200MW)[80]. The potential of fossil fuel energy is limited and is estimated around 500MW[81]. JICA, 2011 estimated a nuclear power potential of 600 to 2000 MW for Uganda. Similarly, the potential of energy import is estimated to be around 300 MW[82].

JICA 2011 based on a multi-criteria decision analysis evaluated the available alternative energy resources to meet the near future electrical energy demand in Uganda. A total of 27 criteria, including economic, technical, environmental and social , were evaluated. The finding of the evaluation rated hydropower, geothermal and solar thermal to have higher advantages compared to other energy sources[83].Solar thermal power was evaluated as the most suitable in terms of minimizing environment impacts; however, solar thermal has no advantage from technical and economic points of view. Geothermal has balanced advantages from the environmental, technical and environmental points of view. However, large-scale hydropower such as IHPP from an environmental point of view.

Geothermal energy which was evaluated as the best among the available alternative energy sources has a limited technical potential (50 MW) for development at present. The estimated peak energy demand (900 MW) by 2023 cannot be supplied by geothermal source only[84]. The solar thermal energy has also similar limitations. It is therefore, that a large scale hydropower project with a technical potential of 2,980 MW has been priorotized for development for a secure supply of energy.

Among the large scale hydropower projects IHPP with an installed capcity of 183.2 MW generating 1063 GWh of annual energy will be one of the best from an environmental and economic point of view to meet the near future energy demand.

[79] JICA, 2011. Project for Master Plan Study on Hydropower Development in the Republic of Uganda

[80] *K.O. Adeyemi* and A.A. Asere, 2014. A review of the energy situation in Uganda. International Journal of Scientific and Research Publications, Volume 4, Issue 1, January 2014; ERA. 207. The Renewable Energy Policy for Uganda,*

[81] *JICA, 2011. Project for Master Plan Study on Hydropower Development in the Republic of Uganda*

[82] *JICA, 2011. Project for Master Plan Study on Hydropower Development in the Republic of Uganda*

[83] *JICA, 2011. Project for Master Plan Study on Hydropower Development in the Republic of Uganda*

[84] *JICA, 2011. Project for Master Plan Study on Hydropower Development in the Republic of Uganda*

5.3 Alternative analysis for the IHPP dam sites and the Upper Reservoir Levels

A number of sites for the IHPP dam and powerhouse locations have been considered in the early phase of the feasibility study to finalize the project layout and design. Similarly, different upper reservoir level alternatives were also considered to optimize the power production from IHPP. The alternative analysis is mostly derived from the works of the feasibility study 2012[85].

5.3.1 Alternative dam site locations

The IHPP Alternative dam sites include the evaluation and assessment of 4 dam site locations. All the dam sites were suitable for the establishment of a dam height for power production. Though the dam sites lie outside KFS, a permissible dam height at the different site for the installation of 183.2 MW power plant with an annual energy of 1063 GWh is important to meet the IHPP project objective.

The 4 dam site locations D1, D2, D3 and D4 are depicted on ***Map 3***. These sites were evaluated taking into consideration the geologic, environmental and socio-economic criteria and economic criteria in the feasibility study report[86].

Among the geologic criteria 10 indicators were evaluated for a comparative alternative analysis in the feasibility study. These are i) foundation conditions in the river, ii) foundation conditions at the left abutment, iii) foundation conditions at the right abutment, iv) characteristics of basic geological features, v) orientation and direction of basic geological features (convenient or not convenient), vi) permeability characteristics, vii) rock availability as construction materials, viii) soils availability as construction material, ix) width of the river channel, and x) availability of islands for coffering.

Similarly, 10 indicators were analyzed for the environmental and a socio-economic evaluation of the alternative dam site locations. These indicators are i) Resettlement and land compensation, ii) Cultural property / cultural heritage sites, iii) Terrestrial flora, iv) Terrestrial fauna, v) Fish / fisheries, vi) Nature conservation / protected areas, vii) Tourism and recreational activities, viii) Landscape / Visual impacts, ix) Water quality and x) Erosion and land slide risks.

[85] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. IIa Revision 1; Annex 6: Analysis of the Reservoir Upstream Boundary Considtion for the Isimba Hydropower Plant, Revision 2; Annex 5: Analysis for Site Location for the Isimba Hydropower Plant, Revision 0.*

[86] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a. Revision 1; Annex 5: Analysis for Site Location for the Isimba Hydropower Plant, Revision 0.*

A total of 4 indicators were analyzed under the economic criteria for the evaluation of the alternative dam site locations. These indicators were i) Hydrological Input and Reservoir Area, ii) Annual power production, iii) Total costs and iv) Generation costs / Internal rate of return.

Scores in 0 to 100 % for the geologic, environmental and socio-economic and economic criteria were used for the evalauation and the overall score arrived at for the various criterions in the feasibility report[87] as presented in ***Table 45.***

Table 45: Overall score for the dam site locations

Overall scoring of the alternatives (0 - 100)%	Dam site alternatives			
	D1	D2	D3	D4
Geological Criteria	61.25	58.75	63.75	57.5
Environmental and Socio-economic criteria	33.75	31.875	31.875	28.75
Economic criteria	51.25	48.75	55	51.25
Overall Score %	**146.25**	**139.**	**150.**	**137.50**

Out of the four alternative dam sites, alternative D3 site is decided as the best site, though the site was not superior from environmental and social consideration. It has sound geological and geomorphologic characteristics and it is least the cost for development[88].

5.3.2 Alternative Upper Reservoir Levels

The three alternative upper reservoir levels evaluated during the feasibility study were:

- ***Alternative 1***: with an upper reservoir boundary level at 1055m amsl.
- ***Alternative 2***: with an upper reservoir boundary level at 1048m amsl.
- ***Alternative 3***: with an upper reservoir boundary level at 1043m amsl.

The above alternative upper reservoir levels were evaluated in the feasibility study report[89] based on technical, environmental, socio-economic and cultural and cost-benefit criteria. Of the three alternative upper reservoir levels, only Alternative 1 reservoir level could meet the IHPP

[87] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a. Revision 1; Annex 5: Analysis for Site Location for the Isimba Hydropower Plant, Revision 0.*

[88] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a. Revision 1; Annex 5: Analysis for Site Location for the Isimba Hydropower Plant, Revision 0.*

[89] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. IIa. Revision 1; Annex 6: Analysis of the Reservoir Upstream Boundary Considtion for the Isimba Hydropower Plant, Revision 2*

development objectives of 183.2 MW installed capacity and 1063 GWh of annual energy. Besides, this alternative was evaluated as superior to the other alternative levels on technical, environmental, socio-economic and cultural and cost-benefit analysis. It is therefore, Upper reservoir level was therefore decided for development. The highlight of the upper reservoir level alternative analysis detailed in the feasibility study report is presented in the sub-sections below.

5.3.2.1 Technical evaluation

The technical evaluation of the alternative upper reservoir level in the feasibility study report takes into account the basis of hydropower production, layout of the hydropower scheme and estimation of the hydropower production.

I. Basis for Hydropower Production

The Basis for hydropower production is the availability of the hydrology and the head. The hydrology of the Victoria Nile for all the selected reservoir levels is governed by the regulated flow from BHPP. It is therefore the adopted installed discharge of 1375 m^3/s is reasonable for all the alternative reservoir levels to maximize the daily peak load while balancing some reserve for the additional spinning capacities.

However, the available water head varies very much depending on the selected reservoir level. Given the reservoir water levels for each of the alternatives the available maximum head for alternatives considered will be:

- Alternative 1 > Maximum Head of 17.7m
- Alternative 2 > Maximum Head of 10.7m
- Alternative 3 > Maximum Head of 5.7m

In the given hydrological regime, the available head determines the energy output. The differences in the available maximum head singularly indicate that Alternative 1 is way superior to successive alternatives in technical terms, the least being the Alternative 3 reservoir level. It is to note that regulating some reserve of water for the additional spinning capacities will also gradually decline from Alternative 1 to Alternative 2 and 3.

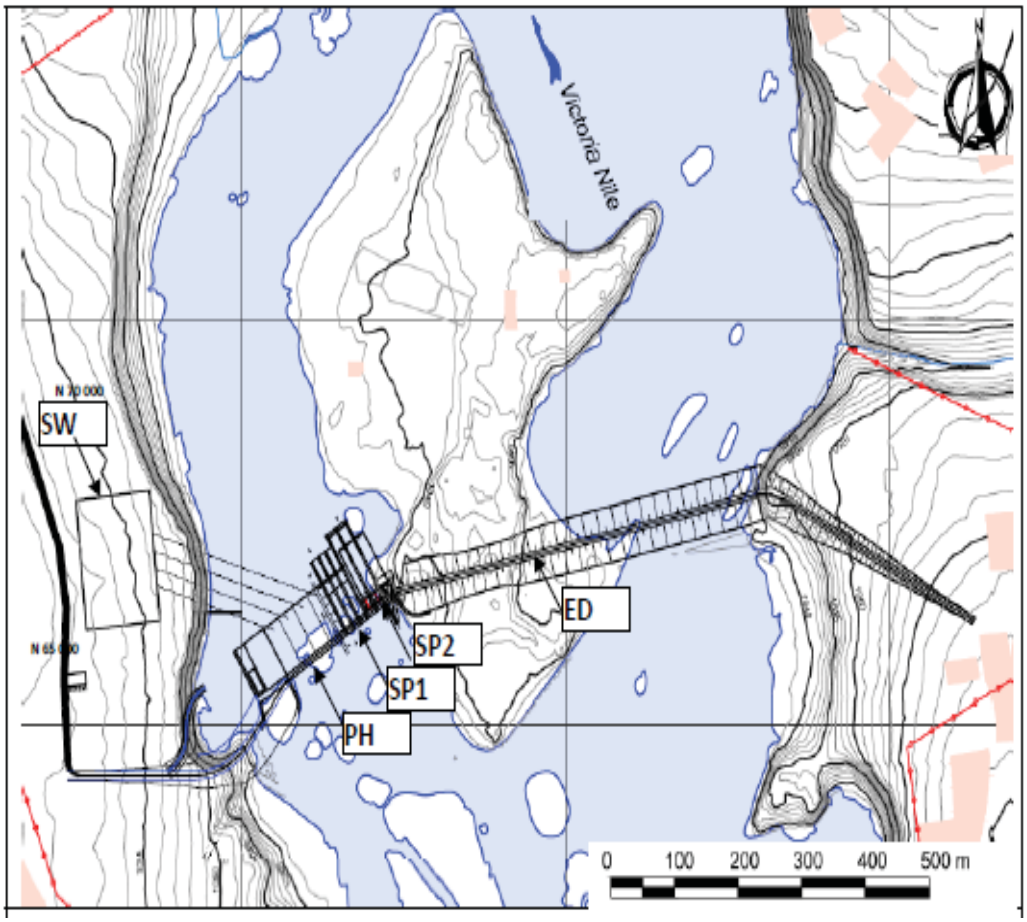
II. Layout of the Hydropower Scheme

Considering the very gentle topography of the area as well as the limited slope of the river Nile, a dam type hydropower development is the appropriate choice. Taking into account the low head availability, climatic conditions of the site etc. a surface powerhouse integrated in the dam structure is the most fitting layout selection. A Wide river cross-section at the selected dam location site from the geotechnical perspective provides a enough place to locate the weir for the flow regulation as well as the weir for high flows along the same dam axis. The selected site has two river channels with an intervening island (***Figure 58)***. The left channel width alone is enough to locate the powerhouse complex and spillways in it, allowing construction easement. The right

channel has the advantage of river diversion permitting uninterrupted construction of the dam and powerhouse structure.

Irrespective of the choice of an alternative reservoir level, the basic layout of the dam and its structural components are not going to alter except for the dam height. ***Table 46*** depicts the estimated dimensions of the dam for different alternative reservoir levels. In terms of costs construction of the dam will be vary according to the choice of the reservoir level, However, such cost variations are not expected to show wide differences in the costs, though Alternative 1 will cost more than the alternative 2 and 3.

Figure 58: The selected dam site and preliminary layout of structures



Note: SW = Switch Yard, PH = powerhouse, SP =Spillway, ED = Earthen Dam

Source: KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.Revision 1; Annex 6 – Reservoir Upstream Boundary Conditions for the Isimba Hydropower Plant, Revision 2.

Table 46: Main dimensions of the Project Structures under different alternative reservoir levels

Dam dimensions [m]	Alternative 3			Alternative 2			Alternative 1		
	H(m)	DF(m)	L(m)	H(m)	DF(m)	L(m)	H(m)	DF(m)	L(m)
Con.Grav. Dam with spillway and powerhouse	16.5	7	77.5	21.5	7	77.5	28.5	7	77.5
Rock-fill Dam	7.5	1.5	600	12.5	1.5	700	19.5	1.5	850
Side Dam	1	1	100	5	1	200	12	1	200
Coffer - Dam	4	0.5	1550	4	0.5	1550	4	0.5	1550
Gravity - Dam	18	3	100	23	3	100	30	3	100

Note: H = Height, DF = Depth of Foundation, L= Length

Source: KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. IIa.Revision 1; Annex 6 – Reservoir Upstream Boundary Conditions for the Isimba Hydropower Plant, Revision 2

Owing to the low head for alternative 3 which isbelow the limits that are normally applied for Kaplan turbine, the appropriate choice for alternative 3 has selected the bulb turbine. The bulb turbine adds difficulties in the operation and maintenance and are assumed to be technically more demanding.

III. Estimation of the hydropower production

Given available discharge and water head for each of the alternatives made, the estimation of the potential hydropower production was given available discharge and water head for each of the alternative made based on the reservoir elevation. Installed capacities were selected for the run-of-river scheme with daily peaking and total production is obtained based on the available discharges from the flow duration curve.

Based on the experience, the main power plant parameters and the estimated costs for each of the alternative reservoir levels were derived and presented in ***Table 47***.

Table 47: Power production and costs evaluation of alternatives reservoir levels

Reservoir Levels	Alternative 3	Alternative 2	Alternative 1
Maximum Design Discharge (m^3/s)	1375	1375	1375
Maximum Gross Head (m)	5.72	10.72	17.72
Installed Capacity (MW)	42.92	101.94	183.2
Total Annual Energy (GWh)	301.89	622.52	1063
Total Cost (US$ Million)	380	444	532

Reservoir Levels	Alternative 3	Alternative 2	Alternative 1
Specific Costs (US$/Kw)	8871	4429	2830

Source: KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.; Annex 6 – Reservoir Upstream Boundary Conditions for the Isimba Hydropower Plant, page 12..

The figures in the tables above reveal the followings:

- Alternative 1 has the highest annual power production over 300 % of alternative 3 and about 41% than the alternative 2.
- Per unit cost of power production is about 3.1 times higher for Alternative 3 and 1.56 times higher for Alternative 2 compared to Alternative 1.
- The Alternative 1 is costlier by 28% to alternative 3 and about 16% to alternative 2.

Thus from the technical point of view alternative 1 is the best choice among the reservoir alternatives selected.

5.3.2.2 Environmental evaluation

The environmental evaluation takes into account the physical and biological aspects potentially affected in relation to the different IHPP alternative reservoir levels.

I. Physical Environment

The key indicators examined in the evaluation under the physical environment comprises of: i) water quality, ii) air quality, iii) noise levels, iv) erosion and sedimentation, v) micro-climate, vi) climate change and green house gas emissions, and vii) landscape and visual aesthetics.

The project construction and operation activities are expected to bring changes to these indicators for different alternatives. Some of the changes in the indicators, specifically water quality, air quality, noise levels, and erosion and sedimentation for different reservoir levels related to construction activities are similar, because the construction activities irrespective of the alternative reservoir levels are localized to one location (i.e. dam site) for a period of 4 years. The construction period will have no implications on the micro-climate, climate change and green house gas emissions, but will adversely affect the landscape and visual aesthetics of the construction sites. Nonetheless, the changes will be similar for all the alternative reservoir levels considered.

Towards the end of construction period (with the initiation of the reservoir filling) and throughout the operation period of the project, the project will bring changes on the downstream water quality and hydrology, and water quality of the reservoir. But these changes have marginal differences between the alternative reservoir levels. The reasons are i) the water regulation for alternative reservoir levels is guided by the water release from the upstream hydropower

projects, and ii) residence time of the water in the reservoir for all alternative reservoir levels considered is less than 12 hours.

Change in the micro-climate due to the formation of the reservoir along the river owing to temperature buffering capacity of the reservoir water and high level of water evaporation from the reservoir area is scientifically arguable. Temperature differences between the water and ambient atmosphere in the pre-project and postproject will hardly change in the given tropical environment. Evaporation, however, will show noticeable difference across the alternative reservoir levels for there will be sizable difference in the exposed water surface of the reservoir (2005 ha for alternative 1, 1127 ha for alternative 2 and 733 ha for alternative 3). Alternative 1 is likely to bring micro-climate change compared to alternatives 2 and 3. The expected changes, nevertheless, are not affecting the surrounding areas negatively to have an adverse impact on the biological and social communities of the adjoining area.

The climate change and the greenhouse gas emission potential exist for all the reservoir levels considered. This issue relates to anaerobic decay and decomposition of the biomass (standing trees, grasses, shrubs, of the land area and the biomass contained in the soil) submerged beneath the water level. Hydropower reservoirs, and swamps specifically located in the tropical and sub-tropical latitudes are susceptible to generate enhanced generation of greenhouse gas compare to those located in temperate and arctic latitudes. The amount of the biomass submerged, and the amount of the organic matter that is added annually to the reservoir determines thevolume of the green house gas, particularly methane generated from the reservoir.

Considering the Victoria Nile and its surrounding characterized by wetlands along its banks in the gentle and depressed areas and grassy and shrubby vegetation with scattered trees on either valley flanks, partly cultivated, does not pose a risk of submergence of a huge mass of biomass due to the formation of reservoir. On the other the hand rolling nature of the terrain sediments in the catchment contribute large amount of organic silt into the reservoir. In view of these ground characteristics, the water body formed under different alternative reservoir level is not likely to bring significant increase in the national greenhouse gas volumes than before the pre-project condition. Nonetheless, Alternative 1 is environmentally damaging than Alternative 2 and 3. Alternative 3 is the least damaging of the 3 alternatives.

The landscape and visual aesthetics is by far the most visible impact difference among the 3 reservoir alternatives. This difference is revealed by the key indicators of the landscape aesthetics of environmental values (***Table 48***).

Table 48: Landscape indicators across the Alternative Reservoir Levels

Landscape indicators	Alternative 3	Alternative 2	Alternative 1
Free flowing River length (km)	7.6	13.6	18.6
Rapids and falls (Nos)	4	6	8
Major Island swarms (Nos)	8	10	15

The Victoria Nile is known for its wide river channel with a high and nearly constant annual discharge characterized by rapids and falls with undisturbed intervening groups of major and minor islands covered with lush green vegetation, and occasionally rocky. Though all the alternative reservoir levels affect the landscape indicators, the difference lies in the magnitude of the effects. Alternative 1 is by far the most adverse when compared to Alternatives 2 and 3. Alternative 2 and 3 are nearly identical but not similar.

An overview of the above physical environmental indicators and their likely implications of change on the physical environment as a whole across the alternative reservoir levels reveal that Alternative 1 is more damaging to the physical environment compared to Alternative 2 and Alternative 3. Alternative 3 is the least damaging of all. But the envisaged differences are not so wide even without the mitigation scenario to impart a significant difference in the overall physical environmental quality ***(Figure 59***). With appropriate mitigation prescriptions such as catchment area improvements for the control of erosion involving greening of the catchment, control on the water polluting activities (discharge of sewage or industrial effluent, use of organic pest control measuresin farm lands etc) is to bring the likely difference to acceptable levels for alternative reservoir levels considered so as to maintain the physical environmental quality of the area.

Figure 59: Overall physical environmental rating of the Alternatives

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1			▲						
Alt 2				▲					
Alt 3				▲					

II. Biological environment

The biological environmental evaluation is based on the indicators such as terrestrial and aquatic flora and fauna, overall habitat conditions and presence or absence of endemic and flora of

conservation significance as per the IUCN Red List. Last but not the least are the areas dedicated for conservation and protection. It is to be noted that none of the alternative reservoir levels considered for evaluation are free of implications on the biological environmentTherefore they should be evaluated based on the potential differences on the implications on the biological environmental quality.

Most of the affected land within the proposed reservoir (for all 3 alternatives) consists of subsistence farmland (but commercial crops like maize and coffee are also grown). Regardless of the alternative, farmland and open water account for approximately 95 % of the land within the proposed reservoir. It is clear that past influx of people to this area and subsequent cultivation have already had a considerable impact on the natural ecosystem and biodiversity. The baseline environment on the land use provides clear evidence that there is little natural vegetation left in the direct impact zone.

A few of the floral species such as *Milicia excelsa, Markhamia lutea* and *Suddiasa gittifolia* out of the over 200 species recorded have been recognized as species of conservation[90]. Moreover, these species are common in the region though the numbers are declining due to over exploitation. Similarly, among the 21 mammalian species recorded, *Lutra maculicollis,* (A former a Near Threatened species) *Panthera pardus* and *Hippopotamus amphibius* 2 vulnerable species as per IUCN Red List 2016) are of conservation concern.

Similarly, among birds, all of the species recorded (over 100) are categorized under “Least Concern” group from the conservation point of view in the IUCN Red List 2016. However, a few of the bird species have been listed as threatened and vulnerable at the regional and local levels. (*Circaetus cinereus, Circus ranivoris, Eminia lepida* and *Nectarinia erythroceria).*

Among of the 24 species of fish recorded, 3 are listed in the IUCN Red List category namely*, i) Oreochromis variabilis* - Critically Endangered*;* ii) *Brycinus jacksonii* - Endangered, and iii) *Synodontis Victoriae* - Nearly Threatened. These species are common throughout the Victoria Nile.

78 haplochromine *cichilids* species that have been recorded in the Victoria Nile and these have adopted to specific habitat conditions within the riverine environment of the Victoria Nile. Some of the species are restricted to the Victoria Nile only. Besides, they show a distinct species composition along the Victoria Nile and have a limited distributional range and are endemic to the area. Out of the 78 species recorded, 12 species are listed in the IUCN Red List.

Irrespective of the alternatives in consideration, the terrestrial and aquatic flora and fauna and their natural habitats are going to be affected but with varying degree of influence on the existing

[90] *FITCHNER GmbH & Co. KG and NORPLAN AS, 2014. Environmental Impact Assessment for the proposed Isimba Hydropower Plant and Reservoir*

habitat. Among the most affected of the species are the different species of Haplochromine cichilids and their natural habitats. The Alternative 1 will have a larger footprint on the natural habitats of the *Haplochromine cichilids* compared to Alternatives 2 and Alternative 3. Alternative 3 has the least impact among the alternatives considered (***Figure 60***).

Figure 60: Biological environmental (Terrestrial and Aquatic Flora and Fauna) rating of the alternatives

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2			▲						
Alt 3				▲					

With regard to the impacts on the dedicated areas of conservation significance, Alternative 1 and 2 infringe the geographical boundaries of KFS, an area agreed between the Government of Uganda and IDA under the Indemnity Agreement. ***Table 49*** presents the level of infringement by the reservoir levels on the KFS land use.

Table 49: Alternative reservoir levels infringement into the KFS

Particulars	Cultivated (ha)	Built up (ha)	NFA Forest Reserve (Ha)				Other forest Dense (ha)	woodlands (ha)	Grass land (ha)	wetland land (ha)	Rocks (ha)	Water body (ha)	Total
			Dense	Scattered	cultivated	Grass land							
KOA	77.28	0.37	123.02	285.27	269.64	32	5	6.37	1.41	45.64	1.66	429.31	1276.92
Alt. 1	0	0	0	6.9	0	5	0	2.15	0	21.52	0.71	252.61	288.89
% Loss KOA	**0**	**0**	**0**	**2.42**	**0.00**	**15.63**	**0.00**	**33.75**	**0**	**47.14**	**43.02**	**58.84**	**22.62**
Alt 2	0	0	0	0	0	0	0	0.76	0	16.37	0.12	7.15	24.41
% Loss KOA	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11.93**	**0**	**35.87**	**7.23**	**1.67**	**1.91**
Alt 3	0	0	0	0	0		0	0	0	0	0	0	0
% Loss KOA	**0**	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**

The level of impact in terms of the geographical encroachment by area KFS, Alternative 1 has a larger footprint compared to alternative 2. The overall evaluation is shown in ***Figure 61***.

Figure 61: Biological environmental (Conservation Area) rating of the Alternatives

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2				▲					
Alt 3					▲				

5.3.2.3 Socio-economic evaluation

The key indicators taken for comparative evaluation of the socio-economic and cultural environment are: i) relocation of APs, ii) resettlement and rehabilitation of APs, iii) loss of agricultural production, iv) loss of water sports related adventure tourism business, and v) loss of cultural and spiritual property (tangible and intangible) including archeological and historical artifacts. None of the alternatives considered for evaluation are free of these implications, however, they show a difference on the degree of implications which vary according to the alternative reservoir level foot prints.

A large part of the land along the Victoria Nile is cultivated on a more or less permanent basis. The dominant crop in the area cultivated extensively on the river banks, is maize. At the time of documenting this report, maize was fetching good prices in the market and therefore serving both as a cash crop and a subsistence crop - being the staple of the local population. Additional cash crops in the project area are coffee and vanilla, but these crops are commonly cultivated more on the uplands away from the areas susceptible for inundation. Other commonly cultivated crops include banana, sweet potatoes, cassava, groundnuts, beans and millet. Common fruit trees include citrus fruits and mango.

The land in the project area is predominantly held under the Mailo land-tenure system, but freehold land tenure also present. Mailo land tenure functions more or less as private land ownership as land or user rights to the land can be bought and sold, and also inherited. Thus, there exists a land market in the area and the price of land varies according to its fertility and location in relation to larger settlements. Land close to Jinja would for instance be more expensive than land further away.

In general, relatively few people are settled permanently on the land along the river that may be inundated. Many, even if land they cultivate land along the river banks, have their houses at safe

distances away from the river (outside the inundation zones). Nevertheless, there are a number of houses that lie within the inundation zones of the different reservoir alternatives. It should be noted that some of these houses are semi-permanent only occupied during the main cropping seasons.

