



**Self Help
Africa**



Lake Bunyoni Islands, Uganda

LAKE BUNYONYI

Sub Catchment Management Plan

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Stone quarrying and sand mining within the Sub Catchment in Nyambugu and Nyarungu Villages, Mwendo Par-ish, Kitumba Sub County, Kabale district



Motor cycle / vehicle washing activities at Lake Bunyonyi outlet in Habutobore Village, Butare Parish, Muko Sub County, Rubanda district



Increased settlements along the shores of Lake Bunyonyi in Muruhinga Village, Mugyera Parish, Bufundi Sub County, Rubanda District



Deforestation observed along Lake Bunyonyi, in Ishanga Village, Kagarama Parish, Bubaare Sub County in Rubanda District.

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LIST OF ACRONYMS AND ABBREVIATIONS

AICM	African International Christian Ministry
AWMZ	Albert Water Management Zone
MASL	Metres Above Sea Level
BOD	Biological Oxygen Demand
CAO	Chief Administrative Officer
CBOs	Community Based Organisations
CBWRM	Catchment Based Water Resources Management
CCD	Climate Change Department
CCF	Climate Change Fund
CDM	Clean Development Mechanism
CFA	Cooperative Framework Agreement
CFR	Central Forest Reserve
CMC	Catchment Management Committee
CMOs	Catchment Management Organisations
CMP	Catchment Management Plan
CMS	Catchment Management Secretariat
COD	Chemical Oxygen Demand
CSF	Catchment Stakeholder Forum
CSOs	Civil Society Organisations
CTC	Catchment Technical Committee
DCDO	District Community Development Officer
DDPs	District Development Plans
DEA	Directorate of Environmental Affairs
DEC	District Environment Committee
DEM	Digital Elevation Model
DEO	District Environment Officer
DESS	Department of Environmental Support Services
DHDs	District Health Departments
DLG	District Local Governments
DNRO	District Natural Resources Officer
DPD	District Production Department

DWD	Directorate of Water Development
DWO	District Water Office
DWSCC	District Water & Sanitation Coordination Committees
EAC	East African Community
ESQO	Environmental and Social Quality Objective
EU	European Union
FGDS	Focus Group Discussions
FSSD	Forestry Sector Support Department
GEF	Global Environment Facility
GHGs	Greenhouse Gases
GIS	Geographical Information System
GoU	Government of Uganda
IEC	Information, Education and Communication
IPCC	Inter-Governmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
KIIs	Key Informant Interviews
LCs	Local Councils
M&E	Monitoring and Evaluation
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MCA	Multi-Criteria Analysis
MLHUD	Ministry of Lands, Housing and Urban Development
MoFPED	Ministry of Finance, Planning and Economic Development
MOH	Ministry of Health
MoLG	Ministry of Local Government
MTIC	Ministry of Trade, Industry and Cooperatives
MTWA	Ministry of Tourism Wildlife and Antiquities
MWE	Water and Environment
NDA	National Drug Authority
NDPII	Second National Development Plan
NEMA	National Environment Management Authority
NFA	National Forest Authority
NGOs	Non-Governmental Organisations

NRDs	District Natural Resources Departments
NU	Nature Uganda
NWSC	National Water and Sewerage Corporation
O&M	Operation and Maintenance
PPPs	Public Private Partnerships
RWHTs	Rainwater Harvesting Technologies and Strategies
SACCOs	Savings and Credit Co-operatives
SCMC	Sub Catchment Management Committee
SCMP	Sub Catchment Management Plan
SDGs	Sustainable Development Goals
SHA	Self Help Africa
SSEA	Strategic Social and Environmental Assessment
SWOT	Strength, Weaknesses, Opportunities and Threats
TSU	Technical Support Units
UBOS	Uganda Bureau of Statistics
UNADA	Uganda National Agro-Input Dealers Association
UNBS	Uganda National Bureau of Standards
UNFCCC	United Nations Framework Convention on Climate Change
UNMA	Uganda National Meteorological Authority
UO	Umbrella Organizations
USD	United States Dollars
UWASNET	Uganda Water and Sanitation NGO Network
VNRMCs	Village Natural Resource Management Committees
VSLAs	Village Savings and Loan Associations
WESWG	Water and Environment Sector Working Group
WMD	Wetlands Management Division
WSDF	Water and Sanitation Development Facility
WSPPs	Water Source Protection Plans
WSSBs	Water Supply and Sanitation Boards
WUAs	Water User Associations
WUCs	Water User Committees

EXECUTIVE SUMMARY

Self Help Africa (SHA), in partnership with the local authorities of Kabale and Rubanda District Local Governments and African International Christian Ministry (AICM), is implementing a project entitled “Striking a Balance: Developing a Green Economy around Lake Bunyonyi” with funding from the European Union (EU). The project aims at holistically addressing multiple environmental and economic challenges faced by the rural population around Lake Bunyonyi. SHA together with their implementing partners engaged a consultant in preparation of a Sub Catchment Management Plan (SCMP) for Lake Bunyonyi. Lake Bunyonyi Sub Catchment is one of the Sub Catchments under Ruhezamyenda Catchment that make up part of the Albert Water Management Zone (AWMZ). Lake Bunyonyi Sub Catchment covers a total area of about 303.114 km² spread across eight Sub Counties (namely: Butanda, Kamuganguzi, Kitumba, Rubaya, Ryakarimira Town Council, Bubaare, Bufundi and Muko) in the districts of Kabale and Rubanda.

The overall objective of the assignment was to develop an elaborate SCMP for Lake Bunyonyi Sub Catchment, which supports the reversal of catchment degradation, increased ecosystem resilience and productivity, and improved community livelihoods.

The legal context under which the SCMP was prepared is provided for in The Constitution of the Republic of Uganda, National Policies, National Legislation, Trans-boundary considerations, and International Conventions. Uganda follows a decentralised government structure, which implies that public service delivery such as water, education and health are to be implemented through the local government structures. Catchment Based Water Resources Management (CBWRM) in Uganda is based on the Integrated Water Resources Management (IWRM) approach, recognizes that many water use and management issues are interrelated, and is founded on early, open and inclusive stakeholder involvement.

The Uganda Catchment Management Planning Guidelines (MWE 2014) guide the planning process. Following these guidelines, the development of this SCMP started with the delineation of the Sub Catchment, the building of a Sub Catchment knowledge base. Based on the results of the assessments (Stakeholder Assessment and Strategic Social and Environmental Assessment (SSEA)), the stakeholders developed the vision and strategic objectives for the Sub Catchment in consideration with Ruhezamyenda Catchment Management Plan, which guided the development of options and scenarios. Multi-criteria analyses of these options and scenarios resulted in the consensus SCMP. Subsequently, an implementation plan was developed, which is an integral part of this SCMP and provides practical guidance regarding locations, prioritization, costing and stakeholder involvement. The development of the SCMP was an iterative process in which findings from literature reviews, field surveys, key informant interviews (KIIs), focus group discussions (FGDs) and remote sensing analyses were combined.

From the above-mentioned assessments, major issues/challenges, opportunities, threats and risks within the Sub Catchment were identified. Conservation and restoration of wetlands along the Lake shores and forests along hilly/mountainous areas, and improved management of agricultural land, is hence critical. Based on these identified issues, a catchment vision, strategic objectives and options for managing the issues were developed in a participatory manner and in consideration with Ruhezamyenda Catchment Management Plan. A set of investment and management actions for each option were outlined, costed including a timing for their implementation.

Lake Bunyonyi Sub Catchment Vision is: *“To be a sustainably managed Sub Catchment that promotes socio-economic development while providing healthy ecosystem services”*. The Sub Catchment’s Strategic Objectives are: (i) To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination; (ii) To protect, conserve and restore the Sub Catchment for provision of sustainable ecosystem services and infrastructure; (iii) To ensure sustainable use and development of water resources within the sub-catchment. The schedule of investment in the short, medium and long-term aligned to each of the strategic objectives is provided. Overall, USD 15,903,532 is needed to implement the SCMP for Lake Bunyonyi.

1. INTRODUCTION

1.1 Background to the Assignment

Self Help Africa (SHA), in partnership with the local authorities of Kabale and Rubanda District Local Governments and African International Christian Ministries (AICM), is implementing a project entitled “Striking a Balance: Developing a Green Economy around Lake Bunyonyi” with funding from the European Union (EU). The project’s overall objective is to contribute to the inclusive and low-carbon economic transformation of communities in the Lake Bunyonyi basin, generating sustainable economic growth, increased employment, reduced poverty, improved nutrition and the sustainable management of their environment for 1,000 project participants.

Lake Bunyonyi Sub Catchment is one of the Sub Catchments under Ruhezamyenda Catchment that make up the Albert Water Management Zone (AWMZ). Lake Bunyonyi Sub Catchment covers a total area of about 303.114 km² spread across eight Sub Counties (namely: Butanda, Kamuganguzi, Kitumba, Rubaya, Ryakarimira Town Council, Bubaare, Bufundi and Muko) in the districts of Kabale and Rubanda.

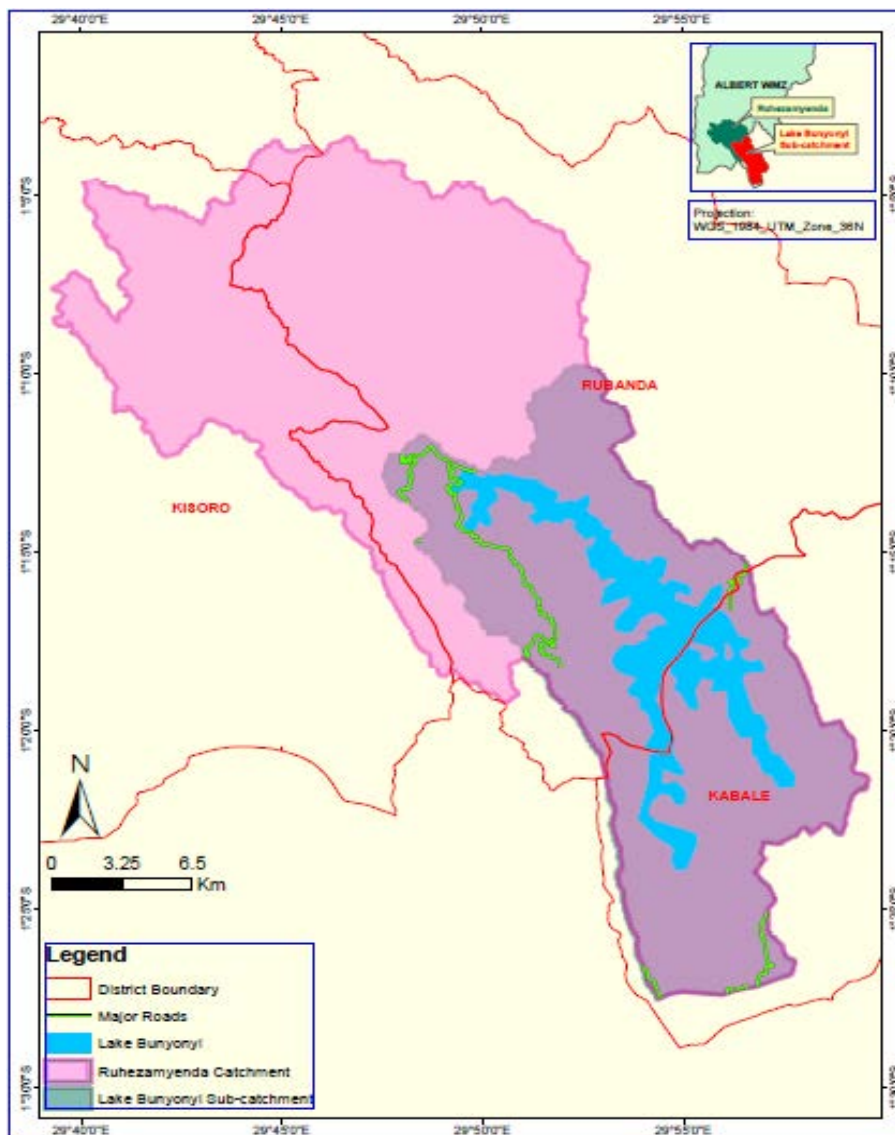


Figure 1 Lake Bunyonyi Sub-Catchment lies under Ruhezamyenda Catchment

Lake Bunyonyi Sub Catchment is however, a home to thousands of people living within and around the area, and its ecosystems deliver a wide range of services that contribute to their well-being. The Sub Catchment is an ecosystem rendering important hydrological and ecological services to a large number of people living and deriving livelihoods within and around the area. The population within the Lake Bunyonyi Sub Catchment is increasing rapidly with a corresponding increase in water demand and wastewater discharge. Some land use practices in the Sub Catchment areas are detrimental to the environment. These practices include deforestation in mountainous areas, destabilisation of lake shores, water pollution, as well as encroachment of crop production along the lake shores and wetlands.

The project aims at holistically addressing multiple environmental and economic challenges faced by the rural population around Lake Bunyonyi. The lake is a high-value natural resource for these communities and it is also an area of outstanding natural beauty and biodiversity, with significant potential to generate tourism revenue. However, poverty and increasing population pressures have led to significant degradation of natural resources in the lake basin. This has resulted into declining soil fertility and deteriorating water quality, and thus posing a long-term threat to the income and food security of poor rural house-holds.

Catchment management planning is an effective tool for addressing these pressures in a holistic way, through the integration of social, economic and environmental ideals and objectives. An integrated approach promotes greater awareness and understanding of environmental issues and encourages a more open and cooperative approach to decision-making. An integrated approach may also help to reduce the risk of future conflict, or, for some of the more potentially contentious issues, at least identify all the key interests at an early stage. The net result is a more coordinated approach to the wise and sustainable use of the water and land resources of the catchments, based on consensus and cooperation of all those with an interest in the resource.

It is against this background that SHA together with their implementing partners engaged a consultant to prepare the Sub Catchment Management Plan (SCMP) for Lake Bunyonyi Sub Catchment. The plan consists of two elements as follows: i) agreed investments and interventions, and ii) various management interventions and actions meant to help resolve conflict, conserve and protect the catchment and its natural resources, and ensure equitable access to and use of water resources.

1.2 The SCMP and its Objectives

A SCMP is an output from a Sub Catchment management planning process. It explores how water resources and land uses interact within a Sub Catchment and identifies important characteristics of a Sub Catchment in which resource management problems exist or may occur as a result of development or other major changes in activity patterns. A SCMP identifies the natural and physical constraints of the Sub Catchment that control the form and intensity of growth/land use. It may describe alternative futures and identify and evaluate the cost effectiveness of addressing their consequences/adverse effects on the Sub Catchment environment.

1.3 Structure of the SCMP

The SCMP is structured as follows:

Chapter 1: Introduction- Gives a general background to the assignment including the definition of a SCMP.

Chapter 2: Approach to the SCMP- Outlines the major steps to Sub Catchment Management Planning in accordance with the Catchment Management Planning Guidelines for Uganda (2014).

Chapter 3: Policy, Legal and Institutional Framework- Analyses the linkages between the relevant policy, legal, and institutional provisions with Sub Catchment management planning and implementation, as well as the existing gaps.

Chapter 4: Status of the Sub Catchment- Profiles the characteristics of the Sub Catchment that were used in the identification of the major social, environmental, water resources and agribusiness issues that affect the catchment.

Chapter 5: Options and Scenarios- This chapter presents the vision and strategic objectives of the Sub Catchment that were formulated from the identified issues/gaps. It further provides options for solving the identified issues.

Chapter 6: Investment, Implementation and Financing Plan- Provides a schedule of costed activities for specific investment and management options as well as probable options for financing the plan.

Chapter 7: Monitoring and Evaluation Framework- Outlines monitoring indicators and targets to be used for evaluating progress of the SCMP.

2. APPROACH AND METHODOLOGY

2.1 Introduction

The approach and methodology used by the Sub Catchment Planning Team in the development of Lake Bunyonyi SCMP is derived from the Uganda Catchment Management Planning Guidelines (MWE 2014) and followed the provided steps. The planning process started with an inception phase which laid the basis for the subsequent assessments on water resources, stakeholders and socio-economic and environmental context. The assessment phase was followed by an analysis and design phase in which the different interventions were identified and designed. The final step included the development of the SCMP. The methodology of each step of the process is described in sub sections below.

Different meetings were held at different levels with existing Sub Catchment management committee members, district local government officials, Sub County officials, village committees, youth, women groups, private sector, NGOs, vulnerable group (specifically the Batwa). The purposes of these meetings were to:

- Present an overview of the Sub Catchment: the major issues, problems, trends and the opportunities and options identified by the planning team in the inception and assessment phases.
- Review and agree on the major issues, problems and trends in the Sub Catchment that need to be addressed by the Sub Catchment plan.
- Review and agree on planning objectives and indicators, which further guided formulation and evaluation of options and scenarios.
- Review and agree on the range and scope of options to be considered.
-

2.2 Inception phase

To obtain a good understanding of the initial situation and to plan activities and resources effectively, an inception phase was undertaken. Available data was reviewed to identify gaps. The Planning Team familiarized herself with relevant legislations including the framework for CBWRM.

The inception phase was used to undertake an initial identification and to refine the stakeholder participation strategy. It was established that a Sub Catchment Management Committee (SCMC) had already been formed specifically for Lake Bunyonyi Sub Catchment in line with the existing Ruhezamyenda Catchment Management Plan.

2.3 Description of the Sub Catchment

This included the delineation of the Sub Catchment and its political and geographical boundaries (from district to village level) followed by the development of a Sub Catchment information system and building the basis of the Sub Catchment knowledge base. Subsequently, the following assessments were undertaken.

2.4 Stakeholder Identification, Engagement and Analysis

In this step, relevant stakeholders were identified, mapped and mobilized. Catchment Management Planning is a multi-stakeholder process in which government agencies together with local

stakeholders, including community based organisations and private sector parties form a “platform” and work together in a complex and intense process that takes time, but which is key for a sustainable process. During the preparation of the catchment management plan, stakeholder participation first aims at understanding the different interests (including the environment) of all stakeholders and finding common solutions for often competitive uses of resources. By discussing different perspectives, causes of problems and ambitions may become clear and thus add to solutions (or change).

A stakeholder mapping and analysis was undertaken to identify all relevant actors and potential members of the different institutions. Data collection methods for the stakeholder analysis included inception meeting, KIIs, FGDs and desk research of relevant documents. Both districts of Kabale and Rubanda within the Lake Bunyonyi Sub Catchment were sampled for the stakeholder assessment. An attempt was made to interview most of the district technical staff in both districts. The stakeholder assessment resulted in a stakeholder assessment and engagement report that formed part of the SSEA report.

2.5 Strategic Social and Environmental Assessment (SSEA)

The SSEA is a step in which the key vulnerabilities in the catchment were identified, and linkages, cumulative impacts and options for mitigation assessed. The SSEA was carried out in a participatory manner. It also depended on outputs from the water quality analysis and Geographical Information System (GIS) which provided key information on cumulative impacts. The SSEA also played a key role when comparing options. The SSEA has been a participatory process that sought to strengthen the integration of socio-economic and ecological aspects of water resource management by:

- Describing the relevant external and in-situ factors influencing water resource use within the Sub Catchment;
- Ensuring integration of stakeholders’ and wider public socio-economic and environmental perspectives including measures to address issues and their causes into the SCMP;
- Identifying and mapping out specific habitats, natural resources and land use zones that should be conserved to ensure survival of the fragile ecosystem;
- Assessing the environmental and social quality objectives that can inform the preferred strategy for the SCMP.

The assessment involved desk studies, mapping, field data collection (focus group discussions and key informant interviews) and surveys. The assessment aimed analysing all social and environmental issues associated with Sub Catchment hazards in Lake Bunyonyi to inform the selection of environmental and social priorities and to assist in developing options and scenarios for the future in order to protect and conserve the water resources.

2.6 Options and Scenario Analysis

At the options and scenarios phase, investment and management options for solving the identified Sub Catchment issues/problems were identified considering various factors. The options were developed from literature, water resources assessment, stakeholder engagement, SSEA, field visits, FGDs and KIIs. The Sub Catchment Management Committee (SCMC) provided a platform to discuss the identified issues, develop a Sub Catchment vision and strategic objectives to guide

further development of options and scenarios of what the Sub Catchment could be like in the future.

With the vision and objectives for the Sub Catchment in place as well as a set of options and interventions, further analysis is undertaken including assessment of the sustainability and compatibility of different types of development options and management actions simultaneously and a scenario analysis. A scenario includes a set of assumptions about the options and how they perform influenced by external factors and under projection of future trends. The results of this process led to a consensus SCMP that guides the actors involved to get into action and includes priorities and phasing.

3. POLICY, LEGAL AND INSTITUTIONAL CONTEXT

3.1 Introduction

Lake Bunyonyi Sub Catchment management planning will promote a coordinated development and management of water, land and related resources within the limits of a basin to optimize and equitably share the resulting socio-economic wellbeing without compromising the long-term health of vital ecosystems. It provides a framework for integration of resources and all relevant activities, thereby promoting coordinated development and management of water, land and related resources. The legal context under which IWRM is implemented and managed in Uganda is provided for in The Constitution of the Republic of Uganda, National Policies, National Legislation, Trans-boundary considerations, and International Conventions. Uganda follows a decentralised government structure, which implies that public service delivery such as water, education and health are to be implemented through the local government. This Chapter presents a summary of the legal, policy and regulatory context under which the IWRM in the Lake Bunyonyi Catchment will occur.

3.2 Policies

3.2.1 The National Environment Management Policy, 1994

Lake Bunyonyi SCMP will integrate key policy objective and provisions on water resources conservation and management which recognise the need to sustainably manage and develop the water resources in a coordinated and integrated manner to provide water of acceptable quality for all social and economic needs.

3.2.2 The National Water Policy, 1999

Overall policy outlines the roles played by different institutions at central, local and community levels and states the role of private sector in WRM. It promotes an integrated approach to managing the country's water resources sustainably. Preparation of Lake Bunyonyi SCMP will promote an integrated approach to managing the country's water resources sustainably as provided for under this National Water Policy that clearly precedes the movement towards Water Management Zones and CBWRM.

3.2.3 The National Forestry Policy, 2001

The Policy recognises the importance of catchment management and soil conservation. It pledges that the government will promote the rehabilitation and conservation of forests that will protect the soil and water in the country's key catchments and lake systems.

