NILE BASIN INITIATIVE
NILE EQUATORIAL LAKES SUBSIDIARY ACTION PROGRAM
KAGERA RIVER BASIN MANAGEMENT PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND DEVELOPING PRELIMINARY RESETTLEMENT POLICY FRAMEWORKS (RPFs) FOR FOUR (4) PROPOSED SMALL MULTIPURPOSE DAMS AT BIGASHA, BUYONGWE, KARAZI AND TABA-GAKOMEYE IN THE KAGERA RIVER BASIN

Burundi, Rwanda, Uganda and Tanzania

NBI/NELSAP/KAGERA/RFP02/2011

FINAL ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT (ESIA)

TABA-GAKOMEYE DAM

DECEMBER 2012

By **Newplan Limited** Consulting Engineers and Planners **Crusader House, Plot 3 Portal Avenue,** **P.O. Box 7544 Kampala, Uganda** **Tel: +256 414 340 243/4/5** **Fax: +256 414 257 861** **Email: info@newplan.ug**	*And* Envirotech Consult P.O Box 3558 Kigali Kigali - Rwanda Tel: +250-788309519/+250-78830-9077 E-mail: Envirotech.consults@gmail.com

STUDY TEAM

NAMES	ROLES
Prof. John Okedi	Team Leader/Environmental Specialist
Jovah Ndyabarema	Deputy Team Leader
Lilianne Kente	Environment Specialist
Jane Mugano	Sociologist
Dr. Alfred Bizoza	Sociologist
Brenda Basaalwa	GIS specialist
Leonard Kassana	Dam Safety Specialist
Sarah Nabeta	Dam Safety Engineer/Support Dam safety
Dr. Simon Mkhandi	Hydrologist
Astri Gullie Ribe	Geotechnical Engineer/Geologist
Kenneth Twinomujuni	Valuer
Dr. Eric Sande	Ecologist
Dismus Ongwen	Archeologist
David Nkutu	Botanist

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ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
CBO	Community Based Organization
CFP	Centre Deformation Professional
CNF	Conseil National des Femmes
EAC	East African Community
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
ESIA	Environmental Social Impact Assessment
ESIS	Environment and Social Impact Statement
ESMP	Environmental and Social Management Plans
EWSA	Energy, Water and Sanitation Authority
FGD	Focus Group Discussions
GHG	Green House Gases
GIS	Geographic information system
HIV	Human Immunodeficiency Virus
ICT	Information and Communication Technology
IUCN	International Union for Conservation of Nature
KRBMP	Kagera River Basin Management Project
LVBC	Lake Victoria Basin Commission
NAFA	National Forestry Authority
NBI	Nile Basin Initiative
NBI	Nile Basin Initiative
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NGO	Non-Governmental Organizations
NH4	Ammonia
NLC	National Land Center
NO	Nitrite
NO2	Nitrate
MDGs	Mellenium Development Goals
MINALOC	Ministry of Local Government
PAPs	Project Affected Persons
PMTCT	Prevention of Mother to Child Transmission
RAP	Resettlement Action Plans
REMA	Rwanda Environment Management Authority
RNRA	Rwanda Natural Resources Authority
RPF	Resettlement Policy Frameworks
RSTF	Rural Settlement Task Force
RUSLE	Revised Universal Soil Loss Equation
SAP	Subsidiary Action Program
SDA	Seventh Day Adventist
STDs	Sexually Transmitted Diseases
SVP	Shared Vision Program

TA	Total Alkalinity
TDS	Total Dissolved Solids
TH	Total Hardness
TN	Total Nitrogen
TP-	Total Phosphorus
TTC	Teacher Training Centers

EXECUTIVE SUMMARY

1.0 Introduction

The Kagera River Basin Management Project (KRBMP) objective is to establish a sustainable framework for the joint management of the water resources of the Kagera River Basin and prepare for sustainable development investments, in order to improve the living conditions of the people and to protect the environment. KRBMP and the Government of Rwanda selected Taba-Gakomeye dam site for the development of a multipurpose reservoir. The KRBMP identified Newplan Consulting Engineers and Planners to undertake an Independent Environmental and Social Impact Assessment (ESIA) of the Taba-Gakomeye dam site. The purpose of the ESIA study was to assess the technical, social, economic, financial and environmental viability of the multipurpose dam project; evaluate the environmental and social aspects of the multipurpose dam site and prepare a Preliminary Resettlement Policy Frameworks for the dam site. The study involved consultations and data gathering activities at Regional, District (Commune) and community (Sector and Colline) levels. Newplan embarked on the study in earnest in January 2012. The first outcome of the study was the Inception Report which was submitted two months after the start of the study in March 2012. The second outcome of this study was the Interim Report which was also submitted 4 months after start of the study which was in June 2012. The Interim Report was submitted in three volumes namely, the Scoping Report which provided information on environmental and social impact scoping results with the relevant annexes. The Scoping Report further analyzed possible project alternatives and identified any other past, existing or planned projects in the area; the Baseline Report which provided key findings of the baseline environmental and social findings in the dam site. These included data on fauna and flora; fish and invertebrates; hydrology and water quality; community livelihoods; settlements and infrastructure; archaeology and culture; dam safety. The consultation and public participation process invoked was also described. The third volume was the Preliminary Resettlement Action Plan (RAP) for the Taba-Gakomeye dam site.

This now, is the third report (A3 Draft ESIA and RPF Report) which is submitted 8 months after start of the study in accordance with the Terms of Reference. This report provides identified potential positive and negative environmental and social impacts of the project on the social and biophysical environment prior to, during and after infrastructure construction including those of the different project alternatives. The report then proceeds to propose measures that will enhance positive impacts of the project and those that will mitigate, minimize, reduce or eliminate negative impacts of the project. It further provides Environmental Flows, Environmental and Social Management Plan (ESMP) and the Resettlement Policy Framework (RPF) for the Taba-Gakomeye dam with relevant annexes.

The Project Components

The Taba-Gakomeye project components reflect priority water uses as determined by the Rwanda Government and as clearly indicated in the Feasibility study report. These priority water uses include water supply, irrigation, livestock, aquaculture and environmental flow requirements. However, due to some circumstances as explained later in the report, livestock and aquaculture were relegated to low priority. The project is therefore constituted with the following priority components.

A dam of 14m high with reservoir storage capacity of 3.09Mm³ which has surface area at MWL (km2) of about 0.6km².

Irrigation command area has been identified to have 4 potential areas as follows.
Area 1 is of about 60 ha along side Karambi Township; Area 2 is of about 36 ha of swampy marsh land some 7 km downstream of the dam axis after the long narrow gorge; Area 3 of about 57 ha after the river flows though a second gorge upstream of the KFW and Area 4 is about 40 km down stream of the dam axis. If the first three potential irrigation command areas are developed, it is expected to realize net controlled area and gross controlled areas of between 20-40%. The potential net irrigated area in the project could be 122 ha at maximum and 92 ha at minimum.

A water supply
The present water demand in Nyabagabe, Huye and Nyaruguru districts has been estimated as follows: Total for urban for 2012 is 1,441 m³/day for; total for peri-urban is 1,005 m³/day; total for rural is 6,724 m³/day. This gives a total water demand at 9,170 m³/day for 2012. This figure is expected to jump to 39,077 m³/day for 2037. It is expected that with the Taba-Gakomeye dam in place, it will be possible to achieve the above water demand including feeding stand pipes, water abstraction, transmission, distribution, storage, pumping and treatment components.
Aquaculture

There are about 9 fish ponds in the project area that were dug by the government some ten years ago but which are not functional. These fish ponds together with fish fry aeration chambers and channels are intact and are in very good condition and could be rehabilitated for aquaculture in the new project. Further, there is potential to develop 57 fish ponds at communal or individual ownership each with 2.29 ha. These will supply 4,575 kg of fish annually.

2.0 Identified Impacts

Highlights of identified positive and negative impacts, their enhancement and their mitigation measures and institutions responsible for management and mitigation of these impacts are therefore provided below theme by theme.

2.1 Positive Impacts of the action

Preparations/Planning and Construction Phase

a) Creation of employment opportunities and increase in income

Positive impacts will be associated with the Preparations/Planning and Construction Phase of the project. Workers including both skilled and unskilled are expected to be employed directly by the project which will in turn contribute to an increase in their income. Local people will be employed mainly as casual workers.
The local communities will further benefit through:
Increased spending of the workforce;
Sale of food stuffs, milk and other basic goods to the workers;
Creation of market for products;
Improvement of incomes and general welfare of the local communities and their families;
Revenue from rent paid by workers.
The magnitude of this impact is expected to be **positive but minimal** as not everyone will benefit from this opportunity at the **Preparations/Planning** stage but its impact will rise at the

Construction phase as more people will be employed. Further, as a result of opportunities generated by the project in aquaculture, fishing and tourism, there would be a **medium-positive** positive impact during operation.

b) Skills development

Those who will have the opportunity to work with the project during the construction phase, particularly the unskilled and semi-skilled, will get an opportunity for skill development. This can be enhanced through training programs for the unskilled and semi-skilled workers.

c) Gender balance

The project will improve women's livelihoods and welfare through direct and indirect employment opportunities. This will lead to greater socializing by women for example the formation of clubs which will serve as physical spaces where women can network, learn, support each other, and undertake both group and individual income earning activities. The magnitude of this impact is expected to be **medium positive**.

Positive impacts associated with the Operation and Maintenance /Post Construction stage of the project include the following;

d) Improved water supply and sanitation facilities

The construction of the dam will improve the availability of safe water coverage in the area for both domestic and animal use and the communities will benefit in both the dry and wet seasons. Given the major water scarcity especially in the dry season and the fact that many people will benefit from water supply, the impact is expected to be **high positive**.

Enhancement measure will include the following:

Continuous sensitization of the communities in regard to use and maintenance of the facilities will be required at all levels;

Regular maintenance programs should be put in place;

Measures should be put in place to ensure that the technical personnel are well facilitated to properly carry out their roles;

Water user and maintenance committees should be put in place and should be well facilitated to carry out their roles.

e) Provision of employment

During the Operation and Maintenance phase, employment opportunities will be available such as clearing of bushes around the dam site, maintenance of the fence and provision of security for the dam among others. Thus the impact is estimated to be **positive but minimal**.

f) Tourism potential

The proposed development of Taba-Gakomeye dam will create a small reservoir which will attract wildlife and birds and other recreational activities including water sports, sport fishing and bird watching. This will be a big tourist attraction given the attractive and scenic environment of Nyabagabe. Several recreational and sporting centres may be constructed near the reservoir thereby generating income. Tourism is expected to be long term. Tourism qualifies to have a **medium positive** impact.

g) Generation of Hydropower

Although power generation as an option has been dropped by the Feasibility Consultant, hydropower generation would have been expected to benefit the local community for lighting, water

supply, agro-based industries, milk processing. This impact will be long term, and thus qualifies as **medium positive** impact.

h) Improved farming through irrigation

The communities practicing farming will benefit from the proposed project as they will be able to practice modern farming through irrigation. Currently, crop farming is mainly rain fed and there are mainly two seasons for farming. The magnitude of this impact is expected to be **high positive.**

i) Accessibility to health services

The improved access roads will improve on accessibility to health services. The impact of accessibility to health services is expected to be medium positive.

j) Improved access roads

Infrastructure such as roads linking trading centres, education and health centres for example local markets and trading centre will be improved. The improved roads will bring about a boost in trade and will create market opportunities for the agricultural products like bananas, animals and milk as more traders will be able to access the area. This will bring about development to the remote villages. The impact is expected to be **medium positive**.

Post construction and operation phase

Positive impacts of the action on fauna will include the following:
The dam will conserve water for domestic and agricultural use throught out the year even durng drought and also during dry seasons;
The dam will control floods down stream thus protect human life, domestic animals, crops and infrastructure down stream;
The dam will induce more rain and better amenable micro-climate;
The dam will ensure sustainable water supply;
More rain and sustainable water supply will ensure better food security;
Water loving animals, birds, reptiles, and insects from far and wide will be attracted;
Better sustainable water supply will bring in more fish and more aquatic organisms.

a) Amphibia

A total of seven species of frogs were recorded with Common river frog *Amietia angolensis* being the most common in both sites. The Albertine Rift reed frog *Hyperolius discodactylus* recorded in the proposed site downstream is globally vulnerable species. Irrigation will favour the survival of amphibian as the habitat will be a mixture of wetness and dryness most of the time. The impact of the project activities on amphibia species will be **high positive**.

b) Dragonflies and Butterflies

A total of 4 dragonfly species were recorded and these are shown in the table below. None of the recorded species is globally threatened according to the list provided Clausnitzer *et al* (2011). A total of 9 Butterflies species were recorded as shown the table below. None of the species is globally threatened or near-threatened. Semi aquatic habitat of irrigated fields will favour the survival of dragonflies and butter flies. The impact of the project activities on these species will be **high positive**.

c) Aquaculture and Fisheries

.Capture fisheries in general is facing increasing risks including overexploitation of natural fish stocks, use of irrational fishing gears, pollution of the basin waters from industrial effluents and agrochemicals. Introduction of aquaculture in the Taba-Gakomeye dam can therefore ensure sustainable fish production. Further, aquaculture can provide an alternative to capture fisheries in the existing lakes and rivers, hence preserving their biodiversity. The creation of the Taba-Gakomeye dam reservoir will therefore, have very **high positive** impact on fish survival in the area. It will also have very high positive impact on fisheries, aquaculture as well as on food nutritional capacity of the local communities and offer opportunity for employment.

d) Hydrological impacts

The construction of the proposed dams will result in changes in the flow regime downstream of the dams. The reservoirs will store excess water during the rainy season and spillage will occur when the reservoirs are full. Thereafter the reservoir will fill with water and the inflow flood hydrographs will be modified.(i.e. from inlet, storage and outlet over the spillway). The modification, which will take place, is that the peak of the inflow hydrograph will be reduced (peak attenuated) and the time base of the inflow hydrograph will be stretched such that there is time lag between the time of the peak of the outflow hydrograph and the time of the peak of the inflow hydrograph.

The amount of outflows from the dam storages will depend on both hydraulic conditions such as the height and width of the spillway and operational rules of the dam. Operational rules for the dams will take into account the various uses of water downstream of the dam. This includes water for domestic use, agricultural requirements including irrigation and water requirement for aquatic and environmental health. The characteristic of the catchment is that it is hilly. This characteristic makes the catchment susceptible to erosion which will cause siltation in the reservoir. It is also likely that the population of livestock in the area is going to increase and this will cause degradation in the catchment which will enhance erosion and thus causing siltation in the reservoir.

2.2 Negative Impacts of the action and their Mitigations

2.2.1 Preparations Phase/Planning phase

Negative impacts associated with the Preparations Phase/Planning phase of the project will include the following:

a) Social expectations generated by disclosure of information to the Community

This stage gives higher social expectations in anticipation for jobs from the project considering the high rate of unemployment in the project area. Another potential impact at this stage is the fear generated in the mind of the public with regard to land acquisition and loss of crops through the activities. This is a **high negative** impact as it affects all the people in the community and it will continue until the project has been implemented. These can be mitigated through:

Dissemination of all information regarding the project, carrying out continuous community consultations and sensitization throughout the project cycle so that all queries and fears are answered, reduced or eliminated from the public mind.

2.2.2 Construction Phase of the project

Negative impacts associated with the Construction Phase of the project will include the following:

b) Influx of people

There will be a temporary increase in population during the construction phase of the project as people look for work. The project will require a workforce of skilled and non-skilled personnel. In addition, businessmen may want to settle in the area and utilize the opportunity of available market

to market their products. The increase in population in the area will come with associated negative consequences like increased conflicts, struggle for the limited resources, and increase in diseases like HIV/AIDS, insecurity, and increase in the price of commodities. However, population influx into the project area is temporary and the impact can be considered **medium negative**. This impact can be mitigated through the following:

The Developer in collaboration with the Contractor to prepare a workers recruitment plan;

Local people to be given priority in employment;

Local authorities shall to be strengthened to deal with the influx and the associated increase in crime, insecurity and cases of indiscipline;

Project should plan for an increase and improvement in infrastructure e.g. sanitary facilities, health facilities, and water facilities among others.

c) Unfulfilled community expectations

All people within the project area have high expectation to get jobs when the project is implemented but jobs are limited. Lack of employment is likely to lead to dissatisfaction and frustration among the unlucky ones. This may affect the relations between the community and the project and may affect the successful completion of the project. The impact is thus qualified as **high negative**. The following measures are suggested to mitigate these impacts.

