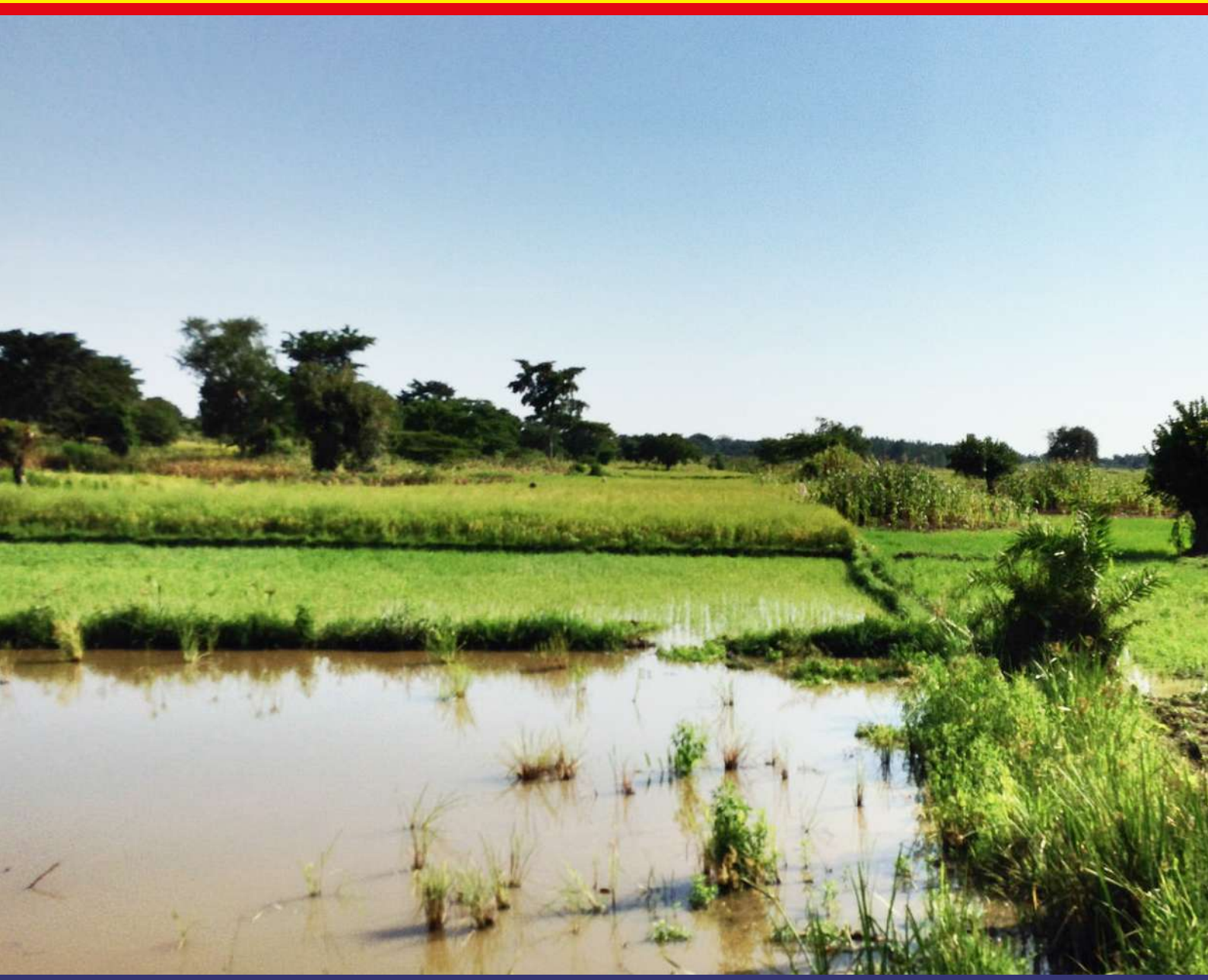
THE REPUBLIC OF UGANDA

Ministry of Water and Environment

Directorate of Water Resources Management

Kyoga Water Management Zone



Mpologoma Catchment Management Plan

FOREWORD

Hon. Sam Cheptoris
Minister of Water and Environment
The Republic of Uganda

Water resources support key sectors of the economy namely hydropower generation, agriculture, fisheries, domestic water supply, industry, navigation etc. However, efficiency and sustainability of intervention under these sectors has recently been a concern in Uganda mainly due to inadequate sectoral collaboration in planning and implementation, increasing frequency of floods and droughts, environmental degradation and pollution of water resources. This situation therefore calls for development of mechanisms for promoting integrated planning, development and management of water resources so as to create synergy among various sectors, promote efficiency in utilization of available resources, reduce water and environmental degradation and ensure more efficient utilization of water resources to meet various social and economic demands.

In 2011, my Ministry embarked on preparation of Catchment Management Plans (CMPs) as tools for ensuring equitable access to, and use of water resources, and safeguard of key natural resources for sustainable socio-economic development of the country.

A CMP provides a long-term strategy for sustainable development and utilization of water and related resource. Catchment based water resources planning and management is in line with the Integrated Water Resources Management (IWRM) paradigm, which ensures that land, water, and related resources are developed and managed in a coordinated manner without compromising sustainability of vital ecosystems. As the lead agency for implementation of Catchment based Water Resources Management (CbWRM) in Uganda, my ministry through the Directorate of Water Resources Management (DWRM) is operationalizing the CbWRM framework through the four Water Management Zones of Albert, Kyoga, Upper Nile and Victoria WMZ.

In order to develop this CMP, a number of studies were undertaken which included an assessment of the existing catchment knowledge base, the current and projected water resources situation, the catchment's social and environmental assessment, and stakeholder engagement. The CMP identifies critical issues, challenges, opportunities, and threats within the catchment which need to be addressed to ensure the socio-economic development of the people.

Guided by the key issues, challenges, threats, opportunities, key water resources planning principles and national strategies, the stakeholders developed a vision for the catchment. To achieve the vision, stakeholders came up with a number of strategic objectives, options and actions that need to be pursued in the short, medium and long term up to the year 2040.

Mpologoma CMP was developed following the Uganda Catchment Planning Guidelines of 2014 and was approved by the Mpologoma Catchment Management Committee (CMC) in October 2018.

My Ministry is therefore pleased to formally make this CMP available for use by various stakeholders. It will enormously help and guide all developers and users of water and related resources at the national and local levels. I therefore wish to call upon all the relevant government ministries and agencies at both national and local levels, the civil society, the private sector, academia and research institutions, cultural institutions, religious institutions and the local communities to utilize this plan in order to optimally plan for the development and management of water and related resources for prosperity.

In line with the provisions of Section 5 of the Water Act, Cap 152 I formally approve this Catchment Management Plan for use by various stakeholders.

For God and My Country

ACKNOWLEDGEMENTS

I would like to thank the Directorate of Water Resources Management for spearheading the preparing of Catchment Management Plans in Uganda. This is a stakeholders driven process that is key in ensuring that water resources are effectively planned for and sustainably developed and managed so as to support the achievement of the country's vision 2040.

Special thanks go to all the stakeholders at the national, regional and local levels for their active participation and involvement in preparation of this plan. Special appreciation goes to the Kyoga Water Management Zone for coordinating the plan preparation process and the Mpologoma Catchment Management Organisation through the Mpologoma Catchment Management Committee for ensuring that the plan is stakeholders' driven and addresses the needs of the people in the catchment.

Finally, I wish to thank the World Bank through the Water Management and Development Project for providing the funding that enabled preparation and printing of this CMP.

Alfred Okot Okidi

Permanent Secretary,
Ministry of Water and Environment

EXECUTIVE SUMMARY

Introduction

The Mpologoma Catchment, which is one of the catchments in the Kyoga Water Management Zone, covers some 7,862 square kilometers (km^2) of land area and 1,127 km^2 of water area. It is bordered on the south by a narrow strip of the Victoria WMZ, which separates the catchments from Lake Victoria. The catchment is characterized by the presence of Mount Elgon (4,321 meters above sea leave [masl]), at the extreme northeast corner of the catchment, where the steepest slopes are found and a few extinct volcanoes and ridges along its southern and eastern rim at lower elevations along the border with Kenya. The altitude of the remainder of the catchment is between 1,150m and 1,033m, with the latter being the mean altitude of Lake Kyoga. Most wetlands in the catchment are located in this relatively flat area.

The catchment traverses a wide range of land-cover types including settled agricultural areas, bushland, swamp/riverine, wetlands of different types, and forested areas. There are numerous wetlands in the catchment: around 16% of the total area of the catchment is covered by wetlands (mainly seasonal wetlands). The main wetland systems include the Naigombwa, Namatala, Malaba, Mpologoma, Manafwa, Lumboka, and Lwakhaka wetland systems. Wetlands act as silt filters, so that much of the transported sediments are retained within the wetlands and vegetated areas, but some transported silt is also deposited in the piedmont where the slope becomes less steep, creating flood-prone zones and flood hazards in the Manafwa and Mbale area

The Mpologoma Catchment covers, totally or partially, 16 districts of Budaka, Bududa, Bugiri, Busia, Butaleja, Iganga, Kaliro, Kibuku, Manafwa, Mayuge, Mbale, Namayingo, Namutumba, Pallisa, Sironko, and Tororo. The growing population in the catchment exerts increasing pressure on water and land resources, resulting in increasing degradation of the environment. The high population growth of 3.2% also leads to increased exploitation and destruction of ecosystem resources. Rainfed agriculture and livestock grazing are the most widespread activities in the Mpologoma Catchment. More than half of the total land area is used for cultivation since a large majority of the population is rural, and directly dependent on agriculture. Most cultivation is done by smallholder farmers averaging some two hectares per farm unit. Two agricultural areas can be distinguished: the upstream drylands and the lowland wetlands.

- Rice is the most important crop in the wetlands although maize is also coming up as a key crop, especially in Butaleja, Namutumba, and Iganga districts.
- Coffee, bananas, cassava, sorghum, finger millet, fruit trees, potato, sweet potatoes, coffee, and maize are predominantly grown in the relatively highly drained areas of the catchment.

Rainfed agriculture is characterized by low productivity, small land holdings, poor soil management practices and lack of incentives and means to commercialize and mechanize.

Approach

The development of this CMP was solely based on the guidelines for Uganda's Catchment-based Water Resources Planning (MWE, 2014). The process stipulated in these guidelines provides for various steps including development of a knowledge base, water resources planning analysis, stakeholders' participation, and social and environmental context. From these thematic assessments, major issues/challenges within the catchment, the available opportunities, potential threats and risks were identified, options for managing the identified issues also identified, and this formed the basis for strategic analysis in order to meet the catchment vision and objective. A set of agreed interventions were then mapped and an implementation plan laid, constituting of the associated timing and costs, to form the main body of a Catchment Management Plan and the Implementation Plan.

The Mpologoma Catchment management plan summary

THE VISION STATEMENT FOR THE MPOLOGOMA CATCHMENT IS:

"To sustainably use, manage and conserve water and related resources in the Mpologoma Catchment for socio-economic growth and improved livelihoods by 2040."

Three strategic objectives were selected by the stakeholders and cover the different key challenges identified in the catchment, namely the environmental degradation, the low level of water resources development, and the low

level of human and social capital and insufficient implementation of integrated resources management approach.

- Strategic objective 1: To restore and sustainably manage the natural resources of the catchment;
- Strategic objective 2: To develop agriculture, alternative livelihoods, and water resources for socio-economic growth;
- Strategic objective 3: To meet the institutional, technical, human requirements for integrated management of natural resources.

The activity and investment plans for the Mpologoma catchment are presented in the tables below:

Table A. Activity Plan for Mpologoma Catchment

Activities	Targeted outputs			
	Indicator unit	1-5 yrs	6-10 yrs	Beyond 10 yrs
1-DEVELOP WATER FOR PRODUCTION INFRASTRUCTURE				
1.1 Create fish ponds	Surface area	979m^2	-	-
1.2 Provide water/organize access to resources for cattle watering	Number (No.) of Sunken pits	300	350	110
	No. of roof water harvesters	300	350	110
	No of rainwater tanks	300	350	110
	No. of livestock access points	25	35	50
	No. of meetings	50	50	25
1.3 Develop large infrastructure	No. of feasibility/drainage studies	5	1	-
	No. of constructed large reservoirs	-	5	-
	No. of completed drainage projects	-	-	1
1.4 Develop upland irrigation	No. of studies completed	2	3	-
	Hactares (Ha.) under new irrigation		8,000	2,060
	No. of meetings	10	10	
1.5 Organise irrigation in wetlands (formal schemes)	Ha. under formalised irrigation	330	66	15,000
	Ha under new irrigation	7,405	1,600	-
1.6 Develop rice/aquaculture schemes	Ha under rice/aquaculture	27	18	-
	No. demonstration farms	2	-	-
	No. of meetings	60	80	1000
1.7 Develop rain water harvesting and individual storage solution	No. of sunken pits	20	50	60
	No. of roof water harvesters	20	50	60
	No. of rainwater tanks	20	50	60
2-DEVELOP THE AGRICULTURAL SECTOR AND IMPROVE PRACTICES				
2.1 Development of agro-forestry and conservation agriculture	No. of trainings	57	35	20
	No. of meetings	75	-	-
	No. of talk shows	5	5	1
	No. of demonstration farms	3	-	-
2.2 Implement soil and water conservation measures	No. of pilot projects	3	-	-
	No. of trainings	60	15	25
	No. of studies	4	3	5
	Ha under conservation measures	-	-	-
2.3 Develop organisation and outlets for agricultural production	-	-	-	-
2.4 Develop and empower farmer groups and associations	-	-	-	-
2.5 Promote the use of quality inputs in agriculture	No. of talk shows	10	5	10
	No. of demonstration sites	3		
	No. of trainings	5	10	2
	No. of meetings	125	-	-
3. DEVELOP OTHER ECONOMIC ACTIVITIES				
3.1 Promote development of quality fingerlings and fish seed production	No. of fish fry centres rehabilitated	-	-	-
	No. of hatcheries constructed	3	-	-
3.2 Develop fish farming	No. trainings	90	90	50
	No. of meetings	90	90	50
3.3 Develop small hydropower production	No. of Feasibility studies undertaken	-	-	6
	No of HP stations constructed	-	-	6
3.4 Improve livestock husbandry (extension, breeding etc)	No. of talk shows	5	-	-
3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping)	No. of meetings	50	50	25
4- ENVIRONMENTAL CONSERVATION AND PROTECTION				
4.1 Development of tree nurseries and tree planting activities	No. of 2ha tree nurseries	8	8	3
	No. of talk shows	5	-	-
	No. of meetings	40	70	130

4.2 Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly	Wetland inventory	1	-	-
	Ha under restoration	-	202	1,485
	Ha of wetland demarcated	-	202	1,485
	No of meetings	35	25	-
	No of talk shows	5	5	10
4.3 Clear demarcation of wetland and forests	Km of demarcation	22	-	-
	No of meetings	70	50	50
	No of talk shows	5	5	10
4.4 River bank protection (cultivation and sand mining)	KM of buffer zone	10	24	16
	No of meetings	60	15	30
	No of talk shows	5	5	10
4.5 Develop a forest management and development strategy	No of studies	1	1	-
	No of restoration projects	4	5	4
	No of meetings	60	60	60
	No of talk shows	5	5	10
4.6 Use of renewable energy/alternative energy sources and development strategy	No of biogas digesters	-	-	-
	No of solar panels	-	-	-
	No of meetings	240	195	-
	No of trainings	130	65	-
IMPROVE WATER SUPPLY AND SANITATION				
5.1 Improve access to safe water supply	No of piped water schemes designed	7	-	-
	No of piped water schemes constructed	7	7	-
	No of piped water schemes rehabilitated	1	-	-
	No of bore holes constructed	50	30	30
	No of well springs & boreholes rehabilitated	30	30	30
	No of wells protected	50	25	25
	No of meetings	15	15	30
	No of talk shows	5	-	-
5.2 Upgrade/improve existing waste water treatment plants and make sure effluents meet national standards	No of studies undertaken	1	2	-
	No of treatment plants upgraded.	-	1	2
5.3 Promote sanitation facilities in rural areas and small towns	No of sanitation system design studies	1	1	1
	No of sanitation systems constructed	-	1	1
	No of latrines constructed	45	75	105
	No of meetings	10	15	-
	No of talk shows	5	-	
5.4 Plan sanitation associated with the new piped schemes being developed in small towns and rural growth centres	No of designs for waste water treatment plants	4	8	-
	No of waste water treatment plants constructed	-	4	8
CONTROL AND REDUCE POLLUTION				
6.1 Improve management of solid waste	No. of solid waste disposal studies conducted	4	3	6
	No. of catchments with proper solid waste disposal mechanisms in place		4	6
6.2 Control waste water discharge and pollution from industries and artisanal activities	No. of meetings	12	15	20
	No. of effluent control studies	10	10	-
7 – COMMUNICATION AND CAPACITY BUILDING	No. of meetings	150	150	300
8- IMPROVEMENT OF INSTITUTIONAL CONTEXT		-	-	-
9 – IMPROVEMENT OF KNOWLEDGE AND DATA COLLECTION		-	-	-

Table B: Investment plan for Mpologoma Catchment

Activities	Cost per period		
	1-5	6-10	Beyond 10
1 - DEVELOP WATER FOR PRODUCTION INFRASTRUCTURE			
1.1 Create fish ponds	1 121 047	384 867	747 384
1.2 Provide water / organize access to resources for cattle watering	1 798 815	436 455	600 110
1.3 Develop large infrastructure	2 508 830	34 078 050	1 054 290
1.4 Develop upland irrigation	90 570	44 854 375	11 731 810
1.5 Organise irrigation in wetlands (formal schemes)	41 485 120	9 131 260	82 910 760
1.6 Develop rice/aquaculture schemes	421 386	2 810 950	114 900
1.7 Develop rainwater harvesting and individual storage solution	58 410	235 000	256 300
2 - DEVELOP THE AGRICULTURAL SECTOR AND IMPROVE PRACTICES			
2.1 Development of agro-forestry and conservation agriculture	210 240	63 450	54 750
2.2 Implement soil and water conservation measures	390 482	357 992	433 881
2.3 Develop organisation and outlets for agricultural production	39 550	39 550	71 190
2.4 Develop and empower farmer groups and associations	6 780		
2.5 Promote the use of quality inputs in agriculture	257 955	79 675	130 090
3 - DEVELOP OTHER ECONOMIC ACTIVITIES			
3.1 Promote development of quality fingerlings and fish seeds production	291 591	65 200	117 360
3.2 Develop fish farming	146 060	93 900	84 400
3.3 Develop small hydropower production	0	0	25 451 910
3.4 Improve livestock husbandry (extension, breeding, etc.)	33 100	32 600	58 680
3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	52 100	80 600	57 600
4 - ENVIRONMENTAL CONSERVATION AND PROTECTION			
4.1 Development of tree nurseries and tree planting activities	838 175	187 411	343 799
4.2 Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly	760 380	760 650	2 271 190
4.3 Clear demarcation of wetlands and forests	96 925	27 725	39 997
4.4 River bank protection (cultivation and sand mining)	1 130 945	1 130 925	2 178 580
4.5 Develop a forest management and development strategy	710 900	358 300	307 280
4.6 Use of renewable energy / alternative energy sources and development strategy	372 450	249 050	0
5 - IMPROVE WATER SUPPLY AND SANITATION			
5.1 Improve access to safe water supply	23 005 671	1 421 996	2 030 409
5.2 Upgrade/improve existing waste water treatment plants and make sure effluents meet national standards	167 940		
5.3 Promote sanitation facilities in rural areas and small towns	329 274	1 767 079	7 125 665
5.4 Plan sanitation associated with the new piped schemes being developed in small towns and rural growth centres	83 970	727 270	1 460 000
6 - CONTROL AND REDUCE POLLUTION			
6.1 Improve management of solid waste	134 570	2 468 227	4 745 284
6.2 Control waste water discharge and pollution from industries and artisanal activities	505 670	474 287	850 530
7 - COMMUNICATION AND CAPACITY BUILDING	267 754	398 406	659 710
8 - IMPROVEMENT OF INSITUTIONAL CONTXT			
9- IMPROVEMENT OF KNOWLEDGE AND DATA COLLECTION			
TOTAL PER PERIOD	77 416 778	102 447 494	145 489 454
GRAND TOTAL			

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrom
AQUASTAT	FAO global information system on water
ASR	Alkali Silica Reaction
ATM	African Textile Mill
BEL	Bujagali Energy Limited
BMU	Beach Management Unit
BOD	Biological Oxygen Demand
CAO	Chief Administrative Office
CAS	Country Assistance Strategy
CBD	Convention on Biological Diversity
CBO	Community-based organisation
CbWAP	Community-based Wetland Action Plan
CbWMP	Community-based Water Management Plan
CEO	Chief Executive Office
CFR	Central Forest Reserve
CIAT	International Centre for Tropical Agriculture
CMO	Catchment Management Organisation
CMP	Catchment Management Plan
CRU	Climate Research Unit
DAP	Di-ammonium Phosphate
DCDO	District Community Development Office
DDP	District Development Plan
DEA	Directorate of Environmental Affairs
DEAP	District Environment Action Plan
DEC	District Environment Committees
DFO	District Fisheries Office
DFR	Department of Fisheries Resources
DLG	District Local Government
DNRO	District Natural Resources Office
DPO	District Production Office
DRC	Democratic Republic of Congo
DSIP	Agriculture Sector Development Strategy and Investment Plan
DWAP	District Wetland Action Plan
DWD	Directorate of Water Development
DWD	Directorate of Water Development
DWO	District Water Office
DWRM	Directorate of Water Resources Management
EAPP	Eastern Africa Power Pool
ECF	East Cost Fever
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EM-DAT	International Disaster Database
EMP	Environmental Management Plan
ERA	Electricity Regulatory Authority
ESIA	Environmental and Social Impact Assessment
FAO	United Nations Food and Agriculture Organization
FIE & FOC	Farm Income Enhancement and Forestry Conservation Project
FMD	Foot and mouth disease

FS	Faecal Sludge
FSM	Faecal Sludge Management
GDP	Gross Domestic Product
GETFIT	Global Energy Transfer Feeding Tariffs
GFS	Gravity Flow Scheme
GIS	Geographical Information System
GIZ	German International Cooperation
GoU	Government of Uganda
GPCC	Global Precipitation Climatology Centre
Ha	Hectare
HPP	Hydro-Power Plant
IBA	Important Bird Area
ICCM	International Conference on Chemicals Management
IDA	International Development Association
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
ISFG	Integrated Support to Farmers' Groups
IUCN	International Union for the Conservation of Nature
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
Km	Kilometre
LFPR	Labour Force Participation Rate
LFR	Local Forest Reserve
LTU	Livestock Tropical Unit
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MEMD	Ministry of Energy and Mineral Development
MERECP	Mount Elgon Regional Ecosystem Conservation Programme
MES	Ministry of Education and Sports
MGLSD	Ministry of Gender, Labour and Social Development
MLG	Ministry of Local Government
MLHUD	Ministry of Lands, Housing and Urban Development
MOH	Ministry of Health
MSIOA	Multi-Sectoral Investment Opportunity Assessment
MTI	Ministry of Tourism and Industry
MWE	Ministry of Water and Environment
NAADS	National Agricultural Advisory Services
NAPA	National Adaptation Programme of Action
NARO	National Agricultural Research Organization
NBI	Nile Basin Initiative
NDP	National Development Plan
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NEMA	National Environment Management Authority
NEPAD	New Partnership for Africa's Development
NERICA	New Rice for Africa (rice variety)
NFA	National Forestry Authority
NGO	Non-Government Organization
NGWDB	National Groundwater Data Base
NPV	Net Present Value
NTU	Nephelometric Turbidity Units
NWP	National Water Policy

NWRA	National Water Resources Assessment
NWSC	National Water and Sewerage Corporation
O&M	Operation and Maintenance
OP	Operational Procedure
OWC	Operation Wealth Creation
PMA	Plan for Modernization of Agriculture
POP	Persistent Organic Pollutants
PPA	Power Purchase Agreement
RAMSAR	Convention on Wetlands of International Importance
RGC	Rural Growth Centre
RWH	Rainwater Harvesting
SAICM	Strategic Approach to International Chemicals Management
SAIL	Sugar and Allied Industries, Limited
SAPP	Southern Africa Power Pool
SCMP	Sub-catchment Management Plan
SEAP	Sub-county Environmental Action Plans
SMM	Sio-Malaba-Malakasi
SSEA	Strategic Social and Environmental Assessment
SWAP	Sub-county Wetland Action Plan
SWC	Soil and Water Conservation
SWL	Static Water Levels
SWOT	Strength, Weakness, Opportunity, Threat
TC	Town Council
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
TSU	Technical Support Unit
UBOS	Uganda Bureau of Statistics
UEGCL	Uganda Electricity Generation Company Limited
UNRA	Uganda National Road Authority
UNRDS	Uganda National Rice Development Strategy
UO	Umbrella Organization
UPE	Universal Primary Education
USAID	United States Development Agency
USD	United States Dollar
UWA	Uganda Wildlife Authority
UWASNET	Uganda Water and Sanitation Network
WAFICOS	Walimi Fish Farmers' Cooperative Society
WATSAN	Water and Sanitation
WMD	Water Management and Development
WMDP	Water Management and Development Project
WMZ	Water Management Zone
WRU	Wetland Resources Users
WSDF	Water, Sanitation and Development Facility
WSDF-E	Water, Sanitation and Development Facility East
WSP	Waste Stabilization Ponds
WSSB	Water Supply and Sanitation Board
WSSP	Wetland Sector Strategic Plans
WUA	Water Users Association
WWF	World Wildlife Fund
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

1.1 Background to Catchment Planning

Figure 1.1: Water Management Zones

The National Water Policy in Uganda is based on the Integrated Water Resource Management (IWRM) approach with implementation at the catchment level and provides an overall policy framework and defines the Government's policy objective as:

"To manage and develop the water resources of Uganda in an integrated and sustainable manner, so as to secure and provide water of adequate quantity and quality for all social and economic needs of the present and future generations and with the full participation of all stakeholders."

As part of the realisation of this objective, the National Water Policy has been based on the implementation of the objectives for water management within the IWRM framework. IWRM in a river-basin context is defined as "a process that enables the coordinated management of water, land and related resources within the limits of a basin so as to optimise and equitably share the resulting socio-economic well-being without compromising the long term health of vital ecosystems."

A key feature of the implementation of IWRM in Uganda by the Ministry of Water and Environment (MWE) through the Directorate of Water Resources Management (DWRM) was to provide for the de-concentrated management of water resources to the local catchment level with the participation of all stakeholders.

Following the recommendations of the National Water Policy, the Water Sector Reform Study (2005), the Joint Sector Review (2006) and other national and regional policies as well as steps already taken for implementation purposes, the country was delineated into four Water Management Zones (WMZs) along hydrological boundaries. Thus, the northern parts of the country are covered by the Upper Nile Water Management Zone (UNWMZ), the western parts by the Albert Water Management Zone (AWMZ), the south by the Victoria Water Management Zone (VWMZ) and the east by the Kyoga Water Management Zone (KWMZ) as shows. Within each WMZ, there exists a number of smaller hydrological units called catchments for which tools and capacity for management of water resources have to be developed. Catchment Management Plans (CMPs) are to be developed for respective catchments in the WMZs to enable planning of water resources development and management at a catchment level.