The living standard in terms of income and the health and education status of the potentially affected people can be classified as being low. According to the socio-economic information collected in the potentially affected districts, household sizes are around 5 (Kamuli District). A majority (more than 80 %) are subsistence farmers. HIV/AIDS is prevalent in the area while other common diseases include: malaria, diarrhoea and respiratory diseases.

I. Arable land

From the land use perspective, specifically privately owned arable land, implications of the alternatives considered are shown in ***Table 50***

Table 50: Land use affected by the Alternatives under consideration

Alternatives	Reservoir Area (ha)	Affected private land (ha)	Affected Nile River area and islands (ha)	Affected public land wetland, forest and bushes (ha)	Affected land KFS (ha)
Alternative 1	2005.62	1160.48	693.38	151.76	288.89 (24.7)
Alternative 2	1127.35	548.19	497.25	81.91	24.41 (0.00)
Alternative 3	732.64	301.82	385.72	45.10	0.00

Note: Figures in parenthesis are potentially cultivated areas though the land use not under the land use category cultivated.

As can be read from the above table the three alternative reservoir levels have quite different impacts in terms of loss of arable land. Alternative 3 with the lowest reservoir level produces a significantly lower loss of farmland compared to the 2 other alternatives. The different reservoir alternatives have been assessed and rated in terms of the magnitude of impacts on farmland (Figure ***62)***.

Figure 62: Socio-economic environmental (Arable land) rating of the alternatives

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2			▲						
Alt 3				▲					

II. Physical Displacement

A number of houses (permanent and semi-permanent) are located in the land areas occupied by the reservoisr for alternatives considered for evaluation (***Table 48***). The figures in the table are based on the losses of permanent and semi- permanent structures. But the status of these structures as residential or not is not well understood. Therefore, all the structures of APs have been considered as being displacement of APs requiring relocation.

Table 51: Physical displacement and relocation requirements for the alternatives under consideration

Alternatives	Total APs	APs in KOA
Alternative 1	457	7
Alternative 2	220	0
Alternative 3	65	0

Alternative 1 has the highest physical relocation requirements compared to Alternatives 2 and 3. APs due for physical relocation in Alternative 1 is higher by 52% and 86% compared to Alternative 2 and 3. The Alternative 2 is higher by 70% as compared to Alternative 3. Alternative 1 displaces APs physically within KFS, while the other alternatives do not involve physical displacement of APs in KFS. The overall implication of the physical displacement for the different alternatives is evaluated in ***Figure 63***.

Figure 63: Socio-economic environmental (physical displacement) rating of the alternatives

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2			▲						
Alt 3				▲					

III. Economic displacement/ resettlement and rehabilitation

For Alternative 1 a total of 2,076 APs are also economically displaced due to the loss of land and agricultural productivity (IHPP, RAP report 2013). 90% of the Aps have since then been compensated. As the land areas are similar quality in terms of productivity, the affected land ownership considered as equally distributed the estimated APs economically displaced by the different reservoir alternatives is shown in ***Table 52***. These APs depending upon severity of the impacts require physical relocation resettlement and rehabilitation. The loss of agricultural productivity from the affected land parcels is stated to contribute nearly 87.7% of the APs livelihood income[91].

Table 52: Economic displacement of APs across the alternative reservoir alternatives

Alternatives	APs Affected	KOA
Alternative 1	2076*	73*
Alternative 2	1050	0
Alternative 3	605	0

*Note: * Figures based on actual numbers as per IHPP Valuation Report 2013.*

The data in ***Table 7*** reveals the severity impacts and the magnitude across the alternative reservoir levels. Alternative 1 has the highest impacts. The magnitude of the impact is higher by 49% and 71% compared to Alternatives 2 and 3 respectively. Impacts of Alternative 2 are higher by 43% compared to Alternative 3. Alternative 3 has the least of impacts across the alternative reservoir levels considered. Alternative 1 also impacts APs within the KFS geographic boundaries. Alternatives 2 and 3 however do not impart economic displacements of APs within

[91] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2013. Resettlement Action Plan for proposed Isimba Hydropower Project (Flood Area)*

the KFS geographical boundaries. These impacts related to economic displacement are evaluated in ***Figure 64***.

Figure 64: Socio-economic environmental (economic displacement) rating of the alternatives

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2			▲						
Alt 3				▲					

IV. Loss of adventure tourism

The Victoria Nile section (between Lake Victoria and Lake Kyoga) has a variety of tourist resources and has over the years experienced steady growth in tourism[92] (Kimbowa *et.al,* 2012). This growth has been characterized with increasing number of visitors, diverse tourist activities and increasing number of accommodation facilities. Most of the tourism developments are concentrated on both sides of the river banks between the Nalubale Dam area, Kalagala/Itanda Falls and Hairy Lemon Islands.

To-date, adventure water-based tourism activities are the main thrusts for tourism development along the Victoria Nile. This river offers unique and high quality water sports tourist experiences provided by the different classes of rapids. With all year round constant water volum, the sequence of rapids provides unequalled extreme world-class White Water Rafting (WWR) and Kayaking experiences. Some of the rapids of the Nile River have one of the best large waves in the world, competing only in the northern hemisphere with those in the Ottawa River in Canada during summers.

There are various tourism assets along the Nile River bank and they can be grouped into two major categories (a) natural assets and (b) cultural assets. The natural assets are further grouped into aquatic (rivers, rapids, fish, birds etc.), and terrestrial (river banks, vegetation, islands, birds etc.). The cultural assets include spiritual shrines, worship centers/ sites, cultural norms and customs, cultural institutions and their respective regalia.

[92] *Kimbowa F., Nyakaana J.B., Ayorekire J. and Ahebwa W.M (2012) Environmental Implications of Tourism Development on River Nile, Uganda. MAWAZO Journal Vol. 11 (2) pp 69 - 80*

The Victoria Nile section from the Bujagali Dam to the IHPP dam site (approximately 36 km) has 17 rapids of various grades (refer ***Table 41***, ***Map 16***), making it a favorite water based adventure tourism destination in Uganda.

Since 1994, these tourism assets have been utilized for tourism promotion purposes. To maximize the tourism potential of the area tourism infrastructures such as transport networks, communication facilities, electricity, water supply, including accommodation facilities (hotels, lodges, camp sites), food and beverage facilities (restaurants, cafes), and other support/accompanying facilities such as signage/ have been developed in parts of the Victoria Nile River course.

The accommodation facilities (usually with restaurant facilities) are mainly found along the Nile to take advantage of the scenic topography and accessibility to the Nile for water based activities. A field survey conducted along the river banks revealed that there are a number of facilities including the high class facilities such as Wild Waters Lodge in the island between the Kalagala and Itanda falls, Hairy Lemon Eco-lodge in the Hairy Lemon Island, Haven, Holland Park, Jinja Nile Resort, Nile Porch, and Nile River Camp.

With regards to the transport facilities on either side of the Victoria Nile, there is a fairly well developed road network that exists at an approachable distance to Victoria Nile from the main city centers of Uganda such as Kampala, Jinja, Kayunga, and Entebbe.

Other tourism support facilities include rafters put-in and take-out/landing points - some have reception/changing/washroom areas. These have been constructed by individual rafting companies on the river banks where the rafters get in or out of the river at starting points or at the end of the rafting trip.

The key tourism operators along the Victoria Nile are those who are engaged in WWR and kayaking. Investment in rafting adventures on the Victoria Nile began in the mid-1990 when overseas whitewater rafters became aware of the high quality series of Grade 4 and 5 rapids. Adrift is the first company to operate white water rafting in Uganda, commencing operations in 1996, followed by theNile River Explorers (NRE) in 1997[93] Since then, adventure tourism has grown steadily,. The major tourism operators in the Victoria Nile engage in a number of water based sports (rafting, kayaking, and tubing, fishing among others). The key operators are Adrift, River Nile Explorers; Kayak the Nile (U) Ltd, Nalubale Rafting, White Nile Rafting, Nile Horseback Safaris and All Terrain Adventures.

The other support services facilitating tourism operators in the region include those involved in; operating accommodation/restaurant facilities, transportation (commuter motor cycles,

[93] (CDAP, 2016).

boat/canoe riding), and tour guides, making and selling of crafts/ceramics. These support services operators such as hotel operators, tour and travel companies (that book and sell adventure tourism products, airlines that fly in international tourists especially rafters and kayakers) are mostly located far off the Victoria Nile site in the city centers of Kampala, and Jinja.

The available data of tourists on the Victoria Nile corridor is mainly based on estimates from tourism operators and establishments. In 2010 six tourism companies operating in the Jinja/Victoria Nile region reported handling a total of 34,040 visitors translating in an average of 473 visitors per month per company. Individual tourism operators such as Kayak the Nile (U) Ltd reported handling an average of 600 clients per month. Some tourism operators (Hairy Lemon, Nile River Explorers and Nalubaale rafting) in collaboration with Brussels Airlines indicated that they are able to fly in over 500 kayakers a year to Uganda[94]. If all these figures are added together, in 2010 nearly 72000 visitors were serviced by these operating companies. Considering that the tourist visit in the Nile River corridor correlates with the tourist visiting Uganda[95], the tourist visit in the Nile River corridor based on the base figure estimated in 2010[96] will be around 116000 for the 2015 with an annual increment rate of 10%.

The total value and revenue generated from tourism businesses operating in the Victoria Nile section is not fully know due to lack of comprehensive information. The feasibility study report (2012) reveals that information from 9 tourism related companies had an annual turnover close to USD 3.6 million in 2010. These values could not be confirmed from the official records.

Basing on the total estimated serviced tourists in 2010 (72000) and all the tourist operators serviced similar number of tourist, an individual tourist on an average contributed about 66.67 US$ in the turnover of the tourist operator. With the above assumption the total turnover of the 12 tourist operators in 2010 is estimated to be US$ 4.8 million. Assuming that the turnover of the other support service provider as an extra amount (about 33% of the tourism operator's turnover – a thumb rule application) the total turnover from the Victoria Nile River tourism is estimated to be around US$ 6.4 million for the year 2010.

Assuming that the tourist number increased by 10% annually, and also assuming 7% price inflation every year, the estimated tourism industry turnover for the year 2015 estimated is US$ 14.46 million.

[94] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.*

[95] *Uganda Bureau of Statistics, 2015. Statistical Abstract for Uganda – 2015*

[96] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and Norplan, 2012. Feasibility Study Isimba hydropower Plant and associated Transmission line. Main Report. Vol. II a.*

The tourism industry related to water sports in the Nile River corridor is not confined to some geographical but it rather covers the whole stretch of the free flowing Nile River starting downstream of the Bujagali Dam to the Kyoga Lake. Since rapids and fall are confined within the stretch between Bujagali to downstream Bugumira, the water sports tourism industry operates within these limits. The normal water sports operations, however, are confined within the Bujagali and Hairy Lemon Islands.

Irrespective of the Alternative reservoir levels, the IHPP development and operation is likely to affect the flourishing water sports related tourism business of the Victoria Nile.

Given the choice of reservoir alternative levels, it is understandably the lowest for a compromise. Technically speaking, the level of impacts is different for different reservoir level alternatives. Various alternative reservoir levels and water regulating regimes have been evaluated based on the following adventure tourism indicators (***Table 53).***

Table 53: Adventure Tourism indicators across the Alternative Reservoir Levels

Adventure Tourism Indicators	BHPP to IHPP Dam	Alt. 1 - IHPP	Alt. 2 - IHPP	Alt3 - IHPP
Free flowing river length (km)	36.5	18.6	13.6	7.6
% loss		50.96	37.26	20.82
Rapids and falls (Nos)	17	8	6	4
% loss		57.14	42.86	28.57
Major Island swarms (Nos)	20	15	10	8
% loss		75.00	50.00	40.00

Alternative 1 results in nearly 14% and 31% higher level of impacts in terms of the loss of free flowing river. Losses of rapids for Alternative 1 are higher by 15% and 29% than Alternatives 2 and 3 respectively. In terms of the loss of islands swarms, alternative 1 is higher by 25 % and 35% than Alternatives 2 and 3 respectively. The difference between Alternative 2 and 3 is usually less than 10% for all tourism related indicators. Alternative 3 is has the least impacts compared to Alternatives 2 and 1. Within KFS the loss of free flowing river is nearly 56% for Alternative 1 and about 5.91 % for Alternative 2 and none for Alternative 3. Only Alternative 1 causes loss of rapids by about 25%. The loss of islands is about 57% for Alternative 1 and about 14% for alternative 2. Alternative 3 does not infringe the KFS area.

The evaluation based on the above indicators is depicted in ***Figure 65***.

Figure 65: Socio-economic environmental (Adventure Tourism) rating of the alternatives

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1			▲						
Alt 2				▲					
Alt 3					▲				

5.3.2.4 Benefit –cost analysis of reservoir alternatives

This section presents details of the costs and benefits of three different alternatives. The costs incurred and benefits generated due to the construction of hydropower project and their assumptions are reported in ***Table 54***. There are three types of costs: (i) construction, operation and maintenance, (ii) environmental cost, and (iii) other economic costs. Two types of benefits are included in the analysis: (i) Revenue from power sell, and (ii) payment for certified emission reductions.

Table 54: Details and assumptions of costs and benefits included in the estimations

Costs	Benefits
C1 Construction, operation and maintenance cost (FICHTNER and NORPLAN, 2012)	**B1** Revenue from power sell
C1.1 Hydropower plant – takes four years to install plant and cost is distributed equally for all year (FICHTNER and NORPLAN, 2012) **C1.2** Transmission system – takes two years for installation and cost is distributed equally for both year and started from third year (FICHTNER and NORPLAN, 2012). **C1.3** Annual operating cost – 1% of hydropower plant cost and transmission system cost (from fifth year) (FICHTNER and NORPLAN, 2012).	Assumed the electricity price is US cent **11.05/kWh** considering that this price is adequate to meet the requirement to return on equity under private ownership model (as per the tariff rate to Bujagali Electricity Limited of 2016 third quartered www.era.or.ug)
C2 Environmental cost	**B2** Payment for Certified Emission Reductions.

Costs	Benefits
	The emission is estimated based on the estimated grid emission factor of 0.693 tCO_2 /MWh and price is USD 30/tCO_2e (Kossoy, A., Peszko, G., Oppermann, K., Prytz, N., Gilbert, A., & Klein, N. (2015). Carbon pricing watch 2015: An advance brief from the state and trends of carbon pricing 2015 report. *State and Trends of Carbon Pricing, World Bank Group, Washington, DC).*
C2.1 Cost to resettle displaced household @USD 20,000/household (FICHTNER and NORPLAN, 2012) **C2.2** Compensation for loss of land @USD 10,000/ha (FICHTNER and NORPLAN, 2012) **C2.3** Mitigation cost (compensate impacts on Kalagala Offset, reforestation and other sorts of compensations) (FICHTNER and NORPLAN, 2012).	Restoration of livlihoods of the communities and compensating for the ha of forest lost to enable establishment of an Offset else where by NFA which will enable reduction in carbon emissions.
C3 Other economic costs	
C3.1 Agriculture – annual loss of production of cereals particularly maize due to loss of land. The estimated maize production is 2,000kg/ha and market price is USD 0.25/kg. In addition to farmland, 20% of public land and bush land can be cultivated. (FICHTNER and NORPLAN, 2012). **C3.2** Tourism – reduction in tourism activities and number of tourists. 19,000 visitors per year, average stay 2.3 days and average expenditure USD 171/day/person (E&D Consulting Services 2013).	Protection of river banks from erosion activities protecting environmental values and habitats for fish.

During the analysis several assumptions were made. These assumptions are based on the report of the feasibility study of the hydropower plant carried out by FICHTNER and NORPLAN (2012) and E &D Consulting Services (2013). Cost of hydropower plant, transmission system and environmental costs are one-off payment, while other costs are annual. Hydropower plant cost is for the first four year and distributed equally for each year. Similarly, transmission system cost is

for the third and fourth year. Annual operation cost starts from fifth year and other economic costs starts from the first year. All environmental costs are for the first year.

These assumptions are very conservative which favors socio-environmental aspects and puts economic interest low, in order to address issues related to hydropower development. For instance, agriculture costs include: the revenue to farmers but cost of cultivation, harvesting and transportation is not deducted. Similarly, the assumption of the number of visitors is based on the total number of tourists for water sports, and their expenditure and duration of their stay is based on the expenses made by leisure tourists as overlanders. Similarly, benefits particularly price of electricity is very low than the price to end users and/or tariff determined by Electricity Regulatory Authority of Uganda for Generation Companies which was US cents 11.51/ kWh for Bujagali Electricity Limited (www.era.or.ug).

In tourism it is assumed that income will increase by 10% for the first 10 years, 7% for 11-20 years, 3% for 21-30 years and then by one percent. Similarly, electricity tariff will increase by a percent every year. And, other annual cost will remain the same.

II. Quantification and valuation of impacts

Table 55 reports the quantification of impacts, both costs and benefits, of three different alternatives. The loss of land was estimated based on FICHTNER and NORPLAN (2012). Other estimates on affected water body and upland area are based on the analysis of GIS map from the study team. The estimated tourism loss was estimated based on the number of rapids affected by the dams. Under Alternative 1 and 2 more rapids will be affected hence the loss is high (60%) compared to Alternative 3. Although international tourists may place more value on intensity of water sports adventure on River Nile rather than the length and number of rapids, the loss of two rapids (Hair of the Dog and Kulu Shaker) in the KFS may reduce the intensity and quality of adventure.

Table 52 reports the quantification of impacts, both costs and benefits, of three different alternatives. The loss of land was estimated based on FICHTNER and NORPLAN (2012). Other estimates on affected water body and upland area are based on the analysis of GIS map from this study team. The estimated tourism loss was estimated based on the number of rapids affected by the dams. However, it is also true that international tourists value those water sports mostly due to the River Nile rather than the length and number of rapid itself.

Table 55: Quantification of loss and benefits from implementing different Alternatives

Particulars	Alternative 1	Alternative 2	Alternative 3
Costs			
Affected water body area (ha)	693.38	497.25	385.72
Affected household (number)	457	220	65
Loss of land (ha)	1160.48	548.19	301.82
Loss of tourism	60%	60%	20%
Production loss from land (ha)	1190.83	564.57	310.84
Benefits			
Annual energy generation (GWh)	1,037.63	622.52	301.89
Carbon emission reductions (million tCO_2)	0.719	0.431	0.209

Table 56 indicates the costs and benefits of different alternatives in monetary value based on the assumptions in Table 15 and quantification of loss and benefits in Table 16. Construction, operation and maintenance costs are derived from FICHTNER and NORPLAN (2012). Here, assumption is that transmission system is same for all three alternatives despite their dam height. In this analysis, the direct value of lost water bodies is not included, however, it can be covered by the mitigation costs.

Table 56: Monetary value of costs and benefits (million US$)

Particulars	Alternative 1	Alternative 2	Alternative 3
Costs (Total Cost = C1+C2+C3)			
C1 Construction, operation and maintenance cost			
C1.1 Hydropower plant	532	444	380
C1.2 Transmission system	15.2	15.2	15.2
C1.3 Annual operating cost	5.45	4.592	3.952
C2 Environmental cost			
C2.1 Resettlement	9.14	4.4	1.3
C2.2 Compensation for loss of land	11.6048	5.4819	3.0182
C2.3 Mitigation cost	1.00	0.5	0.25
C3 Other economic costs			
C3.1 Agriculture loss	0.595	0.282	0.155
C3.2 Tourism	4.483	4.483	1.491

Benefits (Total Benefits = B1+B2)			
B1 Revenue from power sell	114.81	68.73	33.26
B2 Payment for Certified Emission Reductions	21.57	12.93	6.27

III. Cost-benefit Analysis

This study analyses costs and benefits of three different alternatives for 40 years, which is the lifetime of hydropower plant and transmission system (***Table 54*** and ***Appendix 21).*** The discount rate used here is 10%. In general, benefit-cost ratio (BC-ratio) indicates the efficacy of the option. The higher the benefit-cost ratio, the better the project. The benefit-cost ratio indicates that implementing Alternative 1 with BC ratio 1.62 gives more returns per dollar on investment compared to other two alternatives (Alternative 2 with 1.02 BC-ratio and Alternative 3 with 0.74 BC-ratio). This also shows that implementing Alternative 3, which is beneficial in terms of having less ecological impacts, is not financially attractive option since the present value of cost outweighs the present value of benefits.

Table 57 Present value of costs and benefits (million US$)

Particulars	**Alternative 1**	**Alternative 2**	**Alternative 3**
Present value of cost (A)	662.16	630.07	418.22
Present value of benefits (B)	1,070.88	641.02	310.39
Net present value (B-A)	408.73	11.13	-107.83
Benefit-cost ratio (B/A)	1.62	1.02	0.74

IV. Sensitivity analysis

A sensitivity analysis is carried out for the Alternative 1, which produces highest returns on investment and also implemented by the Government of Uganda. The scenarios were developed to examine what would happen if there is change in costs and revenues. The details of scenarios under analysis are follows:

Scenario 1: After the implementation of Alternative 1, there will be no water based tourism. This means the area will lose USD 7.47 million per year and other facts remain same.

Scenario 2: There is reduction in electricity tariff by 20% and the new tariff is US cent 8.84 per KWh.

Scenario 3: This is the mix of above two scenarios i.e. there will be no tourism after the implementation of Alternative 1 and electricity tariff is US cent 8.84 per KWh.

The results of sensitivity analysis indicate that Alternative 1 gives higher returns on the investment of each dollar compared to other alternatives in every scenario (***Table 55, Appendix 22***). Even in the Scenario 3, which assumes no tourism means higher cost of construction and

less electricity tariff, the BC-ratio is 1.19, which is higher than the BC-ratio of Alternative 2 in the normal situation i.e. 1.02 in (***Table 57)***. Even this analysis does not include indirect benefits of hydropower that contributes to other sectors of the economy such as industry.

Table 58: Present value of costs and benefits of alternative 1 in different scenarios (million US$)

Particulars	Scenario 1	Scenario 2	Scenario 3
Present value of cost (A)	742.36	662.16	742.36
Present value of benefits (B)	1,070.88	888.01	888.01
Net present value (B-A)	328.52	225.85	145.65
Benefit-cost ratio (B/A)	1.44	1.34	1.19

V Multi-criteria analysis

The Feasibility Study has carried out multi-criteria analysis in addition to the economic analysis, which provide basis for comparing alternatives based on the criteria, which cannot be expressed in monetary terms (FICHTNER and NORPLAN (2012). Three major criteria are considered for the evaluation. They are: (i) technical, (ii) socio-economic, and (iii) environmental. They have identified several indicators for each criterion and given numbers between +4 to -4 indicates *very large positive* to *very large negative*. The overall score of each alternative are reported in ***Table 59, Appendix 23)***.

Table 59: Overall scoring of alternatives (FICHTNER and NORPLAN, 2012)

Criteria	Alternative 1	Alternative2	Alternative3
Technical	57.5	55	40
Socio-economic	48.21	39.29	32.14
Environmental	31.25	40.63	50

Table 59 shows that by individual criteria, Alternative 1 is best in Technical and socio-economic aspect and worst in environmental aspect, while Alternative 3 is best from environmental perspective. Similarly, Alternative 2 is in between in each case.

For further analysis, different weighted were assigned for different criteria (***Table 60***)). Scenario 1 is based on the concept of sustainable development that equally balances technical, socio-economic and environmental aspects. The Scenario 2 and 6 are less focused on technical aspect and high priority to socio-economic and environmental aspect, however, Scenario 2 is more balanced compared to Scenario 6. Scenario 3, 4 and 5 gives more priority to socio-economic, environmental and technical aspect respectively.

Table 60: Different scenarios based on the weightage

Criteria	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario5	Scenario 6
Technical	33%	30%	25%	25%	50%	20%
Socio-economic	33%	35%	50%	25%	25%	40%
Environmental	33%	35%	25%	50%	25%	40%

Table 61 shows the ranking of alternatives in 6 different scenarios (***Attachment 5***). It indicates that Alternative 1 has better performance in all scenarios compared to Alternative 2 and Alternative 3 except in Scenario 4. The Scenario 4 has highest score to *environmental indicator,* it indicates that Alternative 1 cannot gain support from the environmental perspective, which require additional mitigation measures to minimize environmental conflicts. But, from holistic approach considering the pathway of sustainable development, Alternative 1 is the best. Even in the worst condition for technical indicator in Scenario 6 but balancing environmental and socio-economic indicators, the Alternative is in the top rank.

Table 61: Ranking of alternatives in different scenarios

Alternatives	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario5	Scenario 6
Alternative 1	1	1	1	3	1	1
Alternative 2	2	2	2	1	2	2
Alternative 3	3	3	3	2	3	3

This analysis also indicates that Alternative 3 is the least preferred one. This is because in each case Alternative 2 out competes Alternative 3. Even providing half weightage to environmental indicator, Alternative 2 shows better performance compared to Alternative 3.

5.3.2.5 Water regulation regime

The water regulation regime irrespective of the alternative reservoir level selected is governed by the river hydrology which in turn is governed by water regulation of the upstream hydropower plant. To operate the power plant at the peaking mode in the morning and evening peaking hours (while maintaining the water head for maximum power output) will require regulating water in tandem with the inflow water in the reservoir. This is because the reservoir water holding capacity for water regulation is limited to meet the requirement for peak power generation in the required timeframe. The reservoir water regulating capacity successively declines from Alternative 1 to Alternative 3.

For Alternative 1, the relationship between the water inflow and outflow in the reservoir and the corresponding water level fluctuation in the reservoir is shown in ***Figure 66*** and ***Figure 67.***

The figures indicate that the water level fluctuation in the reservoir will be a 0.53m maximum of 0.53m over a period of a day for the IHPP Alternative 1. The Reservoir water level will increase twice daily between 22 hours to 5 hours and 10 hours to 12 hours. Similarly, the reservoir water level will decrease twice a day from 5 hours to 10 hours and 18 hours to 22 hours. The increase in the reservoir water level is gradual rising 0.53 m over a period of 6 hours between 22 hours to 5 hours of the day and about 0.22 meter over a period of 3 hours between 10 to 13 hours. The water level will decline by about 0.42 m within the period of 4 hours between 18 to 22 hours and about 0.3 m within 4 hours between 6 to 10 hours of the day.