Formulate clear, and well defined employment policy and transparent procedures to avoid conflicts and minimize expectations;

Develop a communication strategy between the project and the stakeholders for purposes of fostering continuous communication and feedback to all parties and minimizing expectations;

Prioritize recruitment of local people for less specialized activities.

d) Increase in price of commodities

There will be an increase in the prices of basic goods like soap, sugar, salt, and paraffin among others due to their increased demand. The impact is expected to be **medium negative** as it will be short term.

e) Increase in diseases

During construction, malaria, sexually transmitted diseases (STDs) and HIV/AIDS prevalence are likely to increase due to population influx. This impact is likely to be long term as HIV impacts may be noticed after several years and will continue even during the construction phase. In addition, during construction, pools of stagnant water in the excavated area are expected especially during the rainy season and may act as breeding places for mosquitoes. This impact can be qualified as **medium negative** and can be mitigated through the following:

The project should put in place strategies to control malaria e.g. distributing mosquito nets and sensitizing communities through health centres and NGOs;

There should be a sensitization program targeting the workers and the communities regarding the spread of (STDs) and HIV/AIDS;

HIV/AIDs awareness campaigns in schools and communities should be undertaken periodically; and

Project workers should be provided with condoms.

f) Pressure on health infrastructure and services

This impact of the project on the health infrastructure and services is expected to be **medium negative** and can be mitigated through the following:

The project to provide laboratory equipment, medicines, extension of electricity, improvement of the buildings and others to support health services in neighbouring villages so as to support the community and the workforce;
The project should plan for additional health infrastructure for its workforce to cater for the increased population;
Employment opportunities should be extended to the local people to reduce on the influx of people in the area.

g) Pressure on water and sanitation facilities

This impact is indirect, short term as it will cease after project construction and its extent is medium thus qualifying to be **medium negative**. It can be mitigated through:
Construction of water points at the workers' camp and construction site;.
The community should be provided with safe water points;
The project should provide additional sanitation facilities to its workers;
Bins for solid waste and garbage collection should be placed at the workers' camp to ensure that any wastes generated at the site are properly disposed of.

h) Pressure on fuel wood

Although there will be a decrease in population after construction, the effects on the general environment of the area will be high thus the magnitude will be ***medium negative***. It can be mitigated by continuous sensitization of the communities about the dangers of deforestation and employment should be extended to the local people to reduce on the influx of people in the area. Local communities should be provided with suitable tree seedlings for planting.

i) Theft of project materials

Although this impact is reversible and short term as it is likely to occur in the construction phase only, it will have a great impact on project costs and project schedule thus qualifying to be **medium negative**. It is to mitigated by employing private security guards at the construction site; the developer and contractor to collaborate with the community and encourage community policing in order to identify the culprits and to ensure safety of project materials; and the contractor to put in place an internal control system to curb cases of theft of materials and to collaborate with the local security in the area.

j) Occupational Health and Safety

Occupational health and safety will be put at risk by employment of semi-skilled and unskilled workforce who will increase chances of occurrence of occupational accidents. This has far reaching consequences and qualifies to be categorized as **medium negative** and can be mitigated by the following:

- *Training of workers in safe operating procedures;*
- *Provision of appropriate Personal Protective Equipment;*
- *Labelling of danger zones and hazardous materials;*
- *Restrictions of access to potential danger zones;*
- *Control usage of hazardous chemicals;*
- *Instituting, enforcing and disseminating procedures to be followed when blasting.*

k) Increased traffic and its associated consequences

The magnitude of this impact is estimated to be **medium negative** as it will be short term mainly in the construction phase and its extent will be local. It can be mitigated through:

- *Existing access roads should be widened and used wherever possible for transportation of both personnel and materials;*
- *Skilled and properly trained drivers should be employed;*
- *Safe speed limits should be instituted and enforced;*
- *Warning signs in busy places like trading centres should be installed;*
- *Flag men should be employed by the project in order to control traffic.*

l) Conflicts

With new people coming into the area, it is likely that there will be an increase in conflicts in the area. The magnitude of the impact is expected to be **medium negative** due to the fact that it will be short term in nature since most people will go back to where they came from after construction works are complete. It can be mitigated by:

- *Local labour should be given priority for employment as this will solve many of the problems associated with influx of people;*
- *There should be sensitization of the workers in cultural values and norms of the area;*
- *Local authorities shall need to be strengthened in order to deal with cases of indiscipline and conflict.*

m) Loss of Land and change in land use

Implementation of the project will lead to loss of grazing land, loss of crops and loss of medicinal plants. The current land use will change permanently to become a reservoir area. The impact of loss of land will be permanent, irreversible, and direct and will affect people's livelihoods. The impact of the magnitude is thus **high negative**. It can be mitigated by

- *Project Affected people should be fairly compensated;*
- *Provide alternative land for PAPs who have lost more than 20% of their land*
- *Livelihood restoration programs should be put in place to ensure that PAPs livelihoods are restored.*

n) Change in land tenure and ownership

The land where the project will be constructed belongs to individuals and after land acquisition it will belong to the Government. The magnitude of the impact is therefore **medium negative** as it is permanent but will affect a small section of the population in the project area.

o) Loss of residential and other structures/Resettlement

Construction of the reservoir will displace some households. Resettlement is expected to generate mainly three types of social impacts such as, psychological stress, loss of social networks and loss of livelihoods or business opportunities. Other project components may also displace a number of people with agricultural land residence, business and other structures. Although the impact of resettlement is long term and irreversible, it will not affect many people as the land mainly comprises of grazing and cultivation land thus the impact is qualified as **medium negative**. It can be mitigated through the following measures:

A Compensation and Resettlement Action Plan should be prepared in accordance with the national laws and the World Bank guidelines;

- *All households losing any structures should be compensated fairly and adequately;*
- *In-kind compensation for the households should be considered as option by the implementing agency;*

- *Livelihood restoration programs should be put in place to ensure that PAPs' livelihoods are restored.*

p) Increased risk of soil erosion

Due to the hilly and steep terrain construction activities may destabilize the soil cover triggering soil erosion. It can be concluded that this impact will be **medium negative** and can be mitigated through:

- *Plan excavation and grading activities to be conducted during the dry season where possible;*
- *After construction, vegetation should be planted in areas where vegetation was removed including area where soil spoil was previously dumped;*
- *General catchment protection through re-vegetation and tree planting to form part of the project;*
- *Loose soils should be removed from worksite;*
- *Proper drainage should be put in place along access roads, murram pits and all other cut areas to avoid water seepage into the ground making slopes vulnerable to landslides.*

q) Impact on Aesthetics

These is due to excavations and construction works, open burrow pits, soil spoil heaps at different locations and poor construction practices which all affect the beauty of the areas where such projects are located. This negative impact is expected to be significant but of **medium negative** magnitude. It can be mitigated through:

Restoration of excavated areas and other open areas and murram pits should be carried out as soon as construction is completed;

Restoration to include covering of pits, levelling, grassing of bare areas and planting of trees; and tree planting in the project area should be encouraged as part of catchment protection.

Plants

The Mwogo valley has been heavily cultivated over time and only a few areas downstream remain marshy with grassland patches of short grass typically of wetland vegetation. There are few native tree species left. The project implementation will affect tree species within the valley while most of the woody plants are on the hills or on sloping ground. There were no plant species of conservation importance recorded as threatened or endangered in the study area. The impact of the project on the ecology and conservation of plant species in the irrigation command area will therefore, be expected to be of **low negative.**

r) Mammals

The mammals that live in this habitat are those that are adapted to semi dry habitats especially the rodents which are also crop pests although only the black rat (*Rattus rattus*) was found in this area. There are 189 mammal species in Rwanda, of which 2 are critically endangered, 4 are endangered, 11 are vulnerable, and 5 are near-threatened. No threatened or near-threatened species were recorded in the project area. The project is therefore expected to have little impact on the ecology and conservation of mammal species and hence, its impact will be **low negative.**

s) Birds

A total of 31 species of birds were recorded at the down stream site whilst 30 species were recorded in the alternative site upstream including one species that is regionally restricted in the East African region. These are mainly non-forest species, water bird specialists and non specialists. None of the species recorded is globally threatened. These birds nest within or on the edges of wetlands, while foraging in wetlands, nearby grasslands and croplands. However, for the cranes, nesting usually occurs in wetlands where the vegetation is significantly high enough to conceal their nests. Thus, the

proposed project will have some negative impacts on the conservation and survival of some bird species and hence, its impact will be **medium negative.**

2.2.3 Operation and Maintenance /Post Construction stage

NegaiveImpacts

a) Increase and impacts of HIV/AIDS and other STDs

Negative impacts include impacts of population increase and impacts of HIV/AIDS and other STDs. These can be mitigated using methods already outlined above. Other risks and negative impacts include:

b) Flooding

This can be caused by poor project designs which may lead to dam breakage and therefore flooding leading to deaths and destruction of property. This impact is mitigable and the probability of its occurrence is minimal. Hence, the magnitude of this impact is **low negative** although its occurrence may have far reaching consequences. Mitigation measures will include:

- *Erection warning signs in case of the dam breaking;*
- *Any destroyed property as a result of dam breakage should be compensated;*
- *There should be coordination of the different institutions in case such an event occurs;*
- *Sensitization of the community of an emergency plan of action in case of a disaster should be done continuously.*

c) Risk of drowning

There is a risk of drowning by both children and adults in the reservoir. Furthermore, domestic animals may also drown in the reservoir while trying to drink from it. Although this risk leads to loss of lives it can be avoided and mitigated thus the magnitude of the impact is considered to be **medium negative** and can be mitigated by fencing off the dam area with live fence and sensitization of communities particularly children and livestock owners. Notices and signs can also be erected at strategic places like schools, health centers and markets. The community should also be sensitised on emergency plans of action in case of disasters.

d) Risk of water borne and insect-borne diseases

There will be a risk of increased water and insect-borne diseases as a result of the reservoir. The water in the reservoir will be stagnant or slow flowing and will act as a breeding ground for mosquitoes. This will increase the prevalence of malaria in the area. The water in the reservoir may also be contaminated by human activities in the vicinity of the dam, thereby leading to water borne diseases like cholera. This impact can be categorized as **medium negative**. It can be mitigated by:

- *Sensitization of communities about the need to boil water before drinking;*
- *Sensitizing communities to constantly sleep under treated mosquito nets;*
- *Distributing treated mosquito nets to communities surrounding the reservoir;*
- *Clearing bushes around the reservoir periodically.*

e) Negative impacts on vegetation

The construction of the Taba-Gakomeye dam will undermine the naturally occurring flooding regime that has been recurring over a very long time and this will affect the ecology of the area. The dam will reduce downstream flooding. This will cause the disappearance of the ecologically important wetland plants in the floodplain below. Further, the reservoir will destroy wooded grassland. The initial filling of the reservoir will flood the existing plant material, leading to the death

and decomposition of the carbon-rich plants. The rotting organic matter will release large amounts of carbon into the atmosphere. The decaying plant matter itself will settle to the non-oxygenated bottom of the reservoir, and the un-aerated decomposition will produce methane gas which has negative impacts on the ozone layer. There were no plant species of conservation importance recorded as threatened or endangered in the study area. The plants killed through flooding of the reservoir are found also in other parts of the valley. Thus the impact of the project on the ecology and conservation of plant species will be **low negative**.

Mitigation measures can include clearing all vegetation and woody biomass from the reservoir prior to filling it;
Instituting and enforcing good watershed management practices including aforestation, terracing, and good agricultural practices.

f) Fish and aquatic Invertebrates
River Mwogo is the source of water for River Nyabarongo, which is itself thought to be the origin of River Kagera. The fish species known from the Nyabarongo River can therefore reach River Mwogo. Irrigation activity in the Mwogo valley, including use of agricultural chemicals is not expected to favour the survival of naturally occurring fish and invertebrates. Hence, the impacts of irrigation activity on fish and invertebrates will be **high negative.**

3.0 Waste Management

Wastes are predominantly generated during the construction and operation phases of this project through several ways for example, spillage of contaminants such as hydrocarbons, oils, concrete admixture, solvents and other chemicals, solid and domestic waste from the workers' camps. Waste of different types of about 100,000m^3 is expected to be generated at the campsite.
Waste in its various forms has capacity to debilitate and derail the project by causing diseases, ill health and thereby raising morbidity and mortality amongst the work force. Hence, there is need to manage, minimize, treat and control waste at all stages of its generation .to avoid its negative impacts on Workers' health and safety is essential to the success of the project The following strategy is recommended to manage waste.

3.1 Management and mitigation strategies to minimize and control wastes

The sponsor of this project namely the Government of Rwanda and the District Local Governments in Huye and Nyamagabe will make sure that the Contractor implements procedures and strategies for managing wastes in order to guarantee the safety of the environment and workers at all times. The Contractor will undertake to establish an emergency response plans, train employees on the risks and precautions, to provide employees with suitable protective equipment, to ensure recycling of wastes and waste water.

The Contractor and operators of the dam when built will be required to follow recommended guidelines for waste management. They will also be required to follow set emergency procedures for safeguarding against spills. A monitoring procedure is further recommended to guarantee proper and appropriate management of wastes during construction and operation of the dam project. Furthermore, implementation costs of the Waste Management program are recommended to be absorbed into the over all construction costs of the project.

4.0 Environment and Social Management Plan (ESMP)

The purpose of the Environmental and Social Management Plan (ESMP) is to mitigate and, wherever possible, prevent adverse environmental and social impacts of a project on the communities as well as on the environment. It is also aimed at helping to maximize positive impacts of the project. The ESMP further aims to ensure implementation of mitigation measures whilst identifying the necessary resources and budgets required for its implementation as well as identifying responsibility schedules of various stakeholders who will be involved in its implementation. The ESMP relies heavily on identified positive and negative environmental and social impacts for its proper formulation. The impacts of the project in the Taba-Gakomeye dam site area have been identified.
A mitigation plan has been proposed and costs for implementation of mitigation plan estimated. A monitoring plan has also been prepared and the cost estimated. These costs exclude Resettlement costs as they have been included in the Preliminary RAP report. Total cost for ESMP has been estimated at **USD 322,960 (**excluding RAP costs)

The implementation of the Taba-Gakomeye dam ESMP will require the full participation of key players from the Ministry of Water, Environment & Land Management, Local Government institutions/officials, Mayors of Huye and Nyamagabe Districts, Huye and Nyamagabe District Officers responsible for Education, Social Protection and Welfare Officer, Infrastructure, Health Monitoring and Evaluation, Environment, Huye and Nyamagabe Cell leaders, Omudugudu leaders (upstream and downstream villages), Community members, downstream and upstream villages, NGOs/CBOs: ABATICUMUGAMBI Cooperative, TWIYUBAKE BAHINZI BA GASUMO (KTBG) Cooperative, DUHARANIRUBUKIRE–Maraba Cooperative, WORLD VISION, UNICOOPAGI (Union des Cooperatives Agricoles Integree). Irrigation Committee and Water User Associations will be formed for sustainability of the management of the dam.

5.0 Conclusion

The Environmental and Social Impact Assessment study (ESIA) has identified a number of positive and negative issues regarding the proposed Taba-Gakomeye project. Identified issues/impacts have been assessed and described in detail to gain an adequate understanding of possible environmental effects of the proposed project – from project construction to decommissioning stages. This has been done in order to formulate appropriate mitigation measures to respond to negative impacts. The Environmental and Social Management Plan (ESMP) provides a way forward for implementation of the proposed mitigation measures.
Given the nature and location of the development, the conclusion is that the potential impacts associated with the proposed development are of a nature and extent that can be reduced, limited and eliminated by the application of appropriate mitigation measures.

The Consultant is of the opinion that most of the potential environmental impacts identified may be reduced, eliminated or mitigated. The proposed environmental management plan and environmental monitoring plan if implemented accordingly during all phases of the project will safeguard the integrity of the environment at the project area. Hence, the proposed Taba-Gakomeye project can be implemented with significant positive socio-economic and environmental impacts and without irreversible impacts on the communities and on the environment

1 INTRODUCTION TO THE STUDY

1.1 PROJECT BACKGROUND

The Nile Basin Initiative (NBI) is a collaborative effort of the Nile riparian countries which aims at developing the River Nile and its resources in an equitable and sustainable way for the benefit of the people of the Nile Basin. The NBI also aims at promoting regional peace and security. The Nile Basin Initiative has a Strategic Action Program which is composed of two complementary programs the first of which is the basin wide Shared Vision Program (SVP), whose mandate is to build confidence and capacity throughout the basin. The second program is the Subsidiary Action Program (SAP), whose objective is to initiate concrete investments in the Eastern Nile (ENSAP) and in the Nile Equatorial Lakes sub-basin (NELSAP). The Kagera Project is one of the three Transboundary integrated water resources management and development projects being implemented within the framework of the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) of the Nile Basin Initiative (NBI). The others include the Sio-Malaba-Malakisi and the Mara River Integrated Water Resources Management and Development Projects.

The Kagera River Basin Management Project (KRBMP) objective is to establish a sustainable framework for the joint management of the water resources of the Kagera River Basin and prepare for sustainable development investments, in order to improve the living conditions of the people and to protect the environment. The Kagera River Basin Management Project (KRBMP) has undertaken various activities to improve the planning, management and utilization of the natural resources in the basin, including the completion of the development of the Kagera River Basin Monograph and the Integrated River Basin Management and Development Strategy. Ongoing activities being undertaken by the project and the NELSAP include Development of the Kagera Cooperative Framework Agreement, and Rusumo Hydropower and Multipurpose Project. In addition, the riparian countries have initiated activities related to water storage and these include the Nyabarongo dams in Rwanda; the Kikagati and Nsongezi dams in Uganda; the Kakono dam in Tanzania, and the Bugesera transboundary ecosystem management and development project which will focus among other things on the development of irrigation in the area.

The Kagera River Basin Management Project (KRBMP) has therefore completed a study for identification and rapid assessment of potential small dams for the multipurpose uses of agricultural development, hydropower generation, water supply, fisheries, and other ecosystem functions. The KRBMP study identified Twenty eight new dam sites were identified and assessed including three previously identified dams in Rwanda. From this list, eleven sites were selected based on criteria including those defined by World Bank OP4.37 such as:

i) Equity (targeting one site per country),
ii) Dam height (targeting small dams as),
iii) Reservoir storage capacity and reservoir yield,
iv) Site foundation conditions,
v) Material availability,
vi) Access to proposed sites,
vii) Potential water uses,
viii) Environmental and social considerations, and
ix) Priority of each participating governments.

From the above criteria, KRBMP and the riparian countries selected four dam sites for feasibility and these were Karazi in Tanzania, Bigasha in Uganda, Buyongwe in Burundi and Taba-Gakomeye in Rwanda.

The KRBMP identified Newplan Consulting Engineers and Planners to undertake an Independent Environmental and Social Impact Assessment (ESIA) for the four identified multipurpose dam sites in December 2011. The ESIA study w to assess the technical, social, economic, financial and environmental viability of the four identified multipurpose dam projects. The ESIA was to evaluate independently the environmental and social aspects of the four priority multipurpose dam sites ad prepare Resettlement Policy Frameworks for each dam site in accordance with the relevant World Bank guiding policies and procedures in full cognizance of national policies.

The ESIA study started in earnest in January 2012 after successful negotiations between the KRBMP Project Management Unit and Newplan Consulting Engineers and Planners in December 2011. The ESIA study was to run concurrently with the Feasibility study. Hence, Consultants from Newplan conducted a reconnaissance survey in January 2012 to identify key issues to be investigated further in a deeper study for the development of the multi purpose dams in the areas. The reconnaissance survey covered baseline studies on general environment assessment, hydrology, ecology, fisheries, archeology, socio-economy, livestock and water demand. The survey results were used to prepare an Inception Report. The Inception Report was presented to key stakeholders in a regional workshop held in Bujumbura, Burundi on 7th February 2012.

Following the Client's acceptance of the Inception Report, the Consultant proceeded to undertake baseline studies which started on 20 March 2012 ending on 7th April 2012. The study involved consultations and data gathering activities at regional and district level whilst at dam site level activities involved the following:

i) Carrying out stakeholder consultations through meetings with regional leaders, district leaders, community leaders and grass root village groups;
ii) Carrying out social surveys;
iii) Conducting training of enumerators and data recorders;
iv) Collecting baseline information and data on hydrology, fish, aquaculture, water quality characteristics, aquatic benthic invertebrates, settlements and infrastructure, archaeology and culture, livelihoods and socio-economy.

After the studies the consultant wrote the **Interim Report** which provided preliminary analysis of baseline environmental and social findings covering in particular, the following:

i) Baseline state of the environment;
ii) Identification and analysis of fauna and flora in the dam sites including fish and invertebrates;
iii) Information on the hydrology and water quality characteristics;
iv) Information on settlements and infrastructure;
v) Information on archaeology and culture; and
vi) Information on livelihoods and the socio-economy of the dam sites.