In line with this, a Catchment Management Plan for Mpologoma, presented in this report, has been developed to mainly identify infrastructure and water management interventions and actions for sustainable management of the catchment. The Mpologoma catchment, which is part of the Kyoga Water Management Zone, covers an area of 8,989 km^2 of which is 12.5% (1,127 km$^{2)}$ is water and the other is land. The preparation of this CMP is in line with the catchment management planning guidelines, (MWE, 2014).

1.2 Objectives and Purpose of the CMP

The purpose of this CMP is to provide a long-term strategy for the sustainable development and utilisation of the water resources in the catchment by the stakeholders in an integrated manner.

The CMP provides the basis for understanding a complex system and prioritising key focus areas for effective management taking into consideration potential development opportunities, problems and challenges, risks and threats. Following a participatory approach in developing the CMP, the objective is to provide information and shared motivation that will initiate interventions and/or investments, which can be implemented to realise sustainable management and development of water resources within the catchment. The CMP also purposes to:

- Consider all conditions and characteristics (physical, social, economic, environmental, political, transboundary etc.) in the catchment in an integrated manner

- Raise awareness on the understanding and importance of as well as the responsibility for water resources management and environmental conservation among all stakeholders and how this will be of benefit to the sustainable economic growth and livelihoods in the catchment as a learning process

- Clarify the interdependence of all activities in the catchment and even the effects on neighbouring catchments
- Engage the stakeholders on all levels in the integrated planning process and help them decide on the best options and scenarios for the development of their catchment as well as in the development and implementation processes

- Motivate the stakeholders and put them into the position to play an active role in preserving their water resources and the environment, and

- Initiate investment from within and outside the catchment.

1.3 Report Structure

This report mainly has six chapters prepared to ensure logical and consistent flow of information throughout the document as highlighted here below:

Chapter 1: Introduction. This chapter presents the background to catchment management planning in Uganda, objectives of the CMP, and general layout of the report.

Chapter 2: Approach to Catchment Management Planning. This chapter describes the general approach to catchment management planning in Uganda, which is in line with the catchment management planning guidelines.

Chapter 3: Legislative and Institutional Framework. The existing policy, legal, and institutional arrangements, their linkages with catchment management planning and implementation, as well as the existing gaps are presented in this chapter.

Chapter 4: Status of the Catchment. This chapter discusses the main characteristics and features of the catchment, which ultimately leads to identification of the major social, environmental, and water resources assessment issues together with the stakeholder engagement and issues' mapping.

Chapter 5: Vision, Objectives, and Analysis of Options. Catchment visioning and strategic analysis is presented and discussed in this chapter. The prioritisation of issues identified within the catchment, analysis of the options to manage the identified issues, as well as configuration of scenario and their evaluation.

Chapter 6: Management and Investment Actions. This chapter presents an agreed set of interventions resulting from the options for the best ranked scenario, the implementation plan, and costing of the agreed interventions.

2 APPROACH TO CATCHMENT MANAGEMENT PLANNING

The development of this CMP was solely based on the guidelines for Uganda's Catchment-based Water Resources Planning (MWE, 2014). The process stipulated in these guidelines provides for various steps including development of a knowledge base, water resources planning analysis, stakeholders' participation, and social and environmental context as indicated in Figure 2.1. From these thematic assessments, major issues/challenges within the catchment, the available opportunities, potential threats and risks are identified, options for managing the identified issues also identified, and this forms the basis for strategic analysis in order to meet the catchment vision and objective. A set of agreed interventions are then mapped and an implementation plan laid, constituting of the associated timing and costs, to form the main body of a Catchment Management Plan and the Implementation Plan.

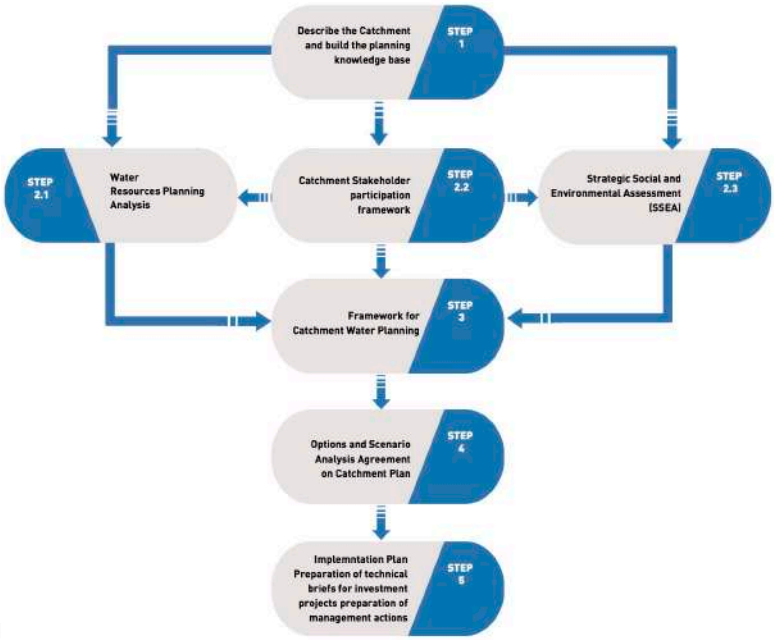

Figure 2.1: Overview of the catchment management planning process

Stakeholder consultation was done at almost all stages in the development process. The roadmap for the development of the Albert Nile CMP, therefore, sequentially included the following key processes:

- **Catchment Description and Building a Planning Knowledge Base** from which a wealth of information emanating from all available Policies, Strategies and Plans, Water Sector data and information on existing and planned water resources development and management, water infrastructure, institutional arrangements all of which will inform, influence, and drive sustainable catchment management and development
- **Water Resource Planning Analysis**, which presents an analysis of current and projected water availability, uses, and demand and related projections to 2030 and 2040 for three key sub-sectors; water for people, water for production, and water for energy. Water for environment was evaluated considering low flow and dry season flow in order to estimate environmental fl .
- **Stakeholder Engagement,** which highlights the stakeholder participation framework and interactions at all levels in the process of developing the CMP. Field visits, informal and formal meetings as well as the proceedings of joint stakeholder forum workshops were highlighted and their input of water resources issues captured.
- **Strategic Social and Environmental Assessment,** which presents the identified social and environmental issues and were taken into account in the planning process to ensure they are integrated into the plan and for which sound measures for social and environmental protection were proposed.
- **Framework of Catchment Water Planning** sets the scene for options by identifying all the issues and conditions in the catchment related to water and natural resources that are likely to be a major influence, or present themselves as risks, needs or opportunities. These mainly come from the Strategic Social Environmental Assessment and the Water Resources Assessment.
- **The Options and Scenario Analysis** provides an analysis of the options and the alternative sets of options that form scenarios. These scenarios are evaluated to get the best scenario, which informs the investment and management interventions or agreed infrastructure investments and interventions within the Catchment Management Plan.

The agreed infrastructure investments and management interventions were then costed, prioritised and sequenced thereby forming the main body of the CMP.

3 INSTITUTIONAL, LEGAL AND POLICY CONTEXT

3.1 Policy and legal context

The Africa Water Vision 2025 states its goal as "an Africa where there is an equitable and sustainable use and management of water resources for poverty alleviation, socio-economic development, regional cooperation, and the environment" and the water policy reform initiative is aimed at realising this vision for water management in Uganda within the IWRM framework. Worth noting is the fact that sustainable management of water resources is not limited to physical management but also incorporates legislation, policies, economic tools, institutions, and stakeholders involved in management, regulation, and utilisation of water resources. Whilst water is essential to livelihoods, and always provides for subsistence and survival, it does not solely drive economic development. Many other factors also have to be in place if the provision of water is to have its full beneficial impact on society. A strong cooperative approach between role-players and especially governmental institutions is, therefore, essential to work together within their respective legislative and policy mandates to promote the approach to IWRM and to ensure the best economic, social and environmental development.

A synopsis of the legal context in Uganda under which IWRM is implemented and managed is provided by:

- The Constitution of the Republic of Uganda
- National Policies
- National Legislation
- Trans-boundary considerations, and
- International Conventions

3.2 The Constitution of the Republic of Uganda (1995)

The Constitution of the Republic of Uganda sets a number of national guiding principles relating to, and supporting the principles of sustainable development including having balanced and equitable development, which requires that the State adopts an integrated and coordinated planning approach. It further stipulates that the State ensures balanced development between different areas of Uganda and between the rural and urban areas with special measures employed to favour of the development of the least developed areas.

Through the constitution, the State is entrusted to protect important natural resources including land, water, wetlands, minerals, oil, and fauna and flora on behalf of the people of Uganda. The state must further endeavour to fulfil the fundamental rights of all Ugandans to social justice and economic development, with all developmental efforts directed at ensuring the maximum social and cultural well-being of the people. In terms of the Constitution, all Ugandans have a right to education, health services, clean and safe water, work, decent shelter, adequate clothing, food security, and pension and retirement benefits

The State must promote sustainable development and public awareness of the need to manage land, air, water resources, as well as use of natural resources, in a balanced and sustainable manner for the present and future generations. All possible measures must be taken to prevent or minimise damage to land, air, and water resources resulting from pollution or other causes. The Constitution entrusts the State to ensure the conservation of natural resources and promote the rational use of natural resources to safeguard and protect the biodiversity of Uganda. Through all this, the Constitution sets the scene for Integrated Water Resource Management in Uganda.

3.3 National Policies

3.3.1 National Water Policy (1999)

The 1999 National Water Policy provides an overall policy framework that defines the Government's policy objective as managing and developing water resources of Uganda in an integrated and sustainable manner, to secure and provide water of adequate quantity and quality for all social and economic needs sustainably, with the full participation of all stakeholders (DWRM, MWE, 2012).

According to the National Water Policy and the Water Act Cap 152, the responsibilities to provide water services and to maintain facilities were devolved to local councils in districts and urban centres. The role of the Central Government's Agencies is that of guiding and supporting as required. The Act thus emphasises the shared responsibilities in development and management of water resources among stakeholders, including the Private Sector and non-Government organisations (NGOs) to regulate human activities that can pose risks to water resources. It also provides for pollution control measures with associated penalties and fines.

The existing policy and legal framework promotes wise use of water resources from the lowest possible level, while considering roles to be played by different stakeholders at different levels. This offers an opportunity to ensure that communities can actively participate in the development and maintenance of water sources within a given catchment.

3.3.2 National Policy for the Conservation and Management of Wetland Resources (1995)

The national policy for the conservation and management of wetland resources (1995) is aimed at restricting the continued loss of wetlands and their associated resources and aims to ensure that benefits derived from wetlands are sustainably and equitably distributed to all people of Uganda. The wetlands 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 futur
- Environmentally sound management of wetlands to ensure that other aspects of the environment are not adversely affected
- Equitable distribution of wetland benefits; an
- 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.

Wetland related issues have been incorporated into the National Environmental Statute 1995. The Wetlands Policy is strengthened by a supplementary law specifically addressing wetland concerns. Wetland resources are regarded as forming an integral part of the environment and is recognised that present attitudes and perceptions of Ugandans regarding wetlands be changed. Wetland conservation requires a coordinated and cooperative approach involving all the concerned people and organisations in the country, including the local communities. Within the context of the guiding principles, the National Wetlands Policy set five goals

- To establish the principles by which wetland resources can be optimally used over time
- To end practices, which reduce wetland productivity
- To maintain the biological diversity of natural or semi-natural wetlands
- To maintain wetland functions and values; and
- To integrate wetland concerns into the planning and decision making of other sectors.

3.3.3 Uganda National Land Policy

The Uganda National Land policy provides a framework for articulating the role of land in national development, land ownership, distribution, utilisation, alienability, management, and control of land. The Land Policy has a specific objective that seeks to ensure sustainable utilisation, protection and management of environmental, natural and cultural resources on land for national socio-economic development. It seeks to ensure that all land use practices and plans conform to principles of sound environmental management, including biodiversity, preservation, soil and water conservation, and sustainable land management. Section 6.7, item 140 of the policy promotes optimal and sustainable use and management of environment and natural resources for the present and future generations.

3.3.4 National Forestry Policy

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 and river systems.

3.3.5 The Renewable Energy Policy for Uganda

The overall goal of the Renewable Energy policy is to increase the use of modern renewable energy, from the current 4% to 61% of the total energy consumption by the year 2017. Renewable sources of energy include solar energy, hydropower, biomass, wind, and geothermal as well as peat and wastes. For hydropower, the policy targets 1,200MW of installed capacity by 2017 for large hydropower plants and 85MW of installed capacity by 2017 for small and micro hydropower plants.

3.4 National legislation

3.4.1 Water Act Cap 152 (1997)

Uganda's Water Act Cap 152 provides for the use, protection and management of water resources and supply; and facilitates the devolution of water supply and sewerage undertakings. Its objectives are:

i) To promote the rational management and use of the water resources of Uganda by:
   - Use of appropriate standards and techniques for the investigation, use, control, protection, management and administration of water resources
   - Coordinating all public and private activities which may influence the quality, quantity, distribution, use or management of water resources
   - Coordinating, allocating and delegating responsibilities for the investigation, use, control, protection, management or administration of water resources.

ii) To promote the provision of a clean, safe and sufficient supply of water for domestic purpose

iii) To ensure appropriate development and use of water resources other than for domestic use, e.g. watering of stock, irrigation and agriculture, industrial, commercial and mining uses, generation of energy, navigation,

fishing, preservation of flora and fauna and recreation in ways which minimise damage to the environment; and

iv) To control pollution and promote the safe storage, treatment, discharge and disposal of waste, which may pollute water or otherwise harm the environment and human health.

According to the National Water Policy (1999) and the Water Act Cap 152, the responsibilities to provide water services and to maintain facilities are devolved to local councils in districts and urban centres, with full mandates to construct, acquire or alter any water supply work. The role of the Central Government's Agencies is that of guiding and supporting as required. The Act thus emphasises the shared responsibilities in development and management of water resources among stakeholders (including the Private Sector and NGOs) to regulate human activities that can pose risks to water resources. It also provides for pollution control measures with associated penalties and fines.

Other Water Sector related policies form synergies with the Water Policy include:

- The National Gender Policy of 1999, which recognises women and children as the key stakeholders of water
- The Local Government Act of 1997, which underscores the role of Local Government in provision and management of water and sanitation, empowering the local authorities to plan and to implement development interventions according to local needs
- The 1998 Land Act, which stipulates the responsibility of the Central and Local Government in protecting 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; and
- The 1998 Water Abstraction and Wastewater Discharge Regulations for controlling water abstraction and wastewater discharge, to promote sustainable and environmentally friendly development and use of water resources. Some issues feature at the level of the policy and regulatory framework while others are crucial at catchment level. For instance, plans to develop irrigation schemes necessitate the development of a proper mechanism to protect water use rights and to settle disputes, especially between upstream and downstream water users. Issues of equity exist, whereby some users, often powerful up-stream users, put their interests first. In establishing the mechanism to handle user rights and conflict resolution, issues of active participation of all concerned stakeholders, including women, livestock keepers, and youths, should be taken into consideration.

The existing policy and legal framework promotes wise use of water resources from the lowest possible level, while considering roles to be played by different stakeholders at different levels. This offers an opportunity to ensure communities actively participate in development and maintenance of water sources.

3.4.2 National Environment Act (1995)

The National Environmental Act provides for **"sustainable management of the environment; to establish an authority as a coordinating, monitoring, and supervisory body for that purpose; and for other matters incidental to or connected with the foregoing."**

The Act makes provision for a tiered approach to environmental planning, commencing with a National Environmental Management Plan to be prepared and reviewed every five years. Each district is required to compile a district environmental action plan every three years that compliments the National Environmental Management Plan. Both of these plans are made available to the public. At a project scale, the Act stipulates that developments of a certain nature (as determined under Section 19(7) of the Act) are required to undertake detailed Environmental Impact Assessment process in a prescribed manner.

The Act also makes provision for the monitoring of air and water quality and makes provision for the establishment and implementation of minimum standards pertaining to emissions and effluent

Section 34 of the Act deals specifically with limitations in the use of rivers and lake systems and aims to minimise the negative impacts and control activities that have the potential to be detrimental to these systems. The Act goes on to make specific provisions for the protection of river banks and lake shores in Section 35 and protection and management of wetland systems in Section 36 and 37 respectively.

Hilly and mountainous areas have also been identified as areas requiring special attention and protection by the Act. The Act makes provision for the restoration of vegetative cover in these areas. This Act coupled with the provisions made in the Prohibition of the Burning of Grass Act (1974) and the Forest Act (1947) and the Cattle

Grazing Act (1945) provides a good basis for restoration, protection and management of vegetative cover in hilly and mountainous areas.

3.5 Transboundary considerations

The trans-boundary nature of Uganda's water resources are such that there are a number of international conventions relating to management of water resources with which Uganda must comply. Currently, the key conventions/organisations to which Uganda is party are; the Protocol for Sustainable Development of Lake Victoria Basin and Nile Basin Initiative.

3.5.1 Legal Framework for the Sustainable Management of the Nile Waters:

Treaties regarding the management of the waters of the Nile basin date back to 1929 when Great Britain and Egypt signed an agreement under which no irrigation, power works or other measures were to be constructed or undertaken on the Nile, and its branches, or on lakes from which it flows in the Sudan, or in countries under British administration except with the previous agreement of the Egyptian government. The Agreement was followed by the 1959 Agreement on the Full Utilisation of the Nile Waters, which was signed between Egypt and Sudan. The 1959 Agreement allocates the waters of the Nile between the two signatory states.

3.5.2 Agreed Curve for the Lake Victoria Release:

Before the construction of the Nalubale (Owen Falls) Dam, which began in 1951, the outflows from Lake Victoria were controlled naturally by the Ripon Falls some 3km upstream of the dam site. After study of the discharge measurements, which had been made since 1923 at Namasagali, about 80km downstream of the lake outfall, an Agreed Curve was established, which described the natural relation between lake levels measured at the Jinja gauge and simultaneous measured outflows from the lake. Since 1954 (when the Nalubale Dam was completed), water flow from the lake has been constrained to mimic the natural outflows from the lake using a rating "Agreed Curve" that correlates the flow of the Nile at the source with Lake Victoria water level

3.5.3 Nile Basin Cooperative Framework Agreement

The Nile Basin countries embarked on the process of negotiating and developing a new agreement for the sustainable management and development of the shared Nile water resources in the 1990s. This process is still on-going and it is envisaged that once these negotiations are successfully concluded, the resulting agreement will supersede all the existing Nile water agreements. (NELSAP, 2012)

3.5.4 The Lake Victoria Basin Commission

The Lake Victoria Basin Commission which was established under article 33 of the "Protocol for Sustainable Development of Lake Victoria Basin" has a broad function of promoting, facilitating and coordinating activities of different actors towards sustainable development and poverty eradication of the Lake Victoria Basin. These activities include catchment management interventions among others.

3.6 International Conventions

3.6.1 Ramsar Convention (1971)

The Convention on Wetlands (Ramsar, Iran, 1971) 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. The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world. "The wise use of wetlands is defined as "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development." Uganda signed the Convention on the 4th July 1988. It currently has 12 Ramsar registered wetland systems, representing a combined area of 454,303ha.

3.6.2 UN Framework Convention on Climate Change (UNFCCC) and related Kyoto Protocol

Uganda ratified the UNFCCC in 1993 and is one of the Least Developed Countries (LDCs).The First National Communication to the UNFCCC was developed in 2002. A Climate Change Policy was launched in 2012, with a related prioritisation of outputs under a short (1-5 years), medium (6 to 10 years) and long-term (10-15 years) timeframes. The priorities in the National Climate Change Policy have been integrated in the Second National Development Plan (NDP II) 2015/16 – 2019/2020.

3.6.3 UN Convention on Biological Diversity

The Convention's main objective is to ensure the conservation of biological diversity and sustainable use of its components. The study process should undertake thorough investigation of the sites and come up with lists of biodiversity in the areas and available information indicate that none of the groups are threatened, rare or

vulnerable, hence no impact of the project on such groups.

3.6.4 International conventions for shared water resources

There are a number of international conventions relating to management of shared water resources with which Uganda must comply. Currently, the key conventions/organisations to which Uganda is party are; the Protocol for Sustainable Development of Lake Victoria Basin and Nile Basin Initiative referred to in section 3.5.3 above.

3.7 The institutional context

3.7.1 National Level

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 related to water and the environment, 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 regulating the 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), which is 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 centers; and the National Forest Authority (NFA), whose mandate is to manage Central Forest Reserves and to supply high quality forestry-related products and services (see Error! Reference source not found.). 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 and the MWE. An outline of organisations directly or indirectly involved in water management is indicated in Figure 3.3.

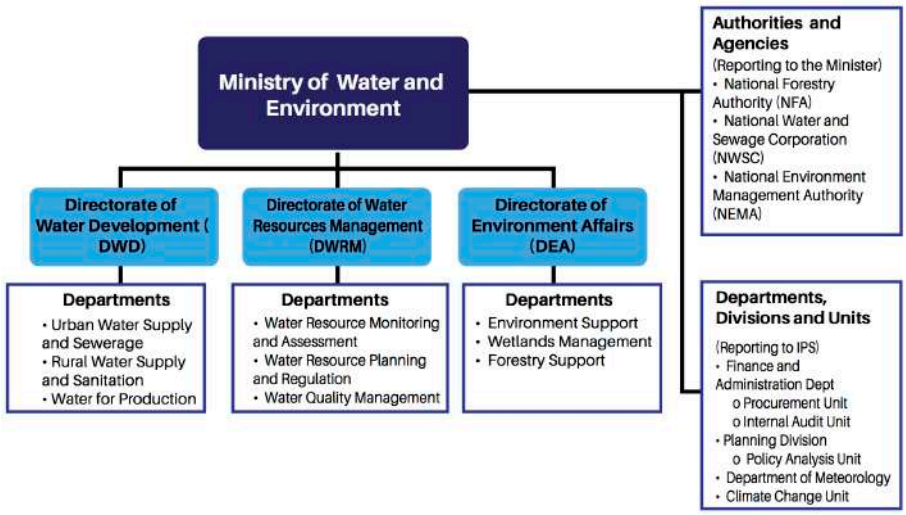

Figure 3.1: Institutional Setup at a National Level (MWE, 2009)

Coordination is a key process for Integrated Water Resources Management (IWRM), which involves multiple stakeholders from different sectors, on different scales, and with different structures and interests. At the national level, the following committees are relevant to integrated water resources management:

- The Policy Committee on Environment: chaired by the Prime Minister, at the highest level of political decision-making
- The Water Policy Committee, which is composed of directors, and enables high-level and strategic dialogue specifically in the water secto
- The IWRM Working group, which is an informal working group enabling technicians to coordinate
- The Water and Environment Sector Working Group (WESWG)
- The Inter-Ministerial Technical Committee regarding Water for Production, comprising members from the MWE, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Office of the Prime Minister, National Planning Authority, and Ministry of Finance. It meets on a quarterly basis to coordinate investments and works regarding water for production
- The Wetlands Advisory Group (WAG), which is a technical group dedicated to wetlands. The WAG improves coordination on wetlands issues, particularly on the issue of dry land rice
- The MWE-DWRM has created Water Net, a network for building capacities of stakeholders connected to the water sector.

The National Environment Management Authority (NEMA) is the apex body for environmental law enforcement in Uganda. However, several functions have been delegated to other institutions as lead agencies in their respective fields. NEMA is in charge of

- Review and administrative clearance of environmental evaluations, in conjunction with other lead agencies
- Delivery of permits (for instance, permits for activities within the legal buffer zones of water bodies). The responsibility of delivering permits is vested into the different lead institutions
- Monitoring compliance. The responsibility of control is distributed over 375 gazetted inspectors (2014) distributed in many Ugandan institutions (including the MWE). Only 30 of them belong to NEMA.

An Environmental Police has been formed at NEMA, comprising 25 officers. Only five regional Environmental Police officers (liaison officers) have been designated, among which one is based in Mbale (for the eastern region: his area covers 52 districts corresponding to a quarter of the country) and one in Jinja (for the south-eastern region). The liaison officers belong to the regular police but are specifically trained in environmental issues. They are under the command of the territorial police (Regional Police Commander/District Police Commander). Their functions include sensitisation, demarcation, control, issuing warnings, following up of cases, eviction, and prosecution.

Within each district, there are offices that are in charge of the environment, forestry, wetlands, agriculture, fisheries, planning among others. Howeve , the structure varies from district to district.

3.7.2 Regional Level

As a result of the deconcentration 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 etlands Department on regional level.

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

3.7.3 Catchment Level

During the catchment management planning process, an institutional framework has to be created, which brings the stakeholders together to present and exchange their views and thus give the process legitimacy. Hence, the WMZ establishes 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 3.2:

- **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, development of plans for coordinated, integrated and sustainable development and management of water and related resources. It endorses the CMP and presents it to the Catchment Stakeholder Forum for information purposes. The CMC acts as an Executive Board for the Catchment Management Organisation.
- **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.

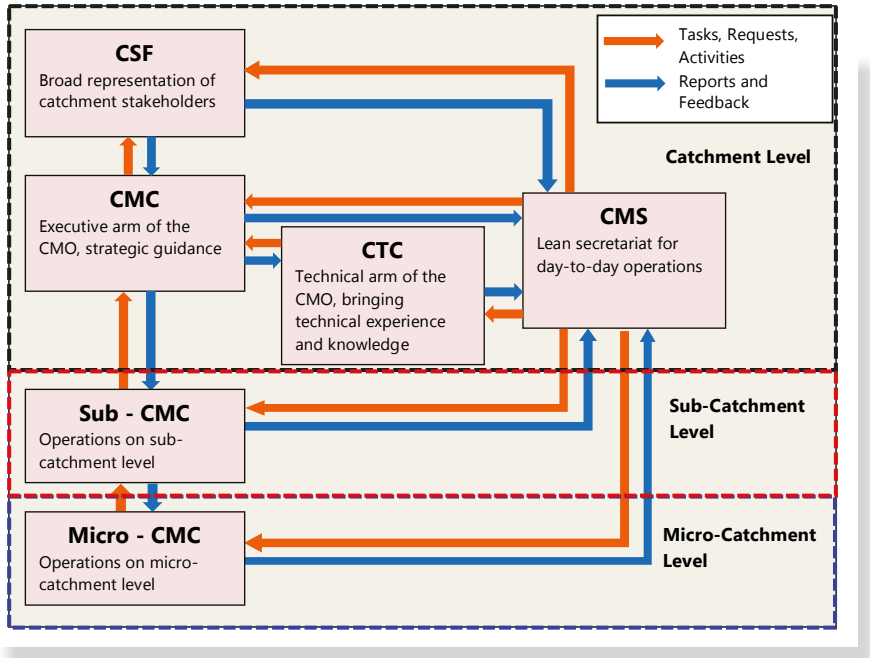

Figure 3.2: Catchment Management Organisation Structure (DWRM)

Other relevant institutions on the catchment level are:

- At the District level, the District Natural Resources Department (including the District Environment Office District Forestry Office, and District Wetlands Office), District Works or Engineering Department under which the District Water Office falls, District Production Department with the District Agricultural Office, District Veterinary Office and District Fisheries Office, District Planning Department, Department of Community Based Services, District Information Department, and District Health Department are key in the implementation of the CMP. However, the structure varies from district to district according to the natural conditions in the district

- Policies at national level are translated into Sector Development Plans, which are implemented at district level under the Decentralization Policy. Most districts have 5-year district development plans in which all sector plans are integrated. Natural Resources Management activities are mandated to be implemented by every district

- Sub-counties
- CBOs and CSOs,
- Water User Associations etc.