The effect of such water level fluctuations will lead to the erosion of the reservoir rim area which may lead to small scale slumps and debris flow depending on the reservoir rim conditions. Since the reservoir rim is geologically stable, its impacts will be minimal. Alternative 1 will have a larger footprint of such changes than Alternatives 2 and 3. The overall evaluation of the reservoir water level fluctuation is presented in ***Figure 68***.

Figure 66: Relationship between inflow and outflow of water in the reservoir for a day

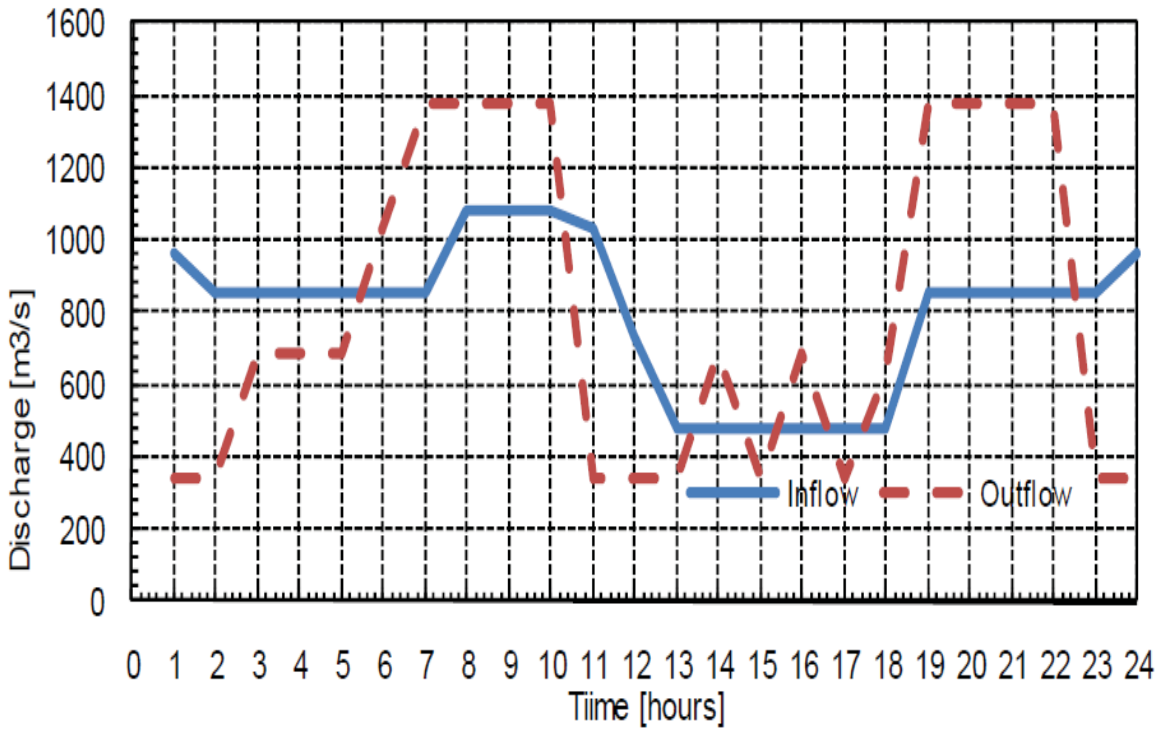


Figure 67: Relationship between water volume and reservoir water surface level variation as water is regulated for Power Production for aday

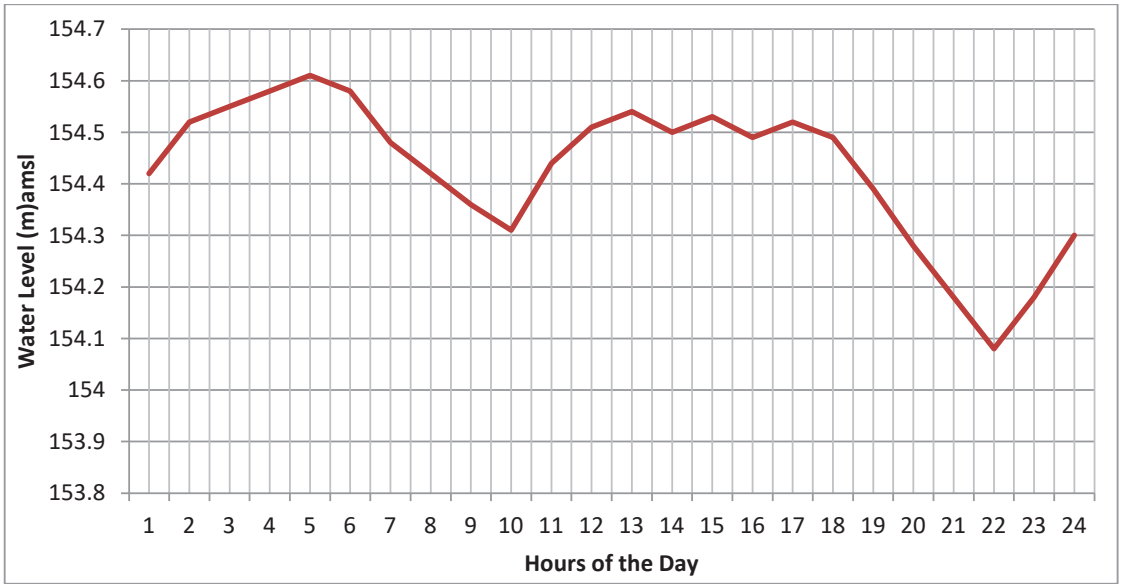


Figure 68: Environmental evaluation (Reservoir water level fluctuation) rating for alternatives considered

Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1				▲					
Alt 2				▲					
Alt 3				▲					

5.4 Alternative analysis of the IHPP Dam Site and Upper Reservoir Levels on KFS

KFS is an area set aside to mitigate the impacts of BHPP which could not be mitigated on site. KFS protects the natural habitats and environmental and spiritual values which were irreversibly impacted on due to the development of BHPP. This area was restricted for energy development projects without the prior consent of GoU and IDA/World Bank. Nonetheless, tourism development has been permitted based on sound social and environmental standards.

5.4.1 Alternative dam site locations

All the alternative sites for the IHPP dam locations lie outside the KFS footprint. The location of the IHPP dam site does not impact KFS. However, the dam height is maintaining a higher operational reservoir level which is likely to impact on the KFS.

5.4.2 Alternative Upper Reservoir Levels

Alternative 1 and 2 reservoir levels flood part of KFS areas, while Alternative 3 does not infringe on the KFS boundary. In the sub-section below the implications of the IHPP Upper Reservoir Level alternatives on KFS are evaluated from the technical, environmental, and socio-economic and cultural perspective.

5.4.2.1 Technical Evaluation

As discussed in 5.3.2.1 Alternative 1 is much superior in technical terms, particularly water regulation, installed capacity to meet the peaking load and annual power production compared to Alternatives 2 and 3. Alternative 3 is the least preferable as it has the least water regulation potential, installed capacity to meet the peaking load and annual power production.

Despite the large footprint of Alternative 1 on the KFS environment, it is a preferable choice from a technical perspective compared to Alternatives 2 and 3 to meet the IHPP development objectives apart from national energy demand and to fulfill the objectives of the National Development Plan. This alternative compared to Alternatives 2 and 3 widens the door for multiple other sector development opportunities such as: industrial development, service sector development, etc adding to the overall socio-economic development of the country. Apart from this, comparatively, it will also reduce the current use of dirty fuels for electrical energy saving hard currency, reducing greenhouse gas generation and improving the overall living conditions of the people.

5.4.2.2 Environmental evaluation

Alternative 1 and 2 overlap the foot print of KFS set aside site in the Bujagali IA. The proposed IHPP Alternatives 1 and 2 thus have a direct impact of concern related to the Bujagali IA natural habitat and environmental values of KFS. The perceived impacts of IHPP on the KFS natural habitat and environment are discussed and evaluated for each of the reservoir Alternatives. The IHPP Alternative 1 has large negative and irreversible impacts, while Alternative 2 has low impacts.

I. Environmental Values

The term "Environmental Value" has a wider meaning. The value is not only limited to the direct and indirect environmental services provided by the natural resources, but also includes the natural scenic beauty, aesthetics, recreational use spiritual values and a sense of belonging

apart from the biodiversity richness and the natural habitats.Though the environmental values of KFS are not explicitly defined in the Bujagali IA and subsequent KO-SMP, all falls, rapids, free flowing river, islands and associated wetlands and woodlands of the Victoria Nile River with unique aquatic biodiversity have environmental values which attract a large number of tourists including the water based sport tourism. The Nile Bank and Kalagala Fall CFR on either banks of the Victoria Nile, despite their highly modified characteristics are other features of environmental values attached to KFS.

Alternative 1 and 2 reservoir levels affect the environmental values of KFS differently and these are discussed below.

A. Land Area

The area of KFS in itself has an environmental value because of its inclusion as a set aside site in the Bujagali IA. In quantified terms the impacts of the IHPP reservoir level alternatives on the KFS land area is presented in ***Table 62.*** Alternative 1 has a larger footprint over the area of KFS compared to Alternative 2. Alternative 3 does not impact the KFS area physically.

Table 62: Impacts of IHPP on the KFS Land Area

Particulars	Area (ha)	% Loss KSF
Total area KSF	1276.92	
Total land area KSF	1276.92	
Area Affected IHPP Alternative 1	288.89	22.62
Area affected IHPP Alternative 2	24.41	1.91
Area affected IHPP Alternative 3	0.00	0.00

Figure 69 evaluates the IHPP impact on the KFS land area for different IHPP alternative reservoir levels. Alternative 1 has medium negative and irreversible impacts compared to Alternative 2, which is low.

Figure 69: The IHPP Alternatives impact ratings on the KFS Land Area

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1			▲						
Alt 2				▲					
Alt 3					▲				

B. Free Flowing River Length

The length of the free flowing river within KFS is the other element of the KFS environmental value. In quantified terms the impacts of the IHPP reservoir level alternatives to the KFS free flowing river length is presented in ***Table 61*** Alternative 1 has alarger footprint over the free flowing river length of KFS compared to Alternative 2. Alternative 3 does not impact KFS free flowing river length physically.

Table 63: Impacts of the IHPP on the Free-Flowing River length of KFS

Particulars	Free Flowing River Length (km)	% Loss
Total Free Flowing River length KSF	10.16	
Length Affected IHPP Alternative 1	5.7	56.10
Length Affected IHPP Alternative 2	0.6	5.91
Length Affected IHPP Alternative 3	0	0.00

Figure 70 evaluates the IHPP impact on the KFS free flowing river length for different IHPP alternative reservoir levels. Alternative 1 has very large negative and irreversible impacts on the KFS free flowing river length than Alternative 2, which is low.

Figure 70: The IHPP Alternatives impact ratings on the KFS free flowing River length

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	**Large (-3)**	**Medium (-2)**	**Low (-1)**	**Insignificant (0)**	**Low (+1)**	**Medium (+2)**	**Large (+3)**	**Very large (+4)**
Alt 1	▲								
Alt 2				▲					
Alt 3					▲				

C. Rapids and falls

All the rapids and falls within KFS have specific environmental values. In quantified terms the impacts of Alternative 1 has the larger footprint over the rapids and falls of KFS. Alternatives 2 and 3 dont impact the KFS rapids and falls physically.

Table 64: Impacts of the IHPP on the Rapids and Falls of the KFS

Particulars	Rapids and falls (Nos)	% loss KFS
Total rapids and Falls KSF	7	
Rapids and Falls Affected IHPP Alternative 1	2	28.6
Rapids and Falls Affected IHPP Alternative 2	0	0.00
Rapids and Falls Affected IHPP Alternative 3	0	0.00

Figure 71 evaluates the impact of IHPP on the KFS rapids and falls for different IHPP alternatives reservoir levels. Alternative 1 has medium negative and irreversible impacts on the KFS rapids and falls. The impact is considered medium for Alternative 1 because it does not impact the recognized environmental feature of the Bujagali IA, and "the Kalagala Fall" on KFS. Alternative 2 and 3 have no impacts on the rapids and falls.

Figure 71: The IHPP Alternatives impact ratings on the KFS Rapids and Falls

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1			▲						
Alt 2					▲				
Alt 3					▲				

D. Island groups

The islands within the Victoria Nile of KFS are the other physical features of environmental values. These islands consistof resistant rocks which stand out against the erosive force of water and are responsible in the creation of rapids and falls in the Victoria Nile. KO-SMP recognizes the islands separating Kalagala, Hyoxia and Itanda Falls as of specific environmental values to KFS.

In quantified terms the impacts of the IHPP reservoir level alternatives on the KFS island groups are presented in ***Table 65***. Alternative 1 has a very large footprint over the island groups of KFS compared to Alternative 2 which is low. Alternative 3 does not impact KFS island groups physically.

Table 65: Impacts of the IHPP on the Island Groups of KFS

Particulars	Island Groups	% loss
Total rapids and Falls KSF	7	
Islands Groups Affected IHPP Alternative 1	4	57.14
Island Groups Affected IHPP Alternative 2	1	14.29
Island Groups Affected IHPP Alternative 3	0	0

Figure 72 evaluates the IHPP impact on the KFS island groups for different IHPP alternative reservoir levels. Alternative 1 has very large negative and irreversible impacts on KFS island groups, though it does not affect the islands separating the Kalagala and Itanda Falls. Alternative 2 has low and irreversible impacts on the Island groups, while Alternative 3 has no impact.

Figure 72: The IHPP Alternatives impact ratings on the KFS Island Groups

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1	▲								
Alt 2				▲					
Alt 3					▲				

E. Land Use

In quantified terms the IHPP impacts on the KFS land use for Alternatives 1 and 2 are presented in ***Table 66*** **and** ***67***. Impacts on different types of land use are high for Alternative 1 compared to Alternative 2. Alternative 1 compared to Alternative 2 impacts larger areas of the existing water body, woodlands, wetlands, grasslands and rocks of KFS. Alternative 1 also impacts a portion of the Nile Bank CFR recognized as of environmental value to KFS in the Bujagali IA. Alternative 3 has no impact on the land use types of KFS.

Table 66: The IHPP Alternatives 1 impacts on the KFS Land Use

Land Use Category	KFS Total (ha)	Alt. 1 Affected Total (ha)	Remaining After Alt.1 (ha)	% Loss of KFS Alt 1
Cultivated	77.28	0	77.28	0.00
Built up	0.37	0	0.37	0.00
NFA Central Forest Reserve	709.93	11.9	698.03	1.68
Dense Forest	*123.02*	0	123.02	0.00
Sparse Forest	*285.27*	6.9	278.37	2.42
Cultivated	*269.64*	0	269.64	0.00
Grassland	*32*	5	27	15.63

Land Use Category	KFS Total (ha)	Alt. 1 Affected Total (ha)	Remaining After Alt.1 (ha)	% Loss of KFS Alt 1
Other Forest Dense	5	0	5	0.00
Woodlands	6.37	2.15	4.22	33.75
Grassland	1.41	0	1.41	0.00
Wetland	45.64	21.52	24.12	47.15
Rocks	1.66	0.71	0.95	42.77
Water Body	429.31	252.61	176.7	58.84
Total	**1276.97**	288.89	988.03	22.62

Note: Dense forest - Crown density abov 30%, Sparse Forest - Crown density between 10 to 30 %.

Table 67: The IHPP Alternatives 2 Impacts on the KFS Land Use

Land use Category	KFS Total (ha)	Alt. 2 Affected Total (ha)	Remaining After Alt.2 (ha)	% Loss of KFS Alt 1
Cultivated	77.28	0	77.28	0.00
Built up	0.37	0	0.37	0.00
NFA Central Forest Reserve	709.93	0	709.93	0.00
Dense Forest	*123.02*	0	123.02	0.00
Sparse Forest	*285.27*	0	285.27	0.00
Cultivated	*269.64*	0	269.64	0.00
Grassland	*32*	0	32	0.00
Other Forest Dense	5	0	5	0.00
Woodlands	6.37	0.76	5.61	11.93
Grassland	1.41	0	1.41	0.00
Wetland	45.64	16.37	29.27	35.87
Rocks	1.66	0.12	1.54	7.23
Water Body	429.31	7.15	422.16	1.67
Total	**1276.92**	24.41	1252.51	1.91

Note: Dense forest - Crown density abov 30%, Sparse Forest - Crown density between 10 to 30 %.

Figure 73 evaluates the IHPP impact on the KFS land use for different reservoir levels. Alternative 1 has very large negative and irreversible impacts on the KFS land use. The impact is rated very large because of its irreversible impacts on the water body and related natural habitats of fish and on the environmental resources of the Nile Bank CFR. The impacts of Alternative 2 is low negative and irreversible. Alternative 3 has no impact on KFS.

Figure 73: The IHPP Alternatives impact ratings on the KFS Land Use

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2				▲					
Alt 3					▲				

II Natural Habitats

The composition of terrestrial floral and wildlife species and their habitats within KFS has been highly modified due to human interference in the last couple of decades. Nearly 90 to 95% of the original vegetation even in the Nile Bank and Kalagala Fall CFR has been modified[97]. The IHPP impacts on the natural habitats of the native terrestrial floral and faunal species is unlikely in KFS.

The natural habitats of haplochromine cichlids and a few riverine fish species, however, are potentially impacted by the IHPP flooding related environmental changes (lotic to lentic). These species of fish, particularly *H*aplochromine cichlids, have adapted to the free flowing Nile River and its shallow substratum characterized by rocky, sandy, and muddy bottoms within the KFS. Many of these species are native to the Victoria Nile and are also listed in the IUCN Red List for Global Conservation under various threat categories.

Similarly, the natural habitats of migratory riverine fish species, particularly *M. kannume, B. altianalis and Labeo victorianus* are likely to be impacted due to flooding and change in the water environment from lotic to lentic within KFS. The natural habitats of these fish species are also potentially impacted on by the barrier effects of the IHPP dam downstream KFS due to the restriction imposed for upstream migration in the spawning seasons and loss of upstream spawning habitats.

The impacts of the IHPP Alternative 1 reservoir level is large, negative and irreversible compared to Alternative 2 which is low (***Figure 74***). Alternative 1 reduces the free flowing river length by 5.7 km and associated natural habitats of fish while Alternative 2 will impact only 0.6 km river length and associated fish habitats. In terms of the area of the water body comprising the natural habitat of fish, Alternative 1 impacts nearly 58.41% (252.61ha) of available habitat within KFS, whereas Alternative 2 impacts only 2% (7.15ha) of the available natural habitats of fish.

[97] Ministry of Water and Environment, 2010. The Kalagala Offset Sustainable Management Plan 2010-2019.

Figure 74: The IHPP Alternatives impact ratings on the KFS Fishery Natural Habitats

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2				▲					
Alt 3					▲				

The natural habitats of other aquatic floral and faunal species will not be adversely impacted because of the enlargement of the area of the water body area from 429.31 to 718.2 ha for Alternative 1 and from 429.31 to 453.72 ha for Alternative 2.

5.4.2.3 Socio-economic cultural evaluation

KFS is used for diverse of socio-economic purposes, from agriculture in privately owned land to operation of adventure tourism industry. Apart from this, some sites in KFS are regarded to have spiritual values to the local communities. The impacts of various reservoir alternatives of the IHPP on the KFS socio-economic and spiritual activities are discussed below. The IHPP Alternative 1 directly impacts the land owned and operated by the local communities, while Alternatives 2 and 3 do not have direct impacts on the lands.

I. Economic and physical displacement

As KFS creation under Bujagali IA did not acquire land nor imposed restriction on the land use within the KFS, parts of KFS land area are still traditionally owned by the households living in the close by village settlements (refer section 4.1.3). A few of the land owners have even built residential and other structures on these lands.

The IHPP Alternative 1 flooding affects 73 land owners economically within the KFS. Five out of the 73 APs 5 of the APs will be displaced physically. Alternatives 2 and 3 flooding does not displace APs economically and physically. Thus Alternative 1 has large adverse impacts due to the economic and physical displacement of APs within KFS (***Figure 75***).

Figure 75: The IHPP Alternatives impact ratings on the KFS economic and physical displacement

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2					▲				
Alt 3					▲				

The other economic activities such as fishing are not affected adversely by the IHPP reservoir level alternatives

II Adventure Tourism

The tourism assets of KFS, particularly for white water rafting, are the free flowing river length and associated rapids and falls in the Victoria Nile. IHPP Alternative 1 will flood nearly 5.7km length or about 56.1% of the KFS free flowing river length. Similarly, it will also flood two of the rapids namely Kulu Shaker Rapid and Hair of the Dog Rapid out of the7 rapids and falls within the KFS. The IHPP Alternative 2 does not submerge the rapids; however, will flood 0.6km or about 5.91% of the KFS free flowing river length. The envisaged impact on the white water rafting tourism within KFS is loss of two rapids for Alternative 1 and none for Alternative 2 (***Figure 76***).

Figure 76: The IHPP Alternatives impact ratings on the KFS Adventure Tourism

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Alt 1		▲							
Alt 2				▲					
Alt 3					▲				

III. Spiritual Sites

None of the IHPP reservoir alternatives affects the cultural sites of local and regional significance within the KFS.

5.4.2.4 Water regulation regime

Water regulation within the reservoir for the power production is discussed in section 5.3.2.5. The dailyexpected water level fluctuation within the portion of KFS under different IHPP reservoir level alternatives will have insignificant impacts on the natural habitats of the Haplochromine cichlids. This is because the original natural habitats of these fish in the area are already impacted by the initial flooding.

Such a fluctuation of the reservoir level, for IHPP Alternative 1 reservoir level, however, will have positive implications on the Vengeance Rapid during the water withdrawal periods. As this rapid is located just upstream of Alternative 1 reservoir level, the length of the rapid with free flow of water will increase substantially during the water withdrawal period. Similarly, for IHPP Alternative 2, positive implications will be seen during the water withdrawal period. Potentially, during the water withdrawal period, there will be no impoundment of water within KFS.

5.5 Alternative analysis for the mitigation of impacts on the KFS

Of the 3 IHPP reservoir level alternatives, alternative 1 is being developed by GoU. Alternative 1 significantly impacts on the natural habitats and environmental values of KFS, an area set aside to mitigate the impacts of BHPP under the Bujagali IA.

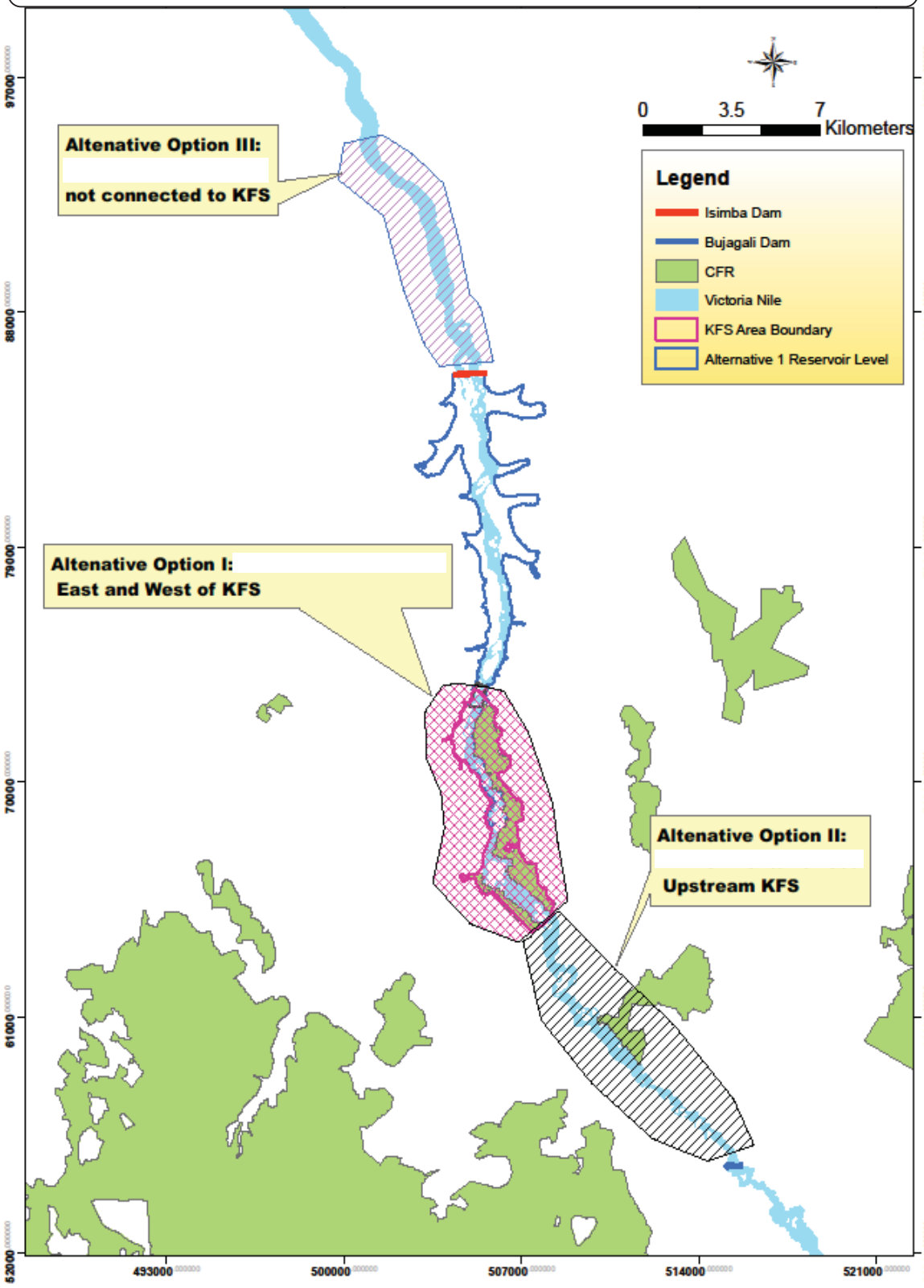
The envisaged impacts on the natural habitats and environmental values under the Alternative 1 development proposal could not be mitigated within the affected KFS. The residual impacts are too high to be ignored and need protection outside the KFS boundary for conservation.