The Consultant also prepared separate reports for **Scoping** which provided information on environmental and social impact scoping results with the relevant annexes for each dam site. In particular, the following information was provided: existing policies, laws and institutions in the riparian countries, the East African Community and International Financial Institutions. The Scoping Report also provided information on Multilateral Environmental Agreements and gave a preliminary identification of impacts and possible mitigation measures. The Scoping Report further analysed possible project alternatives and identified any other past, existing or planned projects in the areas. Likewise, a separate report was prepared on **Preliminary Resettlement Action Plans (RAP)s.**

1.1.1 *Scope of Services*

The TOR originally required the Consultant to prepare **Resettlement Policy Frameworks (RPFs)** for each of the dam sites. However, later, the Client suggested a change where the RPFs were dropped and the Consultant was asked to proceed to prepare **Preliminary Resettlement Action Plans (PRAPS)** for each dam site. These have been prepared.

However due to the multipurpose nature of the dams, the dam at Taba-Gakomeye is expected to provide water for Irrigation, water supply, fisheries development. Therefore ESIA has taken into consideration the following;

- Dam and associated reservoir
- Irrigation Scheme
- Water Supply for livestock and domestic use
- Fisheries development

Hydropower development had also been proposed as one of the benefits of this dam at Taba-Gakomeye, but its feasibility is not yet established. Therefore it has not been included in the assessment.

1.2 OBJECTIVES OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

1.2.1 *Overall Objective*

The Terms of Reference for this study indicated that the objective of the study was to undertake an environmental and social impact assessment of the proposed four multipurpose dams. It was to identify possible positive and negative impacts on the social and biophysical environment prior to, during and after infrastructure construction. The consultancy was also to prepare Environmental and Social Management Plans (ESMPs) and Resettlement Policy Frameworks (RPFs) for each dam site. The consultancy was to coordinate closely with the Feasibility Study Consultancy of the same project which will run concurrently with the ESIA study.

1.2.2 *Specific Objectives*

The specific objectives of the study were:

i) To identify, analyze and evaluate the type and extent of likely positive and negative environmental and social impacts with emphasis on significant benefits and negative

effects of the project on the existing biophysical and socio-economic environment and to assess the capacity of the institutions responsible for management and mitigation of these impacts;

ii) To develop Environmental and Social Management Plans (ESMPs). The ESMPs will identify mitigation measures that will address the concerns associated with the proposed projects and provide details needed to implement the plan. The ESMPs will include the costs of the mitigation measures and monitoring requirements; a capacity building plan of the defined key stakeholders in the ESMP and the RPF will be also included.

iii) To elaborate and customize to the project the Resettlement Policy Frameworks (RPFs) basing on existing templates for Burundi, Rwanda, Tanzania and Uganda.

1.3 ENVIRONMENTAL ASSESSMENT METHODOLOGIES

1.3.1 *Scoping*

Ministerial Order No. 003/2008 of 15/08/2008 sets out the requirements and procedure for EIA including requirement for terms of reference (TORs). Rwanda Development Board is responsible for the approval of the whole EIA process (Cabinet Directive 2009, Resolution 25/03/2009, Minute 3). The Terms of Reference were submitted by Project Implementation Unit –NELSAP and were approved. The approval Letter is attached as **Appendix 1** at the end of this report.
Article 15 of the Operational Policies (OP 4.01) Environment Management, requires public scoping for category 'A' projects. The project at Taba-Gakomeye is expected to have significant social impacts on the communities including displacement of households and loss of some infrastructure eg roads. Therefore it has been categorized as Category A project (see Section on International Financial Institutions -under World Bank Social Safeguard OP 4.01 & OP 4.37).
Borrowers are required to first consult the affected public immediately after screening and before 'terms of reference' for the environmental assessment are finalized. A summary of the proposed project's objectives, functions and potential impacts are expected to be provided at this stage.
Therefore a scoping report has been carried out for this site in fulfillment of the national government and World Bank requirements.

From the Guidelines for Environmental Impact Assessment in Rwanda, the initial stage of Environmental Impact Study (EIS) is to determine the scope of work to be undertaken in assessing the likely Environmental Impacts of the proposed project. This involves identification of potentially significant environmental impacts and/ or eliminating of insignificant impacts. It is applied to all activities that require full Environmental Impact Study. Scoping methodology is outlined below;

i. A review of the proposed project and available documents in the region that are related to this project
ii. Consultations with stakeholders at National level, NELSAP –TAC Members, NELSAP Staff, Local authorities, technical teams in Huye and Nyamagabe Districts and other stakeholders like the community members to identify potential impacts
iii. A biophysical assessment of the project area by technical specialists to further identify the impacts.

iv. A Draft Scoping Report was produced and presented to stakeholders in a Workshop.

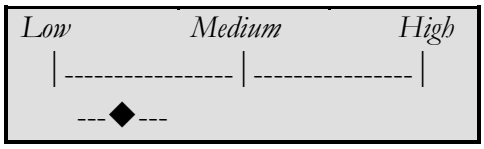
1.3.2 *Impact Assessment Methodology*

The method for assessment of impacts was adapted from the methods recommended by Hydro-Québec (1990), the World Bank (1991) and by the Canadian Environmental Assessment Agency (2000). These methods assess the Intensity, Extent, and Duration of the anticipated positive or negative impacts of the project and determine the environmental and social value of the components. The three components are then grouped together under one indicator, the Significance of the impact. This indicator provides an overall assessment of the anticipated impacts on a given environmental or social component. The assessment of impacts was on the basis of a three step procedure which makes impact assessment conclusive and its recommendations objective and easier to conceptualize, follow and trace back if desired. The core of the procedure was to combine the 'value' (step 1) of the affected environment and the 'magnitude of impacts' (step 2) to obtain the 'overall impact assessment' (step 3).

Step 1: Base line data was collected using different methodologies as follows:

i) Review of existing information;
ii) Onsite assessments –this involved site visits to` observe what exists in the area covering physical, biological and social –cultural issues;
iii) Focus group discussions;
iv) Public /stakeholder consultations – process is highlighted in this report;
v) Social surveys by use of questionnaires.

Baseline environmental and social conditions was described in detail and valued on a continuous scale from 'low value' to 'high value', which was assigned to the impact zones and the characteristics thereof. This value is related to international, national or local guidelines, standards and evaluations. Values were assigned to elements of the biological environment such as flora and vegetation, aquatic ecosystem etc. The human environment aspects will be taken to have "high value" due to their intrinsic value in addition to others. These are presented below diagrammatically.



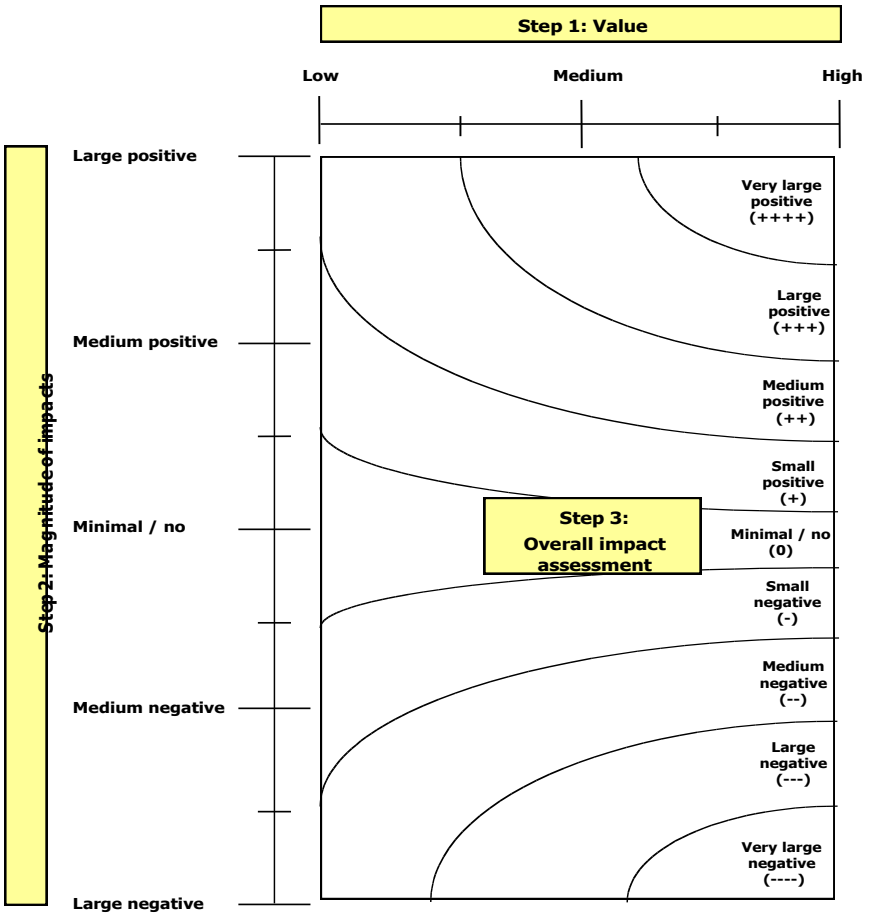
Step 2:

The second step was to describe and evaluate the magnitude of potential project impacts, measured in terms of their **extent in time and space (long term/short-term), the vulnerability of the environments affected, the reversibility (permanent or temporary) of the impacts and the probability that the impacts will occur.** The magnitude of impacts was evaluated on a scale from 'high negative' to 'high positive' as shown below.

Phase	Magnitude of Impacts
	High neg. Medium neg. Low/ Low pos. Medium pos. High pos. |----------|----------|----------|----------|----------|
Planning	------ ▲ ------
Construction	------ ▲ ------
Operation	

Step 3:

The third and final step was combining 'value' (Step 1) and 'magnitude of impacts' (Step 2) to obtain the 'overall impact assessment' (Step 3). This assessment evaluated the importance of an impact on a scale ranging from 'very large negative'; 'medium negative'; 'low negative' to 'very large positive'; 'medium positive' or 'low positive'.



1.3.3 *Specific Methodologies*

1.3.3.1 *Socio-economic Environment*

Focus Group Discussions and Stakeholders Consultations

Group discussions were held at cell level where key informants, stakeholders, and opinion leaders were invited for discussion from the concerned area. These informants consulted include: representatives of the local administration within Nyamagabe and Huye Districts, representatives of the local administrative government at cell and village, representatives of youth, women. In addition, one focus group discussion was organized just for women in both cells of our interest in order to capture their particular perception about the project. A discussion guide was designed and key results obtained from these discussions are presented in the next sections of this report. From these discussions good insights were obtained and contributed to the understanding of the overall expected impacts of the project.

Public consultation

Apart from the Focus Group Discussions, public meetings were organized and held at cell level. In total 3 public meetings were organized: 2 for 6 villages (one for Taba, Gitwa, Kinombe of Gasumba cell within Maraba sector, and the other for Gakomeye, Cyinyana, Kagarama of Kizi cell within Kamegeri sector)and 1 for the downstream part with Karambi cell villagers. This allowed members of the communities that are likely to be directly or indirectly affected by the project to express their issues and concerns with respect to the construction of dams in the region, implementation of the project and also their overall opinion regarding the same project. Issues that require special attention were also outlined as detailed in the public consultation section. The Consultant also asked the participants specific questions in regard to some socioeconomic conditions in the area.

Household survey

A survey with a standardized questionnaire was conducted among households in the project area. Information generated was used as a basis to assess potential socioeconomic impacts of the Kagera project. A training of enumerators and data clerks was conducted to ease the data collection and data entry processes. Key information drawn in the questionnaire includes socioeconomic characteristics of the population, access to services like health, education, water and sanitation, energy, etc.

Observation

Observation was applied for purposes of identifying apparent contradictions or confirming stated responses.

Data processing and analysis

A database was developed and adapted to the new coding for data entry purposes. The data was then entered and analyzed using the SPSS program. MS Excel was also used for data analysis. The research team specified the most crucial questions to be analyzed and the kind of analysis they needed and the analysis was done accordingly. Some of the survey questions allowed the respondent to give more than one response. The advantage of this method of inquiry is that it allows the respondent to give all possible responses to the issue in question. The analysis of such data used the method of multiple responses according to their frequencies.

Data quality control

Interviewers were instructed to check questionnaire completeness and accuracy at the interview site. At the end of each day, questionnaire debriefing sessions were held between the supervisor and all interviewers, to identify any complications, and to agree on common definitions of the key

concepts/words. Interviewers were asked to write down all additional qualitative information, which was analyzed by the team per sites under consideration. This was important in capturing important data that would have otherwise been left out by the research instruments. Using baseline indicators this study would then generate an M&E framework for the project against which the project measurement of process and impact will be done.

Selection of respondents

The survey was conducted in 2 districts of Southern Rwanda that is, Nyamagabe and Huye. The methodology used in this work was especially guided by the terms of reference and available documentation in the above districts of survey consideration. A multistage purposive sampling procedure was employed in the selection of the survey population. The main sampling unit of the survey was the household. Purposive sampling of the study areas was used (from district up to village level). The purposive sampling method employed in this survey was based on the understanding that communities are not homogenous particularly in terms of levels of socio-economic values, development concerns and threats and impacts. Thus, the sample population comprises three strata: (1) population directly affected by the Kagera project or within the project area, (2) the population moderately affected, and (3) population indirectly or less likely to be affected by the above project.

The identified villages are: Taba, Gitwa, Kinombe of Gasumba cell within Maraba sector, Huye District and Gakomeye, Cyinyana, Kagarama of Kizi cell within Kamegeri sector, Nyamagabe District.

Subsequently, a random sampling was done in the purposively-identified villages to select household respondents. The survey sample size for each village is calculated considering the %age proportion of the total village population (total number of households in each village) over the total population (total number of households) of the 3 villages in each of the concerned cells. 119 households in Huye District and 83 households in Nyamagabe District were surveyed making a total of 202 households included in the suvey.

Methodology for analyzing issues of gender and vulnerable groups

Like any other society in Africa, there are vulnerable and marginalized groups in the project area. These may include the elderly, female headed households, widows, people with disabilities and the very poor among others. These groups face a number of problems which include; heavy workload on women, gender based violence, discrimination against and marginalization of people with disabilities, low education levels, low incomes and thus high levels of poverty among others.

The Consultant analyzed the issues of gender and vulnerable groups based on a number of methods and these included analysis of data disaggregated by gender and group type form Rwanda Census Reports, District Development Plans and data from household interviews.

1.3.3.2 *Wild life*

a) Transect counts

Transect counts will be used to study the birds and reptiles present in the project area. Transect count method will be used because it is suited for:

- extensive, open, and uniform habitats
- mobile, large or conspicuous species

- covering the study area very quickly and efficiently
- recording many species with least interference by the observer
- situations where access is good

b) Mist-netting

Mist-netting will also be used in surveying and studying birds and bats. They are called Mist-nets because they are made of extremely fine nylon thread almost impossible to see when stretched out. Mist-nets are currently the only available method of sampling bats and understorey birds adequately. The birds are trapped and hence the method helps to identify difficult birds such as greenbuls and cisticolas in the hand. Mist-netting provides information on species richness, species diversity, local movement patterns, migration, population size (mark-capture-recapture), survival rates, relative abundance and photographic records. About 10 mist-nets will be used.

c) Indirect surveys

Medium sized mammals are large and conspicuous and many are nocturnal meaning that although conspicuous it may not be possible to record them by observation. The presence of such mammals will be recorded using indirect signs such as foot prints and feacal pellets.

d) Interviews

Interviews with the local people will be conducted to generate information on types of mammals they know that occur in the area.

e) Trapping

- Snap traps will be used to trap small mammals (rodents) around the study area. Twenty snap traps will be used;
- Amphibians will be trapped and caught by hand.

f) Sweep netting

Sweep netting will be used to trap butterflies and dragon flies

1.3.3.3 *Plant sampling*

Ten 20 X 20 sample plots will be laid in the project area. This will be stratified to take care of the different microhabitats that occur there. All the trees and saplings wer enumerated and identified in all the dam sites.

a) Use of available literature

Field guides on mammals of Africa (Kingdon 1974), birds of East Africa (Stevenson and Fanshawe 1995) and Amphibians and Reptiles of East Africa are available. These will be used to record mammal, birds, reptiles and amphibians that may be missed by the survey but are present in the project area.

b) Biodiversity of conservation importance

In all the project areas, animal and plant species that are globally threatened with extinction (according to IUCN), species of restricted range and threatened species within the East African region will be recorded and mitigation measures suggested.

c) Opportunistic observations

During the survey, all the opportunistic observations for all the taxa that will be made will be used in the analysis.

1.3.3.4 *Collection and identification of Fish Samples*

Fish in the river will be collected or caught using a Monofilament Net if available. If no Monofilament Net is available fish will be sampled using multiple Gill nets. These will be set over night for one night and drugged along the river the following morning to see what fish will be caught. The fish caught will be preserved in 4 % Formaldehyde solution until identified (to species or Genus level) in a Laboratory.

1.3.3.5 *Collection and identification of Aquatic Invertebrates (Benthos and Zooplankton if any)*

Aquatic invertebrates will be collected using an Eckman Dredge placed in several places along the river. Zooplankton will be caught using plankton net. Samples if caught will be preserved in 4% Formaldehyde solution until identified to species or genus level in a Laboratory.

1.4 PUBLIC DISCLOSURE

EIA Guidelines for Rwanda require public involvement to be an ongoing process throughout the study. It is required before the study, during the study and after the study. A draft scoping report prepared for the project is expected to be presented and discussed with the stakeholders so that their views can be incorporated before the final scoping report is prepared. The draft scoping report was therefore presented to the stakeholders in a workshop on 8thJune 2012 and their views were incorporated. Once the Environment and Social Impact Statement (ESIS) is ready NELSAP will submit it to REMA for review and approval. When the review is completed by REMA, EIS shall be a public document and may be inspected at any reasonable time by any person. REMA shall (if it finds it necessary), publicize receipt of the EIS, identify the concerned region and stakeholders, the places for inspection of the EIS, shall also make copies or summaries of the statement available for public inspection. REMA shall also send copies of the EIS to other relevant agencies and experts for comments. Public comments and/or objections shall be submitted to REMA. These form part of ESIA.

Furthermore, according to World Bank Environmental Assessment (OP/BP 4.01) January 1999, revised in 2011, Taba-Gakomeye dam project has been categorised as category B project (see Chapter 3, Requirements of International Financial Institutions). The disclosure requirements are that EA reports will have to be accessible to local affected groups (in the local language) in their country

1.5 STRUCTURE OF THE REPORT

This report has the following chapters as outlined below:
Chapter 1- INTRODUCTION - provides a description of the background of the project,
The objectives, the methodologies used in the assessment, public disclosure and report structure.

Chapter 2 – PROJECT DESCRIPTION - describes the project location, the area of influence, the project design and activities.