Additionally, there are a number of private sector and NGOs, which also act in the water sector, providing services, advice and facilitation. They work on catchment and regional level or sometimes combine the two. Many of these NGOs are coordinated at the national level through the Uganda Water and Sanitation NGO Network (UWASNET), an umbrella organisation largely funded by development partners and the MWE.

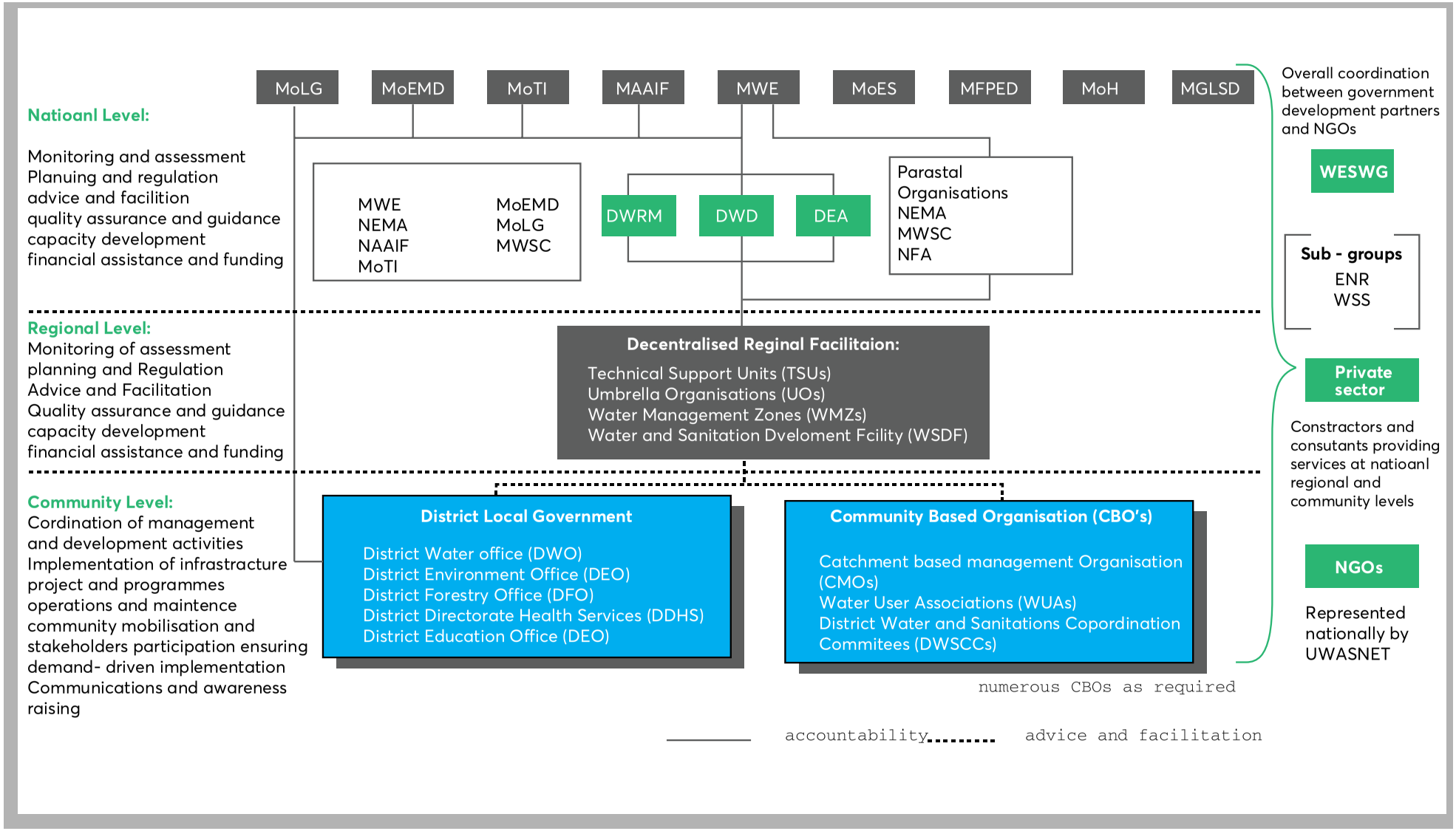

Figure 3.3: An Overview of Uganda's Water and Environment Sector (MWE, 2009)

3.7.4 Institutional Issues

Water resources management in Uganda continues to face some institutional challenges, mainly related with technical capacity, coordination, and enforcement of rules. Table 3.1: Institutional issues and implications highlights some of these challenges.

Table 3.1: Institutional issues and implications

Issues	Background and Implications
Technical Capacity in local authorities	Limited capacity in institutions on local level with limited knowledge base. This has an impact on development and service delivery.
Coordination and cooperation between institutions	Development initiatives by respective institutions are planned independently. Lack of coordination leads to inefficient use of water resources and lack of resource protection.
New institutional framework in water management	CMOs are being established. More direct interaction on local level with institutions will create more awareness and integration. Required capacities are being transferred to the zones.
Water user participation	Formal stakeholder forums are not established yet. Some water sector committees such as water and sanitation advocacy committees need to be expanded. Water sector user groups lack capacity and information on good management practices.
Law enforcement	Limited capacity and political will to enforce legislation leads to degradation of natural resources.
Development of Catchment Management Plans	It is vital that CMPs are implemented to achieve sustainability. All parties need to reach agreement on actual accountability, actual monitoring and actual enforcement as it is here where success or failure of initiatives will be determined.

4 STATUS OF THE CATCHMENT

Figure 4.1: Location of Mpologoma in the Kyoga WMZ

A catchment management plan must reflect the understanding of the catchment characteristics, trends, and national directives. Therefore, a review of the natural and anthropogenic characteristics of the catchment, national and regional plans, needs and expectations of the people is very important. This chapter presents the synopsis of the best available information concerning the biophysical, social, economic characteristics of the catchment and related development and management issues.

4.1 Catchment Description

The Mpologoma Catchment, which is one of the catchments in the Kyoga Water Management Zone (Figure 4.1), covers some 7,862 km^2 of land area and 1,127 km^2 of water area. It is bordered on the south by a narrow strip of the Victoria WMZ, which separates the catchments from Lake Victoria. The catchment is characterised by the presence of Mount Elgon (4,321masl), at the extreme northeast corner of the catchment, where the steepest slopes are found and a few extinct volcanoes and ridges along its southern and eastern rim at lower elevations along the border with Kenya. The altitude of the remainder of the catchment is between 1,150m and 1,033m, with the latter being the mean altitude of Lake Kyoga. Most wetlands in the catchment are located in this relatively flat area. The Mpologoma Catchment covers, totally or partially, 16 districts of Budaka, Bududa, Bugiri, Busia, Butaleja, Iganga, Kaliro, Kibuku, Manafwa, Mayuge, Mbale, Namayingo, Namutumba, Pallisa, Sironko, and Tororo. The population densities in the catchment are amongst the highest in the Kyoga Water Management Zone, especially around Mount Elgon, in Mbale, Bududa, and Manafwa districts The growing population in the catchment exerts increasing pressure on water and land resources, resulting in increasing degradation of the environment. The high population growth of 3.2% also leads to increased exploitation and destruction of ecosystem resources.

The catchment traverses a wide range of land-cover types including settled agricultural areas, bushland, swamp/riverine, wetlands of different types, and forested areas. Mbale, Bududa, and Manafwa districts are part of the Mt. Elgon region, with open shrubland, grasslands and herbaceous areas on the mountain peaks. Trees and shrubs cover mountain slopes, and where the slopes flatten out, there are crops, small herbaceous fields, and trees. Most of the catchment is covered by open shrubland grassland, especially in the central, northern, and eastern parts. In the western part of the catchment, the land cover is dominated by small herbaceous fields with crops and sparse trees. In Bugiri District, there is predominantly savannah woodland with forest covers of Irimbi, Luvunyia, and general savannah grassland punctuated with wetlands and swamps stretching from the lakeshores of Lake Victoria to the northern parts of the district. Kaliro District is part of the cattle corridor, with vegetation cover ranging from grasses interspersed with trees to savannah mosaics and woodlots. The vegetation cover comprises mainly combretum, acacia species, bushlands, and dry thickets. Rangelands are mainly used for grazing animals.

There are numerous wetlands in the catchment: around 16% of the total area is covered by wetlands (mainly seasonal wetlands). The main wetland systems include the Naigombwa, Namatala, Malaba, Mpologoma, Manafwa, Lumboka, and Lwakhaka wetland systems. Wetlands act as silt filters, so that much of the transported sediments are retained within the wetlands and vegetated areas, but some transported silt is also deposited in the piedmont where the slope becomes less steep, creating flood-prone zones and flood hazards in the Manafwa and Mbale areas.

Rainfed agriculture and livestock grazing are the most widespread activities in the Mpologoma Catchment. More than half of the total land area is used for cultivation since a large majority of the population is rural, and directly dependent on agriculture. Most cultivation is done by smallholders averaging some two hectares per farm unit. Two agricultural areas can be distinguished: the upstream drylands and the lowland wetlands.

- Rice is the most important crop in the wetlands although maize is also coming up as a key crop, especially in Butaleja, Namutumba, and Iganga districts.

- Coffee, bananas, cassava, sorghum, finger millet, fruit trees, potato, sweet potatoes, coffee, and maize are predominantly grown in the relatively highly drained areas of the catchment.

Rainfed agriculture is characterised by low productivity, small land holdings, poor soil management practices and lack of incentives and means to commercialise and mechanise.

4.2 Administrative Context and Population

The Mpologoma catchment covers, totally or partially, 16 districts with an estimated total population of 4,093,340 (source: National Population and Housing Census 2014, provisional results, UBOS). The population densities in the catchment are amongst the highest in the Kyoga Water Management Zone, especially around Mount Elgon, in Mbale, Bududa and Manafwa districts. The growing population in the catchment exerts increasing pressure on water and land resources, resulting in increasing degradation of the environment. The high population growth of 3.2% also leads to increased exploitation and destruction of ecosystem resources. The following table shows the population of districts in the Mpologoma catchment and the annual growth rates in the intercensus years between 2002-2014.

Table 4.1: District Population in Mpologoma catchment

District	Catchment	Population	Annual growth rate 2002-2014
Budaka	Mpologoma	193,584	3.53
Bududa	Mpologoma	211,683	4.52
Bugiri	Mpologoma	390,076	3.16
Busia	Mpologoma	314,253	3.08
Butaleja	Mpologoma	245,873	3.71
Iganga	Victoria Nile – Lumbuye and Mpologoma	476,373	2.95
Kaliro	Victoria Nile – Lumbuye and Mpologoma	236,927	3.55
Kibuku	Mpologoma	202,630	3.81
Manafwa	Mpologoma	352,864	2.46
Mayuge	Victoria Nile – Lumbuye and Mpologoma	78,931	3.24
Mbale	Mpologoma	492,804	3.28
Namayingo	Mpologoma	68,238	3.57
Namutumba	Mpologoma	253,260	3.44
Pallisa	Mpologoma	252,784	3.43
Sironko	Mpologoma	75,379	2.36
Tororo	Mpologoma	526,378	2.73
Total / average		**4,372,037**	**3.20**

4.3 Delineation of the catchment

The Mpologoma Catchment was divided into smaller units (sub-catchments) presented in Figure 4.2 and Table 4.2. This delineation into sub-catchment is necessary in order to do the water resources – water demand balance analysis. An analysis at the catchment scale could hide issues and water stress situations. The delineation of the sub-catchments must at the same time:

- be precise enough to allow capturing the situation in term of water resources-water demand balance in the different parts of the catchments.
- take into account the data available. Having too small sub-catchments would not make much sense if the estimations done on water demand cannot be made available at the same level of detail, and if data on water resources available are too scarce. Although some assessment is done for ungauged catchments, divide the overall catchments in too many pieces does not really make sense if there is too much uncertainty on the estimations made.

(Refer to the Knowledge Base Water Resources Assessment report for more information about the delineation of sub-catchments).

Table 4.2: Delineation of the Mpologoma sub-catchments

Code	Name	Description of the Sub-catchment	Remarks
M-1	Namatala	Namatala River from its source to the confluence with Manafwa	
M-2	Upper Manafwa	Manafwa River (upstream gauging station 82212)	Having a gauging station at the outlet of the sub-catchment is an advantage. Moreover, delineating a sub-catchment at this point will allow having a reference point for the Mbale town water supply, which main intake is just downstream from the gauging station 82212.
M-3	Middle Manafwa	River Kipirio and downstream part of Manafwa up to the confluence with Namatala	The Doho rice scheme abstracts water in the downstream part of this sub-catchment. By delineating this catchment, we can test the impact of the water abstraction for irrigation on the water availability downstream (after the confluence with the River Namatala).
M-4	Lower Manafwa	River Manafwa, from the confluence with Namatala to the confluence with Mpologoma	
M-5	Lwakhakha	River Lwakhakha/Malaba from its source to the confluence with Malakisi	It seemed important to delineate these 2 sub-catchments, as 1. They are transboundary, 2. Abstraction for Tororo/Busia water supply (surface water) is located just downstream 3. We expect the hydrology of the sub-catchments downstream to be different (unit runoff) 4. There are specific environmental challenges related to the context (Mount Elgon area)
M-6	Malakisi	River Malakisi from its sources to the confluence with Lwakhakha/Malaba	
M-7	Malaba	River Malaba from the confluence of Malakisi and Lwakhakha up to the confluence with river Lumbaka/Kimbimba	
M-8	Kimbimba	River Lumbaka/Kimbimba from its sources to the confluence with Malaba	Kimbimba rice scheme (one of the larger formal irrigation schemes in the Mpologoma catchment) is located in this sub-catchment.
M-9	Upper Mpologoma	River Mpologoma from the confluence with River Lumbaka/Kimbimba to the confluence with River Manafwa	
M-10	Naeombwa	Rive rNaeombwa (from its source to the confluence with Malaba	
M-11	Middle Mpologoma	River Mpologoma from the confluence with the River Manafwa to the confluence with River Naeombwa.	
M-12	Lemwa	River Lemwa (name to be confirmed) up to the confluence with Mpologoma	
M-13	Lower Mpologoma	River Mpologoma	

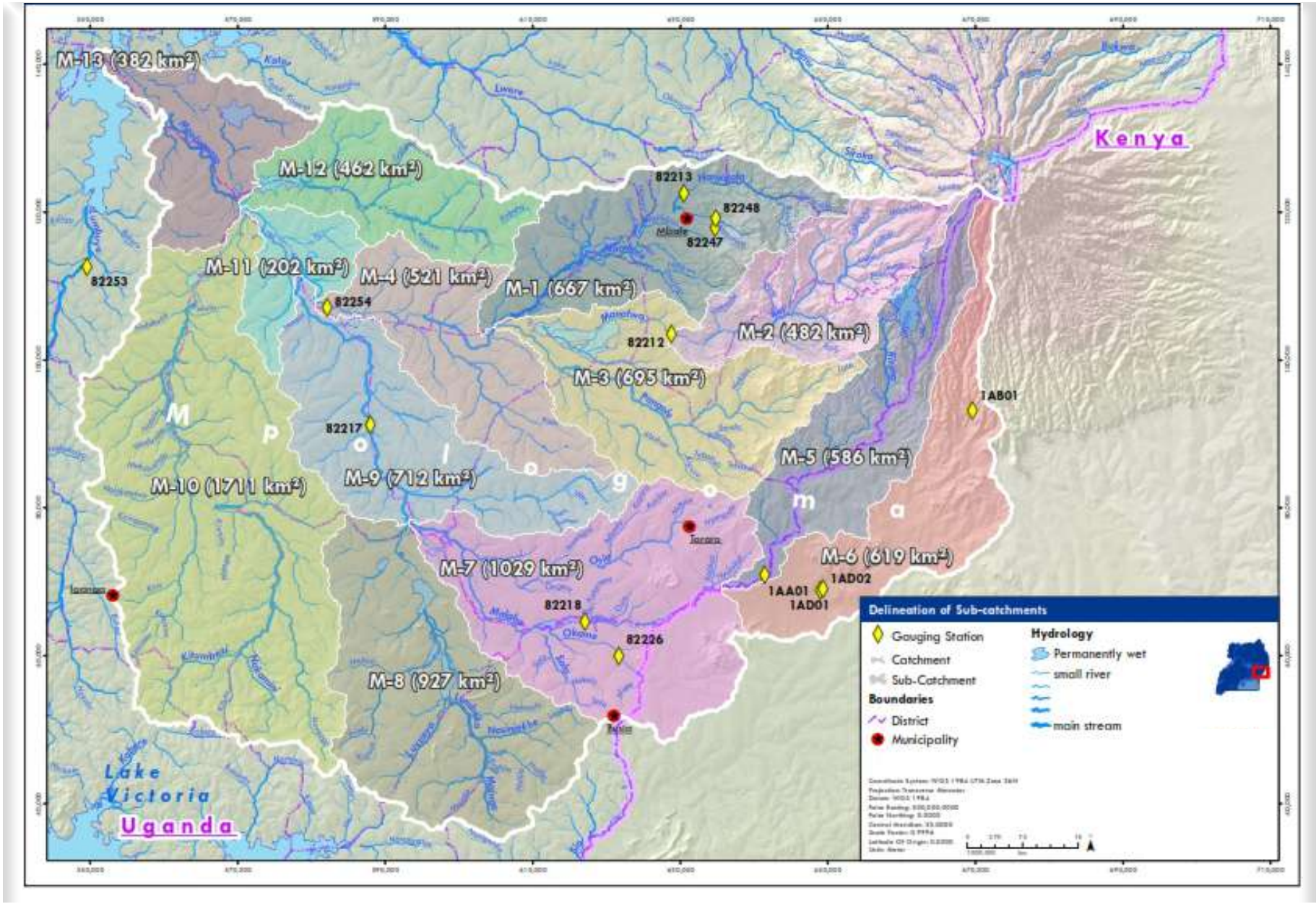

Figure 4.2: Delineated sub-catchments in the Mpologoma catchment

4.4 Topography

In the Mpologoma Catchment, the most striking topographical feature is Mount Elgon, with its craters, deep valleys and ridges. Mount Elgon on the east rises up 4,320 metres, which dominates Mbale, Manafwa, and Bududa districts. The sub-catchments in Manafwa, Bududa, and Mbale districts are divided into three distinct topographical regions, namely lowland, upland and the mountainous landscapes. The altitude of Manafwa District is typical of the continuous mountainous terrain from the neighbouring districts of Mbale and Bududa. Manafwa District is a hilly area with gentle slopes in the wetland areas and parts of the district that border Tororo. In Tororo, the terrain is composed of undulating plains with the occurrence of some river and swamp valleys. There are also out crop of rocks and isolated hills like the Tororo Rock and the Sukulu hills. On average, the plain runs in the north-south direction, from the border of Sironko District to the north, through Bukedea, Pallisa, and Tororo districts to south and southwest, respectively. Areas in Tororo and Butaleja districts consist of very flat plains. Butaleja District is generally composed of continuous flat plains although standing gneisses occur in the form of rocky outcrops in sub-counties such as Edumbe. Pallisa and Budaka districts are characterised by:

- Areas of infill found mainly at the shores of lakes and swamps such as Gogonyo, Mpologoma, and Namatala. The lakes include Nyaguo, Nyasala, Gigati, and Meito to the west, northwest of Pallisa and south in Budaka District;
- Remnants of low land surface largely characterised by open plains. Generally, Pallisa is low and fla with low valleys forming wetlands, while Budaka District is generally low and flat, characterised by shallow valleys.

The catchment area in Bugiri District bordering Tororo to the northeast, Iganga to the west, Namutumba to the northwest, Mayuge to the southwest, and Namayingo to the east, is generally characterised by gentle undulating hills with few higher residual features. A narrow and generally higher accentuated relief to the south forms a watershed between Lake Victoria drainage and northern drainage. Major hills include Irimbi, Bululu, and Namakako believed to have formed as a result of seismic activity. The slopes are cultivatable with high fertility resulting in high population density.

4.4.1 Geology and Soils

The wetland systems are composed of the following soil classes: 1) Gleysols, and 2) Histosols. Gleysols are soils frequently developed under depression areas and low landscape positions with shallow groundwater, which therefore render it appropriate for wetland rice cultivation. Histosols are composed of soils formed in organic material, frequently under papyrus vegetation. It is desirable to protect and conserve such fragile lands because of their intrinsic value (especially their common function as sponges in regulating stream flow and in supporting wetlands containing unique species of animals) and because prospects for their sustained agricultural use.
Land degradation is significant in the Mpologoma Catchmentand the most affected areas (hot spots) are the slopes of Mt. Elgon in Bududa, Mbale, and Manafwa districts. Key issues related to land degradation are the escalating soil erosion and declining soil fertility. The degradation has arisen basically because of the intensive utilisation of land for farming, poor farming methods, deforestation, bush farming and overgrazing characteristic on the upland and mountainous landscapes of Mbale, Manafwa, and Bududa. Land degradation hashad a negative impact on food production and food security due to declining soil productivity.

4.4.2 Climate

The catchment has a tropical climate with comparatively small seasonal variations in temperature, humidity and wind throughout the year. The winds are generally light and variable. The mean annual rainfall is around 1,375mm. The catchment generally experiences two rainy seasons, with heavy rains from March to May and lighter rains from October to December. Rainfall is spatially distributed, with a more pronounced gradient in the eastern Mpologoma Catchment, between the foothills of Mount Elgon and the area around Tororo.The Figure 4.3 below gives the average rainfall and potential evapotranspiration in the Mpologoma Catchment over 65 years.

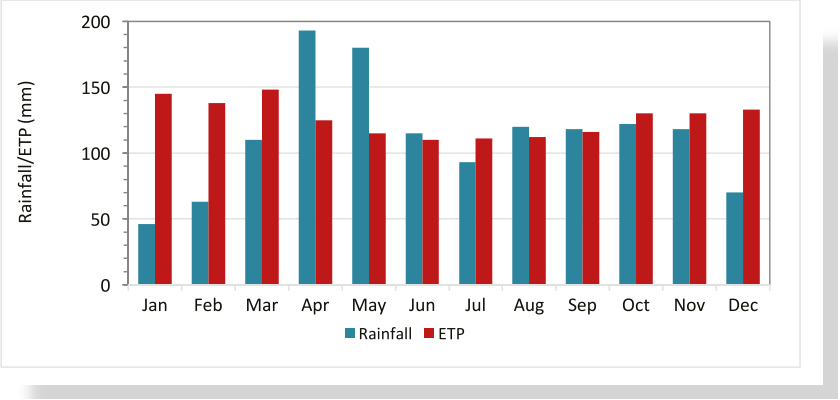

Figure 4.3: Average rainfall and potential evapotranspiration in the Mpologoma catchment (data source: GPCC, climwat).

In combination with the significant elevation differences in the catchments, Mount Elgon is responsible for the pronounced spatial variability of weather patterns in the Mpologoma Catchment. Rainfall patterns are influenced by both the topographic effects of the mountains and the proximity to Lake Victoria, through increasing total rainfall and decreasing severity of the dry period. The upland areas of Mbale, Manafwa, and Bududa experience excessive rain, which is at times very heavy, resulting in landslides that periodically lead to loss of crops, life and property. In Mbale, Bududa, and Manafwa districts, the average annual rainfall is 1,800mm per annum and bimodal. In general, there are no extreme temperatures, however, this condition is found in higher elevations in and near Mt. Elgon National Park. This high rainfall supports intensive agriculture, whichforms the backbone of the area's economy.

On the Mt. Elgon foothills and slopes, rainfall decreases from south to northwith the northern slopes falling within the rain shadow of the mountain. However, the reliability of rainfall generally increases with proximity to Lake Victoria. In parts of Tororo, Butaleja, Budaka, and Pallisa districts bordering Mbale District, rainfall is adequate for intensive agriculture.The typical climate of the districts adjacent to Doho-Namatala wetland system is equatorial sub-humid characterised by topographic and bimodal rainfall with peaks in April-May and September-November. A short dry spell usually occurs in June and July and a longer dry spell from December to February. The average annual rainfall in the Doho-Namatala wetland system ranges from 1,093mm to 1,530mm.

However, it is widely reported by officials and residents consulted that rainfall has become more erratic and unpredictable in recent years, both in amount, duration, and intensity. This is popularly attributed to the effects of climate change affecting east and central Africa, but the causal relations need to be further analysed and verified using time-series data. Climate variability can result in crop failure, damage to infrastructure and property, which increase the vulnerability of the poorer segments of the population and the most hard-to-reach and isolated communities. It also has effect on both the water supply and demand.

4.4.3 Surface Water

The main rivers in the Mpologoma Catchment are:

- Rivers Manafwa and Namatala, flowing from the North-Eastern side of the catchment, from the slopes of Mount Elgon, and joining Mpologoma Mbale-Tirinyi road, close to Butaleja town. This part of the catchment includes the large Doho-Namatala wetland system
- River Malaba, and its tributaries (including River Malakisi), flowing from the Southern slopes of Mount Elgon, including a transboundary section in Kenya, and going through Busia and Tororo districts
- Rivers Kimbimba and Naeombwa, flowing from the south, and joining the lower part of the Mpologoma Catchment.

Figure 4.4 below summarises the outflow from the Mpologoma Catchment to Lake Kyoga, on average and under dry conditions (each month being a dry month with a 5-year return period). Due to inter-annual variability, monthly flows during a dry year can be up to less than half the flows during an average year.

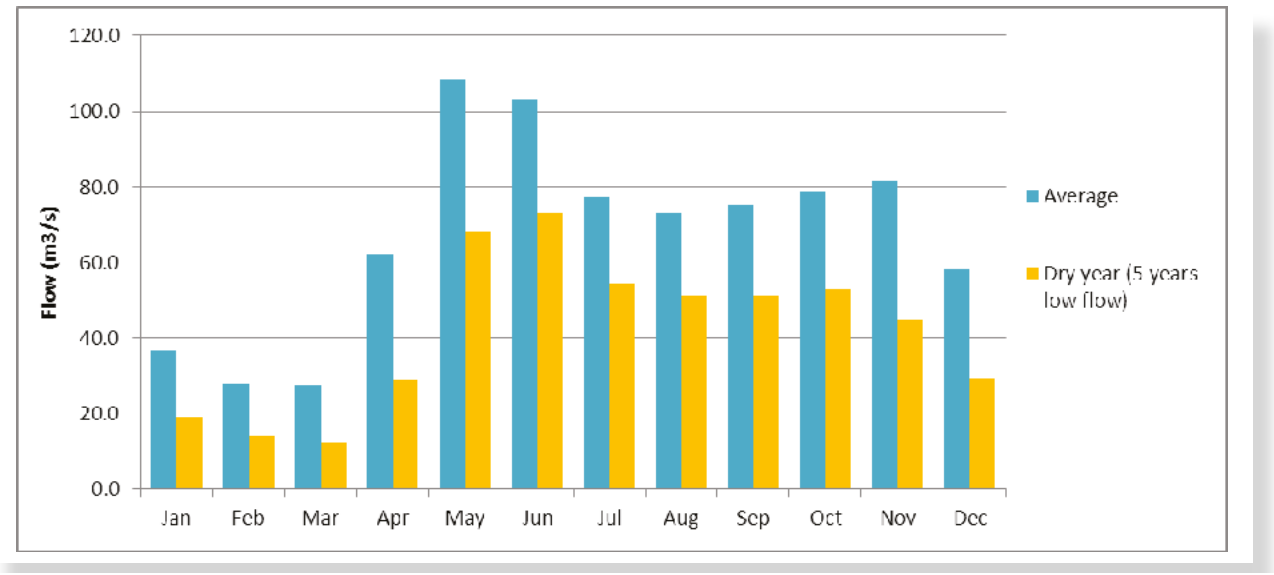

Figure 4.4: Total surface water resources of the Mpologoma catchment

4.5 Groundwater

Groundwater is available in most of the Mpologoma Catchment but the costs associated with the development of the groundwater resources vary depending on the local hydrogeological environment and the actual demand. The exploitable groundwater of the aquifer systems in the catchment has been estimated in different studies and varies from 117mcm/year (JICA, 2011) to 390mcm/year (NWRA, 2013). In both cases, exploitable groundwater seems to be adequate to sustain long-term resource development for domestic rural water supplies. Only a few areas are groundwater stressed, and rural water supply projects should cater for increased budgets in these areas. Urban water supply can also be served by groundwater, especially in view of the good groundwater quality and related low treatment costs.Table 4.3 gives the overview of groundwater consumed and/or discharged in the catchment.

