



**THE REPUBLIC OF UGANDA  
MINISTRY OF WATER AND ENVIRONMENT  
DIRECTORATE OF WATER RESOURCES MANAGEMENT**

**INTEGRATED WATER MANAGEMENT AND DEVELOPMENT PROJECT  
(IWMDP)**

**ENVIRONMENTAL AND SOCIAL PROJECT BRIEF FOR THE PROPOSED  
IMPLEMENTATION OF PRIORITY CATCHMENT MANAGEMENT MEASURES IN  
NYAMWAMBA CATCHMENT**

**JUNE 2021**

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## EXECUTIVE SUMMARY

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### 1 Background to the Proposed Project

Government of Uganda, with funding from the World Bank is implementing Integrated Water Management and Development Project which provides support to catchment management and restoration activities in Nyamwamba Catchment found in Albert Water management Zone (AWMZ).

The project shall support communities to; i) restore degraded riverbanks in Nyamwamba catchment, ii) implement soil and water conservation measures on priority hotspots in the catchment, iii) restore deforested and degraded land through community tree growing, and v) establish and promote alternative income generating activities for improved livelihoods.

### 2 Project Location

River Nyamwamba Catchment is located in Kasese District, south-western Uganda, and is characterized by verdant hilly environment of Rwenzori Mountains, with steep slopes and stones and boulders filling the valleys. The catchment consists of the following administrative units: Bulembia Division, Kilembe subcounty, Nyamwamba Division, Central Division, Rukoki, Kyarusandara, Kyarumba, Bugoye, and Mahango sub-counties. These sub counties are traversed by River Nyamwamba, which has its source in the Rwenzori Mountains.

River Nyamwamba Catchment covers an approximate total area of 257.2 km<sup>2</sup> (7 % of Kasese District). The catchment is located within the Greater Semliki catchment which is approximately 33,487 km<sup>2</sup>. The Greater Semliki catchment is shared between Uganda and the Democratic Republic of Congo and lies within the Albertine Rift Montane Eco-region of African Rift Lakes Priority Place. It lies in the Albert Water Management Zone under the decentralized water resources management in Uganda. Nyamwamba catchment is therefore a sub-catchment within the Greater Semliki catchment.

### 3 Purpose of the Project Brief

The purpose of the project brief is to give an initial environmental examination of the likely impacts of the proposed project on the biophysical and social aspects of the environment as an initial step in the EIA process as spelled out in the Environmental Impact Assessment Regulations. The aim is to improve decision making and to ensure that the proposed project would be environmentally and socially sound and sustainable.

### 4 Environmental and Social Impact Study

#### 4.1 Methodology

The methods used for collection of data used in preparation of this Project Brief included literature review, field visits, stakeholder consultations, onsite observations and specialised studies such as geophysical mapping, studies on the local hydrology of the area.

#### 4.2 Findings

##### 4.2.1 Physical Environment

##### a) Climate

Kasese district experiences bimodal rainfall pattern. The bimodal pattern results from the regional movement of air masses associated with the inter-tropical convergence zone (ITCZ). Unlike typical monsoon climates that are derived

from a reversal of wind currents from the northeast in January to the southwest in July, a north-south reversal in East Africa causes the heavy rains to occur in April and October (Taylor et al. 2007). The first rains are short and occur during March-May and the longer rains from August-November. Annual rainfall ranges from 800 mm-1600 mm, and is greatly influenced by altitude. Alongside, there exists wide temperature variations influenced by altitude from rather high temperatures at the plains to as below zero at the summit. The temperature and humidity in the watershed vary with altitude, with the high land temperatures ranging from 0 to 25°C and the low land from 8 to 30°C.

b) Topography

Kasese District is famous for the Mountains of the Moon which constitute part of the catchment where pristine waters of River Nyamwamba originate. The Rwenzori Mountain ranges, including the Margherita and Stanley peaks can be vividly viewed and accessed from Kasese town. The topography ameliorates tourism, a significant activity within the catchment given its natural resource endowment including mountains and national parks. The national parks located in the catchment include: Queen Elizabeth National Park and Rwenzori Mountains National Park.

c) Geology and Soils

The geology of the catchment is mainly built up of Precambrian metamorphic rock which constitutes of gneisses, quartzites, schists and varying amounts of mafic igneous rocks. Gneiss dominates in the northern part of the mountain range, while gneiss with schists of the Kilembe prevails in the southern part. Kilembe copper mineralisation occurs within an amphibolite unit of the Kilembe Series rocks that are part of the Rwenzori fold belt.

Concerning rock strength characteristics, the schists are considered to have a medium erodibility, the gneisses a low erodibility, while the amphibolites have a very low erodibility. As to the weathering of the bedrock, the weathering rates in the Rwenzori Mountains are low, leading to weathering-limited slope evolution dominated by physical erosion processes. The catchment area is covered with Argillites with basal quartzites and amphibolites locally. Along the river, the site general lithology consists of granitized or high to medium grade metamorphic formations. The Argillites including elements of phylites and Schists and metamorphosed formations are present in this region.

There are four geological features in the Kasese district: partly granitized and metamorphosed formations, pleistone to recent rock formations, wholly granitized or high to medium grade metamorphosed formations and the rift valley geological features and formations.

The soils are mainly non-hydromorphic and owe their development and characteristics to permanent or seasonal water logging conditions. The dominant soils are mainly organic soils ranging from clay loams, sand loams to Murrum in most areas of the catchment. The soils in Kasese District, are Organic, Podsol/ eutrophic, and Hydromorphic. These soils are vulnerable and are degraded because of unwise human activities such as over cultivation, cultivation on steep slopes, poor agronomic practices and over grazing causing soil erosion and fertility loss.

d) Drainage

River Nyamwamba and its tributaries originate from the Rwenzori Mountains a horst on the border with Democratic Republic of Congo and Uganda reaching an altitude of 5019 m.a.s.l. In Kilembe the catchment covers approximately 74.07 km<sup>2</sup>. The slope gradients are rather high and regularly exceed the local and global thresholds for slope stability. The catchment is subdivided by the park boundary at 1700 m.a.s.l above the forest belt, a bamboo belt extends up to 3000 m.a.s.l. after which the healthier forest and shrub zone start. At the highest elevations in the catchment, rock outcrops and bog land prevails. Permanent glaciers are present on the Rwenzori peaks, but the Nyamwamba catchment does not drain the glacier area.

Downstream, the river continuously meanders due to extreme siltation and random deposition of boulders of different sizes, which reduces the river conveyance capacity. Consequently, flash floods are a common occurrence in the catchment. Previous studies have also attributed these floods to climate and land use changes (Jacobs et al., 2016).

#### 4.2.2 Socio-Economic Environment

##### a) Population

The population of Kasese District is estimated to be 694,987 people, of which, 51.3% (356,772) are females and 48.7% (338,215) males living in 139,406 households (UBOS, 2014). Currently, the district's population growth rate (2.45%) is below the national average of 3.4%. Around 75.5% of the population is rural. Only 3.7% of the population is aged over 60 years. This implies that the population of the district has a huge dependent base (Kasese District DDPII 2015/16-2019/2020). Additionally, high population growth rates have great influence on catchment management and therefore this must be taken with great attention during planning and implementation periods. The River Nyamwamba catchment is in 10 sub counties with each contributing a different population pressure.

The proposed interventions will reduce the land available for agriculture for the communities. However, the restored land will be more productive than before due to the interventions, hence leading to increased yields. In addition, the affected communities are practicing agriculture in the buffer zones of rivers and wetlands because they are looking for a source of income and food for their families. Within this project, the affected communities will be supported to start alternative income generating activities which will ensure sustainable ecosystem management, not require much land and be of great financial benefit to them.

##### b) Main economic activities

The main economic activities within the catchment include farming, trade, agricultural produce, transportation, fish enterprises (capture fisheries and farm fisheries), mining, brick baking and laying, livestock keeping (cattle, chicken, piggery and goats), Craft making, Carpentry, Bakery, Alcohol distillation, Charcoal burning, Bee keeping, tree planting and commercial tree production, Mountain climbing, Lumbering, Tourism, Hydro power production. The various crops grown include; Bananas, Coffee, Fruits, Cassava, Beans, Avocados, Vanilla, Vegetables (tomatoes), ground nuts, maize, cotton, sugar canes, Irish potatoes, yams, vegetables (cabbages, tomatoes, onions, carrots, eggplant).

#### 4.2.3 Biological Environment

##### a) Vegetation

The sites within the Mountain Rwenzori National Park are well covered with vegetation. Along and within the river course and catchment, grasses, shrubs and herbs predominantly comprise of *Setaria megaphylla* and *Pennisetum purpureum* (Grasses), *Aframomum sanguineum*, *Impatiens burtonii*, *impatiens nana*, *Aneilema pedunculatum* and *Tragia insuavis* as dominant herbs and *Rubus pinnatus var afrotropicus* and *Acalypha bipartite* as dominant shrubs. Secondary forest mainly surrounds this section of the catchment with trees ranging between 2 – 25 m height. Predominantly, the catchment is covered by *Bridelia micrantha*, *Maesa lanceolata*, *Polyscias fulva*, *Ficus vallis choudae*, *Erythrina abyssinica*, *Newtonia buchananii*, *Spathodea campanurata*, *Sapium ellipticum*, *Solanecio mannii*, *Albizia graberrima*, *Myrica salicifolium* and *Faurea salignam*. Together, these trees with profound rooting systems supported by the shrubs, herbs and grasses form a formidable compact and robust catchment with intact banks providing an adequate breaking system and holding water volumes to slow down despite the steep topography of the Rwenzori mountain ranges.

The middle section of the catchment is severely degraded and characterized by cultivation without robust rooting systems. Grasses, shrubs, herbs and trees have largely been replaced by crops. The pristine nature of the river catchment is extinct and is replaced with patches of tree plantations mainly comprised of *Eucalyptus paniculata* as the dominant tree species combined with food crop cultivation. This has a poor rooting system which may not hold firm especially in such steep slope topography. Other areas are covered by food crops dominated by coffee (*Coffea Arabica*) -bananas (*Musa sapientum*) mosaic. Other crops include *Solanum tuberosum* (Irish potatoes), *Phaseolous vulgaris* (Beans), *Zea mais* (Maize), *Passiflora subpeltata* (Passion fruits), *Saccharum officinarum* (Sugar cane), *Mannihot aesculenta* (Cassava) and *Colocasia aesculenta* (Coco yams). The relatively semi-natural sections have a

dominant cover of shrubs and herbs comprising of *Datura suavelons*, *Phytolacca dodecandra*, *Acanthus pubescens*, *Tithonia diversifolia* as shrubs and *Brillantaisia nitens* as the dominant herb. *Phragmites mauritianus*, and *Vossia cuspidata* also lines sections of the river course in the less disturbed areas.

The lower catchment lies in QENP which is a savannah grassland area predominantly covered by grass species interspersed with dry country tree species of largely *Acacia*. *Cyperus papyrus*, *Phragmites mauritianus* and *Vossia cuspidata* are dominant along the river course. However, several other species of grasses form part of the lower catchment that include, among others, *Pennisetum purpureum*, *Digitaria scalarum*, *Digitaria velutina*, *Sporobolus pyramidalis*, *Panicum maximum*, *imperata cylindrica* and *Cymbopogon*.

b) Mammals

Records of mammals from both direct and indirect assessment methods included African elephant *Loxodonta Africana*, African buffalo *Cyncerus cafer*, Uganda Kob *Kobus kob*, Hippopotamus *Hippopotamus amphibious* among species recorded. The African elephant is globally listed as Vulnerable and nationally categorized as Critically Endangered while the Hippopotamus is both globally and nationally Vulnerable. Several other species exist in this part of the catchment but notable among these is the Lion *Panthera leo* and the Leopard *Panthera pardus*. This leopard is globally Near Threatened and nationally vulnerable while the lion is globally categorized as vulnerable but nationally critically endangered. Other species of both large and small mammals recorded in the survey were of globally and nationally of Least Concern. However, the biological diversity of the Park cannot be under estimated and is therefore beyond these species.

c) Herpetiles

Just like mammals, Queen Elizabeth National Park which holds the lower Nyamwamba catchment is not so diverse in both amphibians and reptiles although it has a wide range of habitats that create several different niches. Reptiles such as the Green Night-adder *Causus resimus*, which is globally Not Evaluated (NE) but nationally Data Deficient (DD) exist. Most of the reptile and amphibian species in this section are less known and therefore Data Deficient.

d) Birds

The avifauna of this section of the Nyamwamba catchment can be reflected in the diversity of species that occur within the savannah areas of Queen Elizabeth National Park. Although diverse in terms of number of species, most of the records are common occurrence and therefore not requiring special conservation attention. However, at least four Vulture species are both globally and nationally threatened requiring utmost conservation attention. Other species of conservation concern recorded included the Grey Crowned Crane *Balearica regulorum* (Globally and nationally Endangered) and the Grey-capped Warbler *Eminia lepida*, which is a species of Regional Responsibility.

#### 4.2.4 Catchment Management Issues

A number of issues were identified in the sub catchment and these include;

- a) Flooding
- b) Sediment loading in the river system
- c) Deforestation and forest degradation
- d) Poor farming practices that promote soil erosion



## 5 Potential Impacts of the Proposed Project

### 5.1 Summary of Potential Positive Social and Environmental Impacts and proposed Enhancement Measures

#### 5.1.1 Positive Impacts associated to restoration of riverbanks

##### Positive impacts

1. **Enhanced ecological functioning of the restored and protected riverbanks:** Restoration and protection of the riverbanks will reduce the possibility of siltation of rivers and restore the capacity of the river to contain the flowing water which could otherwise cause flooding. Sediment transported downstream will also decrease in the downstream systems. This will ensure that the quality of water flowing in the rivers is good for various uses by communities in the area. Riverbank protection will also increase on the emergence of new plant species which can improve the sustainability of the ecosystem around the protected rivers.
2. **Increased access to animal feeds:** The planted grass on the riverbanks could serve as food for the animals.
3. **Increased awareness and enhanced capacities of the communities** in riverbank restoration and protection: During the restoration activities, Communities' awareness on the importance of river bank protection, restoration and management shall be raised so as to ably participate in the restoration process shall be created. Capacities of communities shall be enhanced so to undertake and adopt the river bank protection and restoration measures including river bank stabilisation using grasses, tree lines, stones and to develop site specific riverbank protection and restoration action plans.
4. **Increased access to tools and equipment** to undertake restoration activities: during the process of restoration, communities shall be equipped with tools and equipment to undertake restoration activities. These shall remain the property of the communities involved and shall be available for future use.
5. **Increased recreational activities:** Restored and protected riverbanks could be inviting places for popular recreational activities including hiking, fishing, bird watching, photography and hunting. This could generate incomes to surrounding communities and improve their livelihoods.

##### Enhancement Measures

1. Sensitization of community members on the gazetted buffer zones.
2. Creating awareness to communities of alternative livelihood activities that can be carried out within the buffer zones.
3. Enforcement of the existing laws and regulations on wetland protection.
4. Strengthen/ develop community structures which can be enhance internal community regulation

#### 5.1.2 Positive Impacts associated to implementing soil and water conservation measures

##### Positive impacts

1. **Improved soil fertility and soil structure:** Soil and water conservation measures are meant to prevent soil erosion and improve the quality of the soil in terms of fertility since most of the economic activities in the sub catchment are agro-based. Since most of the methods use a nature-based approach, there will be reduction in the use of inorganic fertilizers which are currently the most common means of improving soil fertility in the sub catchment.
2. **Increased recharge of ground water sources:** An increase in the recharge of the ground water sources that feed the different shallow and

##### Enhancement Measures

1. Farmers to be sensitized on growing crops that improve on soil fertility such as planting of leguminous crops like beans which fix nitrogen into the soil and making the soils fertile.
2. Sensitize farmers on good agricultural practices such as inter cropping and contour ploughing that

spring wells within the sub catchment is anticipated. The implementation of the soil and water conservation measures will improve the infiltration capabilities of the soils allowing the water to infiltrate further in the deep layers of the soil to the base flow and therefore recharging the ground water sources. This will further ensure that there is improved supply of water in the different point sources in the sub catchment.

3. **Improved agricultural production for communities:** Implementation of activities such as agroforestry and proper farming methods through sensitization of communities and trainings will enable the different farmers increase on the production levels in the plantations and hence earn more from the produce.
4. **Increased awareness and enhanced capacities of the communities:** During the restoration activities, Communities' awareness on the advantages of controlling soil erosion / floods through use of water harvesting and biophysical measures as to ably participate in the implementation activities shall be created. Capacities of communities shall be enhanced so to undertake and adopt soil and water conservation practices.
5. **Increased access to tools and equipment** to undertake restoration activities: during the process of restoration, communities shall be equipped with tools and equipment to undertake restoration activities. These shall remain the property of the communities involved and shall be available for future use.

reduce soil erosion allowing the soil to retain its properties. And also use of better farming practices such as mulching and terracing which reduce soil erosion and allow water infiltration into the ground and hence recharge of ground water sources.

3. Carry out enforcement of the existing regulations and laws that prohibit activities that led to destruction of soil fertility such as over grazing.

### 5.1.3 Positive Impacts associated to restoration of deforested and degraded communal and individual land through afforestation, reforestation and agroforestry

#### Positive impacts

1. **Increased tree cover:** Tree growing will ensure that the catchment is restored and the intensity of the impacts of deforestation reduced. In addition, tree planting can become an income generating activity which further improves the livelihoods of these people. The restored forests will help in improving the water quality of the system as they help in trapping silts that would contaminate the water.
2. **Increased energy source:** The growing of tree shall make available of firewood from the planted trees. More so the promotion of energy saving stoves as an alternative energy source shall reduce pressure on the planted trees for firewood as less firewood is required for cooking.
3. The restored forests will provide wildlife habitats for the various plant and animal species such as reptiles, amphibians, insects, birds and mammals among others.
4. The restoration will help in mitigating climate change impacts as trees supply humans with the much-needed oxygen and sequester carbon

#### Enhancement Measures

1. Raise awareness and sensitize communities to promote tree growing across the local landscape
2. Raise awareness and sensitize communities and CBSDs to promote responsible management of existing forests and vegetation across the local landscape
3. Strengthen/ develop community structures which can be enhance internal community regulation

dioxide; The trees will help in fixing nitrogen into soil making it more fertile and this can enable the growth of crops.