Chapter3 – POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK- presents an overview of the legal and institutional framework under which this ESIA has been conducted including national, regional, requirements of financial institutions and Multilateral Agreements.

Chapter 4 - CONSIDERATION OF ALTERNATIVES - presentation of the project alternatives that have been considered in the ESIA taking into account technical, economic, environmental and social considerations.

Chapter 5 – PUBLIC CONSULTATIONS - provides an overview of public disclosure and consultation activities undertaken in connection with the EIA study process. The major concerns raised are dealt with in the Environmental and Social Management Plan.

Chapter 6 – DESCRIPTION OF THE EXISTING ENVIRONMENT - describes physical and chemical environments including geology and soils, hydrology, water quality and climate of the proposed project site; presents the current flora and fauna in the project area and provides an overview of socio economic characteristics of the project area.

Chapter 7 – EVALUATION OF POTENTIAL IMPACTS AND MITIGATION
MEASURES –and describes the potential positive and negative environmental and social impacts according to their magnitude and presents the anticipated overall of impacts of the project. It also lists the measures to be taken to mitigate or compensate the environmental impacts during the various stages of the project phases.

Chapter 8 – ENVIRONMENTAL AND SOCIAL MONITORING AND MANAGEMENT PLAN - Guidelines to be adopted in environmental monitoring and management of the project are presented in this chapter.

Chapter 9– CONCLUSION AND RECOMMENDATIONS – gives concluding remarks, recommendations on the way forward of the project.

2 PROJECT DESCRIPTION

2.1 LOCATION

The Taba–Gakomeye project site is located at S 020 31.060" and E 0290 35.306" along River Mwogo tributary at about 1664m above sea level. The site is located between Huye and Nyamagabe Districts, on Mwogo River. The site sits on the boundary of Taba and Gakomeye villages in Huye and Nyamagabe districts respectively in Southern Province, Rwanda. The catchment is characterized as hilly with steep slopes. The catchment is heavily cultivated with bananas, maize and trees ***(****Plate 2- 1 to 2-2****).*** The valley on the other hand is heavily cultivated with rice during the rainy season and other crops like cabbages, egg-plant, maize and irish potatoes *(Plates 2-4)*. The vegetation is sparse being mainly Eucalyptus and a few scattered trees *(Erthryna, Policious, Trema, Measopsis)* and a few swamp species such as *Phragamites* (*Plate 2-4)*. Hence, the catchment and slopes were almost bare with sparse grass cover and few forests providing optimum conditions for serious soli erosion. Agriculture is basically rain fed and at subsistence level on the slopes with little terracing being practiced. There was rice grown in the valleys under irrigation The Valley bottom is cultivated with paddy, maize, beans, potatoes and cassava. There is therefore, serious catchment erosion (plate 2-3). River is full of sand and gravel sediments in such large quantities that they are mined. There is therefore heavy sand mining along the river *(Plate 2-6)*. There is also some aquaculture few km down stream of the site *(Plate* 2-7). Cattle keeping are widespread amongst the peasants. The proposed dam will provide water for domestic use, agricultural irrigation, livestock, fisheries, and aquaculture. The dam would also assist in controlling floods. There are settlements along the access road to the Dam site. Some houses built close to the bottom valley and a road will be affected by floods once the dam is constructed. The people in the area are using water from the river and springs for their water supply. The local community indicates that their priorities for using the dam were irrigation and hydropower.

Rwanda has a number of biodiversity hotspots, a RAMSAR site and protected areas but the nearest of these is a hotspot in Nyungwe which is 20 km away (following the road) and 16 straight from the project area (see figure 2-1).

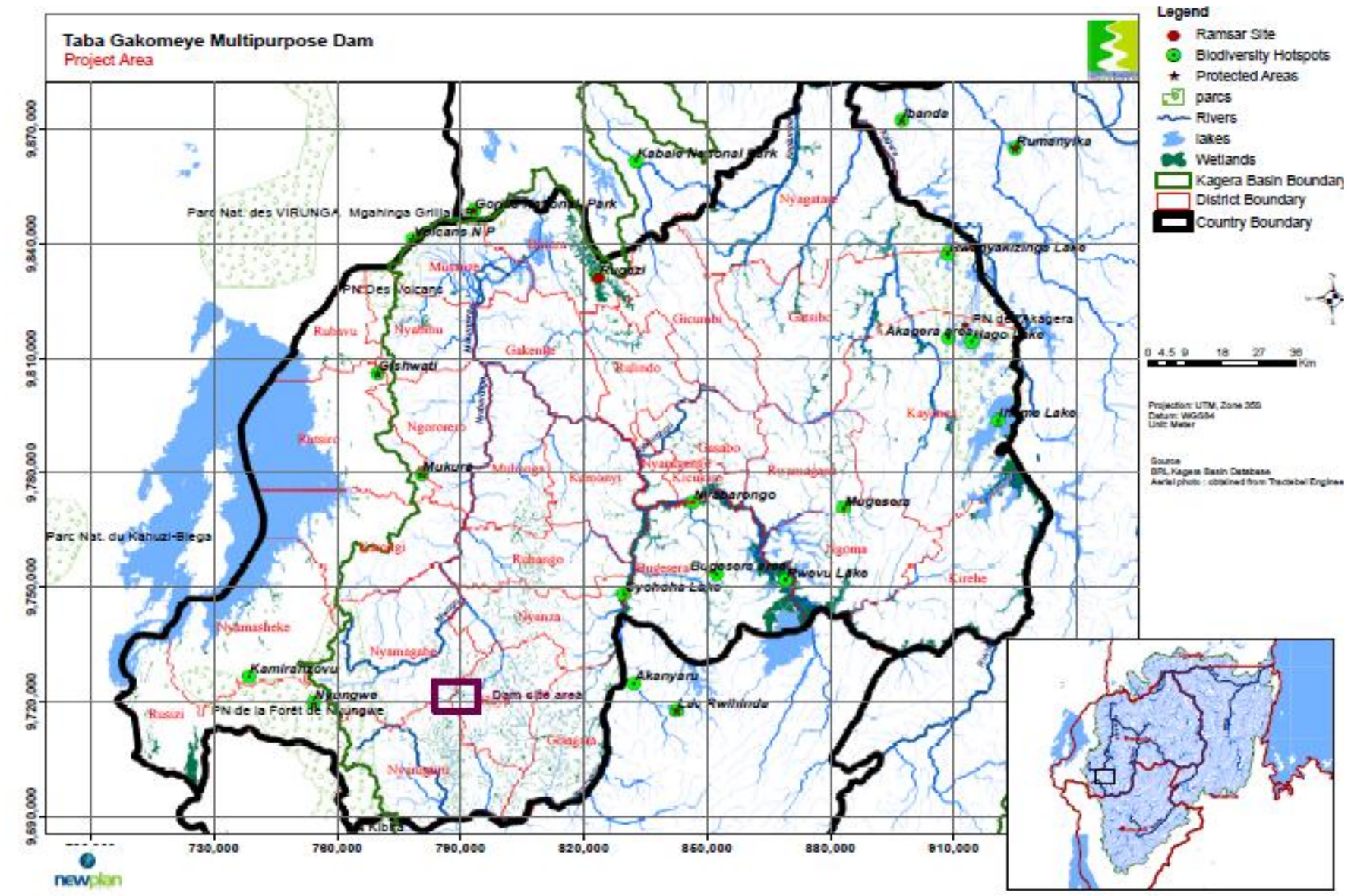


Figure 2-1: Taba-Gakomeye dam site in Rwanda

Picture 2-1: Project area characteristics and agricultural activities

Picture 2-2: Taba-Gakomeye catchment showing slopes and valleys heavily cultivated

Picture 2-3: Pictures showing siltation in Mwogo River

Picture 2-4: Access to the catchment area and its surroundings

Garden of cabbages in the Taba-Gakomeye carhcment

Egg-plant in the valley of the Mwogo River

Garden of cabbages in the Taba-Gakomeye carhcment

Phragmites swamp grass in the valley of R. Mwogo

Picture 2-5:Crops cultivated in Mwogo Valley

Picture 2-6: Sand mining along the Mwogo River

Picture 2-7: Aquaculture ponds downstream of the dam site in Taba-Gakomeye

It was observed that two access roads and a bridge shown in *Plate 2-7* is located in the reservoir area

The proposed area for the site is near a river i.e. River Mwogo. However, the land adjacent to the river (river bank) is being utilised by the local people for crop farming. The main cultivation in the project's area include maize, cassava, paddy, potatoes, soya bean, banana, varieties of vegetables such as tomatoes, beans and plants such as elephant grass, cypress, grevelia, euphorbia, ibitovu, uruhehe, imikeli, imihati, imitobotobo, and imigwampororo.

2.1.1 *Dam description*

The proposed 14 m high dam with a full supply level of 12m and is 1644masl will be an earth fill embankment dam with a storage capacity of 3.09 million m^3 and reservoir surface area of 0.6 km^2,. The features of the proposed Taba–Gakomeye Dam are shown in *Table 2-1* below. The area is characterized by peasant agriculture with little irrigation. The dam characteristics are as shown below.

The proposed dam has a height of 14m with full supply level of 12m (1644masl). The dam is expected to be earth fill with maximum reservoir surface area of about 0.6 km^2 (***Figure 2-2 & 2-3)***), maximum reservoir length of 2.2 km and reservoir width of 0.8km. The storage capacity is expected to be about 3.09 million m^3 (Mm^3). The dam is easily accessible by road but construction materials are not readily available. There is an alternative dam which has been discussed in the chapter for analysis of alternatives.

Table 2-1: Dam site features for the Taba-Gakomeye dam site in Rwanda of dam

Coordinates of dam (Longitude, Latitude)	Eastings 787946.39 and Northings 9721480.00(UTM WGS 1984 Zone 35S)
Dam height (m)	14 .0
Storage capacity (Mm3)	3.09
Dam length (m)	265.0
Dam crest width (m)	6 .00
Reservoir surface area at FSL (km2)	0.6
Maximum Reservoir Length (km)	2.2
Maximum Reservior Width (km)	0.8
Full Supply Level (m)	1644.00
Maximum Water Level (m)	1645.10

2.1.2 *Irrigation command areas*

Irrigation command areas are shown in Figure 2-2 below. It will be divided into four areas;

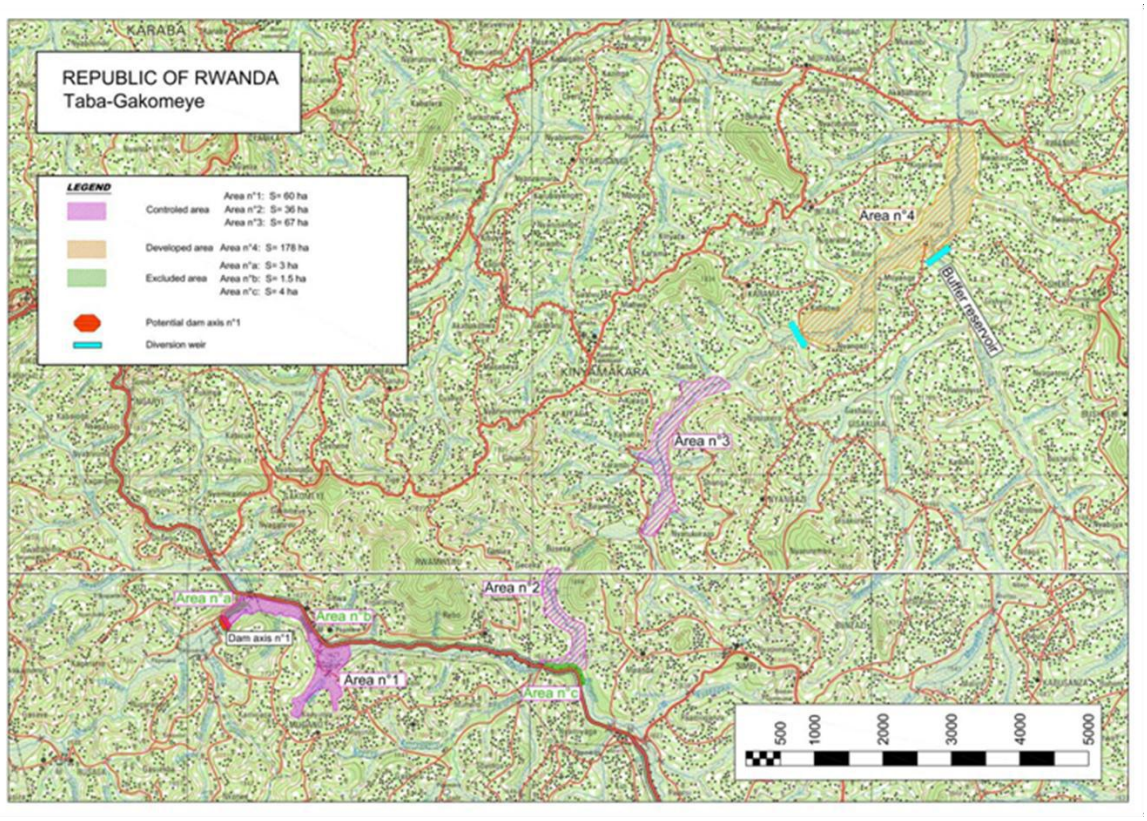


Figure 2-2: Irrigation command areas in Taba-Gakomeye site.
Source: Feasibilty Report 2012

Area 1 will have bulk controlled area of 82.7Ha with net irrigation of 74.4Ha leaving the other area for canals (**Figure 2-3.)**. It will have on main canal because the valley in that section is narrow. Area 2 will also have one main canal as the valley is narrow, 17Ha bulk controlled area and 15.3Ha net irrigation area. Area 110 (**Figure 2-4.)** will consist of 49.5Ha with net irrigation area of 44.6Ha. The remaining area will be used up by the canals. Two main canals will flow on both banks. Area 3 will have two canals one on each bank. One canal will be about 1.5km while the other will be less than a kilometer. It will have a bulk controlled area of 54.3Ha and net irrigation area of 48.9km. Main canals are designed for an irrigation duty of 1,5 l/s/ha, taking into account all losses and irrigation needs of the chosen cropping pattern. Secondary canal are mainly built perpendicular to the River, to supply water to tertiary canals parallel to the general direction of the River.

Tertiary canals are built with a water level 30 cm above the natural ground, to allow for a headloss of 10 cm and a water level inside the basins of 20 cm. Security spillways are inserted at the end of canals and on the main canal, when the section is reduced. The irrigation possibility will allow the farmers to grow three crops in a year: It is proposed to grow an equal area of maize, potatoes, beans and soybeans during the rainy season, while introducing a crop rotation. During the big rainy season (from February up to May/June), farmers will be able to shift with irrigation from their early maize varieties to later hybrid and more productive varieties. The dry season will be mostly dedicated to vegetables. Growing periods of the different crops may present certain flexibility in time. It is expected to reach a yield of 5 t/ha for maize, 1.6 t/ha for beans and soybeans, 15 t/ha for potatoes, and from 2 to 6 t/ha for vegetables, depending on the crop which will be grown.

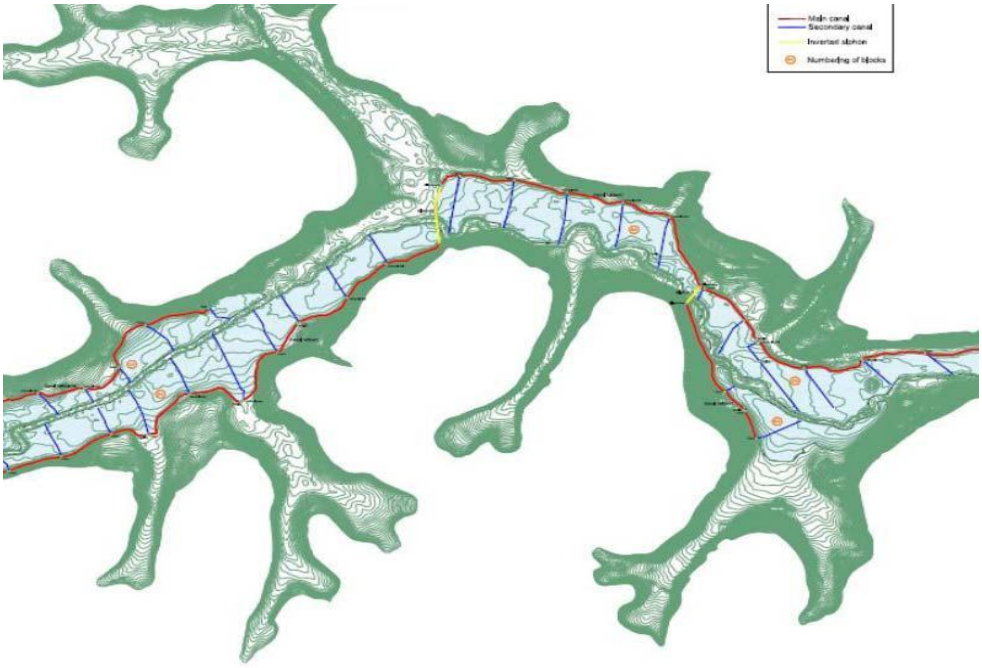


Figure 2-3: Overview of the irrigation area "1" in Taba-Gakomeye site
Source: Feasibilty Report 2012