Table 4.3: Groundwater consumed and/or discharged in m³ per year in the Mpologoma Catchment

	Rural groundwater abstraction								Urban groundwater abstraction	Total groundwater abstraction
Sub-catchments	No. of deep boreholes	Total abstraction / day(1)	No. of protected springs	Total abstraction / day (2)	No. of shallow wells	Total abstraction / day (3)	m3 consumed and/or discharged		Total abstraction / year from production wells	Total groundwater abstraction / year - Rural and urban combined
							per day	per year		
Total Mpologoma	4,320	21,600	2,713	65,112	738	1,845	88,557	32,323,305	504,000	32,465,225
M-1 – Namatala	469	2,345	537	12,888	52	130	15,363	5,607,495	-	5,552,380
M-10 – Narombwa	939	4,695	214	5,136	355	888	10,719	3,912,253	61,500	3,937,983
M-11 Middle Mpologoma	94	470	1	24	20	50	544	198,560	-	198,560
M-12 - Lemwa	400	2,000	115	2,760	38	95	4,855	1,772,075	25,000	1,777,365
M-13- Lower Mpologoma	158	790	7	168	16	40	998	364,270	-	356,970
M-2 – Upper Manafwa	109	545	967	23,208	15	38	23,791	8,683,533	-	8,683,533
M-3 – Middle Manafwa	475	2,375	201	4,824	16	40	7,239	2,642,235	-	2,604,640
M-4 – Lower Manafwa	396	1,980	14	336	20	50	2,366	863,590	27,500	835,793
M-5 – Lwakhahka	97	485	172	4,128	12	30	4,643	1,694,695	-	1,684,110
M-7 – Malaba	373	1,865	237	5,688	52	130	7,683	2,804,295	280,000	3,053,088
M-8 – Kimbimba	437	2,185	195	4,680	106	265	7,130	2,602,450	80,000	2,653,433
M-9 – Upper Mpologoma	373	1,865	53	1,272	36	90	3,227	1,177,855	30,000	1,127,373

Assumptions:

(1) 1 hand-pump equipped deep borehole abstracts 5 m³/day
(2) 1 shallow well abstracts 2.5 m³/day
(3) 1 protected spring discharges 24 m³/day

Figure 4.5 shows the sustainable rates of groundwater utilisation per district, projected to 2030, expressed as the proportion (%) of the available resources. It shows that the demand for domestic water in rural areas and small towns can overall safely be met by groundwater where the utilisation rate is less than 15%, indicated by the various shades of green in the picture. According to the National Water Resources Assessment (2013), estimated renewable groundwater resource exceeds the projected demand for domestic water throughout Mpologoma, but shortages may arise in areas with a high population density. The districts where this issue may arise locally include Mbale, Budaka, Manafwa, Bududa, and Iganga.

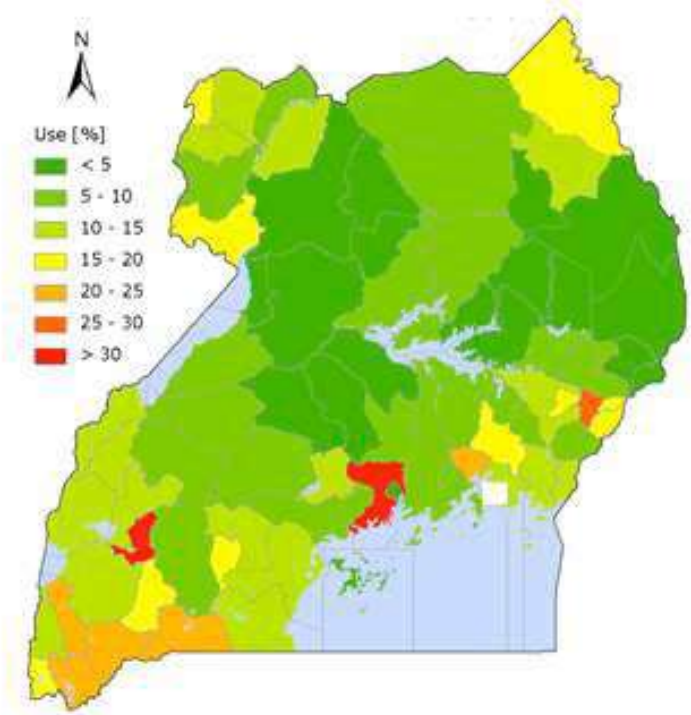

Figure 4.5: Rate of groundwater utilisation

The further development of groundwater resources for town water supplies and small irrigation systems can be successful if appropriate budgets for hydrogeological and geophysical investigations and drilling programmes are available. High yielding boreholes in the catchment have been drilled based on the results of detailed hydrogeological and geophysical tests targeting fractured aquifers through a combination of horizontal resistivity profiling and vertical electrical soundings. Groundwater monitoring programmes should be designed and implemented simultaneously.

Very few boreholes with yields of more than $10m^3hr^{-1}$ have been reported. Therefore, any groundwater development component of a water-related project should start with a detailed groundwater and surface water assessment component to assess the potential of the area. For large-scale groundwater abstraction projects, a test drilling project comprising a detailed hydrogeological survey (1-2 weeks of surveying per five test holes) and the drilling of at least five test holes should be considered. For budgetary purposes one can assume that 40% of the boreholes will have a yield of $5m^3\ hr^{-1}$ or more.

Most boreholes have been drilled in the gneisses and granites of the Basement Complex, having an average yield of $2.8m^3/hr$ and a maximum of $30m^3/hr$, at an average drilled depth of 54m. The highest yields are for boreholes drilled in the Nyanzian System [1]. Recently, more effort has been made to exploit aquifers beyond the average maximum drilling depths of 80m. Aquifers have been encountered at depths of 120 to 150m.

The JICA Lake Kyoga report (2011) shows the variation in drilling depth, static water level and yield within the Lake Kyoga Catchment. It can be concluded that borehole yields in the Central and Eastern part of the catchment are lower, and often insufficient for a hand pump. Drilling depths are on average between 50 and 75m below ground level. Static Water Levels are relatively shallow, less than 15m below ground level, with deeper Static Water Levels around Mount Elgon and in the Southern part of Bugiri District.

[1]The Nyanzian system is mainly composed of lavas and pyroclastics with minor sedimentsand banded ironstones.

Figure 4.6: High yielding boreholes in Mpologoma Catchment

The map below shows the groundwater potential yields.

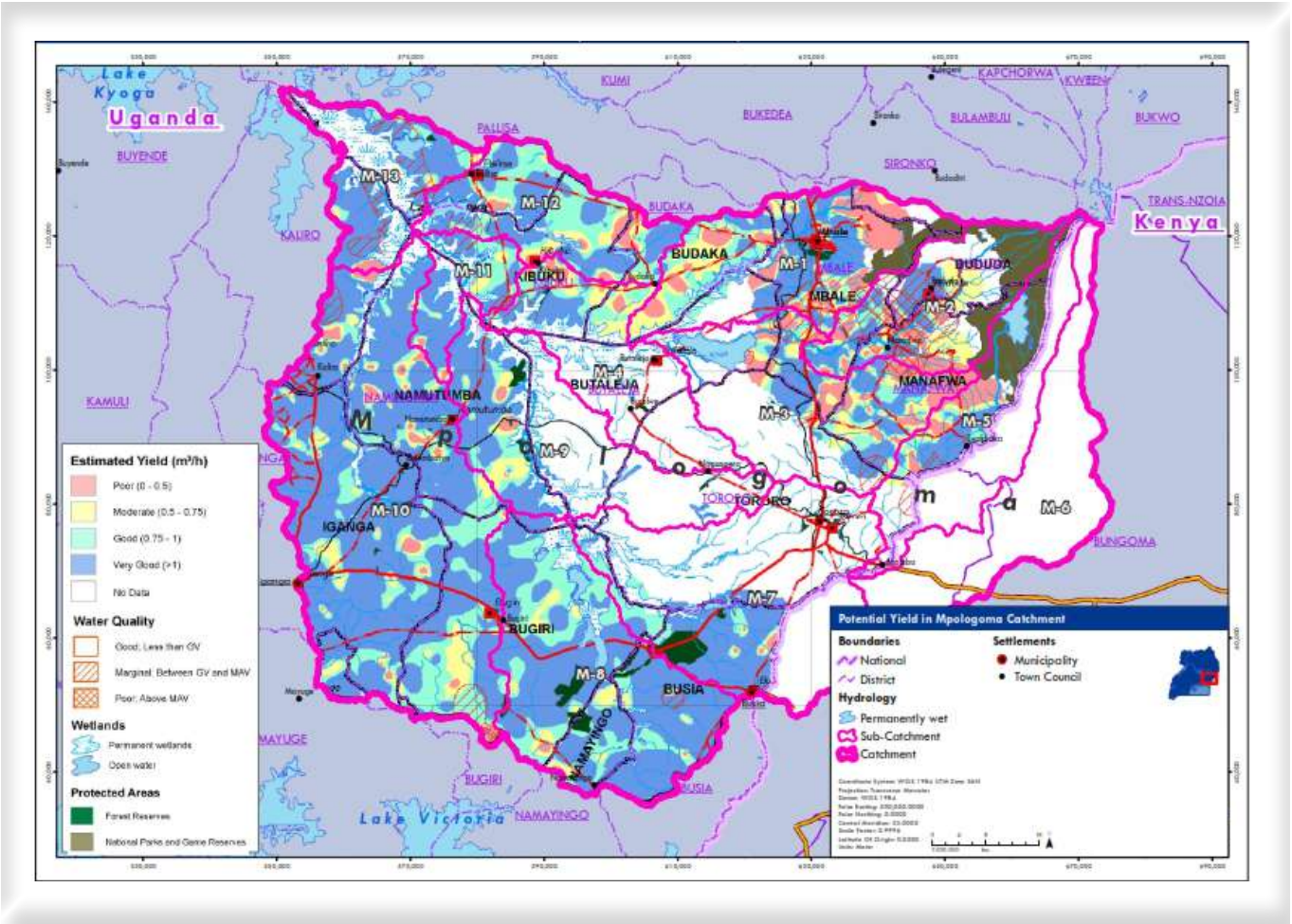

Figure 4.7: Groundwater characteristics (potential yields) in Mpologoma catchment

In view of the prevailing yields of boreholes in the catchment, the volumes of water required for irrigation and commercial livestock watering are too high to be economically provided by groundwater development.

There are some areas in Budaka, Butaleja, and Tororo Districts with high Total Dissolved Solids (TDS) values, above the guideline value in Uganda of 1000mg/L or acceptable maximum of 1,500mg/L. Also iron content is above maximum allowable concentrations of 2mg/L in parts of Mbale, Bududa, and Manafwa districts.The aquifers near the shores of Lake Kyoga contain water with high Total Dissolved Solids (TDS) values. In the rest of the catchment, the groundwater is generally of good quality. The main challenge to groundwater quality in the catchment is pollution from wastewater. In view of the population growth and increasing urbanisation, a double effort is required, viz:

- A water quality and water level monitoring plan should, therefore, be implemented for each piped groundwater scheme
- Sewerage planning for urban communities as soon as piped water supply is developed.

In Uganda, the drying up of boreholes is often mentioned to be occurring as a result of climate change. However, various regional climate change models indicate that rainfall seasons in Eastern Uganda will become more pronounced and intense as a result of climate change, which may result in greater recharge and thus more groundwater rather than less. The perceived drying up of boreholes may be more related to regulatory issues, where (i) boreholes that are low-yielding with deep water strikes are still put to use, or (ii) boreholes are pumped at a higher rate than can be sustained by the aquifer in question. It should be noted on the other hand, that changes in land-use, for instance as a result of deforestation, may negatively impact on the groundwater recharge. More studies in targeted areas are required to evaluate the perceived phenomenon of drying up of boreholes.

4.6 Surface water quality

Based on theoretical approach, the estimation of pollution loads has been done for wastewater, urban runoff, and agriculture. The highest pollution loads come from non-urban run-off:

- The catchment suffers mainly from pollution caused by agricultural run-off. This is consistent with land use in the catchment. This pollution is difficult to control and manag
- BOD loads are partly (between 15% and 18%) caused by the lack and inadequacy of sanitation facilities, which is coherent with our knowledge of sanitation facilities in the catchment
- Urban run-off causes low pollution, which is coherent with land use in the catchment: built-up areas represent usually less than 1% of sub-catchment area, except for M-1 (almost 3%).

Nevertheless, it should be kept in mind that in the absence of significant rainfall events, especially during the dry seasons, little pollution is released from run-off; most of the pollution is due to the lack and inadequacy of sanitation facilities.

To reduce pollution of drinking water supplies, the following measures should be considered:

- Improving sanitation facilities for the urban and rural population as well as industries
- As most water sources are surface water and the main water quality problem is turbidity, adequate drinking water treatment plants should be implemented to reduce pollution and provide drinking water achieving standards of drinking water quality
- Introducing good land-use practices (education of the population)
- Along with quantitative monitoring of surface water, the number of water quality monitoring stations would be expanded and additional parameters measured.

4.7 Flood and droughts

Uganda experiences both flash and slow onset floods. They are common in low-lying areas and areas along riverbanks and close to wetlands. Landslides and mudslides occur in Mount Elgon region, especially in Bududa and Mbale districts.According to the Natural Water Resources Assessment report (2013), flooding in Uganda tends to occur more often during the short rainy season (from October to November), which has a higher frequency of extreme rainfall often associated with El Niño events. Some floods can also occur during the long rainy period, from March to May. Various human factors can aggravate extreme rainfall, such as backwater effects, blocked drainage channels, deforestation and urbanisation. The foothills of Mount Elgon are the most flood-prone areas in the catchment. The EM-DAT disaster database (EM-DAT 2011) indicates high risks of landslides in Mbale District on the slopes of Mount Elgon. In the EM-DAT disaster database, six flood events have been registered since 1997 in Mbale district: 11/1997; 05/2002; 05/2003; 07/2003; 09-10/2007; and 08/2011.

The most drought-prone areas in Uganda are in the cattle corridor – where a very limited part lies in the catchment.

Main droughts registered in the country occurred in 1967, 1979, 1987, 1998, 1999, 2002, 2005, 2008 and 2011 but are concentrated in the North-Eastern part of the country, in Karamoja region (source: Emergency Event Database, Centre for Research on the Epidemiology of Disasters).

In recent years, stakeholders noted a growing uncertainty about the onset and timing of the rains and the occasional cessation of rainfall during the growing season, which contributed to agricultural droughts. The most drought-prone area is the northeast part of the Mpologoma Catchment, which is part of the cattle corridor. Developmentof irrigationreservoirs and water tanks is needed in order to mitigate drought impacts. Adaptation to more erratic rainfall is a major means to adapt to climate change.

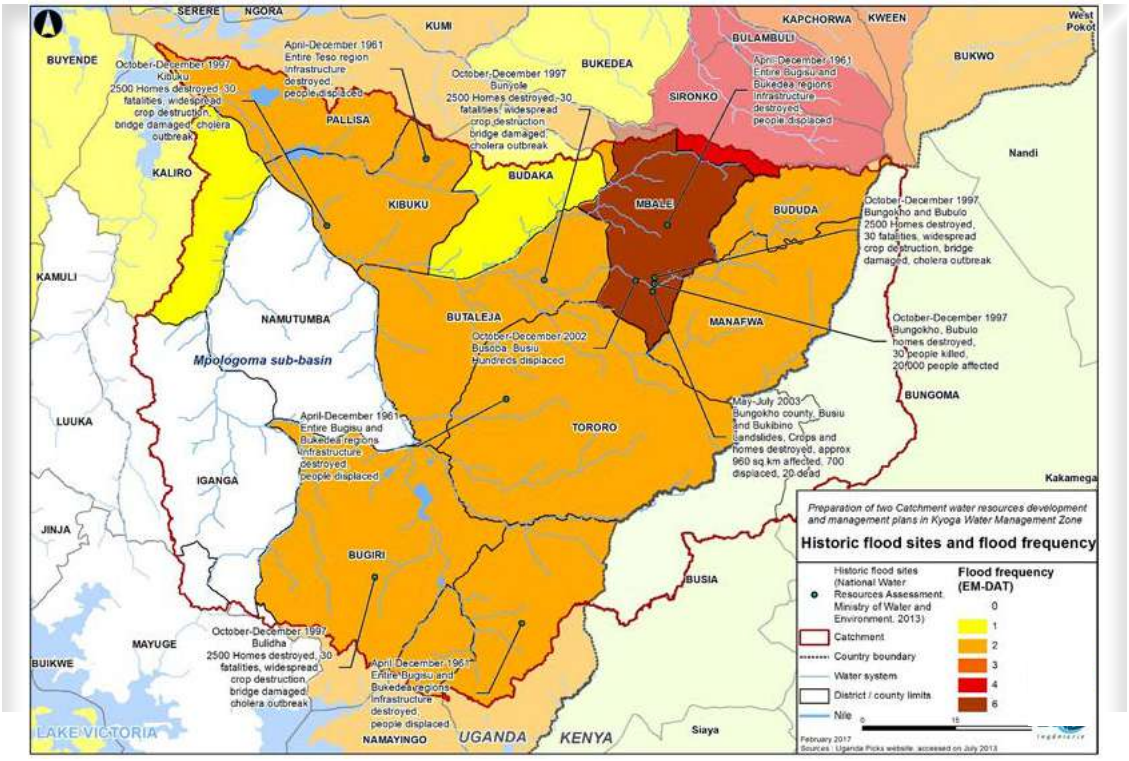

Figure 4.8: Historic flood sites and flood frequency

4.8 Water demand and water balance

Water demand for the different uses (irrigation, livestock, water supply and industry) has been estimated for each sub-catchment. In the Mpologoma Catchment, the total water demand is about 250 Mm^3/year. As visible in Figure 4.9, irrigation is the main water demand and represents 77% of the total current water demand of the catchment. It can be underlined that most of the irrigation requirements are for informal irrigation estimated as 47,130ha in the Mpologoma Catchment. This type of irrigation takes place in wetlands for paddy rice production. In comparison, formal irrigated area is very low and represents only 1,740ha. Domestic water demand is also important (16% of the total).

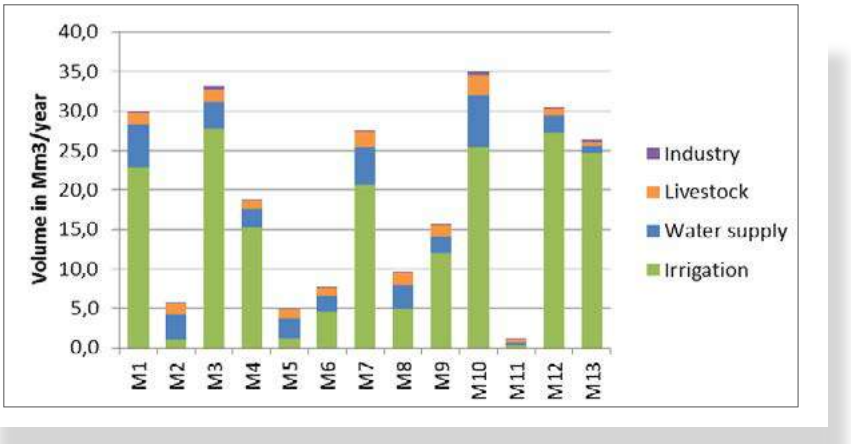

Figure 4.9: Water demand in the Mpologoma Catchment by sub-catchments

On an annual basis, water resources are sufficient to meet the demand in all the sub-catchments. Calculations using a monthly time-step have also been undertaken and show that deficits (periods when water demand exceeds available resources) can occur, especially in March, which is a month when irrigation requirements are high and when flows still have not increased before the rainy season. When minimum flow requirements are taken into account, the deficits are more frequents and last longer. Although deficits are relatively frequent, their extent is in some cases limited, and most of the demand can usually be met.The Figure 4.10 below provides a summary of the water resources – water demand balance for the sub-catchments).

"Water stress" has been evaluated using the following scale:

Low	Deficit encountered less than 10% of the years (once every 10 years)
Moderate	Deficit encountered between 11 to 25% of the years
Moderate to High	Deficit encountered between 226 to 50% of the years
High	Deficit encountered 51 to 70% of the years
Very High	Deficit more than 70% of the years

Catchment	Sub-catchment	Water stress frequency
Mpologoma	M1	
	M2	
	M3	
	M4	
	M5	
	M6	
	M7	
	M8	
	M9	
	M10	
	M11	
	M12	
	M13	

Figure 4.10 Summary of water resources - water demand balance for sub-catchments

4.9 Climate change and water resources

The impact of climate change on the surface water resources available was assessed as part of the water resources assessment. Six climate change scenarios were tested, they correspond to the running of greenhouse gases emission scenarios A1B, A2, and B1 (from the 4th IPCC assessment) combined with two different Global Circulation Models (GCM) ECHAM5 and HadCM3. Although the water resource decreases under the effect of climate change, annual resources available remains largely above annual water demand in the Mpologoma Catchment. However, for the different climate change scenarios tested, a reduction of available water resources between May and November leads to an increase in the water stress and implies larger deficits to meet the demand (both in frequency and intensity). The comparison of current and future mean monthly rainfall is presented in Figure 4.11 below.

This said, it is important to keep in mind that uncertainty is important regarding (i) future climatic conditions (only a few out of hundreds of possible scenarios have been tested) and therefore their impact on water resources, and (ii) the current water resources and current water resources-water demand balance, whose accuracy is limited due to the lack of hydro-meteorological data in the different sub-catchments.

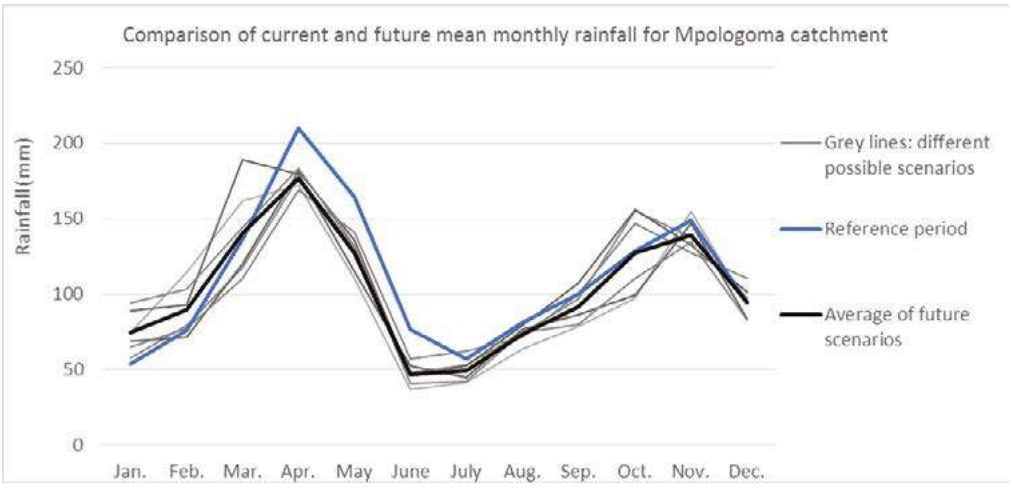

Figure 4.11 Comparison of current and future mean monthly rainfall for Mpologoma catchment

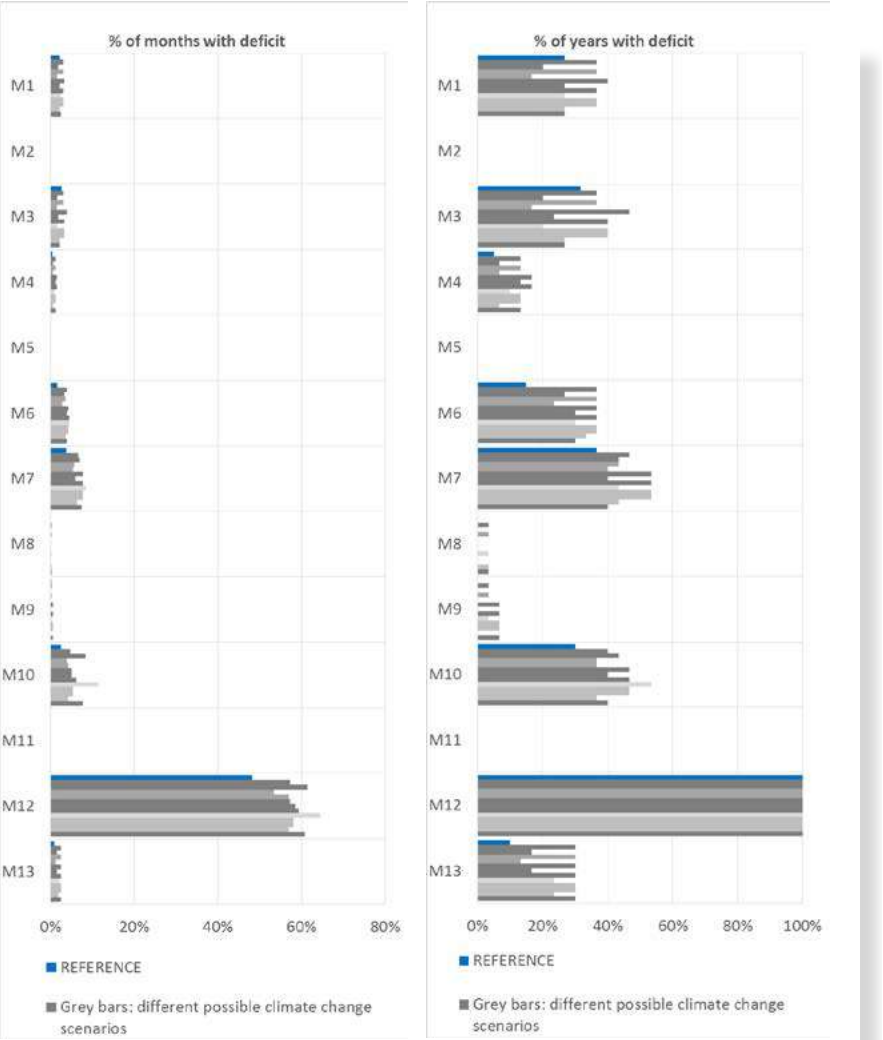

Figure 4.12: Occurrence of deficit under different climate change scenarios in Mpologoma catchment

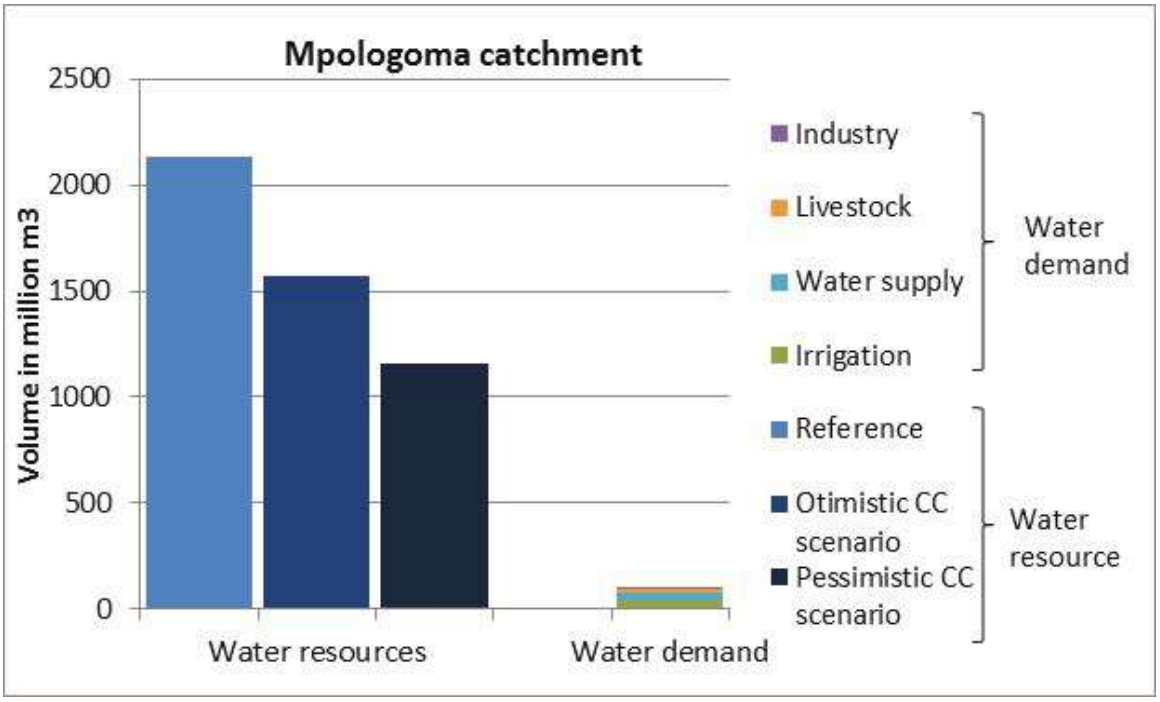

Figure 4.13 Annual Water Resources -Water demand balance under different climate change scenarios

4.10 Rainfed agriculture and livestock

Rainfed agriculture and livestock grazing are the most widespread activities in the Mpologoma Catchment. More than half of the total land area is used for cultivation since a large majority of the population is rural, and directly dependent on agriculture. Most cultivation is done by smallholders averaging some two hectares per farm unit. Two agricultural areas can be distinguished: the upstream drylands and the lowland wetlands.