The valued environmental features and natural habitats of the KFS are riverine environmental features such as: free flowing river, rapids, and islands, which provide natural habitats for the endemic and IUCN Red Listed Global Conservation fish species belonging to Haplochromine cichlids (refer section 4.1.1.2 and 4.1.2.2 E).

As stated earlier, the habitat loss could not be mitigated on site. Therefore, identification of alternative sites of similar habitats with similar species composition is the best solution. Again, if such a site has a direct physical connection with the remaining parts of KFS it would be preferable choice because such a connection provides uninterrupted linkages with a greater chance of habitat expansion in the changed environmental conditions. One of the major drawbacks of such potential alternatives is the likely impacts on the communities who own or operate the land areas within such alternative options.

Setting aside an area to compensate the environmental values and natural habitats of the affected Haplochromine species of similar composition whose habitats are lost due to the IHPP implementation based on the principles of additionality meets the objectives and spirit of Bujagali IA. Given the location of KFS, there are 3 options upstream of the reservior area of IHPP and such an alternative site**,** in theory, has the options incicated in ***Figure 77***.

Figure 77: Potential set aside options



- **Alternative Option I**: Alternative site adjacently connected to the east and west of the existing KFS;
- **Alternative Option II** Alternative site adjacently upstream of KFS along the Nile River further south; and
- **Alternative Option III**: Alternative site not connected to KFS.

Coarse screening based on of the topographic maps was used to evaluate the available alternative options. The option screened was then studied for its baseline for the assessment of its suitability to meet the objectives and spirit of Bujagali IA.

Of the three alternative options evaluated through coarse screening, Option I and II, theoretically, has advantages of housing the remaining environmental values and natural habitats of the KFS in one area by modifying KFS boundary. This offers ease in safeguarding and managing the natural habitats, environmental and spiritual values based on sound social and environmental standards. But such an option to be acceptable should have similarity as well as additionality to the lost KFS natural habitats and values to safeguard the affected fish species.

Option III envisages a distant area, away from the existing KFS area, supposedly downstream of IHPP (between IHPP Dam and Kyoga Lake along Victoria Nile). As this option is located away from the remaining KFS, it has disadvantage in the management of the protected area and in maintaining the ecological integrity of KFS. Apart from this the site is not similar to the KFS species composition and is also vulnerable from the potential water fluctuation effects of the IHPP water regulation. Therefore, this option is rejected in the initial phase of coarse screening.

Among the Options I and II, Option I envisages the expansion of KFS sideways across the river valley in the terrestrial regime of the landscape devoid of water based features of environmental value to house the natural habitats of the affected fish species by IHPP on KFS. Though the option integrates the remaining KFS into one area by the modification of the KFS boundary, it does not compensate for the lost environmental values and natural habitats affected by IHPP. Therefore, this option was also rejected as it does not meet the objectives and spirit of the Bujagali IA.

Option II envisages expansion of KFS to the South along the Victoria Nile River up to the foot of the Bujagali Dam wall. Similar features of environmental values comprising of free flowing water body, islands, and rapids are available in this alternative site. Besides, the alternative site is comprised of the natural habitats of fish lost due to IHPP on KFS. As the option integrates the remaining KFS into one area and also shows similarity in the landscape, environmental values and natural habitats was evaluated as the most suitable option.

This option was then studied for its natural habitats, and environmental and spiritual values to determine its similarity with the KFS. The baseline study Primary and secondary data (refer

section 4.2.1, 4.2.2 and 4.2.3) reveal that it is not only similar to KFS in its general environmental values, but also comprises of the faunal and floral composition having identical species diversity and natural habitats. This KFS Extension Area, has additional floral and faunal species which together with KFS provides additionality to the modified KFS not only in terms of the environmental values lost but also on the available natural habitats of the floral and faunal species affected by IHPP flooding (refer section 7.2.1 - Table 66, and Section 7.2.2 - Table 67, and Table 68)

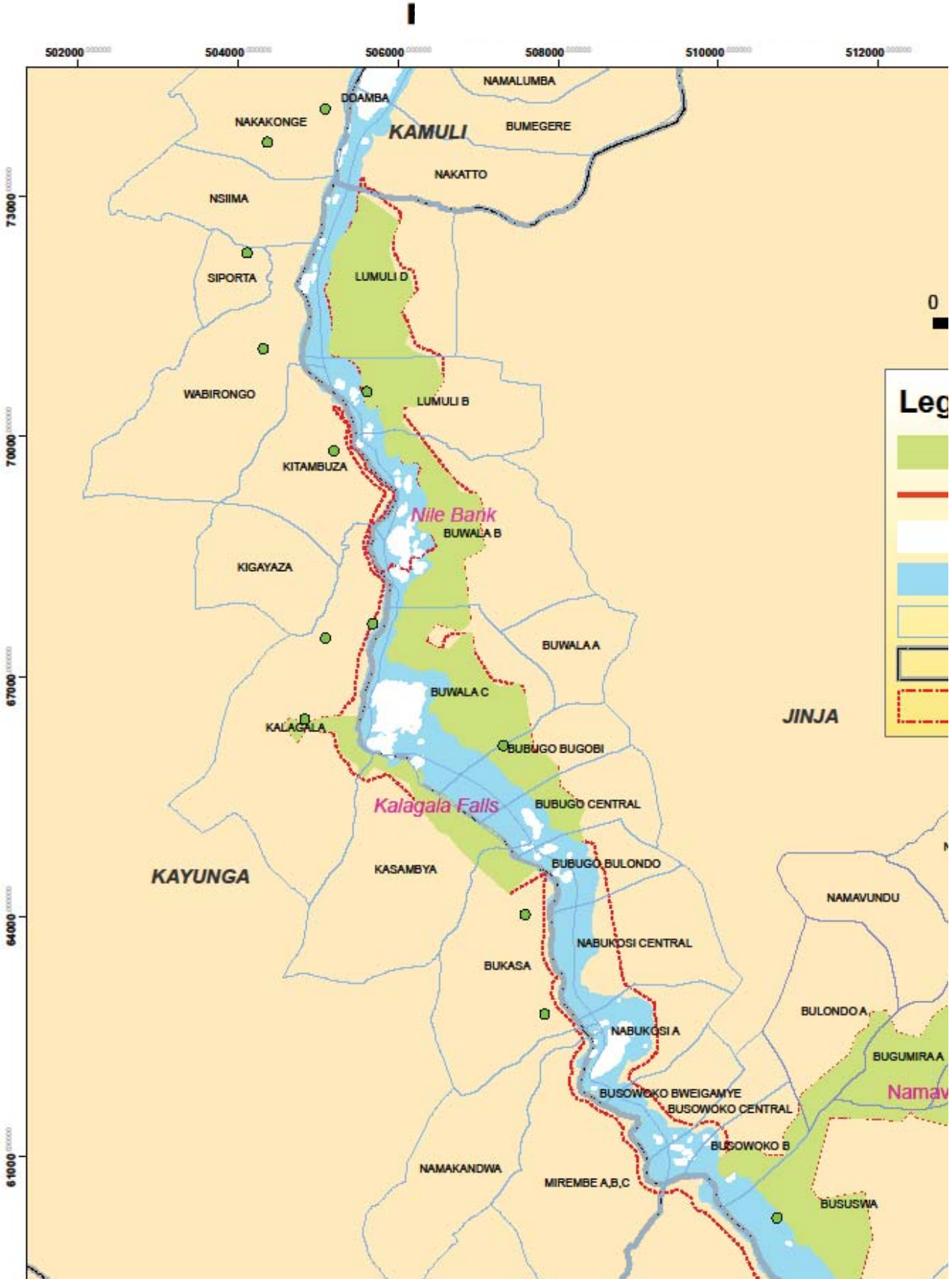
Therefore, Option II (KFS Extension Area) is recommended for the modification of KFS to ensure that the lost natural habitats and environmental values are protected and conserved in the long term.

The modified KFS will include the remaining area of KFS delineated by Bujagali IA and the area of the KFS Extension Area ***(Map 18).*** Thus, the total area of the modified KFS will be 2469.8 ha.

The modified KFS is a geographical area outside the core settlement area. Inclusion of the Extension Area within KFS is likely to incur further restrictions on the already regulated activities under the National Environment (Wetland, Riverbanks and Lakeshore Management) Regulations (2000). With the insertion of the KFS Extension Area, water diversion and damming for energy and irrigation, local sand mining activities on the Nile River, unsustainable agriculture and horticulture along the Nile banks, cattle grazing, dischage of untreated sewage and solid wastes in the Nile, and a host of incompatible water sports tourism, unsustainable fishing practices, etc are likely to be restricted for the protection of the natural habitats, environmental and spiritual values of the modified KFS.

For the overall management, this geographical area will have to be viewed from the administrative perspective to ensure that the Local Government Administrative Units and communities within and outside the modified KFS footprint are responsive and participatory in the whole planning process and implementation of the updated KO-SMP activities to protect and conserve its natural habitats and environmental and spiritual values in the spirit of Bujagali IA.

MAP 18: Modified KFS



6 Stakeholder consultations

6.1 Prior IHPP stakeholder consultation and publicd

During the course of the IHPP EIA, SIA and RAP studies a total of 22 meetings were held with the different stakeholders between 23rd October 2012 to 14th December 2012 at the district and local (village) levels with an objective to disclose the IHPP development of IHPP. A total of 1077 persons representing different institutions, civil societies and APs participated in these meetings. Of the total 22 stakeholder consultations at the local level 6 were held in the villages which are located within the village government's administrative footprints of KFS.

The key stakeholders identified for consultations included Central Government Institutions (MoEMD, UEGCL, UETCL, ERA, MoUHUD, MoGLSD, DWO and WRMO, NAFIRRI, MoTWA), Local Government Institutions (District government of Kayunga, Kamuli, Jinja and County, Sub-county, Parish and Village Government Administrators under the District Governments) Donor agencies, NGOs, Tourism operators and Local communities/APs.

The Stakeholder consultations were organized with the participation and arrangements with the local level leaders and Local Government Institutions. A project brochure both in English and the local language were distributed to the participants which were explained by the Consulting Team on behalf of the client. The specific questions on various environmental, social, and cultural issues were answered by the Consultants.

The stakeholder consultations included in the EIA, SIA and RAP studies were the initial IHPP disclosures to inform the Local Governments, Communities/APs and Tour operators in the Project Area. The contents of the distributed brochures only highlighted the likely key issues regarding land and property of APs and the legal frameworks to govern the affected land. It gave information on the upcoming baseline surveys for natural, social, cultural environments and land and property evaluation.

The specific questions of the stakeholders in the consultative meetings covered the following broad issues of concern.

I. <u>On stakeholder meeting</u>

- *Complaints were received on poor and inadequate sensitization on the project prior to EIA, SIA, And RAP studies.*
- *The project team should have a communication development specialist who will prepare people for eventualities likely to take place for example loss of jobs after construction.*
- *The project team should include a Natural Resources Economist on the list to do the cost-benefit analysis.*

- *Long term effects such as effects on vibrations due to the project should be addressed to communities. There is need to engage the CDOs in sensitization.*
- *Some technical personnel such as Community Development Officers (CDOs) should be involved when sensitizing communities.*

II. Project implementation

- *How long will the project development take because this is useful for entrepreneurs who may wish to develop services that support project development?*
- *All HEP developments seem to be concentrating on the River Nile. What effects will the development have on other planned projects along the Nile?*
- *In case many dams are constructed on the River Nile, won't there be a backwash effect in future creating floods in Jinja District?*
- *What considerations were taken to choose the best location of the dam and what were the alternatives?*
- *Is there a way the MoAAIF can link with MoEMD to reduce the decay of biomass that would by flooded to generate GHG?*
- *Back flooding may affect other areas that were not in the plan. How will the project ensure that the same volume of water flows down to the downstream communities?*
- *Will the district get electricity from the project and how long will Isimba HPP be on the grid?*
- *The proposed project if implemented may damage the already existing roads; therefore, efforts should be made to maintain all existing access roads or improve them.*
- *Which are the actual homesteads to be affected by the project? How soon will valuation data of affected PAPs be given to district officials in charge?*
- *The reservoir extent needs to be clear because approximately 14km of the River stretch which will be covered by the reservoir will inundate white water rafting and completely shut down tourism and knock off effects in some districts.*

III. Land compensation and grievance redress

- *Who gives consent to survey the affected land? Is it the land owners or squatter?*
- *Where will PAPs whose land is going to be affected be resettled? Is there enough land?*
- *The compensation rates set by the District Land Board should be revised so that PAPs are fairly compensated.*
- *Most government projects get problems during the compensation stage especially if given in instalments. Will compensation be done in instalments?*
- *Are squatters on the affected land compensated?*

- *Will the government compensate PAPs with no land tittles because most of the people in Kamuli District do not own land titles?*
- *Is "good will" of an economic facility compensated?*
- *In case of any grievances, where will the offices be located?*
- *There are repercussions of a dam after it has been built. People employed by the project end up contributing to crime after the project ends. What measures have been put in place for such cases?*

IV. Employment and benefit

- *Will the proposed project consider employment for the locals?*
- *When employing workers for the project, won't the contractors consider academic qualifications and bribes?*
- *The benefits of the project to Kisozi Sub-County are less than 10 %, we therefore request the project to set up facilities such as: schools, health centres or roads as a social responsibility.*
- *Is there a plan for revenue/project benefit sharing with stakeholders?*
- *The community desires to have a bridge to connect to Kamuli and Kayunga, Is it possible?*

V. Tourism:

- *What are the immediate tourism resources to be affected by the project?*
- *How will people whose livelihood depends on tourism services be compensated (for example Kayaking instructors)?*
- *Won't the reservoir affect the Kalagala offset and the Itanda Falls?*
- *Won't all tourist attractions be eliminated by the project?*

VI. Kalagala Offset:

- *The Kalagala Offset Management Plan (KO-MP) exists and since IHPP is part of the Kalagala Offset area, It should be integrated with the KO-SMP.*
- *The Mabira Management Area and Kalagala offset if affected by the project should be compensated.*
- *A good monitoring plan for the Kalagala offset should be set up. MOWE developed a good monitoring plan; the project can look at their plan and borrow best practices.*

Though the issue of KFS had been one of the key concerns of the local communities and institutional participants of the Local Governments and Water Sports Operators, the impacts of IHPP on KFS in specific terms were not covered adequately in the EIA, SIA, and RAP studies of IHPP. Nevertheless, the impacts on KFS are addressed in general but not in segregated manner.

After the stakeholder's sensitization, APs were identified based on the cadastral survey for the lands encompassed by the Reservoir Full Supply Level (1055 Ma msl). The cadastral survey was carried out with the active participation of the village leaders, affected APs and the adjacent landowners to avoid conflicts and disputes on land boundaries and land areas. A total of the 2076 land owners were identified.

Each of the private land owners (2074 APs) were covered by the valuation study team as per the provisions of the Constitution of the Republic of Uganda, Land Act, 1988 and the Valuation Act 1965. Key provisions in the Valuation Act are the determination of the market value of the land and built property at the time of involuntary land acquisition, which is approved by District Land Boards. It also requires a census survey of the APs identified and a full scale consultation during the time of the cadastral survey and property valuation. This provision of the Republic of Uganda' law is the second public disclosure regarding the affected land and property to the APs

On 20th June, 2014 at Busaana Sub County, Kayunga district, MoEMD organized a public hearing meeting for the disclosure of the EIA, SIA and RAP reports to the local communities including the valuation of the land and property of the APs. Apart from Public Notices in the Local Newspaper, it was also broadcasted over the National Radio. To further inform people a separate radio talk program was organized by the Ministry on Thursday 26th June, 2014 between 7-8:00 pm.

In response to the concerns registered by Save Adventure Tourism on 10th April 2014 to UEGCL on the IHPP impacts on the tourism business, MoEMD provided a written clarification to the responsible authorities of the Save Adventure Tourism.

6.2 Stakeholder consultation and disclosure - ESIA Addendum Phase

In line with the issues to be addressed as stipulated in the Addendum ESIA ToR and also the concerns of the World Bank as expressed in the letter dated February 3rd, 2014 to the Government of Uganda regarding the potential impacts of the Isimba Project on the Kalagala Offset, the Consultants engaged different Government entities and the World Bank during the study.

On the morning of 27th May 2016 an orientation meeting of all the key and non-key experts of the Consultant's team was organized at MoEMD in the presence of the MoEMD Contract Coordinator, MoEMD Environment and Social Safeguard Specialist and MoEMD Procurement Specialist. The key issues among others focused during the orientation meeting were: i) 2007

Indemnity Agreement, v) Geographical limits of KFS, ii) potentials of IHPP impacts on the KFS geographical limits and its implications on the Indemnity Agreement, iii) WB's comments on IHPP ESIA, vi) Environmental, social and spiritual resources of KFS, v) SMP and associated management plans and their implementation status within KFS and vi) the key and relevant stakeholders including all district local governments of Kayunga, Jinja, Buikwe, and Kamuli and other concerned central government offices. This orientation meeting was fruitful in understanding government views with regard to the potential impacts of IHPP on KFS.

In the afternoon of 27th May 2016, a kick off meeting took place at the premises of MoEMD. The meeting was attended by more than 25 participants representing the client, WB, and the key concerned stakeholders of KFS including central government offices, offices of the districts local governments, tourism operators and communities related to KFS. Wide ranging issues related with IHPP and its implications on KFS were discussed so as to focus the study to evaluate the IHPP impacts on KFS based on a scientific database that paved the way for a meaningful dialogue between the government of Uganda and the World Bank for an amicable solution with regard to the Indemnity Agreement.

With the understanding of the views and concerns of the concerned authorities of the Government of Uganda related to the IHPP development and that of the World Banks concerned personnel, a number of central level institutions related to the KOA Sustainable Management planning and implementation were consulted. The key central level institutions visited for consultations were NFA, UEGCL, MoWE, NEMA, and MoTWA. Apart from the central level institutions, responsible officers of the District Office of Jinja, Kamuli, Kayunga, and Buikwe were consulted.

Interviews with key informants such as community leaders, tourism operators and knowledgeable persons of civil societies, focus group discussions with the communities and affected parties of the KFS area, and person to person interaction with the potentially affected APs by IHPP at KFS and that of the proposed KFS extension area were continued throughout the study period. ***Appendix 16*** gives the details of the institutions visited, persons contacted and individuals and communities consulted during the period.

Apart from the above consultation, a prior stakeholder consultation meeting was organized at the local level at Jinja on 19th of August 2016 specifically targeting the local level stakeholders such as district authorities, officers, community leaders, members of civil societies, local communities and potentially affected persons including the representatives of the adventure tourism operators in the Upper Victoria Nile in compliance to the Environmental Impact Assessment Regulation S.I. No. 13/1998.

The goal of the meeting was to disclose the addendum study initiatives, its objects, potential impacts of IHPP on KFS, briefing on the potential expansion of KFS etc. and to solicit the concerns and suggestions of the local level stakeholders on the various issues relating to IHPP impacts and the KFS extension. A total of 58 participants (12 ladies and 46 men) representing various walks of life participated in the meeting. The key issue of discussion was the implication of IHPP on the adventure tourism business of the area. The details of the proceedings, issues tabled including concerns and suggestion of the stakeholders are presented in ***Appendix 24*** along with the list of participants and their designations.

Similarly in compliance to the Environmental Impact Assessment Regulation S.I. No. 13/1998 to solicit issues, concerns and suggestions of the institutional stakeholders and NGO groups, a stakeholder consultation meeting was organized at the premises of Hotel Royal Suites Bugolobi, Kampala on the 22nd August 2016. Consultants and the concerned environmental officer of MoEMD presented the environmental baseline and issues concerning the IHPP development on KFS prior to opening the forum for discussion. A number of issues related to IHPP impacts on KFS resources including adventure tourism, cultural/spiritual values, fishery etc were raised and discussed. A total of 27 participants representing different institutions and NGOs were present in the consultation meetings. The details of the stakeholder proceedings, issues raised and concerns and suggestions solicited along with the list of participants are presented in ***Appendix 25.***

6.3 Planned stakeholder consultation and disclosure

The stakeholder consultation and disclosure in Uganda will be guided by the EIA regulation 1998. Based on the provisions of the EIA guideline, the following steps will be undertaken by MoEMD and the NEMA Executive Director.

Step 1: Submission of the EIA report in the format as required by NEMA under the EIA regulation by MoEMD.

Step 2: Review of the EIA report by the NEMA Executive Director appointed Lead Agency (MoEMD)

Step 3: Submission of the comments by the Lead Agency to NEMA Executive Director

Step 4: The NEMA Executive Director within 10 days shall invite the general public and the project affected persons through publication of a notice in the Newspaper and other mass media to make written comments within 28 and 21 days respectively on the environmental impact statement as a first step for the disclosure of the EIA report.

Step 5: The NEMA Executive Director to decide on whether a Public Hearing for the project is required or not based on the review of written comments written from the general public and specifically project affected persons

Step 6: If required, the NEMA Executive Director will request the Lead Agency MoEMD for a Public Hearing between 30 to 45 days of the request.

Step 7: The Lead Agency (MoEMD) finalize the location and date of the Public Hearing in consultation with the NEMA Executive Director and leaders of the Local Councils in place where the project affected people could participate

Step 8: The Lead Agency publicize the Public Hearing meeting in the newspaper and other mass media with details of the venue and time of the Public Hearing.

Step 9: The Lead Agency organize a Public hearing on the publicized date. Such a Public Hearing meeting will be chaired by a suitably qualified person known as a Presiding Officer appointed by the Lead Agency in consultation with the NEMA Executive Director.

Step 10: The Presiding Officer submit a report on the Public Hearing within 21 days of the Public Hearing to the NEMA Executive Director.

Step 11: Upon the review of the report, the Executive Director approve, partly approve and disapprove the EIA report.

The EIA report submitted and any other related information with regard to the EIA report are public documents (EIA regulation, section 29) and can be assessed by any person who desires to consult such public documents.

The above legal procedures of the stakeholder consultation and public disclosure are in line with the best practice polices on stakeholder consultation and disclosure of the EIA studies.

7 Evaluation of potential environmental impacts and mitigation measures

7.1 Methodology for assessing impacts

Potential impacts of IHPP development on KFS were assessed by overlaying the footprints of IHPP and its activities over the resource base of KFS, while for the KFS Extension Area the resource base within the KFS Extension Area footprint was evaluated with potential activities after the extension of KFS by modification of the KFS boundary.

GIS tools were exclusively used to quantify the impacts on the natural habitat, environmental and spiritual values of KFS. Environmental values (free flowing river length, rapids and falls, islands, land use) of the KFS were analyzed to assess the impacts IHPP reservoir filling on KFS. In order to maintain the ecological functions of the KFS, analysis was carried to assess the impact of the reservoir filling on the existing KFS native floral and faunal communities including the natural habitat

The impacts of IHPP reservoir filling on the existing KFS physical (land, water, wetlands, forests, woodlands, grasslands and mineral resources), biological (flora and fauna) and spiritual resources (tangible and intangible sites of cultural and spiritual values) used by the communities for the maintenance of their livelihood and happiness are also analysed from the social perspective.

The impacts of the IHPP flooding on the KFS are evaluated/assessed based on the construction and operation activities of the IHPP (refer ***Section 1.4***) on the resources of the geographically affected KFS in terms of the nature of the impacts (direct/indirect), extent of the impacts (site specific, local, regional), duration of the impacts (short term, mid-term and long term), magnitude of the impacts (low, moderate, and high), and significance of the impacts (reversible and irreversible). The evaluation of the impacts is value based judgment of the experts based on the experiences else where and experience of the similar projects.

Similarly, in the KFS Extension Area, the GIS quantified resource base was evaluated based on the nature of activities in the KFS Extension Area that is being proposed for modification to mitigate the impacts of IHPP on the KFS.

7.2 IHPP impacts on the Bujagali Indemnity Agreement

Bujagali IA ensures GoU to protect the natural habitat and environmental and spiritual values of KFS based on sound social and environmental standards acceptable to GoU and IDA/World Bank. The development of IHPP as on-going, is likely to encroach on some of the KFS's natural habitats and other features of environmental values, even though the impacts on the Kalagala and Itanda Falls are avoided. The IHPP impacts on the KFS environmental and spiritual values and the natural habitats along with mitigation measures are discussed below.

7.2.1 The IHPP impacts on the KFS environmental values and mitigation measures

I. Impacts

Besides the small portion (*11.9 ha)* of the Nile Bank CFR, IHPP does not directly impact/flood the Kalagala and Itanda Falls and the interspaced islands of Itanda, Muyanja and the Kalagala Fall CFR known as having environmental values in Bujagali IA and KO-SMP. However, the IHPP flooding affects large areas of the riverine landscape which have environmental values to the KFS. These include: land area, length of the free flowing river, number of rapids and falls, number of island groups, and area of the free flowing water body. **Table 68** presents the impacts in quantitative terms in relation to KFS.

Table 68: Impacts of IHPP on the Environmental Values of KFS

Particulars	Total KFS	Loss due to IHPP Flooding	% Loss
Total area (ha)	1276.92	288.89	22.62
Free Flowing River Length (km)	10.16	5.7	56.10
Rapids and Falls (Nos)	7	2	28.6
Island Groups (Nos)	7	4	57.14
Land Use (ha)			
Cultivated	*77.28*	*0*	*0.00*
Built up	*0.37*	*0*	*0.00*
NFA Central Forest Reserve	*709.93*	*11.9*	*1.68*
Dense Forest	*123.02*	*0*	*0.00*
Sparse Forest	*285.27*	*6.9*	*2.42*
Cultivated	*269.64*	*0*	*0.00*
Grassland	*32*	*5*	*15.63*
Other Forest Dense	*5*	*0*	*0.00*
Woodlands	*6.37*	*2.15*	*33.75*
Grassland	*1.41*	*0*	*0.00*
Wetland	*45.64*	*21.52*	*47.15*
Rocks	*1.66*	*0.71*	*42.77*
Water Body	*429.31*	*252.61*	*58.84*

Note: Dense forest - Crown density abov 30%, Sparse Forest - Crown density between 10 to 30 %.

Though the loss of the KFS area is only limited to 22.62% of the total area, the impacts particularly related to the riverine landscape such as free flowing river length, area of water body and the number of island groups are very large.