5. **Increased access to tools and equipment** to undertake restoration activities: during the process of restoration, communities shall be equipped with tools and equipment to undertake restoration activities. These shall remain the property of the communities involved and shall be available for future use.
6. **Increased awareness and enhanced capacities of the communities:** During the restoration activities, Communities' awareness in tree growing and forest management for restoration shall be undertaken. Capacities of communities shall be enhanced so to undertake and adopt soil and water conservation practices.

#### 5.1.4 Positive Impacts associated to establishing and promoting alternative Income Generating Activities (IGAs)

##### Positive impacts

1. **Increased incomes and improved livelihoods:** The restoration will promote development of local industry by promoting value addition to products from income generating activities like beekeeping, fruit growing, fish farming, and growing of timber and energy plantations, among others; these activities could also provide both direct and indirect employment opportunities to the local community.
2. **Enhanced social cohesion:** Community members shall be encouraged to form groups and work collectively in establishing income generating activities
3. **Enhanced skills and knowledge:** Communities shall be trained in establishing the income generating activities such as bee keeping, fish farming, fruit growing, fodder production, etc.
4. **Improved standard of living:** With increased incomes, communities could afford other needs of life as parents could afford to pay school fees for their children.

##### Enhancement Measures

1. Promote livelihood activities that are compatible with responsible management and use
2. Raise awareness, sentries and train communities and CBSDs on the different IGAs

## 5.2 Summary of Potential Negative Social and Environmental Impacts and proposed Mitigation Measures

### 5.2.1 Negative Impacts associated to restoration of riverbanks

#### Potential Negative impacts:

1. **Reduced agricultural land:** The current subsistence agricultural activities along the river banks will be replaced by a restored environment and the access to use the restored ecosystem will be regulated and restricted.

#### Proposed Mitigation Measures

1. The project has been designed to support and promote alternative income generating activities and the affected communities are expected to benefit from these. These shall be compatible with responsible riverbank management.

2. Some communities shall also be able harvest mature planted grass to feed their animals.

### 5.2.2 Negative Impacts associated to implementing soil and water conservation measures

#### Potential Negative impacts:

1. **Reduced land area for cultivation:** The implementation of some soil and water conservation measures such as percolation pits will require the establishment of shallow ditches/holes within an individual's land. This will mean that the area available for cultivation will be reduced and hence reduction in productivity potential.

#### Proposed Mitigation Measures

1. Whereas the land area available for farming could be reduced, the implementation of these measures will bring about more positive impacts to the land owner such as increased fertility of soils, reduced soil erosion etc. and hence increases the overall productivity of the land. More so, the affected communities shall also benefit from the alternative income generation activities supported by the project.

### 5.2.3 Negative Impacts associated to restoration of deforested and degraded communal and individual land through afforestation, reforestation and agroforestry

#### Potential Negative impacts:

1. **Reduced land area for cultivation:** Some of the cultivable land could be converted into forest land.
2. **Possibility of introducing alien-invasive Tree species:** A possibility of alien-invasive species being introduced in the local and the sub-catchment landscape if planting materials are not properly selected.

#### Proposed Mitigation Measures

- The affected communities shall also benefit from the alternative income generation activities supported by the project.
- Replant tree species that are specific to the areas where the restorations are to be implemented.
- The Local Government technical officers (Natural Resources Officers, Forest Officers, and Environment Officers), together with the experts on the project management team will advise on the best planting materials in the landscape.
- In general terms, indigenous planting materials, or the materials that have adapted ecologically in the landscape shall be planted.

### 5.2.4 Negative Impacts associated to establishing and promoting alternative Income Generating Activities (IGAs)

#### Potential Negative impacts:

1. **Possible misuse of generated incomes:** The incomes obtained could push some community people especially men into doing socially unacceptable practices e.g., over drinking, domestic violence including violence against children (VAC), sexual exploitation and abuse (SEA), gender-based violence (GBV), etc.

#### Proposed Mitigation Measures

1. Train the people in investment and saving mechanisms and encourage the members to open up saving accounts to keep their income.
2. Provide HIV/AIDS awareness and counselling to the communities as regards to family planning approaches.
3. Train DLG social staff on gender aspects including GBV, SEA and VAC who will in turn sensitize project communities on their risks and impacts
4. Mobilize and sensitize project communities on the risks and impacts of GBV, SEA and VAC

### 5.2.5 Cross-cutting Negative Impacts

#### Potential Negative impacts:

1. **Occupational Health and Safety Impacts:** There are a variety of safety issues that may arise during the implementation of certain interventions. Workers may be faced with injuries such as cuts which if taken lightly can lead to contraction of other diseases such as tetanus. Furthermore, people working on river bank interventions can fall into the water which may lead to drowning incidents.
2. **Impacts due to poor waste management:** Waste is likely to be generated throughout the implementation of the project. Poor waste management through littering especially from the plastic potting bags used to hold tree seedlings can result into soil degradation if these are poorly disposed especially through the blockage of soil air spaces and reducing aeration and water infiltration in the soil. Poor human waste disposal especially by contractors and project activities' implementers can lead to a number of issues such as disruption of the surrounding aesthetics and the contamination of nearby water bodies which can cause other impacts to the water leading to diseases such as cholera and bilharzia to the communities that depend on the water source.
3. **Possibility of future re-encroachment into the riverbanks:** Communities whose activities are displaced by the project could re-encroach the protected areas causing further destruction.

#### Proposed Mitigation Measures

##### **Occupational Health and Safety Impacts**

1. During implementation of the project, the contractor should ensure the workers are trained to use any tools that may be required so that they are aware of the potential kickbacks during usage.
2. Safety measures shall be spelt out in the mode that is appropriate for the locality e.g. bill boards, leaflets, meetings, etc.
3. All workers shall be provided with appropriate personal protective equipment, and be required to use them while at work
4. The contractor shall provide a first aid kit for the work force on site to treat minor injuries and services of the nearby health facilities shall be utilized in case of major injuries
5. Inform individuals working on sensitively dangerous hotspots of the potential for falls and provide a barrier tape to notify people of the danger zones of the working area.

##### **Impacts due to poor waste management**

1. During the training of communities, production and waste management will be covered
2. Plastic potting bags that are still in good condition can be reused in the nurseries by repacking seedlings into these bags.
3. Plastic potting bags in poor condition should be disposed of in a proper manner and in locations that are designated by the district authorities.
4. Sanitary disposal areas should be put in place to ensure that human wastes are properly disposed of.
5. Enforce environmental laws by the District Environment Officer and NEMA

##### **Possibility of future re-encroachment into the riverbanks**

1. Establish and strengthen Community institutions (environment committees, sub-catchment and micro-catchment management committees) to enhance monitoring and internal self-regulation
2. Enforce environmental laws by the District Environment Officer and NEMA

## 6 Conclusions

Any possible negative impacts were identified, mitigation measures to avoid, reduce and minimize these impacts were suggested either as part of the design, or as measures to be implemented by the various key actors, namely: Implementing Contractor and the proponent. Sound practice measures were also identified in order to minimize the impact of the proposed development further. The proponent agreed to these mitigation measures and they are, therefore, expressed as commitments.

Overall, the negative impacts of the proposed project were rated by this study as having feasible mitigation measures that have been proposed to address them. When mitigation actions and environmental and social monitoring plans are implemented, the project would have minimal residual environmental and social effects. Hence the project can be implemented in a sustainable manner, in line with national and international environmental and social best practices.

More so, this is the main purpose of implementing sub-catchment management measures. The measures seek to restore ecosystems, improve the livelihoods of the local people, bring the local people into decision making in the management of their resources, and bring in sub-catchment practices that are environment friendly, socially acceptable, and economically feasible.

## 1 INTRODUCTION

### 1.1 Background to the Proposed Project

Government of Uganda, with funding from the World Bank is implementing Integrated Water Management and Development Project which provides support to catchment management and restoration activities in Nyamwamba catchment found in Albert Water management Zone (AWMZ). The project supports implementation of catchment management measures, including soil and water conservation, river bank and wetland protection; and providing alternative livelihoods for affected communities.

### 1.2 Project Location

River Nyamwamba Catchment is located in Kasese District, south-western Uganda, and is characterized by verdant hilly environment of Rwenzori Mountains, with steep slopes and stones and boulders filling the valleys. The catchment consists of the following administrative units: Bulembia Division, Kilembe subcounty, Nyamwamba Division, Central Division, Rukoki, Kyarusandara, Kyarumba, Bugoye, and Mahango sub-counties. These sub counties are traversed by River Nyamwamba, which has its source in the Rwenzori Mountains.

River Nyamwamba Catchment covers an approximate total area of 257.2 km<sup>2</sup> (7 % of Kasese District). The distribution of the catchment amongst the different administrative units is summarized in Table 1-1 below. The catchment is located within the Greater Semliki catchment which is approximately 33,487 km<sup>2</sup>. The Greater Semliki catchment is shared between Uganda and the Democratic Republic of Congo and lies within the Albertine Rift Montane Eco-region of African Rift Lakes Priority Place. It lies in the Albert Water Management Zone under the decentralized water resources management in Uganda. Nyamwamba catchment is therefore a sub-catchment within the Greater Semliki catchment.

*Table 1-1: Nyamwamba surface area coverage per Subcounty*

County	Subcounty	Catchment Area in Subcounty (sq.km)	% Subcounty Area in Catchment	Core/ Fringe
Busongora South	Kilembe	74.07	94.1	Core
	Rukoki	34.82	90.4	Core
	Kyarusandara	0.34	0.2	Fringe
	Muhokya	15.17	3.4	Fringe
Busongora North	Bugoye	3.17	1.6	Fringe
Kasese Municipality	Bulembia Division	59.69	96.4	Core
	Nyamwamba Division	51.35	74.3	Core
	Central Division	2.01	7.8	Fringe
Bukonzo East	Kyarumba	4.02	2.6	Fringe
	Mahango	12.60	38.3	Fringe

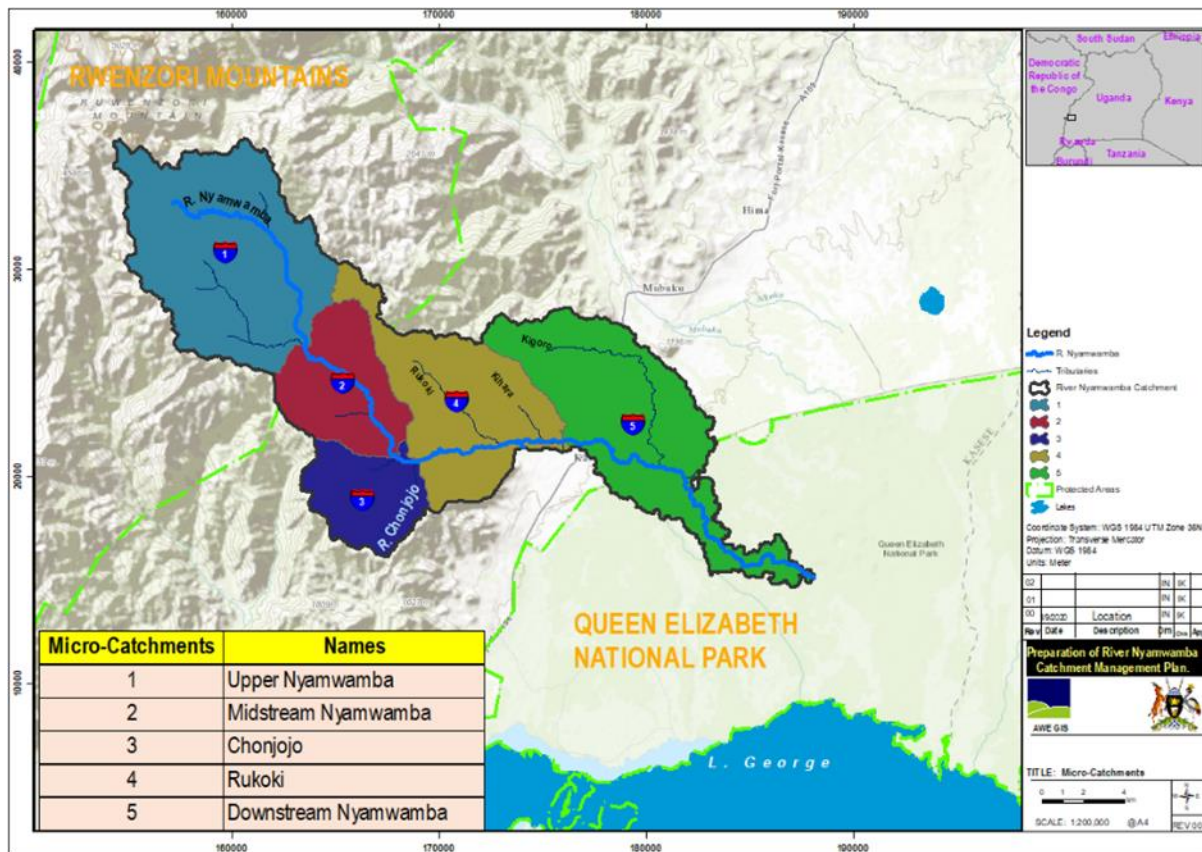


Figure 1-1: River Nyamwamba micro-catchments

### 1.3 Purpose of the Project Brief

The purpose of the project brief is to give an initial environmental examination of the likely impacts of the proposed project on the biophysical and social aspects of the environment as an initial step in the EIA process as spelled out in the Environmental Impact Assessment Regulations. The aim is to improve decision making and to ensure that the proposed project would be environmentally and socially sound and sustainable. Environmental and social consequences should be recognized early in the project cycle and taken into consideration during project siting, planning, technology choice and design. Impact Assessment identifies ways of improving a project environmentally and socially and (in order of priority) preventing, minimizing, mitigating, or compensating for adverse impacts, as appropriate, for a given project. These steps help avoid costly remedial measures.

### 1.4 Project Implementation Arrangements

The Ministry of Water and Environment, shall appoint a Contract Manager who would be responsible for the day-to-day planning, management, coordination and monitoring of the proposed project activities.

#### 1.4.1 Name of the Proponent

Ministry of Water and Environment.

#### 1.4.2 Main Contact Person and Postal Address

The Permanent Secretary,  
Ministry of Water and Environment,  
P.O. Box 20026, Kampala, Uganda  
E-mail: mwe@mwe.go.ug



## 1.5 Structure of this Report

This report is presented in the following chapters:

Chapter 1: Includes background information about the proposed project and site.

Chapter 2: Presents the relevant legal, regulatory and institutional frameworks guiding the proposed development.

Chapter 3: Presents the methodologies used in the study.

Chapter 4: Presents the present state of the environment (survey findings).

Chapter 5: Describes the proposed project activities

Chapter 6: Presents an Analysis of Alternatives.

Chapter 7: Presents an evaluation of project environmental and social impacts.

Chapter 8: Presents suggested mitigation measures to the environmental and social impacts.

Chapter 9: Presents the Environmental and Social Monitoring Plan.

Chapter 10: Presents the Conclusion

## 2 RELEVANT LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

In view of the wide-ranging policy and legal framework that impinges on management of water and the associated resources, implementation of the sub-catchment management measures is expected to conform to all the relevant policies and laws. Therefore, the implementing Ministry is expected to ensure that the land and water resources are utilised in accordance with the laws mentioned above and other relevant laws and regulations. In addition, it is incumbent upon the implementing Ministry to ensure that the local authorities are closely involved in the implementation of the management measures, and in monitoring of the activities of the various actors.

### 2.1 Relevant Policy Framework

#### a) *The National Environment Policy, 1994*

The overall goal of this policy is the promotion of sustainable economic and social development heedful of the needs of future generations through ensuring environmental quality and resource productivity on a long-term basis. It calls for integration of environmental concerns into development policies, plans and projects at national, district and local levels. Hence, the policy requires that projects or policies likely to have significant adverse ecological or social impacts undertake an ESIA before their implementation. This is also reaffirmed in the National Environment Act no. 5 (2019) and National Environment Management Policy, 1994.

**Relevance:** *The implementing ministry is committed to ensure that the proposed interventions are carried out in an environmentally sound manner and will implement the suggested mitigation measures as required by this policy.*

#### b) *The National Water Policy, 1999*

The National Water Policy is one of the fundamental policies for the governance of water resources in Uganda. The overall policy objective is to manage and develop the water resources in a sustainable manner, so as to secure and provide water of adequate quantity and quality for all social and economic needs, with the full participation of all stakeholders, and so as not to leave the future generations any worse off than ourselves.

**Relevance:** *The implementation of the Catchment management measures is geared towards achieving the policy objectives of preserving and ensuring adequate quantity and quality of the catchments' water resources*

#### c) *The National Land Use Policy, 2007*

In support of the national objectives on poverty eradication and economic growth, while at the same time ensuring sustainable utilisation of natural resources, including land and water, the main goal of the National Land Use Policy is 'to achieve sustainable and equitable social and economic development through land utilisation in Uganda'. The specific objective of the policy is to promote land use activities that ensure sustainable utilisation of natural resources for national socio-economic development. The policy emphasises community based participatory planning, gender, and land ownership, among other environmentally friendly practices.

**Relevance:** *Some of the interventions under this project shall promote sustainable land use management practices and shall ensure community participation at all levels as guided by the policy.*

#### d) *The National Agricultural Policy, 2015*

The overall objective of the agricultural policy is to promote food and nutrition security and household incomes through coordinated interventions that focus on enhancing sustainable agricultural productivity and value addition, providing employment opportunities, and promoting domestic and international trade. The guiding principles of the policy aim at pursuing a private sector led and market-oriented economy, development of agricultural development zones, provision of agricultural development services to farmers, ensuring key agricultural resources such as soils and water for agricultural purposes are sustainably used and managed, among others.