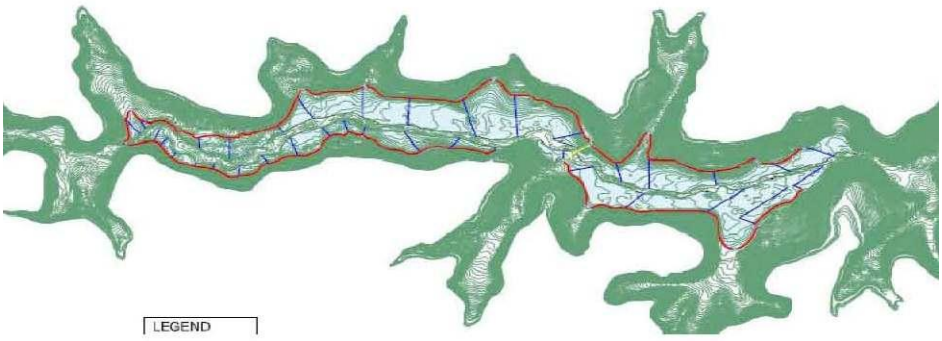


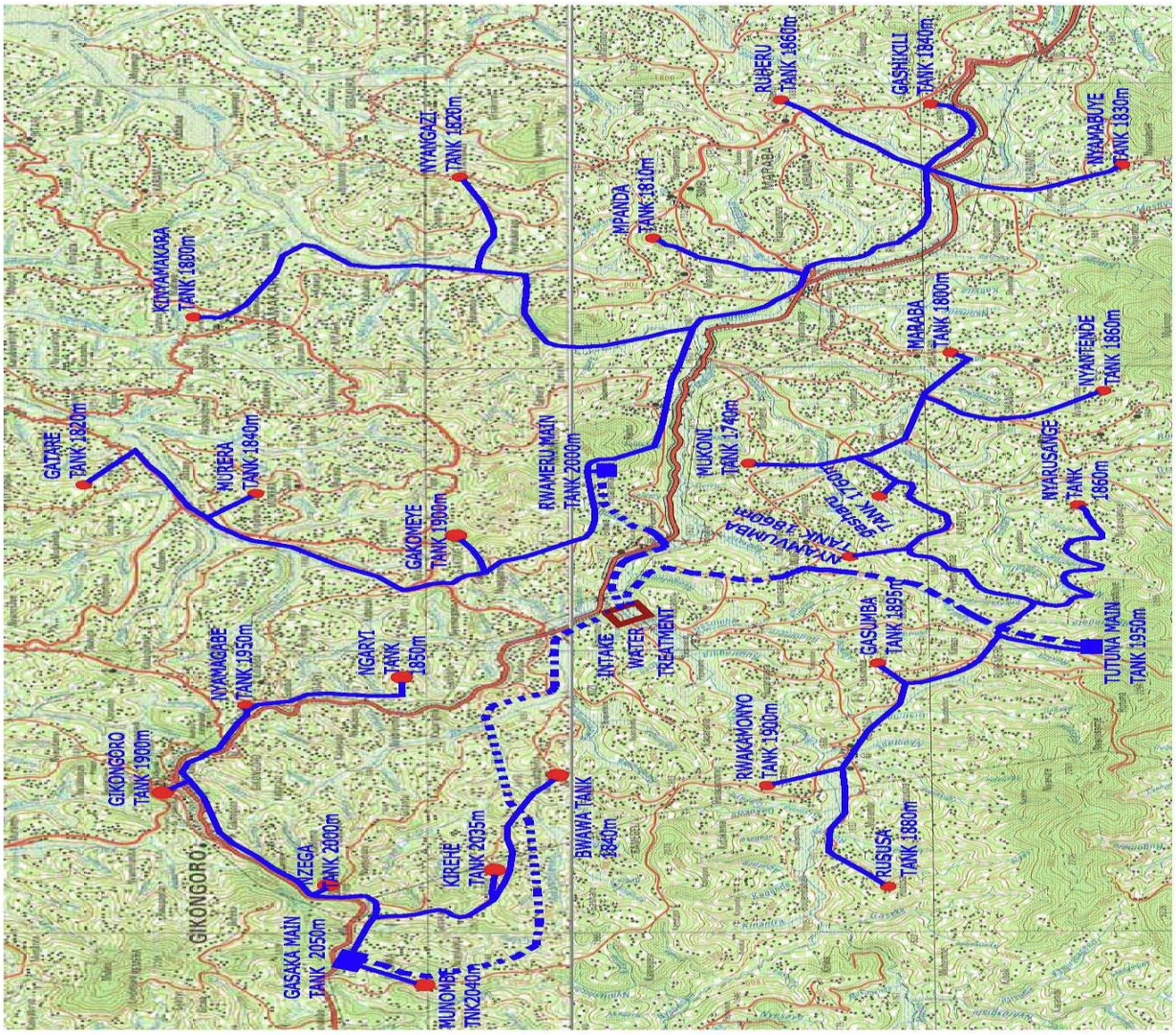
Figure 2-4: Over of the irrigated area "110" in Taba-Gakomeye site

Source: Feasibilty Report 2012

2.1.3 Water supply

The proposed scheme for water supply covers districts and sectors of Nyamagabe District [Kamugeri, Gasaka, Tare Sectors], Nyaruguru District [Mata, Ruramba Sectors] and Huye District. Some 35 140 households could benefit from the project at first. The proposed water supply system consists of a treatment plant,3 main tanks and about 25 storage tanks. It will supply about 25 villages. The treatment system will be at the intake, the main tanks will be located at Gasaka, Tutuna

and and Rwameru while storage tanks will be in each benefiting village (Figure 2-5). The water will be pumped to the 3 main tanks and will flow by gravity to the storage tanks.


NYANGAZI TANK 1820m
KINYAMAKARA TANK 1800m
GATARE TANK 1820m
MUREKA TANK 1840m
GAKOMEYE TANK 1900m
RWAMERU MAIN TANK 2000m
NYAMAGABE TANK 1950m
NGARYI TANK 1850m
GIKONGORO TANK 1900m
IZEGA TANK 2000m
KIREHE TANK 2035m
GASAKA MAIN TANK 2050m
MUNOMBE TNK2040m
GIKONGORO
INTAKE WATER TREATMENT
BWAWA TANK 1840m
MPANDA TANK 1910m
RUBERU TANK 1860m
GASHIKILI TANK 1840m
NYAMABUYE TANK 1830m
MARABA TANK 1860m
NYANTENDE TANK 1860m
MUKONO TANK 1740m
MWAWUMBA TANK 1860m
NYARUSANGE TANK 1860m
GASUMBA TANK 1895m
TUTUNA MAIN TANK 1950m
RWAKAMONYO TANK 1900m
RUSUSA TANK 1880m

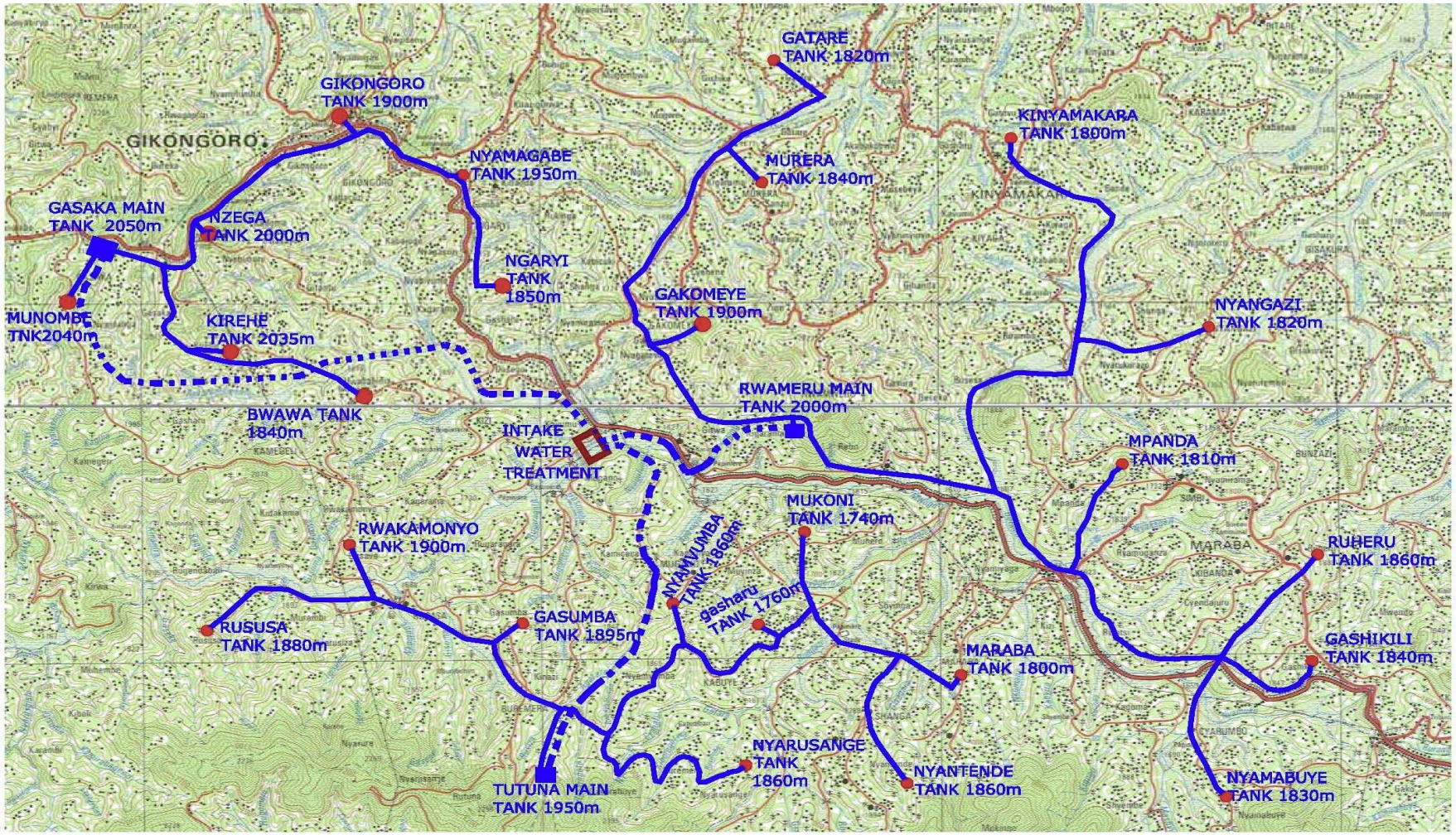


Figure 2-5: Water supply for Taba-Gakomeye project: Source: Feasibilty Report 2012

2.1.4 Fish farming

Aquaculture is already a known activity in the area. Some 27 fish ponds have been identified within the project area to be developed at first as shown in ***Figure 2-6*** below.

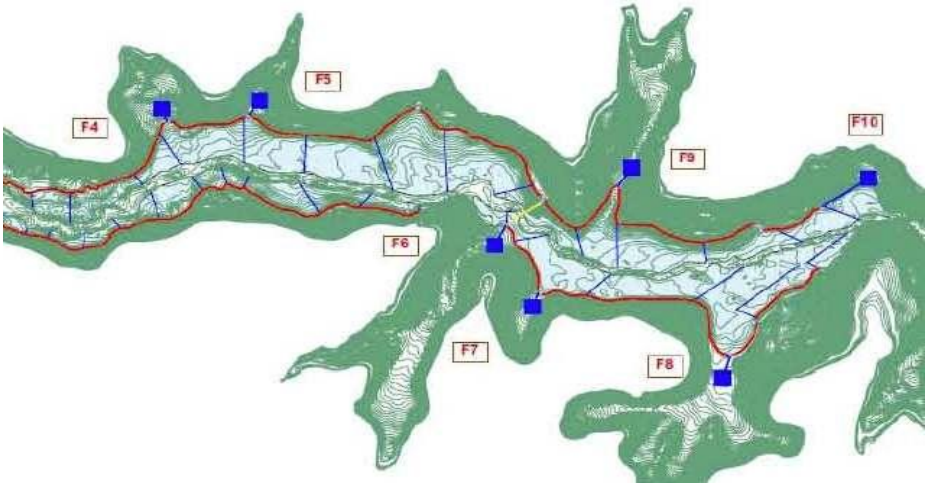


Figure 2-6: Fish ponds to be developed in teh project are

Source: Feasibilty Report 2012

2.1.5 Livestock watering project

For livestock watering, 30 locations have been identified for about 45,500 livestock population. Most of these will be the same as for fish pond (Figure 2-6) above. The required troughs are 12 at first to 15 in future, each of capacity 10 000 liters.

2.2 AREA OF INFLUENCE

This is defined as the area that will be affected by the project development. The zones in this area have been defined based on the intensity of the impacts. These were identified under the Direct Impact Zone (DIZ) and Indirect Impact Area (INDIZ) whether positively or negatively affected. The DIZ is an area that will have a direct impact from the project activities. The key DIZ areas include : the dam location, the reservoir area, irrigation & water supply areas, areas that will be affected by the creation of access road, material sources like burrow pits and quarry (where necessary), the camp sites (temporary), that may receive reduced water flow and soil disposal sites.

The DIZ is mostly in the villages Cyinyana, Gakomeye, Kagarama of Kamegeli Sector, Gitwa, Kinombe and Taba in Maraba Sector which will be mainly affected by the dam and reservoir. The direct impact zone of water supply is indicated in figure 2-2 above. The irrigation areas also located in both Huye and Nyamagabe.

The INDIZ refers to areas that are surrounding the project area that may not be directly affected by the project, but may be influenced by human activities anticipated after the project has commenced. These areas include: the surrounding villages that are not directly affected and downstream villages

2.3 TECHNICAL DESIGN OF THE DAM

2.3.1 *Civil Works*

The cross section of the dam consists of homogeneous earthfill material protected by a layer of filter material which in turn is protected by 1.25m thick riprap on both upstream and downstream faces

Foundation

The dam footprint is stripped of all grass, trees, excessively plastic soil and any deleterious material. Thereafter the cut-off trench is excavated to be a minimum depth of 3 m or to groutable rock foundation.
Although the maximum head of water at full Thereafter the cut-off trench is excavated to a minimum depth of 3 m or to groutable rock foundation. Although the maximum head of water at full supply level is only 10.0 m, this head of water is capable of causing piping problems within a short space of time, hence the relatively deep cut-off which will lengthen the seepage path.

Badly broken areas on the downstream side of the cut-off-trench are covered with a 500mm thick sand filter to prevent the migration of fine particles under seepage forces. Grouting will be undertaken to a maximum depth of 10m. The grouting procedure follows the "stage grout split spacing method" with primary holes at 12m centres, secondary holes at 12m centres and tertiary holes at 6m centres. All primary holes are drilled to a depth of 12m and all other holes will be drilled to 6m. Control holes are drilled to depths up to 18m to check on effectiveness of grouting.

Outlet works

This will consist of;
Intake trash screen, upstream conduit, agate shaft of 3m by 2m with 600mm thick reinforced concrete walls. The gate house is 5m in diameter and 2.5m high with a 200mm thick reinforced concrete roof. The gate house walls are 300mm thick.

3 REVIEW OF THE EXISTING POLICIES AND LAWS

3.1 POLICY FRAMEWORK

3.1.1 *The National Environment Policy, 2003*

The environment is given due consideration in the Rwanda Vision 2020 with protection and management of environment among the pillars. The objective of the Government is that by 2020, it will have built a nation in which pressure on natural resources, particularly on land, water, biomass and biodiversity, has significantly been reduced and the process of environmental pollution and degradation has been reversed.

This Policy is based on a number of guiding principles including;

- Economic growth based on a more rational utilization of resources and consideration of the environmental dimension;
- EIA during consideration of developmental projects; the principle of inter-generational equity;
- Establishment of a favorable social and economic environment for the utilization of natural resources; and recognition of sub-regional, regional and global environmental interdependence.

The overall objective of the Environment Policy is the improvement of the well-being of the person, the judicious utilisation of natural resources and the protection and rational management of ecosystems for sustainable and fair development. Specific policy statements include mainstreaming gender in the protection of environment.

To ensure the successful implementation of the environment policy, an environmental law was adopted for sustainable development through sustainable utilization of environmental resources which meets the needs of present and future generations. The law is ***Organic Law Determining the Modalities of Protection, Conservation and Promotion of the Environment in Rwanda, Law No. 4 of 2005 of 08/04/2005.***

Taba –Gakomeye dam is being proposed on River Mwogo and in an area where mainly agricultural activities are taking place. Thus this policy will be relevant to the proposed construction of a dam at Taba –Gakomeye.

3.1.2 *National Land Policy, 2004*

The Policy is premised on the National Development Strategy of Rwanda (Vision 2020). It provides for land tenure systems, guiding principles of land management, an effective and efficient land registry, and land transactions. To operationalize the National Land Policy the Organic Law on Land and the other more recent land legislation were put in place and are discussed in Section 2.2.1 below.

3.1.3 *National Gender Policy, 2010*

The National Gender Policy highlights the principals that will guide sectoral policies and programmes in the integration of gender issues in their respective social, cultural, economic and political planning and programming. The National Gender Policy is in line with Vision 2020 in terms of creating an environment conducive to the promotion of social security, democratic principles of governance, and an all-inclusive social and economic system that involves effective participation of all social groups within the population.

The overall goal of the Policy is to promote gender equality and equity in Rwanda through a clearly defined process for mainstreaming gender needs and concerns across all sectors of development. The Policy defines the institutional framework and mechanisms within which gender equality and equity policies and programmes will be designed, implemented, monitored and evaluated, and coordinated. Gender mainstreaming is the main in this policy which aims at integrating gender issues into the policies, programmes, activities and budgets in all sectors and at all levels; and the affirmative action approach that aims at correcting the huge gender imbalances that exist.

The main responsibility for the implementation of the policy lies with the Ministry of Gender and Family Protection. Key stakeholders are identified in the policy and they are as wide ranging as gender issues. Taba –Gakomeye area is a rural area with all social groups it is therefore imperative that this policy be adhered to for effective participation of all social groups in this dam project.

3.1.4 *Marginalised People*

Rwanda does not have a group of persons defined as indigenous people but provides for marginalized persons. The Rural Settlement Task Force (RSTF) under the Ministry of Local Government (MINALOC) is responsible for the resettlement of historically marginalized people which it does in grouped settlements in rural areas. Historically marginalized persons are people like the Batwa who live in the forests; and returnees who have been living in forests elsewhere or within Rwanda. *The Resettlement Policy for Rural Areas* provides for affirmative action for marginalized persons. The area where people are to be resettled and the resettlement process must be undertaken in compliance with the environmental laws. In resettlement, social issues are given due regard.

RSTF does not deal with compensation. This is the role of the Ministry, province, district, sector or cell. MINALOC should be involved in the RAP process since the location of the population is the business of MINALOC in terms of where the population is currently located and where they are to be relocated. The construction of the proposed Taba-Gakomeye dam is likely to require that some families be relocated and such people are usually vulnerable therefore MINALOC will be involved in this process.

3.1.5 *Policy on Cultural Heritage, 2008*

The policy defines 'Heritage' as a set of assets and obligations of a person, conceived as a universal right. Therefore, heritage refers to the idea of a legacy of past generations which must be transmitted intact onto future generations. Heritage is any object or collection, whether natural or cultural, tangible or intangible, recognized by a community for its values of testimony and historical memory hence the need to protect, preserve, enhance and transmit it onto descendants.

Rwanda seeks to develop and resolve conflicts arising from among its people based on inherited cultural methods and systems. The policy on cultural heritage is an integral part of the National Policy on Culture. It sets out broad guidelines of the sector and provides a solid foundation for sustainable development. The policy stipulates that cultural heritage should consolidate the benefits from the heritage left by the ancestors to sustain Rwandan identity over the years, must preserve historical sites and monuments as elements belonging to a unifying set of an entity or a larger context and not exclusively as isolated elements or structures, should increase awareness of the Rwandan population to live in harmony with other elements associated with nature and which make up their environment.

The vision of the policy is to have cultural heritage as the basis and driving force for national development. The management, conservation and development of the policy should be tailored towards promotion of cultural tourism; environmental protection, rational use of local natural resources and ecotourism development; and development of social equality, culture of peace and preservation of specific values of sites. The goal of the policy is to make national cultural heritage the basis for social, economic and political development. It is therefore imperative that the planning and development of the Taba-Gakomeye dam puts this into consideration.