The IHPP floods 56.10% of the free flowing river length within KFS. Similarly 57.14 %of the KFS island groups or 33.29% of Island area will be submerged by the IHPP and nearly 58.84% of the free flowing water body area will also be impounded. The magnitude and the significance of the

impacts are large to very large on these KFS physical assets of environmental values. All of these impacted values are related with the riverine environment which attaches a high aesthetic significance to the KFS. The impacts caused are long term, and irreversible lasting throughout the life of IHPP. ***Figure 78*** indicates the impact ratings of the IHPP flooding on the KFS environmental values.

Figure 78: IHPP impact ratings on KFS Environmental Value

IHPP Alternatives	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Total Area			▲						
Free flowing river length	▲								
Rapids and falls			▲						
Island Groups	▲								
Land Use		▲							

II. Mitigation measures

To mitigate the IHPP impacts on the KFS environmental values as discussed above, three alternative approaches have been evaluated. These approaches include:

- Avoid the impacts completely;
- Minimise or compensate the impacts on site; and
- Modification of the KFS Area to mitigate the impacts of IHPP on KFS Environmental Values.

Of the 3 options, the modification of the KFS Area to mitigate the impacts of IHPP on KFS environmental values has been evaluated as the best option and is preffered given the status of the project, which is discussed below.

a. Avoid the impacts completely

This alternative is to adhere to the "avoidance principle "as per the mitigation hierarchy principle. The IHPP Alternative 3 reservoir level avoids all the potential impacts of **the IHPP** development on KFS.

But application of such hierarchical mitigation principles for the IHPP development is not a realistic solution because:

- It does not meet the project goal of generating 1063 GWh of annual energy with a peaking energy of 183 MW to fulfil the near future energy demand. The IHPP Alternative 3 which avoids the IHPP impacts on KFS has a potential installed capacity of only 42.92 MW with an annual energy output of 301.89 GWh. Similarly, IHPP Alternative 2 with less impacts generates about 622.52 GWh of annual energy with a potential of 101 MW installed capacity. Both of these alternatives fall short of the 2nd National Development Plan objectives;
- The On-going IHPP construction works have been designed for the IHPP Alternative 1. The required excavation works for The IHPP dam and power house have been completed with nearly 79% of concreting works of structures is accomplished. Overall over 45 percent of the construction works are completed. Selecting the IHPP Alternative 2 or 3 at present will incur a loss on already made investments;
- Resettlement and rehabilitation implementation works planned for the IHPP Alternative 1 are nearing completion with over 94 % works completed. Choice of Alternative 3 or 2, at this stage of project development, is likely to incur a loss on investments already made. Further, it will create confusion and loss of trust in Government planning by local stakeholders; and
- It will be difficult to close the existing gap between the power demand and supply situation without the IHPP Alternative 1 development as envisioned in the 2nd National Development Plan.

Given the development stage of IHPP and the investments already made, it is too late and not realistic to take a decision on the development of the IHPP Alternative 3 reservoir level to avoid impacts on the KFS natural habitats and environment.

b. Minimize or compensate the HPP impacts on site

The IHPP Alternative 2 reservoir level is an option which will minimize the potential impacts on the environmental values (loss of area, river length, rapids, islands and Nile Bank CFR) on KFS. With this option, there will be no impact on the rapids, islands and The Nile Bank CFR, while the impacts on the river length and land area will be minimized to acceptable levels. However, this alternative has limitations in achieving the objective of power production and will incur losses on the investments already made.

c. Creation of an Environmental Offset Area to mitigate the impacts of IHPP on the KFS Environmental Values

Mitigating the IHPP impacts on KFS, though the IHPP development doesn't affect the Offset Area recognized environmental values (Kalagala Fall, Kalagala Fall CFR and the island between the Kalagala Fall and Itanda Fall except for a small area of Nile Bank CFR), causes substantial implications on the other environmental values (free flowing river lengths, rapids, islands, etc) of

KFS, which are important the existence of KFS. These impacts could neither be minimized nor compensated on site given the development proposal. Therefore, an Offset Area Alternative is the best choice to meet the energy objectives of IHPP development while mitigating the likely impacts on environmental values of KFS.

An alternative analysis for the selection of the environmental offset site (refer Section 5.5) comprising of similar environmental values of KFS recommends that the KFS Extension Area be extended to the South of KFS to meet the objectives of Bujagali IA. This site integrates the remaining unaffected areas of KFS into one area by simply modifying the boundaries of the existing KFS into a modified KFS. By such a modification of the KFS boundaries, the affected environmental values of KFS will not only be compensated but will also be of added value in some aspects. ***Table 69*** presents the additional values of extending the Offset Area in addition to compensating for the affected environmental values of KFS in the modified KFS including the KFS Extension Area.

By integrating The KFS Extension Area with the remaining KFS Area to establish a modified KFS, the overall area of KFS will increase by about 93.5% (1192.88 ha). The land area will increase by 113% (898.51 ha) and water area by about 61% (294.37 ha). The major impact of the IHPP flooding is on the water area of environment values. By integrating the KFS Extension Area in the remaining KFS, the potential water area of environmental value is not only compensated with the modification but also will have substantial value addition in terms of the area.

With the integration of the KFS Extension Area in the remaining KFS, the river length lost by the IHPP flooding is not only compensated but 6.34 km river length is added to the modified KFS. Similarly, 2 additional rapids and falls will be added in the modified KFS to compensate for the lost rapids and falls.

Similarly, the island groups lost will be compensated in the modified KFS, though there is no value addition in terms of the island group numbers.

Table 69: Value addition to Environmental values of KFS through creation of an alternative Environmental Offset Area for the KFS

Environmental values	Environmental values KFS (Total)	Environmental values affected by IHPP on KFS	Environmental values remaining after IHPP flooding	Environmental values of KFS Extension Area (Total)	Environmental values of modified KFS after integration of KFS Extension Area in the remaining KFS	Additions to KFS Environmental Values in the modified KFS
Total Area(ha)	1276.92	288.89	988.03	1481.77	2469.8	1192.88
Free Flowing River Length (km)	10.16	5.7	4.46	12.04	16.5	6.34
Rapids and Falls (No)	7	2	5	4	9	2
Island Groups (No) Island Area (ha)	7 75.9	4 25.27	3 50.63	4 31.09	7 81.72	0 5.82
A. Land Resources	-	-	-	-	-	-
Cultivated (ha)	77.28	0	77.28	18.1	95.38	18.1
Built up (ha)	0.37	0	0.37	7.03	7.4	7.03
NFA Forest Reserve(ha)	709.93	11.9	698.03	683.69	1381.72	671.79
Dense trees(ha)	*123.02*	0	*123.02*	666.52	789.54	666.52
Sparse trees (ha)	*285.27*	6.9	*278.37*	*0*	278.37	-6.9
cultivated(ha)	*269.64*	0	*269.64*	*0*	269.64	0
grass land (ha)	*32*	5	*27*	*17.17*	44.17	12.17
Other forest Dense (ha)	5	0	5	31.71	36.71	31.71
woodlands (ha)	6.37	2.15	4.22	30.01	34.23	27.86
Grass land (ha)	1.41	0	1.41	170.36	171.77	170.36
Wet land (ha)	45.64	21.52	24.12	77.45	101.57	55.93
Rocks (ha)	1.66	0.71	0.95	0.23	1.18	-0.48
Water Body (ha)	429.31	252.61	176.7	463.19	639.89	210.58

7.2.2 Impacts on the natural habitats and mitigation measures

The natural habitat in the Bujagali IA includes terrestrial habitats of native flora and fauna and the water based habitats of native aquatic flora and fauna. Terrestrial habitats of native flora and fauna have been highly modified by human interference and are of low significance, whereas, the aquatic habitats for the native fish fauna are of special significance in relation to the IHPP development on KFS.

7.2.2.1 Impacts on the natural habitats of fish fauna and mitigation measures

The impacts on the riverine fishery natural habitat due to IHPP on KFS are described under the following headings: i) barrier effects on the natural habitats, ii) flooding effects on the natural habitats, and iii) reservoir fluctuation effects on the natural habitats

A. Barrier effects on the natural habitats and mitigation measures

I. Impacts

The life cycle of fish is intimately connected with the river and its longitudinal connectivity. A number of fish use upstream areas for spawning and rearing of the fries and fingerlings, a natural strategy to avoid predation of young by predators. The larger fish move along downstream areas for feeding where feed is available in plenty for growth to maturity. Precise migratory behavior and season of migration are not very well understood for the fish species of the Victoria Nile (refer Section 4.1.2). Nevertheless, the NaFIRRI studies 2000 and 2006 have noted 3 species namely M. *kannume,* B. *altianalis* and *Labeo victorianus* as riverine species. These species of migratory nature with some degree of co-existance in lake-like habitats for feeding are reported in the riverine stretch of KFS using the available natural habitats to complete their lifecycle particularly spawning and breeding. The migration behavior of these species is not well understood. The latest NaFIRRI 2016 report, states that these species migrate upstream for spawning in the KFS and upstream areas. If this is true, then these species are severely impacted due to the restriction on migration by the dam barrier resulting to the reduction of the upstream natural habitats for spawning with long term implications on the population and diversity status of these fish species in the KFS and entire Upper Victoria Nile.

NaFIRRI (2016) also mentions that *Haplochromine cichilids* are also impacted by the dam barrier with implications on the population and diversity in the long term.

Figure 79 presents the rating of the barrier effect on the migratory riverine fish species and the *Haplochromine cichilids* which also have a natural habitat in KFS including the IHPP reservoir areas. The impact rating is evaluated as negative (large to medium).

Figure 79: Barrier effects on the migratory fish species in KFS

Impacts	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Migratory riverine fish		▲							
Haplochromine cichilids				▲					

II. Mitigation measures

a. Short term, Mid-term and Long term fishery monitoring to generate a biodiversity richness database

The ideal mitigation strategy to minimize the impacts of barrier effects on the migratory riverine fish such as Haplochromine cichilids *kannume,* Haplochromine cichilids *aftianafis* and *Labeo victorianus* would be a fish ladder in the dam. But such afish ladders should be designed to suit the swimming behavior of the target fish species. As the exact nature of fish migration is not well understood and there is little knowledge on the swimming behavior of the target fish species, installing a fish ladder may not be an effective solution. This is mainly because of the uncertainty of the ladder efficacy for the upstream migration as intended. In such an event, the investments made on the fish ladder will be wastage of resources.

Three of the riverine fish species namely: *M. kannume, B. aftianafis* and *Labeo victorianus* found along the upper Victoria Nile (NaFIRRI, 2006) have been the target riverine fish species of the Victoria Nile. *Labeo victorianus* is listed under the global conservation list as Critically Endangered.They comprise the riverine fish of the Victoria Nile in the true sense and are part and parcel of the fish diversity and ecology of the river. The study to date does not draw a comprehensive picture of the population density of these species nor provides a clear picture of its life cycle behavior on migration and spawning.

It is therefore recommended to carry out an extensive monitoring of the riverine fish, their migratory and swimming behavior in the Victoria Nile. Such monitoring shall be carried out in 3 stages. Stage I should monitor all the riverine fish every month for a period of 1 year. In Stage II, the target riverine fish based on the results of Stage I should be monitored on a seasonal basis. Such monitoring works should be carried out 4 times a year for a period of one year. In the third stage, the target riverine

fish should be monitored for the critical migration seasons for 3 years, based on the findings of Stage I and Stage II monitoring.

A team of Consultants comprising of an International Expert and Experts from NaFFIRI, as required, should conduct the monitoring work

b. Adaptive management strategy

One of the key outputs of the above suggested monitoring program apart from monitoring the biodiversity richness is to design an adaptive management strategy for the future. Based on the findings of this monitoring, additional adaptive management measures may be warranted. For example, to minimize the impacts of the barrier effects on the target riverine fish, some of these fish could be captured below the Isimba Dam and relocated above it. This might help to maintain viable populations (or improved genetic diversity) of the target migratory fish species. Such an activity, however, would need to be decided in the future, based on the monitoring findings with respect to the populations and migratory behavior of these fish species after the Isimba Dam is operational.

B The IHPP flooding effects on the natural habitats of fish on the KFS and mitigation measures

Impacts

The fish species of the Victoria Nile River are mostly suited to the lotic environment. Some of the fish species of the Upper Victoria Nile are also found downstream of Lake Kyoga and elsewhere in around Lake Victoria and have the resiliency to co-exist both in the lentic and lotic environment.

The NaFIRRI stud**ies** of 2000 and 2006 have noted 3 riverine species namely: *M. kannume, B. altianalis and Labeo victorianus* which prefer the riverine habitat to complete their life cycles particularly spawning. Many of the *Haplochromine cichilids* reported in the Victoria Nile have restricted natural habitats[98] and prefer the shallow riverine (lotic) habitats with a rocky, sandy and muddy substratum of importance is the resiliency of these species in the changing habitat conditions which is not well understood.The NaFIRRI 2016 study concludes that the decline in the *Haplochromine cichilids* species diversity and population in the Bujagali reservoir and immediately downstream of the dam is to due to the low resiliency of these species to changed conditions of

[98] *Nile Power; W.S Atkins; and Fisheries Resources Research Institute, 2001. Haplochromine Habitats Study. Fisheries Resources Research Institute, Jinja and National Fisheries Resources Research Institute (NaFIRRI), 2016. Habitat Characteristics and Haplochromine Fish Diversity of the Upper Victoria Nile: Towards the Development of Biodiversity Friendly Hydropower Projects. Draft Technical Report; and Nile*

natural habitats[99]. A comparative analysis of the *Haplochromine* species richness across Bujagali dam based on the study by Atkins (2001) and NaFIRRI (2016) also substantiates the conclusion of NaFIRRI 2006 Study (refer Table 17, Section 4.1.2 E).

The change in the natural habitat from lotic to lentic due to reservoir formation is very likely to impact on the existing natural habitats of the fish species for both the riverine fish species and the *haplochromine cichilids* not only in the flooded parts KFS but also along the entire part of the IHPP reservoir downstream.

The probable impacts of the change in the natural environment from lotic to lentic on the riverine fish and *Haplochromine cichilids* is a likely decline in the species diversity and abundance, and some of the species dependent on lotic habitats might completely disappear from the area to be inundated by the Isimba reservoir. The impact of such a change is likely to be very large for the IHPP reservoir area as it involves 43 *Haplochromine cichilids* out of 78 reported in the Upper Victoria Nile. Many of these species are endemic to Uganda, although just one-- a presumed species (not yet scientifically described) known as *Neochromis* sp. "Red Pelvics" in NaFIRRI's 2016 report--has only been found to date from from within the future Isimba reservoir area.

The impact rating is considered high because it affects a number of IUCN Red Listed *Haplochromine* species of Global conservation significance. One of these species (*Neochromis simotes* - Data Deficient has only been recorded in the Upper Victoria Nile (above and below Isimba Dam). The other *Haplochromine cichilids* species that are endemic and of Global conservation significance and would potentially be affected by the IHPP reservoir include: i) Extinct - *Xystichromis bayoni*, ii) Critically Endangered - *Astatotilapia brownae*, iii) Vulnerable - *Neochromis gigas, Lithochromis xanthopteryx, Ptyochromis sauvagei*, and *Pyxichromis orthostsoma*, and iv) Data Deficient - *Haplochromis lividus, Xystichromis nuchisquamulatus,* and *Xystichromis phytophagus.*

IHPP converts about 59% of the lotic environment of KFS to the lentic environment. The impact rating of the IHPP flooding on KFS is considered direct, large, negative and irreversible (***Figure 80***) because it is likely to affect the 20 native species of *Haplochromines* out of the 61 reported from the Upper Victoria Nile comprising 3 species of Global conservation significance namely: *Astatotilapia brownae* (Critically endangered), *Neochromis gigas (*Vulnerable*)* and *Xystichromis nuchisquamulatus (*Data deficient*).*

[99] *National Fisheries Resources Research Institute (NaFIRRI), 2016. Habitat Characteristics and Haplochromine Fish Diversity of the Upper Victoria Nile: Towards the Development of Biodiversity Friendly Hydropower Projects. Draft Technical Report; and Nile*

Figure 80: Flooding effects to fish species on the KFS

Impacts	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Natural habitats of riverine fish and *Haplochromine cichilids*		▲							

Apart from the direct flooding as discussed above, there will be indirect impacts of the reservoir downstream on KFS because of fragmentation of the existing lotic environment by the intervening lentic environment after the formation of the reservoir.

Mitigation measures

a. Modification of KFS boundaries

As discussed in Section 7.2.1 on the mitigation measures, there are 3 options: to avoid, minimize or accomodate **t**he envisaged residual impacts by modification of the KFS boundary. For reasons stated above, the avoidance and minimization measures were not preferred as they do not meet the intended power generation objective of the IHPP. With the current development proposal, the losses particularly on the areas of the natural habitats of the target fish species, there is likely to be high residual impacts on the fish species which could not be mitigated on site and will remain as the residual impact throughout the project life. To address the residual impacts of the IHPP on KFS 'the KFS boundary modification option is preferred as the best solution. While the IHPP's impacts on aquatic biodiversity are not fully mitigated, the proposed KFS expansion upstream by about 12km is expected to adequately mitigate the biodiversity losses in that they are specifically attributable to the inundation of almost 6 km of the fast-flowing river within the existing KFS.

The KFS Extension Area as proposed from the analysis of the different available options (refer Section 5.5) has a number of biodiversity additions not only related to fish diversity richness but also related to the area of potential natural habitats.

Table 70 presents the additions to the fish diversity richness on top of compensating for the lost natural habitats in the modified KFS by augmenting the KFS Extension Area to mitigate the impacts on the affected fish species natural habitats in KFS.

Apart from *Haplochromine cichilids,* 12 other fish species are common to both KFS and the KFS Extension Area. Two species (*Rastrineobola argentea* and *Synodontis afrofischeri)* were only recorded in the KFS Extension Area. Fish species of Global conservation concern occur in both the existing KFS and the proposed KFS Extension Area.

Table 70: Value addition in natural habitats and fish species diversity of KFS through Environment Offsets

Particulars	Total KFS	Affected by IHPP	Remaining after IHPP flooding	KFS Extension Area (Total)	Common to KFS and KFS extension area	Modified KFS (Total)	Additions to KFS in the modified KFS
No of Fish species excluding H*aplochromine cichilids*	12		12	14	12	14	2
No of Fish species of Global Conservation Significance excluding *Haplochromine*	1		1	1	1	1	0
No of Haplochromine cichilids species	20		20	42	14	47	27
No of H*aplochromine cichilids* of Global Conservation significance	3		3	7	2	8	4
Habitat area (ha)	481.32	276.28	205.04	570.65		775.69	294.37

Among the *Haplochromine cichilids* whose natural habitats are severely affected by the IHPP flooding, 14 species are common to both exiting KFS and the proposed KFS Extension Area, which also includes: one vulnerable category species and one data deficient category species namely: *Neochromis gigas* and *Xystichromis nuchisquamulatus,* respectively. Existing KFS has 6 species not reported from the KFS Extension Area; one of these species, *Astatotilapia brownae,* is of global conservation significance (listed as Critically Endangered) but it has been found in a portion of the existing KFS that will not be affected by Isimba. These species shall have to be managed and protected in the Upper Victoria Nile by habitat management in the remaining KFS.

Additional 26 species are recorded from the KFS Extension Areas which are not reported from the existing KFS. This adds value to the *Haplochromine cichilids* species diversity richness in the modified KFS. These species include*: Haplochromis sp., Haplochromis sp.* purple yellow*, Haplochromis sp.* thick skin like*, Harpagochromis sp., Harpagochromis sp. guiarti complex, Mbipia cf. mbipi, Mbipia sp., Mbipia* "red pelvics*", Neochromis omnicaeruleus, Neochromis sp., Paralabidochromis cyaneus, Paralabidochromis flavus, Paralabidochromis sauvagei (rockkribensis), Paralabidochromis sp., Paralabidochromis sp.* red breast new*, Paralabidochromis sp.* yellow multispot*, Prognathochromis guiarti, Psammochromis sp., Ptyochromis sauvagei, Ptyochromis xenognathus* red pelvic*, Pundamilia cf. azurea, Pundamilia cf. macrocephala, Pundamilia sp. big blue, Pundamilia sp. blue lip, Xystichromis phytophagus,* and *Xystichromis sp. flameback.* Among these species *Ptyochromis saFuvagei,* and *Pundamilia cf. azurea, Pundamilia cf. macrocephala* are in the Vulnerable Category Red Listed Species whereas *Xystichromis phytophagus* is under the Data Deficient Category.

b. Short Term, Mid term and Long term fishery monitoring to generate a database on biodiversity species richness and other indicators

Limited studies have been conducted to establish the fish diversity in the Upper Victoria Nile. The available studies of NAFIRRI 2000 and 2006 and that of Atkins 2001 and NaFIRRI 2016 do not fully characterize the fish diversity, habitat conditions and behaviors in the Upper Victoria Nile.

A comparative study of 2001 and 2016 with regard to the *Haplochromine cichilids* reveals relatively little correlation in the species composition across the year. This finding highlights the difficulty of sampling for this species group (these fish are not easily caught) as well as the overall high species diversity within the Upper Victoria Nile. Recording of more species in 2016 compared to 2001 study indicates that the surveys are still not adequate to capture the species composition of the area. To have an overall assessment of the *Haplochromine cichilids* and other fish species, their preferential

habitat conditions, lifecycle behavior, etc a comprehensive study is required covering all the months and seasons of the year.

Therefore, a 3-stage monitoring of the fish including *Haplochromine cichilids is* proposed. The objective of the Stage I study is to generate the year round database on a monthly basis on the fish species diversity richness across the Victoria Nile and their distributional range including niche habitat requirements, feeding and spawning behaviors, etc. The Stage I study should be limited for a period of one year.

The Stage II study has an objective to verify the information in the database gathered during the Stage I study with some degree of confidence. It should be based on seasonal monitoring works to be undertaken at least once in 4 months for a period of 1 year.

The Stage III study should be aimed at strengthening confidence on speices diversity database of Stage I and Stage II studies. In this stage fish monitoring will be carried out in the critical months of the year for a period of 3 years.

For the selection of the monitoring sites, the Victoria Nile should be divided into 3 compartments based on the species distribution of the Atkins 2001, and NaFFIRI 2016 studies. These studies indicated that the Victoria Nile has a distinct fish assemblage which represents an affinity to the Lake Victoria in the southern section, an intermediate section comprising of fish assemblages those are distinctly different from the assemblages of the Victoria Nile and Lake Kyoga in the South and North and the Northern stretch of the river comprising of fish assemblages with an affinity to the Lake Kyoga. A number of monitoring locations within each compartment shall then be identified based on the different habitat types of the river, such that all the potential habitat types are covered by the monitoring works to present a comprehensive picture of the fish diversity particularly of H*aplochromine cichilids.*

Most of the monitoring works will be carried out by the National Experts. NaFIRRI has experts and experience to carry out such monitoring works and could be entrusted for the works. The NaFIRRI experts will carry out the works under the guidance of International Experts who have experience on fish studies of similar diversity in Uganda or elsewhere.

The monitoring works will include documentation of water quality, macro-invertebrates, phyto-planktons, zoo-planktons and algae, etc. Apart from the fish diversity, monitoring will be carried out to understand the habitat conditions preferred by these fish, food web, optimum water quality requirements, etc to enable development of future adaptive mitigation strategies to minimize the impacts of barrier effects vis-a-vis flooding and water level fluctuations, if there will be any.

c. Adaptive management strategy - Habitat management and Restoration Plan

One of the key outputs of this study in terms of the adaptive management strategy is a plan for habitat management in the modified KFS and beyond in the reservoir areas of the Owen Fall Complex dam, Bujagali and Isimba and downstream section of the river between Isimba and Lake Kyoga. The objectives of the habitat management plan are to:

i. Identify the areas of natural habitats of the target fish species and other important fish species and delineate them in maps and sites. The target fish species are the fish species of Global Conservation Significance as per IUCN;
ii. Provide pragmatic habitat improvement action programs for the target fish species and other important species for the restoration of the natural habitats where the habitats are in degraded conditions due to human interference, fishing, pollution, siltation, tourism or the loss of rocky substratums;
iii. Prepare guidelines to local fishermen on what can be done and what cannot be done for a sustainable fishing activity;
iv. Prepare guidelines to tourist operators on what can be done and what cannot be done for sustainable tourism promotion;
v. Any other protection actions that are essential for habitat restoration and protection such as creation of rocky substratums, erection of rocky gabion walls on the shore area of the river banks, creation of secured wetland habitats, etc.

d. Captive Breeding and Reintroduction of Threatened Fish Species

The *haplochromine cichlids'* natural habitats of fish hatchery development and fish stocking are potentially impacted not only by IHPP but also by the Bujagali and Owen Fall Dam Complex. Envisaged cumulative impact of hydropower development in the Upper Victoria Nile are very likely to have an unprecedented toll on the natural habitats of the *haplochromine cichilids* in the Victoria Nile. Though *haplochromine cichilids* are reported in Lake Victoria and other places, they do not represent the species types as specialized in the riverine environment as in the Victoria Nile. Most of them are endemic and many of them are listed in the IUCN Global Conservation List.

In view of the above ecological significance of the haplochromine cichilids, the additional impacts of IHPP flooding is likely to result further natural habitat loss and potential decline in the in-situ breeding environment. The modification of the KFS boundaries alone, thus, is not likely to ensure the population and in-situ breeding of all types of the haplochromine cichilids of the Upper Victoria Nile. In consideration of the above likelihood, as an added precautionary measure, it is recommended to carry out ex-situ captive breeding of *haplochromine cichilid_* species of priority conservation

concern. As more is learned of their in-situ survival requirements and the available post-Isimba aquatic habitats, the fish species to be considered for potential captive breeding in hatcheries could include *Oreochromis. variabilis, Brycinus jacksonii, Synodontis victoriae, Haplochromis lividus, Neochromis simotes, Ptyochromis sauvagei, Pundamilia azurea, Pundamilia igneopinnis, Pundamilia macrocephala, Pyxichromis orthostoma, Xystichromis bayoni, Xystichromis nuchisquamulatus,* and *Xystichromis phytophagus*.