- Rice is the most important crop in the wetlands although maize is also coming up as a key crop, especially in Butaleja, Namutumba, and Iganga districts.
- Coffee, bananas, cassava, sorghum, finger millet, fruit trees, potato, sweet potatoes, coffee, and maize are predominantly grown in the relatively highly drained areas of the catchment.

Rainfed agriculture is characterised by low productivity, small land holdings, poor soil management practices and lack of incentives and means to commercialise and mechanise. The Mount Elgon foothills, in the northeast of the catchment, have the highest number of livestock. The total number of livestock in the catchment was close to 916,000LTU (Livestock Tropical Unit) according to the 2008 livestock national census. Table 4.4 presents the number of livestock in each one of the districts partially of totally comprised in the Mpologoma Catchment.

Table 4.4: Number of livestock in the district partially or totally comprised in Mpologoma catchment (based on 2006 district's boundaries)

DISTRICT	Area district (km2)	LTU cattle	LTU Sheep	LTU Goat	LTU pig	LTU Chicken	LTU total	LTU density (nb/km²)
Budaka	410	28,162	598	7,791	2,017	1,726	40,295	98
Bududa	251	35,566	602	3,883	8,554	2,057	50,662	202
Bugiri	1,508	82,899	2,142	33,117	26,181	9,431	153,770	102
Busia	735	18,751	436	11,035	5,681	3,913	39,816	54
Butaleja	653	54,073	1,460	10,741	1,799	2,519	70,592	108
Iganga	1,668	87,715	760	25,487	11,074	9,045	134,080	80
Kaliro	868	45,755	322	8,414	5,910	1,889	62,289	72
Manafwa	602	53,621	719	11,989	15,562	4,443	86,335	143
Mbale	518	44,678	766	14,493	9,326	4,599	73,862	142
Pallisa	1,585	95,358	3,073	22,350	10,121	4,400	135,302	85
Tororo	1,196	83,711	1,963	23,109	18,102	5,916	132,800	111
Mayuge	1,040	59,866	1,202	20,350	7,338	6,079	94,835	91
Sironko	1,097	64,793	1,471	11,871	13,093	3,911	95,140	87
Namutumba	814	53,693	1,004	10,532	4,915	3,019	73,162	90
Kapchorwa	1,206	66,895	1,478	11,261	3,228	2,855	85,717	71
Bungoma (Kenya)	2,053	201,307	10,291	10,258	4,553	11,451	237,860	116
Mount Elgon (Kenya)	961	32,159	3,054	2,200	290	1,108	38,810	40
BUSIA (Kenya)	1,106	49,970	2,290	2,858	8,526	3,756	67,400	61
Teso (Kenya)	552	42,993	1,394	5,918	6,881	3,793	60,979	110

4.11 Irrigation

In Mpologoma, there are only two major irrigation schemes: Kibimba (Tilda) and Doho, and a horticulture project (Lukhuna). Management of large irrigation schemes is difficult because of insufficient involvement of local farmers in planning, management, and operation and maintenance.

Informal small-scale irrigation has been increasing, especially for rice, and there is no updated and precise record of the extent of informally cultivated areas. Existing estimates (NWRA, 2013) reckon that more than 53,000ha of paddy rice irrigation on wetland fringes in Eastern Uganda and has been estimated to more than 47,000ha in Mpologoma. Most of it is located on the fringes of wetlands and smallholder farmers developed it spontaneously without planning and with little or no technical assistance. As for rain-fed agriculture, crops yields are generally low, due to various factors such as poor soil fertility, increased pests and diseases, and low quality seeds.

4.12 Fisheries and fish farming

Fisheries and fish farming is another economic activity in the catchment. There is a high domestic and export demand for high quality fish products. Capture fisheries in the Mpologoma Catchment are entirely small-scale, on small lakes, rivers, streams and associated wetlands. Fish catches are apparently decreasing in the catchment. The main constraints hindering capture fisheries production are degradation of water quality in lakes, rivers and wetlands, use of illegal fishing methods and invasive weeds. Regulation and law enforcement must be improved to prevent the use of prohibited gear and poaching. Similarly, the catchment is characterised by small-scale aquaculture enterprises, mainly practiced by individual fish farmers although there are some farms owned by groups of farmers such as in Mbale District. Developing fish farming would benefit from investment incentives and improved extension services.

4.13 Water supply and sanitation

Improved access to safe drinking water supply is also important for public-health improvement and can support the involvement of women in productive activities. In the Mpologoma Catchment, there is stagnation in water supply coverage resulting from population increase and from increased costs. The overall water supply access is 64.8% (64% urban and 63.4% rural), which is slightly below the national average. Of the districts in the catchment, only Budaka is reported to have safe water coverage above the national target of 77%. The other districts have coverage between 40 and 70%.

It has been observed that sanitation is insufficient in the catchment. In the catchment, only two towns (Mbale and Tororo), have a central sewerage system. Poor sanitation impacts water resources, health, and the dignity of life. Awareness raising and the development of a sanitation culture with emphasis on rural communities is needed. Pit latrines should be within the reach of every household, even poor households; high water tables; floods and fragile soils hinder the construction of latrines in some parts of the catchment.

The development and maintaining functionality of wastewater treatment works, especially in big towns such as Mbale, Tororo, Busia, and Iganga, is also important. As rural growth centres expand, there will be a growing need for centralised sewerage treatment. Planning and implementation of improved sanitation facilities (latrines and hand-washing) for public facilities and meeting places as well as implementation of domestic wastewater treatment options are essential.

4.14 Existing initiatives and Programs

4.14.1 Wetlands

As an impact, this pressure on wetland alters their capacity to provide various services to the local population. Wetlands should be considered as a limited resource, which needs to be managed. For this purpose, various projects and planned approaches are currently ongoing in the study area. The major one taking place in Mpologoma Catchment is the National Wetland Management Project led by the Directorate of Environmental Affairs (DEA) and funded by the Japan International Cooperation Agency (JICA). This project, which is still on-going, has as its main objective to establish a model of conservation and wise use of wetlands in Uganda. The overall goal of the project is "a model of conservation and wise use of wetlands is disseminated."

4.14.2 Floods

In order to support flood risk reduction activities in the Kyoga Water Management Zone, a partnership has been established in 2013 between the German Development Cooperation (GIZ), the International Institute of Rural Reconstruction (IIRR) in collaboration with the Ministry of Water and Environment through the Directorate of Water Resources Management to implement the "Flood Risk Management in the Kyoga WMZ" project. The German Cooperation supported the development and implementation of flood risk management activities that help affected communities and local institutions improve their resilience and adaptive capacities towards extreme weather events like floods, in the knowledge that such events may progress into disasters due to impacts of climate change (GIZ, IIRR, 2014).

In addition to this approach, the project contributed to the implementation of 14 hydrological stations with telemetry status in the Kyoga basin to generate data on water levels and in order to enhance community preparedness to flood risks. Eleven of the 14 stations were visited as part the project "Detailed assessment of requirement for water resources information system" (BRLi, 2015). At the date of the visits, only three were confi med operational.

4.14.3 Other interventions

There are a number of projects and planning documents that identified measures that should be taken into account in the management plan for the Mpologoma Catchment. These include the following:

- National wetlands management project - Wetland use and livelihood assessment - Butaleja District – 2013
- National wetlands management project - Wetland use and livelihood assessment - Mbale District – 2013
- National wetlands management project - Wetland use and livelihood assessment - Budaka District – 2013
- National wetlands management project - Wetland use and livelihood assessment - Butaleja District – 2013
- Framework Management Plan Doho Namatala wetland – 2014
- Sio-Malaba-Malakisi Transboundary Integrated Water Resources Management & Development Project
- Lwakhakha Intervention Implementation Plan - 2016
- Manafwa DDP 2015-2020
- Mbale DDP 2015-2020
- Tororo DDP 2015-2020.
- A number of hotspots were identified by IIRR as pa t of the project "Consultancy Services to Facilitate Stakeholder Engagement and Participation in Catchment Management Planning in Kyoga WMZ". The

NGO undertook a stakeholder consultation at local level (village, parish, etc.). Under this consultation, a comprehensive list of issues and activities to implement were identified and geo-located. These were presented in their report "IIRR Final Survey Report, August 2016 and the IIRR Survey, 31/08/2016 - 02/09/2016"

- The agriculture cluster project" and the "Pre-feasibility study for irrigated rice production in Uganda under the Agriculture Technology and Agribusiness Advisory Services (ATAAS) Project" identified relatively small irrigable areas. The implementation of these projects was also taken into account in the catchment management plan.

4.15 Stakeholder involvement

The purpose of stakeholder analysis is to identify and analyse key stakeholders who presently are or in the future may be involved in planning, developing, managing, regulating or using water resources. This analysis assesses the influence of the stakeholders, i.e. the power that they have to affect the planning process and the implementation of the catchment plans. It also assesses their interest and how much they have to lose or gain from the implementation of the plans. The key to effectively involving stakeholders is in identifying which stakeholders should be involved at any particular stage in the process and how. If the right stakeholders are not identified and involved at the right time and in the right way, the legitimacy and effectiveness of the resulting plans in terms of participation, implementation and the sustainability of benefits can be compromised.Identifying, understanding, consulting, engaging, and organising stakeholders is a condition for the successful preparation and implementation of a CMP. For this reason, stakeholders had the opportunity to participate in all phases of the planning process and subsequently in the management and implementation of the CMPs. The following principles have been observed in the stakeholder engagement process:

a) The interests, issues, needs, capacities, resources, and influence of key stakeholders have been identifie and taken into account in the preparation of the CMP
b) Key stakeholders are informed, understand, appreciate, and accept the need for and benefits of a participatory CMP and are willing to commit time, funds and other resources to its implementation
c) Key stakeholders actively participate in and influence the choices made and priorities in preparing the CMP and feel a sense of ownership, responsibility and accountability in implementing the CMP.

Engaging national, regional, catchment and local stakeholders has a number of benefits, including

a) Raising awareness and fostering a greater understanding and appreciation of the importance of participatory management of water resources at catchment level
b) Facilitating greater "buy-in" and commitment by stakeholders at catchment level to plan, manage, develop and protect water resources in the catchment
c) Identifying an organisation and processes that are accepted by water users and other key stakeholders in the catchment for conflict resolution, water regulation and enforcement, and other water management measures.

As a result of the stakeholder consultation, the inception and stakeholder consultative workshop, the influence and interests of stakeholders in regard to the elaboration and implementation of the Catchment Management Plans have been captured. Table 4.5 below summarises the findings

Table 4.5: Interest and influence of the stakeholders

Level	Stakeholder/institution		Interest	Positive/Negative	Influence	Function
National	Ministry of Water and Environment (MWE)	DWRM	Water resources management, socio-economic development of the catchments.	Positive, they are always involved in water resources and environment Management and conservation	High	- Setting national policies and standards, managing and regulating water resources and determining priorities for water development and management. - Monitors and evaluates sector development programs to keep track of their performance, efficiency and effectiveness in service delivery.
		DWD	Development of water supply and sanitation and infrastructures in general.	Positive, they are involved in water supply and sanitation development.	Medium	- Technical oversight for planning implementation and supervision of delivery of urban and rural water and sanitation services
		DEA	Environment management and conservation. Environmental regulation. Sensitization of the population.	Positive, they are always involved in water resources and environment Management and conservation	High	- Review the environmental regulatory needs (actions, new or revised regulations) based on the adopted final plan; - Issue required regulations, notices, and permits in accordance with legal and regulatory requirements - Responsible for environmental legislation and enforcement; - Issue EIA certificates for major developments
	National Environment Management Authority (NEMA)		Environmental regulation and conservation. Catchment protection, sensitization and awareness of the population, etc.	Positive, they are always involved in Environment Management and conservation	Low	- Coordinate, monitor, regulate and supervise the state of the environment in Uganda
	National Forestry Authority (NFA)		Forest resource management and protection; Tree planting in degraded areas; Sensitization and awareness of the population.	Positive, they are always involved in Environment Management and conservation	Low	Manage Central Forest Reserves on a sustainable basis and to supply high quality forestry-related products and services to government, local communities and the private sector
	Ministry of Agriculture, Animal, Industry and Fisheries (MAAIF)		Improve and conduct training on good farming practices, fish farming, irrigation, and alternative livelihood activities; Develop agriculture schemes in the catchments, Develop formal irrigation, Promotion and development of aquaculture and other alternative livelihoods, Develop necessary infrastructure, Sensitize farmers.	Positive, they are always involved in Environment Management and conservation	High	- Formulate, review and implement national policies, plans, strategies, regulations and standards and enforce laws, regulations and standards along the value chain of crops, livestock and fisheries; - Control and manage epidemics and disasters, and support the control of sporadic and endemic diseases, pests and vectors; - Regulate the use of agricultural chemicals, veterinary drugs, biological, planting and stocking materials as well as other inputs; - Support the development of infrastructure and use of water for agricultural production along livestock, crop and fisheries value chains; - Establish sustainable systems to collect, process, maintain and disseminate agricultural statistics and information; - Support provision of planting and stocking materials and other inputs to increase production and commercialization of agriculture for food security and household income; - Develop public infrastructure to support production, quality / safety assurance and value-addition along the livestock, crop and fisheries commodity chains; - Monitor, inspect, evaluate and harmonize activities in the agricultural sector including local governments; - Strengthen human and institutional capacity and mobilize financial and technical resources for delivery of agricultural services; - Develop and promote collaborative mechanisms nationally, regionally and internationally on issues pertaining to the sector;
	Ministry of Tourism and Industry (MoTI)		Development of tourism potential in both catchments and industrial activities.	Positive, there is an important potential for both tourism and industry in both catchments.	Low	- Formulate, Implement and Monitor Tourism, Wildlife and Cultural heritage Policies, Legislations, Plans, strategies and standards. - Ensure sustainable management of wildlife and cultural heritage conservation areas; - Ensure Tourism Product Diversification; - Promote tourism destination in Uganda; - Ensure Human resource capacity development in Tourism, Wildlife and Heritage sector; - Education and awareness creation of the sector; - Regulation and Quality Assurance of Tourism, Wildlife and Heritage programs and services.; - Tourism, Wildlife and Heritage Research, information management and dissemination
	Ministry of Local Government (MoLG)		Organize and conduct training of local government staff.	Positive	Low	- Responsible for capacity building in local governments and supervision of local authorities; - Establish, develop and facilitate management of decentralised local government systems; - Oversee the implementation of Local Government Development Plans that include water supply, environment and natural resources as well as public health and sanitation in institutions and public places.

Level	Stakeholder/institution		Interest	Positive/Negative	Influence	Function
Regional	Ministry of Water and Environment	Kyoga WMZ	Water resources management, socio-economic development of the catchments.	Positive, they are always involved in water resources and environment Management and conservation	High	- Plan, implement and oversee IWRM activities closer to stakeholders and realities on the ground, as well as improve the effectiveness of regulation and implementation of water resource development plans; - Facilitate and support DWRM's coordination of central level implementation and financial resource mobilization; - Facilitate implementation of catchment planning projects by central departments; - Identify modalities for zonal and catchment level implantation among its public and private sector partners; - Assess water use permit applications under existing regulations;
	Water and Sanitation Development Facility (WSDF)	WSDF-East	Water supply and sanitation development, improvement of population's wellbeing. Water service provision and water resources management. Undertake implementation of projects within their area of responsibility.	Positive, they are involved in water supply and sanitation development.	Low	- Zonal planning and water scheme identification; - Feasibility studies and detailed designs of piped schemes; - Tendering procurement and supervision of construction contracts; - Financial management and reporting; - Capacity building
	NWSC	NWSC Mbale	Improve water supply and sanitation in the catchments. Improve effluent water quality from waste water treatment plants.	Positive, they are involved in water supply and sanitation development.	Low	Plan, operate and maintain water supply and sewerage services in areas entrusted to it in urban centres in Uganda. - Providing water and sewerage services; - Expanding service coverage, improving efficiency in service delivery and improving labour performance.
		NWSC Tororo				
	Uganda Wildlife Authority (UWA)		Promotion of peace, protection of wildlife, sensitization of the people	Positive, they are always involved in Environment Management and conservation	Low	Ensure protection of wildlife in the protected areas
District level	Districts	District CAO	Mobilization and sensitizations of the community, Enforcement of rules and regulations in regards to Natural resource Management	Positive: Emphasis on proper management of natural resources	High	- Coordinate activities in the district
		District Water Office (DWO)			High	- Plan, supervise construction and monitor the operation and maintenance of water supply and sanitation facilities in the district
		District Forestry Office (DFO)			High	- Manage the status and use of the district's forests
		District Natural Resources Office (DNRO)			High	- Monitor and Manage the district's state of the environment, land management issues and the use of natural resources
		District Community Development Office (DCDO)			High	- Manage social issues, welfare, gender issues and vulnerable groups, households and livelihoods profile of the district
		District Planning Unit (DPU)			High	- District plans and investment profiles
	Non-Government Organization (e.g. IUCN, Plan International, Red Cross, One Archer Land, KA NEGO, UWASNET, WaterAid, etc)		Supply of safe water to the community and treatment of wastewater Environmental conservation and management	Positive. Positive: They are involved in treatment of wastewater	High	
	Business Community (Traders)		Utilization of the catchment, Extension of services nearer to the people	Should be more involved in the development process, through CMCs for instance	Low	
	Institutions (Schools, health units and churches)		Utilization of the catchments, education and sensitization of communities	Positive: The institutions emphasise conservation of the environment, At community meetings held in Kamuli District, Namasagali Sub-county, the community appreciated Busitema University for supplying them with tree seedlings and offering to plant trees in all institutions in the sub-county	Low	
	Community members (Subsistence farming and rearing of animals)		Farming	Possibly negative. Some farmers practice poor farming methods such as monoculture and over-cultivation that degrades the land and the environment.	Low	

Table 4.6 below present the main issues identified by the stakeholders during the second consultative workshop. These issues are prioritized from the most (1) to the less (10) important according to eight groups representing different parts of the catchments.

Table 4.6: Issues prioritised by stakeholders for the Mpologoma Catchment

Priority	Mount Elgon area: Bududa, Mbale, Manafwa, Sironko	Mount Elgon Foothills: Mbale, Manafwa, Tororo, Budaka, Butaleja	Low land: Butaleja, Budaka, Kibuku, Namutumba, Pallisa	South-East: Busia, Tororo, Bugiri	Naigombwa: Bugiri, Namutumbe, Kaliro, Iganga, Mayuge
1	Landslides, mudslides	Forest degradation	Encroachment of wetlands and forest reserves; have ill-defined physical boundaries	Pollution of wetlands and rivers	Wetland encroachment
2	Deforestation	Urban and rural water insecurity	Deforestation and degradation of forests ((CFR in Buyenvu, Bududa)	High population density and growth rates	Soil erosion/siltation
3	Land degradation	Reclamation of wetlands	Deposition/siltation in wetlands and lakes	Land tenure issues	Pollution (industries and farmers)
4	Population explosion	Soil degradation	Flood (in Butaleja, Buduka and Pallisa)	Depletion of forest	Land degradation (poor farming practices)
5	Poor enforcement of environmental policies	Confl ct over natural resources	Resource use confl cts*: (1) Kabuna LFR (both in Budaka and Kibuku Districts) conflicting management. (2) Limoto wetland (Pallisa and Kibuku District. (3) Mbale and Budaka*	Uncontrolled encroachment of wetlands	Prolonged droughts due to tree cutting (cultivation, charcoal burning)
6	Floods			High poverty level	Land fragmentation due to population pressure
Additional issues listed but not prioritised by stakeholders					
		- Floods; - Pollution; - Siltation; - Settlement on water ways; - Encroachment of river banks; - Resources mining (sand and quarry);	- Local communities have claimed ownership of ILFRs and wetlands; - Resource user confl cts; - Forged/improper issuance of land titles; - Weak enforcement; - Poverty; - Unproductive soil; - Ignorance		

4.15.1 Lessons learnt from stakeholder consultations

Following are important lessons learned concerning stakeholder analysis, consultation and engagement:

1. The large number and types of stakeholders in the catchments necessitates that a representative sample of stakeholders be consulted and engaged rather than attempting to contact and engage every single stakeholder in the catchments. This approach is realistic and appropriate considering the limited time, personnel, and resources available
2. Coordination between a large number of specialists in many different fields presents a special challenge for managing the inputs and outputs of a multidisciplinary team and achieving synergies between the works of the subject specialists
3. Data required for accurate and comprehensive integrated water resources planning is usually scattered, of poor quality, has many gaps, and is difficult and time consuming to obtain and analyse. In addition, much information and data is "dynamic", underscoring the fact that the information and data presented in reports such as this one is necessarily incomplete and imperfect. At best, a report such as this one represents a "snapshot" of what a certain group of people with certain knowledge and skills, working with limited time and resources have been able to produce at a certain point in time. Therefore, this report should be seen as a living document that will need to be revisited periodically as the body of knowledge expands, new information becomes available, latent conflicts emerge, existing stakeholders change and new stakeholders appear on the scene
4. While the concept and principles of IWRM and stakeholder consultation may be generally understood, how to put these concepts and principles into practice is not. Therefore, there is a need for continuous learning from best (and also bad) practices to show how effective stakeholder engagement can be realised in practice
5. District officers, being civil servants, are subject to administrative actions such as transfers, promotions, sick and maternity leave, etc. As existing staff leave and move away, new officers from other districts in different parts of the country arrive to take their place. This fluid situation creates the need for a continuous flow of info mation, training, coaching, support and related activities by the WMZ offic

6. While consultants may come and go, the WMZ office has become a permanent feature of the IWRM institutional landscape in Uganda and is well positioned and staffed to build on the work with stakeholders carried out by consultants
7. Stakeholders at the same level having common interests and facing similar issues and challenges across district boundaries in the catchments can potentially collaborate effectively if given the opportunity, organisation and resources to do so
8. Severe resource constraints, particularly funding, hinder the effectiveness and limit the impact of stakeholder participation at all levels. Many useful initiatives and activities that were supported by time-bound projects unfortunately end when projects end and (external) funding stops. This discourages and demoralises the stakeholders that were involved in such activities
9. District Development Plans, statistical abstracts, census reports, state of the environment reports, wetland management plans, water atlas, and other useful sources of information should be collected for all districts in the catchments and WMZ. Ideally, this information should be available in hard and soft copy at a central source such as the WMZ office from the start of a consultancy assignment to avoid delays and the time taken to obtain this important information by each new consultant
10. Care should be taken to avoid raising stakeholder's expectations for new projects in the short term during the stakeholder consultations. At the beginning, it is important to make it clear that the initial meetings and consultations are part of a longer planning process that will serve as input to the identification of a range of development options. No particular type and location of new projects can be made at the consultation stage
11. Another important lesson is the need for the WMZ team to explain the purpose and scope of the CMP, including how it will be funded and implemented, and what the long term requirements are for implementation, and operation and maintenance. Not many of the stakeholders have been involved in such an exercise before and the CMP is likely to require them to take new and unfamiliar actions.

4.16 Key issues in the Mpologoma Catchment

Based on extensive stakeholder consultations, interviews with key informants, direct observations during field visits, and relevant reports and other documentation, a number of key water resource-related issues, their causes and possible mitigation measures in the Mpologoma Catchment were identified. These and possible measures to address them are summarisedin Table 4.7 below.