3.2 LAWS

3.2.1 *Organic Law Modalities*

Determining the Modalities of Protection, Conservation and Promotion of the Environment in Rwanda, Law No. 4 of 2005 of 08/04/2005

The law aims at conserving the environment, the people and their habitats. It lays emphasis on equal rights for present and future generations, and guarantees to all the people of Rwanda sustainable development which does not harm the environment and social welfare of the population. It sets up strategies of protecting and reducing the negative effects on the environment, while seeking to restore the degraded environment.

Article 6 stipulates that every person has the duty to protect, conserve and promote the environment. The State has the responsibility of protecting, conserving and promoting the environment (Article 5). The environment is defined as the diversity of things made up of natural and artificial environment. It includes chemical substances, biodiversity as well as socio-economic activities, cultural, aesthetic and scientific factors likely to have direct or indirect, immediate or long terms effects on the development of an area, biodiversity and on human activities.

Article 7 of this law provides for the principles on which Environmental conservation is based.

Article 9 stipulates that permission or license will need to be granted by the relevant Minister for acts like fishing, hunting and capture of animals, mining of valuable minerals and quarry as well as activities carried out in critical ecosystems. Some materials like sand are presently being extracted within and in the vicinity of the proposed reservoir and such materials may continue being extracted for the project. Therefore approvals to this effect may be required.

Chapter IV of the law makes provision for EIA. Every project shall be subjected to an EIA before obtaining authorization for its implementation. This applies to programmes and policies that may affect the environment. The Minister responsible for the environment shall determine the list of projects requiring EIA. An EIA report shall include a brief description of the project and its variants; a study of the direct and indirect projected effects on a place; an analysis relating to the initial state of a place; mitigation measures; reasons for selecting the proposed location; an explanation of the materials to be used during the activities of the project and after completion; and estimates of costs of mitigation measures as well as the measures for controlling and examining the status of the environment. ***Ministerial Order No. 003/2008 of 15/08/2008*** sets out the requirements and procedure for EIA including the selection of experts to conduct the EIA study.

Article 69 stipulates that REMA shall examine and approve but they can also authorize any other person to carry out these functions. REMA comes into force by the ***Law Establishing REMA, Law No. 16, 2006 of 03/04/2006.*** Examination and approval of the EIA in accordance with ***Cabinet Directive 2009 (Resolution of 25/03/2009, Minute 3)***, is currently the function of the Rwanda Development Board (RDB). RDB approves the whole EIA process from screening, preparation and approval of terms of reference, review and issuance of the EIA approval certificate. However REMA retains the responsibility for environmental legislation and policy thus monitoring of the EIA certificate and environmental audits are within their mandate.

The RDB is established as a specialized organ under *Organic Law No. 53/2008 of 02/09/2008 Establishing Rwanda Development Board and Determining its Responsibilities and Functioning* with the main purpose of fast tracking development activities in Rwanda. The EIA is carried out at the cost of the developer by experts approved as EIA Practitioners by REMA. An approved list of practitioners is published and available to the public. The developer must consult the members of the public in the affected areas and include their comments in the study report. Once the final report is received by RDB, public consultations are held with key stakeholders. According to *Ministerial Order 005/2008*, a public hearing can be held if in the view of REMA it is necessary for instance in projects that may lead to resettlement of a large number of people, or irrigation which can affect the ecosystem.

Dumping or keeping of substances is prohibited in places specified in Article 82-84.

Various regulations have been made under the Organic Law on the Environment. Examples include regulations on EIA, pollution control and species protection. The ban of plastic bags is effected by *Law No. 57/2008 of 10/09/2008 Law Relating to the Prohibition of Manufacture, Importation, Use and Sale of Polythene Bags in Rwanda* which prohibits the manufacturing, usage, importation and sale of polythene bags in Rwanda. A polythene bag is defined as a synthetic industrial product with a low density composed of numerous chemical molecules. Institutions in charge of controlling the use of polythene bags are the Judicial Police, Custom officers, Rwanda Environment Management Authority staff, Rwanda Bureau of Standards staff, Security Organs, Local Authorities and other necessary personnel authorized by an Order of the Minister in charge of justice.

During planning, construction and implementation of Taba-Gakomeye dam most of these laws and regulations and policies will be triggered. For example packaging materials, foods and other substances will have to consider that plastics are prohibited.

3.2.2 *Law No. 53/2010 of 25/01/2011 RNRA*

Establishing Rwanda Natural Resources Authority and Determining Its Mission, Organisation and Functioning

The law establishes the Rwanda Natural Resources Authority (RNRA) as the principal agency for the management and promotion of natural resources and to this end RNRA is entrusted with supervision, monitoring and ensuring the implementation of matters relating to the promotion and protection of natural resources in programs and activities of all national institutions. Natural Resources are composed of land, water, forests, mines and geology.

RNRA is responsible for implementing national policies, laws, strategies, regulations and government resolutions in matters relating to the promotion and protection of natural resources; following up and implementing international conventions Rwanda ratified on matters relating to the conservation of natural resources; advising the Government on appropriate mechanisms for conservation of natural resources and investments opportunities; registering land, issuing and keeping authentic deeds and any other information relating to land of Rwanda; ensuring proper geological data and their respective maps; providing technical advice on the proper use of natural resources; following up and supervising activities relating to proper management, promotion and valuation of natural resources.

The National Land Center (NLC); the National Forestry Authority (NAFA); and Rwanda Geology and Mines Authority are merged into RNRA.

Therefore RNRA will make sure that Taba-Gakomeye dam is developed within the policy and legal frame work and ensure that natural resources are protected during construction and operation of the dam.

3.2.3 *Ministerial Order N°007/2008 of 15/08/2008 Establishing the List of Protected Animal and Plant Species*

This Order establishes the list of protected animal and plant species. The species of protected animals shall be classified as follows: Mammals, birds, and reptiles. The list of protected animals and plants found in Appendix 1 should not be hunted except when there is prior authorization from competent authorities. The Order is implemented by the Ministry responsible for Natural Resources. Therefore species of concern have to be identified and analysed in Environmental Assessment.

3.2.4 *Law Establishing the Rwanda Water and Sanitation Corporation, Law No.43/2008 of 09/09/2008*

The Law establishes the Rwanda Water and sanitation corporation with the purpose of promotion of sanitation services in districts and in the city of Kigali in collaboration with other institutions; participating in formulation of water and sanitation policy; and collaborating with other institutions in the treatment, management and distribution of water in urban and rural areas.

Construction of a dam at Taba-Gakomeye is expected to form a reservoir with a capacity of about 3.09million cubic meters of water. This law will therefore be triggered especially in the planning and management of this reservoir.

3.2.5 *Organic Law N° 08/2005 of 14/07/2005 Determining the Use and Management of Land in Rwanda.*

The Law provides for the land tenure system in Rwanda. It prohibits discrimination against women in inheritance to or ownership of land. Lakes, rivers, springs, wells, national land reserved for environmental conservation, state roads & their boundaries, public administration land and buildings are all State land in the public domain. The law recognizes expropriation of land but does not provide for it. Article 25 of this law points out that competent authorities assisted by a commission in charge of land at every level shall allocate or lease land, Article 29 stipulates that Swamp Land belongs to the state while Article 30 stipulates Registration of land by a person owning it as obligatory. This law will be relevant in the acquisition and registering of the land that will be used by the project.

Taba-Gakomeye proposed dam is likely to affect private land and public land thus triggering this law.

3.2.6 *The Law Relating to Expropriation in the Public Interest, Law No. 18/2007 of 19/04/2007*

The Law determines the procedures relating to expropriation in the public interest. Expropriation is the taking of private property in the public interest aimed at development, social welfare, security and/or territorial integrity. An expropriator is a government organ with responsibilities and powers conferred by law to carry out expropriation in public interest. An Act of public interest is defined as an Act of Government, public institution, non-governmental organisation, legally accepted associations operating in Rwanda or an individual with a public interest aim. Public interest includes water dams, electric lines, basic infrastructure and any other activities aimed at public interest which are not indicated on this list but are approved by an Order of the Minister in charge of expropriation at his own initiative or upon request by other concerned persons.

Expropriation can only be carried out by Government and only in the public interest and with prior and just compensation. Underground or surface activity may be carried out with a public interest aim, on land belonging to a person. No landowner is permitted to oppose such activity. In the event that the activity causes any loss to the land owner, he shall receive just compensation for it.

Just compensation must be paid before relocation of the person whose land has been expropriated. Just compensation is an indemnity equivalent to the value of land and the activities performed thereon given to the person whose real property has been expropriated and calculated in terms of market prices. Activities that were carried out on the land may include different crops, forests, any buildings or any other activity aimed at efficient use of land or its productivity. Just compensation may be monetary or alternative land and building equivalent to the determined just monetary compensation. This is determined by agreement between the parties.

A project whose implementation shall entail expropriation is required to make financial provision for the expropriation process in terms of funds for inventory of assets of the person whose property is to be expropriated; and for just compensation on its budget. Compensation is only payable to persons who have a legally recognized interest in the real property in issue.

Expropriation requests may be initiated by the local government to wit the executive Committee at the district level in case the activities concern one district; City of Kigali for matters within its

jurisdiction; the relevant ministry in cases where such planned activities concern more than one district or if it is an activity at the national level.

Evaluation of the proposal for expropriation for purposes of approval is made by the Land Commission of the district where the approval is concerned with one district; the Land Commission of the City of Kigali where the land is within its jurisdiction; the Land Commission at the national level where the proposal concerns more than one district or is a proposal at the national level. Approval of expropriation is made at each level by the district council, the council of the city of Kigali, an Order of the Minister responsible for Lands (where more than one district), and at the national level by an Order of the Prime Minister.

Compensation must be paid within one hundred twenty days from the day of approval of the just compensation. Failure to do so will invalidate the compensation computed unless an agreement to the contrary is reached between the parties. **The person whose land has been expropriated must relocate within ninety days of receiving compensation**. Forceful relocation is permitted where a person receives an award and refuses to relocate. Such relocation shall be undertaken by competent authorities.

Taba-Gakomeye dam and associated reservoir is likely to affect 150 acres of land and about 39 structures. This indicates that there is likely to be land expropriation since some land is privately owned and relocation of households. Therefore, this law will be very important in the planning and implementation of this project.

3.2.7 *Law Establishing and Organising the Real Property Valuation Profession in Rwanda, Law No.17/2010 of 12/05/2010*

This law aids the law on expropriation in terms of undertaking valuation. Valuation of real property can only be done by a person certified as a valuer under this law. A valuer may use one or more of the valuation methods mentioned in order to determine the value of real property. The valuer shall select the best valuation method to determine the fair market value of the real property. The methods used shall be clearly explained in the valuation report. Upon approval by the Council for the Regulation of Real Property Valuation in Rwanda (established under this law) a valuer may use any other relevant worldwide methods not provided in this Law in order to carry out the assigned work.

There is established an Institute of Real Property Valuers of Rwanda as a body corporate with autonomy. In order to be recognized as a real property valuer in Rwanda, a person must be a member of the Institute. A Council for the Regulation of the Real Property Valuation Professionals in Rwanda is established as a regulatory agency. The Institute proposes regulations, guidelines and standards for valuation while the function of approval lies with the Council. A register of real property valuers is maintained by the Council who can enter or remove a real property valuer from the register of certified valuers. The Chairperson of the Council approves valuation and is equivalent to the Chief Government Valuer in other jurisdictions.

A person dissatisfied with a real property valuation shall refer the matter to the Council for determination. The Council shall select other certified valuers who shall decide other valuation methods to be used. If the dispute remains unsettled, it shall be submitted to a court of law for

adjudication. As already indicated, valuation of property including land, crops, structures will have to be carried out before expropriation of the land needed for the Taba-Gakomeye dam.

3.2.8 *Rwanda New Labour Law:*

Pursuant to the International Labour Conventions, the Rwanda new labour law under Article 2 of its Application governs labour relations between workers and employers as well as between the latter and the apprentices or the trainees under their authority as per contract. Key issues of this Law relevant for this project at the implementation stage are reflected in the several Articles among which include: the prohibition of the employment of children before the age of 16 under Article 4, Protection of workers against violence or harassment in Section 3, Prohibition of Gender based violence in Article 9, payment of damages to workers due to unlawful termination of contract reflected under Article 33, provision of Funeral indemnities by the employer to the deceased family in the event of the workers death at work under Article 37 and provision of PPEs to all workers and ensure their correct use in Article 91. This law will therefore be invoked during the employment process of the workers constructing the Dam.

3.2.9 *Law N°62/2008 of 10/09/2008 putting in Place the use, Conservation, Protection and Management of Water Resources Regulations*

This Law defines the applicable rules to the use, conservation, protection and management of water resources. Under Articles 5, it stipulates Water resources management principles while in Article 6 highlights the Government's the duty of establishing a national policy on protection, planning, use and management of the water resource and the aquatic ecosystems, including the humid zones and swamps. Article 7 stipulates Priority in water distribution .The law will therefore be relevant in this project since government will have to get involved in the management and protection of this water resource upon completion.

3.2.10 *Ministerial Order N°002/16.01 of 26/04/2010 Determining the Reference Land Price Outside Kigali City*

This Order determines the reference land prices to be used in Rwanda outside the Kigali City. This Order is in pursuant to the Constitution of the Republic of Rwanda of 04 June 2003 as amended to date, especially in Articles 29, 30, 120, and 201; pursuant to Organic Law no08/2005 of 14/07/2005 determining the use and management of land in Rwanda, especially in Articles 5, 6 and 24; and pursuant to Law no18/2007 of 19/04/2007 relating to expropriation in the public interest. A copy of this order is attached to this report as Appendix IV. The Taba Gakomeye project is located outside Kigali City therefore this Ministerial Order will be relevant.

3.3 EAST AFRICAN INSTITUTIONS

3.3.1 *The East African Community*

3.3.1.1 *The EAC Treaty, 1999*

The objectives of the Treaty include the sustainable utilisation of natural resources; taking measures to protect the environment; sharing meteorological information; collaboration in the development of energy sources; and cooperation in environment & natural resources management. The need for joint efforts in environmental protection and conservation was realized right from the formulation of the revived East African Cooperation.

Chapter Nineteen of the Treaty is dedicated to cooperation in environment and natural resources management. The Partner States recognize that development activities may have negative impacts on the environment leading to degradation of the environment and depletion of natural resources and that a clean and healthy environment is a prerequisite for sustainable development. The States agree to take measures to foster cooperation in the joint and efficient management and sustainable utilisation of natural resources within the community; and shall provide prior and timely information to each other on activities that may have significant trans-boundary impacts and shall consult at an early stage. The development of a common environment management policy is encouraged including joint development and adoption of water resources conservation and management policies that ensure sustenance and preservation of ecosystems. The states undertake to adopt common environmental control regulations, incentives and standards; and develop capabilities and measures to undertake EIA of all development project activities and programmes.

3.3.1.2 *The Protocol on Environment and Natural Resources, 2006*

The Protocol is not yet in force pending the ratification of a member State. It governs cooperation between the Partner states in the management of the environment and natural resources over areas within their jurisdiction including trans-boundary environment and natural resources.

The Protocol provides for areas of cooperation between Partner States and specifically for cooperation in conducting EIA and environmental audits. Other areas of cooperation include the management of trans-boundary resources; harmonisation and adoption of common policies, laws & programmes requiring EIA; prior planning for trans-boundary activities & projects that may have adverse impacts. Common guidelines on EIA in shared ecosystems shall be adopted. Partner states undertake to ensure that the Regional Environment Assessment Guidelines for Shared Ecosystems of East Africa-Annex I to the protocol-are adhered to. The Annex is currently under review by the EAC and may not constitute part of the Protocol.

Taba-Gakomeye is on river Mwogo which flows into R. Nyabarongo. Nyabarongo has Akanyaru as one of its tributaries that is shared by Rwanda and Burundi. The protocol may be applicable since it is one river system.

3.3.1.3 *A Draft EAC Climate Change Policy, 2011*

This policy has been proposed and is in the approval process. The policy was developed as a result of lack of national policies on climate change and the effects of climate change in the East African region. The proposed EAC Climate Change Strategy and Climate Change Master Plan were referred by the Sectoral Council on Environment and Natural Resources to Partner States for further input.

3.3.2 *The Lake Victoria Basin Commission (LVBC)*

3.3.2.1 *The Protocol for the Sustainable Development of Lake Victoria Basin, 2003*

LVBC is established under the Protocol for the Sustainable Development of Lake Victoria Basin. The Protocol looks to cooperation of Partner States in conservation and sustainable utilisation on the basin resources. All LVBC programmes are aimed at promoting sustainable development in the Lake Victoria basin. In implementing programmes particularly development projects, there may be need for EIA. Some projects are environmental mitigation measures to restore degraded environments around the lake basin. Projects that require EIA are subjected to national processes. This applies to trans-boundary projects mechanism currently available for trans-boundary EIA.

3.4 REQUIREMENTS OF INTERNATIONAL FINANCIAL INSTITUTIONS

3.4.1 *World Bank Safeguard Policies review*

The 'Environmental and Social Safeguard Policies' of the World Bank consist of Operational Policies (OP), Operational Directives (OD) and Bank Procedures (BP). Some of these policies likely to be triggered by the proposed dam construction at Taba –Gakomeye are highlighted below.

3.4.1.1 *Environmental Assessment (OP/BP 4.01)*

Section 7 requires that a range of EA instruments be used depending on the project. Section 8 categories the project according to type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. This policy emphasizes consultation and public disclosure. Section 14 requires that developer of category A and B projects consults the project-affected groups and local nongovernmental organizations (NGOs) about the project. The policy also requires that relevant material be provided in a timely manner prior to consultation and in a form and language that is understandable by groups being consulted (Section 15). Before the project can be upraised by the Bank, an EA report for such project (category A and B) has to be disclosed to the affected persons and the public. Furthermore, the developer is required to report on compliance monitoring of the EMP.

A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas-

-including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A projects.

Taba-Gakomeye proposed dam project is likely to have very significant social negative impacts related to loss of agricultural land and displacement of households. Therefore Taba-Gakomeye project can be categorized as a Category A

3.4.1.2 *Cultural Property (OP/BP 4.11) Physical Cultural Resources*

These procedures assist in preserving physical cultural resources (PCR) and help in avoiding the destruction or damage. PCR includes resources of archaeological, paleontological, historical religious (including graveyards and burial sites), or other cultural significance. Rwanda has a very reach culture and therefore this safeguard is likely to be ivoked.