The one presumed species which merits the most urgent attention-- in terms of searching for additional wild specimens and then possibly maintaining a captive population for potential future reintroduction—is the as yet scientifically undescribed *Neochromis* sp. “Red Pelvics”. Based on NaFIRRI’s 2016 report, this fish has only ever been found to date from from within the future Isimba reservoir area, although not within the KFS. It is at risk of global extinction, if it indeed (i) does not occur outside the Upper Victoria Nile stretch to be inundated by Isimba and (ii) requires aquatic habitat types that would not persist within the Isimba reservoir area. Accordingly, it is recommended that NaFIRRI carry out additional survey work in the Upper Victoria Nile to search for additional individuals of this presumed new species before filling of the Isimba reservoir commences. If and when additional individuals presumed to be *Neochromis* sp. “Red Pelvics” are captured during this survey work, they should be kept live and brought into captivity for possible breeding and eventual re-introduction to the wild in potentially suitable habitat upstream or downstream of Isimba.

C. Reservoir fluctuation effects on the Natural Habitats

Impacts

To operate the power plant at the peaking mode in the morning and evening hours while maintaining the water head for the maximum power output will require regulating water in tandem with the inflow water in the reservoir. This is because the reservoir water holding capacity for water regulation is limited to meet the requirement for peak power generation.

The relationship between water inflow and outflow in the reservoir and the corresponding water level fluctuation in the reservoir has been worked out [100](***refer Section 5.3.2.5 and 5.4.2.4)***. The expected daily water level fluctuation within the portion of KFS will have insignificant impacts on the natural

[100]*KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN, AS, 2012. Feasibility Study Isimba Hydropower Plant and associated Transmission line. Main Report. Vol. II a.;*

habitats of *Haplochromine cichilids.* This is because the original natural habitats of these fish in the area are already impacted by the initial flooding.

Mitigation measure

Since the daily fluctuation of the reservoir levels is not going to affect the natural habitats of the reservoir area, which have already been modified by the initial flooding, mitigation measures have not been prescribed.

7.2.2.2 Impacts on Natural Habitats - Terrestrial flora and fauna

In quantitative terms, the IHPP reservoir inundates about 12.61 ha or 0.97% of the terrestrial habitats on KFS. The impacted terrestrial habitats include about 11.9 ha of the Nile Bank CFR constituting about 1.68% of the Nile Bank CFR. These was included in the Valuation Report for ISHPP and NFA will be compensated to enable establishment of an altertive forest else where. The trees to be partially inundated do not include the species of Global Conservation Significance. It is to note that the Nile Bank CFR is one of the integral environmental components of Bujagali IA to be protected. Though the percentile of the habitat loss is too small to cause any significant impact to the terrestrial flora and fauna, the impact rating is evaluated as low negative and irreversible (***Figure 81***).

Figure 81: Environmental evaluation (Terrestrial flora and fauna) rating

Impact	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Loss of Terrestrial Flora				▲					

Table 71: Value addition in the floral and faunal biodiversity richness of KFS by Environmental Offsetting at the Modified KFS

Particulars	Total KFS	affected by IHPP	Remaining After IHPP Flooding delete	KFS Extension Area (Total)	common to KFS and KFS extension area	Modified KFS (total)	Additionality to KFS in the modified KFS
C. Floral diversity							
Nos of Tree species	39		39	29	15	53	14
Nos of Tree species of Global conservation significance	1		1	1	1	1	0
Habitat Area (ha)	795.65	12.61	783.04	911.12		1694.16	898.51
D. Faunal diversity							
Mammals							
Nos of Mammal Species	17		17	15	15	17	0
Nos of Mammal Species of Global Conservation Significance	3		3	3	3	3	0
Habitat Area (ha)	795.65	12.61	783.04	911.12		1694.16	898.51
Birds							
Nos of Bird species	54		54	57	39	69	15
Nos of Bird species of Global Conservation Significance	0		0	0	0	0	0
Habitat Area (ha)	1276.97	288.89	988.08	1481.77		2469.85	1192.88
Butterflies							
Nos of Butterfly species	35		35	26	26	35	0
Nos of Butterfly species of Global Conservation Significance	0		0	0		0	0
Habitat Area (ha)	1276.97	288.89	988.08	1481.77		2469.85	1192.88

Note:

** = The habitat area for mammal includes land area only*

*** = The habitats for Birds and Butterflies include both land area and water body area*

With the implementation of the proposed KFS modification, the following biodiversity richness and habitat area will be added to the modified KFS (***Table 71***). By integrating the KFS Extension Area with the remaining KFS Area, the overall area of the KFS will increase by about 93.5% (1192.88 ha). The land area will increase by 113% (898.51 ha) and water area by about 61% (294.37 ha).

Floral diversity in terms of tree life forms in the remaining KFS and KFS Extension Area have 15 species in common, while the KFS extension adds 14 additional species in the modified KFS. These species include: *Albizia zygia, Annona senegalensis, Antiaris toxicaria, Atocarpus heterophyla, Cassia mannii, Celtis durandai, Combretum molle, Cordia Africana, Cupressus lustanica, Dombeya bagshawei, Erythrina abysinica, Sapium elipticum, Tectona grandis,* and *Terminalia superba.* These tree species are additions in the modified KFS. The tree species of conservation significance is also common to both the remaining KFS and KFS Extension Area.

15 species of mammals are common in the remaining KFS and KFS Extension Area. The mammalian species of Global Conservation Significance area are also common. Two species found in the remaining KFS are not reported from the KFS Extension Area, namely *Heliosciurus gambianus* and *Herpestes ichneumon.*

39 avian species are common to both the remaining KFS and KFS Extension Area. Ten avian species reported in the remaining KFS are not reported from the KFS extension area, whereas an additional 12 species are reported from the KFS extension area. These 12 species are the additions in the modified KFS and they include: *Tockus nasutus*, *Cypsiurus parvus, Eurystomus glaucurus, Dyphorophyia castanea, Lanius excubitoroides, Dryoscopus gambensis, Cinnyrisery throcerca, Musophaga rossae, Lamprotornis purpuropter, Colius striatus, Pogoniulus scolopaceus* and *Pogoniulus subsulphureus.*

II. Mitigation measure

The environmental or biodiversity offset prescribed to mitigate the residual impacts on the environmental values and natural habitat losses of KFS (refer Section 7.2.1, II, c and 7.2.2.1 B. II. a) serves in the mitigation of the loss of the flora and habitat loss. Additional mitigation measures are not required to mitigate the envisaged residual impacts.

7.2.2.3 Impacts on Natural Habitats - Aquatic Flora

I. Impacts

Nearly 1.85% of the woodland and wetland areas combined will be flooded in the KFS area by IHPP. As these areas occupy the near shore zone of the reservoir, there will be little or no impact on the wetland and woodland floral species. Instead the habitat by area will increase (***Figure 82***).

Figure 82: Environmental evaluation (Wetland and woodland floral species) rating for alternatives considered

Impacts	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Aquatic Flora					▲				

7.2.3 The IHPP impacts on socio-economics and spiritual values of KFS and mitigation measures

KFS represents a landscape outside the typical village settlements of Central and Eastern Uganda. However, the KFS land units have been exploited by the adjoining village communities for agriculture; forest products, fishery, and spiritual satisfaction (refer Section 4.1.3). More recently, with the development of road infrastructure, even outsiders are involved in the water based tourism industry (refer section 4.1.4).

The IHPP flooded portions of KFS is likely to impact the socio-economics and the spiritual values of KFS. This section presents the potential impacts of the IHHP flooding under various reservoir alternative levels.

A The IHPP involuntary land and property acquisition and related displacement and mitigation measures

I. Impacts

As KFS creation under Bujagali IA did not acquire land nor impose a restriction on the land use within KFS, parts of the KFS land area are still traditionally owned by the households living close by (refer Section 4.1.3). A few of the land owners have even built residential and other structures on these lands. Cadastral maps show 73 affected land owners within KFS affected by IHPP (refer

Section 4.1.3). Of the total land owners, 5 have built residential structures on their land (refer Cadastral map***, Appendix 14***).

The land owners and settlers affected by IHPP have already been identified in the IHPP RAP report (2013) and the affected property is also evaluated as per the land acquisition and resettlement procedures of the GoU. The IHPP RAP report thus recognizes 5 APs as physically displaced out of the 73 APs identified and the rest as economically displaced. Tourism Operators are not to be physically displaced from land since their operations are mainly carried out on the river. However since they will be economically affected the GoU has considered them for compensation for loss of revenue under the Community Development Action Plan (CDAP). Eight major tourism businesses that operate in the Nile region to be affected by IHPP have been earmarked for compensation. IHPP ESIA (2014) budgeted for an USD 10 Million for compensation of Tourism Operators. However according to the MEMD Community Development Action Plan (CDAP) draft report six out of the eight tourism companies have submitted compensation claims amounting to USD 30.9 million (the submitted compensation costs are still subject to revision and negotiation with GoU through MEMD).

Despite the small land area to be acquired within KFS, the implications of the IHPP involuntary land acquisition within KFS on the affected APs are evaluated as large and negative because most of the PAPs are from poor economic backgrounds. A recent sample socio-economic survey of the KFS households (refer Section 5.1.3) reveals that nearly 79 % households in KFS has an income below US$ 5000 per annum and live below the poverty line.

II. Mitigation measures

The IHPP SIA and RAP studies have already included the PAPs of the KFS impacted areas for the purpose of Resettlement and Rehabilitation. A resettlement Policy and Entitlement Matrix has already been developed in compliance to the Ugandan Laws and the International best practice Policies (refer section 1.2). The primary goal of the RAP policy is to ensure that the IHPP APs livelihood is restored to at least well better than the pre-project scenario. An implementation Institutional structure with details of roles and responsibilities for compensation, resettlement and rehabilitation is already in place. Monitoring/Auditing of the RAP implementation (internal and external) is also in place to ensure that the Resettlement Action Plan is implemented as per the Resettlement Policy and Entitlement Matrix. This ESIA recognizes that agriculture comprises not only the single large provider of employment, but also the major source of livelihood**.** As a safeguard mechanism additional social-economic studies need to be made to evaluate, measure and mitigate probable adverse social-economic impacts to poor communities whose agricultural based livelihoods have also depended on the proposed Extension Area. It will be important to map out a Livelihood

Management Strategy that will benefit them. It is noted that a grievance mechanism has been developed and structured such that any complains with regard to RAP implementation is given due attention in time to resolve the issues of un-satisfaction to create a win-win situation. But to wait for poor households to complain would not be fair considering the characteristic voiceless nature of this category. The IHPP Developer (UEGCL) must take consideration of this as part of the wider provisions of the RAP to be implemented in the spirit that such implementation is well monitored and ensured by the NEMA.

B. The IHPP impacts on other Rural Economics of KFS and mitigation measures

I. Impacts

Creation of KFS under Bujagali IA and subsequent KO-SMP have not imposed restriction on the resource use of KFS to the local communities. Currently the imposed restriction on the economic activities within the 100m zone on either bank of the river is related to the legal compliance of prior legislative instruments related to Forests and Wetlands[101].

As discussed, the other economic activities of the communities on KFS relating to the livelihood of the adjoining villages are extraction of forest products and fishery (refer Section 5.1.3.3) of the KFS Area.

Since the flooding of KFS by IHPP development has minimal impacts on forests, the envisaged impacts are insignificant on the economic activities of the HHs of surrounding villages depending on the forest resources of KFS.

The KFS flooding by IHHP is expected to increase the area of the water body and wetlands, thus increasing fish habitats. Though some fish are affected by the flooding, the others preferring a lentic environment will have a prolific increment in population. The villagers depending on the fishery economic activity for livelihood in the KFS may in fact experience positive impacts in their catch and will not be adversely affected.

However, imposition of restriction on the resources, particularly fishery as envisaged in the Adaptive Management Strategy (refer Section 7.2.2.1 B. II.c) will have a direct implication on the fishery related economics of the communities. In such a case, the envisaged impacts are evaluated to be medium and negative.

[101] *National Environment (Wetlands, River Banks and Lakeshores Management) Regulations, 2000, and National Forestry and Tree Planting Act, 2003*

II. Mitigation measures

In case restriction on the fishery activities are imposed as a part of the Management Strategy for the protection and restoration of fishery habitats, the fishermen involved in the fishing activities for livelihood will have to be addressed through payments for environmental services. The hydropower developers should be made responsible for such payments. NEMA as a Regulating Authority will make Developers of hydropower on the upper Victoria Nile responsible for such payments based on a mutually agreed basis.

As the exact number of such fishermen involved in the fishing activities within KFS are not known. It is proposed to conduct such an inventory survey of fishermen whose livelihood partly or wholly depends on the fishing income.

C. The IHPP Impacts on tourism within KFS and mitigation measures

a. Impacts

The water based tourism industry in the Nile River corridor is not confined to some geographical boundary rather it covers the whole stretch of the free flowing Nile River starting from downstream Bujagali Dam to Kyoga Lake. Since rapids and falls are confined within the stretch between Bujagali to downstream Isimba, the water sports tourism industry operates within these limits. The normal water sports operations, however, are confined within the Bujagali and Hairy Lemon Islands (about 24 km river stretch) which includes 10 km stretch of the free flowing Nile within the geographical limits of KFS comprising 7 rapids and falls out of the total 18 in the river corridor (refer Section 4.3.6, ***Table 38*** and ***Map 16***).

The IHPP development and operation is very likely to affect the flourishing water sports related tourism business of the Victoria Nile. Consultation with the representatives of the water sports tourism business reveals this hard reality. ***Table 72*** presents the IHPP impacts on the KFS tourism related indicators for the different reservoir level alternatives.

Table 72: Adventure tourism indicators across the alternative reservoir levels of KFS boundary limits

Adventure tourism indicators	KFS	IHPP impacts
Free flowing river length km)	10.16	5.7
% loss in KFS		56.10
Rapids and falls (Nos)	7	2
% loss in KFS		28,57
Major Island swarms (Nos)	7	4

From the technical perspective the impacts on the tourism related indicators within KFS are presented in ***Figure 83***, which are different for different indicators. IHPP will have large to medium negative and irreversible impacts on the water based tourism within the KFS limits.

Figure 83: Environmental (Adventure Tourism) rating of the alternatives within KFS

Impacts	Rating								
	Negative				None	Positive			
	Very large (-4)	Large (-3)	Medium (-2)	Low (-1)	Insignificant (0)	Low (+1)	Medium (+2)	Large (+3)	Very large (+4)
Free Flowing River		▲							
The Rapids and fall			▲						
The Island swarms		▲							

From the economic perspective, it is very difficult to determine the business and tourism related resources losses only confined within the KFS limits. More so the losses could not be judged from numerical counts given the various tourism indicators.

Given that the tourism potentials of the Upper Victoria Nile are not documented and mapped, it is therefore difficult to even estimate the tourism potential of the area in economic terms. The economic returns exclusively from tourism industry from the Upper Victoria Nile were estimated at US$ 14.46 million for the year 2015. But this amount generated is for the entire stretch of the Victoria Nile now utilized for the tourism industry and it is unfeasible to be divided for the different stretches of the river in monetary terms.

Tourism Industry Operators, claim that the remaining section of the rapids in KFS alone is not feasible for the tourism industry. A similar argument from the then Tourism Operators were made during the planning and its construction of BHPP then.

The Bujagali Dam in the past also created similar impacts on the tourism business due to loss of a number of rapids and fall between Bujagali Dam and Owen Complex Dams. In those periods two days tourism packages in the Upper Victoria Nile were sold by the operators compared to one day package at present. But the fact is that the tourism revenue even after the construction BHPP continued to rise with associated increase in visitor numbers. In the above context, on the remaining 75% of the rapids in the KFS there is potential of water based tourism in the remaining KFS stretch

similar to post BHPP scenario. So, as claimed by some of the tourism industry operators, there would probably not be a total loss of the tourism industry due to loss of rapids and falls in the KFS.

The loss of river lengths and rapids within KFS will constrain the potential of water based tourism opportunities that were available in KFS, but would probably not collapse the existing tourism industry as claimed. Even with the projected loss of KFS river length and rapids/falls that may result in Operators offering half day packages, there exist ample opportunities to maximize the water based tourism. The water based tourism planning, packaging, and marketing strategies will have to be changed to ehance the available resources in KFS and IHPP reservoir that will be formed for the maximization of economic returns. However, if the above mentioned measures are not put in place, tourism losses will be incurred and could vary between 40 to 50% of the present tourism business – an aspect that would slow down the growth of the tourism industry regionally and nationally. The above value is based on the loss of the one-day package currently operated by the Tourism Industry which links Kalagala Falls with Hairy Lemon Island located outside the KFS limits.

b. Mitigation measures

The KO-SMP (***Appendix 1)*** and the Kalagala-Itanda Ecotourism Development Plan proposed a number of activities for the overall Eco-tourism development of the Upper Victoria Nile including the KFS. These plans and activities are still relevant to mitigate the effects of IHPP on the tourism industry of the modified KFS and beyond. The IHPP SIA (2013) also emphasized on this need and proposed funding assistance for the implementation of KO-SMP by the Developers of the IHPP. As proposed in the KO-SMP, activities to promote and diversify the tourism in the area have yet to be implemented in its spirit. Considering the changed context, a range of additional tourism promotional activities in conjunction with the already proposed KO-SMP activities have been forwarded to rejuvenate the tourism industry in the post IHPP scenario. Some of these measures need to be initiated right from now, so that by the time IHPP comes into effect, Tourism Operators have capacity to adapt the changing situation.

To achieve this, the first requirement is to review and upgrade the KO-SMP Ecotourism Development Plan within the proposed framework with additional activities in the changed context. The funds made available by the GoU from its central treasury for the implementation of the KO-SMP shall be utilized for the upgrading of the KO-SMP in addition to the funds committed by IHPP Developer in the IHPP SIA report. Some of the potential additional activities for the KO-SMP Ecotourism Development Plan have been discussed in the section below, but will have to be internalized into the plan based on wider stakeholder participation particularly the local communities and the Tourism Operators of the area.

A. Expansion of KFS in the remaining Upstream stretch of the free flowing Nile River (KFs Extension Area)

The primary objective of this expansion is to house the natural habitats and environmental and spiritual values of KFS which could not be mitigated on site within the remaining KFS. Nonetheless, this option provides an avenue for confidence building to the Tourism Operators of the area. This will ensure that the remaining stretch of the nearly 16.5 km free flowing river with 9 rapids and falls and 7 swarms of islands will not be affected by future hydropower development. The limited development of the tourism infrastructure and facilities in this modified KFS based on sound social and environmental standards fulfil the objectives of the protection of the modified KFS natural habitats and environmental and spiritual values in the spirit of Bujagali IA. Correspondingly, this will also help restore the lost tourism business and further enhance the tourism income by the diversification of tourism in the area.

B. Demarcation of the access routes at the interface of KFS and IHPP reservoir

The proposed activity has an objective to provide an unhindered access routes for water sports tourists and fishermen from the modified KFS to the newly formed IHPP reservoir. This is an additional measure not envisaged in the KO-SMP Ecotourism Development Plan. This activity envisages extension of water based tourism and the fishing in the newly formed IHPP reservoir from modified KFS downstream. This will establish inter-linkage of the ongoing white water rafting tourism business with that of the standing water based tourism such as: speed motor boats, cruises, house boats, etc.

The Victoria Nile River immediately downstream of the modified KFS has a number of islands at or near the surface of the water. These islands pose risks to the water sports tourists and fisherman alike. Fluctuations of the reservoir levels daily might expose some of the flooded islands in the water withdrawal period. Such unseen protuberances need to be demarcated by water buoys along the River Nile and river shore lines for tourists and other commuter (local fishermen) safety. Partially submerged standing vegetation, are also fenced by water buoys for the safety of the commuters Vis a Vis protection of the available fish and bird habitats. The IHPP Developer will ensure that such potential hindrance on the passage way be permanently demarcated by water buoys and maintained at all times for the safety of the tourists and other local commuters.

C. Development of alternative Tourism activities

In order to ensure sustainability of tourism in the modified KFS and beyond in the newly formed IHPP reservoir (apart from rafting and kayaking) , new activities need to be introduced not only to

compensate for the lost tourism business but also to enhance the competitiveness of the region as a water based adventure tourism destination. Since the modified KFS as well as IHPP reservoir that will be formed have an advantage in water/river based niche activities/products, alternative water based tourism activities should be developed to be carried out on the free flowing river section and in the reservoir that will be created by the dam. The activities that can be developed and the strategies required are summarized in ***Table 73***. Many of these activities and strategies are already inbuilt in KO-SMP, which still has relevance for the promotion of tourism in the modified KFS[102] and beyond.

Table 73: Development of alternative tourism activities in the Modified KFS and beyond

Strategies	Activities
A. Water based	
River Cruises	• Map and mark with buoys navigable sections of the Nile and reservoir* • Set standards/guidelines for existing cruises operating* • Introduce house boat cruises – with accommodation*
Water Park adventure activities	• Identify suitable area for an adventure water park to be established. • Introduce water adventure activities including swimming, water polo, water slides, etc*. • Design a water quality monitoring mechanism*.
Motorized and non-motorized water sports	• Mapping and marking of areas suitable for water sports • Introduce motorized water sports - jet ski, water skiing, para-sailing, wind surfing and kit surfing, canoeing and rowing* • Develop a strategy for organizing water sports competitions* • Design a water quality monitoring mechanism*
Sport fishing	• Develop inventory of fish species* • Zone sport fishing areas*

[102] IHPP EIA and SIA has not proposed any specific mitigation measures for tourism

Strategies	Activities
	• Introduced recreational fishing based on sustainable indigenous methods*
B. Non-water based	
Bird watching	• Develop check list of all birds in the area* • Train local guides on the various bird species in different ecosystems in the area*
Nature walks	• Develop trails along the river bank and in forest reserves
Cycling and mountain biking	• Develop trails along the scenic shores of the Nile and in the forest reserves
Picnicking and Scenic viewing	• Design and develop picnic and viewing sites. • Provide necessary infrastructural facilities.
Camping	• Design and develop camping sites. • Provide necessary infrastructural facilities.

*Note: * Additional activities proposed than the Kalagala - Itanda Ecotourism Development Plan*

In order for the existing cultural assets to be developed for tourism purposes, as stipulated in the KO-SMP Ecotourism Development Plan, there is a need for a mechanism to package and promote cultural tourism products. There is also a need for sensitization and capacity building of the communities to develop products and engage in cultural tourism activities. Using the community based tourism approach, the community should be mobilized and skilled to develop various cultural products along defined community trails which are yet to be realized even after 6 years of the KO-SMP implementation. To provide a more fulfilling cultural experience, in collaboration with the kingdoms of Buganda and Busoga, a cultural tourism center(s)/village(s) should be established on either side of the river banks to show respective cultures.

In general, there is a need for tourism development opportunities mapping to be carried out in the whole of the modified KFS as proposed in the Eco-tourism Development Plan to determine most suitable and economically viable areas where specific activities can be carried out.

D. Development of tourism assets

The modified KFS and the newly formed IHPP reservoir have a number of tourism assets. For the optimal utilization of these assets for tourism business, each of the tourism potential assets in the area and adjoining vicinities require being mapped, updated, and packaged for communication as per the following short-term, mid-term and long-term framework (***Table 74***). KO-SMP has also proposed similar mapping of the tourism assets. In the changed context these assets will have to be mapped for the newly formed IHPP reservoir surroundings as well.

Table 74: Activity framework for tourism assets development and promotion

Period	Activities
Short-term	Tourism assets mapping and zoning
	Enforce existing conservation laws and regulations
	Develop a Strategy to maximally utilize the remaining rapids to a maximum.
	Develop a strategy to effectively utilize other existing tourism resources (apart from rapids).
Medium-term	Develop tourism resource conservation guidelines.
	Design a tourism assets conservation/development financing mechanism.
Long-term	Operationalise the tourism assets conservation/development financing mechanism.

E. Support for tourism infrastructure and facilities and tourism activities

As noted earlier there is need for tourism infrastructure and facilities in order for tourism to effectively develop within the modified KFS.The KO-SMP Ecotourism Development Plan also emphasizes this at the framework level to be determined later based on stakeholder consultations. Well planned and sufficiently distributed infrastructure such as: good roads will help spur tourism development within the modified KFS and beyond since it will help reduce the operating costs of the tourism investors/operators. They include:

(i) Rafting/kayaking support infrastructure – currently each company has to secure a put-in and take-out site along the Nile and set up the required facilities. This is costly and in order to cut costs some of the facilities are improvised (which may compromise visitor satisfaction). To make

the business less costly, a well planned 'collective-use' infrastructure should be established and should be accessible to all operators (at a minimal user fee for covering the maintenance costs).

(ii) Track and trails – in order to ensure that tourism resources are efficiently utilized, a well-planned network of tracks and trails should be laid out within the modified KFS. These will spur the growth of tourism activities such as: nature walks, cycling, quad biking, bird watching and scenery enjoyment, among others. To provide a more exciting and longer experience the tracks/trails on either side of the river bank should be interconnected by boats or ferries across the Nile.

(iii) Accommodation facilities – there is a need to establish eco-friendly accommodation facilities within the modified KFS in order to attract more visitors, with longer stay and increase the trickle effect from tourism. The facilities should include high end, middle range and budget accommodation in order to be able to cater for various categories of tourists. However, caution should be taken to ensure that the facilities are established in compliance with the exiting conservation laws and social safeguards put in place to avoid negative impact on the community. Detailed land use planning should be carried out to ensure KFS is not 'over crowded' with economically unviable and environmentally destructive accommodation facilities.

(iv) For tourism to become vibrant in the modified KFS there is a need for the establishment of Visitor Information Centers (VICs) with well-designed interpretation facilities. VICs should provide detailed information about the natural and cultural resources within the modified KFS and surrounding areas. Well designed and customized signage should be erected at key tourism sites and along the trails and on key access roads to the modified KFS.

(v) Community infrastructure and services - tourism development greatly relies on good support infrastructure to thrive. Therefore, in the modified KFS and surrounding areas there is a need for deliberate effort to target infrastructure improvement and development. The infrastructure and facilities include: good road networks, public ferry to cross the Nile, clean water, adequate and stable electricity supply and security services. Provision of infrastructure and services will reduce the operation costs since currently Operators have to incur high costs accessing various tourism sites through bad roads and most of them who are operating lodges, campsites or restaurants have to provide their own water and power supply.