Table 4.7: Key issues in Mpologoma Catchment

Risk

Issues	Strategic implications	Possible measures	Criticality	Specific location
Floods	- Landslides; - Water borne diseases; - Displaced persons; - Loss of infrastructure and crops; - Loss of life;	- Develop flood warning systems; - River protection work; - Implement flood risk management activities; - Develop drainage network associated with irrigation schemes; - Implementation of flood control reservoirs.	+3/Moderate	- Foothills of Mount Elgon, Mbale district (M1, M2), Manafwa and Namatala area. - Tororo, Bugiri, Pallisa districts (M3, M5, M7, M12, M13)
Landslides	- Loss of infrastructure and crops; - Erosion and siltation of wetlands, rivers and streams - Lost of life	- Land use planning, reforestation, land management; - Establish siltation monitoring system for future planning; - Prioritise the structure and design of comprehensive integrated reforestation, rehabilitation and Sustainable Land Management programmes for steep landscapes; - Awareness of landslide preparedness	+2/Low	Bududa, Manafwa, Mbale (M1, M2, M5,M6)
Droughts	- Loss of crop and livestock; - Food insecurity; - Insufficient hydroelectric generation; - Water supply and health.	- Promotion of rainwater harvesting for domestic use and livestock watering; - Development of water resources for irrigation and irrigation infrastructure in order to enhance crop production; - Training the local community in sustainable agriculture and irrigation management; - Develop stock watering dams.	+3/Moderate	Butaleja region (M1, M3)

Catchment Management

Issues	Strategic implications	Possible measures	Criticality	Specific location
Soil erosion	- Loss of soil fertility; - Reduced soil quality; - Siltation of wetlands, rivers and streams; - Loss of biodiversity; - Water pollution	- Promote and train farmers on agricultural practices that ensure stability of the soils (promote zero/minimum tillage, construction of contours, ploughing, trenches, cut- off drains, contour hedges); - Establish conservation agriculture - Training of the community and demonstration on soil and water conservation techniques (construction of ditches/bands, - Land use planning; - Reforestation and tree planting activity; - Field management (contouring, buffer zones for river banks and roads.) - River bank protection; - Road drainage	+5/severe	- Mount Elgon area (M1, M2, M3, M5, M6), common in Mbale, Manafwa and Bududa districts
Deforestation and encroachment of forests (creation of crop lands and industrial areas, etc.)	- Soil erosion; - Sedimentation; - Decrease of soil fertility; - Loss of habitat; - Increase risk of flood events.	- Sensitisation of the local communities on sustainable use and management of natural resources; - Sensitise the communities on afforestation - Restoration of degraded forests; - Demarcate rehabilitation zones; - Promote tree planting activities; - Establish and manage tree nurseries; - Increasing vegetation cover through afforestation, re-afforestation and agro-forestry; - Train farmers on clean energy production through the use of energy-efficient cooking stoves; - Promote alternative sources of energy; - Develop bylaws with incentives and sanctions; - Awareness creation on environment regulations and enforcement	+5 / Severe	Mt Elgon: Upland and mountainous landscape alterations (M1, M2, M3, M5, M6)
River bank/lakeshore degradation and loss of vegetation on riparian lands	- Disturbance of the aquatic ecosystem; - Increased erosion, soil loss and siltation	- Pegging of riparian zones for the rivers and streams, wetlands and swamps; - Land use planning for the riparian areas - Adopt Sustainable Land Use Management practices such as contour farming; - River bankprotection through planting trees; - Sensitize community on river bank protection. - Awareness creation on environment regulations and enforcement	+4/Moderate to severe	Mount Elgon area rivers: Manafwa (M2, M3), Namatala (M1) and Mpologoma (M4, M9, M11, M13), river Malaba (M7).
:sources	- Without monitoring, there can be no management	- Develop monitoring programme; - Prioritise monitoring activities	+4/Important	Mpologoma river (M8, M11, M13), Naigombwa river (M10), rivers in sub-catchment M3, M5, M8, M12

Wetlands (Environmental services)

Issues	Strategic implications	Possible measures	Criticality	Specific location
- Encroachment of wetlands for sugar cane, rice cultivation and subsistence farming; - Degradation of wetlands from various human activities (collecting materials, etc.)	- Drainage of wetlands; - Loss of habitat and biodiversity; - Loss of flood control capacity; - Reduced yield from fisheries	- Sensitisation of the local communities on sustainable use and management of natural resources; - Support wetlands rehabilitation and management programmes; - Restoration of degraded systems; - Wetland protection through sustainable use of the wetlands; - Develop classification of wetlands and implement conservation strategies accordingly - Development of bylaws with incentives and sanctions. - Compensate land users, if possible, of wetlands of critical importance and embark on restoration - Awareness creation on environment regulations and enforcement	5/severe	- Upper-Middle-Lower Manafwa (M2, M3); - Lwakhakha area (M5, M7); - Namatala areas (M1); - Iganga, Bugiri, Butaleja and Pallisa (M10, M8, M9, M4, M3, M12, M13); - Middle and lower Mpologoma (M4, M9, M11, M13); - Lemwa (Namutumba, Iganga, Bugiri, and Pallisa areas).

Agriculture-Irrigated and Rainfed

Issues	Strategic implications	Possible measures	Criticality	Specific location
Dependence in rainfed agriculture/Reliance on rainfall	- Little opportunity for large-scale commercial development without rainfall reliability support; - Food insecurity depending on rainfall; - Requires systems focused on rainfed crops.	- Develop irrigation schemes; - Develop water harvesting; - Adapt simple rainwater harvesting technologies like sunken pits, ditches etc; - Implement good agricultural practices to optimise rainfall and soil moisture; - Match dams to needs	+5/Severe	Entire catchment
- Low productivity of rainfed agriculture; - Poor crop variety; - Poor agricultural practices - Lack of extension services for farmers	- Low yields; - Food insecurity; - Soil degradation; - Loss of soil fertility; - Limited agricultural development in the catchment	- Training farmers in improved agricultural agronomic interventions or practices; - Develop tree planting, agro-forestry and fruit trees; - Increase extension services to the farmers for all crops and livestock enterprises; - Promote drought tolerant crop varieties of sorghum, cassava; - Land use planning on farms; - Crop and seed selection; - Implement rice/aquaculture schemes to develop new agricultural practices; - Partnerships with the private sector; - Provide and promote the use of inputs - Create farmers' organisations for better management and marketing;	+4/Important	Entire catchment

Pests and diseases	- High damage to coffee plantations; - Loss of crop; - Loss of income; - Food crops turned into cash crops - Food insecurity	- Control diseases; - Develop high technology laboratory for crop disease identification and disaster preparedness.	+2/Low	Entire catchment
Predominance of informal irrigation on the fringes of wetland and rivers	- Minimum/no water control structures; - Wetland degradation and drainage;	- Improve technical human resources for irrigation and drainage at the district level and below; - Create a position for irrigation engineer in district staff; - Increase farmers' organisation for proper irrigation, water management and marketing of produce; - Improve planning and management of water and natural resources; - Capacity building of farmers; - Creation of water users' associations	3/Moderate	Entire catchment

Aquaculture and fisheries

Issues	Strategic implications	Possible measures	Criticality	Specific location
Use of illegal fishing methods	- Declining fish stocks; - Over fishing and overexploitation of fisheries resources in the catchment; - Reduced income and employment	- Enforce control of illegal fishing practices; - Awareness creation on the application of illegal fishing methods.	+3/Moderate	Small lakes in Bugiri (M8), Pallisa (M12, M13), Kibuku (M4, M11, M12) and Namutumba (M10) districts. Naigombwa wetlands (M10)
Invasive weeds	- Interfere with fishing activities; - Destroy fish nets		+3/Moderate	Entire catchment
Limited access to good quality fingerlings and fish feed	- Hinder development of the aquaculture sector; - Fish farmers turn to inappropriate feed; - Reduced productivity and benefits from fish farming; - Abandoning ponds; - Undesirable size of fish (slow growth rates); - Losses	- Rehabilitation and put into operation the regional fish fry centres; - Encouraging or facilitating the private sector with soft loans or subsidies to set up hatcheries and feed making factories; - Facilitate provision and promote the use of quality inputs to fish farmers (fingerlings, fish feed, etc.)	+2/Low	Entire catchment
Limited skills and access to credits	- Hinder development of the aquaculture sector; - Low stocking levels, - Limited uptake of new technologies; - Abandonment of fish farms; - Limited access to key equipment and tools for harvesting, grading, sampling and water quality management; - Limited start-ups by prospective fish farmers.	- Organising farmers into groups and encouraging them in joining other social groups in their communities such as Savings and Credit Cooperative Organisations (SACCOs)	+2/Low	Entire catchment
Inadequate facilitation of technical staff at district level (DFO)	- Hinders development of the aquaculture sector; - Farmers not supported technically, - Absence of demonstration farms; - Lack of enforcement to avoid fishing violations; - Limited innovation transfer and skills among fish farmers; - Limited enforcement of fishing regulations	- Establish demonstration fish farms, hatcheries and feed manufacturing infrastructure nearby; - Setting up training programmes; - Establish office facilities; - Improve the capacity of fisheries technical staff	+3/Moderate	Entire catchment
Limited fish processing facilities and access to basic social services	- Reduced development of the sector; - Reduced fish quality; - Increased post-harvest losses	- Mobilize funds for the implementation of fish processing facilities; - Develop the necessary infrastructure for fishing (landing sites, refrigeration, ice plants, access to electricity, etc.)	+3/Moderate	Entire catchment

Cattle keeping/Livestock

	Strategic implications	Possible measures	Criticality	Specific location
Poor livestock productivity and livestock breeds	- Poor growth and off-take rates - Poor livestock productivity	- Integrate livestock production with rice production systems, utilisation of rice straw and chaff as livestock feed; - Integration of livestock into crop production systems; - Construction and/or rehabilitation of access points for cattle watering	+3/Moderate	Entire catchment
Livestock diseases	- Massive loss of livestock	- Control of livestock diseases with support from development partners such as FAO and USAID - Develop high technology laboratory for livestock disease identification and disaster preparedness.	+3/Moderate	Entire catchment

Water supply and sanitation

Issues	Strategic implications	Possible measures	Criticality	Specific location
Low access to safe water supply	- Health, water for productive use (subsistence and economy); Vulnerability to drought, food security; Economic value of the resource.	- Develop piped water systems; boreholes; rainwater harvesting; shallow wells and springs; Water quality monitoring; guidelines and plans for rainwater harvesting (roof water tanks and large underground tanks); dams (large, small, etc.); promote water source protection	+5/Severe	Entire catchment
Inadequate management and development of sanitation facilities	- Health; - Diseases; - Water pollution	- Clustering towns within a radius of 30km to be served by NWSC - Plan sanitation facilities associated with piped water systems; - Construct sludge drying beds; - Support district sanitation programme (implementation of latrines, etc.) - Construct new water treatment plants with adequate technologies; - Develop drainage systems - Sensitize on water, sanitation and water source protection	+5/Severe	Entire catchment

Water quality / pollution

Issues	Strategic implications	Possible meas	Criticality	Specific location
Discharge of untreated municipal wastes into water bodies	- Impacts fisheries by reducing fish catches; - Water pollution; - Loss of aquatic habitats; - Water-related diseases.	- Implement existing policies that for example prohibit human activities within 200 m from shorelines of water bodies or prohibit discharging untreated waste into water bodies; - Protect sensitive habitats as breeding and nursery areas for fish in order to replenish the reduced fish stocks; - Organise and develop infrastructure and mechanisms for solid waste disposal and management	+3/Moderate	- Mbale (M1, M2, M3); - Tororo: river Aturukuku (M7, M9, M3)
Low sanitation coverage and inadequate treatment (wastewater discharge below national standards)	- Pollution of water resources;	- Construct sewer systems; - Strengthen adherence of factories to effluent discharge standards and strengthen monitoring mechanisms. Put incentives to promote compliance to standards. Harmonize regulatory frameworks - Support water treatment plants to meet national standards (upgrading plant, adopting new technologies);	+4/Important	Entire catchment Waste discharges to the environment (water bodies and land) from Mbale, Tororo and Iganga wastewater treatment plants are below national standards
Discharge of untreated wastewater by industries	- Impacts fisheries by reducing fish catches; - Water pollution; - Loss of aquatic habitat; - Water-related diseases.	- Identify and implement appropriate treatment systems to manage waste emitted by factories; - Strengthen adherence of treatment plants to effluent discharge standards and strengthen monitoring mechanisms. Put incentives in place to promote compliance to meet standards. Harmonize regulatory frameworks. - Sensitization on industrial pollution;	+3/Moderate	Especially Mbale and Tororo (M1, M2, M3, M7, M9)
Mining (sand and murram mining leading to soil degradation, loss of biodiversity and water pollution)	- Adverse impacts on flora and fauna - Water and air pollution - Soil degradation and erosion of sites and adjacent river banks - Erosion, landslides and downstream sedimentation leading to water quality degradation.	- Control and regulate sand mining; - Sensitisation of mining consequences on the environment	+1/Very low	Mbale, Bududa-Manafwa (M1, M2,M5) and Busia (M6)
Siltation	- Rise in level of the river bed; - Increased risk of floods; - Water and wetlands pollution; - Decreased fishing activities; - Affects functionality of downstream wetlands.	- Improve agricultural practices that ensure stability of the soils; - Gully rehabilitation as a means of preventing further erosion and sediment loadings in rivers	+4/Important	- River Manafwa and Namatala (M1, M2, M3); - Mpologoma wetlands (M4, M9, M11, M13); River bank mining of River Manafwa (M2, M3), soil mining in Mbale (M1, M2, M3), Iganga (M10) and Busia (M7) areas.

Hydroelectric power

	Strategic implications	Possible measures	Criticality	Specific location
Shortage of the order of 150 MW/insufficient energy alternative	- Fatal flaw for development: Inability to run irrigation pumps, cold chains, etc.	- Undertake feasibility study for small HPPs; - Obtain license to build and operate small HPPs; - Promote alternative sources of energy (solar, biogas).	+3/Moderate	Entire catchment especially newly created districts, urban areas and rural growth centres

Land management

	Strategic implications	Possible measures	Criticality	Specific location
Land conflicts among communities (between farmers and cattle-keepers)	- Inadequate sharing of the natural resources	- Sensitising farmers on the Land Act, 1998 - Encouraging and facilitating farmers to acquire land titles - Strengthening sub-county land tribunals to help solve these conflicts	+3/Moderate	Mbale District (M1, M2, M3)

Institutional and management

Issues	Strategic implications	Possible measures	Criticality	Specific location
Lack of finance	- Inability to implement plans	- Increase financial support from the government to various sectors; - Fund-raising;	+4/Important	Entire catchment
Lack of capacity	- Failure to implement plans	- Capacity building at all levels for planning and implementation; - Development of guidelines	+4/Important	Entire catchment
Enforcement of legislation	- Without enforcement legislations becomes meaningless - Environmental degradation	- Improve technical capacity and management; - Farmers training organisation and management; - Include legislation in awareness raising; - Government support for enforcement; - Enforcement	+4/Important	Entire catchment
Inadequate manpower and weak institutional structures to support development of irrigation	- Hinders development of irrigation in the catchment; - Development of informal irrigation and its consequences for the environment;	- Introduce position for irrigation engineer and agronomist at district and sub-county levels; - Strengthen and expand the capacity to manage water and natural resources at the catchment/sub-catchment level - Develop and strength farmer group organisations/associations such as water users associations (WUA) for better management and marketing of their produce, - Train existing staff in the districts to enhance their technical capacity in planning, installation, operation, maintenance and management of irrigation, - Train farmers in operation, maintenance, and management of irrigation and also record keeping, post-harvest processing and marketing. - Set up demonstration sites at sub-county and parish level where the farmers can learn.	+4/Important	Entire catchment
Lack of knowledge and understanding of livelihoods	- Environmental degradation as a consequence of human behaviour that could be mitigated	- Awareness raising; - Coordination of awareness raising initiatives	+4/Important	Entire catchment
Failure to maintain infrastructure	- Wasted investment, failed projects	- Maintenance planning and budget provision must accompany all development plans; - Reinforce principles of good maintenance and ensure that it is in policy and practice	+4/Important	Entire catchment

Alternative livehoods and income

Issues	Strategic implications	Possible measures	Criticality	Specific location
Lack of alternative livelihoods and income	- Concentration in agricultural activities with low income generated; - Hinders development in the catchment	- Sensitise and promote alternative sources of income; - Promote alternative livelihoods (bee-keeping, fish farming, etc.); - Develop infrastructure and provide means for development of other activities	+5/Severe	Entire catchment

5 VISION, OBJECTIVES AND ANALYSIS OF OPTIONS

5.1 Vision and Objectives

The aim of catchment visioning is to:

- Develop a sense of cohesion and common purpose in people with diverse interests in the water resource
- Direct activities related to diverse interests towards that common purpose
- Continuously improve water resources management practices and the state of the resource
- Promote a culture of co-operation and consensus-building
- Provide a chain of accountability that links the vision to management objectives and management actions, so that it is possible to track whether the actions contribute to achieving the overall vision
- Provide objectives that allow operational managers to interpret applications of water license, and formulate and recommend license conditions in a strategic manner (DWAF, 2006).

The vision statement for the Mpologoma Catchment is:

"To sustainably use, manage and conserve water and related resources in the Mpologoma Catchment for socio-economic growth and improved livelihoods by 2040."

Three strategic objectives were selected by the stakeholders and cover the different key challenges identified in the catchment namely; the environmental degradation, the low level of water resources development, the low level of human and social capital, and insufficient implementation of integrated resources management approach.

- **Strategic objective 1**: To restore and sustainably manage the natural resources of the catchment.
- **Strategic objective 2:** To develop agriculture, alternative livelihoods and water resources for socio-economic growth.
- **Strategic objective 3**: To meet the institutional, technical, human requirements for integrated management of natural resources.

Strategic objective 1: To restore and sustainably manage the natural resources of the catchment

This strategic objective addresses the key water-related challenge of "environmental degradation."The growth of the population and increasing food demand imply a growing demand for arable land. The result is increasing agricultural encroachment on wetlands and forest reserves including even marginal areas such as the steep slopes of Mount Elgon or river banks. In addition, the absence of soil and water conservation and poor agricultural practices exacerbate degradation of the environment (erosion, sedimentation in wetlands, etc.). This also increases the risks of natural disasters such as floods and droughts

Stopping and reversing land degradation is arguably the most critical step towards realisation of the vision. Integrated catchment management practices can result in reduced loss of top soil, better soil moisture retention, and increased crop yields at the farm level while better water quality, reduced silt load and an improved hydrological regime will occur downstream. The implementation of environmental protection measures (reforestation, terracing, etc.) can reduce the risk of floods and droughts and help mitigate the potential impacts of climate change
Sustainable integrated catchment management practices should include the following targets:

a) Identification of priority areas for prese vation of the catchments
b) Implementation of improved farming practices including soil and water conservation measures (including contouring or terracing in areas of steeper slopes), improved inputs (seed, pesticides and fertilizers)
c) Sustainable forest and wetland management programs combining both protection and sustainable utilisation.
d) Provision for minimum flow requirement to protect and sustain water course
e) Provide alternative livelihoods and promote environmentally sustainable socio-economic development
f) Enforcement of existing laws and regulations
g) Improvement of water quality.

Strategic objective 2: To develop agriculture, alternative livelihoods, and water resources for socio-economic growth

This strategic objective addresses the key water related challenge of "low level of water resources development."In addition to a growing population and increased demand for food, the catchment is characterised by a high level of poverty. Most of the people live in rural areas and derive their livelihood from rain-fed agriculture. Due to lack of appropriate resources and poor practices, agricultural surpluses and derived income are low. There is poor access to credit and markets among other barriers that contribute to the never ending poverty situation. A key component of the catchment management planning vision is water resources development across all water-related sectors in order to promote socio-economic growth. This strategic objective is central to the concept of catchment

management planning, which aims at maximising development from shared water resources or a shared water resources development project.

This strategic objective includes a wide range of water resources development interventions. The development of water resources can range from something very simple to complex and expensive infrastructure. The common element is that an investment is made to develop the available water resources so that they can be used to satisfy a development need.

Typical developments that are required to bring socio-economic benefits to the population include, among others:

a) Improve rain-fed agriculture farming practices and inputs (seeds, pesticides and fertilisers) to increase yields and marketable surplus and improve food security
b) Develop abstraction and distribution of water (water control) for irrigation resulting in improved food security (for the region/country), irrigation efficiency and employment opportunities (in the basin or close to the basin) in agriculture and agro-processing
c) Develop alternative livelihoods through:
   - Storage of water for the development of capture fisheries and aquaculture for improved food security (for the region/country) and employment opportunities (in or close to the basin)
   - Storage of water for the development of livestock for improved food security (for the region/country) and employment opportunities (in or close to the basin)
   - Promote alternative livelihoods such as bee-keeping, activities linked to ecotourism, etc.
d) Improvement of the existing potable water supply resulting in improved health and efficienc
e) Treatment of wastewater for both urban and rural communities resulting in improved human health and reduced pollution
f) Development of hydropower for national-level socio-economic benefit but direct local benefits especially in the case of mini and micro-hydropower development and to develop alternative sources of energy
g) Development or conservation of water resources can also support the tourism and recreation industry and create employment opportunities in or close to the basin).

Strategic objective 3: To meet the institutional, technical, human requirements for the integrated management of natural resources

This strategic objective addresses the key water-related challenge of "low level of human and social capital and insufficient implementation of the integrated water resources management approach."Addressing this challenge is critically important if development is to be need-responsive, coordinated and sustainable, bearing in mind that different sectors/users are relying on a common resource and in some cases common infrastructure, and in others a shared resources management system. It is also a necessary condition to achieve the other strategic objectives in an efficient way and to optimise outputs

The main issues that need to be addressed are the following:

a) Coordination: Coordination between sectors in the identification and planning process to ensure that planners in each sector are fully aware of development initiatives in other sectors and to identify opportunities for the implementation of multi-purpose projects. The lack of coordination between sectors leads to duplication of effort and waste of financial and technical resources. As soon as they are fully operational, the CMOs/CMCs in the Lake Kyoga Water Management Zone should collect information about the planned projects in each sector and be a central actor in the coordination of development plans. Regarding plan implementation, the process is rarely fully comprehensive. Elaboration of the plan and initial commitment to its implementation is generally done by participants who do not have decision-making powers. In addition, commitments that are not accompanied by a budget and planned actions may not be budgeted. Lack of inter-district coordination is also crucial for natural resources management, as districts may be sharing common resources like wetlands or forests. Also, upstream actions may impact downstream stakeholders (flooding, erosion, pollution, etc.). This coordination is not efficient at prese
b) Law enforcement: the existence and effective implementation of environmental laws and regulations is a crucial aspect to control the impact of human activities on the environment and use of resources that constitute it. Existing regulation is recognised as adequate. However, too often there is an absence of compliance with the law (encroachment on wetlands, use of illegal fishing nets, etc.) at all levels (the population, politicians, etc.). These excesses are justified by the lack of sufficient mechanisms for the implementation and effective enforcement of the relevant laws and regulations.
c) Human capital: sensitisation and capacity-building of district technical staff, members of CMOs and users in order to improve water resources management and associated development practices in the Lake Kyoga basin. This would also contribute to narrowing the gap in capacity between decision-makers and beneficiaries and thus promote a bottom-up approach to water resources development and management.

Sensitisation and capacity building is needed in order to:

- Increase awareness of the various stakeholders (including politicians) on water management issues, and on the necessary coordination and communication for efficient cross-sectoral plannin
- Promote a bottom-up approach to water resources development and management
- Increase the capacity of water users to manage in a sustainable way the water resources (irrigation water users associations, farming practices, fishing practices, etc.
- Train technical staff
- To support the management and development of projects
- To provide advice to the beneficiaries of water development projects (e.g. on soil and water conservation measures, technical advice for aquaculture, etc.)

d) Technical means for action: Data acquisition and knowledge needs to be strengthened (data on climatic and hydrological parameters, on water quality, on groundwater, knowledge of existing water abstraction, on informal irrigated areas, assessment of minimum flow requirements, etc.) in order to provide information to consolidate the plans and inform the decisions of the CMOs.

5.1.1 Factors and driving forces affecting achievement of the strategic objectives

Driving forces include forces, which according to the literature/accepted theory drive changes in social, technological, environmental, economic, and political factors. This section of the report presents and assesses the driving forces that can cause changes and influence the attainment of the strategic objectives. The driving forces are divided into two categories according to the level of mastery and command one can have on each of them in the framework of the catchment management plans. These are:

- The internal driving forces, with a high level of mastery and command. These forces are most likely to be influenced by actions of the CMPs. They correspond to variables and strategic levers that could be used to achieve the strategic objectives through the identification of option
- The external driving forces, with a low potential for command. These forces cannot be used directly in the achievement of the strategic objectives. These driving forces represent the framework/background within which the CMPs will be implemented. Actions in the CMPs will not be able to influence such driving forces, but they can adapt to them or mitigate their impact.

The identification of the driving forces and the SWOT analysis revealed details of the dynamics of the catchments. Aspects that are crucial for the future of the catchments are described in the sections below.

5.1.1.1 External forces affecting the future of the catchment

The analysis highlighted the following external forces that are likely to act as constraints in which the catchment management plans will be implemented. These are:

a. High population density and population growth:It is important to acknowledge the impact of this driving force. Although it does not fall within the CMPs responsibility, slowing down the increase in population is crucial to enable sustainable management of the catchments
b. Land tenure: Land rights vested in the citizens of Uganda (Land Act - 1998), but the ownership of wetlands belongs to the Government. The question of land titles delivered legally in wetlands prior to the Land Act is not easy to solve, as compensation mechanisms are not yet in place. In addition, some land titles in wetlands have also been obtained illegally after the Land Act was enacted
c. Gender issues: In Uganda, women are generally unable to own or inherit land due to restrictive practices under customary land tenure or are not economically endowed to purchase land rights. While the Land Act caters for a spouse to some extent, it does not tackle the land rights of widows, divorcees, and children. Also, the representation of women in political bodies is a challenge. For the two catchments, it is desirable that women should be fairly represented in CMOs and CMCs
d. Climate change is also one of the external driving forces, which can have an impact on the catchments. Implementing measures to adapt to and mitigate the impacts of climatechange is needed. When assessing the relevance of the different actions to be included in the CMP, their contribution to climate change mitigation and reduction to climate change variability should be considered
e. Insufficient law enforcement has been identified by the stakeholders as one of the causes of environmental issues such as wetland encroachment and forest degradation. Modification of law enforcement mechanisms and of the budget allocated to the institutions in charge of this task is outside the CMPs influence. However, some measures can be taken to adapt to this constraint:
   - Identify priorities to make sure the resources available are not wasted and concentrated on sensitive priority areas
   - Raise awareness on existing laws and regulations and the need to enforce them
   - Issue ordinances and by-laws
   - Acknowledge the fact that law enforcement is unrealistic as long as some people have no other alternative but breaking the law in order to survive.

e. Insufficient financing capacity, at all levels, is a hindrance to development as well as to the implementation of actions. There is not much that can be done at catchment level to improve the overall financial capacity of its institutions. It is important to acknowledge this factor in order to adapt the content of the plans:
   - Keep in mind financial aspects and limits of budget and consider possible financing possibilities when elaborating the plan
   - Establish clear priorities between the different measures and actions to be implemented
   - Optimise coordination to avoid duplication of effort (the cross sectoral approach adopted during the CMPs and the development of an integrated water resources management approach is a step toward this optimisation)
   - Make sure that no-regret investments are selected, in particular those generating sustainable income.

5.1.1.2 Main internal forces and need for action

The analysis identified the following main internal forces that need to be considered by the plan development process:

Agricultural productivity, for both rain-fed and irrigated agriculture is a key driver for the future of the catchment. There is space for improvement and increasing productivity for the improvement of the socio-economic situation (contributing to achievement of strategic objective Number 2). At the same time, increase of productivity is also a necessary condition to satisfy the ever-growing population and to limit encroachment on natural habitats such as forest and wetlands (contributing to the achievement of strategic objective Number 1). There are many different ways to increase productivity, including actions such as implementation of soil and water conservation measures, training of farmers, improving the quality and availability of inputs (including seeds), and management of water for irrigated crops among others. Irrigation can also be a way to increase productivity in some cases, but is not always the limiting factor.

Inadequate and unreliable income as well as lack of alternative livelihoods are other important weaknesses in both catchments and need to be addressed. These weaknesses impact negatively on socio-economic development as well as the condition of natural resources. All the actions aiming at improving agricultural productivity will contribute to increasing incomes generated by agricultural activities. Other possible interventions include development of water for production infrastructure (for fish farming; cattle watering; and irrigation); develop alternative livelihoods; and complementary sources of income (bee keeping, ecotourism, development of agro-processing and other industries, etc.…).