3.2.4 The National Policy for the Conservation and Management of Wetland Resources, 1995

The SCMP for Lake Bunyonyi is aimed at restricting the continued loss of wetlands and their associated resources and will ensure that benefits derived from wetlands are sustainably and equitably distributed to all people for improved livelihoods and wetland conservation. The policy calls for:

- No drainage of wetlands unless more important environmental management requirements supersede;
- Sustainable use to ensure that benefits of wetlands are maintained for the foreseeable future;
- Environmentally sound management of wetlands to ensure that other aspects of the environment are not adversely affected;
- Equitable distribution of wetland benefits and
- The application of environmental impact assessment procedures on all activities to be carried out in a wetland to ensure that wetland development is well planned and managed.

3.2.5 The Uganda National Land Policy, 2013

This SCMP for Lake Bunyonyi seeks to ensure sustainable utilisation, protection and management of environmental, natural and cultural resources on land for national socio-economic development. Sustainable use and management of environment and natural resources for the present and future generations will be promoted during Lake Bunyonyi SCMP implementation.

3.2.6 The Uganda Forestry Policy, 2001

The National Forestry policy provides for the establishment, rehabilitation and conservation of watershed protection forests. It aims at promoting the rehabilitation and conservation of forests that protect the soil and water in Uganda's key watersheds. Lake Bunyonyi SCMP recognises the importance of catchment management and soil conservation. Some of the proposed interventions within the catchment include: rehabilitation and conservation of Central Forest Reserves (CFRs) under NFA that have been encroached upon as this will protect the soil and water in Lake Bunyonyi Catchment.

3.2.7 The National Wetlands Policy, 1995

This policy aims at promoting conservation of Uganda's wetlands in order to sustain their ecological, social and economic functions for the present and future generations. Lake Bunyonyi SCMP provides for no drainage of wetlands unless more important environmental management requirements supersede; sustainable use to ensure that benefits of wetlands are maintained for the foreseeable future; environmentally sound management of wetlands to ensure that other aspects of

the environment are not adversely affected; equitable distribution of wetland benefits; the application of environmental assessment procedures on all activities to be carried out in a wetland to ensure that wetland development is well planned and managed.

3.2.8 Uganda Wildlife Policy, 2014

Part of the upper Lake Bunyonyi Sub Catchment falls within the protected area of Echuya Forest Reserve and it was observed that some human activities are carried out within this area such as livestock grazing and watering. Poaching and resource extraction (such as firewood and poles for construction activities) by the local communities were reported to be taking place. Lake Bunyonyi SCMP thus incorporates aspects of collaborative management and sustainable resource utilisation as provided for under this Policy i.e. the involvement of local communities, private sector, public institutions and other stakeholders in the management of wildlife resources e.g. conservation education and awareness.

3.2.9 The National Agriculture Policy, 2013

The overall objective of the agriculture policy is to achieve food and nutrition security and improve household incomes through coordinated interventions that focus on enhancing sustainable agricultural productivity and value addition; providing employment opportunities, and promoting domestic and international trade. To ensure sustainable use and management of agricultural resources, Lake Bunyonyi SCMP will incorporate, promote and support the dissemination of appropriate technologies and practices for agricultural resources conservation and maintenance among all categories of farmers, including Sustainable Land Management and Conservation Agriculture; harvest and utilize rain water for agricultural production; enact and enforce ordinances and by-laws; land use and farm planning services among farmers.

3.2.10 The National Agricultural Extension Policy, 2016

This policy is in response to government's commitment to realize an agricultural revolution in the country in line with the National Agriculture Policy (2013) and the overall national policy framework articulated in Vision 2040 and periodic National Development Plans. Lake Bunyonyi SCMP will contribute towards achieving this Policy's Area 2.2 on Strengthening Agricultural Education and Training; Policy Area 3.2 on Agribusiness Development Services and Market Linkages; Policy Area 3.3: Agricultural Knowledge Management and Information System and; Policy area 4.1: Farmer organizations and empowerment.

3.2.11 The Fisheries and Aquaculture Policy, 2018

The policy will ensure sustainable exploitation of fisheries resources while maintaining fish availability for both present and future generations, and without degrading the environment. Some of the policy strategies that will be promoted through Lake Bunyonyi SCMP include: Supporting the

private sector and other grassroots stakeholders and communities to standardize local and indigenous technologies; Establishment of the necessary infrastructure to facilitate the operations and management of fisheries and aquaculture; demarcate suitable ecological areas for ponds and cage development, and regulate aquaculture development within Lake Bunyonyi Sub Catchment.

3.2.12 The National Health Policy, 1999

This Policy emphasises prevention through Primary Health Care (PHC) including sanitation and hygiene. Some of the environmental objectives for Lake Bunyonyi SCMP will promote sanitation and hygiene at the household level within the catchment thus improved water quality and reduction in disease incidences.

3.2.13 The National Gender Policy, 1997

It provides for equal participation in development activities including water supply and sanitation. It recognises women and children as the main carriers and users of water. It anchors the importance of gender responsiveness in terms of planning, implementation and management of water and sanitation initiatives. Preparation of Lake Bunyonyi SCMP is part of planning, implementation and management of water and sanitation initiatives within the catchment.

3.2.14 Uganda Vision 2040

Lake Bunyonyi SCMP will contribute towards the improvement of water security and mitigate adverse effects of floods and droughts, large and strategic water reservoirs will be constructed and maintained in appropriate areas within the catchment. Vision 2040 aims at ensuring optimal and sustainable utilisation of the water resources where Government will strengthen and manage water resources at the lowest appropriate levels. This will be at water management zones and water catchment zones.

3.2.15 The Third National Development Plan (NDPIII) 2020/21 – 2024/25

Climate change mitigation and environment management are critical to the achievement of increased household incomes and improvement of quality of life of the population as mentioned in NDPIII. Furthermore, NDPIII recognises that poor management of water, environment and natural resources coupled with the worsening effects of climate change have resulted into: (i) high exposure to hazards and disasters, within the context of limited capacity for climate change adaptation and mitigation; (ii) low disaster risk planning; (iii) rampant degradation of the environment and natural resources caused by low enforcement capacity, limited environmental education and awareness, limited alternative sources of livelihoods and limited research, innovation and adoption of appropriate technology among others.

NDPIII therefore aims at stopping and reversing the degradation of Water Resources, Environment, Natural Resources as well as the effects of Climate Change on economic growth and livelihood security. Implementation of the plan will meet the following NDPIII objectives and interventions:

- Assure availability of adequate and reliable quality fresh water resources for all uses i.e. for example through (a) improved coordination, planning, regulation and monitoring of water resources at catchment level; (b) Strengthen enforcement capacity for improved compliance levels;
- Increase forest, tree and wetland coverage, restore bare hills and protect mountainous areas and rangelands e.g. strengthening conservation, restoration of forests, wetlands and water catchments and hilly and mountainous areas;
- Maintain and/or restore a clean, healthy, and productive environment;
- Reduce climate change vulnerability and carbon footprint;
- Reduce human and economic loss from natural hazards and disasters;
- Increase incomes and employment through sustainable use and value addition to water, forests and other natural resources e.g. supporting local community based eco-tourism activities for areas that are rich in biodiversity or have attractive cultural heritage sites.

3.3 Legislation

3.3.1 The Constitution of the Republic of Uganda, 1995

The Constitution of Uganda, 1995 is the supreme law of the country. Under Objective XIV Government is required to ensure that all Ugandans enjoy rights and opportunities and access to clean and safe water, under XIV the Government is required to ensure that all Ugandans' rights and opportunities are protected including access to clean and safe water; under Objective XXI Government is required to take all practical measures to promote a good water management system at all levels and under Article XXVI Government is required to promote development sustainable development and the public awareness of the need to manage water resources in a balanced and sustainable manner for the present and future generations. Article 39 gives citizens of Uganda the right to enjoy a clean and healthy environment. Conservation and protection of natural resources as required under the Constitution will contribute towards improved water quality, quantity and livelihoods and also ensure a clean and health environment for Lake Bunyonyi Sub Catchment as required under Article 39 of the Constitution of the Republic of Uganda.

3.3.2 The Water Act, Cap. 152

The Water Act Cap 152 details the procedures and rules for water abstraction and management. All rights to investigate, control, protect and manage water in Uganda for any use is vested in the

Government and shall be exercised by the MWE. Catchments or watersheds are not mentioned in the act, meaning that the policy to install a WMZ or a CMO is not part of the Water Act (yet). However, the act establishes that the MWE may identify any area to be a water supply area and establish a protected zone on land to protect that water supply. Of note, is that the water policy, as well as the water act is currently under review to make it responsive to emerging issues and challenges such as CBWRM.

3.3.3 The National Environmental Act No. 5 of 2019

The Act establishes the National Environment Management Authority (NEMA) as the overall body, charged with responsibility of coordinating, and monitoring all environment management issues in the country. The Statute empowers NEMA, in consultation with lead agencies, to issue guidelines and prescribe measures and standards for the sustainable management and conservation of natural resources and the environment in general. The Statute also provides for mandatory Environment Impact Assessments (EIA) to be conducted for any activity likely to have a significant effect on the environment. Provides the framework for coordinated and sound management of the environment including environmental impact assessment of water resources related projects and setting water quality and effluent standards.

3.3.4 The Local Governments Act, Cap. 243

The Act provides for decentralization of service delivery including water services to local governments and for cooperation between and among districts. Districts are responsible for water supply outside the jurisdiction of NWSC, operation and maintenance of wells, dams and other water supply infrastructure, and protection and restoration of local water resources. The CMP should provide the guidelines to improve the sustainability, effectiveness and efficiency of these tasks, particularly with regards to the alignment of activities of different districts, and between districts and other implementers.

3.3.5 The Land Act, Cap. 227

Lake Bunyonyi SCMP emphasizes Section 44 (1) of the Land Act that provides that the government or local government holds land in trust for the people and protects environmentally sensitive areas such as natural lakes, rivers, groundwater, natural ponds, natural streams, wetlands, forest reserves, national parks and any other land reserved for ecological and tourist purposes for a common good of the citizens of Uganda.

3.3.6 The National Forestry and Tree Planting Act, 2003

The Act regulates and controls forest management in Uganda by ensuring forest conservation, sustainable use and enhancement of the productive capacity of forests for the benefit of all Ugandans, to provide for the promotion of Tree growing and through the creation of forest reserves in

which human activities are strictly controlled. Lake Bunyonyi SCMP is in rhyme with this Act and provides for tree growing and ownership which should be undertaken in the catchment programs as part of environmental mainstreaming.

3.3.7 The Uganda Wildlife Act, Cap. 2019

Lake Bunyonyi Sub Catchment is a tourist destination and it was observed that some human activities are carried out within catchment by the local communities. Lake Bunyonyi SCMP will thus promote among others: the sustainable management of wildlife conservation areas, the enhancement of economic and social benefits from wildlife management by establishing wildlife use rights and the promoting of tourism and public participation in wildlife management as provided under the Uganda Wildlife Act.

3.3.8 The Fish Act, Cap. 197

Lake Bunyonyi SCMP will promote sustainable fishing activities and fisheries value chains for improved livelihoods but further promote control measures for improving on water quality and quantity as provided under the Fish Act.

3.3.9 The Investment Code Act, Cap 92

Priority areas under this law that have potential within Lake Bunyonyi Sub Catchment that are listed under Second Schedule include: tourism industry, crop processing, processing of forest products, fish processing, transport, energy, construction and building industry. Lake Bunyonyi SCMP will provide interventions that are aimed at ensuring that the natural resources are managed sustainably.

3.4 Regulations

3.4.1 The Water Resources Regulations, 1998

These provide for application for a water permit where a person who, (a) occupies or intends to occupy any land; (b) wishes to construct, own, occupy or control any works on or adjacent to the land referred to in regulation 10; may apply to the Director for a water permit. Lake Bunyonyi SCMP will address activities that affect drainage and the environment including the applications of permits for controlling water abstraction and wastewater discharge, to promote sustainable and environmentally friendly development and use of water resources. Lake Bunyonyi SCMP will provide for the different types of permits provided for under the Regulations that require enforcement and these include: Surface water Abstraction Permit, Groundwater Abstraction Permit, Drilling Permit – For persons involved in drilling of Boreholes, Construction Permit - for a person who wishes to engage a driller to construct a borehole on his land for using water or recharging an

aquifer or fitting a motorized pump or borehole, Waste Water Discharge Permit and Easement Permit.

3.4.2 The Water (Waste Discharge) Regulations, 1998

It provides for the regulation of water abstraction and waste water discharge through permits. Lake Bunyonyi SCMP provides for the Waste Water Discharge Permit system to be implemented specifically for hotels that discharge wastewater after treatment.

Examples of Water and Wastewater Discharge Permits Issued under the Regulations

- Surface water Abstraction Permit,
- Groundwater Abstraction Permit,
- Drilling Permit – For persons involved in drilling of Boreholes,
- Construction Permit - for a person who wishes to engage a driller to construct a borehole on his land for using water or recharging an aquifer or fitting a motorized pump or borehole,
- Waste Water Discharge Permit and
- Easement Permit.

3.4.3 The National Environment (Hilly and Mountainous Area Management) Regulations, 2000

Lake Bunyonyi SCMP promotes the management of hilly and mountainous areas through the proposed environmental and social quality objectives where every land owner or occupier shall while utilizing land in a mountainous and hilly area: (a) observe the carrying capacity of the land; (b) carry out soil conservation measures; (c) utilize underground and surface water resources; (d) carry out measures for the protection of water catchment areas; (e) use the best available technologies to minimize significant risks to ecological and landscape aspects; and (f) maintain such vegetation cover as may be determined by an agricultural extension officer or a local environment committee.

3.4.4 The National Environment (Wetlands; River Banks and Lake Shores Management) Regulations, 2000

Lake Bunyonyi SCMP promotes some of the provisions of this regulation namely; wetland resources to be utilized in a sustainable manner compatible with the continued presence of wetlands and their hydrological functions and service; environmental impact assessment to be done for all activities in wetlands likely to have an adverse impact on the wetland; special measures essential for the protection of wetlands importance as ecological systems and habitat for fauna and flora species have been provided; and wise use of wetlands to be interpreted into the local approaches

to the management of their resources through awareness campaigns and dissemination of information.

3.5 Transboundary International Agreements/Conventions

3.5.1 The Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (Ramsar Convention)

The Ramsar is an intergovernmental treaty that commits member countries to maintain the ecological character of Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories including designation of wetland sites of international importance and to ensure that all wetland resources are conserved, now and in the future. The Convention promotes an integrated package of actions to ensure the conservation and wise use of wetlands ecosystems that are the primary resources from which water and all its benefits for humans are derived, and they are a major and critical component of the hydrological cycle. Therefore, elements of conservation and wise use of wetlands ecosystems around the lake will be incorporated in the Lake Bunyonyi SCMP.

3.5.2 The Convention on Biological Diversity, 1992

The Convention has three main goals including: conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of benefits arising from genetic resources. The Convention recognizes that watersheds are an appropriate biogeographic unit for applying the ecosystem approach towards the conservation and sustainable use of inland water biodiversity. The Lake Bunyonyi SCMP will incorporate watersheds as an appropriate biogeographic unit for applying the ecosystem approach towards the conservation and sustainable use of the lake biodiversity.

3.5.3 The UN Framework Convention on Climate Change (UNFCCC) 1992 and related Kyoto Protocol, 1998

The fundamental objective of the UNFCCC is to achieve stabilisation of the concentration of greenhouse gases in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The UNFCCC and Protocol recognise the need to make policies and take measures that take into account different cover sinks and reservoirs of greenhouse gases and adaptation. The Lake Bunyonyi SCMP will incorporate measures to promote and intensify wetland protection and restoration in order to enhance sinks of greenhouse gases.

3.5.4 The Paris Agreement on Climate Change, 2016

The Paris Agreement provides a framework for global climate action. The Lake Bunyonyi SCMP will incorporate measures to promote adaptation to climate change to be mainstreamed through national adaptation plans.

3.5.5 The Nile River Basin Cooperative Framework Agreement 2010

The CFA covers the use, development, protection, conservation and management of the Nile River Basin and its resources. It also establishes an institutional mechanism for cooperation among the Nile Basin States. The Bunyonyi SCMP will incorporate Nile Basin Sustainability Framework that include strategies on environmental and water-related natural resources management and climate change adaptation and mitigation.

3.5.6 The Treaty for Establishment of the East African Community of 1999

The EAC treaty covers five partner States of Kenya, Uganda and Tanzania, Burundi and Rwanda. One of the objectives provided in the Preamble of the treaty is promotion of a sustainable growth and equitable development of partner States including rational utilisation of the region's natural resources and protection of the environment.

The EAC Treaty is perhaps the most comprehensive regionally binding basis for developing joint strategies for integrated management of water resources of the Lake Bunyonyi. The integrated management strategies will be incorporated in the Lake Bunyonyi SCMP.

3.5.7 The Protocol for Sustainable Development of Lake Victoria Basin of 2003

This protocol is a detailed document aimed at sustainable development in Lake Victoria. Article 25 requires the Partner States in their respective territories to establish water quality and quantity monitoring and surveillance stations and water quality and quantity control laboratories. This implies that Uganda as a signatory to the Protocol is required to enforce measures that require developers of planned activities to prevent pollution, and where prevention is not possible, minimize it. The Bunyonyi SCMP will incorporate strategies for ensuring water quality and quantity in the lake.

3.5.8 EAC Protocol on Environment and Natural Resources Management 2006

The Protocol is designed to govern the Partner States in their cooperation in the management of environment and natural resources over areas within their jurisdiction including trans-boundary environment and natural resources. The Lake Bunyonyi SCMP will incorporate strategies for promoting river and lake basin management in order to protect water resources and improve water catchment management.

3.5.9 The Convention for the Establishment of the Lake Victoria Fisheries Organization, 1994

The Bunyonyi SCMP will incorporate strategies for discussing water quality in the Lake basin and maintain a strong liaison with the existing bodies and programs.

3.5.10 Non-legally Binding International Law Instruments

There are several principles are contained in non-legally binding international law instruments that are relevant for the Lake Bunyonyi SCMP.

3.5.11 The Sustainable Development Goals (SDGs) 2015

SDG goal 6 aims at ensuring availability and sustainable management of water and sanitation for all. Target 6.5 aims to implement integrated water resources management at all levels. The Bunyonyi SCMP will incorporate four key components of IWRM.

3.5.12 The Rio Declaration on Environment and Development 1992

The Rio Declaration on Environment and Development 1992 was also among the documents that were adopted at the Earth Summit. It also provides guidelines for urban development and management.

3.5.13 The Stockholm Declaration 1972

The Stockholm Declaration is non-legally binding instrument that was the outcome of the United Nations Conference on the Human Environment which was the first UN summit on the environment, an event that really put the issue on the global political agenda.

3.6 The Institutional Context

3.6.1 National Level

3.6.1.1 The Ministry of Water and Environment (MWE)

The Ministry of Water and Environment (MWE) plans and coordinates all water and environmental sector activities and is the ultimate authority responsible for water resources and environmental management in Uganda. The MWE has the overall responsibility for setting national policies and standards, managing and regulating all water resources and determining priorities for water development and management. The MWE is divided into three directorates: Directorate of Water Resource Management (DWRM), the Directorate of Water Development (DWD) and the Directorate of Environmental Affairs (DEA).

The DWD has the responsibility for providing overall technical oversight for the planning, implementation and supervision of the delivery of urban and rural water and sanitation services across the country, including water for production. It is responsible for regulation of provision of water supply and sanitation and the provision of capacity development and other support services to Local Governments, Private Operators and other service providers. The Directorate comprises of three Departments: Rural Water Supply and Sanitation, Urban Water Supply and Sanitation and Water for Production.

The DEA is responsible for environmental policy, regulation, coordination, inspection, supervision and monitoring of the environment and natural resources as well as the restoration of degraded ecosystems and mitigating and adapting to climate change. The DEA comprises of four departments of Environmental Support Services (DESS), Forestry Sector Support Department (FSSD), Wetlands Management (WMD), and the Department of Meteorology (DOM), recently turned into an Authority.

The MWE further works closely with the National Environment Management Authority (NEMA) mandated with the coordination, monitoring, regulation and supervision of environmental management, the National Water and Sewerage Corporation (NWSC), with the mandate to operate and provide water and sewerage services in the larger urban centres, and the National Forest Authority (NFA), whose mandate is to manage Central Forest Reserves and to supply high quality forestry-related products and services (Figure 2). Uganda National Meteorological Authority (UNMA) is responsible for establishing and maintaining weather and climate observing stations

network, collection, analysis and production of weather and climate information, (including warnings/advisories) to support social and economic development. Awareness raising is one of their key roles to be considered under the Lake Bunyonyi SCMP.

3.6.1.2 Other National Entities

Other national entities significantly impacted by technical water management issues are the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), the Ministry of Tourism and Industry (MTI), and the Ministry of Energy and Mineral Development (MEMD). The Ministry of Education and Sports (MES) is responsible for the implementation of Water and Sanitation in Schools, and the Ministry of Health (MOH) is responsible for sanitation via the environmental health department.

The Ministry of Local Government (MLG) oversees the implementation of Local Government Development Plans, which include water supply and programmes for the improvement of hygiene and sanitation in institutions and public places. There are a number of development partners, private sector and NGOs that also act in the water sector, providing services, advice and facilitation. A number of NGOs active in the water sector are coordinated at the national level through the Uganda Water and Sanitation NGO Network (UWASNET), an umbrella organisation largely funded by development partners including MWE.

3.6.2 Regional Level

As a result of the de-concentration of the management of water resources, DWRM created four Water Management Zones (WMZ) following hydrological boundaries. They operate on regional level with the objective to bring the central services closer to the stakeholders. Their primary role is to facilitate sustainable development of the water resources for the economic and social benefit of the people in the catchment and to implement the water management measures needed to protect and conserve the catchment and its water resources, ensure sustainability, and reduce or resolve conflicts over resource use.

The DWD established the Water and Sanitation Development Facility (WSDF) as a mechanism for supporting water supply and sanitation facilities for rural growth centres and small towns, intended to promote a demand-responsive approach where Water Authorities/Town Councils or Town Boards apply for funding. The successful applicant is assisted by the WSDF to develop piped water supply systems.

Technical Support Units (TSU) established by DWD at the regional level have the mandate to support capacity building of district-based structures. This involves training, technical advice and support supervision of districts to enable them to effectively implement their roles in the rural sub-sector. The mandate also covers water for production.

Umbrella Organizations (UO) are also regional organisations constituted as associations of the local Water Supply and Sanitation Boards (WSSBs) with the principle objective of providing operation and maintenance (O&M) back-up support (training, technical, legal and organisational support, supervision of rehabilitation, and extension works as well as water quality monitoring).

The DWD has further deployed staff from its Department of Water for Production to the regions while DEA has also established offices for its Wetlands Management, Environmental and Forestry Support Departments at regional level.