**Relevance:** *All the agricultural interventions that have been suggested by the proponent shall be carried out in accordance to this policy to ensure sustainable use of the key agricultural resources such as soils and water.*

### e) **The Uganda Forestry Policy, 2001**

The Forest Policy (2001) emphasizes the ecological and socio-economic importance of protecting the country's forest resources. Through the policy, Government is committed to promoting an integrated sector that achieves sustainable increases in the economic, social and environmental benefits from forests and trees by all the people of Uganda, especially the poor and vulnerable. To achieve this goal, the policy aims at improving management of the natural forests both on protected land and land under private ownership, promoting commercial forestry, forest products processing and value addition, increasing forests on-farm, and conserving biodiversity. The policy also gives government the responsibility to control illegal practices, monitor best practice, and measure environmental and social impacts. In addition, community participation in forest management is affirmed because it contributes to the social strength of the forestry sector and ensures:

- sustainable management of the forestry resources,
- sufficient supplies of forest products,
- Protection of water resources, soils, fauna and flora.

**Relevance:** Due to the high rate of deforestation in the sub catchment, afforestation activities as some of the interventions are proposed and this should be carried out in line with this policy to ensure sustainable development and management of forests in the region.

## 2.2 Relevant Legal Framework

### a) **The Uganda Constitution, 1995**

The constitution in its National Objectives and Directive principle of State policy, objective XIII provides for the protection of natural resources. It provides that the state shall protect important natural resources, including land, water, wetlands, minerals, oil, fauna, and flora on behalf of the people of Uganda. Objective XXVIII (i) requires State to promote sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable manner for the present and future generations. Paragraph (ii) of that objective goes ahead to state that the state shall take all possible measures to prevent or minimize damage and destruction to land air and water resources resulting from pollution or other causes.

**Relevance:** To ensure the project's compliance with the constitutional obligations on sustainability, an Environmental Project Brief has been prepared to give mitigation measures to ensure that the environment is not compromised during implementation of the interventions.

Article 39 preserves the right of every Ugandan to clean and healthy environment. Article 237(2)(b) of the constitution provides that notwithstanding clause(1) of Article 237 which provides that land in Uganda belongs to the citizens of Uganda to vest in them according to the land tenure systems provided for in the constitution, Government or local government shall hold in trust for all the people and protect natural lakes, rivers, wetlands, forest reserves, game reserves national parks and any land to be reserved for ecological and tourism purposes for the common good of all citizens.

### b) **The National Environment Act No.5 (2019)**

The Act requires the developer of a project described in the fourth schedule to the Act to submit a project brief to the lead agency, in the prescribed form and giving the prescribed information. Where a project or an activity may have, is likely to have, or will have significant impact on the environment, an environmental impact study is required.

**Relevance:** The implementation of the proposed interventions is likely to have impacts on the environment thus the undertaking of this environmental assessment by the proponent was to identify its potential impacts on the neighboring communities and the environment and so devise mitigations to these impacts.

### c) **The National Forestry and Tree planting Act, 2003**

The Act provides for:

- Conservation, sustainable management and development of forests for the benefit of the people of Uganda
- The declaration of forest reserves for the purposes of protection and production of forests
- Sustainable use of forest resources and the enhancement of the productive capacity of forests
- The promotion of tree planting
- The establishment a National forestry Authority.

**Relevance:** Consultations were made with stakeholders at the district level for all districts within the sub catchment regarding the proposed project with an objective of obtaining their opinion on the proposed interventions and their applicability within their jurisdiction and ascertain viability of the interventions. Such engagements shall continue even during implementation of the project.

Part V section 41 of this Act provides for licenses and subsection (1) states that, a responsible body may, subject to the management plan, grant to an interested person for: the cutting, taking, working or removing of forest produce from a forest reserve or community forest; or the sustainable utilization and management of the forest reserve or community forest.

**d) The Water Act (1995)**

Section 100 vests all rights to investigate, control, protect and manage water in Uganda in the Government and in section 34, it makes it an offence to pollute or cause a risk of water pollution.

**Relevance:** The implementations of the interventions will adhere to the requirements of the Act to prevent contamination of the nearby water resources

**e) The Public Health Act, Cap 281**

Section 7 of the Public Health Act provides local authorities with administrative powers to take all lawful, necessary and reasonable measures to prevent the occurrence of, or to deal with any outbreak of, any infectious communicable or preventable disease in order to safeguard and promote public health. Section 105 of the Act imposes a duty on the local authorities to take measures to prevent any pollution that is dangerous to health to enter any water supply that the public has a right to use for drinking or for domestic purposes. The Act further details the location of waste disposal facilities such as solid waste skips and septic tanks in relation to settlements and food points.

**Relevance:** The developer also aims at operating without subjecting the public and environment to any danger / nuisance arising from the implementation of interventions. Sanitary facilities will be set up at all project areas to prevent exposing communities to nuisances.

**f) The Local Government Act, 1997**

The Local Government Act, 1997 provides for decentralization and devolution of Government functions, powers and services from the central to LGs and sets up the political and administrative functions of LGs. The LGs are responsible for the protection of the environment at the district level. This therefore, implies that LGs should be consulted on projects to be located within their jurisdiction and on matters that affect their environment.

**g) The Occupational Safety and Health Act, 2006**

Section 13 of the Act puts the responsibility of protection of the worker and the general environment on the employer and he or she must take all measures to protect the workers and the general public from the dangerous aspects of his or her undertaking.

**Relevance:** The project proponent will put in place all measures necessary to protect safety of workers on each intervention site where necessary and the general public in the vicinity of the intervention site.

**h) The Wild Life Act, 2019**

The Act provides for the conservation of wildlife throughout Uganda so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use, in order to support sustainable

utilisation of wildlife for the benefit of the people of Uganda;(b) the sustainable management of wildlife conservation areas; (c) the protection of rare, endangered and endemic species of wild plants and animals;(d) ecologically acceptable control of problem animals;(e) the enhancement of economic and social benefits from wildlife management by establishing wildlife use rights and the promotion of tourism;(f)the control of import, export and re-export of wildlife species and specimens;(g) the implementation of relevant international treaties, conventions, agreements or other arrangement to which Uganda is a party; and(h) public participation in wildlife management.

### 2.3 Relevant Regulatory Framework

#### a) **The National Environment (Environmental Impact Assessment) Regulations, 1998**

The EIA regulations S.I. No.13/1998 hold for all projects/activities listed under the third schedule of the National Environment Act, 1995. The regulations state in part II section 5 that, environmental project briefs will be carried out by a developer stating in a concise manner the nature of the project in accordance with the categories identified in the Third Schedule of the Act and well require the developer to pay particular attention to the issues specified in the First Schedule to these Regulations while preparing the project brief.

**Relevance:** *This project brief is carried out in fulfilment of the requirements of these regulations and the proponent will submit the briefs to the Authority for their comments and approval.*

#### b) **The National Environment (Waste Management) Regulations, 1999**

These regulations apply to all types of waste (non-hazardous and hazardous) and its storage and eventual disposal. Regulation 12 prohibits the disposal of waste into the environment without adequate treatment at a treatment facility approved by the lead agency.

**Relevance:** *The proposed interventions are not expected to produce hazardous waste and only organic wastes are expected to be produced though in small quantities. The proponent will ensure that these wastes are disposed in line with these regulations.*

#### c) **The National Environment (Riverbanks, Lakeshore and Wetlands) Management Regulations, 2000**

According to the National Environment (Riverbanks, Lakeshore and Wetlands) Regulations, Government or Local Governments (LGs) shall hold in trust for the people and protect wetlands, riverbanks and lakeshores for the common good of the citizens of Uganda. Government or local government shall not lease out or otherwise alienate any wetlands, riverbank or lakeshore.

The Regulations provide a list of regulated activities whose implementation in wetlands, riverbanks and lakeshores is subject to issuance of a permit granted by the National Environment Management Authority (NEMA) in consultation with the relevant Lead Agencies. The activities include brick making, recreation activities such as spot fishing, maintenance of green spaces, cultivation, drainage, commercial exploitation, sewerage filtration, fishing using fish gear and weirs, fish farming and other aquaculture, construction of transport and communication facilities such as roads, railways, telephone lines, burning and any other exploitative activity which is of a commercial or trade nature, such as harvesting of papyrus for commercial purposes.

**Relevance:** *The interventions that will be carried out within riverbanks shall be implemented with regards to the principles of these regulations to ensure proper utilization and sustainable management of the riverbanks in the sub catchment.*

An environmental impact assessment as required under the Environment Act is mandatory for all activities in the wetlands, riverbanks and lakeshores and special measures are essential for protection of riverbanks, lakeshores and wetlands of international, national, and local importance as ecological systems and habitats for fauna and flora, and for cultural and aesthetic purposes, as well as for their hydrological functions and values for preventing soil erosion, siltation and water pollution. Every landowner, occupier or user who is adjacent or contiguous with a wetland, riverbank and lakeshore has a duty to prevent the degradation or destruction of the wetland, and to maintain ecological and other functions of the wetland. A developer desiring to conduct a project which may have a significant impact on

a wetland, riverbank or lake shore, is required to carry out an environmental impact assessment in accordance with sections 19, 20 and 21 of the Act.

**d) *The National Environment (Hilly and Mountainous Area Management) Regulations, 2000.***

These Regulations shall apply - (a) to facilitate the sustainable utilization and conservation of resources in mountainous and hilly areas by and for the benefit of the people and communities living in the area; (b) to promote the integration of wise use of resources in mountainous and hilly areas into the local and national management of natural resources for socio-economic development; and (c) to regulate and promote efficient and sustainable use of resources in mountainous and hilly areas so that the functions and values derived therefrom are maintained for the present and future generations.

The regulations call for District Councils shall make by-laws identifying mountainous and hilly areas within their jurisdiction which are at risk from environmental degradation. The project intends to restore degraded hills and mountains in Nyamwamba Catchment.

## 2.4 Institutional Framework

**a) *National Environmental Management Authority (NEMA)***

The National Environment Management Authority (NEMA) is a statutory body tasked with coordinating, monitoring, and supervising all matters pertaining to the environment, with the Ministry of Water and Environment as its line ministry.

**Relevance:** *The developer intends to restore, conserve and protect riverbanks as one of the proposed interventions and therefore shall work closely with the NEMA. In addition, NEMA shall work hand in hand with the MWE to solve issues regarding encroachment of communities on riverbanks*

**b) *Ministry of Gender, Labour and Social Development***

Ministry of Gender, Labour and Social Development is a Government Ministry with a responsibility to empower communities in diverse areas. The Ministry promotes cultural growth, skills development and labour productivity while promoting gender equality, labour administration, social protection and transformation of communities. Through its Occupation Health and Safety Department, the ministry ensures safety, health and welfare of a person at a workplace.

**Relevance:** *The department of Occupation Health and Safety will be charged with monitoring the developer/contractor's compliance to the requirements of the Occupational Health and Safety Act 2006.*

**c) *Ministry of Local Government (MoLG)***

This is charged with the responsibility of promoting a decentralized and good local governance system, facilitating delivery of quality lower local government services in order to contribute to sustainable socio-economic development.

**Relevance:** *The project will be implemented in several Local Governments (LGs) that will certainly have roles and responsibilities to play.*

**d) *National Forest Authority (NFA)***

NFA is the body mandated to; “Manage Central Forest Reserves on a sustainable basis and to supply high quality forestry-related products and services to government, local communities and the private sector”. NFA has a vision of contributing to a sufficiently forested, ecologically stable and economically prosperous Uganda. They also have the national tree seedling centre where different species of trees are obtained and supplied to different institutions.

**Relevance:** *The developer intends to supply a number of tree seedlings as one of the proposed interventions and therefore should work closely with the NFA. In addition, NFA shall work hand in hand with the MWE to solve issues regarding encroachment of communities on forest reserves.*

**e) Ministry of Water and Environment (MWE)**

This is the ministry that is responsible for the management of all environmental and water related issues in the country. The MWE is responsible for the protection of all water resources and water sources in the country including management and monitoring of all the water basins in the country and their surrounding ecosystems.

**Relevance:** *The Water Management zone under the Directorate of Water Resources Management is responsible for monitoring and management of the Catchment and shall be in charge of implementing the proposed interventions.*

**f) Ministry of Energy and Mineral Development (MEMD)**

This is the Ministry that is responsible for the management of all energy and mineral resources in the country. MEMD is responsible for the development of energy and mineral resources.

## 2.5 International Laws and Regulations

**a) The 1968 African Convention on the Conservation of Nature and Natural Resources**

Article II of the convention gives its fundamental principle as conservation, utilization and development of soil, water, flora and faunal resources in accordance with scientific principles and with due regard to the best interests of the people.

In Article IV, the convention requires all contracting States to take effective measures for conservation and improvement of the soil and shall in particular combat erosion and misuse of the soil. Article IV (a) points out need to establish land-use plans based on scientific investigations (ecological, pedagogical, economic, and sociological) and, in particular, classification of land-use capability by the contracting state.

**Relevance:** *The proponent will ensure conservation of natural resources especially the water resources and sensitive flora and fauna during implementation of the proposed interventions.*

**b) The World Bank Safeguard Policies**

The proposed project triggers the World Bank Operational Policy OP 4.01, requiring an Environmental Assessment which takes into account the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples and physical cultural resources) and trans-boundary and global environmental aspects. EA considers natural and social aspects in an integrated way, and aims at preventing, minimizing, mitigating or compensating for adverse environmental impacts. Whenever feasible, preventive measures are preferred over mitigation or compensatory measures. The proposed project was subjected to a screening process based upon which it was rated as category B of the World Bank classification framework.

**Relevance:** *The World Bank Safeguard Policies guide the implementation of relevant safeguards on the project.*

## 3 STUDY METHODS USED

The methods used for collection of data used in preparation of this Project Brief included literature review, field visits, stakeholder consultations, onsite observations and specialised studies such as geophysical mapping, studies on the local hydrology of the area, mapping to ensure continued or better ecosystem functioning in the area and analyses. Some of these methods are further described below.

### 3.1 Review of Relevant Literature

The team identified several documents related to the project and reviewed them prior and during the compilation of this brief, and details of these have been showed in the bibliography. Primary data and secondary baseline data on area land use, social aspects, sensitive receptor systems and ecology that are likely to be affected by the project at the proposed site were reviewed. Literature was also reviewed to obtain the regulatory and institutional context relevant to the project.

The review also indulged use of secondary data on legislation and environmental standards both locally and World Bank safeguard policies in regard to the project proposed, biodiversity conservation, area land use, area physical plans and socio-economic issues. This literature was reviewed to get baseline and background information of the proposed project site.

### 3.2 Field Based Surveys

Site visits were undertaken within sub catchment to study environmental conditions in the different identified hotspots where interventions are to be implemented. This involved establishing biophysical baseline conditions of the sub catchment through observation, taking measurements of physical environmental parameters, capture of sensitive receptor systems, in-situ analysis of some environmental parameters and public consultations. It also involved noting an inventory of activities, land use and social infrastructure in the neighbourhood affected or likely to be affected by the proposed project activities. Site/field visit and inventories created assisted in establishing yardsticks that will be used in monitoring compliance of the project to mitigation measures and legal requirements.

#### 3.2.1 Direct Observation and Photography

Direct observation and photography were used to obtain the appearance of the project area and evidence collection for analysis. Transects walks through the proposed area were carried out to collect data and help in assessing site suitability and the likely impacts as a result of project implementation. This enabled the environmental assessment team to make professional observation of the physical environment in addition to other social and environmental attributes likely to affect or be affected by the implementation of the proposed catchment interventions.

### 3.3 Consultations with Stakeholders

One on one interviews were held with various stakeholders and community members to ensure stakeholder participation in the assessment process as recommended by the National Environment Act No. 5 (2019), EIA Regulations (1998), and Guidelines for EIA in Uganda. The aim of these interviews was to identify and take note of environmental and social concerns and views of stakeholders at an early stage so that their suggested mitigation measures are incorporated in the final implementation plan for implementation of the identified measures.

Consultations were held with various stakeholders regarding the proposed interventions to be implemented within the sub catchment. The proposed project was disclosed particularly to the catchment management committees, local members within the hotspots in the sub catchment through their local leaders, different districts officials such as Environment Officers, Natural Resource Officers, and Community Development Officers, among others to establish concerns related to the proposed activities and its future operations. Details of people consulted and key issues raised by stakeholders are presented in annex 11.1.

### 3.4 Professional Judgement



This involved prediction and analysis of environmental impacts that may result from the implementation of the project activities, proposing appropriate mitigation measures and development of an Environmental and Social Management and Monitoring Plan.

## 4 BASELINE INFORMATION

### 4.1 Physical Environment

#### a) Climate

Kasese district experiences bimodal rainfall pattern. The bimodal pattern results from the regional movement of air masses associated with the inter-tropical convergence zone (ITCZ). Unlike typical monsoon climates that are derived from a reversal of wind currents from the northeast in January to the southwest in July, a north-south reversal in East Africa causes the heavy rains to occur in April and October (Taylor et al. 2007). The first rains are short and occur during March-May and the longer rains from August-November. Annual rainfall ranges from 800 mm-1600 mm, and is greatly influenced by altitude. Alongside, there exists wide temperature variations influenced by altitude from rather high temperatures at the plains to as below zero at the summit. The temperature and humidity in the watershed vary with altitude, with the high land temperatures ranging from 0 to 25°C and the low land from 8 to 30°C.

#### b) Topography

Kasese District is famous for the Mountains of the Moon which constitute part of the catchment where pristine waters of River Nyamwamba originate. The Rwenzori Mountain ranges, including the Margherita and Stanley peaks can be vividly viewed and accessed from Kasese town. The topography ameliorates tourism, a significant activity within the catchment given its natural resource endowment including mountains and national parks. The national parks located in the catchment include: Queen Elizabeth National Park and Rwenzori Mountains National Park.

#### c) Geology and Soils

The geology of the catchment is mainly built up of Precambrian metamorphic rock which constitutes of gneisses, quartzites, schists and varying amounts of mafic igneous rocks. Gneiss dominates in the northern part of the mountain range, while gneiss with schists of the Kilembe prevails in the southern part. Kilembe copper mineralisation occurs within an amphibolite unit of the Kilembe Series rocks that are part of the Ruwenzori fold belt.