(vi) Cultural tourism facilities –there is a need to establish infrastructure that will promote cultural tourism. There is need to construct cultural centers/villages where indigenous cultural assets (tangible and intangible) can be preserved. With 2 distinct cultural groups on either side of the Nile banks (Baganda on the western bank and Basoga on the eastern bank), 1 cultural

center/village should be established on either side. Along the cultural centers community crafts and arts with souvenir outlets should be established.

The activity framework for the support of tourism infrastructure and facilities and tourism activities is proposed for the short-term, mid-term and long -term as shown (***Table 75***).

Table 75: Activity framework for tourism infrastructure and facilities development

Period	Activity
Short term	Carry out tourism activities opportunities mapping.
	Infrastructure needs assessment.
	Design strategies to support enhancement of existing activities.
	Design strategies to integrate cultural tourism with water based activities.
	Develop guidelines for establishment of infrastructure and facilities e.g. roads, accommodation, trails, leisure parks.
	Intensify marketing of the modified KFS tourism activities.
Medium term	Establish a Visitor Information Center and install signage.
	Improve existing infrastructure and facilities.
	Interconnect track/trails on either sides of the river.
	Design guidelines for introduction of new activities.
Long term	Develop new tourism products
	Develop new infrastructure
	Design and market new products

F. Community involvement

Community involvement in the planning, decision making, and implementation for benefit sharing are the key aspects discussed in the KO-SMP Ecotourism Development Plan. Despite this, under the current situation there is limited community involvement in tourism and where it exists, it is informal. As a result, the benefit of the community from tourism is minimal and very difficult to quantify. In

order to increase community involvement and benefits from tourism, the following measures should be undertaken:

(i) Support and encourage communities in the modified KFS to form Community Based Tourism Organizations. This will create a formal framework under which communities will be involved in tourism related activities and engage with various Tourism Operators.

(ii) Community members already involved (directly or indirectly) in tourism related activities should be supported to establish formal groups. These include: site guides, rafting guides, porters, craft and art producers and cultural performance groups.

(iii) In order to increase the involvement, the community should be sensitized and skilled in order to increase their capacity to get involved in tourism related activities. They should be trained in vocational tourism skills (such as: tour guiding, rafting and product development among others) and in basic management and financial skills in order to be able to manage Community Tourism Projects.

(iv) Provision of micro-credit facilities where community based tourism organizations can borrow capital to invest in tourism related ventures.

(v) Establish formal structures or framework through which support (for instance through volunteer tourism) to the community can be channeled through.

Design guidelines for private sector-community partnerships – this will guide private sector investment and protect community interests. These can further be strengthened by Local Governments passing by-laws on the 'do's' and 'don'ts' while partnering with communities.

The activity framework for community involvement is proposed for the short-term, mid-term and long -term as shown in ***Table 76***.

Table 76: Activity framework for community involvement

Periods	Activity
Short term	Design a strategy to enhance community involvement in tourism.
	Design a strategy to involve communities in the natural habitat and environmental and spiritual site monitoring, including fishery habitats and water quality monitoring.

Periods	Activity
	Design strategies for the establishment of the local Community Organizations for the environmental and spiritual values and overseeing protection of the tourism activities.
	Train/ community members of the Community Organizations in tourism related fields including protection and monitoring activities.
	Strengthen existing community capacities on tourism related activities.
	Establish micro-credit facilities.
Medium term	Formation of new Community Based Organizations.
	Involve Community Organizations in the protection and monitoring works of natural habitats and environmental and spiritual values.
	Design a framework for private sector-community partnership in tourism.
	Support community tourism related projects.
Long term	Establish community museums.
	Develop self-sustaining community tourism related projects.

7.2.4 IHPP impacts on the spiritual values of KFS

I. Impacts

Of the total 7 cultural/spiritual sites of the KFS geographical boundary, 2 sites at the Kalagala and Itanda Falls recognized as having spiritual values of KFS in KO-SMP are not affected directly or indirectly by the IHPP flooding of KFS. The 4 spiritual sites, namely Kyammese spiritual site at Nsiima Kibaati village, Namuzinda spiritual site at Nsiima Sipoota village, Wabirongo spiritual site at Wabirongo village, and Kyondo spiritual site at Kitambuza village will not be directly affected by the flooding but will be closer to the Nile River water than in the pre-IHPP scenario. The IHPP SIA and RAP reports have also not discussed these 4 spiritual sites as being impacted. These are privately owned and operated sites with a leader or a priest performing the ritual rights and bestowing spiritual blessings (refer ***Table 21*** and ***Map 11, Section 4.1.4***).

Therefore, there are no impacts on the spiritual sites of KFS directly or indirectly due to IHPP flooding and there will be no diminishing effect on the spiritual values of KFS in the post IHPP scenario.

II. Mitigation measures

By the flooding of KFS 4 cultural sites, namely Kyammese spiritual site at Nsiima Kibaati, Namuzinda spiritual site at Nsiima Sipoota, Wabirongo spiritual site at Wabirongo and Kyondo spiritual site at Kitambuza will lie close to the flooded Nile River. These sites are not impacted by flooding but consultation with the leaders of the spiritual sites is recommended.

7.2.5 Summary of the IHPP impacts on KFS

Table 77 presents a snap shot of the impacts of the IHPP on the KFS.

Table 77: Summary of the IHPP impacts on the KFS

Impacts	Nature of Impact	Duration of Impact	Geographical coverage of Impact	Irreversible/ Reversible	Impact Magnitude Rating	Remarks
A. Environmental Values						
Land area	Direct	Long term	Local	Irreversible	Adverse Medium	Impacts the land area of IA
Free flowing river length	Direct	Long term	Local	Irreversible	Adverse Very large	Directly associated with natural habitats of KFS as stipulated in IA
Rapids and falls	Direct	Long term	Site specific	Irreversible	Adverse Medium	
Island groups	Direct	Long term	Local	Irreversible	Adverse Very large	Directly associated with natural habitats of KFS as stipulated in IA
Land Use	Direct	Long term	Local (water environment)	Irreversible	Adverse Large	Directly associated with natural habitats of KFS as stipulated in IA
Natural Habitats						
Barrier effects on natural habitats	Indirect	Long term	Regional	Reversible	Adverse Medium	Indirectly associated with the diversity and population of fish species. Includes endemic and species of

Impacts	Nature of Impact	Duration of Impact	Geographical coverage of Impact	Irreversible/ Reversible	Impact Magnitude Rating	Remarks
						global conservation significance
Flooding Effects on the natural habitats	Direct	Long term	Local	Irreversible	Adverse Large	Directly associated with natural habitats of KFS as stipulated in IA. Includes endemic and fish species of global conservation significance
Reservoir water level fluctuation effects on natural habitats	Direct	Long term	Local	Reversible	Adverse Low	
Terrestrial fauna and flora	Direct	Long term	Site specific	Reversible	Adverse Low	
Aquatic flora and fauna	Direct	Long term	Local	Reversible	Beneficial	
Socio-economic and spiritual Value						
Physical and economic displacement of APs	Direct	Long term	Site Specific	Reversible	Adverse High	Impacts the livelihood of the APS
Fishing economic activities	Direct	Long term	Local	Reversible	Adverse medium	
Forest product extraction	Direct	Long term	Site specific	Irreversible	Adverse Low to insignificant	
Tourism industry	Direct	Long term	Local	Reversible	Adverse Large	
Spiritual values	No Impact					

7. 3 Impacts on the KFS Extension Area/ the Modified KFS

I Impacts

The KFS Extension Area is an area set aside to mitigate the residual impacts that could not be mitigated on site in the KFS. This KFS Extension Area will be protected based on sound social and environmental standards as stipulated in Bujagali IA.

Creation of KFS under Bujagali IA did not acquire private land owned and operated by the local communities and households. It is for this reason that the private lands flooded by IHPP within KFS required involuntary acquisition of land and properties as a part of resettlement and rehabilitation for the IHPP development. The Project affected persons whose land and property was affected within KFS have been taken care of in the IHPP RAP report for resettlement and rehabilitation (refer Section 7.2.3 A).

KO-SMP prepared for the KFS and Mabira ecosystem (KOA) in 2010, has outlined sound social and environmental standards to manage the natural habitat and environmental and spiritual values, which were accepted by the parties of the Association of Bujagali IA. The same principles of KO-SMP will be applied for the protection and management of the KFS Extension Area. KO-SMP has not restricted land use and has provided unrestricted access to the resources to all communities within the framework of the existing Legislations and Regulations.

Discussions with the concerned officials of MoWE reveal that the 100 m of the land on either banks of the river above the highest flood level in the Upper Victoria Nile have been declared as wetlands under the National Environment (Wetland, Riverbanks and Lakeshore Management) Regulations (2000)". Leaving aside CFR, the land area within the modified KFS which largely lies within the 100m zone of the protected wetland should be protected and secured as an offset area.

CFR within the modified KFS are also protected areas under the National Forestry and Tree Planting Act. In other words, nearly all the areas within the modified KFS are already protected areas within the existing legislative framework.

It appears that private lands within the 100 m wetland zone along the Nile River have not been acquired as per the stipulation of Regulation 4 (b). As a result, land use restriction imposed by NEMA without compensation and resettlement as per the Act provisions is not respected by the local communities.

The Nile River banks are under cultivation right upto the water level leading to land degradation and excessive erosion thus river siltation. Similarly, sizable areas of the Nile Bank and Kalagala Fall CFR

are also under cultivation (refer Section 4.1.1.3) and NFA land use restriction other than forestry is not complied with in these area by the local communities.

Restrictions on ongoing activities have a direct impact on the livelihood of the communities who own and operate agro-economic and fishing activities in this area. The level of impacts to the APs, however, will depend upon their socio-economic standing and other modes of livelihood skills to adjust to the changed situation. Such impacts can only be analyzed after detailed targeted socio-economic census and survey of all the affected persons.

The sample socio-economic surveys conducted in the KFS extension area (including the remaining KFS) on the households who own and operate land based resources are mostly poor people below the poverty line. Any new restrictions on the existing agro-economic and fishery activities are likely to have a substantial negative impact on the livelihoods. This impact will need to be adequately addressed to satisfy the affected communities.

Apart from the possible restriction on land use and fishery, KO-SMP proposes a number of developmental activities such as: foot trails, roads, tourist accommodation facilities, tourist centers, cultural centers, toilets, sewage system, etc in and outside the offset areas. These areas planned for development occupy land, which could be community or privately owned, and may require involuntary land acquisition. And such acquisition will ultimately lead to the impoverishment of the APs in a variety of ways.

II Mitigation measures

The experience shows that without acquisition of community/privately owned lands or provision of benefits not less than the annual production/benefit to the owners or users of the lands, it will be rather impossible to achieve the protection and developmental objective of the modified KFS by simply imposing restrictions through policing. Therefore there are 2 options to mitigate the impacts so as to protect the modified KFS. These are:

- Acquisition of the entire community or privately owned lands.
- Providing annual benefits equal to the production potential of the lands.
- Providing income-earning opportunities

a. Acquisition of the entire community or privately owned land

Within the framework of the Constitution of Uganda and many other Acts related to natural resource conservation (Uganda Wildlife Act, National Forestry and Tree Planting Act, National Environment (Wetland, Riverbanks and Lakeshore Management) Regulations, etc), the land area falling within the modified KFS owned and operated by communities and individuals could be acquired involuntarily for the public good. But such acquisition of lands will have to undergo a thorough social and Resettlement Action Pan Study in compliance to the National Resettlement Policy and Acts and the provisions of NEMA.

Land parcels falling within the IHPP Alternative 1 reservoir level within KFS have been identified and census carried out for the valuation of land and property in complience with the national resettlement policy and acts and the provisions of NEMA. Based on the census survey and land valuation studies Resettlement Policy and Entitlement Matrix has already been developed in compliance with the Ugandan laws and the international best practice policies (refer: Social Impact Assessment[103] and Resettlement Action Plan[104]) for parts of the KFS area. **Appendix 5** and **Appendix 6** presents the highlights of the Resettlement Policy / Entitlement Matrix and the Grievance Redress Mechanism adopted for IHPP.

As the modified KFS is similar to the KFS in its socio-economic characteristics (refer section 4.2.3), the adopted IHPP Resettement and Rehabilitation Policies / Entitlement Matrix and Grievance Redress Mechanism could also be applied to the modified KFS. Since Socio-economic cesus of the land owners in the modified KFS area are not undertaken, it has to be accomplished as per the National Resettlement Policy and Acts and the provisions of NEMA for the modified KFS though Ministry of Water and Environment carried out census of the property owners within the 100-meter Zone but no detailed socio-economic status of the communities was carried out. The objective of such census is to verify the land and propery owners of the modified KFS and to determine the loss of livelihood assets for compensation, resettlement and rehabilitation as per the policy and entitlement matrix. If this option of land acquisition is favored to ensure the protection of the Offset Area, it will have to comply with the National Resettlement Policy and Acts in conjunction with International best practice. But with this option, participation of the local people in the protection works may not be ensured and will still require policing at some level for the protection works.

[103] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLA AS, 2014.Social Impact Assessment for Proposed Isimba HPP (Dam and Reservoir); KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPAN AS; 2012.Isimba 132 kV Transmission Line Project, Social Impact Assessment Report;*

[104] *KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2013.Resettlement Action Plan for proposed Isimba Hydropower Project (Flood Area); KAGGA & PARTNERS LTD; FITCHNER GmbH & Co. KG and NORPLAN AS, 2013.Resettlement Action Plan for proposed Isimba 132 kV PowerTransmission Line*

b. Providing annual benefit equal to the production potential of land

With this option, the ownership of the land and property will still be maintained. APs are given incentives in exchange for managing their land to provide some sort of ecological service as Payment for Environmental Services which is at least equal to the annual production value of the land area. APs will still operate the land sustainably by imposing self restircition such as: on clearing of natural vegetation, agriculture on steep river bank slopes, wetland encroachment for farming, and fishing using harmful gears and means, etc. Given the choice of the land use to be developed (in this case greening of the land area) even the carbon fund could be channeled for the partial payment of environmental services. Developer has the responsibility to undertake protection works in the modified KFS area either by involving directly "Proponent Driven Direct" or indirectly "Proponent Driven Indirect" or through the Financial Settlement with the concerned government agency. NEMA being an approval authority and responsible for environmental management in Uganda, has to have a dialogue with the developer in the Upper Victoria Nile to get a commitment on the responsibilities for sustainable financing for KO-SMP in the modified KFS. One of the options is to earmark an additional fixed tariff on the bulk distributed units of electrical energy (kWh). A pre-defined 1 UGX/KWh additional tariff over the existing bulk distributed unit of electricity is adequate for the sustainable financing of KO-SMP in the modified KFS.

c. Providing income-earning opportunities

Provisioning of other income-earning opportunities as a replacement for unsustainable river bank cultivation to the farmers is the other potential option. Among such income-earning opportunities, support to agricultural extension program in farmlands outside modified KFS is the most likely option. But this option is suitable to farmers who also have lands outside modified KFS.

Of the above options discussed, the most effective option for the modified KFS would be to enforce prohibitions on cultivation of river banks and Central Forest Reserve lands in accordance with Ugandan law as well as international standards. For this purpose, a process framework should be designed while updating the KO-SMP. The process framework should outline the participatory process by which appropriate livelihood restoration measures will be identified and implemented.

7. 4 Impacts of construction and Tourism activities on KFS and KFS Extension Area

The IHPP heavy construction works are mainly confined to the Dam and Powerhouse sites. The potential light construction works in the reservoir area relates to reservoir rim stabilization works and vegetation clearance activities if required.

Given the water fluctuations levels in the reservoir in normal operating conditions, limiting to 0.61 m, and the general gentler landscape feature with bed rocks near to the surface as the reservoir rim area shows a high degree of stability to stand the projected reservoir fluctuation. The reservoir rim protection works are not required.

The vegetation around the reservoir flood area including the flooded KFS is minimal with few scattered trees, which will be partially submerged. Many of the trees could stand the partial submergence and provide protected habitats for water loving birds. These partially submerged trees thus act as a habitat replacement related to the submergence of islands and rocks by the reservoir flooding. Further, the trees and foliage provide shades to fish. Besides, submerged trunks also provide refuge and habitats to many of the fish species. In view of the above beneficial aspects of the partially submerged trees in the KFS flooded area, vegetation clearance from the KFS flooded area is not planned.

For the reasons discussed above, there will be no impact of the IHPP related construction within the flooded KFS.

The potential impacts of construction in the modified KFS are the activities of tourism, particularly related with the construction of tourism infrastructures and facilities. The KO-SMP Eco-tourism Development plan proposes to develop tourism infrastructures and facilities in and around KFS (refer section 1.1.2). Similar compatible tourism infrastructures facilities will also be developed in and around the KFS extension area including Namavundu CFR.

Most of the proposed tourism infrastructure within KFS and the KFS Extension Areas are of smaller nature. However, some of the infrastructure, such as: roads, accommodation facilities, waste and sewerage management facilities, etc could vary in size depending on the scale of development.

All of these activities will require environmental clearances from NEMA prior to construction. . Otherwise, a host of environmental problems which include: natural habitat degradation, pollution, public health, and occupational health apart from the cultural and socio-economic impacts may emerge. As of todate, there are no specific guidelines for the Contractors and Tourism Operators working within the administrative footprints at the village and Parish levels covered by the modified

KFS. Under unregulated conditions, it is likely to have a wide range of environmental threats such as: pollution, public health, occupational health, etc, which have direct implications on the natural habitats and environmental and cultural/spiritual values of KFS and the KFS Extension Areas.

II. Mitigation measures

The nature and scale of construction activities related with the tourism infrastructure and facilities within the administrative footprints of the modified KFS are yet to be planned on site. What is known to date is that such facilities and infrastructure are required for tourism promotion in the modified KFS and beyond.

Expected construction works related to accommodation facilities, sanitation facilities, tourism information centers and foot trails, etc, within the modified KFS are small scale construction works involving mostly limited human labor. For such kinds of works there are no requirements for equipment and vehicles, extended construction camps for labors and Contractors, etc. Even these types of works if not controlled could pose risks to the environment of the surrounding areas.

The key risks related to such construction works are: i) construction wastes, ii) solid wastes of the labor force, iii) sanitary wastes related to the labor force, and iv) environmental insensitive behavior of the Contractors and labor force in and around the construction sites.

The impacts related to these small construction works could be effectively mitigated by the following measures.

- Enforcement of the environmental code of conduct to the Contractors and labour force (refer ***Appendix 26***);
- Employment of the local contractors and labour from nearby village (avoids establishment of a camp);
- Restriction on the use of heavy equipment for construction works;
- Establish on -site, temporary sanitation facilities to the construction force;
- Establish first aid facilities on site;
- Establish solid waste collection facilities on-site and collect solid waste off the site daily and transport outside the modified KFS for final management;
- Establish a construction waste collection facility on-site and collect construction waste daily and transport outside the modified KFS for final management;
- On-site burning of waste or vegetation is prohibited;
- Strict prohibition of any hunting, bush-meat purchase, wildlife capture, free-roaming pets, plant collection, or fishing by any contractor or worker;

- Contractor and construction labour force activities outside the construction site is controlled;
- Provide PEP to the labour force and monitor its use by the labour force;
- Prohibit construction camps and storage camps within the modified KFS;
- Apply chance find procedures (refer ***Appendix 26***); and
- Strict and transparent penalties for any non-compliance with these rules.

However, for large scale construction works involving large scale construction force and heavy equipment such as: roads, sewerage plants, etc wide ranging mitigation measures are required. KO-SMP envisages the requirements of such infrastructure for tourism promotion within and outside the modified KFS area. To mitigate the impacts of such large scale construction works an exhaustive mitigation guideline framework is provided in ***Appendix 26*** to cover all kinds of potential construction works. The implementing agencies of the construction works within the modified KFS administrative footprints will use this as reference and incorporate only those sections of the guideline in the contract document for compliance to ensure that the construction activities do not harm the natural habitats, social and cultural fabric and quality of the overall environmental resources.

8 Environmental and social management and monitoring plan

8.1 Objective of the ESMMP

For a construction project, the primary objective of this Environmental and Social Management and Monitoring Plan (ESMMP) is to safeguard the environment, site staff and the local population from site activity which may cause harm or nuisance. This ESMMP, as it is concerned with the protection of the natural habitat and environmental and spiritual vlaues of the modified KFS is the updated KO-SMP implementation framework prepared for the sustainable management of the modified KFS.

The proposed ESMMP or updated KO-SMP implementation framework for the modified KFS ensures transparent and effective monitoring, prevention, minimization, mitigation, and enhancement measures to address the environmental and social impacts associated with IHPP on KFS and impacts related to the updated KO-SMP implementation. ESMMP covers all aspects of planning, construction and operation of the project, which is relevant to the environment within the modified KFS. It is essential to implement ESMMP in the modified KFS right from the planning stage and then continue with it throughout the implementation and management of the KO-SMP activities. It also involves the physical planning, including work programmes, time schedule and allocations for putting mitigation management systems in place, identifying implementing agencies, delineation of a financial plan for implementing the mitigation measures in the form of budgetary estimates and demonstration of its inclusion in the modified KFS budget estimates.

The objectives of the Environmental and Social Management and Monitoring Plan are to:

a. bring the management plans within the modified KFS into compliance with applicable national environmental and social legal requirements and international legislation;
b. outline the mitigating/enhancing, management, consultative and institutional measures required to prevent, minimise, mitigate or compensate for adverse environmental and social impacts of IHPP on KFS and management activities of the updated KO-SMP in the modified KFS;
c. address capacity building requirements to strengthen the updated KO-SMP implementing agency"s environmental and social capacities if necessary; and
d. allocate responsible authorities for each monitoring requirement.

8.2 The Stakeholders of ESMMP

The lead stakeholder responsible for implementing ESMMP or KO-SMP, as per the approved KO-SMP under implementaion in KFS is the MoWE. MoWE is assisted by other Lead Instituions such as: MoTWA, MoLGSD, NFA, NFA of GoU for the KO-SMP plan activities related to the sub-

sector. The IHPP Developer i.e., MoEMD through UEGCL has not been assigned specific roles except advisory in the KO-SMP implementation. Similarly, the District Local Governments and administrators of the County, Sub-county, Parish, and Villages and the local communities. tourism operators and NGOs have been assigned participatory roles in the planning , implementation and monitoring of the KO-SMP implementation.

As Lead Agencies involved in the KO-SMP implementation in KFS are regulating agencies of the government, there is little control on the compliance on the KO-SMP implementaion. It is therfore that this model of the KO-SMP implementation needs some readjustment to make the KO-SMP implementation more effective to address the modified KFS environmental and social managment requirements.

The key stakeholder for planning and implementing the KO-SMP programs in the modified KFS shall be as per the directives of NEMA in the approved conditions of the addendum ESIA. Three potential alternatives for the KO-SMP implementation could be considered by NEMA.

Alternative 1: Proponent driven direct

Under the Proponent Driven Direct, the IHPP developer (MEMD, / UEGCL) itself will be responsible for the implementation of the KO-SMP programs and the regulating Agencies such as: MoWE, MoTWA, MoLGSD, NFA, NFA, District Local Governments and administrators of the County, Sub-county, Parish, and Villages and the local communities, Tourism Operators and NGOs will be involved in the planning and monitoring of the activities.

Alternative 2: Proponent driven indirect

Under Proponent Driven Indirect, the IHPP developer appoints the implementing agency (contractor) who will be responsible for the KO-SMP implementation, while the developer (MoMED/UEGCL) including regulating agencies such as: MoWE, MoTWA, MoLGSD, NFA, NFA, District Local Governments and administrators of the County, Sub-county, Parish, and Villages and the local communities, tourism operators and NGOs will be involved in the planning and monitoring of the activities.

Alternative 3: Financial settlement

Under the Financial Settlement, the GoU/NEMA will appoint the contractor as the KO-SMP implementing Agency while the project developer (MoEMD/UEGCL will provide the agreed financial settlement for KO-SMP implementation. The regulating Agencies such as: MoWE, MoTWA, MoLGSD, NFA, NFA, District Local Governments and administrators of the County, Sub-county, Parish, and Villages and the local communities. tourism operators and NGOs will be involved in the planning and monitoring of the activities.

Of the 3 alternative, Alternative 3 is the recommended option for the KO-SMP implementation. However, there is a need of prior agreement on the alternatives for the KO-SMP management and its sustainable finance between NEMA and the IHPP developer.

Monitoring is recommended in the context of ensuring that the ecosystem function, environmental and spiritual values of the modified KFS is maintained and enhanced at all times. The KO-SMP implementing Developer or Contractor will carry out frontline monitoring works and internal environmental audit, while representatives of the regulating Agencis, and where required, external consultants will undertake monitoring of the KO-SMP implementation and its performance as to the objective of Bujagali IA.

8.3 Stakeholders roles and responsibilities

The organizational structure of the KO-SMP implementation management and coordination for the KO-SMP implementation is depicted in ***Figure 82*** for the financial settlement Alternative.