These deconcentrated units in the regions are based together for improved cooperation and integration and represent the MWE on regional level.

3.6.3 Catchment Level

Lake Bunyonyi Sub Catchment is part of the larger Ruhezamyenda Catchment that covers a total area of about 682 km² with six Sub Catchments. Ruhezamyenda Catchment Management Plan (CMP) was prepared in 2015 and falls under Albert Water Management Zone (AWMZ). The establishment of the CMO which commenced with formulation of the Catchment Management Committee (CMC) for Ruhezamyenda Catchment on August 7th, 2015, by the AWMZ. Subsequently, a SCMC was formulated and the Consultant worked closely with the SCMC for Lake Bunyonyi Sub Catchment in preparation of the Lake Bunyonyi SCMP. During the catchment management planning process, an institutional framework was created, which brings the stakeholders together to present and exchange their views and thus give the process legitimacy. Hence, AWMZ established a Catchment Management Organisations (CMOs), which builds on and utilises to the maximum practicable extent, existing structures and relationships. The CMOs consists of several bodies Figure 3:

- *The Catchment Stakeholder Forum (CSF)* brings together all actors on catchment management. The CSF defines key issues related to water resources in the catchment that require consideration in order to effectively protect, manage, and develop water resources. It provides input to the CMP for coordinated, integrated and sustainable development and management of water and related resources in the catchment, including their implementation status
- *The Catchment Management Committee (CMC)* is composed of representatives of all relevant stakeholder groups (government, politicians, and community-based organisations, NGOs, water users, media, academic institutions, and private sector) and collaborates with the WMZ during the formulation of a Catchment Management Plan and plays a steering role during its implementation. The CMC responsibilities include: coordination of stakeholder-driven definition of key issues related to water resources, promotion of coordinated

planning, and implementation as well as stakeholder-driven decision-making related to integrated and sustainable development and management of water and related resources etc.

- *The Catchment Management Secretariat (CMS)* provides support to the Catchment Management Committee in coordinating the planning and implementation of activities in the catchment as well as following up of recommended actions by the stakeholders. The CMS acts as an administrative secretariat for the Catchment Management Committee as well as the Catchment Technical Committee.

The Catchment Technical Committee (CTC) forms the technical arm of the CMO and supports the CMC in their tasks. The CTC brings technical expertise and knowledge during the formulation of the Catchment Management Plan, operationalises and sometimes implements programmes and projects from the plan, and generally ensures that the different districts collaborate to implement the plan. It comprises of technical people from government, NGOs, private sector, development agencies, and other relevant organisations in the catchment.

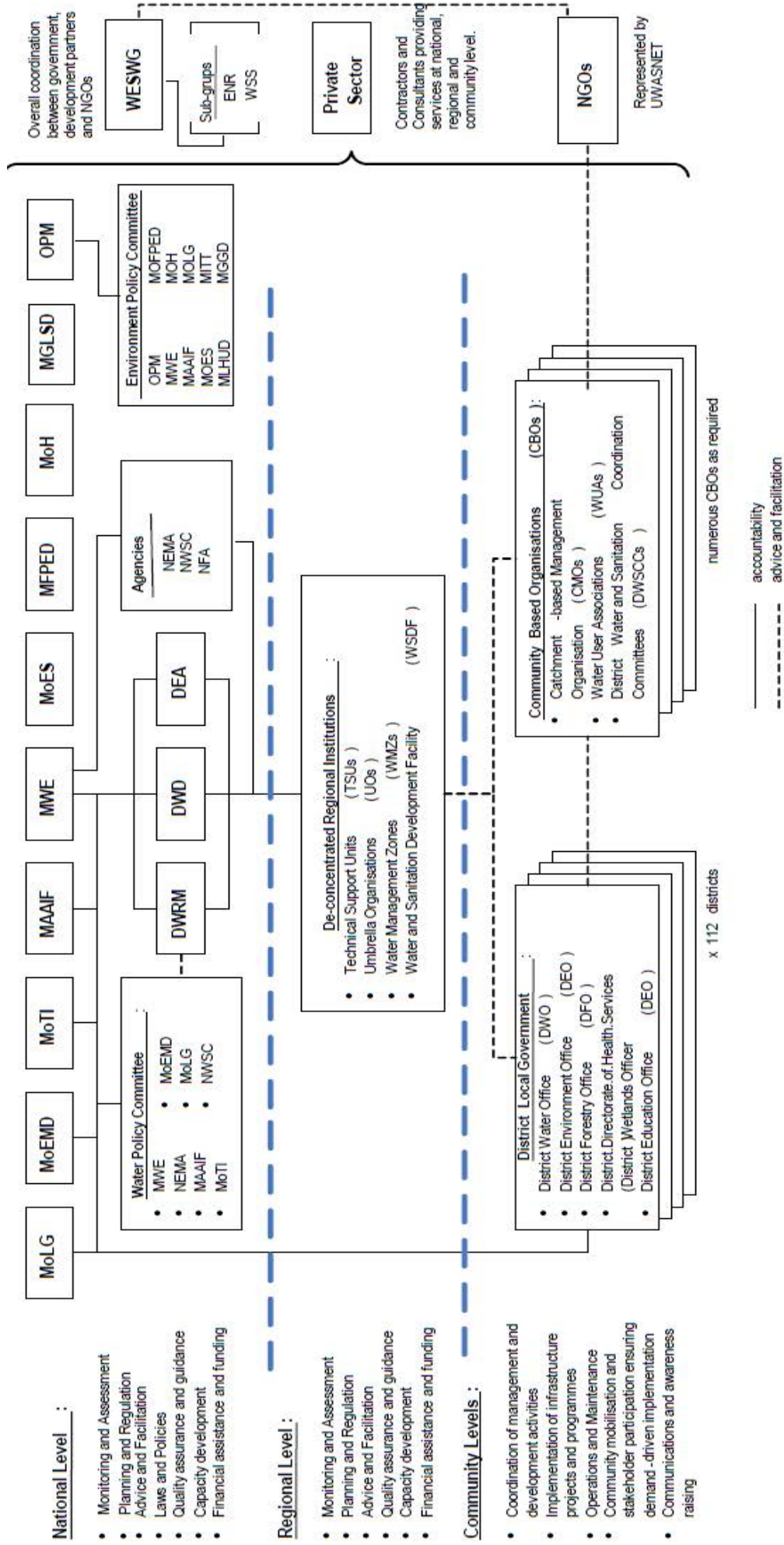


Figure 2: Institutional framework for Water and Environment Sector Support Programme (JWESSP, 2013 - 2018).

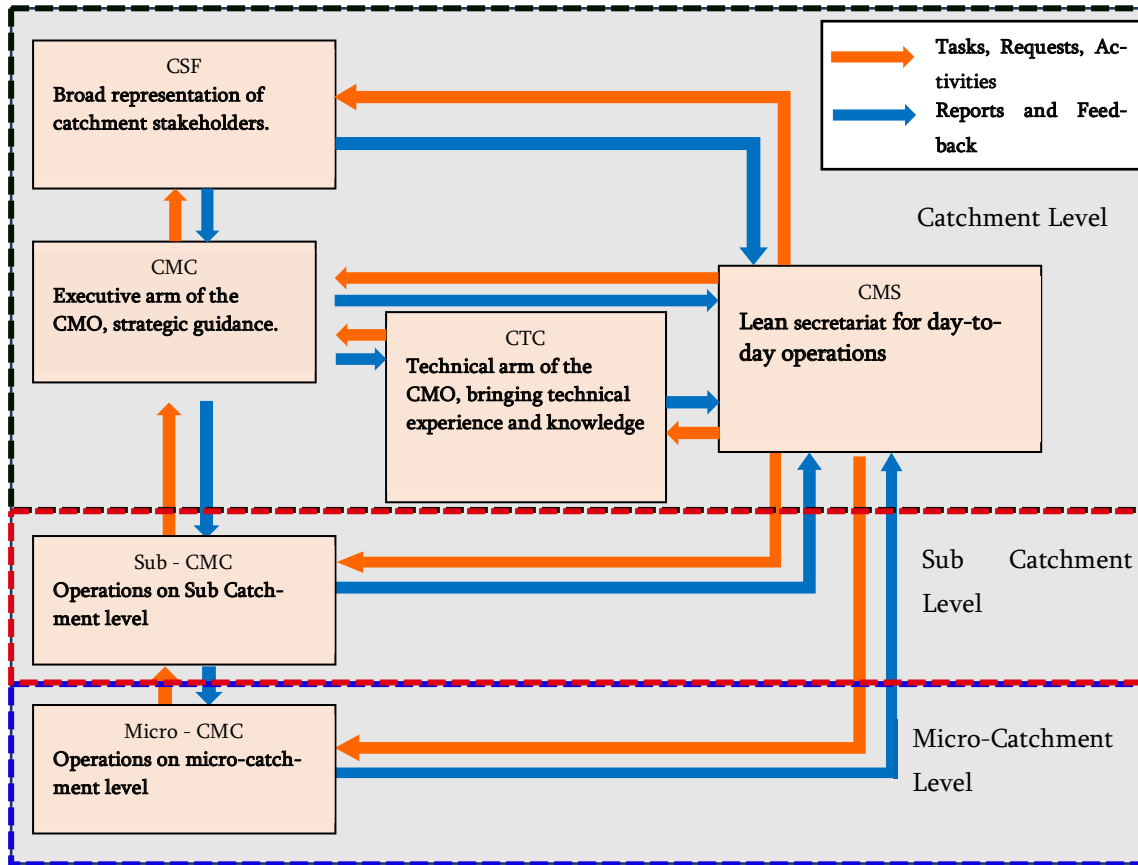


Figure 3: Catchment Management Organisation Structure (DWRM 2016)

Other relevant institutions at the catchment level include: The District Natural Resources Department, District Works or Engineering Department, District Production Department, District Planning Department, Department of Community Based Services, District Information Department, and District Health Department are key in the implementation of the SCMP. However, the structure varies from district to district according to the natural conditions in the district. Most districts have 5-year district development plans in which all sector plans are integrated.

Based on all possible present stakeholders the Catchment Planning Guidelines (2014) envision roles as indicated in Table 3-1.

Table 3-1: Roles of Stakeholders in Catchment Plan Implementation

AWMZ	<ul style="list-style-type: none"> • Coordinate all implementation activities • Facilitate and support DWRM coordination of central level implementation and financial resource mobilization • Facilitate implementation of SCMP projects by central departments • Identify modalities for zonal and catchment level implantation among its public and private sector partners
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	<ul style="list-style-type: none"> • Mobilize funds (Medium Term Expenditure Framework, budget, donors, private sector) with the assistance of DWRM for implementation of zonal and catchment level projects • Coordinate, manage and undertake project preparation for zonal and catchment level plan projects • Assess water use permit applications under existing regulations • Facilitate implementation and installation of upgraded and expanded monitoring network and WIS, and operate system within the zone • Monitor hydrologic and meteorological conditions, compliance with regulations, implementation of catchment plans and source protection plans • Support and facilitate the increasing role the CMC and other stakeholder groups including keeping all stakeholders informed of implementation progress • Undertake secretarial functions for the CMC/SCMC.
CMC and SCMC	<ul style="list-style-type: none"> • Facilitate and promote implementation of catchment management plans • Coordinate implementations from the SCMP • Include interventions from the SCMP into the respective District Development Plans • Monitor SCMP implementation • Review the SCMP regularly • Mobilize resources for the implementation of the SCMP interventions • Carry out meetings with the CSF
MWE - DWRM	<ul style="list-style-type: none"> • Organize and coordinate the technical review of planned project proposals and assign implementation to the appropriate department • Mobilize funds for the implementation of the SCMP and AWMZ support • Review policy, identify needs for legal and regulatory revisions based on plan recommendations and manage the process for updating and revision
MWE - NEMA	<ul style="list-style-type: none"> • Review the environmental regulatory needs (actions, new or revised regulations) based on the adopted final SCMP • Issue required regulations, notices, and permits in accordance with legal and regulation requirements
MWE – Line departments	<ul style="list-style-type: none"> • Undertake preparation of projects and investments within their area of responsibility that are proposed in the adopted final SCMP (feasibility studies) • Supervise and manage project implementation (designs, tender documents, procurement, construction) • Operate the completed project in accordance with the permit and operating rules agreed with AWMZ

Line departments in the concerned sector Ministries	<ul style="list-style-type: none"> • Undertake preparation of projects and investments within their area of responsibility that are proposed in the adopted SCMP (feasibility studies) • Supervise and manage project implementation (designs, tender documents, procurement, construction) • Operate the completed project in accordance with the permit and operating rules agreed with AWMZ
District government	<ul style="list-style-type: none"> • Facilitate and support implementation of the adopted SCMP • Incorporate priority projects and programs into the District development plans as appropriate
Donor partners and NGOs	<ul style="list-style-type: none"> • Implement priority projects and programs in collaboration with AWMZ and other stakeholders in accordance with agreements and Memoranda of Understanding (MOUs)
Private sector	<ul style="list-style-type: none"> • Facilitate and support implementation of the adopted CMP

4. STATUS OF LAKE BUNYONYI SUB CATCHMENT

4.1 Sub Catchment Description

Lake Bunyonyi has an area of 56 km²; maximum depth of 40 m lying at 1,973 masl (Beadle, 1966; Green, 2009). Lake Bunyonyi is fed by River Kabirita at its Southern end from Rwanda and remains stratified for many years without mixing (Hughes and Hughes, 1992) thus having anoxic bottom waters. It drains into Lake Mutanda via River Ruhezamyenda.

Extensive swamp reclamation is primarily limited to edge encroachment in the area around Lake Bunyonyi. During drier periods rural farmers are forced to abandon their land on higher ground and drain parts of the swamp to grow crops. During wetter periods the swamps re-flood and the farmers use the higher land again. Several types of crops are grown around the edges of swamps. Irish potatoes, sweet potatoes and cabbages are the main crops planted in these wetter areas, but tomatoes, beans, carrots, cauliflower and sugar are also occasionally grown. Handcrafts, such as carpets, mats, trays and baskets are all woven from thin strips of papyrus (*Cyperus papyrus*) stem and sold primarily on the domestic market, but also increasingly to tourists.

Fishing is carried out on a relatively small scale at Lake Bunyonyi, due to its depth and the consequential scarcity of shallow breeding grounds for fish. Nevertheless, the swamps support substantial populations of Louisiana crayfish (*Procamuurus clarkii*), introduced into Lake Bunyonyi in the 1970s, and native fish such as Mudfish (*Clarius cassoni*) and *haplochromides*. Smaller numbers of tilapia spp. and mirror carp (*Cyprinus carpio*) are also reported to reside in papyrus swamps and are fished on occasion.

Sub Catchment delineation for Lake Bunyonyi was done using a 30m by 30m Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) using ArcGIS. Based on the water body network, hydrological stations, and points of interest, Lake Bunyonyi Sub Catchment was delineated.

The map of Lake Bunyonyi Sub Catchment is shown in

Figure 4. The total area of the catchment is approximately **303.114** Km² as shown under Table 4-1.

Table 4-1 shows the Sub Catchment areas, districts in the Sub Catchment and the area contribution of each district and its corresponding Sub County in the sub-catchment. The biggest (51.3%) percentage of the Sub Catchment falls within Rubanda district while the smallest (48.7%) percentage is in Kabale district.

Table 4-1 Sub Catchment Area and Area Contribution per District and Sub County

District	Sub-county	Area (km ²)
Kabale	Butanda	36.992
	Kamuganguzi	26.123
	Kitumba	17.287
	Rubaya	51.601
	Ryakarimira TC	15.669
Rubanda	Bubaare	21.049
	Bufundi	69.631
	Muko	64.762
Total		303.114

The map of the Sub Catchment is shown in Figure 4.1.

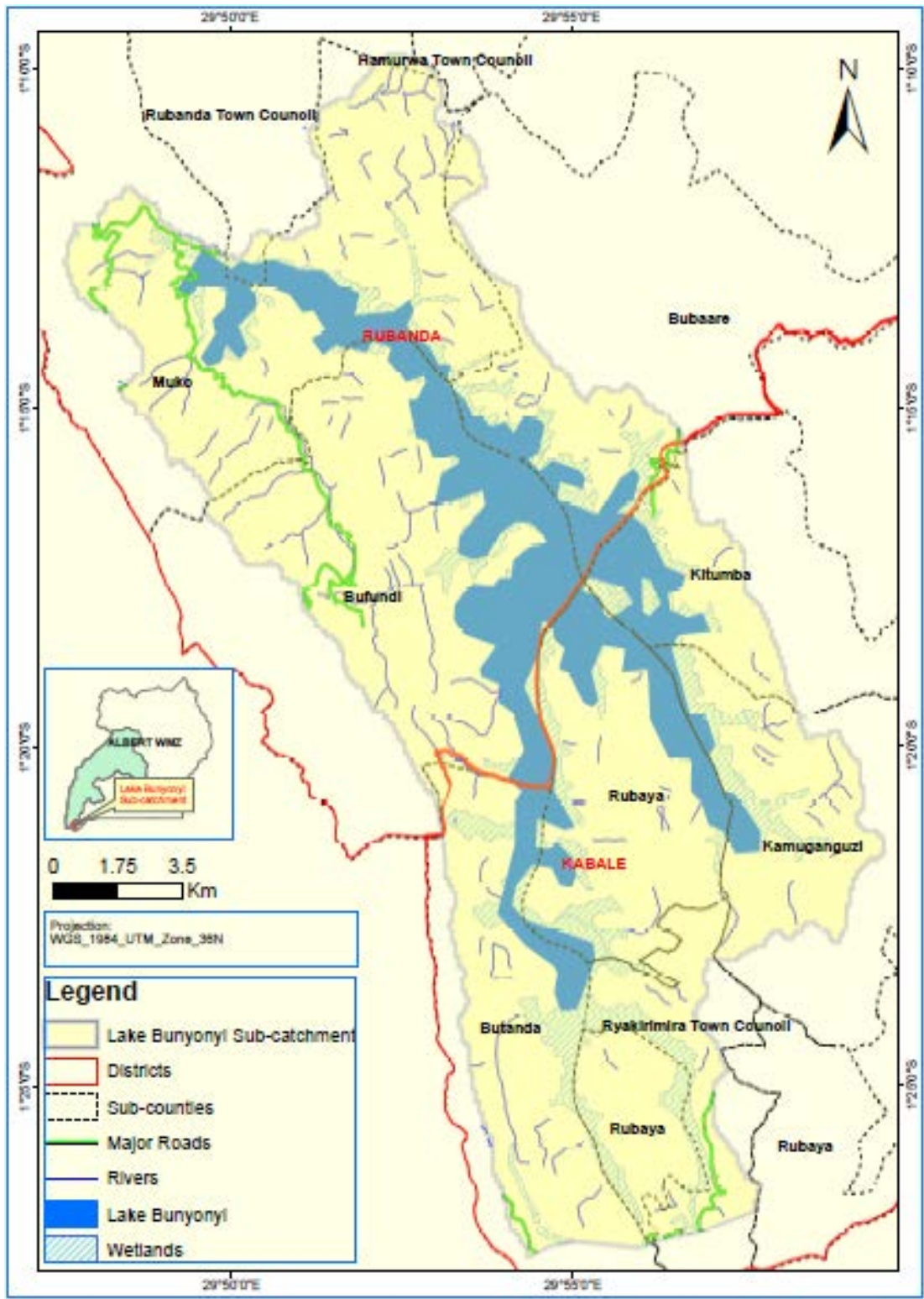


Figure 4 Lake Bunyonyi Sub-Catchment

4.2 Environmental Baseline

4.2.1 Climate

The climate of the Sub Catchment area is warm and temperate and the average annual temperature is 17.2°C. The temperature in February (warmest month of the year) averages 17.5°C. At 16.8°C on average, June is the coldest month of the year in the project area. Temperatures average about 18°C during the day and fall to about 10°C at night. The variation in annual temperature is around 0.7°C. The relative humidity in the project area is between 90% and 100% in the morning and decreases to between 42% and 75% in the afternoon, all the year around.

The average annual rainfall is 1368mm. The driest month is July, with 29mm of rain. In April, the precipitation reaches its peak, with an average of 173mm. There is a difference of 144mm of precipitation between the driest and wettest months. The Sub Catchment area experiences bimodal rainfall pattern with long rains occurring from February to May and short rains between September and November.

4.2.2 Vegetation/Flora

Plant life diversity in the Sub Catchment is a mixture of shrubs, grass, herbs, sedge and trees (Plate 4-1).

Plant life diversity in the Sub-Catchment is a mixture of shrubs, grass, herbs, sedge and trees (Plate 6-1). The vegetation in both areas is very much simplified with a general absence of woody vegetation and mostly comprised of herbaceous plant species. None of the plant species in Tables 4-2 are listed on the IUCN or the NFA list for Uganda. All are fairly common and widely occurring species.

Table 4-2 Examples of plant life diversity in the Sub Catchment

Species	Family	IUCN Status	Growth form
<i>Ageratum conyzoides</i>	Asteraceae	LC	Herb
<i>Alysicarpus rugosus</i>	Papilionaceae	LC	Herb
<i>Andropogon schirens</i>	Poaceae	LC	Grass
<i>Bidens grantii</i>	Compositae	LC	Herb
<i>Brachiaria platynota</i>	Papilionaceae	LC	Herb
<i>Bridelia micrantha</i>	Phyllanthaceae	LC	Tree
<i>Chloris gayana</i>	Poaceae	LC	Grass
<i>Christella parasitica</i>	Thelypteridaceae	LC	Fern
<i>Cissampelos mucronata</i>	Menispermataceae	LC	Climber
<i>Clausena aniseta</i>	Rutaceae	LC	Shrub
<i>Clematis hirsuta</i>	Ranunculaceae	LC	Climber
<i>Conyza floribunda</i>	Myrtaceae	LC	Tree
<i>Cyperus latifolius</i>	Cyperaceae	LC	Grass

<i>Cyperus papyrus L.</i>	Cyperaceae	LC	Sedge
<i>Cyphostemma ukerewense</i>	Vitaceae	LC	Sedge
<i>Desmodium uncinatum</i>	Asteraceae	LC	Herb
<i>Digitaria abyssinica</i>	Asteraceae	LC	Herb



Plate 4-1: Plant life diversity in Bufuka Village, Mwendo Parish, Kitumba Sub County, Kabale District and Highland bamboo at Echuya Forest Reserve Village, Ikamiro Parish, Muko Sub County, Rubanda District

Much of this area is today largely modified for farming and settlement, not much natural habitat still remains and except where areas were set aside as protected areas especially Muko CFR and within tea plantation in Ryakarimira TC where natural vegetation still exists.