Concerning rock strength characteristics, the schists are considered to have a medium erodibility, the gneisses a low erodibility, while the amphibolites have a very low erodibility. As to the weathering of the bedrock, the weathering rates in the Rwenzori Mountains are low, leading to weathering-limited slope evolution dominated by physical erosion processes. The catchment area is covered with Argillites with basal quartzites and amphibolites locally. Along the river, the site general lithology consists of granitized or high to medium grade metamorphic formations. The Argillites including elements of phylites and Schists and metamorphosed formations are present in this region.

There are four geological features in the Kasese district: partly granitized and metamorphosed formations, pleistone to recent rock formations, wholly granitized or high to medium grade metamorphosed formations and the rift valley geological features and formations.

- Pre-Cambrian: This comprises of the Kilembe series which is closely associated with the Buganda-Toro system.
  - This system is the most expensive of the cover formations which occupy much of western Uganda.
- Cenozoic (Pleistocene to recent): This category covers some district areas such as the plains in Kasese Municipal Council, Muhokya, Karusandara, and Lake Katwe area where rift valley segments are quite evident.
- The Crater Lake comprising of volcanic rocks, and parts of Kitholhu and Munkunyu - Lake Katwe area.
  - The permanent swamp area where sediments, alluvium, black soils and moraines occur.



Figure 4-1: Some of the copper tailings in Kilembe Subcounty

The soils are mainly non-hydromorphic and owe their development and characteristics to permanent of seasonal water logging conditions. The dominant soils are mainly organic soils ranging from clay loams, sand loams to Murrum in most areas of the catchment. The soils in Kasese District, are Organic, Podsol/ eutrophic, and Hydromorphic. These soils are vulnerable and are degraded because of unwise human activities such as over cultivation, cultivation on steep slopes, poor agronomic practices and over grazing causing soil erosion and fertility loss.

#### d) Drainage

River Nyamwamba and its tributaries originate from the Rwenzori Mountains a horst on the border with Democratic Republic of Congo and Uganda reaching an altitude of 5019 m.a.s.l. In Kilembe the catchment covers approximately 74.07 km<sup>2</sup>. The slope gradients are rather high and regularly exceed the local and global thresholds for slope stability. The catchment is subdivided by the park boundary at 1700 m.a.s.l above the forest belt, a bamboo belt extends up to 3000 m.a.s.l. after which the healthier forest and shrub zone start (Figure 3-1). At the highest elevations in the catchment, rock outcrops and bog land prevails. Permanent glaciers are present on the Rwenzori peaks, but the Nyamwamba catchment does not drain the glacier area.

Downstream, the river continuously meanders due to extreme siltation and random deposition of boulders of different sizes, which reduces the river conveyance capacity. Consequently, flash floods are a common occurrence in the catchment. Previous studies have also attributed these floods to climate and land use changes (Jacobs et al., 2016).

Following the hydrological drainage, five micro-catchments were delineated in the Nyamwamba catchment (Figure 1-1). The sub-catchments have been named according to the streams draining them. Table 4-1 provides the list of the micro-catchments and their respective areas.

Table 4-1: Delineated River Nyamwamba Micro-catchments

Number	Name	Area (km <sup>2</sup> )
1	Upper Nyamwamba	79.85
2	Midstream Nyamwamba	31.87
3	Chonjojo	23.44
4	Rukoki	52.60
5	Downstream Nyamwamba	69.47
<b>Total</b>		<b>257.23</b>

## 4.2 Socio-Economic Environment

### a) Population

The population of Kasese District is estimated to be 694,987 people, of which, 51.3% (356,772) are females and 48.7% (338,215) males living in 139,406 households (UBOS, 2014). Currently, the district's population growth rate (2.45%) is below the national average of 3.4%. Around 75.5% of the population is rural. Only 3.7% of the population is aged over 60 years. This implies that the population of the district has a huge dependent base (Kasese District DDPII 2015/16-2019/2020). Additionally, high population growth rates have great influence on catchment

management and therefore this must be taken with great attention during planning and implementation periods. The River Nyamwamba catchment is in 10 sub counties with each contributing a different population pressure (**Table 4-2**).

**Table 4-2: Population distribution in sub counties comprising R. Nyamwamba catchment**

Subcounty	Population	Land Area (sq. km)	Population Density
Bulembia Division	13,251	62.4	212
Muhokya	19,222	317.3	61
Kyarumba	42,195	155.8	271
Mahango	19,682	31.7	621
Central Division	31,711	25.9	1224
Bugoye	35,367	205.1	172
Nyamwamba Division	56,103	65.8	853
Karusandara	11,890	154.6	76
Rukoki	13,999	37.4	374
Kilembe	13,330	78.4	170

(Source: UBOS, 2014)

The proposed interventions will reduce the land available for agriculture for the communities. However, the restored land will be more productive than before due to the interventions, hence leading to increased yields. In addition, the affected communities are practicing agriculture in the buffer zones of rivers and wetlands because they are looking for a source of income and food for their families. Within this project, the affected communities will be supported to start alternative income generating activities which will ensure sustainable ecosystem management, not require much land and be of great financial benefit to them.

### **b) Main economic activities**

The main economic activities within the catchment include farming, trade, agricultural produce, transportation, fish enterprises (capture fisheries and farm fisheries), mining, brick baking and laying, livestock keeping (cattle, chicken, piggery and goats), Craft making, Carpentry, Bakery, Alcohol distillation, Charcoal burning, Bee keeping, tree planting and commercial tree production, Mountain climbing, Lumbering, Tourism, Hydro power production. The various crops grown include; Bananas, Coffee, Fruits, Cassava, Beans, Avocados, Vanilla, Vegetables (tomatoes), ground nuts, maize, cotton, sugar canes, Irish potatoes, yams, vegetables (cabbages, tomatoes, onions, carrots, eggplant).





Figure 4-2: Different economic activities in the Nyamwamba catchment

### 4.3 Biological Environment

The outlook of the biodiversity assessments has taken considerations of the flora and fauna including avifauna and aquatic life. The assessments have been presented largely at strategic level while giving the existing situation in the catchment with the catchment being divided into three sections – Upper, middle and lower catchment. The strengths, weaknesses, opportunities and threats as regards biodiversity within the catchment have also been analysed.

#### 4.3.1 Upper catchment characterization

The upper Nyamwamba catchment is housed by Mt. Rwenzori National Park. Due to its forest cover, the Park is characterized by heavy rains which are supplemented by the glacial depreciation increasing water volumes in the streams that supply River Nyamwamba. Within the Park, the quality of vegetation both along the streams that feed into R. Nyamwamba and along the course of the river is intact. There is a tree-shrub-herb and grass root mosaic that binds the soils avoiding loss of any loose soils that would otherwise have caused heavy sedimentation and siltation of the river. The intact natural vegetation coupled with a solid rooting system act as breaks naturally controlling flow velocities, keep the banks intact as soils are well bound and provide ambient conditions for the wildlife that uses the river and other streams for watering.

##### 4.3.1.1 Flora characterization in the upper catchment

The sites within the Mountain Rwenzori National Park are well covered with vegetation. Along and within the river course and catchment, grasses, shrubs and herbs predominantly comprise of *Setaria megaphylla* and *Pennisetum purpureum* (Grasses), *Aframomum sanguineum*, *Impatiens burtonii*, *impatiens nana*, *Aneilema pedunculolum* and *Tragia insuavis* as dominant herbs and *Rubus pinnatus var afrotrropicus* and *Acalypha bipartite* as dominant shrubs. Secondary forest mainly surrounds this section of the catchment with trees ranging between 2 – 25 m height. Predominantly, the catchment is covered by *Bridelia micrantha*, *Maesa lanceolala*, *Polyscias fulva*, *Ficus vallis choudae*; *Erythrina abyssinica*, *Newtonia buchananii*, *Spathodea campanurata*, *Sapium ellipticum*, *Solanecio mannii*, *Albizia graberrima*, *Myrica salicifolium* and *Faurea salignam*. Together, these trees with profound rooting systems supported by the shrubs, herbs and grasses form a formidable compact and robust catchment with intact banks providing an adequate breaking system and holding water volumes to slow down despite the steep topography of the Rwenzori mountain ranges.

##### 4.3.1.2 Fauna characterization – Upper catchment

The Rwenzori Mountain is a world heritage site and is also well known for its unusual biodiversity which includes many species that are endemic to the Albertine Rift. Knowledge of the fauna is skewed in favor of the higher altitude species. There are 106 species of mammals known to the Rwenzori Mountains, of which three are not found anywhere else in the world and a further 15 are endemic to the Albertine Rift. The Nyamwamba river and its catchment within the Rwenzori form part of the lifeline through provision of habitat to water dependent species but more so as a source of water to other species.

### Mammals

Among species of conservation concern known for Rwenzori National Park and, therefore, the upper catchment section but not recorded during the survey are; Rwenzori duiker *Cephalophus rubidus* which is endemic to the Rwenzori Mountains as well as globally endangered. The species is also nationally listed as endangered. Among primates, the Chimpanzee *Pan troglodytes*, is both globally and nationally listed as endangered. Among small mammals, the Montane Marsh rat *Dasymys montanus*, Rwenzori Mouse Shrew *Myosorex bralina*, Rwenzori Musk Shrew *Crocidura Niobe*, East African Montana Shrew *Paracrocidura maxima*, Rwenzori Shrew *Ruwenzorisorex suncooides*, Dwarf Forest Shrew *Sylvisorex vulcanorum*, Long-tailed Forest Shrew *Sylvisorex lunaris*, and the Rwenzori Otter Shrew *Micropotamogale ruwenzorii* are all global and national species of conservation concern as well as Albertine Rift Endemics present in the Rwenzori National Park and therefore deemed present within the upper Nyamwamba catchment. However, species of small mammals captured during the survey included *Grammomys dolichurus*, *Lemniscomys striatus*, *Lophuromys sikapusi*, *Mastomys natalensis* and *Mus musculoides* all of which are of Least Concern both globally and nationally.

### **Herpetiles**

Lying within the Rwenzori National Park and at relatively high altitude, the Nyamwamba upper catchment is likely to have herpetiles of global and national concern some of which may also double as Albertine Rift Endemics. Species such as Rwenzori Plate-nosed Chameleon *Kinyongia xenorhina*, High Casqued Forest Chameleon *Kinyongia carpenter*, Mount Elgon Forest Gecko *Cnemaspis elgonensis*, all Albertine Rift Endemics and nationally endangered are bound to exist. However, among species observed during the survey, none is listed under global or national threat categories.

### **Birds**

Like other taxa, the upper Nyamwamba catchment being housed within the Rwenzori Mountains National Park, it is likely to consist of avifauna species of global and national concern. Among these may include Shelley's Crimson-wing *Cryptospiza shellei* (globally Vulnerable, Nationally endangered), Mountain Buzzard *Buteo oriohilus* (Globally Near Threatened, Nationally Vulnerable), Handsome Francolin *Francolinus nobilis* (nationally Vulnerable) and Lagden's Bush Shrike *Melaconotus lagdeni* (Globally Near Threatened, Nationally Vulnerable). However, among species recorded during the survey and are of global, regional or national conservation concern where the Grey-crowned Crane *Balearica regulorum* (Globally and nationally endangered) and the African Crowned Eagle *Stephanoaetus coronatus* (Globally Near Threatened and nationally endangered). The Cinnamon-chested Bee-Eater *Merops oreobates*, Grey-capped Warbler *Eminia lepida* and White-headed Saw-Wing *Psalidoprocne albiceps* are listed as species of Regional Responsibility.

#### **4.3.2 Mid-catchment characterization**

Outside the Park, there is modified environment along the river and its erstwhile catchment. Natural vegetation along streams and the R. Nyamwambahave been greatly degraded through cultivation with the streams and river course all exposed. Loose soils without a binding rooting system characterize the river banks and are continuously washed by the speeding volumes of water driving heavy debris including boulders. Given this exposure of the heavy water volumes downstream without a breaking system coupled with the nature of the topography, the lower areas give way and are therefore exposed to flush flooding. This causes devastation of the communities in the Kilembe-Kasese townships. Anthropogenic activities along the river e.g. sand mining further aggravate the situation and affect would be ecological health of the system through for instance destruction of would fish spawning sites.

##### **4.3.2.1 Flora characterization for the mid-catchment**

This section of the catchment is severely degraded and characterized by cultivation without robust rooting systems. Grasses, shrubs, herbs and trees have largely been replaced by crops. The pristine nature of the river catchment is extinct and is replaced with patches of tree plantations mainly comprised of *Eucalyptus paniculata* as the dominant tree species combined with food crop cultivation. This has a poor rooting system which may not hold firm especially

in such steep slope topography. Other areas are covered by food crops dominated by coffee (*Coffea Arabica*) - bananas (*Musa sapientum*) mosaic. Other crops include *Solanum tuberosum* (Irish potatoes), *Phaseolous vulgaris* (Beans), *Zea mais* (Maize), *Passiflora subpeltata* (Passion fruits), *Saccharum officinarum* (Sugar cane), *Mannihot aesculenta* (Cassava) and *Colocasia aesculenta* (Coco yams). The relatively semi-natural sections have a dominant cover of shrubs and herbs comprising of *Datura suavelons*, *Phytolacca dodecandra*, *Acanthus pubescens*, *Tithonia diversifolia* as shrubs and *Brillantaisia nitens* as the dominant herb. *Phragmites mauritaianus*, and *Vossia cuspidata* also lines sections of the river course in the less disturbed areas.

#### 4.3.2.2 Fauna characterization mid-catchment

##### **Mammals**

With the level of degradation characterizing the mid catchment, most of the large mammals have been either eliminated through loss of habitat and where persistent, have adopted to living within highly modified habitat. A few primate species still persist along the river where semi-natural vegetation cover exists. The Black and white colobus *Colobus guereza* and the Vervet monkey form these primate species. Small mammals, mainly those within modified habitat, were also recorded during the survey and included *Mus musculoides*, *Lophuromys sikapusi*, *Lemniscomys striatus* and dominated by *Mastomys natalensis*. No species of conservation concern were recorded are known in this highly modified habitat.

##### **Herpetiles**

The catchment being a wetland system, it is home to various species of herpetiles especially those inhabiting boulders even where the land has been heavily modified. Although no species of conservation concern were recorded, there could be chances of presence. However, it should be noted that most herpetiles are listed as Data Deficient (DD) both by the global and national red lists. Amphibians recorded included *Amietia ruwenzorica*, *Phrynobatrachus mababiensis*, *Phrynobatrachus natalensis*, *Hoplobatrachus occipitalis*, *Afrixalus fulvovittatus*, *Hyperolius kivuensis*, *Kassina senegalensis*, *Hyperolius viridiflavus* and *Hyperolius cinnamomeoventris* among others. Reptiles recorded included *Kinyongia xenorhina*, *Trioceros gracilis*, *Trioceros johnstoni*, *Hemidactylus brookii*, *Adolfus jacksoni*, *Python sebae*, *Hapsidophrys lineata* and *Naja melanoleuca* among others.

##### **Birds**

The avifauna of the mid catchment is characteristic of disturbed areas save for sites that still maintain relatively dense riverine forest. These recorded a few Forest dependent species typical of intact forest highlighting the importance of good habitat. Notable species of conservation concern include the Grey Crowned Crane *Balearica regulorum* (Globally and nationally endangered) and the African Crowned Eagle *Stephanoaetus coronatus*, which is globally Near Threatened and nationally endangered. The forest dependent species included the Green-headed Sunbird *Cyanomitra verticalis* and the Snow-crowned Robin Chat *Cossypha niveicapilla*.

#### 4.3.3 Nyamwamba Lower catchment characterization

After traversing the community areas, the river course enters its final stage through Queen Elizabeth National Park (QENP) to drain into L. George. Most of this course is characterized by tall grasses, predominantly *Phragmites* that lines the river course. The river banks in some cases are relatively intact despite the large volumes. However, given the speed of the river water from the open degraded community areas, some parts of the river banks burst and expose sections of the Park to intermittent flooding. This flooding has far reaching impacts on the wildlife, especially those that are slow moving, within the Park.

##### 4.3.3.1 Flora characterization in the lower-catchment

The lower catchment lies in QENP which is a savannah grassland area predominantly covered by grass species interspersed with dry country tree species of largely Acacia. *Cyperus papyrus*, *Phragmites mauritaianus* and *Vossia cuspidata* are dominant along the river course. However, several other species of grasses form part of the lower

catchment that include, among others, *Pennisetum purpureum*, *Digitaria scalarum*, *Digitaria velutina*, *Sporobolus pyramidalis*, *Panicum maximum*, *imperata cylindrica* and *Cymbopogon*.

#### 4.3.3.2 Fauna of the lower catchment

Largely within the Queen Elizabeth National Park, the lower catchment is characterized by savannah species within the park and its environs. It is a biologically diverse area consisting of several species of conservation concern across taxa.

#### Mammals

Records of mammals from both direct and indirect assessment methods included African elephant *Loxodonta Africana*, African buffalo *Cyncerus cafer*, Uganda Kob *Kobus kob*, Hippopotamus *Hippopotamus amphibious* among species recorded. The African elephant is globally listed as Vulnerable and nationally categorized as Critically Endangered while the Hippopotamus is both globally and nationally Vulnerable. Several other species exist in this part of the catchment but notable among these is the Lion *Panthera leo* and the Leopard *Panthera pardus*. This leopard is globally Near Threatened and nationally vulnerable while the lion is globally categorized as vulnerable but nationally critically endangered. Other species of both large and small mammals recorded in the survey were of globally and nationally of Least Concern. However, the biological diversity of the Park cannot be under estimated and is therefore beyond these species.

#### Herpetiles

Just like mammals, Queen Elizabeth National Park which holds the lower Nyamwamba catchment is not so diverse in both amphibians and reptiles although it has a wide range of habitats that create several different niches. Reptiles such as the Green Night-adder *Causus resimus*, which is globally Not Evaluated (NE) but nationally Data Deficient (DD) exist. Most of the reptile and amphibian species in this section are less known and therefore Data Deficient.