3.4.1.3 *Involuntary Resettlement (OP/BP 4.12)*

This Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out. Therefore the Bank has the following objectives on involuntary resettlement;

- to avoid involuntary resettlement and where this is not feasible, resettlement activities should be conceived and executed as sustainable development programs through meaningful consultation, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits.
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

Some households are expected to be affected by the inundation at the Taba-Gakomeye site thus this operation procedure will be relevant.

3.4.1.4 *Natural Habitats (OP/BP 4.04)*

The policy promotes environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions. The policy limits the circumstances under which projects can damage natural habitats. Specifically it prohibits projects which would lead to significant loss or degradation of any Critical Natural Habitats, while in Non-Critical Natural Habitats; feasible alternatives can achieve the projects potential overall net benefits.
In Taba-Gakomeye area, no Critical Natural Habitats are envisaged. However, there are other habitats that need measures to be put in place for the project's net benefit to be achieved.

3.4.1.5 *World Bank guidelines on vulnerable people*

The World Bank resources and toolkits for vulnerable people are relevant to this project. They describe the vulnerable as those who are most likely to fall through the cracks of regular programs and need to be protected from negative outcomes and /or allowed participation. Vulnerable people

need to be given special attention to remove the barriers that stand in the way of equal participation in projects, or through special project components and targeting strategies tailored to their needs.

Groups of vulnerable people have been identified in the communities and these include; the widows, orphans, the women etc. which will trigger this safeguard during implementation of this project.

3.4.1.6 *Public Disclosure*

The policy requires that;

- Category A project EA reports be disclosed at the World Bank Infoshop (English) and should be accessible to local affected groups (local language) in their country;
- Category B project reports be accessible to local affected groups (local language) in their country;
- Category FI should have their Framework disclosed at the World Bank Infoshop and appropriate in-country Web site (e.g. Rwanda Natural Resources Authority (RNRA). Individual subproject disclosure requirements defined in Framework (OP 4.01, *Environment Assessment January 1999, revised in 2011).*

Being a category A therefore, EA reports will have to be disclosed as indicated above for the category A projects.

3.4.1.7 *Safety of Dams (OP 4.37)*

Section 1 of these procedures clearly indicates that the responsibility of ensuring that appropriate measures are taken and sufficient resources provided for the safety of the dam lies with the owner irrespective of its funding sources or construction status.

Section 2 to 6 of OP 4.37 concerns the "New Dams". When the project includes the construction of a new dam for example a water storage dam for multipurpose project, it requires that the dam be designed and its construction supervised by experienced and competent professionals. It also requires that the lender makes sure that the borrower adopts and implements certain dam safety measures for the design, bid tendering, construction, operation, and maintenance of the dam and associated works (section 2). Section 3 distinguishes between small and large dams. Section 3a stipulates that small dams are normally less that 15meters in height. Section 3b indicates that large dams are 15 meters or more in height. However if they present special design complexities--for example, an unusually large flood-handling requirement, location in a zone of high seismicity, foundations that are complex and difficult to prepare, or retention of toxic materials then if such dams are between 10-15meters in height are treated as large dams.

Taba-Gakomeye dam is a proposed new dam of 14 m height that will be used for water storage dam for multipurpose uses e.g. water supply, irrigation and fisheries. Considering that it has height of less than 15m, it is regarded as a small dam.

3.5 MULTILATERAL ENVIRONMENTAL AGREEMENTS -

Rwanda has ratified numerous international conventions related to the environment and takes its international obligations seriously. For each convention ratified, a focal point is identified and a strategic plan and action plan developed for realization of Rwanda's rights and obligations. The relevant conventions for the dam construction at Taba-Gakomeye are discussed below.

3.5.1 *The Ramsar Convention of Wetlands, 1971 Note sure about*

This an international treaty for the conservation and sustainable utilisation of wetlands that is to stem the progressive encroachment on and loss of wetlands now and in future recognizing the fundamental ecological functions of wetlands and their economic, cultural scientific and recreational value. This convention has Rwanda Environment Management Authority (REMA) as focal point.

Rwanda has one RAMSAR site, Rugezi wetland located on R. Mukungwa in Northern Rwanda. Mukungwa river meets river Nyabarongo downstream of Rugezi; they are both tributaries of Nyabarongo thus are in the same river system (***Figure 3-1***). Rugezi is much downstream of the proposed Taba-Gakomeye dam on river Mwogo and therefore no impact is envisaged on this wetland by implementing the project. Thus Ramsar Convention on Wetlands will not be triggered.

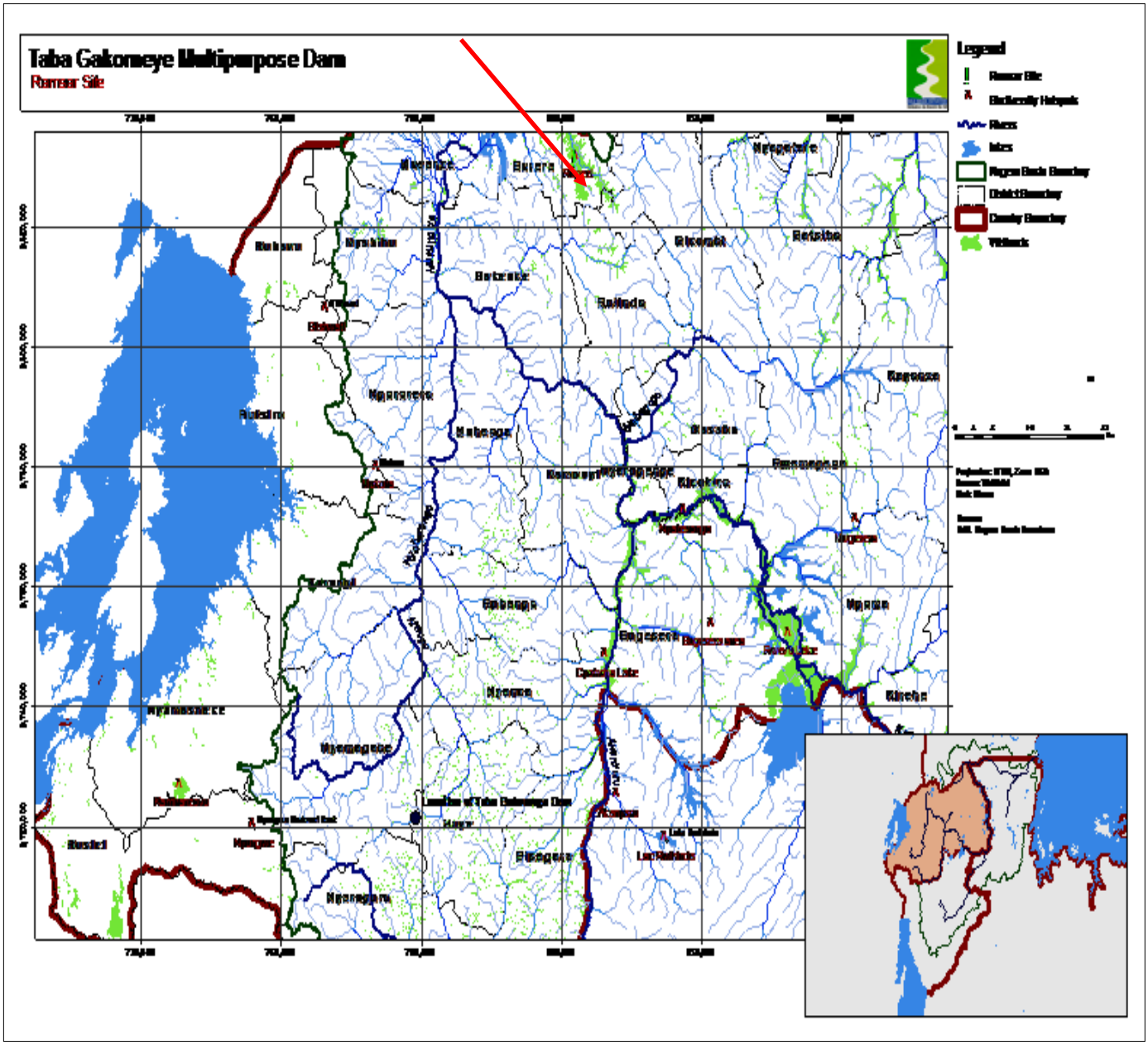


Figure 3-1: Red arrow in the Map shows Rugezi Ramsar site in Rwanda

3.5.2 *Convention for the Protection of the Ozone Layer and its Montreal Protocol*

This is a protocol to the Vienna Convention for the Protection of the Ozone Layer which is an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion. The Ozone depleting substances are Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs). The ozone shield is important because it protects plant and animal life on land from the sun's ultraviolet rays, which can cause skin cancer, cataracts, and damage to the immune system. Thinning of the ozone layer also may alter the DNA of plants and animals. They also act as greenhouse gases, with several thousand times the per-molecule greenhouse potential of carbon dioxide.

Rwanda ratified this convention in 2001 but has not yet signed. However they put in place structures and processes to implement the protocol and REMA is the focal point for this convention and is responsible for all issues related to this convention. Therefore they are also obligated to fulfill the requirements like other countries that are signatory the convention.

The signatory are required to;

- Recognize that worldwide emissions of certain substances can significantly deplete and otherwise modify the ozone layer in a manner that is likely to result in adverse effects on human health and the environment.
- Determine to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it, with the ultimate objective of their elimination on the basis of developments in scientific knowledge.
- Acknowledge that special provision is required to meet the needs of developing countries.
- Accept a series of stepped limits on CFC use and production, including:

A number of construction equipment will be required during construction of Taba –Gakomeye dam and these use CFCs and HCFCs thus triggering the Protocol.

3.5.3 *United Nations Framework Convention on Climate Change (UNFCCC)*

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbondioxide and other greenhouse gases. The convention encouraged industrialized countries to stabilize greenhouse gases while the Kyoto protocol commits them to do so. Vehicles and construction equipment release fumes including carbondioxide which is one of the greenhouse gases which affect the temperature of the earth.

Rwanda ratified the convention in July 2004 and its enforcement was February 2005 (web page). Rwanda Environment Management Authority (REMA) is the focal point. It is expected that a lot of construction equipment and vehicles will be required for Taba-Gakomeye dam. Thus UNFCCC will be relevant to this project.

4 ANALYSIS OF ALTERNATIVES

4.1 PROPOSED DAM

This dam site is located on Mwogo River in Taba village in Nyamagabe District and Gakomeye Village in Huye District Rwanda.

Dam features have been described under project description above however for purposes of comparison, it has been repeated.
The proposed dam has a height of 14m with full supply level of 12m (1644masl), maximum water level of 1645.10m and a dam length of 265.0m. The dam is expected to be earth fill with maximum reservoir surface area of about 0.6 km^2, maximum reservoir length of 2.2 km and reservoir width of 0.8km. The storage capacity is expected to be about **3.09 million m^3** (Mm^3). The dam is easily accessible by road but construction materials are not readily available.

Dam construction and the reservoir created will inundate about 60 Ha of mostly agricultural land.. About 20Ha of these belong to individual while 40 Ha are government owned. Relocation of about 39 houses is envisaged. The area likely to be inundated is mainly agriculture dominated in the wet season by rice fields. Construction of this dam is likely to lead to loss of livelihood through loss of agricultural land and sand mining activities. Some infrastructure like roads including that to the Taba-Gakomeye site and small bridge across river Mwogo is likely to be affected by inundation. The reservoir for this dam will inundate a lot of land and leave less land for irrigation. From feasibility study, water demand for all uses is about $3Mm^3$.

This dam will be expensive to construct because the dam structure will be big. The communities were not comfortable with this option.
The annual sedimentation rate at Taba-Gakomeye site is according to Feasibility Report is about 0,075 Mm3 per year which is high.

4.2 ALTERNATIVE SITE (OPTION)

The dam is generally in the same area as the selected alternative but slightly upstream on the same river. This dam alternative is likely to inundate about 28 acres of agricultural land may not affect any structure/house.

The proposed dam has a height of 14 m with a transverse cross section of 235m long. From feasibility findings, this dam height at this location will give storage of **$1Mm^3$** representing less than 2% of the annual runoff. This dam is likely to be silted within 15 years according to feasibility report. This is inadequate for a proper river regulation and will not bring about the benefits envisaged. . The dam is easily accessible by road. This alternative will inundate less land and leave much land for irrigation but will have less storage capacity. Economic activities like agriculture and sand mining will also be affected and fewer infrastructures compared to the proposed option. Construction for this dam will be cheaper as the dam structure than Option 1. The communities preferred this option.

The annual sedimentation rate at is also about 0,075 Mm3 per year as the two locations are in the same valley.

4.3 DO NOTHING SCENARIO

The Lake Victoria Basin is endowed with a variety of natural resources; however the basin is characterized by seasonal water scarcity. One of the major issues facing Kagera catchments is Water scarcity and the situation is expected to get worse as the population increases and as demand by the different water use sectors out-matches the existing supply. Water related conflicts are on the increase and cause security risks in the catchments. The Nile Basin as a whole is characterized by poverty and rapid population growth (**NELSAP, n.d.** *Development of Tools and Guidelines for Climate Adaptation Mainstreaming in Water Infrastructure Development, Task 1Report*).

In order to partly address this challenge structural approaches have been proposed including the dam at Taba-Gakomeye. These are expected to improve water storage in the catchment, and enhancing demand management to minimize wastage of the scarce water resources. Especially for Taba-Gakomeye valley where rice growing flourishes in the wet season but in the dry season the soils dry up and the rice yields go down. Furthermore during the wet season a lot of crops are damaged by floods and a lot of siltation leading to loss of crops which affects livelihood of the communities. With storage, floods will be controlled and thus improved livelihood. Stored water can also be used for irrigation of downstream gardens in the dry season and also the reservoir can be used for fish farming. Thus seasonal water scarcity will be mitigated. The benefits are many.

If the dam at Taba-Gakomeye is not implemented, then all the impacts of floods and seasonal water scarcity will continue leading to food insecurity. This is not a desirable alternative as it will generally affect human development.

4.4 ANALYSIS

Analysis of alternatives has been carried out using the information provided under each alternative. Scores 1-4 have been used; score 1 refers to very high negative/not desirable while score 4 refers to the most desirable or very high positive. Results have been put in **Table 4-1** below.
General parameters used include but not limited:

- Economic efficiency
- Storage capacity in relation to demand
- Cost of construction
- Environmental impacts
- Public preference

The scores have been assigned to the alternatives as shown in table below and the options with the highest scores being considered.

Table 4-1 Analysis of Results

Parameters	**Scores for the Options**			
	Option 1		**Option 2**	
Economic efficiency	Take longer to get silted as it is bigger (more than 3times the size of reservoir in option 2)	3	Reservoir volume is less than 1/3 of that in option 1 yet they have same and high sedimentation rate. Thus will be silted faster (in less than15yrs)	1
	Slightly less land for irrigation	3	More land for irrigation	4
Storage capacity	Satisfies demand and more economic activities likely to result	4	Storage lower and does not satisfies demand. Less economic activities likely to result	1
Cost of construction	More expensive as stronger structures are needed	2	Slightly less expensive	3
Maintenance cost espectly towards desilting	Lower maintenance cost	3	High maintenance cost	1
Environmental impacts	Structures affected More land inundated thus more people affected Road infrastructure affected	2	No structure affected, less land inundated thus less people affected Road infrastructure affected	3
Public preference	Less preference	2	More preferred	3
Total scores		**19**		**16**

From the above results, option 1 seems to be the one that can be advanced and then proper mitigation measures worked out for the major environmental impacts identified. Thus further environment and social impact assessment has been carried out to come up with solutions to implement this project with less environmental risk.

5 PUBLIC CONSULTATIONS

5.1 INTRODUCTION

This chapter describes the process of the public consultation and public participation followed to identify the key issues and impacts of the proposed project. Views from national stakeholders, the local residents and local leaders were sought through interviews and public meetings. The feedback from these consultations has been taken into account when preparing this report. A summary of the issues raised is given below.

5.2 STAKEHOLDER IDENTIFICATION AND COMPOSITION

In order to develop an effective stakeholder involvement programme it is necessary to determine exactly who the stakeholders are, basing on the definition that a stakeholder is "any individual or group who is potentially affected by a project or can themselves affect a project". A number of stakeholders were identified and consulted during the study and these included the following.

National Liaison Officer, TAC Members, , Rwanda Water Resources Management, Trans-boundary Water Coordinator, Rwanda Environment and Management Authority (REMA), Local government stakeholders.

- National government institutions/officials
  - National Liaison Officer
  - TAC Members
  - Deputy Director General Rwanda Water Resources Management,
  - Hydrological Engineer Rwanda Water Resources Management
  - Trans-boundary Water Coordinator
  - Ministry of Water, Environment & Land Management
- Local government institutions/officials
  - Mayor, Nyamagabe District
  - Mayor, Huye District
  - Nyamagabe District Education Officer
  - Nyamagabe District Social Protection and Welfare Officer
  - In charge of GIS & land survey, Nyamagabe District
  - Ag. Infrastructure Officer, Nyamagabe District
  - Health Monitoring and Evaluation Officer, Nyamagabe District
  - EnvironmentalOfficer, Nyamagabe District
  - Cell leaders (Kizi and Gasumba cells)
  - Omudugudu and village leaders (upstream and downstream villages)
- Community members, downstream and upstream villages
- NGOs/CBOs: ABATICUMUGAMBI Cooperative, TWIYUBAKE BAHINZI BA GASUMO (KTBG) Cooperative, DUHARANIRUBUKIRE – Maraba Cooperative, WORLD VISION, UNICOOPAGI (Union des Cooperatives AgricolesIntegree).Opinions of the NGOs/CBOs

A full list of stakeholders consulted is attached as **Appendix 3**

5.3 PUBLIC PARTICIPATION PROCESS

Consultations for this project started in January during inception and scoping process where different stakeholders from national level, district level and the community levels were held to identify significant issues that should be included in the studies. Outcome of this consultation as documented in an inception report and scoping report earlier submitted. Pictures of some of these meetings are shown in **figure 5-1.**

A regional workshop to present inception report was held on the 7th February 2012 (**Error! Reference source not found.**) in Burundi as Taba-Gakomeye project is part of the Kagera River Multipurpose dams project and the issues raised are incorporated in this report. Scoping report was disclosed to regional stakeholders in a workshop at Silver Springs on 8th June 2012 in Kampala and this contributed greatly to this report.

Figure 5-1: Consultation with Communities at Taba-Gakomeye-Jan 2012

Figure 5-2: Regional Workshop at Bujumbura, February 2012

Further consultations were carried out during baseline studies starting from March 2012. Stakeholders for this project were identified purposively. Appointments for meetings with the different stakeholder were arranged a few days prior to the meetings. However, in some cases impromptu meetings were carried out. The meetings were carried out in the months of January and March 2012. At the national level meetings were carried out in the respective offices of the identified stakeholders. At the local government level (District and Cell) meetings were carried out with the different officials in their respective offices. Both individual meetings and focus group discussions were held.