The Sub Catchment is comprised of different types of wetlands including fresh water emergent reed swamps dominated by single reed species; seasonally flooded herbaceous wetlands with variable species composition; fresh water montane wetlands dominated by sedges and grasses and fresh water palustrine forests (dominated by *Mitragyna spp.* and *Syzigium spp.*). The following major vegetation types within the project area were recorded: *Carex spp.* interspersed with a few plant species of *Helichrysum formosissimum*, *Eriocaulon schimperii*, *Alchemilla johnstonii*, *Lobelia wollastonii* and *Hypericum revolutum*. Other wetland species included: *Thunbergia alata*, *Achyranthes aspera L.*, *Asystasia gangetica T. Anders.* Cultivated, fallow and grazing land species included: *Sanseveria Americana*, *Achyranthes aspera L.*, *Ageratum conyzoides L.*, *Dicrocephala integrifolia*. Waterlogged valleys are dominated by scattered *Phoenix reclinata* and *Acacia polyacantha* trees with several grasses commonly found in water logged areas like *Leersia hexandra* and *Miscanthus violaceous*.

Vegetation clearance, habitat loss and biodiversity deterioration are increasingly recognized in this Sub Catchment. The factors causing biodiversity loss center primarily on habitat modification and by far the major factor has been clearing for cultivation. Several lakeshores are planted with Irish potatoes, maize, sugarcane, sweet potatoes and Eucalyptus species resulting into floral change. Habitat modification does not only affect plants but also fauna. The most recorded woodland species across all sub counties within the Sub Catchment area included: *Eucalyptus spp.*, and *Pinus spp.* which are planted along the slopes and sometimes in valleys. Farmlands were mainly of sweet potatoes, beans, sorghum, Irish potatoes, field peas, maize, wheat and vegetables (mainly cabbages).

4.2.3 Fauna

Birds are some of the most widely used indicator taxon for monitoring human mediated impacts on the environment. Most of the birds recorded in the area were encountered close to this natural habitat mix. Some of the arms of the Lake still have a long stretch of wetland ecosystem that provides refuge to bird communities as a natural habitat. Some of the bird species recorded along the Lake shores that are ranked as of conservation significance at the East African level i.e. Grey Crowned Crane (*Balearica regulorum*), Brown Snake Eagle (*Circaetus cinereus*) and African Crowned Eagle (*Stephanoaetus coronatus*). Other species recorded included: Black-and-white Mannikin (*Lonchura bicolor*), Common Waxbill (*Estrilda astrild*), Bronze Mannikin (*Lonchura cucullata*), African Firefinch (*Lagonosticta rubricate*), Fan-tailed Widowbird (*Euplectes axillaris*), Spectacled Weaver (*Ploceus ocularis*), Grey-headed Sparrow (*Passer griseus*), Fork-tailed Drongo (*Dicrurus adsimilis*), White-crested Helmet-shrike (*Prionops plumatus*), Collared Sunbird (*Hedydipna collaris*), Grey-backed Camaroptera (*Camaroptera brachyuran*) among others. Common migrant species included: Grey Heron (*Ardea cinerea*), Ring-necked Dove (*Streptopelia capicola*) and Cattle Egret (*Bubulcus ibis*) and all these are listed as Least Concern (LC) on the IUCN Red List of Threatened species. The habitats these species were recorded in were mainly agricultural fields, swamps, natural and planted woodlots.

A pair of Grey Crowned Crane (*Balearica regulorum*) was recorded in Lake Bunyonyi area (specifically in Butanda Sub County at Nyakihanda Swamp) and it may well be important for their breeding. Its generalist feeding strategy makes it highly adaptable and has allowed it to persist in human modified habitats. The most significant threat to its survival is the loss of critical nesting sites which occur in wetlands. There is need to ensure that this sensitive habitat for the cranes is not destroyed. Plate 4-2 shows examples of bird's species recorded within the Sub Catchment.



Plate 4-2: Examples of birds species recorded (*Balearica regulorum*, *Motacilla aguimp*, *Bubulcus ibis*, *Ardea melanocephala*) at Nyakihanda Wetland/Village, Kahungye Parish, Butanda Sub County, Kabale District

Reptiles and amphibians are a unique group of vertebrates and are very sensitive to changes in their environment such as habitat loss and modification. The Amphibians recorded were of Least Concern as their conservation status and included: Flat-backed Toad (*Amietophrynus maculatus*), African Common Toad (*Amietophrynus regularis*), Reed frog (*Afraxalus quadrivittatus*). One of the common reptiles encountered was the Monitor lizard (*Varanus exanthematicus*). There were no endangered amphibians and reptiles recorded, and even if they did occur, it is not likely that there will be a large population in the kind of landscape of such species.

Butterflies are widely used as bio-indicators for assessing biodiversity and monitoring ecosystem responses to environmental perturbations. Butterflies belonging to two families Nymphalidae (*Bicyclus vulgaris* and *Ypthima asterope*) and Pieridae (*Belenois creona* and *Mylothris rubricosta*) were mainly encountered. Others included: *Danaus chrysippus*, *Junonia Sophia* and *Eurema brigitta*. Generally, low species richness and abundance was recorded probably due to disturbances that already exists from cultivation, cattle ranching, infrastructure for human settlement and the Eucalyptus woodlots.

Fishing is carried out on a relatively small scale at Lake Bunyonyi, due to its depth and the consequential scarcity of shallow breeding grounds for fish. Nevertheless, the swamps support substantial populations of Louisiana crayfish (*Procamuurus clarkii*), introduced into Lake Bunyonyi in the 1970s, and native fish such as Mudfish (*Clarius cassoni*), Cat Fish (*Bagrus bayad*) and haplochromides. Smaller numbers of Mudfish (*Clarias gariepinus*), Tilapia (*Tilapia zilli*), Tilapia (*Tilapia leucostictus*) and mirror carp (*Cyprinus carpio*) are also found in papyrus swamps and are fished on occasion.

4.2.4 Topography

The Sub Catchment is characterized by undulating hills, which are usually smooth in outline, with steep fluted slopes with hill tops continually rising to over 1846 m above sea level. It has plateau areas, which are deeply incised particularly within the rightward drainage with local relief dropping to 615m above sea level. The Sub Catchment has two distinctive topographic zones namely: (i) *The highland and plateau area*- These areas are associated with rejuvenated landscapes and were affected by rift valley faulting. The topography is deeply incised with steep slopes which occur along fault lines and extend considerable distances in drainage basins. The hills characteristically encircle lowland embankments which are broadly circular. (ii) *The rift valley area* –These are relatively flat with broad tracts of clay swamps. The elongated trough-like feature cuts across the project area.

4.2.5 Geology

The geology of the Sub Catchment is characterized by pre-cambrian rock comprising large orgil-laccous sediments now seen as slates, phyllites and micaschists. These rocks are extensively metamorphosed and granitized.

4.2.6 Soils

The soils are mainly ferralitic, volcanic and histic underlain by the oldest pre-cambium age variety of metamorphic largely granitoid rocks, acid gneisses, schists and foliated granites. Loamy fertile soils with varying proportions of sand and clay are along the Lake shores. The commonest soil type is feral soils. Most of these soils support agriculture, brick making, pottery, ceramics and tiles making among other things.

4.2.7 Surface water quality assessment

The surface water quality in the Sub Catchment is dependent on both natural and human induced factors, and varies with seasonality. The reduced water quality results from hydrological changes, such as draining of wetlands. More obvious are the polluting activities, such as the discharge of domestic and other wastewaters into the watercourses and the use of chemicals and fertilizers on agricultural land in the drainage basin.

A water quality assessment was therefore carried out to: i) assess the surface water quality with an aim of evaluating the possible health and environmental risks, ii) investigate the suitability of the water for domestic and other uses and iii) obtain information for use in development of the SCMP.

Surface water quality assessment was done using primary data. Water samples were picked from seven (7) different locations (Figure 4-2) across the Sub Catchment from 9th to 13th March 2020. The samples were picked using clean plastic bottles and carefully stored before delivering them to a certified laboratory for analysis. The samples were analysed using standard methods.

The results of the water quality assessment were compared with the national drinking water and effluent standards (Table 4-3). The following parameters were found to conform to the National standards for potable water (UNBS 2014): pH, Conductivity, Total Dissolved Solids, Total Suspended Solids, Turbidity, Arsenic, Calcium, Chromium, Iron, Lead, Magnesium, Manganese, Sodium Chlorides, Nitrates, Mercury, Ammonia and Sulphates. However, there is need for water treatment (sedimentation and disinfection) to make it suitable for that primary purpose. All the samples analysed met the effluent discharge standards as provided for under the National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations (1999).

On the other hand, Phosphates exceeded the National standard for potable water at two (2) specific locations. Phosphates are chemicals containing the element phosphorous, and they affect water quality by causing excessive growth of algae. Although phosphate is not harmful to humans, anthropogenic, or man-made, inputs of phosphorus are well known to have a significant impact on ecosystems, and can damage the health of rivers and lakes (known as eutrophication). If an excess of phosphate enters the waterway, algae, and aquatic plants will grow wildly, choke up the waterway and use up large amounts of oxygen.

4.2.8 Rivers, lakes, and wetlands

There exists a network of rivers (mainly seasonal) within the Sub Catchment. These rivers, however, change names as they traverse the different areas within the Sub Catchment. There are no other lakes within the Sub Catchment. Wetlands do exist mainly along the lake shores of Lake Bunyonyi as seen in Figure 4-3 and these support livelihoods that depend on fishing and farming within the Sub Catchment as well as attenuating floods and capturing sediment.

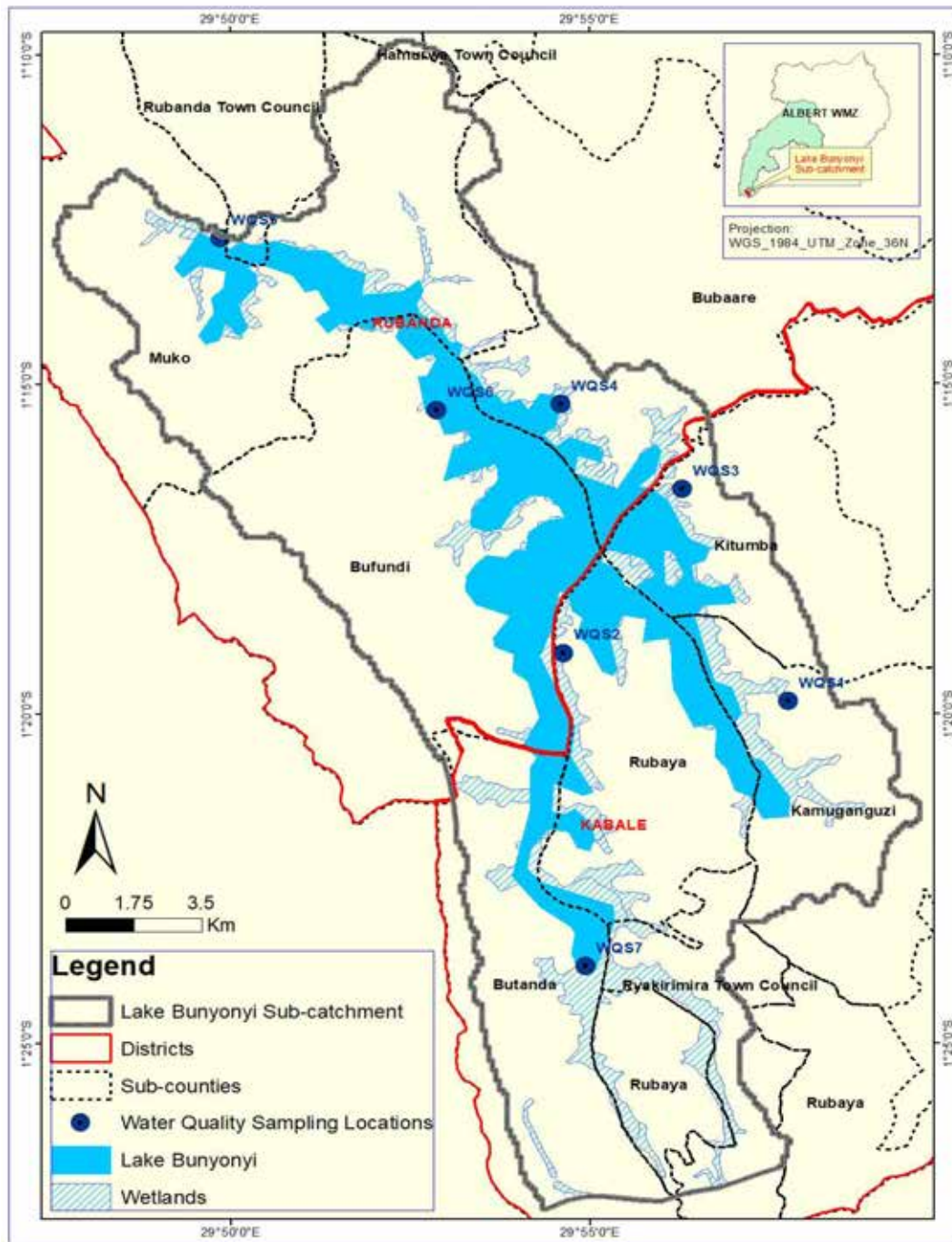


Figure 5: Water Sampling Locations in Lake Bunyonyi Sub Catchment

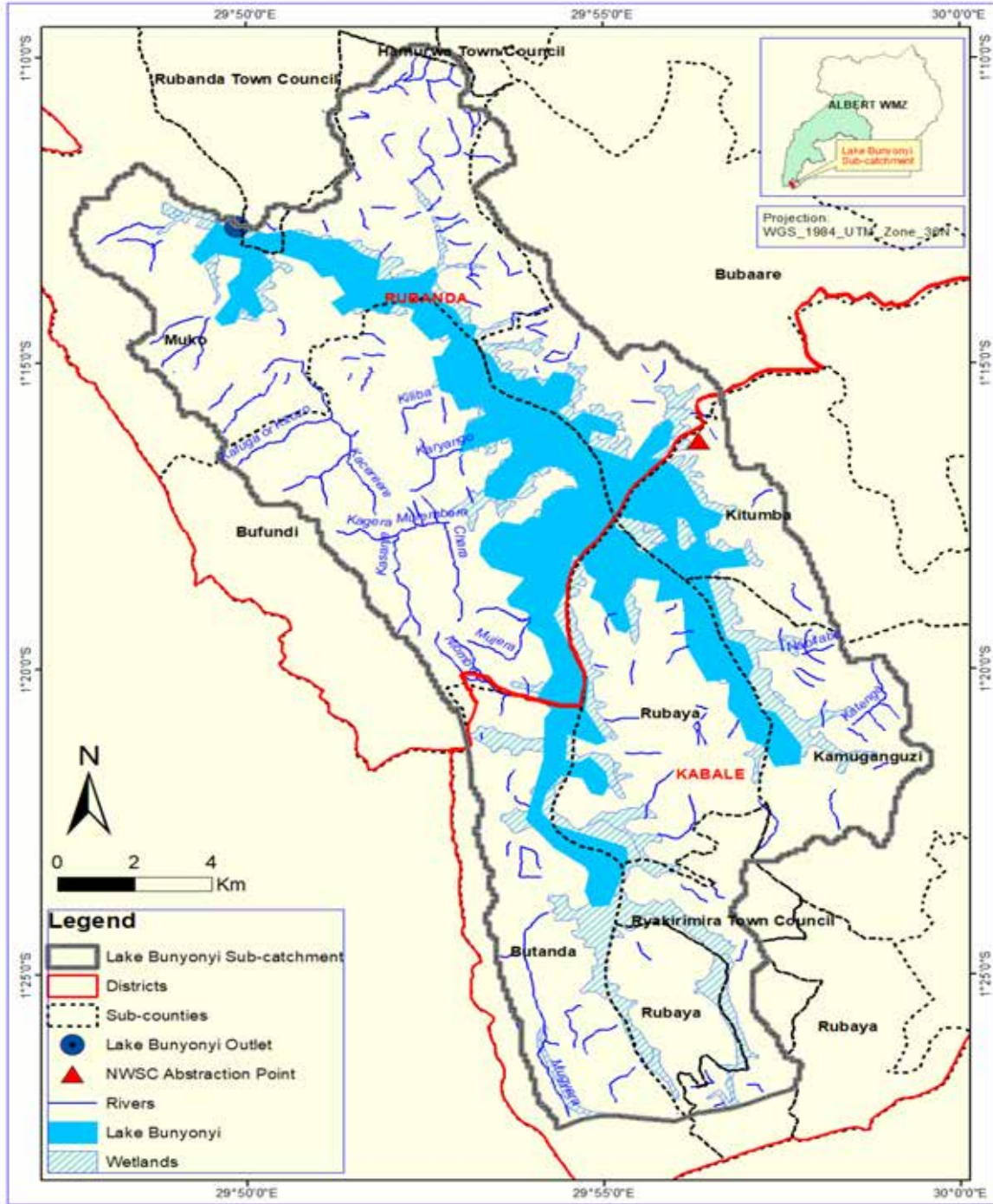


Figure 6: Rivers, Lakes, and Wetlands in Lake Bunyonyi Sub Catchment

Table 4-3: Surface Water Quality Analysis Results

S/N	Parameter	Results										Limits/ Authority
		WQS1	WQS2	WQS3	WQS4	WQS5	WQS6	WQS7				
1.	pH	6.8	6.8	7.4	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.0 - 8.0
2.	Conductivity (µS/cm)	124	145	327	456	237	289	289	289	289	289	1500 Max
3.	Total Dissolved Solids (mg/l)	984	942	170	912	980	1083	983	983	983	983	1200 Max
4.	Total Suspended Solids (mg/l)	14	16	1.4	11	12	12	12	12	12	12	100 Max
5.	Turbidity (NTU)	12	10	4	12	6	12	12	12	12	12	300 Max
6.	Arsenic (mg/l)	≤0.01*	0.1	≤0.01*	0.01	0.1	≤0.01*	≤0.01*	≤0.01*	≤0.01*	≤0.01*	0.2 Max
7.	Calcium (mg/l)	28	25.2	14.4	35.2	24.8	12.4	32.4	32.4	32.4	32.4	250 Max
8.	Chromium, Total (mg/l)	0	0.4	0	0.4	0.2	≤0.01*	≤0.01*	≤0.01*	≤0.01*	≤0.01*	1.0 Max
9.	Iron (mg/l)	4.4	4.8	1.4	4.5	9.2	0.2	4.2	4.2	4.2	4.2	10 Max
10	Lead (mg/l)	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	0.1 Max
11	Magnesium (mg/l)	26	18.2	4.6	22.2	26.6	28.2	28.2	28.2	28.2	28.2	250 Max
12	Manganese (mg/l)	2.7	0.4	1.2	0.4	2.6	1.2	1.2	1.2	1.2	1.2	10 Max
13	Mercury (mg/l)	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	0.01 Max
14	Sodium (mg/l)	32.4	28.4	10.4	44.4	22.3	31.2	30.2	30.2	30.2	30.2	250 Max
15	Ammonia (mg/l)	0	0	0	0	0	0	0	0	0	0	10 Max
16	Chlorides (mg/l)	156	125	1.3	122.5	122	18.8	188	188	188	188	500 Max
17	Nitrates (mg/l)	12.4	4.6	1.8	12	10.4	10	18.8	18.8	18.8	18.8	20 Max
18	Phosphates (mg/l)	2.4	12.2	4.2	2.2	14.4	2.2	10	10	10	10	10 Max
19	Sulphates (mg/l)	98	128	74	280	145	14.8	148	148	148	148	500 Max
20	BOD ₅	43.6	48.2	42.6	38.2	36.8	43.4	48.7	48.7	48.7	48.7	50 Max
21	COD	97.8	98.9	84	68.9	78.8	97.6	98.8	98.8	98.8	98.8	100 Max
22	Total coliforms (cfu/ml)	102	97	--	14	128	144	104	104	104	104	10,000 Max
	Value above guideline											

4.2.9 Land use/cover change

The major land-use/covers in Lake Bunyonyi are small-scale agriculture, woodlot, tropical forest, grassland, wetland and open water. Small scale farmland, grassland and open water have not significantly changed from 1987 to 2014 period. The tropical high forest has declined gradually with time while woodlot has changed drastically with time. Patches of small scale farmlands, woodlots, and wetland changed to use/cover form one period to another. Although the tropical high forest lost more than it gained, it only gained and lost to small-scale farmland and woodlots; while grassland mainly lost to small-scale farmland and woodlots. In order to reduce on land use/cover change, the terraces that used to control land degradation should be rehabilitated and stabilized; while other soil and water conservation practices like trenches and grass bands, should be included within the terrace (Kizza *et al.*, 2017).

Self Help Africa (SHA) from 11th to 15th November 2019 conducted training on GIS and Remote Sensing on Spatial Monitoring and Detection of Land Use change in Lake Bunyonyi Sub-catchment, South Western Uganda where land use maps were generated (Figure 4-4).