#### Birds

The avifauna of this section of the Nyamwamba catchment can be reflected in the diversity of species that occur within the savannah areas of Queen Elizabeth National Park. Although diverse in terms of number of species, most of the records are common occurrence and therefore not requiring special conservation attention. However, at least four Vulture species are both globally and nationally threatened requiring utmost conservation attention. Other species of conservation concern recoded included the Grey Crowned Crane *Balearica regulorum* (Globally and nationally Endangered) and the Grey-capped Warbler *Eminia lepida*, which is a species of Regional Responsibility.

### 4.4 Sub-catchment Management Issues

A number of issues were identified in the catchment through using the methods explained in chapter 3 of this report. The issues that concern water for environment, which is of critical importance in Nyamwamba Catchment include:

#### **a) Flooding**

River Nyamwamba floods nearly three to four times a year but serious catastrophic floods have been around four with the worst being the most recent one of May 1, 2013 and July 2015. Other earlier known catastrophic ones include that of April 7, 1966. In the last few years, the frequency and intensity of rainfall have increased causing a number of rivers in the region e.g., Mubuku and others to burst their banks. This has led to flash floods in most parts of Kasese District resulting in loss of lives, destruction of infrastructure like bridges, roads, schools, houses, etc. and displacement of people. Some of the damages caused by the flooding of the river are presented in Photos 3-22 to 3-25.



The devastation from the 2013 floods is still evident to this day. These floods were characterized by heavy rains, outbursts of river banks, destruction of houses, crops, bridges, roads, power lines, displacement of over 10,000 people and destruction of the infrastructure at Kilembe mines and the Kilembe mines hospital. Most of the destruction occurred as a result of running water and rolling boulders from the highlands. The flash floods are characterized by rapid onset with very high initial discharges and occur over a short duration.

The occurrence of floods is attributed to land use changes due to a high percentage of bare rock cover in the upstream areas, recent climate changes characterized by intense precipitation, steep channels, and siltation of the river course and wild fires that destroyed vegetation on the hills. The River Nyamwamba training in the 1950s from the original course that flowed through the Kilembe mines is likely to be contributing to the flood frequency. Other potential factors such as mountainous forest fire and landslides in the upper Rwenzori are also potentially contributing to the flooding within the catchment (Binego 2014).



*Figure 4-3: A hotspot of a degraded river bank in Kilembe Subcounty*



*Figure 4-4: Some of the affected structures during the 2013 floods in Kilembe Subcounty*



*Figure 4-5: Gabion walls to attenuate River Nyamwamba floods at perilous hotspots in Kilembe Subcounty*



Figure 4-6: Makeshift bridges used for crossing the River Nyamwamba

### b) Sediment loading in the river system

The estimated sediment yield was ranging from 0 – 66.16 t/km<sup>2</sup>/yr. Total soil loss from a watershed is usually significantly greater than the measured sediment yield, the bulk of the sediment is deposited at intermediate locations wherever the entraining runoff waters are insufficient to sustain transport, deposition occurs where gradients decline downslope, at the base of the slope. It is substantially explicit (**Error! Reference source not found.**) that sediment yield is most and least pronounced in sub catchment 3 and Sub catchment 1 respectively. The former straddles mostly Mahango Subcounty, a landslide prone area and the latter straddles mostly Rwenzori Mountains a conservation area.

### c) Deforestation and forest degradation

The vegetation of Rwenzori Mountains National Park is largely influenced by elevation and five distinct zones are identified. These include grasslands at an altitude of 1000 - 2000 m.a.s.l, Montane Forest 2000 - 3000 m.a.s.l, bamboo/mimolopsis zone at 2,500 - 3,500, healthier/riparian zone 3,000 - 4,000 m.a.s.l and the afro-alpine moorland zone 4,000 - 4,500 m.a.s.l. Kasese district is famous for the Mountains of the Moon. The elevation ranges from 878 to 5017 meters above sea level. The Rwenzori ranges including the Margherita and Stanley peaks can be viewed and accessed from the district. There are a number of mineral resources in Kasese that include: Copper (Kilembe Mines), Cobalt, Cement (Hima), and Limestone (Muhokya). These can further be explored to benefit the people of Kasese. Tourism is a significant activity within the district given its natural resource endowment including mountains and national parks. National parks in Kasese include: Queen Elizabeth National Park, Rwenzori Mountain National Park and Kibale National Park. Wildlife sanctuaries include: Katwe, Kasenyi, and Hamukungu while bird sanctuaries are located on the Kazinga Channels with over 6000 species. There is a Salt Lake at Katwe where salt is mined. The western rift valley also goes through the district.

Most of the wetlands in the Nyamwamba sub-catchment are related to relief. The majority are found around Lake George. Other swamps are along the river banks with U-shaped valleys. On top of Mount Rwenzori are bogs occupying depressions. The low land wetlands exist between 800 - 1,200m above sea level while high up in the Rwenzori, they are at altitude 2,000 - 5,100 m above sea level.

The edge of Lake George is occupied by wetlands containing a very rich ecosystem that requires protection. The enormous climatic, social and economic importance of the wetlands was recognized by the Uganda Government in 1986. Subsequently, on 4th March 1988, Uganda became a signatory to the Ramsar convention naming Lake George wetland as a wetland of international importance.

The Ramsar site is the internationally recognized wetland of Uganda situated around L. George and shared by the districts of Kasese, Bushenyi and Kamwenge with the largest part being in Kasese district. Covering an area of approximately 250 sq. km, this wetland was included on the Ramsar convention's list of wetlands of international importance in 1988. Much of this site lies in Queen Elizabeth National Park (QENP) area. The Lake George Ramsar site contains extensive permanent lakeside swamps, riverine swamps, marshes, swamp forests and savanna grasslands which are seasonally or permanently flooded with water and support organisms adapted to water logged

conditions. Dominant vegetation in this wetland is the papyrus communities all around the lake, cyperus and some patches of woody vegetation.

#### d) Land use

The vegetation is made up of montane forests in the section of mountain Rwenzori national park, cassava and banana gardens as well as Pine and Eucalyptus plantations on the mountain slopes in the project area. The river itself has heavy boulders through which the water flows while the banks are dominated by Pennisetum polystachion, banana and coffee gardens in various sections.

- **The river bank area:** This area predominantly comprised of grasses amidst huge boulders of rock interspersed with herbs, shrubs and trees.
- **The forested area:** This area comprised of rocks with an undergrowth of herbs and shrubs interspersed with grasses.
- **The farmland area:** Pennisetum purpureum, Digitaria scalurum, D. velutina, Sporobolus pyramidalis and Panicum maximum were dominant grasses here.



Figure 4-7: Vegetation cover along the slopes



Figure 4-8: Tree planting on the left bank of River Nyamwamba in Kilembe Sub County



Figure 4-9: Aerial view of boulder river Nyamwamba project area



Figure 4-10: One of the Eucalyptus plantations along the banks of River Nyamwamba

#### e) Poor farming practices that promote soil erosion

Soil refers to the wearing away of the top-soil by the natural physical forces of water and wind, or through forces associated with farming activities such as tillage. The top-soil, which is high in organic matter, fertility and soil life, has been carried (and continues to be carried) away into drainage channels, including streams and rivers. As a result of soil erosion this reduces productivity of the land and also contributes to the pollution of adjacent springs, streams and rivers.

**f) Environmental degradation: Deforestation and soil erosion**

Severe soil erosion is experienced at Kilembe where the river banks attributed to poor farming practices, cultivation of hilltops and overstocking of cattle. The resultant effect of soil erosion has led to low crop yields, siltation in the river/dams and destruction of infrastructure i.e., roads and blockage of water supply systems.



Figure 4-11: Poor planning of settlements on the steep slopes aggravating the likelihood of soil erosion and landslides respectively

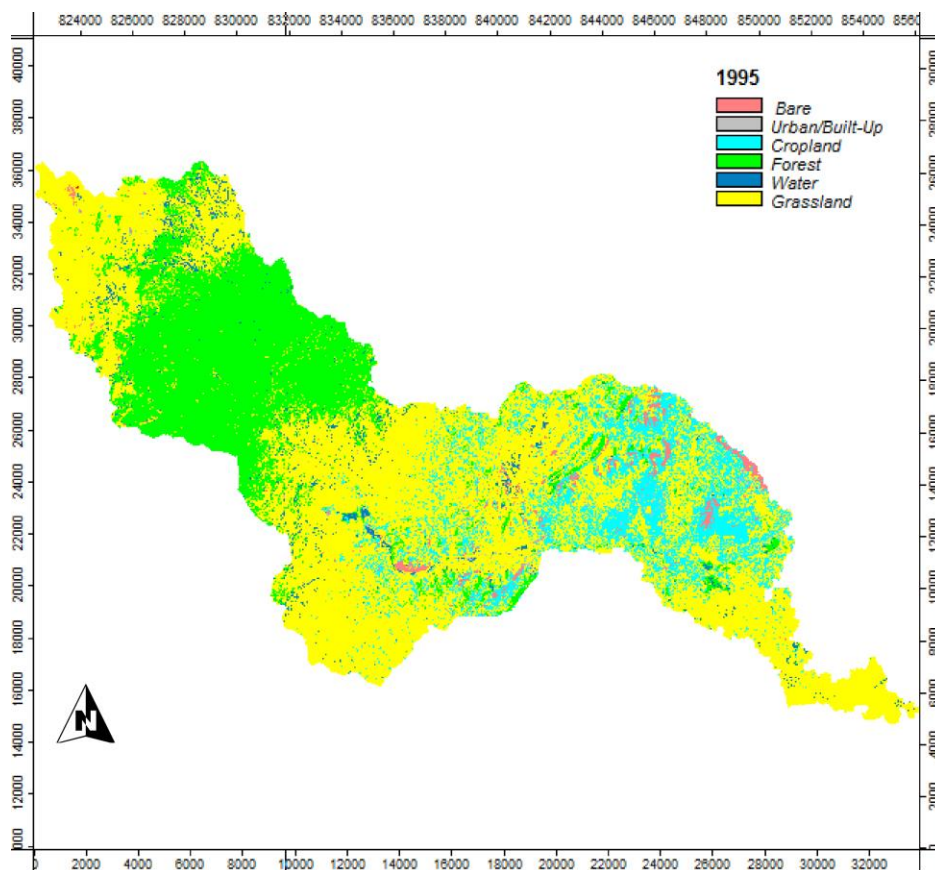


Figure 4-12: Land use classification map for 1995

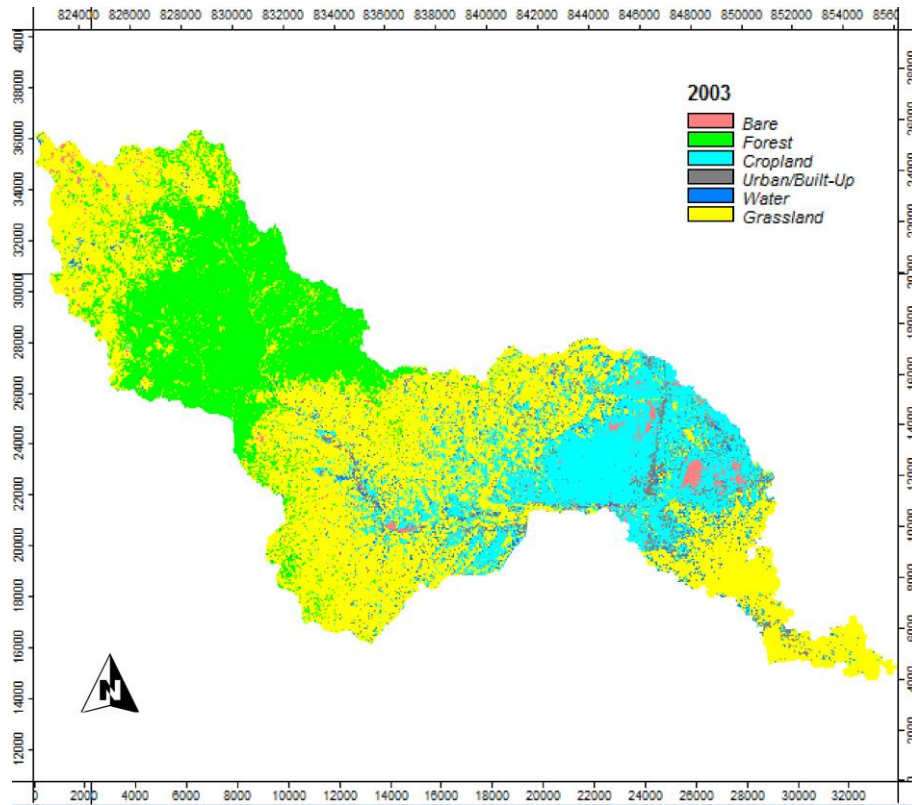


Figure 4-13: Land use classification map for 2003

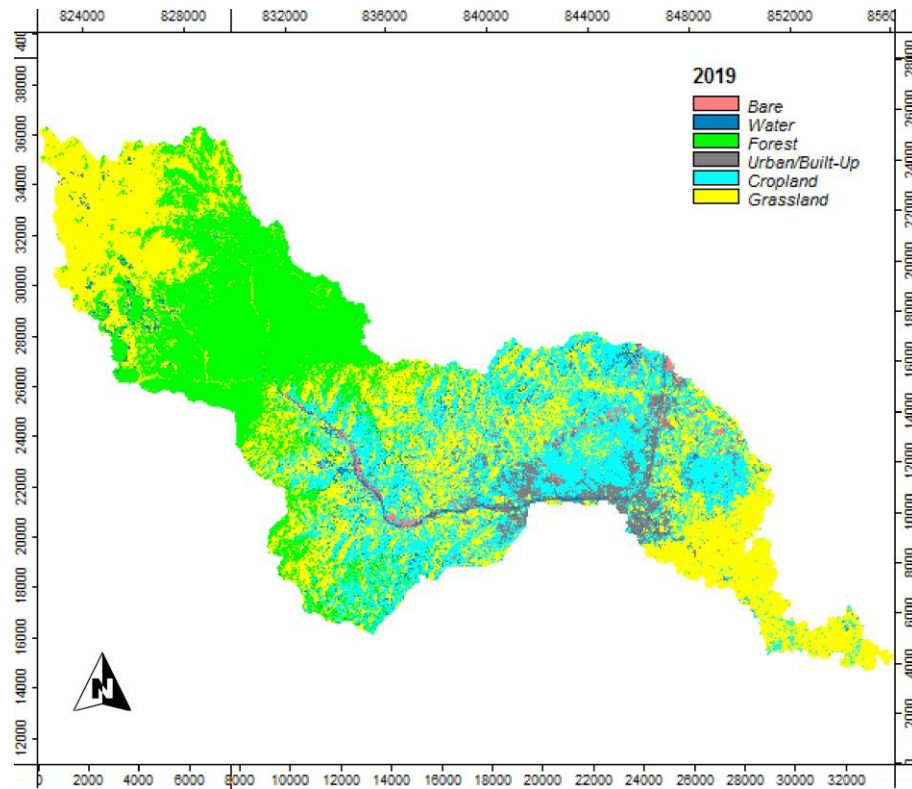


Figure 4-14: Land use classification map for 2019

## 5 DESCRIPTION OF PROJECT ACTIVITIES

This project seeks to support communities in Nyamwamba catchment to implement catchment-based and community driven actions aimed at improving soil and water conservation, riverbank/wetland restoration and community livelihood improvements. The activities proposed in this project are community-based actions and will majorly involve local community labour from the affected communities themselves; that is, the people that have been degrading the area. There will be no Labour from outside. There will however be a consultant/contractor to support, supervise, guide and design any structures that will be part of the restoration activities and ensure the project is delivered successfully. Therefore, the Service Provider shall employ and pay the community members for the work done as per agreed rates based on government Labour rates and precedence set by other similar projects.

Thus, community mobilization and sensitizations will be key to the implementation of the assignment. Sub-catchment and catchment management committees shall play a major role in this assignment and the Service Provider shall engage and involve them accordingly. In addition, community capacity building sessions during implementation of the project shall be carried out. Meetings, radio talk shows, and guided field tours to sensitize communities on the importance of ecosystems protections and management will be organized. Specifically, the project shall undertake the following tasks:

### 5.1 Activities in the Upstream section of River Nyamwamba

#### Task 1: Support communities in catchment rehabilitation through soil and water conservation measures, contour bunds on priority hotspots in the Micro-catchments.

Soil and water conservation measures shall be promoted and established under this task on 400ha of individual farmers/public land to restore degraded hotspots and reduce/control runoff to control soil erosion and siltation. This shall however, be carried out as described in the scope of works. Accordingly, the Service Provider shall;

- Mobilise 1000 community members and raise their awareness on the advantages of controlling soil erosion/floods through use of water harvesting and biophysical measures to as to ably participate in the implementation activities (50 members per meeting)
- Conduct trainings for 350 community members from selected communities to undertake and adopt on soil and water conservation practices for each of the parishes at selected farms: infiltration trenches, stormwater diversion drains, percolation ditches; grow trees, shrubs grasses on contour bunds; gully control developed terraces. Use of other agronomic measures such as cover crops, Conservation Tillage, Deep Tillage, Conservation Farming, Contour-Farming, Mulching, Growing of Cover Crops, Strip Cropping, Mixed Cropping, etc. (50 members per training for 3 days)
- Provide tools (wheelbarrow, Handles, Spades, Pangas, etc.) to communities for use during the establishment of water harvesting and soil and water conservation structures (terracing, soil bunds, infiltration pits etc.)
- Establish 10 Ha of soil and water conservation structures at selected farm sites to serve as training and demonstration centres.
- Support individual farmers to establish 400 Ha similar soil and water conservation structures on the hotspots identified on their individual land.
- Carry out quarterly inspections and monitoring of the established structures to ensure survival and growth of the planted species and also to ensure effective functioning of the structures established. This shall remain the responsibility of the SCMC, CMC and the AWMZ staff after the project.

### Task 2: Support communities to restore deforested and degraded communal and individual land through tree growing in the Upstream Nyamwamba Micro-catchment.