Management of wetlands is another key area for the catchment. Their preservation has been mentioned as a necessity by many stakeholders during the consultation process and is contained in strategic objective Number 1. However, restoring and conserving all wetlands in both catchments, given the current level of encroachment and the increase in population seems unrealistic. The balance between conservation and development must be discussed, and the identification of priority areas is important to decide where efforts on restoration and conservation need to be intensified. The existing legal framework and the work undertaken under the Wetland Management and Development Project and associated action plans constitute strengths for improvement of wetland management.
Awareness and technical capacity at different levels (farmers, local government, CMOs, etc.) are also important driving forces, generally as weaknesses. Including awareness raising activities (directed toward communities and politicians), as well as developing a training programme at different levels is needed in both catchments.

5.1.2 Identified options

The SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis framework was used to identify and understand the driving forces, both external and internal, that could contribute to or hinder the achievement of the strategic objectives. From the SWOT analyses, a number of options emerged to (i) build on the identified strengths, (ii) take advantage of the identified opportunities, (iii) address the identified weaknesses, and (iv) mitigate against the identified threats in the catchment. These options also took into account the results of the previous steps, in particular the proposals made by the stakeholders, and preliminary identification of actions by the experts to address the issues identified in the catchment. The following table presents the list options taking into consideration comments and requests from the stakeholders.

Table 5.1: Options and issues addressed

Options	Details
1. Develop water for production infrastructure	1.1 Create fish ponds
	1.2 Provide water/organise access to resources for cattle watering
	1.3 Develop large infrastructure (multi-purpose dams)
	1.4 Develop upland irrigation
	1.5 Organise irrigation in wetland (formal schemes)
	1.6 Develop rice/aquaculture schemes
	1.7 Develop rain harvesting and individual storage solution
2. Develop the agricultural sector and improve practices	2.1 Development of agro-forestry and conservation agriculture
	2.2 Implement soil and water conservation measures
	2.3 Develop organisation and outlets for agricultural production
	2.4 Development and empowerment of farmer groups and associations
	2.5 Promote the use of quality inputs in agriculture
3. Develop the other economic activities	3.1 Promote development of quality fingerlings and fish feed production
	3.2 Develop fish farming
	3.3 Develop small hydropower production
	3.4 Improve livestock husbandry (extension, breeding, etc.)
	3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development path (tourism, bee keeping, etc.)
4. Environmental conservation and protection	4.1 Development of tree nursery and tree planting activities
	4.2Develop a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly
	4.3 Set up clear demarcation of wetlands and forests
	4.4 River bank protection (cultivation and mining)
	4.5 Develop a forest management and development strategy
	4.6 Use of renewable energy/alternative energy sources and development strategy
5. Improve water supply and sanitation	5.1 Improve access to safe water supply
	5.2 Upgrade/improve existing wastewater treatment plants and make sure effluents meet national standards
	5.3 Promote sanitation facilities in rural areas
	5.4 Plan sanitation along with new piped schemes being developed in small towns and rural growth centers
6. Control and reduce water pollution	6.1 Improve management of solid waste
	6.2 Control wastewater discharge and pollution from industries (sugar factories, etc.) and artisanal activities (breweries, mining, etc.)
7. Communication and capacity building	7.1 Awareness raising campaigns (subjects identified: existing laws and regulation, impact of malpractices, etc.)
	7.2 Capacity building at farm and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)
	7.3 Capacity building of CMOs
	7.4 Capacity building for local government staff
	7.5 Dissemination of the plan
8. Improvement of institutional context (related to the water sector, at catchment level)	8.1 Improvement of cross-sectoral planning
	8.2 Put into operation the CMOs
	8.3 Support preparation of ordinances and by-laws by district local government
	8.4 Improve coordination between different institutions involved in law enforcement (technical, political, environmental police, NEMA)
9. Improvement of knowledge and data collection on water resources	9.1 Participate and collaborate with the Kyoga WMZ for data analysis and interpretation
	9.2 Collection of information on natural resources and activities in the catchment (assess the extent of informal irrigation,)

It is emphasised that all options should be accompanied by training and capacity-building activities specific to each option. The stakeholders expressed this request as a first priorit .

5.2 Multi-criteria evaluation of alternative plans

The Multi-criteria analysis (MCA) was used to select a realistic and/or preferred scenario that can best meet the ambitions of the vision and strategic objectives. The six different scenarios that were compared are described as follows:

- Two extreme scenarios: Scenario "Full development", which corresponds to a situation where all efforts are concentrated toward socio-economic development without considering environmentally orientated options; and on the other extreme the "Maximum environmental conservation scenario" which corresponds to a scenario where all efforts are concentrated toward improvement of environmental conditions without investment toward socio-economic development. These two scenarios are voluntarily extreme and in a way unrealistic/undesirable. The aim of studying them is to highlight the harm of neglecting one or the other of the two aspects (environment / socio-economic development)
- Four (4) intermediate scenarios: These scenarios include the same level of development for environmental, institutional and for some of the socio-economic type of options, meant to allow a sustainable development of the catchment and which take into account the priorities expressed by the stakeholders. They differ from the levels of infrastructure and irrigation development.

A water resources analysis was undertaken in order to check the feasibility of the scenarios (and see if the resource available can meet the projected demand), and to estimate the need for storage associated to each one in the different sub-catchments (or group of sub-catchments).The content and philosophy of each one of the six scenarios is presented in Table 5.2 below.

Table 5.2: Description of the scenarios

<table>
<tr><th rowspan="2">Scenario</th><th rowspan="2">Development of environmental and institutional options</th><th colspan="2">Development of socio economic options</th></tr>
<tr><th>Options not involving large storage infrastructures</th><th>Option related to large Infrastructures and irrigation development</th></tr>
<tr><td>Scenario 1: Maximum environmental conservation</td><td>Priority for the scenario.</td><td>No effort toward this type of option. Only options with an impact on environment are considered (e.g.: improvement of sanitation)</td><td>Not developed</td></tr>
<tr><td>Scenario 2</td><td colspan="2" rowspan="3">Set of options (the same for the four scenarios) based on what is considered needed to allow a sustainable development and taking into account the priorities expressed by the stakeholders (the annex 1 presents the activities developed during the stakeholder consultation workshop and how they have been used to guide and adjust the initial proposal of the consultant).</td><td>Formalization of irrigation in wetlands in all areas where informal irrigation is taking place.</td></tr>
<tr><td>Scenario 3</td><td>Same as scenario 2 + development of 50% of the upland irrigation potential (around 15,000 ha)</td></tr>
<tr><td>Scenario 4</td><td>Part of the wetlands already converted (10%) are restored. Formal irrigation is developed in the rest of encroached wetlands.
Upland irrigation is developed on 8,000 ha</td></tr>
<tr><td>Scenario 5</td><td></td><td></td><td>Developed up to the maximum (all seasonal wetlands are converted (formal irrigation), including the one still intact at the moment).
All the area identified as irrigable in uplands is developed.</td></tr>
<tr><td>Scenario 6: Full development</td><td>No effort toward this type of option</td><td>Priority for the scenario</td><td>Developed up to the maximum (all seasonal wetlands are converted (formal irrigation), including the one still intact at the moment).
All the area identified as irrigable in uplands is developed.</td></tr>
</table>

In collaboration with stakeholders, the list of criteria and weighing of the criteria was developed. The scenario evaluation focuses on the potential benefits or impacts of development interventions and management options in terms of social, environmental and economic aspects. The criteria were selected for being good markers of progress toward achievement of the catchments' objectives and, hence, of the visions. Inputs from the stakeholders were taken into account to adjust the initial list proposed by the consultant.

A. Criteria to best represent progress toward the first strategic objective ("To restore and sustainably manage the natural resources of the catchment")
   1. **Watershed protection and enhancement:** The catchment is threatened by environmental issues such as deforestation, erosion, siltation of rivers and wetlands, etc. This criterion is used to assess the potential benefits or damages caused by each option in regard to catchment management and protectio
   2. **Improvement of water quality:** Water quality in the catchments is degraded by several sources of pollution: industries, lack of sanitation, malpractices, etc. Improvement of water quality is a criterion which must be taken into account in evaluating the scenarios in order to promote actions improving water quality and limiting the practices that contribute to water quality degradation
   3. **Wetland conservation and wise use:** this criterion seeks to assess to what extent each option contributes to the implementation of measures favouring the conservation and enhancement of wetlands, which is an important issue in catchment.

B. Criteria to best represent progress toward the second strategic objective ("To develop agriculture, alternative livelihoods and water resources for socio-economic growth")
   1. **Increase income per capita:** The majority of the peoplein the study area are involved in agricultural production, which overall generates low yields and low incomes. In addition, almost no alternative source of income exists. The criteria "income increase per capita" aims at evaluating the potential benefit of each scenario in te ms of income generated per capita and reduction of poverty
   2. **Improved food production per capita:** The catchment is characterised by a significant increase in population. Most of this population lives from agriculture whose yields are relatively low, which implies low food production and low income. By 2040, one of the challenges of the catchment will be to increase food production per capita. Without actions favouring increase in food production, the catchment will be subject to food insecurity.
   3. **Lowest incidence of water related diseases:** The catchment is threatened by the increased incidence of water borne diseases such as cholera, dysentery, and typhoid reported in several districts in the catchment. Options, which will score high for this criterion, are the one contributing to improved access to drinking water, sanitation, reduction of water pollution, etc. This criterion reflects one major aspect of the livelihood of the population in the catchment.

C. Criteria which contribute to the achievement of both the first and second objective
   1. **Well balanced use of water resources:** The potential effects of climate change and the development of water related activities (irrigation, aquaculture, etc.) could bring up water availability problems. Balanced use of water resources is an important factor to consider in evaluating scenarios.
   2. **Mitigation/adaptation to natural disasters and climate change:** With this criterion, the objective is to assess to what extent the analysed options and scenarios contribute to mitigating natural disasters (floods, droughts, landslides, etc.) and the potential effects of climate change. This includes adaptation and mitigation to the (potentially increasing) risks of droughts and floods and their consequences in terms of reduced agricultural yields and food insecurity.

D. Criteria to best represent progress toward the third strategic objective ("To meet the institutional, technical, human requirements for integrated management of natural resources")
   1. **Optimises the impact of other actions:** This criterion serves to evaluate the dependence of certain options on others. As part of the future management plan, this will help to not dissociate implementation of two options, which should be implemented together. Options with high scores for this criterion will be, for example, the ones related to capacity building, knowledge improvement and data collection, awareness, etc.

E. Criteria to assess the feasibility and capacity to implement the options and scenarios:
   1. **Feasible/affordable cost:** Limited financial capacity is one of the factors identified, which limits development in the catchments. It would be counterproductive, for the final management plan, to promote too many options whose excessive cost would not allow them to be implemented. The criteria "Affordable/feasible cost" evaluates the potential constraints (or absence of constraints) linked to the cost of the options. Some options whose implementation cost is very high can be developed, but in only one or a very limited number of locations.
   2. **Ease of implementation:** Some actions may be considered useful but could be difficult to implement in practice, depending on acceptability by some stakeholders. For example, large dams can face difficulties due to conflict with some stakeholders in the catchment, especially when resettlement is needed or when environmental impacts are important. There is, in addition, uncertainty of technical feasibility since many of the options have not been studied well. It is not desirable that the plan includes too many interventions with low scores on this criterion.

The process of rating the options comprised of three steps:

1. Evaluation of the impact of each option (positive or negative) on each criterion by the establishment of

a rating system. This allows assigning a score indicative of the impact of the scenario in relation to each criterion

2. Normalisation: as the ranges of scores used for each criterion are not identical,they are normalised to obtain a score ranging between 0 and 1 for each criterion
3. Evaluation of the importance given to each criteria (weighting). This weighting allows making a distinction between the different criteria when calculating the final score for a scenario

Figure 5.1shows how the scenarios perform against the different criteria considered. The overall scores of each scenario, taking the individual scores for all the criteria and their weighting into account are presented in Table 5.3.

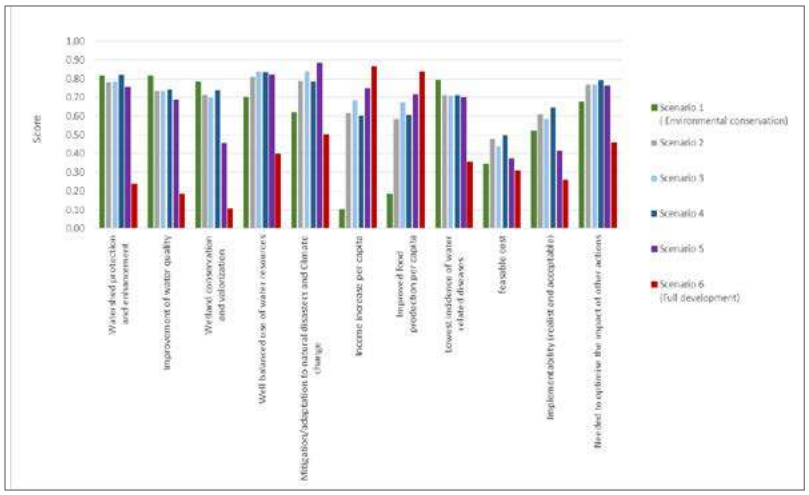

Figure 5.1 Scores of each scenario for different criteria

Table 5.3: Overall scores of each scenario

Scenario	Overall Score
Scenario 1 : Environmental conservation	0.58
Scenario 2	0.69
Scenario 3	0.71
Scenario 4	0.71
Scenario 5	0.66
Scenario 6 : Full development	0.4

The results of the multi-criteria analysis lead to the definition of a compromise scenario associating socio-economic development and environmental conservation for each catchment.In the light of the results, the options and actions that will constitute the Catchment Management Plan are close to the ones that constitute scenario 4. The compromise scenario includes the formalisation of irrigation in the wetlands, their restoration and the partial development of the upland irrigation potential. On this basis, it will be possible to identify the possibilities and the opportunities to further develop the upland irrigation potential, and thus to orient the Catchment Management Plan towards scenario 3. In the medium term (after the first 10 years of the plan), It will be necessary to re-define the ambitions regarding the restoration of wetlands, the formalisation of irrigation in wetland and the level of development of the upland irrigation potential. This will be done taking into account the studies made and the feedback from the results obtained during the first period of the plan

The following conclusion were made from the scenario analysis: (i) formalisation of irrigation in the wetlands, (ii) development of large storage infrastructure is need to meet the future water demand especially if large irrigation schemes are to be developed, and (iii) restoration of wetlands.

5.2.1 Formalisation of irrigation in wetlands

In the Mpologoma Catchment, formalisation of irrigation in wetlands is imperative to improve the agricultural production and get a better control over wetland encroachment. It should not take place on wetlands, which have not yet been converted, to avoid encroaching on additional natural areas. Irrigation in wetlands also requires the development of a wetland strategy and management plan, complementary to other work undertaken on wetlands in the catchment. The objective of developing such a plan would be as follows: (i) to identify and map the extent of informal irrigation and other types of wetland degradation, (ii) to identify the wetlands to be preserved (because of little or no impact by human activities), (iii) to identify the wetlands to be restored (wetlands impacted by human activities but with important ecological roles and functionalities making them a priority for restoration), and (iv) to identify the wetlands where irrigation and other type of activities can be developed, applying a wise-use policy. In addition to being easily implementable in the first years of the management plan, the formalisation of irrigation and the improvement of agricultural practices present a significant potential in terms of increasing yields. The Table 5.4 below summarises the irrigation scheme projects that will be implemented in the plan.

Table 5.4 Summary of future irrigation schemes in the Mpologoma Catchment

Id	Planned future Irrigation scheme		District(s)	Location (County, S/C)	Size (ha, acre)	Water source	Crops	Implement ation agency	Term
1	Extension of Doho - Namatala irrigation scheme (1/2)		Mbale	Bwiryia	500 ha	Manafwa river, wetland	Rice	JICA , GoU	Short
2	Extension of Doho - Namatala irrigation scheme (2/2) (will be developed only if Bulusambu dam is constructed)		Mbale/ Butaleja		1000 to 2300 ha	Manafwa river, wetland	Rice	DWD	Medium to long
	Including:	Hisega-Kachonga	Butaleja	Bunyole county; Kachonga sub-county	500 ha				
		Bingo-Nwajo	Butaleja	Nawajo sub-county	800 ha				
		Nagwiga	Butaleja	Busolwe town council	500 ha				
		Busoke-Busolwe	Butaleja	Busolwe and Busaba sub-county	500 ha				
3	Kitubezi		Bugiri	Buwunga sub-county	> 1,000 acre (> 405 ha)	Stream , Wetland	Rice	JICA, GoU	Short
4	Busawa Cooperative Association Irrigation Scheme		Bugiri	Buwunga and Nabakalu sub-counties	>6,000 ha	Igogero wetland	Rice, horticulture	MAAIF, Islamic Development Bank.	Short
5	Pre-feasibility study for the Mpologoma River Basin Integrated Agriculture Development Project in eastern Uganda		Pallisa and Kibuku	Three sites	About 1,000ha	Stream, wetland	Rice	MAAIF, Korea Rural Community Corporation (KRC)	Short to medium
6	Lwoba		Butaleja	Lwova	600				Medium
7	The Agriculture Cluster Development Project		Tororo, Bugiri, Iganga and Budaka			500			Short to Medium
8	Pre-feasibility study for irrigated rice production in Uganda under the Agriculture Technology and Agribusiness Advisory Services (ATAAS) Project		12 districts targeted including 6 in the catchments (Iganga, Bugiri, Namatunda, Palissa, Tororo, Butaleja).					Rice	Short to medium

5.2.2 Development of large storage infrastructures is needed to meet the future water demand

As shown by the results of the scenario 3 and 4, upland irrigation is worth being developed. Indeed, the scores obtained on the criteria "income increased per capita" and "improved food per capita" clearly show that these scenarios, particularly the scenario 3, favour food production and income generation. Their scores on the criteria "feasible cost" and "Implementibility" are relatively high compared to scenarios 5 and 6 and suggest that the implementation of scenario 4 is easier to achieve compared to scenario 3. It generally requires storage infrastructures, which may necessitate specific studies (feasibility, impact assessment, detailed design) and are likely to be developed only in the medium or long term. To bring all their expected benefits such developments should take place in a context where agriculture and farmers have a good level of knowledge, adequate extension services and organisation. Irrigation add complexity to the crop management techniques which at the moment, based on the data available on observed yield and information collected during the previous step of the project, are not mastered by the farmers. It is, therefore, considered important to associate the development of upland irrigation with prior training of farmers (on irrigation but also on other technical aspects of crop management), development of farmers' groups, of extension services. Development of upland irrigation, especially for large schemes, will, therefore, be proposed in the plan for the medium (years 6 to 10) and long (years 11 and after) terms.

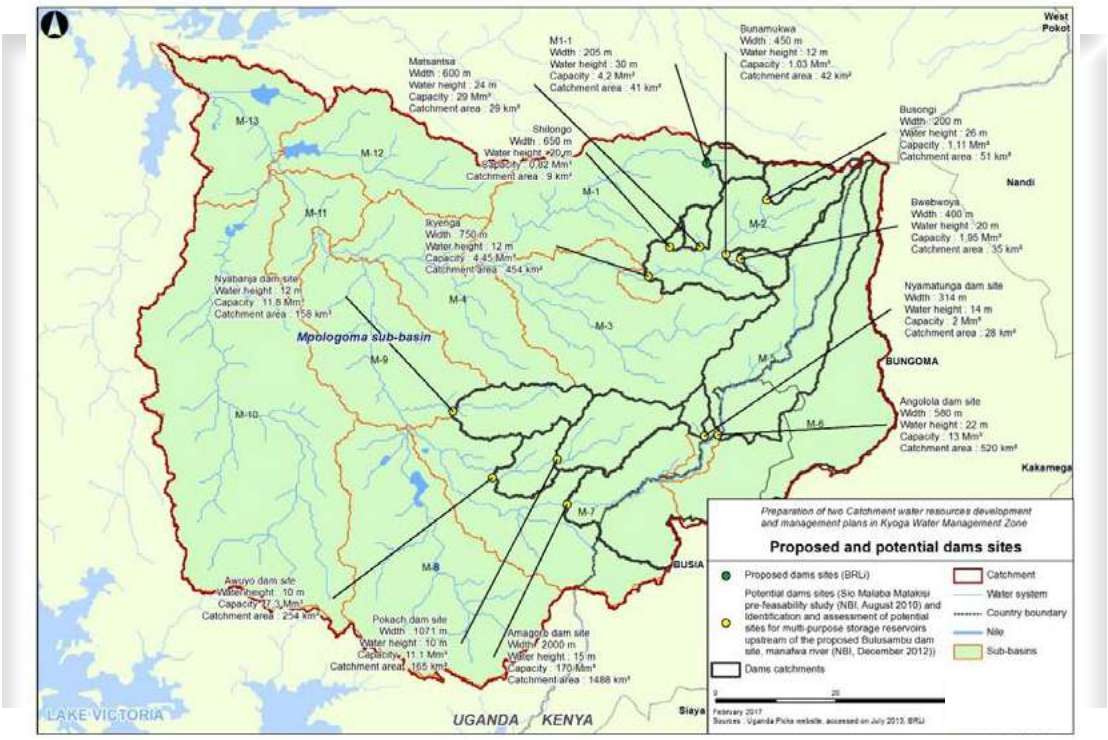

Figure 5.2: Proposed and Potential Dam Sites

5.2.3 Restoration of wetlands

The scenario 4 includes the restoration of a part of the degraded wetlands. Compared to scenarios 2, 3 and 5, scenario 4 gets the highest score (0.73) for the "Wetland conservation and valorisation criterion." In addition, preservation and restoration of wetlands is one of the themes highlighted often as important during stakeholders' consultation.

The rehabilitation of wetlands for their conservation is envisaged and implemented in the first 10 years of the plan. Scenario 4 takes into account the rehabilitation of 10% of the wetlands where informal irrigation is currently in place, representing 4,500ha of the Mpologoma Catchment.

6 MANAGEMENT AND INVESTMENT ACTIONS

The intervention plan consists is a set of activities to be implemented in the short term: from 1-5 years, the medium term: from 6-10 years, and the long term: from 11-20 years. Activities included in the plan were identified based on the expertise carried out in the previous stages of the process, especially the analysis of issues and corresponding measures, the evaluation of options and analysis of the scenarios. The implementation of the activities has been prioritised over time. The first five years of the management plan (1-5 years), the activities are implemented in the areas of the catchment where they are most needed. Then, on the medium and the long term, they are implemented in the less priority areas of the catchment. The table below presents the activity plan. The sections that follow provide more detail explanation for the activities that require additional information or where specific inte ventions that are in line with the plan are already underway.

Table 6.1: Activity plan for the Mpologoma Catchment

Activities	Indicator unit	Targeted outputs		
		1-5 yrs	6-10 yrs	Beyond 10 yrs
1-DEVELOP WATER FOR PRODUCTION INFRASTRUCTURE				
1.1 Create fish ponds	Surface area	979m^2	-	-
1.2 Provide water/organize access to resources for cattle watering	Number (No.) of Sunken pits	300	350	110
	No. roof water harvesters	300	350	110
	No of rainwater tanks	300	350	110
	No. of livestock access points	25	35	50
	No. of meetings	50	50	25
1.3 Develop large infrastructure	No. of feasibility/drainage studies	5	1	-
	No. of constructed large reservoirs	-	5	-
	No. of completed drainage projects	-	-	1
1.4 Develop upland irrigation	No. of studies completed	2	3	-
	Hectares (Ha.) under new irrigation		8,000	2,060
	No. of meetings	10	10	
1.5 Organise irrigation in wetlands (formal schemes)	Ha. under formalised irrigation	330	66	15,000
	Ha under new irrigation	7,405	1,600	-
1.6 Develop rice/aquaculture schemes	Ha under rice/aquaculture	27	18	-
	No. demonstration farms	2	-	-
	No. of meetings	60	80	1000
1.7 Develop rain water harvesting and individual storage solution	No. of sunken pits	20	50	60
	No. of roof water harvesters	20	50	60
	No. of rainwater tanks	20	50	60
2-DEVELOP THE AGRICULTURAL SECTOR AND IMPROVE PRACTICES				
2.1 Development of agro-forestry and conservation agriculture	No. of trainings	57	35	20
	No. of meetings	75	-	-
	No. of talk shows	5	5	1
	No. of demonstration farms	3	-	-
2.2 Implement soil and water conservation measures	No. of pilot projects	3	-	-
	No. of trainings	60	15	25
	No. of studies	4	3	5
	Ha under conservation measures	-	-	-
2.3 Develop organisation and outlets for agricultural production	-	-	-	-
2.4 Develop and empower farmer groups and associations	-	-	-	-
2.5 Promote the use of quality inputs in agriculture	No. of talk shows	10	5	10
	No. of demonstration sites	3		
	No. of trainings	5	10	2
	No. of meetings	125	-	-
3. DEVELOP OTHER ECONOMIC ACTIVITIES				
3.1 Promote development of quality fingerlings and fish seed production	No. of fish fry centres rehabilitated	-	-	-
	No. of hatcheries constructed	3	-	-
3.2 Develop fish farming	No. trainings	90	90	50
	No. of meetings	90	90	50
3.3 Develop small hydropower production	No. of Feasibility studies undertaken	-	-	6
	No of HP stations constructed	-	-	6
3.4 Improve livestock husbandry (extension, breeding etc)	No. of talk shows	5	-	-
3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping)	No. of meetings	50	50	25
4- ENVIRONMENTAL CONSERVATION AND PROTECTION				
4.1 Development of tree nurseries and tree planting activities	No. of 2ha tree nurseries	8	8	3
	No. of talk shows	5	-	-
	No. of meetings	40	70	130
4.2 Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly	Wetland inventory	1	-	-
	Ha under restoration	-	202	1,485
	Ha of wetland demarcated	-	202	1,485
	No. of meetings	35	25	-
	No. of talk shows	5	5	10
4.3 Clear demarcation of wetland and forests	Km of demarcation	22	-	-
	No.of meetings	70	50	50
	No. of talk shows	5	5	10
4.4 River bank protection (cultivation and sand mining)	Km of buffer zone	10	24	16
	No. of meetings	60	15	30
	No. of talk shows	5	5	10
4.5 Develop a forest management and development strategy	No. of studies	1	1	-
	No. of restoration projects	4	5	4
	No. of meetings	60	60	60
	No. of talk shows	5	5	10

Activities	Indicator unit	Targeted outputs		
		1-5 yrs	6-10 yrs	Beyond 10 yrs
4.6 Use of renewable energy/alternative energy sources and development strategy	No. of biogas digesters	-	-	-
	No. of solar panels	-	-	-
	No. of meetings	240	195	-
	No. of trainings	130	65	-
5 – IMPROVE WATER SUPPLY AND SANITATION				
5.1 Improve access to safe water supply	No. of piped water schemes designed	7	-	-
	No. of piped water schemes constructed	7	7	-
	No. of piped water schemes rehabilitated	1	-	-
	No. of bore holes constructed	50	30	30
	No. of well springs & boreholes rehabilitated	30	30	30
	No. of wells protected	50	25	25
	No. of meetings	15	15	30
	No. of talk shows	5	-	-
	No. of studies undertaken	1	2	-
5.2 Upgrade/improve existing waste water treatment plants and make sure effluents meet national standards	No. of treatment plants upgraded.	-	1	2
5.3 Promote sanitation facilities in rural areas and small towns	No .of sanitation system design studies	1	1	1
	No. of sanitation systems constructed	-	1	1
	No. of latrines constructed	45	75	105
	No. of meetings	10	15	-
	No. of talk shows	5	-	
5.4 Plan sanitation associated with the new piped schemes being developed in small towns and rural growth centres	No. of designs for waste water treatment plants	4	8	-
	No. of waste water treatment plants constructed	-	4	8
6 – CONTROL AND REDUCE POLLUTION				
6.1 Improve management of solid waste	No. of solid waste disposal studies conducted	4	3	6
	No. of catchments with proper solid waste disposal mechanisms in place		4	6
6.2 Control waste water discharge and pollution from industries and artisanal activities	No. of meetings	12	15	20
	No. of effluent control studies	10	10	-
7 – COMMUNICATION AND CAPACITY BUILDING	No.	150	150	300
8- IMPROVEMENT OF INSTITUTIONAL CONTEXT		-	-	-
9 – IMPROVEMENT OF KNOWLEDGE AND DATA COLLECTION		-	-	-

6.1 Develop Water for Production Infrastructure

6.1.1 Creation of fish ponds

The catchment has a capacity to expand fishponds up to 4,000ha according to the National Wetland Management project report –Budaka District. Accordingly, the following activities should be implemented in the short-term period:

- Make a complete inventory of all existing ponds (stocked, unstocked, abandoned, etc.) to identify the existing potential and make the abandoned ponds available for new fish fa mers
- Register all private aquaculture practitioners. This can protect farmers from malicious practitioners who exploit them by providing them with sub-standard advisory services
- Promote fish fa ming as an alternative livelihood and source of income among the population
- Promote the creation of fish farmers groups. The creation of such groups is a mean to strengthen the fis farming sector by pooling capital, which will allow the purchase of new means of production. It is also a means to enhance production and sales
- Training fish farmers on good farming practices such as water quality management, sampling, grading, record keeping and feeding, stocking and making their own feed
- Establish demonstration farms: this measure is seen as a mean to promote and train farmers on good farming practices.