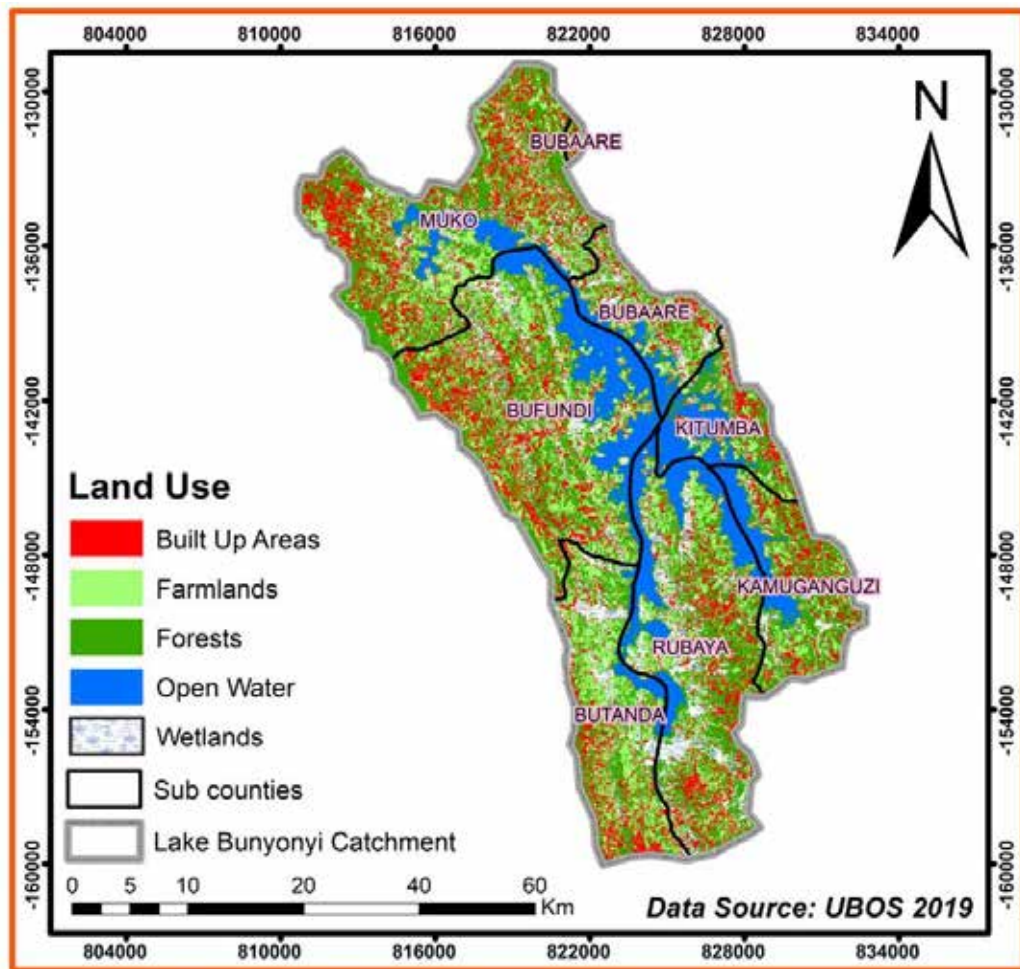


Figure 7: Land use map of Lake Bunyonyi Sub Catchment (2019)

4.3 Stakeholder Analysis

Stakeholders were identified at national, regional, catchment and local levels as those people/groups/institutions that: i) are interested in the proposed SCMP, ii) are potential beneficiaries, iii) might be adversely impacted, iv) may impact the SCMP and v) have the power to influence the SCMP. The stakeholder identification was done through interviewing experts, brainstorming and reviewing of relevant documents. The identified stakeholders broadly include those whose livelihoods are dependent on some of the water, land and related catchment resources; those that perform regulatory roles, those that are in charge of developing some of the resources, Civil Society Organisations among others. The stakeholders were grouped according to their importance and interest as shown in Table 4-4.

Table 4-4: Stakeholder Mapping for Lake Bunyonyi Sub Catchment

Category	Key stakeholders consulted	Comment
International	European Union (EU), SHA	Development partners that provide both technical and financial resources required for implementation of the SCMP
Government Institutions (National)	Ministry of Water and Environment (MWE), Uganda Wildlife Authority (UWA), National Environment Management Authority (NEMA), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), National Forest Authority (NFA), National Water and Sewage Corporation (NWSC)	Governmental organisations with a direct interest in IWRM outcomes and /or that are able to provide support for implementation of the SCMP
Government Institutions (Regional)	Albert Water Management Zone (AWMZ), Umbrella Organisation (UO), Water Sector Development Facility (WSDF), National Environmental Management Authority (NEMA)	
District Local Government	District Local Governments (DLG) of Kabale and Rubanda.	
Sub-County level	Sub-County leaders in the Sub Catchment e.g. Sub-County Chiefs, Parish Chiefs, and Community Development Officers (Rubaya, Kamuganguzi, Kitumba, Butanda, Bubaare, Bufundi, Muko Sub Counties and Ryakarimira Town Council)	
NGOs and Civil Society Organisations	Diocese of Kigezi, Nature Uganda, International Crane Foundation, CARITAS Kabale Diocese, AICM	Organised groups carrying out activities within the Sub Catchment or region related to IWRM
Private Sector	Green enterprises operating in the Lake Bunyonyi basin, Tour Operators, Lake Bunyonyi Hotels and Lodges Owners, Water transporters, Farmer groups, Women farmers, Youth	Individuals in the Sub Catchment or region representing user groups with interest in water use and
Community	Local Councils (LCs), Councillors, etc.	

Category	Key stakeholders consulted	Comment
Village	Village Natural Resource Management Committees (VNRMCs), Vulnerable groups e.g. Batwa etc.	natural resources management

4.4 Socioeconomic Assessment

4.4.1 Population, population density and trends

The current population estimates for Kabale and Rubanda districts are 245,600 and 206,600 people respectively with a growth rate of 1.28%¹. The region is one of the most densely populated areas in Uganda with overall population densities of 422.4/km² Kabale and 286.5/km² for Rubanda². The probable reasons for the high population density include a good climate, fertile soils, high fertility rates and in the past the absence of disease agents for diseases like malaria. The Sub Catchment is predominantly rural and agriculture is the main activity of the population. Only 7% of the population is urban and the rest is rural.

4.4.2 Land tenure and land use

The major land tenure system in the Sub Catchment is customary, with some leasehold titles in the wetlands mainly where dairy farms have been established and farmer society groups grow Irish potatoes for commercial purposes. Leasehold titles are mainly in Nyamuriro wetland in Muko Sub County and Musamba in Rubaya Sub County. There is also privately owned land with freehold titles mainly the islands and tourism sites in Kitumba and Bubaare sub counties bought by tourism developers. Land speculation around the lake is rife due to the high demand for tourism developments. Most people with land at the lake side especially in Kitumba and Bubaare have sold most of their land and could become landless (Sub County chiefs of Kamuganguzi and Kitumba Sub Counties) leading to increased poverty and vulnerability of the surrounding community.

Major land use in the Sub Catchment is subsistence agriculture, growing mainly annual crops such as maize, Irish potatoes, sweet potato, sorghum, beans. Other crops grown include wheat, barley in the higher areas, vegetables in the wetlands, tree tomatoes (as a fruit) and bananas. The eucalyptus woodlot plantations on hilltops and valleys along wetlands (Plates 4-3). The woodlots are primarily for sale of building materials although fuelwood is harvested.

Settlements are concentrated on the higher areas or hill tops while gardens are on lower slopes and in the valleys. The average land area for agriculture in the area is approx. 1-2.06 ha per household. Land holdings are fragmented with a household owning plots of land on different hillsides and in wetlands.

¹UBOS (2019) Statistical Abstract

² Ibid

Land fragmentation is due to traditional inheritance system of dividing and subdividing family plots among the beneficiaries as well as selling portions to meet necessities like paying medical bills and other eventualities.

Wetlands have been encroached and drained for cultivation and other uses. The high level of land degradation due to poor farming practices is prominent. Tilling without fallowing and use proper soil and water conservation techniques on the steep slopes has resulted into soil and water erosion leading to crop loss and low productivity. Gardens are up to lake shore leaving no buffer to protect the lake from siltation.



Plate 4-3: Gardens at the shores of the lake and bare hills accelerating soil erosion in Musesamba village, Rwanyena Parish, Rubaya Sub County, Kabale District

4.4.3 Livelihoods

Agriculture: is the main occupation of the population with 82% producing at subsistence level as a source of their livelihoods and the rest on a semi-commercial basis. The main cash crops are wheat, sorghum, cabbages, beans, Irish potatoes, tea and tree tomatoes. Mushrooms and passion fruits are being developed as cash crops promoted by partner development projects supporting improved livelihoods like Nature Uganda, Self Help Africa and CARITAS-Kabale Diocese.

Tourism: Tourism is a major source of employment for the local youth especially those engaged in provision services like boat cruises, nature guided walks and working in the lodges and hotels (Plate 4-4). Major attractions are Lake Bunyonyi, the surrounding terraced hills scenery and pleasant cool weather. Activities include nature walks, boat cruises, lodging and adventures like zip lines. There is little evidence of sell of local produce to the hotels and lodges which could have been an important market chain and source of income for the local farmers.



Plate 4-4: Tourism luxury lodges employing the local people at Birdnest Resort Hotel in Bufuka Village, Mwendo Parish, Kitumba Sub County, Rubanda District

Livestock sector: This is characterised by small numbers of stock per household keeping mainly goats, sheep and piggery. A few people keep cattle (local breed) practicing free range grazing while zero grazing is negligible.

Fishing Sector: Lake Bunyonyi’s productivity to yield **fish** to feed the population and for commercial purpose is limited. There is limited mud fish catch from the few remaining swamps. Although there is crayfish few people are engaged in their fishing and are mainly sold to the lodges. Fishing is a negligible source of livelihood for the surrounding communities.

Bee-keeping: This is an established activity and source of income for the people in the Sub Catchment. However, most beekeepers use traditional and destructive practices like fire and smoke to harvest honey. There is need to promote adoption of improved hives for increased honey yields and the opportunity for value addition to honey processing. Other economic activities are businesses trade and retail in various merchandise.

Stone quarrying and sand mining: These are other sources of income for some communities within the Sub Catchment area (Plate 4-5).



Plate 4-5: Sand mining and stone quarrying in Nyambugu and Bufuka and villages, Mwendo Parish, Kitumba Sub County, Kabale district

4.4.4 Health status

Although each Sub County has a Health Center III facility, there are inadequate health equipment and staff in the health centres. This is attributed to inadequate funding of the facilities and lack of replacement plans. Consequently, patients are referred to distant facilities to receive the same services putting their lives at risk. For example, inadequate health equipment at health centre facilities was reported in Auditor General's report on the financial statements of Rubanda district local government for the year ended 30th June 2018. Sixty-nine (69%) of households in Bufundi and Muko Sub Counties are 5 Km or more to the nearest public health facilities (UBOS 2017) while in Rubaya Sub County Kabale district they are over 70% of the households within 5Km or more to a health facility.

4.4.5 Poverty

Some of the conditions within the community that are signs of poverty in the Sub Catchment include inadequate incomes and limited income generating activities, small land holdings, food shortages, poor paying jobs mainly casual labour, lack of household assets and poor shelters like in the case of Batwa people, dependency on surplus for sale as a source of income and limited paid employment opportunities. However, the National Household and Health Survey 2016 reveals that incidence of poverty in Kigezi region is 12.2 % much lower than the national average of 21.4 %.

4.4.6 Food security

Most stakeholders consulted indicated that agricultural production in the Sub Catchment had reduced over time due to reduced soil fertility resulting from soil erosion and over cultivation. Coupled with this, is weather variability and extreme events of drought and heavy rains leading to landslides, flooding and crop failure thus resulting into food shortages. At the time of the consultations lack of food due to crop failure of the previous season especially beans and Irish potatoes

was reported. Due to limited alternative sources of income farmers are unable to recover from climate change shocks as they are cannot purchase food and other essential commodities due to lack of money.

4.4.7 Access to services

Farmers have been mobilised into various farmer groups by the agricultural extension and community development officers to ease service delivery. Groups organise regular training and as groups receive subsidised inputs. Partner development projects are also working through farmer groups to disseminate information and implementation of interventions. Through Wealth Creation Programme, the government continues to support farmers with seeds and seedlings at the sub counties. The inadequacy of this method is that majority of the average farmers are far from these Sub County centres and therefore most of them do not pick these items. The Sub Catchment protection interventions will therefore need to be channelled through farmer groups to attain meaningful results.

Access to markets is hampered by poor road network and impassable roads during rainy seasons. Most markets lack facilities like sheds, water, storage, power, roads, etc. and most operate only once a week. Farmers market their produce through a long market chain involving many players and middlemen that offer low prices to the farmers. Some of the products like Irish potatoes, vegetables, and sorghum are sometimes sold by the road side. Supply of essential commodities is from Kabale town, hence farmers have to travel long distances or cross the lake to a weekly market at Harutindo landing site at the tourism hub in Kitumba to sell their produce and buy essential commodities to take back.

There are 24 islands but the only inhabited island is Bwama, with a primary, secondary school and health center III facility serving people on the island and mainland. In general access to health and education services within the Sub Catchment is poor. In some areas school children cannot hike the long distances or have to travel by boat to attend school thus exposing them to risks for their lives. According to the Uganda Water Supply Atlas 2017, there is relatively sufficient access to clean water in the Sub Catchment with access rates varying from 52% in Muko Sub County to 95% in Kamuganguzi, Kitumba and Rubaya Sub Counties respectively. Kituma, Kamuganguzi, and Rubaya Sub Counties have surpassed the national target of 79% access to clean water supply in rural areas by 2019/2020 while the other Sub Counties stand at 52% access, for Muko, Bubaare 58%, Butanda 60% and Bufundi 78%. Safe water access is mostly protected springs 43.7%, shallow wells 0.5%, deep borehole 5.4%, Rain water harvesting tanks 0.6% and public tap 49.9% with over 80% functionality.

4.4.8 Language, ethnicity and gender issue

Kabale and Rubanda districts are predominantly occupied by the Bakiga speaking Rukiga. However, there are a few other ethnic groups also found in the two districts. These include the Banyarwanda and Bafumbira and minority Batwa. Gender statistics projections for 2019 show as expected, women to be more than men; Kabale has 118, 300 males compared to 127, 300 females, Rubanda has 97, 900 males and 198,700 females, (UBOS 2019). Despite women being more they are gender inequalities in the distribution of resources where women do not own land or trees

and other production assets, responsibilities, leadership, participation in decision making and community programmes. Women participation in leadership is still hampered by low levels of education, cultural beliefs and perceptions. For example, females aged 18 years and above who are illiterate in Rubanda district are 35% of the people aged 18 years and above who are illiterate (UBOS, 2017). Most women who are actively participating in leadership and politics are on affirmative action basis. Even women participation in community programmes and discussions is restricted due to cultural barriers, norms, reproduction responsibilities and lack of empowerment.



Plate 4-6: During a community consultation meeting in Kyondo Village, Katenga Parish, Kamuganguzi Sub County, Kabale District, women sat behind the men according to the cultural norms

In such circumstance as in the above scenario women may not fully participate in the discussions as they are obscured and men dominating the discussion (Plate 4-6), unless women's inputs are therefore obtained in a separate FGD. In respect of them being more than men and mostly engaged in agricultural production they need to be targeted for mobilisation and engagement in planning and implementation of interventions for rehabilitation of the catchment.



Plate 4-7: Focus group discussion & consultation with Kacerere Women Group Initiative for Development in Kacerere Village, Kacerere Parish, Bufundi Sub County in Rubanda District

In the above discussions the women were able to mention their preferred needs e.g. Calliandra trees for agroforestry as it is multipurpose; it improves soil fertility, provides bean stakes, fodder for zero grazing, and firewood while men preferred *Grivellia* and other timber trees. They also indicated that they prefer to have livestock for zero grazing as a source of income instead of growing passion fruits which are laborious and require a lot material especially poles and security against thefts which they cannot afford.

4.4.9 Vulnerable groups

Vulnerability, according to the categories of the population, stems from limited access to productive assets and their different backgrounds. The vulnerable groups were identified as the youth, orphans, widows, elderly, people with disabilities, the landless, and marginalised groups of Batwa (Plate 4-8).

The Batwa are the most vulnerable groups because they lack basic needs e.g. food, shelter, clothing, education, are poorly mobilised, landless, lack skills, depend on sale of their labour with high affinity to depend on others discriminated by the host community. They have limited access to resources especially wetlands as these have been taken over by the hosts and they have no voice to demand for their rights. Although Nature Uganda and AICM are support the Batwa groups a lot more needs to be done especially securing land for them. They have no burial grounds and dump the dead in a nearby small wetland that drain into River Kagoma flowing into the lake.



Plate 4-8: FGD held with Batwa Initiative for Conservation of Echuya and Development Organisation in Murandamo Trading Centre, Mushanje Village, Kashasha Parish, Bufundi Sub County, Rubanda District

4.4.10 Energy sources

Over 97% of households use fuelwood (charcoal and firewood) for cooking and heating while only 2.6 % use electricity, gas and paraffin, (UBOS 2014). This shows heavy reliance on biomass energy around the Sub Catchment. The major source of fuel is planted woodlots as all natural forest cover was converted into agricultural fields except Echuya Forest Reserve. Even then the pressure on the available planted trees biomass is immense to sustain the wood fuel demand.

There is low coverage of electricity from the national grid. Electricity supply is at the tourism hub serving the lodges and hotels and one island privately owned. A line is currently being extended to Bufundi Sub County headquarters. Promotion of Tree growing strategies especially multipurpose species combined with use of energy saving technologies and alternative clean energy sources like solar will help to reduce pressure on trees biomass energy sources.

4.4.11 Sanitation and waste disposal

Use of proper sanitation facilities in some parts of the catchment is generally poor. The Rubanda District Statistical Abstract (UBOS 2017) indicate that 11.4% of households in Bufundi Sub County, 12.2 in Bubaare did not have a toilet facility. Ryakarimira Town Council was the worst

culprit with 14.3 % of the households not using toilet facilities, Kabale District Statistical Abstract (UBOS 2017). The foregoing finding implies that the households without a toilet facility either share or practice open defecation. Low sanitation coverage exposes the catchment inhabitants to health risks associated with poor sanitation e.g. cholera, diarrhoea, dysentery, etc. It also makes the open water sources vulnerable to faecal contamination as a result of open defecation. The rest of the Sub Counties were in the range of 1.1-2 % of households without toilet facilities.

Lack of sanitation and waste disposal facilities were observed at the Harutindo market at the tourism hub in Mwendo Parish, Kitumba Sub County. The market place has no proper public toilet, market vendors practice open defecation, a poorly constructed one stance latrine by the Sub County is in the middle of the market and another dilapidated pit latrine and urinal at the edge of the lake serve the market kiosks along the lake shore. All the human excreta in these pit latrines and urinals flow directly into the lake.

All solid wastes from the market and surrounding kiosks is disposed at shores and into the lake, there is lot of litter as there is no proper waste disposal facility or mechanism. Households close to the lake also dispose their waste directly into the lake. Stakeholders expressed fears that surrounding hotels and lodges could be disposing waste and discharging untreated effluents/sewage into the lake³. All these are potential sources of water pollution and health risks associated with poor sanitation and waste disposal. The makeshift market needs to be relocated to where all proper service facilities have been planned for.

The tourism stakeholders nonetheless mentioned that hotels and lodges were complying with Ministry of Tourism, Wildlife Antiquities (MTWA) standards (which include proper sewage and waste disposal) for health certification, the health certification audits are carried out annually by the ministry. Some of them were practicing composting of solid waste and burning.

The area manager National Water and Sewerage Corporation (NWSC) Kabale indicated that most of the users are doing onsite sewage management including the lodges at Lake Bunyonyi. NWSC at the station has limited capacity to monitor sewage management at the lake and in addition the sewage network cannot cover the lodges because of the terrain and unplanned development.

4.5 Strategic Social and Environment Assessment

The Strategic Social and Environmental Assessment (SSEA) is a participatory process that seeks to strengthen the integration of socio-economic and ecological aspects of water resource management. The overall purpose of the SSEA is to identify major social and environmental issues that must be taken into account in the planning process and that could inform the plans' outcome. The identified stakeholders, through a number of consultative meetings and key informant interviews helped to identify issues regarding natural resources management within the catchment.

³ The team was unable to verify these fears due to limited availability of information. This needs verification by the mandated and competent authorities

4.5.1 Key environmental and social issues/drivers

Population pressure is one of the major social factors within Lake Bunyonyi catchment. The current population of the catchment is concentrated around productive agricultural areas, trading centres, and water sources. Population growth leads to opening up of land, leading to resource use conflicts, over-exploitation of resources and encroachment into sensitive ecosystems such as wetlands and forests in search of alternative sources of livelihoods such as charcoal burning. Lack of an income means that communities remain trapped in a continuous cycle of poverty, leading to overexploitation of resources in search of sources of livelihoods. Other key catchment environment and social drivers include:

- Land ownership system and land fragmentation
- Land degradation and soil erosion
- Weak institutional coordination and enforcement
- Socio-cultural influences

Environmental and social issues and hotspot areas in the Sub Catchment were identified through holding KIIs and FGDs with various stakeholders and verified during transect walks and by observations. It was established that degradation of the Sub Catchment is manifested by wetland encroachment for crop cultivation, cultivation along hilly and mountainous areas resulting into soil erosion, siltation of the water sources, flooding and degraded ecosystems along the lake shores, Artisanal mining activities and indiscriminate waste disposal by various economic activities being undertaken along the lake shores such as markets and lodges.

Table 4-5 summarizes the key environmental and social issues in the catchment and their causes/drivers.

Table 4-5: Main environmental and social issues and impacts

No.	Issue	Impact
1.	Wetland encroachment and depletion along lakeshores	Loss of vegetation cover thus vulnerability to floods, drowning/loss of life, soil erosion, siltation, water contamination, deposition/removal of nutrients and soil, sedimentation, loss of ecosystem services, food insecurity, Environmental Water Requirements threatened
2.	Deforestation along mountainous/hilly areas	Soil erosion, landslides on steeper land, loss of soil fertility, deposition of nutrients and soil, sedimentation, drought, infrastructure deterioration, global warming, lack of resilience, food insecurity, loss of ecosystem services, water contamination, loss of income, reduced water infiltration
3.	Artisanal mining	Soil erosion, landslides, siltation, water contamination, sedimentation, infrastructure deterioration, ecosystem alteration and loss

4.	Indiscriminate waste disposal due to increased human settlements along lake shores, lodges and hotels	Water contamination, increased disease incidences, air pollution, sedimentation
5.	Motorcycle/motor vehicle washing bay	Water and air pollution, increased disease incidences, , sedimentation
6.	Institutional challenges due to lack of capacity, finance, failure to maintain infrastructure, enforcement of legislation, monitoring	Unable to implement plans and programs, environmental degradation, lack of compliance to legislation

4.5.2 Strengths, weaknesses, opportunities and threats

As part of the development of the SSEA for Lake Bunyonyi Sub Catchment, a Strength, Weaknesses, Opportunities and Threats (SWOT) analysis was conducted. The results of the SWOT analysis in addition to ESQOs provide a good basis for the development of interventions specific to Lake Bunyonyi Sub Catchment. Table 4-6 presents the results of the SWOT analysis.

Table 4-6: SWOT analysis for Lake Bunyonyi Sub Catchment

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Presence of natural habitats especially within tea and forestry plantations. • Presence of Muko Central Forest Reserve. • Presence of wetlands along the lakeshores providing diverse ecosystem services. • Presence of wildlife at Echuya Forest Reserve. • Presence of L. Bunyonyi with the 	<ul style="list-style-type: none"> • Dependence on rain-fed agriculture. • Poor infrastructure. • Long-term dependency on natural resources. • Unregulated artisanal mining • Limited law enforcement to govern NRM • None compliance to legislation that govern natural resources management 	<ul style="list-style-type: none"> • Interest by development partners on the Sub Catchment (i.e. EU, USAID, GIZ). • Eco-tourism potential • Small-scale irrigation agriculture. • Cash crop development. • Industrial development (processing). 	<ul style="list-style-type: none"> • Degraded natural resources specifically hilly and mountainous areas and lakeshores for crop cultivation. • Wetland and lake shores encroachment resulting to soil erosion, siltation and sedimentation of the lake. • Deforestation of hilly & mountainous areas.