Restoring of 500 Ha of degraded communal and individual land through tree growing (afforestation, reforestation, and agroforestry) of the upstream Nyamwamba Micro-catchment will be carried out. According to the service provider shall;

- Mobilise and sensitize 500 households in 4 meetings to engage in tree growing initiatives
- Conduct 4 trainings to 500 households in tree growing and forest management for restoration
- Provide tools and materials (wheelbarrow, Handles, Spades, Pangas, etc.) to 500 households for use during tree growing.
- Provide 400,000 tree seedlings of average height of 30cm to communities
- Plant 400,000 tree seedlings of average height of 30cm to communities and restore 500 ha of degraded land (at a spacing of 5m x 5m) under technical supervision. Indigenous trees to include false mvule, ficus species, myopsis ("emit"), taminalia species.
- Carry out quarterly inspections and monitoring to provide extension services during and after establishment to ensure tree survival and growth.
- Facilitate 150 members of sub-catchment and micro catchment structures to develop and enforce bye-laws to manage the tree growing

### Task 3: Support communities to establish and promote alternative income generating activities for improved livelihoods.

Under this task, Bee-keeping, energy saving technologies (e.g. improved cookstoves), fruit growing, and fish farming as alternative income generating activities shall be promoted and supported. The beneficiaries of these alternative livelihoods are the land owners along river banks, and other degraded areas to be restored. Each community member or farmer will select the enterprise they are interested in and it is after this that the list of farmers per enterprise will be generated. Success will be measured based on the number of community members or farmers that adopt and use the different alternative income generating activities. This shall however be carried out as described in the scope of works

1. Support Bee-keeping as alternative income generating activity
  - Mobilise and engage 100 selected farmers to identify the potential site (0.25ha) for beekeeping/ apiary establishment.
  - Train 100 selected farmers in bee keeping and siting of apiary; Hives deployment and baiting; Inspection and maintenance of deployed hives; Honey harvesting and handling; and Marketing including value-addition.
  - Provide key beekeeping equipment to 10 farmer groups each with 25 bee hives as:
    - 25 KTB beehives for each of 10 groups (standard size; lid is 58cm x 97cm, Side 33cm x 88.9cm, Bottom is 22.9cm x 96.5cm)
    - 1 Smoker pump (metallic) for 10 groups
    - 02 (15-20 litre) plastic buckets for (harvesting honey combs) to each of 10 groups
    - 1 Honey metallic aluminium non-corrosive material Settling Tank (25lts) for each of 10 groups
    - 1 Air tight Bucket (20lts for each of 10 groups)
    - 1 Kg of bee wax for each of 10 groups
    - 1 protective wear (an overall with a hat with a net and gloves all in one-to protect from stings) for each of 10 groups
    - 1 bee knife and 1 Bee brush for each of 10 groups

- Provide bee colonies to the selected farmers to start beekeeping and establish apiaries each with 25 bee hives. Install hives at least 1-1.5m above ground and at 5m interval (distance between hives) for easy management of pests. Identify and fence off an area of 0.25 ha per farmer for establishing the apiary, using local live fencing trees of an average height of 1.5-2m high (e.g. Ficus natalensis – mutuba spaced at 3 metres) and three lines of barbed wire all round. Plant suitable fodder trees and shrubs (e.g. Calliandra, Eucalyptus, bottle brush trees, neem tree, etc.).
  - Provide technical support to bee-keeping farmers: Carry out quarterly colony inspection and management to monitor status of colony development, disease condition, and presence of queen, brood (eggs, larvae and pupae), and amount of food (pollen and nectar stores) and provide them with value-addition facilities such as packaging materials and branding.
2. Support energy saving technologies (e.g. improved cookstoves) as alternative income generating activity
- Identify, mobilise and sensitise 500 community members on advantages of using improved cook stoves (50 members per meeting)
  - Select and train 3 women groups of 20 members in construction, use, and maintenance, marketing of improved cook stoves (1-day training per group)
  - Provide materials and equipment (wheelbarrow, Handles, Spades, Moulds, Pangas, Strings, etc.) to women groups and facilitate them (labour) to construct 2000 cookstoves for households.
  - Carry out quarterly monitoring visits to the women groups to ensure the production, usage and maintenance of the constructed cook stoves is efficient and effective. This shall remain the responsibility of the SCMC, CMC and the AWMZ staff after the project.
3. Support fruit growing as alternative income generating activity
- Identify and mobilise 100 fruit growing farmers, sensitise and engage the farmers to form 4 groups
  - Conduct one training to each of the farmer groups in eco-agriculture/agronomic practices (including soil and water conservation, pests and diseases control, fruit tree management, organic farming, post-harvest handling).
  - Provide 2500 orange seedlings of average height of 30cm per group to plant and maintain the seedlings (at a spacing of 4m x 4m) under technical supervision.
  - Provide technical support to fruit farmers that includes disease/pest control and prevention and conduct on farm monitoring per farmer per month for the first 6 Months.
4. Support Eco-tourism enterprise development.
- Identify and mobilise 100 youths and women, and engage them to form 4 groups
  - Support in profiling eco-tourism services and products
  - Build capacity of the youth and women in eco-tourism sector development
  - Support in construction of tourism shades along the river bank
  - Provide support in training of the youth as eco-tourism guides
5. Support value chain addition to coffee development
- Identify and mobilise 200 women and youths, sensitise and engage them to form 5 groups.
  - Conduct three trainings to each of the farmer groups in coffee value chain development, (including soil and water conservation, maintaining the trees and picking up cherries, sorting of the cherries, organic farming, processing and roasting, packaging and storage).
  - Support each of the five groups with a sorting rack and a dry mill



- Provide technical support to the farmers that includes disease/pest control and prevention and conduct on farm monitoring per farmer per month for the first 6 Months.
6. Support to stone mining and development
- Identify and mobilise 100 youths, sensitise and engage them to form 4 groups.
  - Train the youths in art and design based on river stones and associated products
  - Support the youth with equipment (e.g., shovels) to ease on the stone mining business
  - Support the youth in business skills that shall include marketing of stone products and services.

## 5.2 Activities in the Midstream section of River Nyamwamba

### Task 1: Support communities in catchment rehabilitation through soil and water conservation measures, contour bunds on priority hotspots in the Micro-catchments.

Soil and water conservation measures shall be promoted and established under this task on 150ha of individual farmers/public land to restore degraded hotspots and reduce/control runoff to control soil erosion and siltation. This shall however, be carried out as described in the scope of works. Accordingly, the Service Provider shall;

- Mobilise 1000 community members and raise their awareness on the advantages of controlling soil erosion/floods through use of water harvesting and biophysical measures to as to ably participate in the implementation activities (50 members per meeting)
- Conduct trainings for 350 community members from selected communities to undertake and adopt on soil and water conservation practices for each of the parishes at selected farms: infiltration trenches, stormwater diversion drains, percolation ditches; grow trees, shrubs grasses on contour bunds; gully control developed terraces. Use of other agronomic measures such as cover crops, Conservation Tillage, Deep Tillage, Conservation Farming, Contour-Farming, Mulching, Growing of Cover Crops, Strip Cropping, Mixed Cropping, etc. (50 members per training for 3 days)
- Provide tools (wheelbarrow, Handles, Spades, Pangas, etc.) to communities for use during the establishment of water harvesting and soil and water conservation structures (terracing, soil bunds, infiltration pits etc.)
- Establish 10 Ha of soil and water conservation structures at selected farm sites to serve as training and demonstration centres.
- Support individual farmers to establish 150 Ha similar soil and water conservation structures on the hotspots identified on their individual land.
- Carry out quarterly inspections and monitoring of the established structures to ensure survival and growth of the planted species and also to ensure effective functioning of the structures established. This shall remain the responsibility of the SCMC, CMC and the AWMZ staff after the project.

### Task 2: Support communities to restore degraded stretches of riverbanks in the Chonjojo and Rukoki micro catchments through use of catchment management measures

Restoration of the riverbanks in the Chonjojo and Rukoki micro catchments shall be through the use of catchment management measures. This shall, however, be carried out in the two lots as described in the scope of works. Accordingly, the Service Provider shall;

- Mobilise riparian community members (500), raise their awareness on the importance of river bank protection, restoration and management to ably participate in the restoration process (50 members per meeting)
- Conduct trainings for 500 community members to undertake and adopt the river bank protection and restoration measures including river bank stabilisation using bamboo, woodlot (both indigenous and fruit tress) establishment along the river banks, and organise members to develop site specific riverbank protection and restoration action plans (50 members per training for 2 days)

- Provide tools (wheelbarrows, Hoes, spades, Peak Axe, Pangas etc.) to communities for use in implementing the riverbank protection and restoration action plans
- Demarcate off and re-vegetate 20 km buffer zone/stretch on both sides of the river using live markers like indigenous trees, and fruit trees planted in 3 lines along the river at spacing 5m x 5m (660 tree seedlings per km, incl. 20% spoilt during transportation + replacement planting).
- Carry out quarterly inspections and monitoring of the interventions after establishment to ensure high survival rate of trees. This shall remain the responsibility of the SCMC, CMC and the AWMZ staff after the project.

### Task 3: Support communities to restore deforested and degraded communal and individual land through tree growing in the Chonjojo and Rukoki micro catchments.

Restoring of 700 Ha of degraded communal and individual land through tree growing (afforestation, reforestation, and agroforestry) of the Chonjojo and Rukoki micro catchments will be carried out. According to the service provider shall;

- Mobilise and sensitize 500 households in 4 meetings to engage in tree growing initiatives
- Conduct 4 trainings to 500 households in tree growing and forest management for restoration
- Provide tools and materials (wheelbarrow, Handles, Spades, Pangas, etc.) to 500 households for use during tree growing.
- Provide 400,000 tree seedlings of average height of 30cm to communities
- Plant 400,000 tree seedlings of average height of 30cm to communities and restore 700 ha of degraded land (at a spacing of 5m x 5m) under technical supervision. Indigenous trees to include false mvule, ficus species, myopsis ("emit"), taminalia species.
- Carry out quarterly inspections and monitoring to provide extension services during and after establishment to ensure tree survival and growth.
- Facilitate 150 members of sub-catchment and micro catchment structures to develop and enforce bye-laws to manage the tree growing

### Task 4: Support communities to establish and promote alternative income generating activities for improved livelihoods.

Under this task, Bee-keeping, energy saving technologies (e.g. improved cookstoves), fruit growing, and fish farming as alternative income generating activities shall be promoted and supported. The beneficiaries of these alternative livelihoods are the land owners along river banks, and other degraded areas to be restored. Each community member or farmer will select the enterprise they are interested in and it is after this that the list of farmers per enterprise will be generated. Success will be measured based on the number of community members or farmers that adopt and use the different alternative income generating activities. This shall however be carried out as described in the scope of works

Accordingly, the Service Provider shall;

1. Support Bee-keeping as alternative income generating activity
  - Mobilise and engage 100 selected farmers to identify the potential site (0.25ha) for beekeeping/ apiary establishment.
  - Train 100 selected farmers in bee keeping and siting of apiary; Hives deployment and baiting; Inspection and maintenance of deployed hives; Honey harvesting and handling; and Marketing including value-addition.
  - Provide key beekeeping equipment to 10 farmer groups each with 25 bee hives as:

- 25 KTB beehives for each of 10 groups (standard size; lid is 58cm x 97cm, Side 33cm x 88.9cm, Bottom is 22.9cm x 96.5cm)
  - 1 Smoker pump (metallic) for 10 groups
  - 02 (15-20 litre) plastic buckets for (harvesting honey combs) to each of 10 groups
  - 1 Honey metallic aluminium non-corrosive material Settling Tank (25lts) for each of 10 groups
  - 1 Air tight Bucket (20ltrs for each of 10 groups)
  - 1 Kg of bee wax for each of 10 groups
  - 1 protective wear (an overall with a hat with a net and gloves all in one-to protect from stings) for each of 10 groups
  - 1 bee knife and 1 Bee brush for each of 10 groups
  - Provide bee colonies to the selected farmers to start beekeeping and establish apiaries each with 25 bee hives. Install hives at least 1-1.5m above ground and at 5m interval (distance between hives) for easy management of pests. Identify and fence off an area of 0.25 ha per farmer for establishing the apiary, using local live fencing trees of an average height of 1.5-2m high (e.g. Ficus natalensis – mutuba spaced at 3 metres) and three lines of barbed wire all round. Plant suitable fodder trees and shrubs (e.g. Calliandra, Eucalyptus, bottle brush trees, neem tree, etc.).
  - Provide technical support to bee-keeping farmers: Carry out quarterly colony inspection and management to monitor status of colony development, disease condition, and presence of queen, brood (eggs, larvae and pupae), and amount of food (pollen and nectar stores) and provide them with value-addition facilities such as packaging materials and branding.
2. Support energy saving technologies (e.g. improved cookstoves) as alternative income generating activity
- Identify, mobilise and sensitise 500 community members on advantages of using improved cook stoves (50 members per meeting)
  - Select and train 3 women groups of 20 members in construction, use, and maintenance, marketing of improved cook stoves (1-day training per group)
  - Provide materials and equipment (wheelbarrow, Handles, Spades, Moulds, Pangas, Strings, etc.) to women groups and facilitate them (labour) to construct 2000 cookstoves for households.
  - Carry out quarterly monitoring visits to the women groups to ensure the production, usage and maintenance of the constructed cook stoves is efficient and effective. This shall remain the responsibility of the SCMC, CMC and the AWMZ staff after the project.
3. Support fruit growing as alternative income generating activity
- Identify and mobilise 100 fruit growing farmers, sensitise and engage the farmers to form 4 groups
  - Conduct one training to each of the farmer groups in eco-agriculture/agronomic practices (including soil and water conservation, pests and diseases control, fruit tree management, organic farming, post-harvest handling).
  - Provide 2500 orange seedlings of average height of 30cm per group to plant and maintain the seedlings (at a spacing of 4m x 4m) under technical supervision.
  - Provide technical support to fruit farmers that includes disease/pest control and prevention and conduct on farm monitoring per farmer per month for the first 6 Months.
4. Support Horticulture value chain development
- Identify and mobilise 100 women and youths, sensitise and engage them to form 4 groups.
  - Conduct three trainings to each of the farmer groups in horticulture value chain development, (including soil and water conservation, pests and diseases control, organic farming and post-harvest handling).
  - Support on farm irrigation with supply of irrigation kits to the formed 4 groups
  - Provide 100 tins each of tomato and watermelon seedlings to the groups formed.
  - Provide technical support to the farmers that includes disease/pest control and prevention and conduct on farm monitoring per farmer per month for the first 6 Months.

5. Support Eco-tourism enterprise development.

- Identify and mobilise 100 youths and women, and engage them to form 4 groups
- Support in profiling eco-tourism services and products
- Build capacity of the youth and women in eco-tourism sector development
- Support in construction of tourism shades along the river bank
- Provide support in training of the youth as eco-tourism guides

6. Support Aquaculture enterprise development

- Identify and mobilise 100 community members, sensitise and engage them to form 4 groups.
- Support development and construction of 4 fish ponds in the riparian communities
- Build capacity in fish farming and marketing and distribution
- Support each of the four groups with 10,000 fish fingers and starter feed

### 5.3 Activities in the Downstream section of River Nyamwamba

#### Task 1: Support communities to restore degraded stretches of riverbanks in the downstream Nyamwamba micro-catchment through use of catchment management measures

Restoration of the riverbank in the downstream Nyamwamba micro catchment shall be through the use of catchment management measures. This shall, however, be carried out in the two lots as described in the scope of works. Accordingly, the Service Provider shall;

- Mobilise riparian community members (500), raise their awareness on the importance of river bank protection, restoration and management to ably participate in the restoration process (50 members per meeting)
- Conduct trainings for 500 community members to undertake and adopt the river bank protection and restoration measures including river bank stabilisation using bamboo, woodlot (both indigenous and fruit trees) establishment along the river banks, and organise members to develop site specific riverbank protection and restoration action plans (50 members per training for 2 days)
- Provide tools (wheelbarrows, Hoes, spades, Peak Axe, Pangas etc.) to communities for use in implementing the riverbank protection and restoration action plans
- Demarcate off and re-vegetate 20 km buffer zone/stretch on both sides of the river using live markers like indigenous trees, and fruit trees planted in 3 lines along the river at spacing 5m x 5m (660 tree seedlings per km, incl. 20% spoilt during transportation + replacement planting).
- Carry out quarterly inspections and monitoring of the interventions after establishment to ensure high survival rate of trees. This shall remain the responsibility of the SCMC, CMC and the AWMZ staff after the project.

#### Task 2: Support communities to restore deforested and degraded communal and individual land through tree growing in the downstream Nyamwamba Micro-catchment.

Restoring of 400 Ha of degraded communal and individual land through tree growing (afforestation, reforestation, and agroforestry) of the downstream Nyamwamba Micro-catchment will be carried out. According the service provider shall;

- Mobilise and sensitize 500 households in 4 meetings to engage in tree growing initiatives

- Conduct 4 trainings to 500 households in tree growing and forest management for restoration
- Provide tools and materials (wheelbarrow, Handles, Spades, Pangas, etc.) to 500 households for use during tree growing.
- Provide 400,000 tree seedlings of average height of 30cm to communities
- Plant 400,000 tree seedlings of average height of 30cm to communities and restore 400 ha of degraded land (at a spacing of 5m x 5m) under technical supervision. Indigenous trees to include false mvule, ficus species, myopsis (“emit”), taminalia species.
- Carry out quarterly inspections and monitoring to provide extension services during and after establishment to ensure tree survival and growth.
- Facilitate 150 members of sub-catchment and micro catchment structures to develop and enforce bye-laws to manage the tree growing

### Task 3: Support communities to establish and promote alternative income generating activities for improved livelihoods.