In regard to community meetings, a schedule of the meetings was made with the help of Kizi and Gasumba cell leaders. They advised on the best time to carry out the meetings and the meeting places. The morning hours were discouraged as many of the people use this time for cultivation and tilling of their gardens. The Cell leaders were very instrumental in mobilisation of the community meetings participants; attendance lists are attached in **Appendix 3**.

For the local leaders and community members, meetings were held in different places as indicated in the schedule of meetings below. The Cell leaders were instrumental in the selection of the appropriate venues and in mobilization of the participants. The main materials/tools used for the meetings included maps, checklists and attendance lists.

Table 5-1: Schedule of Consultation meetings and Focus Group discussions.

Date	Venue	Time	Participants	Nature of the meeting
27/03/2012	KiziPrimary School	12.00noon	Kizi&Gasumba Cell leaders	Focus Group Discussion
28/03/2012	Karambi Cell Office	11.30am	Local leaders downstream	Focus Group Discussion
28/03/2012	Kizi Vocational Training Centre	2.50pm	Women	Focus Group Discussion
28/03/2012	Gasumba Cell Office	5.10pm	Communities in the reservoir area (Taba,	Public meeting

Date	Venue	Time	Participants	Nature of the meeting
			Gitwa, Kinombe)	
29/03/2012	KiziPrimary School	3.20pm	Communities in the reservoir area (Gakomeye, Cyinyana, Kagarama)	Public meeting

A total of 92 participants turned up for the 2 public meetings of which about 53.3% were men and 46.7% were women. The high turn up of women could be attributed to the fact that of recent, the government is trying to provide equal opportunities and rights to the women. The women thus make decisions on important issues like ownership of resources. Pictures of some of the meetings are shown in *Figure 5-3 to Figure 5-5*.

Figure 5-3:Focus group discussion with women in Kizi Cell

Figure 5-4: Focus group discussion with women is Gasumba Cell

Figure 5-5: Focus group discussion with Kizi and Gasumba Cell leaders

5.3.1 *Participation and Consultation Objectives*

The objectives of stakeholder participation included the following:

- To disseminate and inform the stakeholders about the proposed project.
- To gather comments, suggestions and concerns of the interested and affected parties that will hence help in the formulation and refinement of the project design and the development of effective mitigation measures and management plans.
- To collect all relevant information about the existing social values, practices and norms and socioeconomic characteristics of the people in the project area within which the project will operate

5.3.2 *Stakeholder briefings and consultation*

A brief description of the proposed project was presented to the participants in the local language of Kinyarwanda. English was used mainly with the national and local government stakeholders. The aim of the presentation was to provide a brief description of the proposed project including its features, location and purpose; the phases of project planning and development, the EIA process, the specialists involved in the study and to encourage the participants to be cooperative in all stages of the project and to air out their views and concerns.

After the presentation, a discussion then followed whereby the communities were asked to raise any issues and /or concerns. Below is a summary of the issues raised.

5.4 **ISSUES RAISED**

5.4.1 *Positive Issues*

During the consultations, several issues/concerns were raised which include the following.
Positive issues

- Increase in agricultural production due to irrigation possibilities. The stakeholders said that with irrigation they might be able to have farming 3 farming seasons instead of only 2 seasons.

- The supply of potable water would reduce water-related disease occurrences.

- Relocation to another place will be advantageous to the people currently living near the water sheds.

- Villagers in this area think that if they are provided with another place to live in, this is an advantage for them as it is not good to live near watersheds.

- Reduction in prices of vegetables. There is hope that due to irrigation, there will be a constant supply of vegetables for families and for sale and as a result the price will also be reduced.

- There will be a possibility of controlling floods

5.4.2 *Negative issues*

- *There will be reduction of the size of plots of land for cultivation*
  The stakeholders were worried that the land for cultivation will greatly reduce. They explained that although this was government land, the local people were using it for cultivation of their crops.

- *Famine due to food shortage*
  The watershed is far more fertile than uphill land. Therefore the production may be decreased due to the decrease in land size.

- *Non-payment for raw of materials for construction*
  The stakeholders were worried that materials needed for construction such as gravel and aggregates might be taken from local people's plots of land without payment. It was proposed that anyone whose land has construction materials that the project is interested in should be paid before they are extracted.

- *Use of imported labour instead of local labour*
  The stakeholders were worried that that labour will be imported from outside the area and they will thus not benefit from the project. It was proposed that workers should be sourced from the local villages because this may be also regarded as a means of compensation to the people who will be affected during and after the construction of the dam. People whose land will be taken by the project should be given first priority for employment opportunities.

- *Loss of plots of land for cultivation*
  The stakeholders were worried that some people who own plots at the periphery of the river banks might lose them to the project. They also feared that they will no longer be able to cultivate in the valley as is currently the practice.

- *Damage of crops*
  It was feared that there might be damage of crops during the construction activities. Land taken and crops destroyed should be compensated and payments should be done promptly.

- *Decrease of water which would negatively affect the production*
  The stakeholders feared that the little that is currently available to them will be decreased during the construction activities as springs and the river will be interrupted with.

- *Delay in payment of affected PAPs*
  The PAPs feared that there might delay in compensating the affecting which will make the transition period hard for them.

- *Risk of accidents*
  There was fear among the CBOs that there will be increased risk of accidents especially for the children with a reservoir in place.

Other issues

- *Communication*
  Communication to the local people about project activities should be done early enough to enable them prepare themselves in case they are to vacate the area.

Appreciation
There was general appreciation of the project as the stakeholders hope that it will improve people's livelihoods.

6 BASELINE ENVIRONMENTAL AND SOCIAL FINDINGS

6.1 PHYSICO-CHEMICAL ENVIRONMENT

6.1.1 *Geology and Soils*

Information regarding the topography and landforms is determined from the "Landforms Map" by Nile Basin Initiative – Kagera River Basin as well as site inspection observations. Mwogo in Rwanda are located in a hilly, mountainous area. There are hills with steep slopes, while the bottom valley is cultivated land. Available information on the geology of the Kagera River Basin is limited. Detailed geological maps are not available for this area. However, useful information was obtained from The Nile Basin Initiative – Kagera River Basin "Soils map" and "Lithology map". Mwogo in Rwanda is in a shale deposit area. Generally, the soils on the Rwanda site are located at the interface between ferralsols, cambisols and leptosols. Cambisols are developed in medium and fine-textured materials, mainly from alluvial and colluvial deposits. These soils make good agricultural land. Leptosols are very shallow soils over a hard rock, or a deeper soil which is very gravelly or stony and are typical in mountainous areas. Letposols are unattractive soils for agriculture due to it's inability to hold water, but at times may be used for tree crops or grazing.

From the geophysical investigations performe, the valley has roughly 0-5meters of clay and sandy clay, not fully calibrated by the geotechnical investigations. The weathered substratum is a layer of 5 meters composed of sand and/or cemented sand sandstones.

On the Mwogo river banks, it is expected that there are about 0 -10 meters of reddish sand and rock, which correspond to lateritic soils. This layer is underlain by a small thickness of C2, then R2 entity attributed to massive rock. The overlaying material is suitable for dam core as it is practically impervious (< 10-8 m/s) after compaction while still plastic. Its grain size properties display a percentage of fines below 80 microns in many of the augers drilled. The plasticity index is lower than 5 except in a few areas and the liquid limit varies between 21 and 37.

6.1.2 *Climate of Taba Gakomeye Catchment*

The hydrology of Taba Gakomeye catchment was characterized by analyzing climatic data obtained from Gikongoro climate station located in Mwongo sub-catchment. The seasonal variation indicate the relatively dry period between June and August with monthly rainfall amounts predominantly below 40 mm. July is the driest month in the catchment while the highest rainfall amounts are experienced in April ***(Fig-6.1)***. The total amount of annual rainfall recorded for Taba Gakomeye catchment is estimated to be 1300 mm.

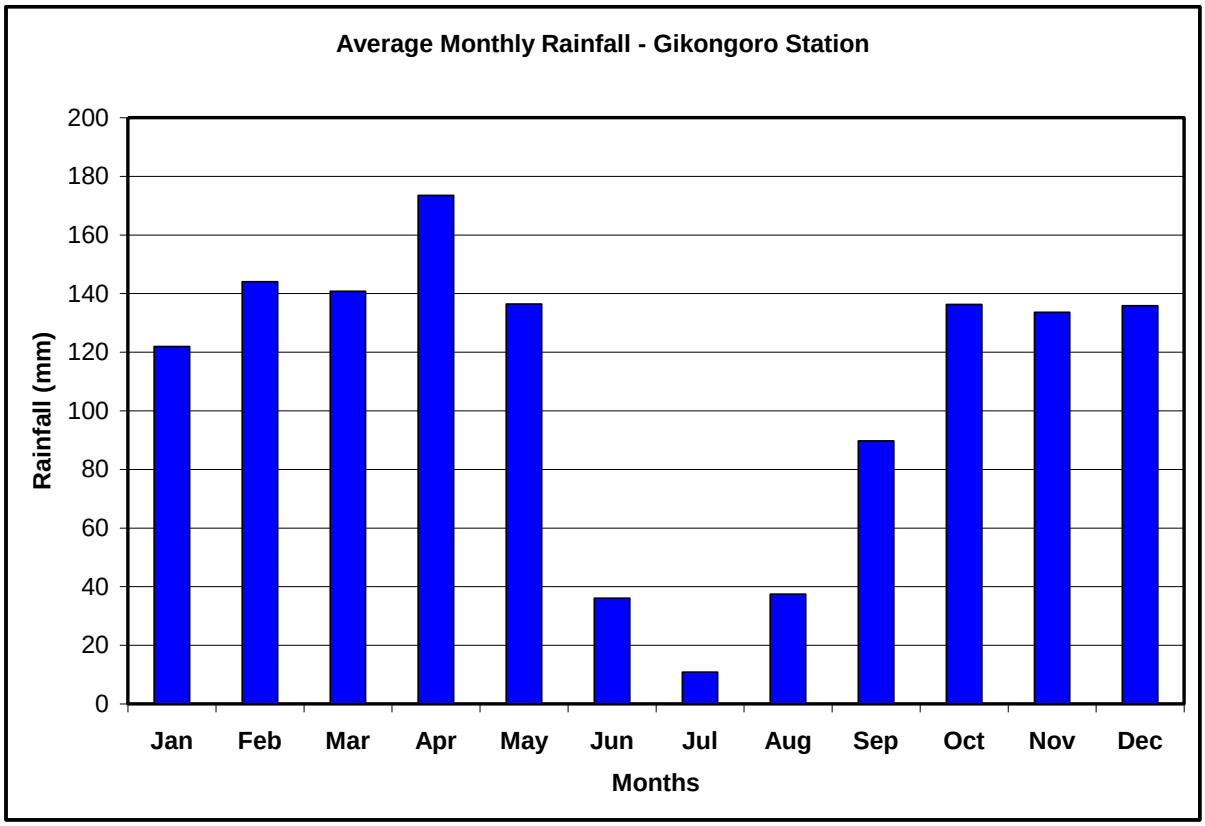


Figure 6-1: Typical seasonal rainfall patterns in Taba-Gakokeye catchment

The variation in mean monthly temperature is very small in Taba Gakomeye ranging from 18° C – 19.5° C ***(Fig 6-2).*** Overall the temperature of Taba Gakomeye can be characterized as cool. Altitudes as well as the apparent movement of the sun are among the factors that influence the seasonal variation of temperature. The lowest temperature in Taba Gakomeye is recorded in November (17.8° C) while the highest temperature is recorded during the month of August (20.5° C).

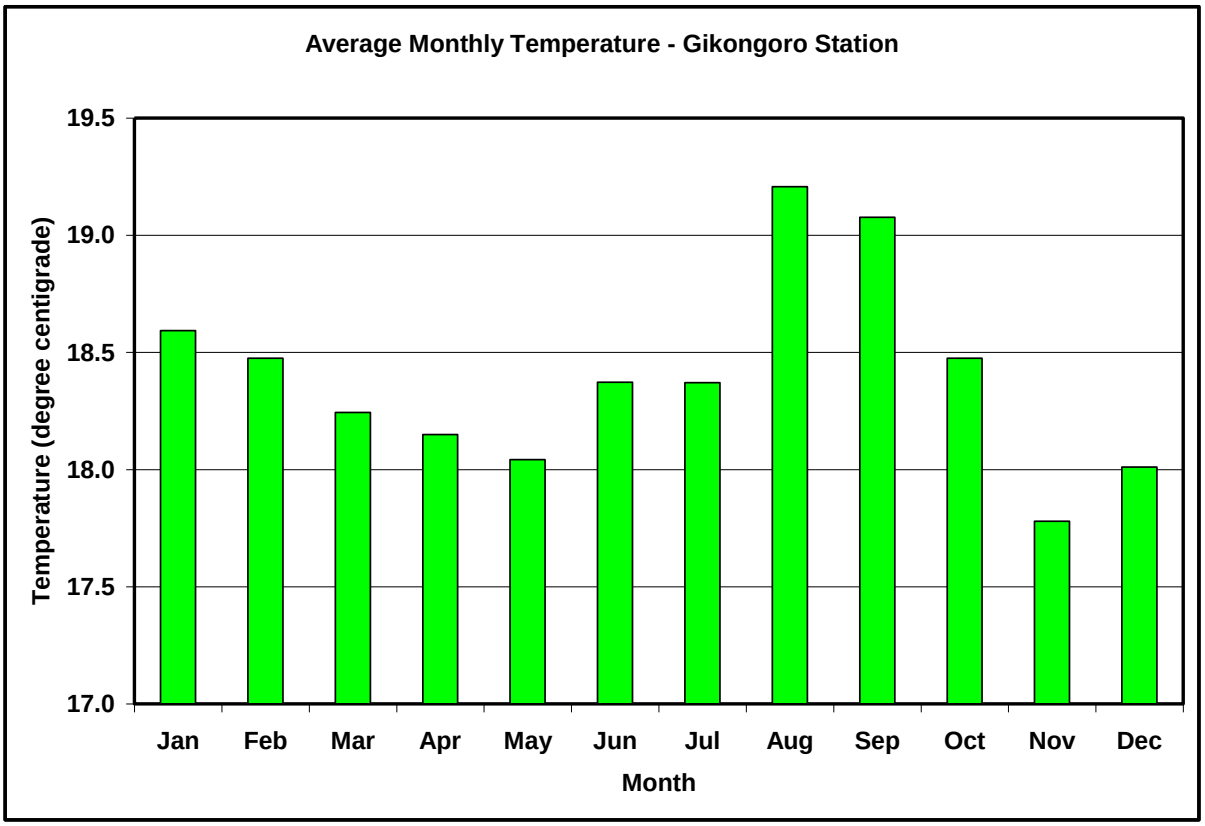


Figure 6-2: Seasonal variation of temperature at Taba-Gakomeye Catchment

The Potential evaporation pattern for Taba Gakomeye was derived from pan evaporation data recorded at Gikongoro climate station. The pan evaporation data were multiplied by a factor of 0.7 to get potential evaporation values shown in ***Fig.6.3.*** The highest evaporation rate is recorded during the month of August. The annual total potential evaporation at Taba Gakomeye catchment is estimated to be 720 mm.

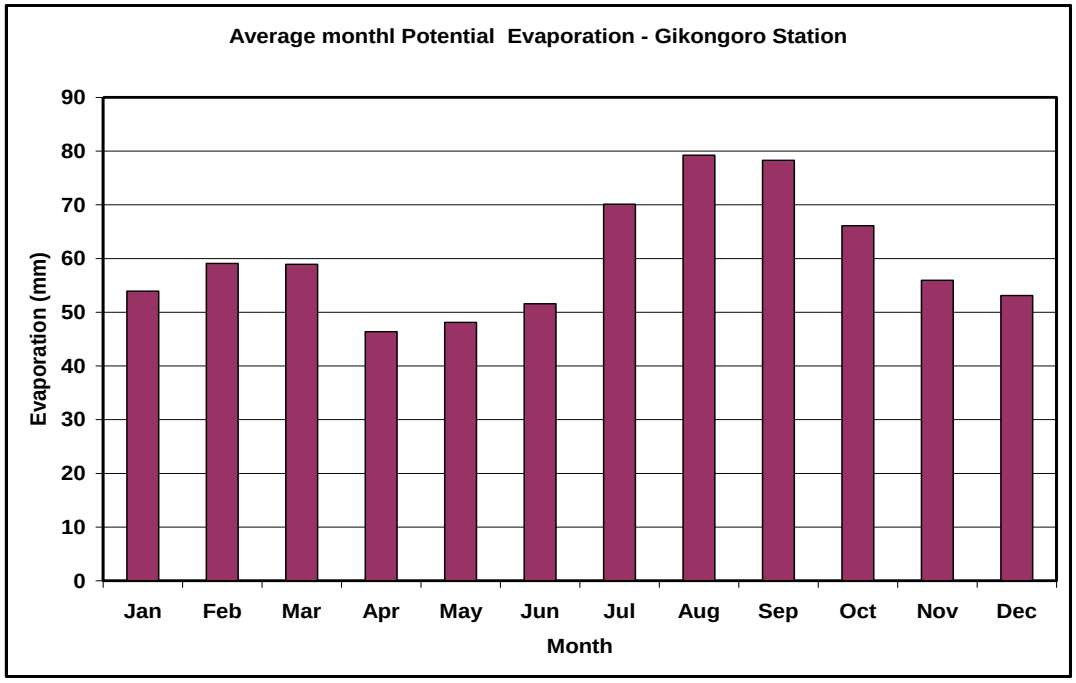


Figure 6-3: Seasonal variation of evaporation at Taba-Gakomeye catchment

6.1.3 *Hydrology of Taba Gakomeye Catchment*

The Taba Gakomeye catchment is located on Mwongo River which is a perennial stream. The river is gauged at Nyabisindu downstream of the dam site and thus historical flow records are available to estimate runoff from the catchment. The catchment upstream of the dam site can be characterized as hilly with steep slopes. The catchment is cultivated with banana plantations and some trees on the high ground. The valley bottom is cultivated with paddy, maize, beans, potatoes and cassava as already discussed in project description

The recorded stream flow data from the gauging station were used to estimate the runoff yield for Taba Gakomeye catchment. The results of estimates of runoff yields for Taba Gakomeye catchment are presented in **Table 6.1.**

Table 6-1: Runoff yield for Taba-Gakomeye

Month	Inflow (Mm^3)	Cum. Inflow (Mm^3)
Oct	1.37	1.37
Nov	1.50	2.84
Dec	1.40	4.21
Jan	1.36	5.52
Feb	1.43	6.90
Mar	1.57	8.41
Apr	1.97	10.32
May	1.88	12.14