<p>aquatic species-therein</p> <ul style="list-style-type: none"> • Presence of sand, rock and stones • Technical human resource availability at district and regional levels. 	<ul style="list-style-type: none"> • Limited institutional development • Poverty. 	<ul style="list-style-type: none"> • Developing sustainable businesses around fish farming). 	<ul style="list-style-type: none"> • Increased water demand due to increased population growth. • Climate change variability and their implications such as droughts and floods. • Siltation of the lake • Politics • Poverty levels in communities due to low incomes • Susceptibility to floods.
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Based on the above SWOT analysis, there is need to implement interventions that will improve on water quality and quantity, improve community livelihoods and ensure environmental sustainability.

5. OPTIONS AND SCENARIOS

5.1 Introduction

During the Sub Catchment stakeholder engagements of between 9th – 20th March 2020 in Kabale and Rubanda Districts, the stakeholders made suggestions for the vision and strategic objectives for Lake Bunyonyi Sub Catchment. Thereafter, stakeholders further supported the identification of intervention opportunities that contribute to achieving the strategic objectives. Lake Bunyonyi Sub Catchment is one of the Sub Catchments under Ruhezamyenda Catchment that make up part of the AWMZ thus the strategic objects and the options for the catchment management interventions for Ruhezamyenda Catchment have also been considered to arrive at the harmonised options.

Valuable contributions were also made by the stakeholders of Lake Bunyonyi Sub Catchment from the eight Sub Counties in form of working groups at the eight Sub County offices between 27th – 30th July 2020 during the presentation of the SCMP. Furthermore, a workshop to discuss the SCMP was held on 31st July 2020 at Kabale and was attended by representatives of various stakeholders from Kabale and Rubanda Districts (including local government officials, academicians, media, NGOs, Tourism etc).

In this options and scenarios chapter, the vision and strategic objectives are presented and the options for the Sub Catchment management interventions that respond to the identified issues are elaborated. Through a scenario analysis the ideal combination of interventions is determined.

5.2 Vision and Strategic Objectives

The following Sub Catchment vision was formulated during Sub Catchment stakeholder engagement meetings carried out between 9th – 20th March 2020. Lake Bunyonyi Sub Catchment Vision is:

To be a sustainably managed Sub Catchment that promotes socio-economic development while providing healthy ecosystem services.

Similarly, the following three strategic objectives were formulated from different suggestions proposed during Sub Catchment stakeholder meetings held between 9th – 20th March 2020.

- (i). Strategic Objective 1: To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination.
- (ii). Strategic Objective 2: To protect, conserve and restore the Sub Catchment for provision of sustainable ecosystem services and infrastructure.
- (iii). Strategic Objective 3: To ensure sustainable use and development of water resources within the Sub-Catchment.

5.3 Options and Scenarios

5.3.1 Options

To achieve the vision and strategic objectives, there is need to undertake measures which address the main issues and reverse those trends that undermine sustainable development in the Sub Catchment. These measures are called **options**. Based on the established issues in the catchment, a number of options including corresponding investment/management actions for addressing the issues were proposed during Sub Catchment stakeholder meetings. The detailed options and investment/management actions are presented under their corresponding strategic objectives in Tables 5-1, 5-2 and 5-3

Table 5-1: Detailed options and investment/management actions for Strategic Objective 1

Strategic Objective 1: To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination.			
Issue	Causes/Drivers	Options	Actions
1. Poor access to safe water supply	1.1 Variability in water quantity, quality and non-functionality of water supply points.	1.1.1 Sensitization of stakeholders (end users, WUCs, etc.) on proper use and maintenance of water supply infrastructure.	Undertake quarterly radio talk shows in each of the 2 districts. Hold quarterly meetings with WUCs in each of the 2 districts. Prepare and distribute IEC (posters, fliers) materials.
	1.2 Reliance on technologies that require high capital and maintenance costs.	1.2.1 Synergize with relevant institutions (e.g. consultancy firms, contractors, academia, etc.) to adopt low cost and maintenance technologies.	Undertake annual trainings (approx. 25 pax) per training. Establish low cost demonstration sites for community uptake.
2. Poor access to improved sanitation facilities	2.1 Lack of awareness	2.1.1 Sensitize communities on good sanitation and hygiene practices.	Undertake monthly radio talk shows in each of the 2 districts. Prepare and distribute IEC (posters, fliers) materials.
		2.1.2 Development of sanitation bye-laws	Draft and approve sanitation bye-laws for each of the 2 districts.
		2.1.3 Strengthen the enforcement of the Public Health Act (2000) and specific sanitation bye-laws.	Undertake annual inspections for each property (30 HHs per day).
3. Lack of access to markets	3.1 Poor market information flow and organization of farmers		Undertake quarterly radio talk shows in each of the 2 districts.

Strategic Objective 1: To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination.			
Issue	Causes/Drivers	Options	Actions
4. Low agricultural productivity	4.1 Lack of appropriate farming skills and knowledge	3.1.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers)	Prepare and distribute IEC (posters, fliers) materials in each of the 8 sub counties.
		3.1.2 Strengthening and formation of Farmer Associations	Constitute a farmers' association at each of the 8 sub counties.
		3.1.3 Adoption and use of ICT in agriculture e.g. mobile phones, radios, computers, drones, etc.	Train and equip farmer groups and extension workers at Sub County level.
		4.1.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers).	Undertake quarterly radio talk shows in each of the 2 districts.
		4.1.2 Strengthen research-farmer and extension linkages.	Prepare and distribute IEC (posters, fliers) materials in each Sub County.
			Undertake trainings (15 pax) for farmer groups at sub-county level twice a year.
4.2 Limited access to quality agricultural inputs e.g. seeds, agrochemicals, breeds, etc.	4.2.1 Provision of improved seed, agrochemicals, breeds, etc.	Establish demonstration farms at Sub-County level.	Establish a tree nursery at Sub-County level.
		Establish community seed production at Sub County level.	Establish a livestock breeding facility at Sub County level.

Strategic Objective 1: To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination.			
Issue	Causes/Drivers	Options	Actions
	4.3 Limited access to mechanization (e.g. use of tractors, harvesters etc.)	4.3.1 Provision of mechanical equipment e.g. tractors, harvesters etc. 4.3.2 Capacity development for farmers in productive use of machinery.	Establish mechanical equipment hire service stations at the district. Undertake annual training (15 pax) for farmer groups at Sub County level.
	4.4 Lack of access to financial services/credit	4.4.1 Formation of savings and credit schemes e.g. SACCOs and VSLAs. 4.4.2 Build capacity of farmers in record keeping, financial literacy and business planning so that they can easily access credit from financial institutions. 4.4.3 Foster partnerships between farmer associations and financing institutions to enhance access to credit (by farmers) and business opportunities (by financial institutions).	Formation of a SACCO at Sub County level. Undertake annual trainings (approx. 50 pax per training). Organise annual agricultural shows. Establish green enterprise clinics forum At Sub County level.
5. Limited value addition to agricultural products	5.2 Lack of agro-processing industries.	5.2.1 Establishment of agro-processing facilities 5.2.2 Sensitize farmers/farmer groups on the need for commercial production, benefits of economies of scale and collective bargaining.	Establishment of an agro-processing facility at Sub County level. Undertake annual trainings (approx. 50 pax per training)

Strategic Objective 1: To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination.			
Issue	Causes/Drivers	Options	Actions
		5.2.3 Promote collaboration amongst various actors in the agriculture value chain.	Enhance collaboration through organised annual agricultural shows.
	5.3 Lack of technical skills and knowledge in value addition.	5.3.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers).	Undertake trainings (50 pax) for farmer groups at Sub-County level annually.
6. Poor quality agricultural products	6.1 Poor pre- and post-harvest handling	6.1.1 Training in pre- and post-harvest handling (e.g. timing, packaging, transportation, etc.)	Undertake trainings (50 pax) for farmer groups at Sub-County level annually.
	6.2 Poor agricultural inputs (e.g. seeds, agrochemical, etc.)	6.2.1 Collaboration with NDA, UNBS, UNADA, etc. to promote only standard agricultural inputs.	Undertake trainings (50 pax) for agro input dealers at Sub-County level annually.
7. Deforestation along hilly and mountainous areas	7.1 Lumbering, charcoal burning, firewood, land clearing for agricultural activities.	7.1.1 Sensitization of private forest owners about relevant laws and regulations. 7.1.2 Strengthen the enforcement of existing regulations for timber production.	Hold annual meetings (50 pax) with private forest owners at Sub-County level. Undertake annual inspections in privately owned forests in each Sub-County.
8. Wetland encroachment	8.1 Agricultural activities, population dynamics/Illegal housing settlements, Illegal water use, alcohol brewing, Eucalyptus woodlots and brick-making.	8.1.1 Sensitization of communities about wetland conservation and utilization. 8.1.2 Strengthen the enforcement of relevant laws and regulations.	Hold quarterly radio talk shows at district. Hold sensitization meetings for communities twice a year. Undertake quarterly inspections of gazetted wetlands at district level.

Strategic Objective 1: To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination.			
Issue	Causes/Drivers	Options	Actions
9. Lakeshores encroachment	8.2 Weak enforcement of laws on wetland conservation	8.2.1 Strengthen the enforcement of relevant laws and regulations.	Hold sensitization meetings for local authorities once a year.
	9.1 Agricultural activities (crop cultivation, livestock grazing and watering), illegal water use, alcohol brewing, Eucalyptus woodlots, brick-making, washing bays & mining (sand and stones)	9.1.1 Sensitization of communities about lakeshores protection.	Undertake quarterly radio talk shows at district level. Hold sensitization meetings for communities twice a year.
10. Flooding	9.2 Weak enforcement of applicable laws/bye-laws	9.1.2 Strengthen the enforcement of relevant laws and regulations.	Undertake quarterly inspections of gazetted wetlands at district level.
	10.1 Wetland/lakeshores encroachment	9.2.1 Strengthen the enforcement of relevant laws and regulations.	Hold sensitization meetings for local authorities once a year.
11. Droughts	11.1 Deforestation	10.1.1 Sensitization of communities about wetland conservation and lakeshores protection.	Undertake radio talk shows twice a year. Hold sensitization meetings twice a year.
		10.1.2 Strengthen the enforcement of relevant laws and regulations.	Undertake quarterly inspections of gazetted wetlands/lakeshores.
11.2 Wetland degradation	11.2 Wetland degradation	11.1.1 Sensitization of communities about forest conservation	Undertake radio talk shows twice a year. Hold sensitization meetings twice a year.
		11.1.2 Strengthen the enforcement of laws on forest conservation	Undertake quarterly inspections of forests.
		11.2.1 Sensitization of communities about wetland conservation	Conduct radio talk shows twice a year.

Strategic Objective 1: To enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination.			
Issue	Causes/Drivers	Options	Actions
12. Soil erosion	12.1 Deforestation	14.2.2 Strengthen the enforcement of laws on wetland conservation	Hold sensitization meetings twice a year.
		12.1.1 Sensitization of communities about forest conservation	Undertake quarterly inspections of gazetted wetlands. Undertake radio talk shows twice a year. Prepare & distribute IEC (posters, flyers) materials.
13. Climate change	12.2 Poor farming methods	12.2.1 Training of farmers in effective soil and water conservation practices	Undertake pre-season training of farmers in effective soil and water conservation practices.
		13.1.1 Sensitization of communities about the causes and effects of climate change.	Undertake radio talk shows twice a year. Prepare & distribute IEC (posters) materials.
		13.1.2 Enforcement of applicable laws	Undertake annual inspections on industrial emissions.

Table 5-2: Detailed options and investment/management actions for Strategic Objective 2

Strategic Objective 2: To protect, conserve and restore the Sub Catchment for provision of sustainable ecosystem services and infrastructure.			
Issue	Causes/Drivers	Options	Actions
1. Poor access to safe water	1.1 Variability in water quantity, quality and non-functionality of water supply points.	1.1.1 Development of site-specific water source protection plans.	Preparation of water source protection plans. Implementation of water source protection plans.
		2.1 High capital costs	Design & construction of low-cost improved sanitation facilities for public places such as markets, parks, institutions, etc. Design & construction of shared faecal sludge treatment facilities in selected Town Councils. Provision of 5m ³ cesspool emptying trucks.
2. Limited access to improved sanitation systems.		3.1.1 Afforestation	Tree growing
		3.1.2 Restoration of degraded forest.	Tree growing.
		3.1.3 Promote alternative livelihood sources.	Establishment of ecotourism sites. Establishment of fish farms. Establishment of poultry farms.
3. Deforestation along hilly and mountainous areas	3.1 Lumbering and Tree clearing for agricultural use, Mining (sand, stone quarrying, etc.), pole harvesting, charcoal and firewood		

Strategic Objective 2: To protect, conserve and restore the Sub Catchment for provision of sustainable ecosystem services and infrastructure.			
Issue	Causes/Drivers	Options	Actions
4. Wetland encroachment.	4.1 Agricultural activities, live-stock watering, illegal housing settlements, illegal water use, alcohol brewing, eucalyptus woodlots and brick-making.	3.1.4 Promoting energy saving cooking stoves 4.1.1 Restoration and protection of wetlands.	Establishment of Apiary (bee-keeping) farms. Piggery and handicraft Establishment of cattle farms. Install demonstration stoves. Demarcation of boundaries for permanent and seasonal wetlands (using concrete pillars). Identify and clear all Eucalyptus woodlots and other invasive species from permanent wetlands. Installation of watering troughs. Ecotourism sites. Poultry and piggery farms Apiary (Bee-keeping) farms Cattle farms
5. Lakeshore encroachment.	5.1 Agricultural activities, live-stock watering, illegal housing settlements, illegal water use, alcohol brewing, eucalyptus woodlots, sand mining, stone quarrying and brick-making.	4.1.2 Promote alternative livelihood sources for at least 5 groups around encroached wetlands. 5.1.1 Restoration and protection of lakeshores.	Demarcation of lakeshores buffer zones (using bamboo). Identify and clear all eucalyptus woodlots and other invasive species along the lakeshores. Planting of indigenous plants e.g. elephant grass. Installation of watering troughs.

Strategic Objective 2: To protect, conserve and restore the Sub Catchment for provision of sustainable ecosystem services and infrastructure.			
Issue	Causes/Drivers	Options	Actions
			Establishment of gazetted car/motor cycle washing facilities. Lakeshores stabilization using gabions.
6. Droughts	6.1 Changing weather patterns.	6.1.1 Afforestation	Tree growing- approximately 10 indigenous drought resistant fruit trees per HH.
7. Soil erosion	7.1 Loss of vegetation cover and poor farming practices.	7.1.1 Terracing, stone bands, infiltration ditches, etc.	Establish demonstration sites.

Table 5-3: Detailed options and investment/management actions for Strategic Objective 3

Strategic Objective 3: To ensure sustainable use and development of water resources within the sub-catchment.			
Issue	Causes/Drivers	Options	Actions
1. Poor access to safe water supply.	1.1 Variability in water quantity, quality and non-functionality of water supply points.	1.1.1 Establish/enhance water supply infrastructure.	Design and construct water supply systems in each Village. Design and install rainwater harvesting systems (plastic, concrete or steel tanks). Rehabilitate malfunctioned protected springs, shallow wells, deep boreholes & RWHTs
2. Low agricultural productivity.	2.1 Limited water supply and climate variability	2.1.1 Establish small-scale solar-powered irrigation systems.	Construct (4,000m ³ capacity) valley tank, install solar-powered pump, overhead tank, and distribution system at each encroached wetland.
		2.1.2 Promote alternative livelihood sources.	Construct 4 No. fish ponds each approximately 1,000m ² and 1.5m deep.

5.3.2 Scenarios

A set of options combined with external factors, government policies, ongoing trends and projections for the future then form a scenario. Thus, a scenario analysis was undertaken to assess the “behavior” and impact of sets of options under certain expected circumstances or trends. Such analysis aims to select or prioritize those sets of options that counter certain negative trends or accelerate positive trends. Two scenarios were formulated envisioning different states of the catchment and these were:

5.3.2.1 Scenario 1: Water Resources Development

This scenario envisages the status quo in 2040 with minimal efforts towards ecosystem protection and conservation. Thus, the scenario is more focused on realizing Strategic Objective 3: “ensure sustainable use and development of water resources within the catchment”.

5.3.2.2 Scenario 2: Ecosystem Protection and Restoration

This scenario envisages investments towards ecosystem protection and restoration with planned water resources infrastructure development in 2040. Thus, this scenario aims to realize restoration of all degraded wetlands, hilly/mountainous areas and lakeshores by the year 2040. This scenario encompasses all the three strategic objectives (Strategic Objectives 1, 2 and 3). For both scenarios, the impacts of climate change high emission scenario were considered.

5.3.2.3 Evaluated scenarios

Two scenarios were formulated envisioning different states of the Sub Catchment and these were:

- Scenario 1: Water Resources Development
- Scenario 2: Ecosystem Protection and Restoration

Multi-criteria analysis (MCA) was used in the scenario evaluation. MCA establishes preferences between scenarios by reference to an explicit set of objectives identified. Measurable indicators grouped into economic, social and environmental factors were established and used to evaluate the two scenarios. Table 5-4 below summarises the categorization and description of the indicators used.

Table 5-4: Indicators used for Scenario Evaluation

Group	Indicator	Description
Social	1) Water availability	Volume of water in valley tanks provided
	2) Water source protection Plan Implemented	Number of water Source Protection Plans (WSPPs) Implemented
	3) Improved farming methods	Number of demonstration farms established
	4) Displaced people	Number of people displaced from gazetted wetlands and lakeshores
Economic	1) Cost difference	Cost under each scenario
	2) Irrigation	Area of land irrigated
	3) Eco-tourism sites	Annual income from ecotourism

Environmental	1)	Wetland area restored	Hectares restored
	2)	Lakeshores length restored	Hectares restored
	3)	Forest area restored	Hectares restored
	4)	Tree growing on private area	Hectares of trees of planted on private land

The weighted average method of the MCA was used. The relative merits of indicators under each group were expressed in numeric form, ranging from zero, for very unfavourable characteristics to 100 for very favourable ones. The scores were based on the indicator values under each scenario presented in Table 5-5. The scenario with better indicator value received a higher score based on expert judgement. The scenario presenting an indicator with a high value and contributing a positive impact like water availability scored highest (100) and that with no positive impact scored lowest (0). The indicator values for each scenario and the respective scores are presented in Table 5-5.

The social group was assigned a weight of 40 and four indicators were identified and used to evaluate the scenarios for the social group. Each of the four indicators was assigned equal weight of 10. The economic group was assigned a weight of 30 and three indicators were identified and used to evaluate the scenario and these were cost difference, irrigation and ecotourism which were assigned a weight of 15, 8 and 7 respectively. The cost difference was based on the cost required to implement each of the scenarios. Also, four indicators were identified for the environmental group and these were wetland area restored, lakeshores length restored, forest area restored, and Tree growing on private land and each was assigned a score of 7 apart from planting of trees on private land that scored 9. It should be noted that the cost of implementing scenario 2 is higher than that of implementing scenario 1.

Table 5-5: Value of Indicators Against Each Scenario

Group	Indicator	Indicator Values		Scores		Weight (%)	Weighted Score	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2		Scenario 1	Scenario 2
Social	Water availability	25,000M ³	0	100	0	8	8	2
	WSPPs implemented	0	30	0	100	12	0	8
	Improved farming methods	0	26	0	100	10	0	8
	Displaced people	0	4,500	100	0	10	10	2
Economic	Cost difference	4,200,000	8,300,000	65	10	15	10.5	2.5
	Irrigation	1,200 Ha	0	100	0	10	6	0
	Ecotourism sites	0	\$35,000	0	100	5	0	8
Environmental	Wetland area restored	0	12,000 Ha	0	100	5	0	9
	Lakeshores length restored	0	850 Ha	0	100	5	0	9
	Forest area restored	0	225 Ha	0	100	5	0	9
	Tree growing on private land	0	125 Ha	0	100	15	0	8
	Total						100	34.5

An arithmetic was done from Table 5-5. For each scenario an overall merit score was calculated as the weighted average of its scores under the different indicators. At the end the table, the ranking representing the results of the multi-criteria analysis is presented for the prioritization of the scenarios. In this case, scenario 2 had the higher score (65.5) than scenario 1 (34.5) and therefore, scenario 2 should be prioritised.

6. A COSTED IMPLEMENTATION PLAN

6.1 Investment Plan

The costs for the implementation of various investment and management actions were developed to facilitate the analysis of the options for the Lake Bunyonyi sub-catchment. The costing was done for strategic planning purposes to provide necessary information for accurately estimating individual options and their investment/management actions. The unit costs (USD) used in computing the line totals are summarised in Appendix 6 while the costing of the investment/management actions is presented in Table 6-1 to

Table 6-3. The proposed locations where the investment and management interventions are to be implemented are shown in Appendix 2.