Under this task, Bee-keeping, energy saving technologies (e.g. improved cookstoves), fruit growing, and fish farming as alternative income generating activities shall be promoted and supported. The beneficiaries of these alternative livelihoods are the land owners along river banks, and other degraded areas to be restored. Each community member or farmer will select the enterprise they are interested in and it is after this that the list of farmers per enterprise will be generated. Success will be measured based on the number of community members or farmers that adopt and use the different alternative income generating activities. This shall however be carried out as described in the scope of works

Accordingly, the Service Provider shall;

1. Support Bee-keeping as alternative income generating activity
  - Mobilise and engage 100 selected farmers to identify the potential site (0.25ha) for beekeeping/ apiary establishment.
  - Train 100 selected farmers in bee keeping and siting of apiary; Hives deployment and baiting; Inspection and maintenance of deployed hives; Honey harvesting and handling; and Marketing including value-addition.
  - Provide key beekeeping equipment to 10 farmer groups each with 25 bee hives as:
    - 25 KTB beehives for each of 10 groups (standard size; lid is 58cm x 97cm, Side 33cm x 88.9cm, Bottom is 22.9cm x 96.5cm)
    - 1 Smoker pump (metallic) for 10 groups
    - 02 (15-20 litre) plastic buckets for (harvesting honey combs) to each of 10 groups
    - 1 Honey metallic aluminium non-corrosive material Settling Tank (25ltrs) for each of 10 groups
    - 1 Air tight Bucket (20ltrs for each of 10 groups)
    - 1 Kg of bee wax for each of 10 groups
    - 1 protective wear (an overall with a hat with a net and gloves all in one-to protect from stings) for each of 10 groups
    - 1 bee knife and 1 Bee brush for each of 10 groups
  - Provide bee colonies to the selected farmers to start beekeeping and establish apiaries each with 25 bee hives. Install hives at least 1-1.5m above ground and at 5m interval (distance between hives) for easy management of pests. Identify and fence off an area of 0.25 ha per farmer for establishing the apiary, using local live fencing trees of an average height of 1.5-2m high (e.g. Ficus natalensis – mutuba spaced at 3 metres) and three lines of barbed wire all round. Plant suitable fodder trees and shrubs (e.g. Calliandra, Eucalyptus, bottle brush trees, neem tree, etc.).
  - Provide technical support to bee-keeping farmers: Carry out quarterly colony inspection and management to monitor status of colony development, disease condition, and presence of queen, brood

(eggs, larvae and pupae), and amount of food (pollen and nectar stores) and provide them with value-addition facilities such as packaging materials and branding.

2. Support energy saving technologies (e.g. improved cookstoves) as alternative income generating activity
  - Identify, mobilise and sensitise 500 community members on advantages of using improved cook stoves (50 members per meeting)
  - Select and train 3 women groups of 20 members in construction, use, and maintenance, marketing of improved cook stoves (1-day training per group)
  - Provide materials and equipment (wheelbarrow, Handles, Spades, Moulds, Pangas, Strings, etc.) to women groups and facilitate them (labour) to construct 2000 cookstoves for households.
  - Carry out quarterly monitoring visits to the women groups to ensure the production, usage and maintenance of the constructed cook stoves is efficient and effective. This shall remain the responsibility of the SCMC, CMC and the AWMZ staff after the project.
3. Support fruit growing as alternative income generating activity
  - Identify and mobilise 100 fruit growing farmers, sensitise and engage the farmers to form 4 groups
  - Conduct one training to each of the farmer groups in eco-agriculture/agronomic practices (including soil and water conservation, pests and diseases control, fruit tree management, organic farming, post-harvest handling).
  - Provide 2500 orange seedlings of average height of 30cm per group to plant and maintain the seedlings (at a spacing of 4m x 4m) under technical supervision.
  - Provide technical support to fruit farmers that includes disease/pest control and prevention and conduct on farm monitoring per farmer per month for the first 6 Months.
4. Support Horticulture value chain development
  - Identify and mobilise 100 women and youths, sensitise and engage them to form 4 groups.
  - Conduct three trainings to each of the farmer groups in horticulture value chain development, (including soil and water conservation, pests and diseases control, organic farming and post-harvest handling).
  - Support on farm irrigation with supply of irrigation kits to the formed 4 groups
  - Provide 100 tins each of tomato and watermelon seedlings to the groups formed.
  - Provide technical support to the farmers that includes disease/pest control and prevention and conduct on farm monitoring per farmer per month for the first 6 Months.
5. Support Eco-tourism enterprise development.
  - Identify and mobilise 100 youths and women, and engage them to form 4 groups
  - Support in profiling eco-tourism services and products
  - Build capacity of the youth and women in eco-tourism sector development
  - Support in construction of tourism shades along the river bank
  - Provide support in training of the youth as eco-tourism guides
6. Support Aquaculture enterprise development
  - Identify and mobilise 100 community members, sensitise and engage them to form 4 groups.
  - Support development and construction of 4 fish ponds in the riparian communities
  - Build capacity in fish farming and marketing and distribution
  - Support each of the four groups with 10,000 fish fingers and starter feed
7. Support to stone mining and development

- Identify and mobilise 100 youths, sensitise and engage them to form 4 groups.
- Train the youths in art and design based on river stones and associated products
- Support the youth with equipment (e.g., shovels) to ease on the stone mining business
- Support the youth in business skills that shall include marketing of stone products and services.

## 6 ANALYSIS OF PROJECT ALTERNATIVES

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The purpose of this chapter is to present alternatives to the proposed project. The aim is to determine which alternative represents the most optimal balance between the environmental and economic costs and benefits. Two alternatives were considered in the environment impact study. The alternatives are compared in terms of their environmental impacts and their achievement of project objectives.

### 6.1 The “No Action” Alternative

The No Action alternative in respect to the proposed activities implies that the status quo is maintained i.e. management measures are not implemented. This option is not suitable in any way and it means the degradation of sub catchment continues to take place making the existing impacts severe. However, implementation of the measures will ensure that ensure catchments restoration and environmental conservation. Therefore, the No Project scenario is therefore **is not recommended**.

### 6.2 The “Action” Alternative

The Action alternative supports the proposed development to be implemented. The “Action” Alternative suggested by the proponent is considered a viable option because of the necessity to restore, conserve and protect the sub catchment. The proposed project was designed to limit its impact on the environment. All possible impacts were assessed and found to have practicable mitigation measures. The “Action” Alternative as described in this report exhaustively discusses the impacts of the proposed project activities. The impacts and mitigation measures for the “Action” alternative were thoroughly discussed throughout this report, particularly in Chapters 7 and 8. With the implementation of the proposed mitigation measures, this alternative would have only minimal impacts on the environment; hence, the “Action” alternative is hereby preferred.



## 7 EVALUATION OF ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS

This chapter identifies and evaluates significant environmental and social impacts that are likely to result from the implementation of proposed catchment management measures. The section contains a discussion of the environmental and social impacts of the proposed interventions and their mitigation and enhancement measures during the life cycle of the proposed project. While positive attributes of this project should be enhanced, mitigation measures will be put in place to minimize or eliminate the likely negative environmental impacts.

### 7.1 Impact Assessment Methodology

To evaluate the impacts associated with the proposed development, the following impact characteristics and an impact matrix were defined systematically. Potential and apparent impacts have been identified based on proposed activities to be undertaken. To establish impact significance, the following key concepts will be utilized as follows:

- **Impact identification:** Potential environmental impacts during the implementation of the different interventions of project development are identified and described including their causes.
- **Impact evaluation:** Each impact is evaluated based on extent, persistence, and ecological/social sensitivity, regulatory and legal compliance.
- **Impact severity:** Using a combination of the above criteria (extent, persistence, ecological/social sensitivity, and regulatory and legal compliance), the overall severity of the impact was rated as severe, substantial, moderate, minor and negligible as per with broad categories of impacts for each rating.

Table 7-1 presents potential Impacts of the Proposed Project. Where potentially negative impacts were identified, mitigation measures to avoid, reduce or minimise them have been suggested; some of them were incorporated into the project designs while others would be implemented during project implementation. Good practice measures were identified and included in order to further minimise the impact of the proposed development. The proponent has agreed to these mitigation measures and they are, therefore, expressed as commitments.

Table 7-1: Potential Impacts of the Proposed Project

## 7.2 Impacts associated to restoration of riverbanks

### Positive impacts

1. **Enhanced ecological functioning of the restored and protected riverbanks:** Restoration and protection of the riverbanks will reduce the possibility of siltation of rivers and restore the capacity of the river to contain the flowing water which could otherwise cause flooding. Sediment transported downstream will also decrease in the downstream systems. This will ensure that the quality of water flowing in the rivers is good for various uses by communities in the area. Riverbank protection will also increase on the emergence of new plant species which can improve the sustainability of the ecosystem around the protected rivers.
2. **Increased access to animal feeds:** The planted grass on the riverbanks could serve as food for the animals.
3. **Increased awareness and enhanced capacities of the communities** in riverbank restoration and protection: During the restoration activities, Communities' awareness on the importance of river bank protection, restoration and management shall be raised so as to ably participate in the restoration process shall be created. Capacities of communities shall be enhanced so to undertake and adopt the river bank protection and restoration measures including river bank stabilisation using grasses, tree lines, stones and to develop site specific riverbank protection and restoration action plans.
4. **Increased access to tools and equipment** to undertake restoration activities: during the process of restoration, communities shall be equipped with tools and equipment to undertake restoration activities. These shall remain the property of the communities involved and shall be available for future use.
5. **Increased recreational activities:** Restored and protected riverbanks could be inviting places for popular recreational activities including hiking, fishing, bird watching, photography and hunting. This could generate incomes to surrounding communities and improve their livelihoods.

### Potential Negative impacts

1. **Reduced agricultural land:** The current subsistence agricultural activities along the river banks will be replaced by a restored environment and the access to use the restored ecosystem will be regulated and restricted.

### Enhancement Measures

1. Sensitization of community members on the gazetted buffer zones.
2. Creating awareness to communities of alternative livelihood activities that can be carried out within the buffer zones.
3. Enforcement of the existing laws and regulations on wetland protection.
4. Strengthen/ develop community structures which can be enhance internal community regulation

### Proposed Mitigation measures

1. The project has been designed to support and promote alternative income generating activities and the affected communities are expected to benefit from these. These shall be compatible with responsible riverbank management.
2. Some communities shall also be able harvest mature planted grass to feed their animals.

## 7.3 Impacts associated to implementing soil and water conservation measures

### Positive impacts

1. **Improved soil fertility and soil structure:** Soil and water conservation measures are meant to prevent soil erosion and improve the quality of the soil in terms of fertility since most of the economic activities in the sub catchment are agro-based. Since most of the methods use a nature-based approach, there will be reduction in the use of inorganic fertilizers which are currently the most common means of improving soil fertility in the sub catchment.
2. **Increased recharge of ground water sources:** An increase in the recharge of the ground water sources that feed the different shallow and spring wells within the sub catchment is anticipated. The implementation of the

### Enhancement Measures

1. Farmers to be sensitized on growing crops that improve on soil fertility such as planting of leguminous crops like beans which fix nitrogen into the soil and making the soils fertile.
2. Sensitize farmers on good agricultural practices such as inter cropping and contour ploughing that reduce soil erosion allowing the soil to retain its properties. And also use of better farming practices such as mulching and terracing which reduce soil erosion and allow

soil and water conservation measures will improve the infiltration capabilities of the soils allowing the water to infiltrate further in the deep layers of the soil to the base flow and therefore recharging the ground water sources. This will further ensure that there is improved supply of water in the different point sources in the sub catchment.

3. **Improved agricultural production for communities:** Implementation of activities such as agroforestry and proper farming methods through sensitization of communities and trainings will enable the different farmers increase on the production levels in the plantations and hence earn more from the produce.
4. **Increased awareness and enhanced capacities of the communities:** During the restoration activities, Communities' awareness on the advantages of controlling soil erosion / floods through use of water harvesting and biophysical measures as to ably participate in the implementation activities shall be created. Capacities of communities shall be enhanced so to undertake and adopt soil and water conservation practices.
5. **Increased access to tools and equipment** to undertake restoration activities: during the process of restoration, communities shall be equipped with tools and equipment to undertake restoration activities. These shall remain the property of the communities involved and shall be available for future use.

water infiltration into the ground and hence recharge of ground water sources.

3. Carry out enforcement of the existing regulations and laws that prohibit activities that led to destruction of soil fertility such as over grazing.

#### Potential Negative impacts:

1. **Reduced land area for cultivation:** The implementation of some soil and water conservation measures such as percolation pits will require the establishment of shallow ditches/holes within an individual's land. This will mean that the area available for cultivation will be reduced and hence reduction in productivity potential.

#### Proposed Mitigation Measures

1. Whereas the land area available for farming could be reduced, the implementation of these measures will bring about more positive impacts to the land owner such as increased fertility of soils, reduced soil erosion etc. and hence increases the overall productivity of the land. More so, the affected communities shall also benefit from the alternative income generation activities supported by the project.

## 7.4 Impacts associated to restoration of deforested and degraded communal and individual land through afforestation, reforestation and agroforestry

### Positive impacts

1. **Increased tree cover:** Tree growing will ensure that the catchment is restored and the intensity of the impacts of deforestation reduced. In addition, tree planting can become an income generating activity which further improves the livelihoods of these people. The restored forests will help in improving the water quality of the system as they help in trapping silts that would contaminate the water.
2. **Increased energy source:** The growing of tree shall make available of firewood from the planted trees. More so the promotion of energy saving stoves as an alternative energy source shall reduce pressure on the planted trees for firewood as less firewood is required for cooking.
3. The restored forests will provide wildlife habitats for the various plant and animal species such as reptiles, amphibians, insects, birds and mammals among others.

### Enhancement Measures

1. Raise awareness and sensitize communities to promote tree growing across the local landscape
2. Raise awareness and sensitize communities and CBSDs to promote responsible management of existing forests and vegetation across the local landscape
3. Strengthen/ develop community structures which can be enhance internal community regulation

4. The restoration will help in mitigating climate change impacts as trees supply humans with the much-needed oxygen and sequester carbon dioxide; the trees will help in fixing nitrogen into soil making it more fertile and this can enable the growth of crops.
5. **Increased access to tools and equipment** to undertake restoration activities: during the process of restoration, communities shall be equipped with tools and equipment to undertake restoration activities. These shall remain the property of the communities involved and shall be available for future use.
6. **Increased awareness and enhanced capacities of the communities:** During the restoration activities, Communities' awareness in tree growing and forest management for restoration shall be undertaken. Capacities of communities shall be enhanced so to undertake and adopt soil and water conservation practices.

#### Potential Negative impacts:

1. **Reduced land area for cultivation:** Some of the cultivable land could be converted into forest land.
2. **Possibility of introducing alien-invasive Tree species:** A possibility of alien-invasive species being introduced in the local and the sub-catchment landscape if planting materials are not properly selected.

#### Proposed Mitigation Measures

1. The affected communities shall also benefit from the alternative income generation activities supported by the project.
2. Replant tree species that are specific to the areas where the restorations are to be implemented.
3. The Local Government technical officers (Natural Resources Officers, Forest Officers, and Environment Officers), together with the experts on the project management team will advise on the best planting materials in the landscape.
4. In general terms, indigenous planting materials, or the materials that have adapted ecologically in the landscape shall be planted.

## 7.5 Impacts associated to establishing and promoting alternative Income Generating Activities (IGAs)

### Positive impacts

1. **Increased incomes and improved livelihoods:** The restoration will promote development of local industry by promoting value addition to products from income generating activities like beekeeping, fruit growing, fish farming, and growing of timber and energy plantations, among others; these activities could also provide both direct and indirect employment opportunities to the local community.
2. **Enhanced social cohesion:** Community members shall be encouraged to form groups and work collectively in establishing income generating activities
3. **Enhanced skills and knowledge:** Communities shall be trained in establishing the income generating activities such as bee keeping, fish farming, fruit growing, fodder production, etc.

### Enhancement Measures

1. Promote livelihood activities that are compatible with responsible management and use
2. Raise awareness, sentries and train communities and CBSDs on the different IGAs

4. **Improved standard of living:** With increased incomes, communities could afford other needs of life as parents could afford to pay school fees for their children.

#### Potential Negative impacts:

1. **Possible misuse of generated incomes:** The incomes obtained could push some community people especially men into doing socially unacceptable practices e.g. over drinking, domestic violence including violence against children (VAC), sexual exploitation and abuse (SEA), gender-based violence (GBV), etc.

#### Proposed Mitigation Measures

1. Train the people in investment and saving mechanisms and encourage the members to open up saving accounts to keep their income.
2. Provide HIV/AIDS awareness and counselling to the communities as regards to family planning approaches.
3. Train DLG social staff on gender aspects including GBV, SEA and VAC who will in turn sensitize project communities on their risks and impacts
4. Mobilize and sensitize project communities on the risks and impacts of GBV, SEA and VAC

### 7.6 Cross-cutting Negative Impacts

1. **Occupational Health and Safety Impacts:** There are a variety of safety issues that may arise during the implementation of certain interventions. Workers may be faced with injuries such as cuts which if taken lightly can lead to contraction of other diseases such as tetanus. Furthermore, people working on river bank interventions can fall into the water which may lead to drowning incidents.
2. **Impacts due to poor waste management:** Waste is likely to be generated throughout the implementation of the project. Poor waste management through littering especially from the plastic potting bags used to hold tree seedlings can result into soil degradation if these are poorly disposed especially through the blockage of soil air spaces and reducing aeration and water infiltration in the soil. Poor human waste disposal especially by contractors and project activities' implementers can lead to a number of issues such as disruption of the surrounding aesthetics and the contamination of nearby water bodies which can cause other impacts to the water leading to diseases such as cholera and bilharzia to the communities that depend on the water source.
3. **Possibility of future re-encroachment into the riverbanks:** Communities whose activities are displaced by the project could re-encroach the protected areas causing further destruction.

#### Proposed Mitigation Measures

##### Occupational Health and Safety Impacts

1. During implementation of the project, the contractor should ensure the workers are trained to use any tools that may be required so that they are aware of the potential kickbacks during usage.
2. Safety measures shall be spelt out in the mode that is appropriate for the locality e.g. bill boards, leaflets, meetings, etc.
3. All workers shall be provided with appropriate personal protective equipment, and be required to use them while at work
4. The contractor shall provide a first aid kit for the work force on site to treat minor injuries and services of the nearby health facilities shall be utilized in case of major injuries
5. Inform individuals working on sensitively dangerous hotspots of the potential for falls and provide a barrier tape to notify people of the danger zones of the working area.