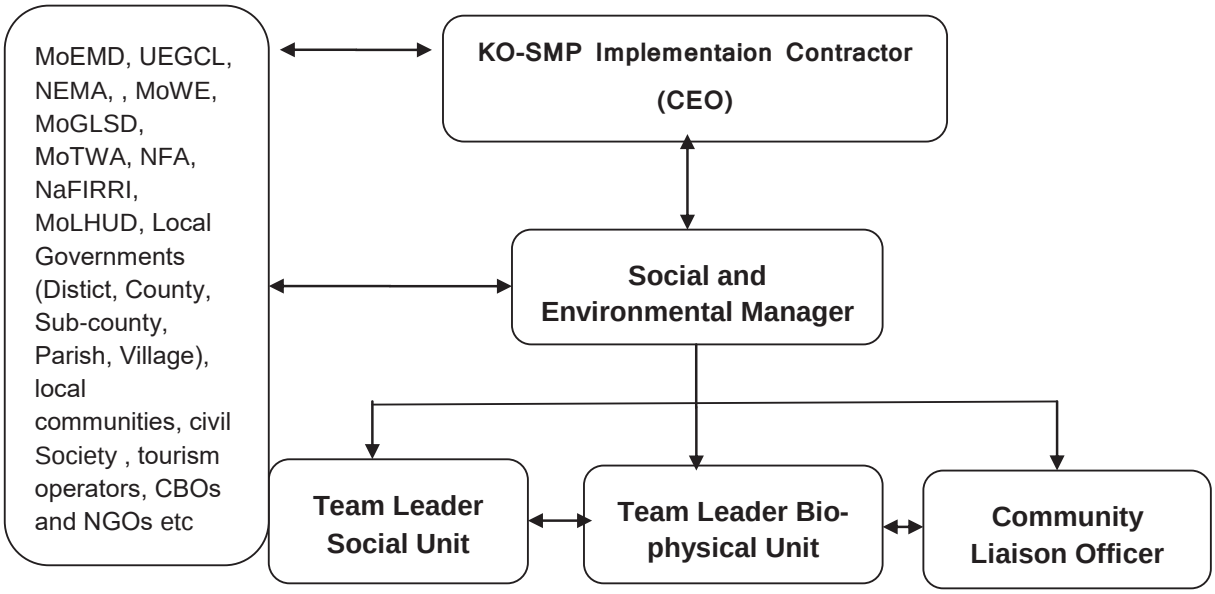
The scope and responsibility of the main stakeholder responsible for implementing and monitoring of KO-SMP are presented in ***Table 78*** for the financial settlement Alternative.

Table 78: Scope and responsibilities of the main stakeholders

Main implementation Stakeholder	Scope and responsibility
The KO-SMP Implemeting Contractor	• The KO-SMP Contractor shall appoint a KO-SMP implementation CEO with an Environmental and Social Manager for the overall responsibility to oversee the environmental and soical safeguard conditions of the KO-SMP implementation. The Environmental and Socail Manager will be assisted by a Team Leader Bio-physical Unit, a Team Leader Social Unit and a Community Liason Officer with required staff to consult the community, implementation of Ko-SMP and its frontline monitoring and auditing of the KO-SMP environmental and social safeguard performance as per the aproved conditions. • Review the approved Addendum ESIA document, particularly the required mitigation measures and the environmental management and monitoring plans. • Review approval conditions provided by NEMA (approval certificate), and permits from Lead Agencies including DoWRM, DoWD, UWA, DoOHS, DoPS, MoIA, MoWE, NFA. • The Contractor should then prepare a Contractor's Environmental, Social, Health and Safety Action Plans to comply with the above requirements. This should include an implementation framework, including staffing and budget. • Frontline monitoring and internal environmental auditing of the KO-SMP implementation its compliance to the mitigation measures and perfromance to meet the objective of Bujagali IA. • Facilitate third party monitoring of the KO-SMP implementation by the representatives of the regulating Agencies or a expert consultant as required. • The Contractor will also consult the general public and disclose information in relation to the KO-SMP schedules related to protection actions, construction, traffic management, public health and safety, and the results of environmental monitoring.

	• All expenditures and costs related to complying with environmental safeguards as applicable to the protection of natural habitat and environmental and spiritual values, construction of sustainable tourism and cultural facilities within the modified KFS would be met by the Contractor. • Update KO-SMP as per the recommendation of this addendum ESIA and the inputs of the KO-SMP stakeholders (,UEGCL ,MoEMD,NEMA, , MoWE, MoGLSD, MoTWA, NFA, FSSD, NaFIRRI, MoLHUD, Local ,local ,(Village ,Parish ,county-Sub ,County ,Distict)governments civil ,communities Society tourism , CBOs a ,operatorsetc)
Developer (MoEMD/UEGCL)	• The Developer will come into Agreement with NEMA for the KO-SMP implementation and it's financing. • Provision required budget to the KO-SMP implementing contractor as agreed with NEMA. • Assist the KO-SMP implementing Contractor with the required information and co-ordination with the other stakeholders of the modified KFS.
Regulating Agencies such as MoWE, MoTWA, MoLGSD, NFA, NEMA ,district governments and administrators of the County, Sub-county, Parish, and Villages.	• NEMA decides on the KO-SMP implementation modality. • NEMA makes the Developer responsible for the sustainable financing of the KO-SMP implementation. • NEMA appoints the KO-SMP implementation contractor based on transparent selection criteria. • All regulating agencies designated representatives for the third party monitoring and auditing of the KO-SMP implementation and its performance to meet Bujagali IA objectives. • All regulating agencies designate representatives for updating the planning of KO-SMP.
Local communities, civil society, tourism oerators, NGOs and CBOs.	• Designate representatives for the third party monitoring and auditing of the KO-SMP implementation and its performance to meet the Bujagali IA objectives. • Designate representatives for the update planning of KO-SMP. • Assist KO-SMP implementing contractor in the implementation of KO-SMP with the other stakeholders in the modified KFS.

Figure 84: Organizational structure and coordination



8.4 Environmental and social management framework

Modification and extension of KFS will have minimal adverse environmental impact if the recommendations and mitigation measures identified in Section 7 are incorporated into all the contracts and followed by responsible parties. The management plans with specific mitigation measures to be implemented are summarized in ***Table 79.*** The implementation period for the mitigation of IHPP impacts on KFS will be completed in the first year of the KFS flooding, whereas the KO-SMP implementation for the protection of the natural habitats and environmental and spiritual values of the modified KFS will continue thoughout the IHPP life.

Table 79: Proposed Environmental and Social Management Plan

SN	Environmental impacts	Mitigation measures	Implementation and monitoring responsibility	Supervision and internal auditing responsibility	External monitoring auditing responsibility	Estimated Costs (USD)
I	**For KFS impacts by IHPP**					
I.A.	Environmental Values					
I.A.1	Land Area	Demarcate area of the mordified KFS as per the recommendation of the Addendum ESIA	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Social and Environmental Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	As per the addendum ESIA approval conditions or as agreed between the parties of association of the Bujagali IA
I.A.2	Free flowing river length	Demarcate area of the mordified KFS as per the recommendation of the Addendum ESIA	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Social and Environmental Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
I.A.3	Rapids and Falls	Demarcate area of the mordified KFS as per the recommendation of the Addendum ESIA	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Social and Environmental Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
I.A.4	Island groups	Demarcate area of the mordified KFS as per the recommendation of the Addendum ESIA	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Social and Environmental Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
I.B	***Natural Habitats***					
I.B.1	Barrier to migratory fish on natural habitats	Short term, id term and long term monitoring of the riverine fish diversity richness, migration behavior, swimming behavior, spawning habitats etc, for the design of a adaptive mitigation strategy which include catch and haul program, and habitat management	KO-SMP Implementation Contractor through NaFIRRI and International KO-	KO-SMP Implementation Contractor Team Leader Bio-physical Unit	DoEMD/UEGCL, NEMA, NFA, MoTWA, MoWE, Districts and local authorities,	3,35,000

SN	Environmental impacts	Mitigation measures	Implementation and monitoring responsibility	Supervision and internal auditing responsibility	External monitoring auditing responsibility	Estimated Costs (USD)
		etc.			Department of Fishery	
B.2	Loss of natural habitats of riverine fishery due to flooding	Demarcate area of the modified KFS as per the recommendation of the Addendum ESIA	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Social and Environmental Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
I.B.3	Loss of natural habitats of the haplochromine cichilids due to flooding	Demarcate area of the modified KFS as per the recommendation of the Addendum ESIA	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Social and Environmental Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
		Short term, midterm and long term monitoring of the h*aplochromine cichilids* fish diversity richness, distributional range, niche habitats etc for the design of a adaptive mitigation strategy which include habitat management in the modified KFS	KO-SMP Contractor through NaFIRRI consultants	KO-SMP Implementation Contractor Team Leader Bio-physical Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.B.1
		Pilot Fish Hatchery Development and fish Stocking of the target h*aplochromine cichilids* in the modified KFS and development of a long term plan for a fish hatchery development for adaptive management and costing	KO-SMP Contractor through NaFIRRI consultants	KO-SMP Implementation Contractor Team Leader Bio-physical Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	75,000
I.C. Socio-economics						
I.C.1	Physical and economic displacement of APs	Compensation, resettlement and rehabilitation of the APs as per the approved IHPP RAP	UEGCL	UEGCL	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in the IHPP RAP report
I.C.2	Adventure Tourism	Demarcate area of the mordified KFS as per the recommendation of the Addendum ESIA	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Team Leader Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1

SN	Environmental impacts	Mitigation measures	Implementation and monitoring responsibility	Supervision and internal auditing responsibility	External monitoring auditing responsibility	Estimated Costs (USD)
		Demarcation of the pathways at the Interface of KFS and IHPP Reservoir using water buoys without the clearing the islands and the submerged vegetation	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Team Leader Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	10,000
I.D.	***Spiritual Values***					
I.D.1	Spiritual sites	Prior information and consultation with the personnel of Kyammese spiritual site at Nsiima Kibaati, Namuzinda spiritual site at Nsiima Sipoota, Wabirongo spiritual site at Wabirongo and Kyondo spiritual site at Kitambuza	KO-SMP Implementation Contractor as per the approval conditions of NEMA	KO-SMP Implementation Contractor Team Leader Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in the RAP administration cost of IHPP
II.	**KO-SMP implementation in the modified KFS**					
II. A.	***Construction impacts of tourism infrastructures and facilities***					
II.A.1	Land degradation, pollution, occupational health and safety, community health and safety etc.	Avoid infrastructure and facilities development within the modified KFS. In case such infrastructure facilities are needed such development shall undergo a EIA study and approval as per the requirement of NEMA prior to the development of such infrastructure	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	No cost
		Enforcement of the environmental code of conduct to the labor force (refer Appendix 26)	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
		Employment of the local contractors and labors of the nearby village (avoids establishment of camp	KO-SMP Contractor through Team Leader Bio-physical Unit and Social Unit	KO-SMP Implementation Contractor Environmental and Social Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local Authorities	Include the costs in the civil contract of the sub-contractor
		Restriction on the use of heavy equipment for construction works	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts	Include the costs in the civil contract of the sub-contractor

SN	Environmental impacts	Mitigation measures	Implementation and monitoring responsibility	Supervision and internal auditing responsibility	External monitoring auditing responsibility	Estimated Costs (USD)
				Leader Bio-physical Unit and Social Unit	and local authorities	
		Establish on site, temporary sanitation facilities (toilets) to the construction force	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
		Establish first aid facilities on site	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
		Establish solid waste collection facilities on site and collect solid waste of the site daily and transport outside modified KFS for final management	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
		Establish a construction waste collection facility on site and collect construction waste daily and transport outside modified KFS for final management	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
		Sub-contractor and construction labor force activities outside the construction site is controlled	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
		Provide PEP to the labor force and monitor its use by the labor force	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts	Include the costs in the civil contract of the sub-contractor

SN	Environmental impacts	Mitigation measures	Implementation and monitoring responsibility	Supervision and internal auditing responsibility	External monitoring auditing responsibility	Estimated Costs (USD)
				Leader Bio-physical Unit and Social Unit	and local authorities	
		Prohibit construction camps and storage camps within modified KFS	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
A.2	Archeological and historical artifacts	Apply chance find procedures (refer ***Appendix 26***)	KO-SMP Contractor through petty contractors	KO-SMP Implementation Contractor Team Leader Bio-physical Unit and Social Unit	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Include the costs in the civil contract of the sub-contractor
II. B.	***KO-SMP Upgrading and Implementation***					
II. B.1	Impacts to natural habitat and environmental and spiritual value of the modified KFS	Carry out detailed baseline survey of the modified KFS which includes physical biological environments of environmental values and their complete documentation; Natural habitats by native community types of flora and fauna and their distribution documented and recorded in maps; . Spiritual sites and importance of these sites; Land ownership and use practices, fishing activities and households depending on fishing for livelihood, Socio-economic census survey of the households owning and operating the lands for livelihood etc.	KO-SMP Contractor through group of expert consultants	KO-SMP Implementation Contractor Environmental and Social Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
		Review and upgrade the KO-SMP in the context of the baseline survey in the active participation of the local communities particularly land owners and users of the modified KFS and other stakeholders (NEMA, MoEMD, UEGCL, UETCL, ERA, MoWE, DoWRM, DoWD, MoWT, MoGLSD, UWA, MTTI, NFA, FSSD, NaFIRRI, MoLHUD , tourism operators, NGOs, Civil Society etc. to ensure that the protection of the	KO-SMP Contractor through group of expert consultants	KO-SMP Implementation Contractor Environmental and Social Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1

SN	Environmental impacts	Mitigation measures	Implementation and monitoring responsibility	Supervision and internal auditing responsibility	External monitoring auditing responsibility	Estimated Costs (USD)
		natural habitats and environmental and spiritual values are uphold and enhanced apart from diversifiacation of the tourism activities to compensate the toursim economic losses.				
		Each of the detailed management plans for the protection shall undergo EIA approval process as to the requirement of NEMA prior to its implementation and the approval conditions complied	KO-SMP Contractor through group of expert consultants	KO-SMP Implementation Contractor Environmental and Social Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
		Implement the protection management plans as per the approval conditions	KO-SMP Contractor through Team Leader Bio-physical Unit and Social Unit	KO-SMP Implementation Contractor Environmental and Social Manager	DoEMD, NEMA, NFA, MoTWA, MoWE, Districts and local authorities	Included in I.A.1
Total Costs USD						**420,000**

8.5 Environmental and social monitoring framework

During project implementation, a framework in the form of a plan is proposed to ensure efficient and effective undertaking of the mitigation measures. Environmental monitoring is used as a tool in relation to environmental management as it provides the basis for rational management decisions regarding impact control. By using the information collected through monitoring, environmental mitigation and benefit enhancement measures can be improved and the works or operation will be modified or halted when necessary. Therefore, the objectives of this environmental monitoring programme include:

- To monitor changes in the environmental conditions as a result of IHPP development on KFS.
- To check on whether mitigation and benefit enhancement measures have actually been adopted, and are proving effective in practice;
- To provide a means whereby any impacts which were not clearly defined/identified/evaluated or unforeseen at the time of preparation of this ESIA Addendum can be identified, and to provide a basis for developing appropriate and additional impact mitigation measures to take into account those newly evaluated impacts;
- To provide information on the actual nature and extent of key impacts and the effectiveness of mitigation meaures and benefit enhancement measures which, through a feedback mechanism, can improve the planning and execution of other similar hydropower projects.
- To ensure that personnel exercise due diligence in carrying out activities.

The proposed environmental monitoring programmes shall include:

I. Compliance monitoring

An environmental compliance monitoring programme will ensure that KO-SMP commitments made to regulatory agencies, and other stakeholders are implemented. Frontline compliance monitoring will be performed by the Team leader Bio-physical Unit and Team leader Social Unit that are familiar with the applicable regulations and will ensure that activities be planned and conducted with the knowledge and understanding of approval requirements. In the event of non compliance, the Team Leaders of the Bio-physical and Social Units overseeing compliance monitoring will immediately report the activity to KO-SMP Contractor CEO through the Environmental and Social Manager and implement measures to achieve compliance.

II. Baseline monitoring

Pre-construction (i.e. baseline) monitoring will be conducted to characterize a variety of parameters associated with environmental components, and facilitate finalization of the envisaged conservation needs. It is therefore recommended that further baseline information be generated for key indicators immediately prior to the anticipated flooding of the KFS.

III. Environmental effects monitoring

After KO-SMP implementation, potential environmental effects of KO-SMP activities will be monitored. Site visual examinations of the environmental features along the Nile River on the KFS protected area will be conducted to identify potential problem areas. This will facilitate the assessment of recovery trends and zones that may require additional restoration activities. Monitoring may include documentation on the following among others:

- Aquatic habitat,
- Species at risk (fish, wildlife and forestry).
- Quality of life of the affected APs before and after KO-SMP implementation.

This monitoring plan (***Table 88***) identifies monitoring activities that will take place, when and by whom and identifies the indicators and data collection methods, allocates the budget and Institutions and persons to implement the plan.

Table 80: Environment and social monitoring framework

Issues for Monitoring	Monitoring Indicator	Monitoring Location	Monitoring Method	Monitoring frequency and timing	Monitoring Responsibility	Monitoring cost (USD)
I. KFS potential flooding area						
A. Baseline Monitoring						
Water quality	Physical, chemical, and micro-biological parameters	Three places at equidistant within the potential flooded area within KFS	Water sampling and laboratory testing	Once prior to flooding	KO-SMP implementation contractor through water testing laboratory	2000
Erosion and siltation	Erosion features along the banks of the Nile River	Within the KFS, potential flooded area	Direct observation and mapping in the appropriate scale map	Once prior to flooding	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
Islands, and rapids	The number of islands	Within the KFS, potential flooded area	Direct observation and mapping in the appropriate scale map	Once prior to flooding	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
Vegetation	Trees and other aquatic vegetation along the Nile river	Within the KFS, potential flooded area	Direct observation and documentation	Once prior to flooding	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
Terrestrial Fauna	Types of terrestrial fauna	Within the KFS, potential flooded area	Direct observation and documentation	Once prior to flooding	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
Aquatic Fauna	haplochromine cichilids fish and natural habitats	Within the KFS, potential flooded area	Fish sampling and documentation of natural habitat area	Once prior to flooding	KO-SMP implementation contractor Hire NaFIRRI personal	10000

Issues for Monitoring	Monitoring Indicator	Monitoring Location	Monitoring Method	Monitoring frequency and timing	Monitoring Responsibility	Monitoring cost (USD)
Spiritual sites	Location and importance	Within and outside the KFS, potential flooded area	Direct observation	Once prior to flooding	KO-SMP implementation contractor Team leader Social unit	Include in the KO-SMP implementation Contractor administrative cost
Physical and economic displacement	Numbers of APs, physically and economically displaced and their socio-economic status	Within the KFS, potential flooded area	Consultation with APs identified in the IHPP RAP study	Once prior to flooding	KO-SMP implementation contractor Team leader Social unit	Include in the KO-SMP implementation Contractor administrative cost
B. Compliance Monitoring						
ESMMP Mitigation Measures	Compliance to the ESMMP mitigation measures	KFS flooded area and Modified KFS area	Records of mitigation implementation, Direct observation, consultation with the local people	*once after the flooding*	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
Approval conditions and other permit conditions	Compliance to the approval conditions of NEMA and other Permit conditions of the central and district governments	KFS flooded area and Modified KFS area	Records of implementation, Direct observation, consultation with the local people	*Once after the flooding*	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
C. Impact Monitoring						
Water Quality	Physical, chemical, and micro-biological parameters as of baseline monitoring	On the same three locations within the flooded KFS	Water sampling and laboratory testing	Once after flooding	KO-SMP implementation contractor Hire water testing laboratory	6000
Erosion and siltation	Erosion and siltation along the reservoir rims	Reservoir area within KFS	Direct observation	Once in 3 months for a period of 6 months	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
Islands, and rapids	Nos of Islands and rapids flooded	Reservoir area within KFS	Direct observation	Daily for a week after flooding	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost

Issues for Monitoring	Monitoring Indicator	Monitoring Location	Monitoring Method	Monitoring frequency and timing	Monitoring Responsibility	Monitoring cost (USD)
Vegetation	Vegetation flooded	Reservoir area within KFS	Direct observation	Monthly for a period of 2 months	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost
Terrestrial Fauna	Affects to terrestrial fauna	Reservoir area and outside within KFS	Direct observation	Monthly for a period of 2 months	KO-SMP implementation contractor Team Leader Bio-physical Unit	Include in the KO-SMP implementation Contractor administrative cost P
Aquatic Fauna	Fish species, particularly Riverine fish and haplochromine cichilids	Reservoir area within KFS	Sampling and direct observation	*Once after 3 months of flooding*	KO-SMP implementation contractor Hire NaFIRRI consultants	30000
Spiritual sites	Nearness to the reservoir area	Outside the KFS, potential flooded area	Direct observation	*Once after flooding*	Team leader Social unit	Include in the KO-SMP implementation Contractor administrative cost
Physical and economic displacement	APs livelihood status after the resettlement and rehabilitation	APs affected by flooding within KFS	Census surveys	*Once*	Team leader Social unit	Include in the KO-SMP implementation Contractor administrative cost
D.Environmental Auditing						
Internal Auditing and reporting	Baseline, compliance and impact monitoring activities of the project and their performance to maintain the environmental and social sustainability	Limited to the KFS impacted areas	Review of records, consultation with local communities, and direct observation	*Once in 4 months*	Manager Social and Environment	Include in the KO-SMP implementation Contractor administrative cost
External Auditing	Baseline, compliance and impact monitoring activities of the project and their performance to maintain the environmental and social sustainability	Limited to the KFS impacted areas	Review of records, consultation with local communities, and direct observation	*Once a year*	Project appoints environmental expert from academia or private sectors	7000
II. Modified KFS and KO-SMP Implementation						

Issues for Monitoring	Monitoring Indicator	Monitoring Location	Monitoring Method	Monitoring frequency and timing	Monitoring Responsibility	Monitoring cost (USD)
A. Monitoring						
Implementation of Mitigation measures as listed in ***Table 76***.	All measures listed in the Table 76	Within Modified KFS areas	Direct observation, documented records,	*Quarterly every year*	MoEMD, NEMA, NFA, MoTWA, and other concerned central and district government authorities	
B. Environmental auditing						
Internal Auditing and reporting	Activities of the KO-SMP implementation and their performance to protect the natural habitats, and environmental and spiritual values of the modified KFS	Limited to the modified KFS areas	Review of records, consultation with local communities, and direct observation	*Once in 6 months*	Manager Social and Environment of the KO-SMP implementing contractor	Include in the KO-SMP implementation Contractor administrative cost
External Auditing	Activities of the KO-SMP implementation and their performance to protect the natural habitats, and environmental and spiritual values of the modified KFS	Limited to the KFS impacted areas	Review of records, consultation with local communities, and direct observation	*Once a year*	KO-SMP implementing contractor appoints environmental expert from academia or private sectors	Included in D above
Total Environmental Monitoring and Auditing Cost						**55000**

8.5 Institutional strengthening

Several Governmental Agencies at both the Local and National Levels will be responsible for the ongoing monitoring of the IHPP activities in KFS and implementation of KO-SMP and its monitoring. NEMA will ensure that the KO-SMP implementation contractor is appointed as per the addendum ESIA report has the capacity to discharge theresponsibilities.

For the KO-SMP planning, implementation and monitoring, the responsible KO-SMP implementation contractor will have to establish an in-house capacity for all these activities. Wherever appropriate, institutional strengthening should be integrated with existing programmes being planned or implemented by the KO-SMP contractor.

The general process to be followed to establish the institutional strengthening needs is as follows:

- Discuss the mandate and implementation and monitoring responsibilities of the KO-SMP contractor and develop an implementation and monitoring plan that will include details of procedures, equipment and staff requirements;
- Establish the Ko-SMP contractor's in a house capability for managing such activities, and identify any shortfalls;
- Develop, in consultation with the regulatory Agencies, a plan for meeting these shortfalls;
- Assist the responsible units of the contractor to implement a specific capacity building plan, taking into account other capacity building programmes being planned or implemented by the government or international organisations; and,
- Monitor the effectiveness of institutional strengthening measures, and carry out any further measures as required.

8.6 The ESMMP Budget

The costs accounted under the ESMMP in Tables 76 and 77 are for i) implementation of a fish hatchery pilot program, ii) implementation of the safe passage at the interface of the reservoir and the free flowing river, iii) monitoring of water quality, iv) monitoring of fishery, and v) external environmental auditing. The cost estimated is USD 475,000.

KO-SMP prepared in 2010 estimated a total cost of nearly USD 10 million over a period of 10 years for the implementation of the then prepared KO-SMP Framework Plan. Since only a small fraction of the estimated budget for KO-SMP has been consumed so far for the demarcation of the central forest reserves and the 100 m wide riverine wetland from the river bank within KFS, most of the KO-SMP plan is yet to be implemented. In view of the updating works of KO-SMP in the changed context about USD 10 million is estimated on the top of the USD 475,000 required for the identified mitigation and monitoring programs.

9. Conclusions and recommendations

9.1 Conclusions

The proposed IHPP will cause significant impacts on the KFS natural habitats and environmental values. KFS is an area set aside for the protection of the natural habitat and environmental and spiritual values affected by BHPP under the Bujagali IA.

Since the recognized features of the environmental values (such as the Kalagala Fall, Itanda Fall, interspaced islands of Itanda and Muyanja and some portions of the associated waters and islands of the Victoria Nile, Nile Bank and Kalagala Fall CFR), spiritual values (spiritual sites of Kalagala, Itanda and Muyanja islands) and some portions of the natural habitats of *haplochromine cichilids* in and around the Kalagala Fall are not affected by the IHPP development, there still exist the potential of the protection of the remaining natural habitat, environmental and spiritual values in the remaining KFS.

9.2 Recommendations

The affected natural habitats, environmental and spiritual values of KFS could be counter-balanced by the modification of KFS to incorporate an additional offset area, the KFS extension area with the remaining KFS area. Such a modification of the KFS area will not only compensate the losses in the natural habitat and environmental values but will have additionality in terms of the lost natural habitat area and biodiversity. The modified KFS is also expected to ensure confidence building among tourism operators of the area for the long term viability of the adventure tourism industry by internalizing adventure tourism diversification opportunities in the changed context. The potential impacts on APs due to modification of KFS boundary shall be mitigated in compliance with the already in place policies on resettlement and rehabilitation for IHPP.

The experiences of the KO-SMP implementation in the past were not satisfactory to ensure the protection of KFS. It rather covered large areas which were not relevant for the protection of the KFS natural habitat, environmental and spiritual values. KO-SMP and its activities need updating and should be focused more on the modified KFS territory. Sustainable financing for KO-SMP is one of the core issues for long term protection and sustainable management of the modified KFS. The hydropower developers in the Upper Victoria Nile should be made responsible for the funding of KO-SMP through the Payment for Environmental Services apart from the contribution from the central treasury of GoU as agreed in Bujagali IA.

Given that the above recommendations are internalized, in view of the power development objectives to meet the 2nd National Development Plan goals, the construction stage of IHPP and

the investments already made for the construction works and resettlement and rehabilitation works, it is logical to go ahead with the IHPP development as proposed.