Table 6-1: Costing of Investment and Management Actions for Strategic Objective 1

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
1.1.1 Sensitization of stakeholders (end users, WUCs, etc.) on proper use and maintenance of water supply infrastructure.	Undertake quarterly radio talk shows.	Number	8	100	800	0	0	800
	Hold quarterly meetings with WUCs.	Number	4	3,500	7,000	7,000	0	14,000
	Prepare and distribute IEC (posters, flyers) materials.	Number	85	100	4,250	4,250	0	8,500
1.2.1 Synergize with relevant institutions (e.g. consultancy firms, contractors, academia, etc.) to adopt low cost and maintenance technologies.	Undertake annual trainings (approx. 50 pax) per training	Number	1	3,500	3,500	0	0	3,500

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
2.1.1 Sensitize communities on good sanitation and hygiene practices.	Undertake monthly radio talk shows in each of the 2 districts.	Number	24	100	1,200	600	600	2,400
	Prepare and distribute IEC (posters, flyers) materials.	Number	85	100	4,250	4,250	0	8,500
2.1.2 Development of sanitation bye-laws	Draft and approve sanitation bye-laws for each District.	Number	2	12,000	12,000	6,000	6,000	24,000
2.1.3 Strengthen the enforcement of the Public Health Act (2000) and specific sanitation bye-laws.	Undertake annual inspections for each property (10HH per village).	Number	1,200	2	1,200	1,200	0	2,400
3.1.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers)	Undertake quarterly radio talk shows in each of the 2 districts.	Number	8	100	800	0	0	800
	Prepare and distribute IEC (posters, flyers) materials in each Sub County.	Number	8	100	800	0	0	800
3.1.2 Strengthening and formation of Farmer Associations	Constitute a farmers' association at each Sub County.	Number	4	2,500	5,000	5,000	0	10,000
3.1.3 Adoption and use of ICT in agriculture e.g. mobile phones, radios, computers, drones, etc.	Train and equip farmer groups and extension workers at sub-county level.	Number	4	3,900	7,800	7,800	0	15,600
	Undertake quarterly radio talk shows.	Number	8	100	800	0	0	800

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
4.1.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers).	Prepare and distribute IEC (posters, flyers) materials in each Sub County.	Number	8	100	800	0	0	800
	Undertake trainings (15 pax) for farmer groups at sub-county level twice a year.	Number	4	1,050	4,200	0	0	4,200
4.1.2 Strengthen research-farmer and extension linkages.	Establish demonstration farms at sub-county level.	Number	4	12,000	24,000	24,000	0	48,000
4.2.1 Provision of improved seed, agrochemicals, breeds, etc.	Establish a tree nursery at sub-county level.	Number	4	15,000	30,000	30,000	0	60,000
	Establish community seed production at Sub County level.	Number	4	3,000	6,000	6,000	0	12,000
4.3.1 Provision of mechanical equipment e.g. tractors, harvesters, weeders, etc.	Establish a livestock breeding facility at Sub County level.	Number	4	5,000	10,000	10,000	0	20,000
	Establish mechanical equipment hire service stations at the district each equipped with 2 tractors, 1 combined harvester, 10 agricultural weeders, 10 grain sorting machines and 10 corn removing machines.	Number	2	800,000	800,000	800,000	0	1,600,000

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
4.3.2 Capacity development for farmers in productive use of machinery.	Undertake annual training (15 pax) for farmer groups at Sub County level.	Number	8	1,050	4,200	4,200	0	8,400
4.4.1 Formation of savings and credit schemes e.g. SACCOs and VSLAs.	Formation of a SACCO at Sub County level.	Number	4	2,500	5,000	5,000	0	10,000
4.4.2 Build capacity of farmers in record keeping, financial literacy, business planning so that they can easily access credit from financial institutions.	Undertake annual trainings (approx. 50 pax per training).	Number	4	3,500	7,000	7,000	0	14,000
4.4.3 Foster partnerships between farmer associations and financing institutions to enhance access to credit (by farmers) and business opportunities (by financial institutions).	Organize annual agricultural shows.	Number	1	30,000	15,000	7,500	7,500	30,000
5.2.1 Establishment of agro-processing facilities.	Establishment of an agro-processing facility at Sub County level equipped with grain processing, milk processing/packaging, meat processing/packaging	Number	4	180,000	360,000	360,000	0	720,000

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
	and fish processing/packaging plants.							
5.2.2 Sensitize farmers/farmer groups on the need for commercial production, benefits of economies of scale and collective bargaining.	Undertake annual trainings (approx. 50 pax per training)	Number	4	3,500	7,000	7,000	0	14,000
5.2.3 Promote collaboration amongst various actors in the agriculture value chain.	Enhance collaboration through organized annual agricultural shows.	Number	1	3,500	3,500	0	0	3,500
5.3.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers).	Undertake trainings (50 pax) for farmer groups at sub-county level annually.	Number	4	3,500	7,000	7,000	0	14,000
6.1.1 Training in pre- and post-harvest handling (e.g. timing, packaging, transportation, etc.)	Undertake trainings (50 pax) for farmer groups at sub-county level annually.	Number	4	3,500	7,000	7,000	0	14,000
6.2.1 Collaboration with NDA, UNBS, UNADA, etc. to promote only standard agricultural inputs.	Undertake trainings (50 pax) for agro input dealers at sub-county level annually.	Number	4	3,500	7,000	7,000	0	14,000
7.1.1 Sensitization of private forest owners about relevant laws and regulations.	Hold annual meetings (50 pax) with private forest owners at sub-county level.	Number	4	3,500	7,000	7,000	0	14,000

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
7.1.2 Strengthen the enforcement of existing regulations for timber production.	Undertake annual inspections in privately owned forests in each sub-county.	Number	8	600	2,400	1,200	1,200	4,800
8.1.1 Sensitization of communities about wetland conservation and utilization.	Hold quarterly radio talk shows at district.	Number	8	100	800	0	0	800
	Hold sensitization meetings for communities twice a year.	Number	4	3,500	7,000	7,000	0	14,000
8.1.2 Strengthen the enforcement of relevant laws and regulations.	Undertake quarterly inspections of gazetted wetlands at district level.	Number	16	600	4,800	4,800	0	9,600
8.2.1 Strengthen the enforcement of relevant laws and regulations.	Hold sensitization meetings for local authorities once a year.	Number	2	3,500	3,500	1,750	1,750	7,000
9.1.1 Sensitization of communities about lakeshores protection.	Undertake quarterly radio talk shows at district level.	Number	8	100	800	0	0	800
	Hold sensitization meetings for communities twice a year.	Number	4	3,500	7,000	7,000	0	14,000
9.1.2 Strengthen the enforcement of relevant laws and regulations.	Undertake quarterly inspections of gazetted wetlands at district level.	Number	8	1,000	8,000	0	0	8,000
9.2.1 Strengthen the enforcement of relevant laws and regulations.	Hold sensitization meetings for local authorities once a year.	Number	4	3,500	7,000	7,000	0	14,000

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
10.1.1 Sensitization of communities about wetland conservation and lakeshores protection.	Undertake radio talk shows twice a year.	Number	4	100	400	0	0	400
	Hold sensitization meetings twice a year.	Number	4	3,500	7,000	7,000	0	14,000
10.1.2 Strengthen the enforcement of relevant laws and regulations.	Undertake quarterly inspections of gazetted wetlands/lakeshores.	Number	8	1,000	4,000	2,000	2,000	8,000
11.1.1 Sensitization of communities about forest conservation	Undertake radio talk shows twice a year.	Number	4	100	400	0	0	400
	Hold sensitization meetings twice a year.	Number	4	3,500	7,000	7,000	0	14,000
1.1.2 Strengthen the enforcement of laws on forest conservation	Undertake quarterly inspections of forests.	Number	8	1,000	4,000	2,000	2,000	8,000
11.2.1 Sensitization of communities about wetland conservation	Undertake radio talk shows twice a year.	Number	4	100	400	0	0	400
	Hold sensitization meetings twice a year.	Number	4	3,500	7,000	7,000	0	14,000
11.2.2 Strengthen the enforcement of laws on wetland conservation	Undertake quarterly inspections of gazetted wetlands.	Number	8	1,000	4,000	2,000	2,000	8,000
	Undertake radio talk shows twice a year.	Number	4	100	400	0	0	400
12.1.1 Sensitization of communities about forest conservation	Prepare & distribute IEC (posters, fliers) materials.	Number	85	100	4,250	4,250	0	8,500

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
12.2.1 Training of farmers in effective soil and water conservation practices	Undertake pre-season training of farmers in effective soil and water conservation practices.	Number	4	3,500	7,000	7,000	0	14,000
	Undertake radio talk shows twice a year.	Number	4	100	400	0	0	400
12.1.1 Sensitization of communities about the causes and effects of climate change.	Prepare & distribute IEC (posters, fliers) materials.	Number	8	100	800	0	0	800
	Undertake annual inspections on hotels/lodges emissions.	Number	8	1,150	4,600	2,300	2,300	9,200
12.1.2 Enforcement of applicable laws								
GRAND TOTAL					1,447,050	1,394,100	25,350	2,866,500

Table 6-2: Costing of Investment and Management Actions for Strategic Objective 2

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
1.1.1 Development of site-specific water source protection plans.	Preparation of water source protection plans.	Number	20	10,000	100,000	100,000	0	200,000
	Implementation of water source protection plans.	Number	20	25,000	250,000	250,000	0	500,000
2.1.1 Improvement of access to sanitation facilities.	Design & construction of low-cost improved sanitation facilities for public places such as markets, parks, institutions, etc.	Number	20	4,000	40,000	40,000	0	80,000

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
	Design & construction of shared faecal sludge treatment facilities in selected Town Councils/Areas.	Number	2	60,000	60,000	60,000	0	120,000
	Procurement of 5m ³ cesspool emptying trucks.	Number	2	60,000	60,000	60,000	0	120,000
3.1.1 Afforestation	Tree growing	Ha	225	600	67,500	67,500	0	135,000
3.1.2 Restoration of degraded forest	Tree growing	Ha	125	600	37,500	37,500	0	75,000
3.1.3 Promote alternative livelihood sources.	Establishment of ecotourism sites each having 30 accommodation units, an office, bar and restaurant.	Number	8	310,000	1,240,000	750,000	490,000	2,480,000
	Establishment of fish farms each having 4 ponds (@1.5m deep, 25m wide and 40m long)	Number	16	60,000	480,000	480,000	0	960,000
	Establishment of poultry farms with a capacity of 1,000 layers each.	Number	25	8,000	100,000	100,000	0	200,000
	Establishment of Apiary (bee-keeping) farms.	Number	25	450	11,250	0	0	11,250
	Establishment of cattle farms.	Number	25	4,200	52,500	52,500	0	105,000

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
3.1.4 Promoting energy saving cooking stoves	Install demonstration stoves.	Number	100	25	2,500	0	0	2,500
	Demarcation of boundaries for permanent and seasonal wetlands (using concrete pillars).	Number	3,240	80	129,600	110,600	19,000	259,200
4.1.1 Restoration and protection of wetlands.	Identify and clear all eucalyptus woodlots and other invasive species from permanent wetlands.	Ha	420	300	63,000	43,000	20,000	126,000
	Installation of watering troughs.	Number	20	250	2,500	2,500	0	5,000
	Ecotourism sites.	Number	8	310,000	1,240,000	1,240,000	0	2,480,000
	Poultry farms	Number	50	8,000	200,000	185,000	15,000	400,000
	Apiary (Bee-keeping) farms	Number	50	450	11,250	7,250	4,000	22,500
	Cattle farms	Number	50	4,200	105,000	8,000	97,000	210,000
5.1.1 Restoration and protection of lakeshores.	Demarcation of lakeshores buffer zones (using bamboo).	Km	488	600	146,250	126,250	20,000	292,500
	Identify and clear all eucalyptus woodlots and other invasive species along the lakeshores.	Ha	98	300	22,000	5,000	2,250	29,250

Option	Action	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
	Planting of indigenous plants e.g. elephant grass.	Ha	116	40	4,640	0	0	4,640
	Installation of watering troughs.	Number	10	250	2,500	0	0	2,500
	Establishment of gazetted car/motor cycle washing facilities (per Sub County) .	Number	8	2,000	16,000	0	0	16,000
	Lakeshores stabilization using gabions.	m ²	63	70	4,375	0	0	4,375
6.1.1 Afforestation	Tree growing- approximately 10 indigenous drought resistant fruit trees per HH.	Number	112	1.5	167	0	0	167
7.1.1 Terracing, stone bands, infiltration ditches, etc.	Establish demonstration sites.	Number	8	80,250	642,000	0	0	642,000
GRAND TOTAL					5,090,532	3,725,100	667,250	9,482,882

Table 6-3: Costing of Investment and Management Actions for Strategic Objective 3

Options	Actions	Unit	Quantity	Unit Cost (USD)	2020-2025	2025-2030	2030-2040	Line Total (USD)
1.1.1 Establish/enhance water supply infrastructure.	Design and construct water supply systems in each Village.	Number	223	7,000	780,500	700,500	80,000	1,561,000
	Design and install rainwater harvesting systems (plastic, concrete or steel tanks).	Number	223	1,500	167,250	147,250	20,000	334,500
	Install & rehabilitate malfunctioned protected springs, shallow wells, deep boreholes & RWHTs.	Number	223	550	61,325	61,325	0	122,650
2.1.1 Establish small-scale solar-powered irrigation systems.	Construct (4,000m ³ capacity) valley tank, install solar-powered pump, overhead tank, and distribution system at each encroached wetland (2 per Sub County).	Number	8	72,000	288,000	288,000	0	576,000
2.1.2 Promote alternative livelihood sources.	Construct 4 No. fish ponds each approximately 1,000m ² and 1.5m deep (4,000x16)	m ²	64,000	15	480,000	480,000	0	960,000
GRAND TOTAL					1,777,075	1,677,075	100,000	3,554,150

Overall, 15,903,532 USD is needed to implement the SCMP for Lake Bunyonyi.

Table 6-4: Summary of the Total Cost of Investment and Management Actions for SCMP for Lake Bunyonyi

Strategic Objectives	2020-2025	2025-2030	2030-2040	Line Total (USD)
Enhance sustainable utilization of natural resources within the Sub Catchment through awareness creation, capacity building, law enforcement and institutional coordination	1,447,050	1,394,100	25,350	2,866,500
Protect, conserve and restore the Sub Catchment for provision of sustainable ecosystem services	5,090,532	3,725,100	667,250	9,482,882
Ensure sustainable use and development of water resources within the sub-catchment	1,777,075	1,677,075	100,000	3,554,150
GRAND TOTAL	8,314,657	6,796,275	792,600	15,903,532

6.2 Implementation Plan for Lake Bunyonyi SCMP

The implementation plan assigns each investment or management action to one or more stakeholders. The implementation time-frame for particular actions will either be short-term (2020-2025), medium-term (2025-2035) or long-term (2035-2040) as provided under Tables 6-1 to Table 6-4. The proposed implementation plans for each of the investment and management actions under the respective strategic objectives are shown in Table 6-5 to Table 6-7.

Table 6-5: Implementation Plan for the Investment and Management Actions under Strategic Objective 1

Option	Action	Responsibility
1.1.1 Sensitization of stakeholders (end users, WUCs, etc.) on proper use and maintenance of water supply infrastructure.	Undertake quarterly radio talk shows in each of the 2 districts.	District Water Office (DWO)
	Hold quarterly meetings with WUCs in each of the 2 districts.	DWO
	Prepare and distribute IEC (posters, fliers) materials.	DWO
1.2.1 Synergize with relevant institutions (e.g. consultancy firms, contractors, academia, etc.) to adopt low cost and maintenance technologies.	Undertake annual trainings (approx. 50 pax) per training	DWO
2.1.1 Sensitize communities on good sanitation and hygiene practices.	Undertake monthly radio talk shows in each of the 2 districts.	District Health Depts. (DHDS)

Option	Action	Responsibility
	Prepare and distribute IEC (posters, fliers) materials.	DHDs
2.1.2 Development of sanitation bye-laws	Draft and approve sanitation bye-laws for each District.	DHDs
2.1.3 Strengthen the enforcement of the Public Health Act (2000) and specific sanitation bye-laws.	Undertake annual inspections for each property (HH).	DHDs
3.1.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers)	Undertake quarterly radio talk shows in each of the 2 districts.	District Production Department (DPD)
	Prepare and distribute IEC (posters, fliers) materials in each Sub County.	DPD
3.1.2 Strengthening and formation of Farmer Associations	Constitute a farmers' association at each Sub County.	DPD
3.1.3 Adoption and use of ICT in agriculture e.g. mobile phones, radios, computers, drones, etc.	Train and equip farmer groups and extension workers at sub-county level.	DPD
4.1.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers).	Undertake quarterly radio talk shows in each of the 2 districts.	DPD
	Prepare and distribute IEC (posters, fliers) materials in each Sub County.	DPD
	Undertake trainings (15 pax) for farmer groups at sub-county level twice a year.	DPD
4.1.2 Strengthen research-farmer and extension linkages.	Establish demonstration farms at sub-county level.	DPD
4.2.1 Provision of improved seed, agrochemicals, breeds, etc.	Establish a tree nursery at sub-county level.	DPD
	Establish community seed production at Sub County level.	DPD
	Establish a livestock breeding facility at Sub County level.	DPD
4.3.1 Provision of mechanical equipment e.g. tractors, harvesters, weeders, etc.	Establish mechanical equipment hire service stations at the district.	DPD
4.3.2 Capacity development for farmers in productive use of machinery.	Undertake annual training (15 pax) for farmer groups at Sub County level.	DPD

Option	Action	Responsibility
4.4.1 Formation of savings and credit schemes e.g. SACCOs and VSLAs.	Formation of a SACCO at Sub County level.	DPD
4.4.2 Build capacity of farmers in record keeping, financial literacy, and business planning so that they can easily access credit from financial institutions.	Undertake annual trainings (approx. 50 pax per training).	DPD
4.4.3 Foster partnerships between farmer associations and financing institutions to enhance access to credit (by farmers) and business opportunities (by financial institutions).	Organize annual agricultural shows.	DPD
5.2.1 Establishment of agro-processing facilities.	Establishment of an agro-processing facility at Sub County level.	DPD
5.2.2 Sensitize farmers/farmer groups on the need for commercial production, benefits of economies of scale and collective bargaining.	Undertake annual trainings (approx. 50 pax per training)	DPD
5.2.3 Promote collaboration amongst various actors in the agriculture value chain.	Enhance collaboration through organized annual agricultural shows.	DPD
5.3.1 Enhance the use of extension and advisory services (e.g. Agricultural, Veterinary and Fisheries Officers).	Undertake trainings (50 pax) for farmer groups at sub-county level annually.	DPD
6.1.1 Training in pre and post-harvest handling (e.g. timing, packaging, transportation, etc.)	Undertake trainings (50 pax) for farmer groups at sub-county level annually.	DPD
6.2.1 Collaboration with NDA, UNBS, UNADA, etc. to promote only standard agricultural inputs.	Undertake trainings (50 pax) for agro input dealers at sub-county level annually.	DPD
7.1.1 Sensitization of private forest owners about relevant laws and regulations.	Hold annual meetings (50 pax) with private forest owners at sub-county level.	District Natural Resources Departments (NRDs)
7.1.2 Strengthen the enforcement of existing regulations for timber production.	Undertake annual inspections in privately owned forests in each sub-county.	NRDs
8.1.1 Sensitization of communities about wetland conservation and utilization.	Hold quarterly radio talk shows at district.	NRDs
	Hold sensitization meetings for communities twice a year.	NRDs

Option	Action	Responsibility
8.1.2 Strengthen the enforcement of relevant laws and regulations.	Undertake quarterly inspections of gazetted wetlands at district level.	NRDs
8.2.1 Strengthen the enforcement of relevant laws and regulations.	Hold sensitization meetings for local authorities once a year.	NRDs
9.1.1 Sensitization of communities about lakeshores protection.	Undertake quarterly radio talk shows at district level.	NRDs
	Hold sensitization meetings for communities twice a year.	NRDs
9.1.2 Strengthen the enforcement of relevant laws and regulations.	Undertake quarterly inspections of gazetted wetlands at district level.	NRDs
9.2.1 Strengthen the enforcement of relevant laws and regulations.	Hold sensitization meetings for local authorities once a year.	NRDs
10.1.1 Sensitization of communities about wetland conservation and lakeshores protection.	Undertake radio talk shows twice a year.	NRDs
10.1.2 Strengthen the enforcement of relevant laws and regulations.	Hold sensitization meetings twice a year.	NRDs
	Undertake quarterly inspections of gazetted wetlands/ lakeshores.	NRDs
11.1.1 Sensitization of communities about forest conservation	Undertake radio talk shows twice a year.	NRDs
11.1.2 Strengthen the enforcement of laws on forest conservation	Hold sensitization meetings twice a year.	NRDs
11.2.1 Sensitization of communities about wetland conservation	Undertake quarterly inspections of forests.	NRDs
11.2.2 Strengthen the enforcement of laws on wetland conservation	Undertake radio talk shows twice a year.	NRDs
	Hold sensitization meetings twice a year.	NRDs
12.1.1 Sensitization of communities about forest conservation	Undertake quarterly inspections of gazetted wetlands.	NRDs
	Undertake radio talk shows twice a year.	NRDs
12.2.1 Training of farmers in effective soil and water conservation practices	Prepare & distribute IEC (posters, fliers) materials.	NRDs
13.1.1 Sensitization of communities about the causes and effects of climate change.	Undertake pre-season training of farmers in effective soil and water conservation practices.	NRDs
	Undertake radio talk shows twice a year.	NRDs
	Prepare & distribute IEC (posters, fliers) materials.	NRDs

Option	Action	Responsibility
13.1.2 Enforcement of applicable laws	Undertake annual inspections on industrial emissions.	NRDs

Table 6-6: Implementation Plan for the Investment and Management Actions under Strategic Objective 2

Option	Action	Responsibility
1.1.1 Development of site-specific water source protection plans.	Preparation of water source protection plans.	DWO
2.1.1 Improvement of access to sanitation facilities.	Implementation of water source protection plans. Design & construction of low-cost improved sanitation facilities for public places such as markets, parks, institutions, etc. Design & construction of shared fecal sludge treatment facilities in selected Town Councils.	DWO DHDs DHDs
3.1.1 Afforestation	Procurement of 5m ³ cesspool emptying trucks.	DHDs
3.1.2 Restoration of degraded forest areas.	Tree growing	NRDs
3.1.3 Promote alternative livelihood sources.	Tree growing. Establishment of ecotourism sites. Establishment of fish farms. Establishment of poultry farms. Establishment of Apiary (bee-keeping) farms. Establishment of cattle farms.	NRDs DPD DPD DPD DPD DPD
3.1.4 Promoting energy saving cooking stoves	Install demonstration stoves.	DPD
4.1.1 Restoration and protection of wetlands.	Demarcation of boundaries for permanent and seasonal wetlands (using concrete pillars). Identify and clear all eucalyptus woodlots and other invasive species from permanent wetlands. Installation of watering troughs.	NRDs NRDs
4.1.2 Promote alternative livelihood sources for at least 5 groups around encroached wetlands.	Ecotourism sites. Poultry farms Apiary (Bee-keeping) farms	DPD DPD DPD DPD

Option	Action	Responsibility
	Cattle farms	DPD
5.1.1 Restoration and protection of lakeshores.	Demarcation of lakeshores buffer zones (using bamboo).	NRDs
	Identify and clear all eucalyptus woodlots and other invasive species along the lakeshores.	NRDs
	Planting of indigenous plants e.g. elephant grass.	NRDs
	Installation of watering troughs.	DPD
	Establishment of gazetted car/motor cycle washing facilities.	Urban Councils Works Departments
6.1.1 Afforestation	Lakeshores stabilization using gabions.	NRDs
	Tree growing- approximately 10 indigenous drought resistant fruit trees per HH.	NRDs
7.1.1 Terracing, stone bands, infiltration ditches, etc.	Establish demonstration sites.	NRDs

Table 6-7: Implementation Plan for the Investment and Management Actions under Strategic Objective 3

Options	Actions	Responsibility
1.1.1 Establish/enhance water supply infrastructure.	Design and construct water supply systems in each Village.	DWO
	Design and install rainwater harvesting systems (plastic, concrete or steel tanks).	DWO
	Rehabilitate malfunctioned protected springs, shallow wells, deep boreholes & RWHTs.	DWO
2.1.1 Establish small-scale solar-powered irrigation systems.	Construct (4,000m ³ capacity) valley tank, install solar-powered pump, overhead tank, and distribution system at each encroached wetland.	DWO
2.1.2 Promote alternative livelihood sources.	Construct 4 No. fish ponds each approximately 1,000m ² and 1.5m deep.	DPD

It should be noted that the stakeholders assigned responsibility above will take the lead and co-opt other stakeholders such as: District Environment Committee (DEC), District Community Based Services Depts., District Land Board, Urban Councils Works Departments, NEMA, Uganda Wildlife Authority (UWA), National Forestry Authority (NFA), District Water & Sanitation Coordination Committees (DWSCC), Water User Associations (WUAs), Cultural and religious institutions, Area-based NGOs, Development partners.