##### Impacts due to poor waste management

6. During the training of communities, production and waste management will be covered

7. Plastic potting bags that are still in good condition can be reused in the nurseries by repacking seedlings into these bags.
8. Plastic potting bags in poor condition should be disposed of in a proper manner and in locations that are designated by the district authorities.
9. Sanitary disposal areas should be put in place to ensure that human wastes are properly disposed of.
10. Enforce environmental laws by the District Environment Officer and NEMA

**Possibility of future re-encroachment into the riverbanks**

11. Establish and strengthen Community institutions (environment committees, sub-catchment and micro-catchment management committees) to enhance monitoring and internal self-regulation
12. Enforce environmental laws by the District Environment Officer and NEMA

## 8 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

### 8.1 Introduction

The approach to Environmental and Social Management would be to apply the key principles of environmental and social safeguards to all activities of the proposed project right from project planning through to implementation. For the proposed project, these principles would include:

- Prior assessment of environmental and social impacts;
- Minimization of potential impacts through design and other mitigation controls; and
- Monitoring of the effectiveness of suggested controls and their implementation.

The goal of the Environmental and Social Management and Monitoring Plan is to ensure that environmental and socio-economic issues continue to be fully integrated into the decisions of the developer while promoting resource allocation efficiency throughout the lifetime of implementing the sub-catchment management measures. This section is designed to ensure that the commitments/ mitigation measures in this project brief, and in any subsequent assessment reports, together with any license approval or similar conditions, are implemented. In executing the sub-catchment management measures, the management team is expected to take all practicable measures to ensure that the requirements of this brief are complied with.

### 8.2 The Monitoring Plan

A monitoring process will need to be established to check/ assess progress in implementation, the effectiveness of the mitigation measures suggested, and the resulting effects of the proposed management measures on the environment and communities. The process will begin during the pre-works assessments stage and continue into the restoration phase. It will also include regular reviews of the impacts that cannot be adequately assessed before the beginning of the project, or which arise unexpectedly. In such cases, appropriate new actions to mitigate any adverse effects will be undertaken.

### 8.3 Roles and Responsibilities

In order to enhance the potential for integrating sustainability concerns in the management measures, it is important to assign clear roles and responsibilities to actors so as to ensure that environmental and social plans are implemented effectively.

#### 8.3.1 The role of NEMA

In consultation with LG Authorities, and in collaboration with the other Agencies (especially NFA, Forestry Sector Support Department, and Directorate of Water Resources Management), NEMA will monitor all environmental phenomena in order to assess possible changes in the environment and their possible impacts. NEMA and the Lead Agencies will also monitor implementation of the management measures with a view to determining the immediate and long-term effects of the measures on the environment. An environmental inspector appointed by NEMA will closely observe the implementation process.

#### 8.3.2 The role of DLGs

The DLGs will supervise the implementation of the interventions according to the specifications, designs and methods prescribed. They will also approve any proposed changes and will continue to monitor the interventions even beyond the project. They will also help in mobilizing the communities and settling any disputes during and after implementation.

#### 8.3.3 The Role of Ministry of Gender, Labour and Social Development

Social Development Sector (SDS) that promotes issues of social protection, gender equality, equity, human rights, culture, decent work conditions and empowerment for different groups such as women, children, the unemployed youth, the older persons and persons with disabilities. The sector through The Community Based Services Departments (CBSD) at district level shall ensure that communities are empowered to appreciate, access, participate in, and manage community-based initiatives brought about by the project for improved livelihoods and social security for all.

#### 8.3.4 The Role of the Ministry of Water and Environment

Although the contractor will have the primary role in delivering on the measures set out in the Plan, MWE will have the ultimate responsibility for ensuring that the sub-catchment management measures are delivered. In this respect, MWE will review and approve contractor plans for delivery of the actions contained in the Plan, review contractor performance through monitoring, environmental and social audits, and inspection to ensure that all proposed mitigation measures are implemented.

#### 8.3.5 The Role of the Implementing Contractor

During pre-works assessments, and during implementation of the management measures, the contractor will be responsible for ensuring compliance with all relevant legislation as well as adherence to all environmental and socio-economic mitigation measures specified in the Plan. MWE is also responsible for managing the potential environmental, socio-economic, safety and health impacts of all contractual activities, whether these are undertaken by themselves or by their subcontractors.

#### 8.3.6 The Monitoring Team

A monitoring team will be formed at district level. It will be composed of officials from the departments of Natural Resources, Production, Health, Physical Planning and Community-Based Services Department (CBSD). The team will be headed by the Chief Administrative Officer. In addition, respective local environment and social committees will be expected to take serious interest in participating in the monitoring process.

### 8.4 The Environment and Social Management and Monitoring Plan

A monitoring and feedback mechanism would be required to effectively implement and monitor the environmental and social management plan. This would ensure proper implementation of proposed mitigation measures and also to effect mid-course corrections. Monitoring would be carried out on a regular basis using standard methods of various environmental attributes by suitably qualified personnel.

A monitoring plan has been prepared taking into account project activities (as shown in Chapter 5). The recommendations in this report would provide a basis for tracking progress of the proposed project activities with regard to sound environmental and social practice and mitigation measures.

The purpose of the plan is to detect violations, ensure compliance with the set laws, and check whether the necessary permits are in place as required. MWE and its constituent departments will oversee the implementation of the management measures, and will ensure regular monitoring of the implementation of the Plan. In addition, the LGs particularly the departments of Natural Resources, and Community-Based Services, will ensure all measures and interventions on the ground are environmentally sound and socially acceptable. NEMA and MoGLSD will advise them accordingly.



Table 8-1: Environmental Management and Monitoring Plan for the Potential Impacts of the Proposed Project

Impact category	Potential Positive/negative impacts	Proposed Enhancement/Mitigation Measures	Cost Estimates (US\$)	Responsibility	Monitoring/ Supervision Requirement	Timeframe
Impacts associated to restoration of riverbanks	<b>Positive impacts</b> <ul style="list-style-type: none"> <li>→ Enhanced ecological functioning of the restored and protected riverbanks</li> <li>→ Increased access to animal feeds</li> <li>→ Increased awareness and enhanced capacities of the communities in riverbank restoration and protection</li> <li>→ Increased access to tools and equipment to undertake restoration activities</li> <li>→ Increased recreational activities</li> </ul>	<b>Enhancement Measures</b> <ul style="list-style-type: none"> <li>→ Sensitization of community members on the gazetted buffer zones.</li> <li>→ Creating awareness to communities of alternative livelihood activities that can be carried out within the buffer zones.</li> <li>→ Enforcement of the existing laws and regulations on wetland protection.</li> <li>→ Strengthen/ develop community structures which can be enhance internal community regulation</li> </ul>	40,000	Implementing Contractor	MWE (WMZs), Supervising Consultant, DLG	Throughout the implementation of the project
	<b>Potential negative impact</b> <ul style="list-style-type: none"> <li>→ Reduced agricultural land</li> </ul>	<b>Proposed Mitigation Measures</b> <ul style="list-style-type: none"> <li>→ The project has been designed to support and promote alternative income generating activities and the affected communities are expected to benefit from these. These shall be compatible with responsible riverbank management.</li> <li>→ Some communities shall also be able harvest mature planted grass to feed their animals.</li> </ul>				
Impacts associated to implementing soil and water conservation measures	<b>Positive impacts</b> <ul style="list-style-type: none"> <li>→ Improved soil fertility and soil structure</li> <li>→ Increased recharge of ground water sources</li> <li>→ Improved agricultural production for communities</li> <li>→ Increased awareness and enhanced capacities of the communities</li> <li>→ Increased access to tools and equipment to undertake restoration activities</li> </ul>	<b>Enhancement Measures</b> <ul style="list-style-type: none"> <li>→ Farmers to be sensitized on growing crops that improve on soil fertility such as planting of leguminous crops like beans which fix nitrogen into the soil and making the soils fertile.</li> <li>→ Sensitize farmers on good agricultural practices such as inter cropping and contour ploughing that reduce soil erosion allowing the soil to retain its properties. And also use of better farming practices such as mulching and terracing which reduce soil erosion and allow water infiltration into the ground and hence recharge of ground water sources.</li> <li>→ Carry out enforcement of the existing regulations and laws that prohibit activities that led to destruction of soil fertility such as over grazing.</li> </ul>	35,000	Implementing Contractor	MWE (WMZs), Supervising Consultant, DLG	Throughout the implementation of the project
	<b>Potential negative impact</b> <ul style="list-style-type: none"> <li>→ Reduced land area for cultivation</li> </ul>	<b>Proposed Mitigation Measures</b> <ul style="list-style-type: none"> <li>→ Whereas the land area available for farming could be reduced, the implementation of these measures will</li> </ul>				

Impact category	Potential Positive/negative impacts	Proposed Enhancement/Mitigation Measures	Cost Estimates (US\$)	Responsibility	Monitoring/Supervision Requirement	Timeframe
		bring about more positive impacts to the land owner such as increased fertility of soils, reduced soil erosion etc. and hence increases the overall productivity of the land. More so, the affected communities shall also benefit from the alternative income generation activities supported by the project.				
Impacts associated to restoration of deforested and degraded land through afforestation, reforestation and agroforestry	<b>Positive impacts</b> <ul style="list-style-type: none"> <li>→ Increased tree cover</li> <li>→ Increased energy source</li> <li>→ increased wildlife habitats for the various plant and animal species</li> <li>→ Enhanced mitigation of climate change impacts</li> <li>→ Increased access to tools and equipment to undertake restoration activities</li> <li>→ Increased awareness and enhanced capacities of the communities</li> </ul>	<b>Enhancement Measures</b> <ul style="list-style-type: none"> <li>→ Raise awareness and sensitize communities to promote tree growing across the local landscape</li> <li>→ Raise awareness and sensitize communities and CBSDs to promote responsible management of existing forests and vegetation across the local landscape</li> <li>→ Strengthen/ develop community structures which can be enhance internal community regulation</li> </ul>	25,000	Implementing Contractor	MWE (WMZs), Supervising Consultant, DLG	Throughout the implementation of the project
	<b>Potential negative impact</b> <ul style="list-style-type: none"> <li>→ Reduced land area for cultivation</li> <li>→ Possibility of Introducing alien-invasive Tree species</li> </ul>	<b>Proposed Mitigation Measures</b> <ul style="list-style-type: none"> <li>→ The affected communities shall also benefit from the alternative income generation activities supported by the project.</li> <li>→ Replant tree species that are specific to the areas where the restorations are to be implemented.</li> <li>→ The Local Government technical officers (Natural Resources Officers, Forest Officers, and Environment Officers), together with the experts on the project management team will advise on the best planting materials in the landscape.</li> <li>→ In general terms, indigenous planting materials, or the materials that have adapted ecologically in the landscape shall be planted.</li> </ul>				
Impacts associated to establishing and promoting	<b>Positive impacts</b> <ul style="list-style-type: none"> <li>→ Increased incomes and improved livelihoods</li> <li>→ Enhanced social cohesion</li> <li>→ Enhanced skills and knowledge</li> <li>→ Improved standard of living</li> </ul>	<b>Enhancement Measures</b> <ul style="list-style-type: none"> <li>→ Promote livelihood activities that are compatible with responsible management and use</li> <li>→ Raise awareness, sentries and train communities and CBSDs on the different IGAs</li> </ul>	40,000	Implementing Contractor	MWE (WMZs), Supervising Consultant, DLG (CBSD)	Throughout the implementation of the project

Impact category	Potential Positive/negative impacts	Proposed Enhancement/Mitigation Measures	Cost Estimates (US\$)	Responsibility	Monitoring/Supervision Requirement	Timeframe
	<b>Potential negative impact</b> → Possible misuse of generated incomes	<b>Proposed Mitigation Measures</b> → Train the people in investment and saving mechanisms and encourage the members to open up saving accounts to keep their income. → Provide HIV/AIDS awareness and counselling to the communities as regards to family planning approaches. → Train DLG social staff on gender aspects including GBV, SEA and VAC who will in turn sensitize project communities on their risks and impacts → Mobilize and sensitize project communities on the risks and impacts of GBV, SEA and VAC				
Cross-cutting Negative Impacts	<b>Potential negative impact</b> → Occupational Health and Safety Impacts → Impacts due to poor waste management → Possibility of future re-encroachment into the riverbanks	<b>Proposed Mitigation Measures</b> Occupational Health and Safety Impacts: → During implementation of the project, the contractor should ensure the workers are trained to use any tools that may be required so that they are aware of the potential kickbacks during usage. → Safety measures shall be spelt out in the mode that is appropriate for the locality e.g. bill boards, leaflets, meetings, etc. → All workers shall be provided with appropriate personal protective equipment, and be required to use them while at work → The contractor shall provide a first aid kit for the work force on site to treat minor injuries and services of the nearby health facilities shall be utilized in case of major injuries → Inform individuals working on sensitively dangerous hotspots of the potential for falls and provide a barrier tape to notify people of the danger zones of the working area. Impacts due to poor waste management: → During the training of communities, production and waste management will be covered → Plastic potting bags that are still in good condition can be reused in the nurseries by repacking seedlings into these bags.	15,000	Implementing Contractor	MWE (WMZs), Supervising Consultant, DLG	Throughout the implementation of the project

Impact category	Potential Positive/negative impacts	Proposed Enhancement/Mitigation Measures	Cost Estimates (US\$)	Responsibility	Monitoring/Supervision Requirement	Timeframe
		<ul style="list-style-type: none"> <li>→ Plastic potting bags in poor condition should be disposed of in a proper manner and in locations that are designated by the district authorities.</li> <li>→ Sanitary disposal areas should be put in place to ensure that human wastes are properly disposed of.</li> <li>→ Enforce environmental laws by the District Environment Officer and NEMA</li> </ul> <p>Possibility of future re-encroachment into the riverbanks:</p> <ul style="list-style-type: none"> <li>→ Establish and strengthen Community institutions (environment committees, sub-catchment and micro-catchment management committees) to enhance monitoring and internal self-regulation</li> <li>→ Enforce environmental laws by the District Environment Officer and NEMA</li> </ul>				

## 9 CONCLUSION

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Any possible negative impacts were identified, mitigation measures to avoid, reduce and minimize these impacts were suggested either as part of the design, or as measures to be implemented by the various key actors, namely: Implementing Contractor and the proponent. Sound practice measures were also identified in order to minimize the impact of the proposed development further. The proponent agreed to these mitigation measures and they are, therefore, expressed as commitments.

Overall, the negative impacts of the proposed project were rated by this study as having feasible mitigation measures that have been proposed to address them. When mitigation actions and environmental and social monitoring plans are implemented, the project would have minimal residual environmental and social effects. Hence the project can be implemented in a sustainable manner, in line with national and international environmental and social best practices.

More so, this is the main purpose of implementing sub-catchment management measures. The measures seek to restore ecosystems, improve the livelihoods of the local people, bring the local people into decision making in the management of their resources, and bring in sub-catchment practices that are environment friendly, socially acceptable, and economically feasible.

## 10 REFERENCES

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9. Uganda Government (1994): The National Environmental Management Policy;
10. Uganda Government (1964): The Public Health Act, 1964;
11. Uganda Government (2000): The National Environment (Wetlands, River Banks and Lake Shore Management) Regulations, 2000;

## 11 ANNEXES

### 11.1 Annex I: People and Organisations Contacted in the sub catchment

Name	F/M	Title	Organization	Contact
1. Mwesigwa Bosco	M	Power Plant Assistant	Seams Hydro -Nyamwamba II Hydropower Scheme	0781 756886
2. Hassan Otim	M	Health and Safety Officer	Seams Hydro -Nyamwamba II Hydropower Scheme	0782 234179
3. Moreen Kagende	F	Health and Social Officer	Seams Hydro -Nyamwamba II Hydropower Scheme	0777 537331
4. Winfred Nakalema	F	Health and Safety Officer	Seams Hydro -Nyamwamba II Hydropower Scheme	0704 172 448
5. Mukiiza Derrick Kwikiriza	M	Client Site Manager	Seams Hydro -Nyamwamba II Hydropower Scheme	0703 690 466
6. Joshua Miramagho	M	Principal Assistant Secretary	Kasese District Local Government	0772 680343
7. Augustine Kooli	M	Senior Environment Officer	Kasese District Local Government	0782 544 911
8. Robert Musabe	M	Power Plant Assistant	Seams Hydro -Nyamwamba II Hydropower Scheme	0775 555891

#### General Summary of key issues of concerns during stakeholder consultations

##### Concern from the community members

- Who will be displaced from the river banks? What will happen to our crops
- Who will benefit from the project activities? Is it some or all communities?

##### Response by Project Team (PT) during consultations and project design

All illegal activities shall be stopped and those involved communities shall be encouraged to engage in other ecosystem friendly activities. These activities have been incorporated in the project design.  
All those communities that are affected by the project activities are potential beneficiaries

##### Concern from the District officials

- How will the project be implemented, who will be involved at District level and what is our role in the project?
- How were the Sub catchments chosen? What criteria was followed?
- How will the beneficiaries of IGAs be selected

##### Response by Project Team (PT) during consultations and project design

The project shall be implemented through the already existing frameworks. The Districts within which the project falls shall play vital role of ensuring the project succeeds either through supervision, monitoring and also guiding the processes. All the CBSDs at district level shall be involved at all stages of project implementation. This has been incorporated in the project design.  
The chosen sub catchments are those that are ranked high risk as regards levels of degradation compared to other sub catchments in the same catchment. This comprehensive assessment is in the respective catchment management plans.  
The beneficiaries will be all those households that have been affected by the project activities

##### Some very important comments to Note:

- That the environment is highly degraded due to climate change with a lot encroachment ongoing from the communities and thus something needs to be done urgently to revert the situation
- That in order to ensure project success, the project must involve all stakeholders and that supervision and monitoring should be given priority.

##### Response by Project Team (PT) during consultations and project design

Noted by PT  
  
Noted by PT and provided for in the project design