6.3 Financing Plan and Options

Realisation of the implementation plan is heavily dependent, among other things, on both the availability and timing of finances. The conventional sources of finance for the water sector include; domestic (tax and non-tax) sources, grants (on and off budget), loans (domestic and external) and Public Private Partnerships (PPPs). However, the growing concern is that the existing financial resources are insufficient, sometimes characterised by budget cuts, as well as inconsistency and unreliability in flow, therefore the need to expand the resource base to realise implementation of the SCMP. It is important to note that the implementation of the SCMP will require funding from different sources, depending on the type of action/intervention and of the relevant sectors involved in the implementation. Some of the available financing options include:

The Government of Uganda (GoU) through the Ministry of Water and Environment will support implementation of the CMP through the Water and Environment Sector Budget, including direct field investments or promotion of investments from other institutions and development partners, enabling and coordination activities, training and capacity building, communications/awareness and stakeholder outreach and engagement activities, as well as procuring the recommended equipment, facilities and human resources. Implementation of most of these interventions shall be by the respective district of Kabale and Rubanda, Albert Water Management Zone (AWMZ) and NGOs like SHA.

The Ministry of Water and Environment, through donor funded projects can also facilitate implementation of the SCMP interventions. Donors including the EU, World Bank and GIZ are currently supporting SCMP activities in several projects but also other donors (e.g. Africa Development Bank, KfW) in many other sectors are involved in similar activities. Some donors also finance CBIWRM interventions through NGOs e.g. SHA, AICM, CARITAS-Kabale Diocese, Nature Uganda, IUCN for interventions. The AWMZ needs to position itself appropriately to interest donors in funding these interventions.

The Sector Budget Support is used to channel funds to the local governments for activities to be implemented at the de-concentrated level, through conditional grants, directly from the treasury/MoFPED to the Local Governments, in line with Uganda's fiscal de-concentration policy. Sector Budget Support is intended to be the preferred channel to contribute to the core funding of regulatory, water resources management, and environment management activities.

Off-budget operations are forms of government operations that are not fully reconciled with the national budget and sector budget. The main forms of off-budget expenditures are off-budget funds, direct loans, guarantees, and PPPs. Other forms of off-budget expenditures are the budgetary funds and quasi-fiscal operations conducted through the public enterprises and sometimes the private sector, which are not covered by transfers from the national budget.

The engagement of the private sector in the management and development of water infrastructure and services is a key factor for the successful implementation of the SCMP. Private actors might include either international or national, regional and local operators, as well as joint ventures

among private operators with public institutions or utilities. The private sector can develop and implement a wide range of projects and activities in the Water and Environment Sector.

PPPs are considered as an important tool in Uganda's plan to bridge the infrastructure financing gap in the next years. The PPP Act, passed in 2015, provides methods for procurement and the engagement of private partners in PPPs. It also regulates the roles and responsibilities of government bodies during the development and implementation of PPP projects. The PPP Act established two PPP agencies; the Public-Private Partnerships Committee as well as the Public-Private Partnerships Unit (within the Ministry of Finance). There is need to use the SCMP to develop fundable projects and to interest funding partners. Furthermore, the vital role of non-profit organisations (CBOs and NGOs) should be included in the private sector contribution to the implementation of the SCMP activities.

Several sector financing opportunities that may be sought include; the Climate Change Fund (CCF) earmarked for climate related projects, the Green Climate Fund (loans and grants) and the Global Environment Facility (GEF grant for wetlands restoration, community resilience and readiness and project preparation).

7. MONITORING AND EVALUATION OF THE SCMP

Implementation of Lake Bunyonyi SCMP will be evaluated from time-to-time against the catchment vision, strategic objectives and proposed investment and management actions. An independent mid-term monitoring and evaluation of the project implementation, regular internal monitoring and evaluation will be conducted. This will entail setting measurable performance indicators to guide stakeholders on progress, relative to the set targets and planned activities. Performance indicators reflect whether or not the implementers have successfully realized the original vision and whether some challenges were faced. Evaluation outcomes will inform how best the strategic objectives can be achieved.

Monitoring and evaluation (M&E) mechanisms will improve efficiency and effectiveness of the SCMP implementation process. The actual impacts of the CMP will be assessed against the strategic options/actions. The monitoring and evaluation process will be conducted during the course of the SCMP implementation process. This SCMP will be subjected to successive revision to address changing situations and emerging challenges. AWMZ has led the SCMP development process. Now the SCMC needs to take over the lead in the SCMP implementation and review.

The SCMC will quarterly discuss progress of the plan and will annually discuss progress of the implementation of the SCMP. As part of the annual meeting, there is an opportunity to refine the options scoring framework so that the whole plan or options within the plan are evaluated against the most relevant framework. An evaluation of effectiveness and efficiency of the SCMP should take place on a 5-year cycle. This evaluation should also include the review of the strategic objectives. A mid-term review will be undertaken after 2.5 years.

In a later stage, also management plans at micro-catchment levels will be developed. These plans will be subject to a similar monitoring and evaluation process by micro-catchment management committees, reporting to the next level of the catchment management structure. Besides the continuous planning process, data must be collected in order to support fact-based decision making. A SCMP M&E framework will support this process and will facilitate structured monitoring and evaluation of the SCMP.

NGOs and CBOs should align their monitoring in order to facilitate data delivery for the SCMP and District Development Plans (DDPs). Availability of this knowledge base strengthens impact measurement of development initiatives; fact-based decision making and thereby will increase the access to funds. The development of purposeful and effective interventions (and sourcing for their funding) is much easier when sufficient information is available to properly understand the problem and when there are clear systems for monitoring impact and learning lessons. Good M&E starts with strong baseline studies and collaborative planning so proposals should provide sufficient funding for this.

The SCMC should take a further facilitating role in regular sectoral coordination, like the promotion of joint planning, monitoring and evaluation meetings between technical officers within districts. District Planner, supported by DNRO and the technical officer who is member of the SCMC, should lead quarterly cross-sectoral planning/coordination/learning meetings per district.

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APPENDICES

Appendix 1: Unit Costs of the Proposed Investment/Management Actions⁴

Item	Unit Cost (USD)
Cost of organizing 1 radio talk show	100
Training cost for each pax including venue, per-diem, meals/refreshments	70
Cost of 1 flier	0.3
Professional fees for a Consultant per man-day	400
Cost of inspecting each HH	1.5
Cost of poster and billboard	100
Cost of organizing and registration of a farmer association	2,500
Cost of establishing a 1Ha demonstration farm	12,000
Cost of establishing a tree nursery	15,000
Cost of 1Kg of quality seeds	3
Cost of an improved breed of cow	1,400
Cost of an improved breed of goat	100
Cost of an improved breed of sheep	100
Cost of an improved breed of pig	150
Cost of buying and feeding one chicken up to laying eggs	5
Cost of constructing a poultry structure	3,000
Cost of a combined harvester	500,000
Cost of a farm tractor (4WD 150HP)	100,000
Cost of a grain processing plant (5 ton/Hr)	50,000
Cost of a grain sorting machine (Maxwell Multigrain sorter)	10,000
Cost of a corn removing machine (Industrial 10tons per day)	10,000
Cost of dairy processing and packing plant (50 punches/ Hr)	100,000
Cost of meat processing and packing plant	50,000
Cost of fish processing and packing plant	50,000
Cost of organizing farmers and registration of a SACCO	2,500
Cost of construction of a warehouse per square meter	100
Cost of preparing a water source protection plan	10,000
Cost of implementing a water source protection plan	25,000
Cost of designing& constructing a lined VIP latrine	4,000
Cost of designing& constructing a faecal sludge treatment plant	60,000
Cost of procuring a 5m ³ cesspool emptier	60,000
Cost of buying and planting 1no. indigenous tree seedling	1.5
Cost of planting 1 Ha of indigenous tree species at5m x 5m spacing	600
Cost of supplying & installation of a concrete pillar for demarcation of CFR/WLRs boundaries.	80
Cost of establishment of ecotourism sites per unit of accommodation	10,000
Cost of establishment of fish pond per square meter	15
Cost of bee suit	100
Cost of smoker	50
Cost of modern bee hive	100

⁴Sources of unit costs include: Agriculture Sector Strategic Plan 2015/16-2019/20. (2016). Ministry of Agriculture, Animal Industry and Fisheries. Cordaid. (2017); Catchment Management Plan for Lokok; Aswa Catchment Management Plan; Ministry of Water and Environment Design Guidelines for Water Supply Infrastructure in Uganda (2013); Ministry of Water and Environment Uganda Catchment Management Planning Guidelines (2014); Ministry of Water and Environment and several supplier market prices.

Item	Unit Cost (USD)
Cost of planting bamboo shoots per Km	600
Cost of clearing invasive plants per Ha	100
Cost of planting elephant grass per Ha	40
Cost of installing a watering trough	250
Cost of establishment of car/motor cycle washing facility	2,000
Cost of gabions per square meter	70
Cost of constructing a borehole	7,000
Cost of 10,000ltr PVC tank	2,000
Cost of rehabilitating a borehole	550
Cost of constructing a 4,000m ³ valley tank	22,000
Cost of solar pump (Q=2m ³ /hr, H=50meters)	5,000
Cost of plumbing works<= 500meters	5,000
Cost of drip irrigation system for 1 acre	3,000
Cost of civil works for irrigation system	5,000
Cost of consultancy services for irrigation system	12,000

Appendix 2: Proposed Locations for the Investment/Management Actions

No.	District	Sub County	Parish	Village	Hotspot	Category	Latitude	Longitude
1.	Kabale	Bubaare	Bushura	Kiyase	Stone quarry, soil erosion	Artisanal Mining	-1.22377	29.90015
2.	Kabale	Kitumba	Kagarama	Rwengwe	Stone quarry, Soil erosion along hills	Artisanal Mining	-1.26479	29.93779
3.	Kabale	Kitumba	Mwendo	Nyarungu	Stone quarrying	Artisanal Mining	-1.26128	29.94412
4.	Rubanda	Bubaare	Bubaare	Mwaro A	Deforestation	Deforestation	-1.23271	29.94063
5.	Kabale	Kitumba	Kagarama	Karaaro	Hotels and Lodges	Hotels and Lodges	-1.26586	29.93746
6.	Rubanda	Kitumba	Mwendo	Bufuka	Hotels and Lodges	Hotels and Lodges	-1.27059	29.93903
7.	Rubanda	Kitumba	Mwendo	Bufuka	Hotels and Lodges	Hotels and Lodges	-1.27927	29.93318
8.	Rubanda	Kitumba	Mwendo	Bufuka	Hotels and Lodges, Market	Hotels and Lodges	-1.27646	29.93821
9.	Rubanda	Kitumba	Mwendo	Kiyooro	Hotels and Lodges, Waste Management	Hotels and Lodges	-1.25349	29.95373
10.	Rubanda	Muko	Karengyere	Murukoro	Muko market, Waste management	Indiscriminate Waste Disposal	-1.21006	29.82115
11.	Kabale	Kitumba	Mwendo	Harutindo market	Garbage dumping	Indiscriminate Waste Disposal	-1.26913	29.93747
12.	Kabale	Muko	Kabere	Nyakatooma	Cultivation along Lake Shores, Soil erosion	Lake shore cultivation	-1.22466	29.87949
13.	Kabale	Rubaya	Kitooma	Mukoni	Soil erosion along hills	Land degradation and Wetland encroachment	-1.30561	29.91573
14.	Rubanda	Rubaya	Rwanyana	Ndarura	Soil erosion along hills	Land degradation and Wetland encroachment	-1.34699	29.94485
15.	Kabale	Rubaya	Kitooma	Mburashasho	Soil erosion along hills, Settlements along Lake Shores	Land degradation and Wetland encroachment	-1.32379	29.91979
16.	Kabale	Rubaya	Kitooma	Mukoni	Soil erosion along hills, Settlements along Lake Shores	Land degradation and Wetland encroachment	-1.31915	29.91539
17.	Kabale	Kitumba	Mwendo	Bufuka	Soil erosion along hills, Stone quarry, Stone quarry	Land degradation and Wetland encroachment	-1.26934	29.93629
18.	Kabale	Muko	Kabere	Hamukaaka II	Deforestation, Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.22211	29.87005
19.	Rubanda	Bufundi	Nyamiryang	Kifurugutu	Settlements, Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35134	29.88870
20.	Kabale	Muko	Kagarama	Bushato	Wetland encroachment	Land degradation and Wetland encroachment	-1.24391	29.90563
21.	Kabale	Bufundi	Nyamiryang	Kagorogoro	Wetland encroachment	Land degradation and Wetland encroachment	-1.35205	29.89512
22.	Kabale	Bufundi	Nyamiryang	Kateete-Nkora	Wetland encroachment	Land degradation and Wetland encroachment	-1.35431	29.90209

No.	District	Sub County	Parish	Village	Hotspot	Category	Latitude	Longitude
23.	Kabale	Bufundi	Nyamiryang o	Kateete-Nkora	Wetland encroachment	Land degradation and Wetland encroachment	-1.34698	29.90387
24.	Kabale	Butanda	Nyamiryang o	Kateete-Nkora	Wetland encroachment	Land degradation and Wetland encroachment	-1.34259	29.89710
25.	Kabale	Bufundi	Nyamiryang o	Katooma	Wetland encroachment	Land degradation and Wetland encroachment	-1.38187	29.89524
26.	Kabale	Muko	Kamiro	Habuhinga	Wetland encroachment, Cultivation along hilly areas	Land degradation and Wetland encroachment	-1.46208	29.94007
27.	Rubanda	Bufundi	Kacerere	Omurubindi	Wetland encroachment, Cultivation along hilly areas	Land degradation and Wetland encroachment	-1.44474	29.95140
28.	Rubanda	Muko	Nkamiro	Mukajagi	Wetland encroachment, Cultivation along hilly areas	Land degradation and Wetland encroachment	-1.21359	29.82641
29.	Rubanda	Muko	Karengyere	Bugarambiro	Wetland encroachment, Cultivation along hilly areas	Land degradation and Wetland encroachment	-1.21873	29.82667
30.	Rubanda	Muko	Ikamiro	Bigyegye	Wetland encroachment, Cultivation along hilly areas	Land degradation and Wetland encroachment	-1.22264	29.82282
31.	Rubanda	Muko	Ikamiro	Bigyegye	Wetland encroachment, Cultivation along hilly areas	Land degradation and Wetland encroachment	-1.22760	29.82693
32.	Rubanda	Kitumba	Mwendo	Bufuka	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.25497	29.94398
33.	Kabale	Bubaare	Kagarama	Bushato	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.25454	29.90323
34.	Rubanda	Bubaare	Kagarama	Kyabahinga	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.27062	29.93024
35.	Rubanda	Muko	Kagarama	Ishanga	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.24804	29.90847
36.	Rubanda	Muko	Kyenyi	Muko Forest Res.	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.21269	29.83096
37.	Rubanda	Muko	Ikamiro	Katembe	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.21275	29.83095
38.	Rubanda	Bufundi	Karengyere	Murukoro	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.20911	29.82113
39.	Rubanda	Bufundi	Kagunga	Bushambara	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.26601	29.88894
40.	Rubanda	Bufundi	Ikamiro	Bigyegye	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.24049	29.82998
41.	Rubanda	Bufundi	Kashasha	Ryakashara	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.34584	29.87386
42.	Rubanda	Butanda	Kashasha	Buhanyura	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35253	29.88065

No.	District	Sub County	Parish	Village	Hotspot	Category	Latitude	Longitude
43.	Rubanda	Bufundi	Kacherere	Mukirwa	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.26114	29.85197
44.	Kabale	Bufundi	Nyamiryang o	Katungu	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35580	29.88464
45.	Kabale	Butanda	Nyamiryang o	Murambo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.39243	29.91598
46.	Kabale	Butanda	Nyamiryang o	Murambo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.38896	29.91893
47.	Kabale	Butanda	Nyamiryang o	Katungu	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35863	29.89090
48.	Kabale	Butanda	Nyamiryang o	Katungu	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.36154	29.89193
49.	Kabale	Butanda	Nyamiryang o	Butebe	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35984	29.89885
50.	Rubanda	Butanda	Mugyera	Bushure	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.32465	29.89569
51.	Rubanda	Rubaya	Mugyera	Bushure	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.31314	29.89209
52.	Kabale	Rubaya	Nyamiryang o	Kyevu	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35987	29.90582
53.	Kabale	Butanda	Nyamiryang o	Kyevu	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.36541	29.90406
54.	Kabale	Butanda	Nyamiryang o	Kyevu	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.37088	29.90025
55.	Kabale	Butanda	Nyamiryang o	Rutojo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.38037	29.90334
56.	Rubanda	Bufundi	Mugyera	Murandi	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.28073	29.90662
57.	Rubanda	Bufundi	Mugyera	Murandi	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.27784	29.90803
58.	Kabale	Butanda	Kahungye	Nyakhanda	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.44453	29.92379
59.	Kabale	Butanda	Nyamiryang o	Murambo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.39893	29.91322
60.	Kabale	Butanda	Nyamiryang o	Murambo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.34574	29.90524
61.	Rubanda	Bufundi	Mugyera	Musirwe	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.33546	29.90884
62.	Rubanda	Bufundi	Kagunga	Kibare	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.23775	29.86366

No.	District	Sub County	Parish	Village	Hotspot	Category	Latitude	Longitude
63.	Kabale	Kamuganguzi TC	Kyasano	Bunagana	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35648	29.95375
64.	Kabale	Kamuganguzi TC	Mayengo	Nyakabungo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.36554	29.95721
65.	Kabale	Kamuganguzi TC	Katenga	Bwiranyi	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.33960	29.96856
66.	Kabale	Kamuganguzi TC	Katenga	Nyabyamba	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35445	29.96619
67.	Kabale	Kamuganguzi TC	Katenga	Nyakabungo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35161	29.96558
68.	Kabale	Kamuganguzi TC	Kyasano	Bunagana	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.36300	29.96291
69.	Kabale	Kamuganguzi TC	Katenga	Nyabyamba	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.35516	29.96684
70.	Kabale	Kamuganguzi TC	Katenga	Nyakabungo	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.34809	29.96151
71.	Kabale	Kamuganguzi TC	Katenga	Bwiranyi	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.34245	29.95700
72.	Rubanda	Muko	Ikamiro	Bigyegye	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.22772	29.82515
73.	Rubanda	Bufundi	Kagunga	Bushambara	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.26224	29.88694
74.	Rubanda	Bufundi	Kagunga	Bushambara	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.25921	29.88231
75.	Rubanda	Bufundi	Kagunga	Muziku	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.25300	29.88312
76.	Rubanda	Bufundi	Kagunga	Muziku	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.24893	29.88339
77.	Kabale	Butanda	Nyamiryo	Kyevu	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.37502	29.89804
78.	Rubanda	Bubaare	Kagarama	Karaaro	Wetland encroachment, Settlements along Lake Shores	Land degradation and Wetland encroachment	-1.26819	29.93273
79.	Kabale	Ryakarimira	Mugandu	Rukore	Wetland encroachment, Soil erosion along hills	Land degradation and Wetland encroachment	-1.41930	29.95185
80.	Kabale	Ryakarimira	Mugandu	Rukore	Wetland encroachment, Soil erosion along hills	Land degradation and Wetland encroachment	-1.41929	29.95190
81.	Kabale	Rubaya	Rwanyana	Kishaze	Wetland encroachment, Soil erosion along hills	Land degradation and Wetland encroachment	-1.36467	29.94154
82.	Kabale	Rubaya	Rwanyana	Kabirango	Wetland encroachment, Soil erosion along hills, Settlements along Lake Shores	Land degradation and Wetland encroachment	-1.35644	29.93954

No.	District	Sub County	Parish	Village	Hotspot	Category	Latitude	Longitude
83.	Kabale	Rubaya	Kitooma	Rwabihindu	Wetland encroachment, Soil erosion along hills, Settlements along Lake Shores	Land degradation and Wetland encroachment	-1.35095	29.93243
84.	Kabale	Rubaya	Kitooma	Mukoni	Wetland encroachment, Soil erosion along hills, Settlements along Lake Shores	Land degradation and Wetland encroachment	-1.30297	29.91376
85.	Kabale	Butanda	Nyamiryango	Murambo	Settlements, Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.39704	29.91566
86.	Rubanda	Bubaare	Kagarama	Ishanga	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.25506	29.91006
87.	Rubanda	Bufundi	Kagunga	Muziku	Wetland encroachment, Cultivation along Lake Shores	Land degradation and Wetland encroachment	-1.25649	29.88131
88.	Kabale	Rubaya	Kitooma	Itara	Wetland encroachment, Soil erosion along hills, Settlements along Lake Shores	Land degradation and Wetland encroachment	-1.31784	29.91058
89.	Kabale	Kamuganguzi TC	Katanga	Kyondo	Wetland encroachment	Land degradation and Wetland encroachment	-1.33001	29.96273
90.	Kabale	Rubaya	Mugandu	Rukore	Kagyera wetland degradation	Land degradation and Wetland encroachment	-1.42311	29.95069
91.	Kabale	Rubaya	Rwanyana	Kishaze	Landslide	Landslide	-1.37155	29.92648
92.	Kabale	Muko	Butare	Habutobere	Motor vehicle/cycle washing, Waste management, Outlet for Lake Bunyonyi	Motor vehicle washing	-1.21280	29.83126
93.	Rubanda	Kitumba	Mwendo	Bufuka	NWSC water abstraction point	NWSC water abstraction point	-1.27124	29.93897
94.	Kabale	Kitumba	Mwendo	Harutindo market	Poor waste management	Indiscriminate Waste Disposal	-1.26883	29.93681



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