6.1.2 Construction and rehabilitation of livestock watering points

In the short-term, the following measures to improve water access for cattle watering should be implemented:

- Promote and implement simple rainwater harvesting technologies like sunken pits, ditches, roof water harvesting and rainwater tanks
- Development of roof water harvesting such as corrugated, plastic and ferro-cement tanks is a useful solution to storing water for domestic purposes. Rainwater tanks can also be useful to capture local runoff and can provide water for subsistence food gardening
- Organise access to watering points and formulate policy guidelines that provide for establishment of livestock corridors to access watering points in wetlands
- Integration of livestock into crop production systems such as rice production systems. For example, residues from crop harvests like maize stover, rice straw and chaff can be used as feed for livestock. This will improve agricultural water productivity since the amount of water depleted in the production of crop residues will be almost negligible and already accounted for in the crop water requirement to produce food.

6.1.3 Development of upland irrigation

The upland irrigation potential per sub-basin is presented as follows:

Table 6.2: Upland Irrigation Potential per sub-basin

Sub basin	Area (ha)
M1	5,447
M2	7,546
M3	3,847
M4	904
M5	2,236
M6	0
M7	2,189
M8	683
M9	1,632
M10	4,446
M11	214
M12	160
M13	1,045

The development of about 8,350ha of upland irrigation is considered in the catchment management plan. Approximately 8,000ha are associated with the development of the Nyabanja and Angolola dams. In addition, the management plan considers the development of 350ha of upland irrigation in Kibimba sub-catchment (M8). The detailed design of the irrigated perimeter is expected to take place over the medium term for a long term implementation. Implementation of upland irrigation in Kibimba area does not rely on the implementation of reservoir.

To be effective, development of upland irrigation must be associated with:

- Training farmers on good farming practices, operation, maintenance, and management of irrigation and also record keeping, post-harvest processing, and marketing. This must be done jointly with the establishment of demonstration farms
- Organising farmers into groups and encouraging them to join other social groups to help them gain access to credit and other benefits

6.1.4 Organise irrigation in wetlands

Cultivation of rice in wetlands is the traditional informal irrigation. Most of it is located on the fringes of wetlands and smallholder farmers developed it spontaneously without planning and with little or no technical assistance. In the Mpologoma Catchment, informal irrigation has been estimated to be 47,130ha. Conversion of informal irrigated areas into formal irrigation schemes is seen as a way to limit the uncontrolled encroachment of wetlands and to improve the water control and, therefore, the efficiency of irrigation. Assuming that farmers practicing irrigation in an area targeted by a project will all access the new formal irrigation facilities and will not relocate their activity in other informally irrigated areas, such conversion will imply a reduction of the water demand by improving the irrigation efficienc . To be effective, the above measures must also be accompanied by the organisation of training on good irrigation practices in the short-medium term.

Three identified sites present in the table below represent an important potential for implementation of formalised irrigation. The area involved is relatively large and shall be developed on the wetlands, therefore, potentially detrimental to the protection of wetlands. The implementation of these irrigated areas should be based on a more comprehensive study taking into account the state of degradation of wetlands and the relative importance to give to development of irrigated agriculture and wetland protection. In the Catchment Management Plan, the realisation of these studies is proposed in the short term (0-5 years).

Table 6.3: Location of existing irrigated areas and of the potential for irrigation in the Mpologoma Catchment. (Source: National Water Resources Assessment, 2013 & IIRR Survey 31/08/2016 - 02/09/2016).

District	Village	Latitude	Longitude	Sub-basin	Description/details
					Crop= N/A Type= N/A
Namutumba	Kizuba	0.843	33.749	M9	**500 acres** (202 ha) in Kizuba vilage, Nawangunga wetland
Bugiri		0.533	33.878	M8	In Kibimba, in Mpologoma swamps, 665ha of formalised irrigation with bunds for cultivation of rice are existing. This can be increased to 1,500ha.

Although many projects are already planned and many sites are identified for the implementation of formal irrigation, it will be necessary in the medium term to identify new sites for implementation of formal irrigation. It is, therefore, recommended to carry out an inventory of the sites where informal irrigation is practiced, to prioritise them by criticality and plan for implementation of formal irrigation. This study will necessarily be associated with a wetland conservation plan.

6.1.5 Development of rice/aquaculture

Development of schemes combining rice production with will contribute to:

- Formalise irrigation in wetlands
- Associate two different sources of income and, therefore, increase the generated income
- Increase the production of different marketable surplus.

In Butaleja District, the National Wetlands Management Project (Wetland use and livelihood assessment - Butaleja District, 2013) plans the implementation of two rice/aquaculture schemes as pilot projects. In the short term, this initiative must be monitored. With the results obtained from the pilot projects and lessons learned, the association of aquaculture with rice cultivation must be promoted and developed in the medium term. This should be done by identifying new sites and supporting farmers technically and financially in adopting these practices.

In order to optimise the development of rice/aquaculture scheme among the population, the following measures must also be implemented:

- Establishment of demonstration farms
- Training adequate local government staff in rice/aquaculture production for them to support farmers' initiatives
- The organisation of producers into groups to facilitate access to credits for the development of their activities and the promotion of marketable products
- Identification and organisation of markets for the sale of marketable surpluses

6.2 Develop the Agriculture Sector and improve practices

6.2.1 Development of agro-forestry and conservation agriculture

Promoting good agricultural practices among farmers' communities is a way to:

- Increase agricultural yields and, therefore, reduce food insecurity and generate additional income
- Reduce soil degradation and loss of fertility, thus reduce enrichment of aquatic systems with sediment, nutrients, and other pollutants among others.

In the Mpologoma Catchment, the framework management plan for the Doho Namatala wetlands (Framework Management Plan for Doho Namatala wetland, 2014) plansto implement a pilot project introducing agroforestry. This project will take place in Kaato and Buwagogo sub-counties in Manafwa District on the slopes of Mount Elgon degraded by lack of good agricultural practices.

In the short term (0-5 years), adoption of those practices among farmers must be promoted. Training must be organised in priority in the Mount Elgon area (M1, M2, M5 and M6 sub-catchments) and the command area of Nyabanja and Angolola dam (M5 and M9 sub-catchments). On medium to long term, promotion and training must also take place in the other part of the catchment. Five sites have been identified for the adoption of good agricultural practices. In addition, training of relevant local government staff must be done for them to be able to support farmers on the adoption of good agricultural practices.

6.2.2 Develop soil and water conservation measures

The implementation of soil and water conservation measures and the training of farmers must be carried out in priority in the Mount Elgon area (sub-basins M1, M2, M5). Five hotspots (see Table 6 4 below) have been identified by IIRR. In the short term, the definition of pilot projects on three different areas of the Mount Elgon (sub-catchments M1, M2, and M5) is considered. These projects aim at enhancing conservation of soil and water by associating complementary activities such as: reforestation, training of farmers on soil conservation measures and reforestation, and demarcation of forest. The first project would take place in the upstream part of the Namatala sub-catchment (M1) and include the hotspots 35, 49, and 41. The second project would take place in the Upper Manafwa sub-catchment (M2) and include the hotspots 32, 58, and 59. In Lwakhakha sub-catchment, the project is already defined under the Lwakhakha Inte vention Implementation Plan (2016).

The plan proposes the implementation of activities related to various options including reforestation, clear demarcation of forests, and implementation of soil and water conservation measures among others. Those activities are planned for both Upper Lwhakhakha sub-catchment and River Lirima. These are:

- Baseline survey and boundary marking with community stakeholders - Sisal plants, aloe plants as boundaries
- Reforestation programme: Replanting/infilling the degraded forest area with appropriate seedlings, 10h
- Reforestation programme: Facilitating households to plant at least 10ha tree seedlings (timber and fuelwood) for domestic use
- Reforestation programme: Facilitating 1 school to plant at least 2ha tree seedlings
- Manage/rehabilitate five gullies in the ecosyste
- Facilitate construction of terraces in 20 farms/200 meters.

The command areas of the Nyabanja and Angolola dams also constitute priority areas for implementation of soil and water conservation measures. Implementation of soil and water conservation measures will contribute to reduce siltation in streams where the dams will be implemented.

Although hotspots have been identified where implementation of soil and water conservation measures is required, it will be necessary in the medium and long term to identify new sites.
The identified hotspots are listed below

Table 6.4: Hotspots identified by IIRR where soil and water conservation measures must be implemented

ID	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
31	Manafwa	Wesswa	Buwesswa	Mufufu	0.99158	34.3309	M-2
32	Bududa	Bushiyi	Matuwa	Matuwa	1.0803	34.4110	M-2
33	Mbale	Bubyangu	Bubyangu	Bukwaga a	1.0791	34.2702	M-1
34	Mbale	Bubyangu	Budanda	Bukwaga a	1.0789	34.2701	M-1
35	Mbale	Lwasso	Bwangulo	Kibagala	1.0836	34.2175	M-1

6.2.3 Promote the use of quality inputs in agriculture

Agriculture in the Mpologoma Catchment is essentially rain-fed with low yields. Use of poor quality inputs is a major constraint to agricultural production. Pilot projects are already planned under the Framework Management Plan for Doho Namatala Wetland – 2014. The project plans the promotion of Best Rice varieties and fish farming practice for implementation of wise use concept. In addition, under the National Wetlands Management Project - wetland use and livelihood assessment - Budaka District – 2013, a project aimed at selection of best rice variety is also planned. Best varieties of rice are selected through participatory process by establishing demonstration farms in Chali village in Budaka Sub-county. Best variety suited to the village will be chosen by comparing yield and quality of rice plant.

As part of the catchment management plan, monitoring of this pilot project must be done. It will be useful to capture its different components: costs, benefits, ease of implementation, acceptability by the population, etc. This pilot project will provide a basis to increase the use of high yields crop and improve agricultural production. Several hotspots have been identified to implement the use of improved seeds and fertilizers and are listed below:

Table 6.5: Identified hotspots for the implementation of quality inputs and the use of fertilizers

ID	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
37	Mbale	Lwasso	Kiwuno	Kibagala	1.08281	34.2063	M-1
38	Iganga	Idudi	Idudi		0.6068	33.6757	M-10
41	Manafwa	Wesswa	Bwesswa	Mufufu	0.9915	34.3307	M-2

6.3 Other Economic Activities

6.3.1 Promotion development of quality fingerlings and fish feed production

Currently, the main source of commercial feeds is Ugachick, located in Kampala that is distant from most of the areas in the catchments. The expensive feed, coupled with low returns, has led to limited pond area under aquaculture, and abandonment of ponds observed in most of these areas. In addition, limited access to quality seeds for stocking ponds is also a problem to aquaculture. Farmers obtain seeds from the wild or are supplied by malicious stakeholders with seeds of poor quality with slow growth rates leading to undesirable sizes of fish at the end of the culture period leading to losses. Activities for promotion and procurement of quality fingerlings and fish feed include

- Rehabilitation and put into operation the regional fish fry centres such as the one in Mbale District so that farmers can get increased access to fish seed from areas near their establishments. This can reduce costs for fry, transport, and loss of fish seed due to stress suffered during transi
- Promote and organise production of fish seeds among fish f mers
- Encouraging or facilitating the private sector with soft loans or subsidies to set up hatcheries and feed making factories
- Development of hatcheries.

Such activities are already planned in the District Development Plans for financial years 2015-2020 of Tororo and Manafwa Districts (Tororo District Development Plan, 2015-2020: Manafwa District Development Plan, 2015-2020).

6.3.2 Develop fish farming

The Mpologoma Catchment has potential for development of fish farming. In Pallisa, Kamuli, and Kayunga Districts, there are either fish farms or plans to establish fish farms. These are on lakes in Pallisa, Lake Kimira in Bugiri, River Nile in Kamuli, and in Butaleja. Plans to set up and expand fish enterprises in the sub-catchments are in line with the sector plans to promote fish supply deficits in Uganda. In the framework of the catchment management plan, the following activities shall be implemented:

- Register all private aquaculture practitioners. This can protect farmers from malicious practitioners who exploit them by providing them with sub-standard advisory services
- Training fish farmers on good farming practices such as water quality management, sampling, grading, record keeping and feeding, stocking and making their own feed
- Sensitise fish fa mers on proper fishing methods, impact on water qualit .

6.3.3 Provide alternative livelihoods and promote environmentally sustainable socio-economic development paths

Promotion and development of alternative livelihoods is a way to:

- Generate alternative sources of income
- Reduce part of the population involved in agricultural activities
- Reduce the existing pressure on natural resources.

Among alternative livelihoods, the development of tourism can be closely linked with the protection and enhancement of wetlands. The Mpologoma Catchment is also characterised by the presence of a Ramsar site. The implementation of an eco-tourism project, combining protection and enhancement of wetlands is considered. Development of tourism is also suggested under the National Wetlands Management Project. Another area that can be developed is beekeeping and its integration into other activities (nurseries, etc.). A pilot project is planned in the management plan framework for Doho Namatala wetland system. This project involves the development of beekeeping as a source of income in Kabwangasi subcounty in Pallisa. This initative can be a springboard for the dissemination of beekeeping information for income generation.

Development of alternative livelihood can also be considered through development of integrated/combined activities: fish farming, horticulture, tourism, bee keeping, rice culture, etc. Two pilot projects are already planned

under the framework management plan for Doho Namatala wetlands. These projects are:

- Lyama integrated Fish, Horticulture, and Tourism support project for wise use of wetlands in Budaka district
- Strengthening the livelihoods of Nalwanza wetland stakeholders through tree planting and beekeeping to protect the river banks and wetland from siltation and eroding;

As part of the management plan, monitoring of these projects is a starting point for the dissemination and implementation of similar initiatives

6.4 Environmental conservation and protection

6.4.1 Development of tree nurseries and tree planting activities

Tree planting is a need generalised in the catchment. It is a way to reduce soil erosion, risk of landslide and siltation of rivers and wetlands. Related activities include planting trees with a rapid growth. This type of measure can help to quickly recover a forest cover and reduce erosion and watershed degradation. Alternatively, when watershed degradation is not critical, it is possible to reforest with indigenous trees. In the catchment, the implementation of such measures and the training of farmers must be carried out in priority (0-5 years) in the Mount Elgon area (sub-basins M1, M2, M5) and the command areas of Nyabanja and Angolola dams (M5 and M9 sub-catchments). For the other part of the catchment, the CMP plans tree planting in the medium to long term.

The Lwakhakha Intervention Implementation Plan – 2016 proposes the implementation of activities related to various options including reforestation, clear demarcation of forests, and implementation of soil and water conservation measures among others. Those activities are planned for both Upper Lwhakhakha sub-catchment and Lirima River. These are:

- Baseline survey and boundary marking with community stakeholders - Sisal plants, aloe plants as boundaries
- Reforestation programme: Replanting/infilling the degraded forest area with appropriate seedlings, 10h
- Reforestation programme: Facilitating households to plant at least 10ha tree seedlings (timber and fuelwood) for domestic use
- Reforestation programme: Facilitating one school to plant at least 2ha tree seedlings
- Manage/rehabilitate five gullies in the ecosystem

Activities related to tree planting are also planned under the following planning documents:

- Manafwa District Development Plan (2015-2020)
- Tororo District Development Plan (2015-2020)
- Kaliro District Development Plan (2015-2020).

6.5 Cross-cutting and/or permanent activities

Implementation of the identified measures in the catchment management plan must be accompanied by sensitisation and awareness campaigns among the population. According to the issues addressed, these campaigns aim to inform, create awareness, introduce new concepts, and imply change in every day practices. Sensitisation campaigns can have different forms to reach a maximum of the population. These include poster campaigns, radio talk shows, and organising meetings among others. The implementation of these campaigns is essential to the implementation of the management plan. Sensitisation of the greatest number on the protection of wetlands, forests, the existence of alternative sources of income, good agricultural practices, etc. is essential for the integration and implementation of these practices in the basin. The different sensitisation campaigns identified are listed in the table below.

Table 6.6: Identified sensitisation campaigns identified for the optimisation of the catchment management plan

Capacity building	Objectives
1. Develop water for production infrastructures	
Rain water harvesting	Sensitise communities on the interest of rainwater harvesting systems (corrugated, plastic and ferro-cement tanks) as a way to supplement domestic water supplies and reducing dependence on polluted and distant water sources. Sensitisation can also be done on surface water harvesting with installation of sub-surface masonry rainwater tanks for supplementary irrigation
2. Develop the agricultural sector and improve practices	
Good farming methods	Sensitise farmers and communities on the impact of poor farming methods on soil fertility, erosion, etc. and introduce better farming practices.
The Land Act, 1998	Sensitising farmers on and popularising the Land Act, 1998 to improve land management among farmers and communities and minimize conflict among farmer communities.
Flood awareness	Raise awareness about the risk of flooding. The existing causes (siltation of wetlands, poor soil management, etc.) and advise on possible measures to limit the risk of flooding or protect themselves.
Landslide preparedness	Awareness on landslide risks and possible consequences. Raise awareness of the possible causes (deforestation, poor farming practices, etc.) and inform on possible measures.
Soil and water conservation practices	Sensitise farmers and the general population on the need to implement measures for the conservation of water and soil. Raise awareness about the risks: erosion, landslides, siltation, floods, etc. Learn about the different existing conservation measures.
Pesticides with low fish and bird toxicity and to promote safe use of pesticides.	Sensitise farmers on the interest of pesticides for agriculture, the potential benefits and the possible negative impacts. Educate farmers on the proper use thereof.
3. Develop the other economic activities	
Existing alternative source of income	Raise awareness about the existence of alternative sources of income (tourism, beekeeping, etc.), especially the young population. This will open up the agricultural sector.
4. Environmental conservation and protection	
Sustainable use and management of water and natural resources	Sensitise farmers and communities on water resources protection and other natural resources. This includes pollution of water resources, degradation of wetlands (bushfire, etc.) and the forest. Raise awareness about the impacts of human activities (bushfire in wetlands, deforestation, etc.) and offer alternative practices.
Reforestation/tree planting/ Benefits of the trees and forests	Sensitise on the impacts of deforestation and promote and train farmers and communities on tree planting.
Importance of wetlands/ Sustainable utilisation of the wetland	Raise awareness of the importance of protecting wetlands, the impact of human activities on wetlands, and the importance of wetlands for flood mitigation. Raising awareness on the sustainable use of wetlands
Boundaries (forest, wetlands, etc.)	Raise awareness of the role and significance of forest and wetland delineation and associated regulations.
Buffer zone for river bank and lakeshore protection through tree planting	Sensitise communities on the consequences of agriculture and mining on the river banks and lakeshores (erosion, siltation, etc.). Promote the establishment of buffer zones and the re-vegetation of the edges of rivers and lakes.
Benefits of using energy saving technologies and clean energy	Sensitise communities on the impact of deforestation and on the use of energy saving technologies (cooking stoves, use of solar panel, etc.).
5. Improve water supply and sanitation	
Water source protection by fencing, tree and grass planting around the wells and sources and prohibiting polluting practices	Sensitise communities on practices likely to pollute water resources, the need to separate resources according to uses (watering livestock or source of drinking water). Promote implementation of water source protection by fencing, tree and grass planting, etc.
Hygiene promotion through sanitation and hygiene promotion activities.	Promote good hygiene practices among the population.
6. Control and reduce water pollution	
Solid waste disposal	Sensitise the population to the impact of solid waste on the environment and potentially on health. Promotes the use of garbage bag and good practices (dumps, etc.).
Sensitisation on the chemicals used by miners that mercury which is used to purify the gold adversely affects the quality of water, soil and human health	Sensitise minors and the public on the health impact of mercury use. Sensitize also on the environmental impact of mercury and mining activities in general.
8. Improvement of institutional context (related to water sector, at catchment level)	
Environmental laws, environment regulations and their enforcement	Warn and educate communities about the existence of laws for the protection of the environment, the importance of these laws and the importance of respecting them for the restoration of the basin.

6.6 Investment plan

Table 6.7 presents the investment plan for the project. The basis for the estimation of the costs is provided in the annex I below.

Table 6.7: Synthesis of costs for the implementation of the plan

	Activities	Cost per period (USD)		
		1-5 Yrs	6-10 Yrs	Beyond 10 Yrs
1	**DEVELOP WATER FOR PRODUCTION INFRASTRUCTURE**	**47,484,178**	**91,930,957**	**97,415,554**
1.1	Create fish ponds	1,121,047	384,867	747,384
1.2	Provide water / organize access to resources for cattle watering	1,798,815	436,455	600,110
1.3	Develop large infrastructure	2,508,830	34,078,050	1,054,290
1.4	Develop upland irrigation	90,570	44,854,375	11,731,810
1.5	Organise irrigation in wetlands (formal schemes)	41,485,120	9,131,260	82,910,760
1.6	Develop rice/aquaculture schemes	421,386	2,810,950	114,900
1.7	Develop rainwater harvesting and individual storage solution	58,410	235,000	256,300
2	**DEVELOP THE AGRICULTURAL SECTOR AND IMPROVE PRACTICES**	**905,007**	**540,667**	**689,911**
2.1	Development of agro-forestry and conservation agriculture	210,240	63,450	54,750
2.2	Implement soil and water conservation measures	390,482	357,992	433,881
2.3	Develop organisation and outlets for agricultural production	39,550	39,550	71,190
2.4	Develop and empower farmer groups and associations	6,780	-	-
2.5	Promote the use of quality inputs in agriculture	257,955	79,675	130,090
3	**DEVELOP OTHER ECONOMIC ACTIVITIES**	**522,851**	**272,300**	**25,769,950**
3.1	Promote development of quality fingerlings and fish seeds production	291,591	65,200	117,360
3.2	Develop fish farming	146,060	93,900	84,400
3.3	Develop small hydropower production	-	-	25,451,910
3.4	Improve livestock husbandry (extension, breeding, etc.)	33,100	32,600	58,680
3.5	Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	52,100	80,600	57,600
4	**ENVIRONMENTAL CONSERVATION AND PROTECTION**	**3,909,775**	**2,714,061**	**5,140,846**
4.1	Development of tree nurseries and tree planting activities	838,175	187,411	343,799
4.2	Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly	760,380	760,650	2,271,190
4.3	Clear demarcation of wetlands and forests	96925	27,725	39,997
4.4	River bank protection (cultivation and sand mining)	1130945	1,130,925	2,178,580
4.5	Develop a forest management and development strategy	710900	358,300	307,280
4.6	Use of renewable energy / alternative energy sources and development strategy	372450	249,050	-
5	**IMPROVE WATER SUPPLY AND SANITATION**	**23,586,855**	**3,916,345**	**10,616,074**
5.1	Improve access to safe water supply	23,005,671	1,421,996	2,030,409
5.2	Upgrade/improve existing waste water treatment plants and make sure effluents meet national standards	167,940		
5.3	Promote sanitation facilities in rural areas and small towns	329,274	1,767,079	7,125,665
5.4	Plan sanitation associated with the new piped schemes being developed in small towns and rural growth centres	83,970	727,270	1,460,000
6	**CONTROL AND REDUCE POLLUTION**	**640,240**	**2,942,514**	**5,595,814**
6.1	Improve management of solid waste	134,570	2,468,227	4,745,284
6.2	Control waste water discharge and pollution from industries and artisanal activities	505,670	474,287	850,530
7	**COMMUNICATION AND CAPACITY BUILDING**	**267,754**	**398,406**	**659,710**
8	**IMPROVEMENT OF INSTITUTIONAL CONTEXT**			
9	**IMPROVEMENT OF KNOWLEDGE AND DATA COLLECTION**			
	TOTAL PER PERIOD	**77,316,659**	**102,715,250**	**145,887,859**
	GRAND TOTAL			**325,919,768**

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8 ANNEXES

Annex I
Unit costs used in the calculations in the investment plan

The sources listed below were used to define the unit costs. TheConsultant's experience was used wherever there were no appropriate sources within the country. Provisional costs for the civil works have been proposed by the consultant based on its expertise.

- Uganda Catchment Management and Planning Guidelines (DWRM, April 2014);
- Ministry of Water and Environment (July 2009), Strategic Sector Investment Plan for the Water and Sanitation Sector in Uganda
- Ministry of Water and Environment, Water for Production Strategy and Investment Plan, (DWMR, August 2009)
- Council on Water (AMCOW, 2011)
- Uganda Water Supply and Sanitation - Country Status Overviews" (African Ministers)
- Water Sector Investment Plan (WSIP) (PEMConsult, 2009);
- National Irrigation Master Plan (NIMP) (PEMConsult, 2011);
- Final Catchment Management Plan – Albert Nile, 2016;
- Final Catchment Management Plan - Aswa , 2016
- Development of the Awoja Catchment Management Plan in the Kyoga Water Management Zone, (Awoja CMP, 2013)
- The Lwakhakha Implementation Intervention Plan (MWE, 2016);
- The District Development Plans for Financial year 2015/16 – 2019/20 for Mbale, Tororo and Manafwa districts.

Table 8.1: Unit cost used for the investment plan

Time	Monthly Cost (USD)
Employee	2,260
Consultant	12,995
Transportation costs	**Monthly Cost (USD)**
4*4	1,000
Construction of Water for Production infrastructure and drainage system	**Unit cost (USD/m³)**
Valley Tanks	9.8
Valley Dams	3.8
Sand Dams	14.7
Sub-surface Dams	4
Fish pond for aquaculture	9.8
Concrete dams	0.6
Organisation of meetings and trainings	**Unit cost (USD)**
Conduct public awareness raising and deliver extension messages (per campaign)	291
Training of 1 farmer	20
Training of government officers or CMOs	40
Training one operator	24
Organize radio talk show (per radio talkshow)	99
Fisheries	**Unit cost (USD)**
Consolidation of existing plants (purchasing 5 sign nets, and 200 m PVC pipes to ensure sustainable activity)	1,710
Rehabilitation of one pond	600
Rehabilitation of the regional fish fry centre	150,000
Development of one hatchery	17,857
Development of rice-aquaculture scheme (per ha)	7,143
Livestock	**Unit cost (USD)**
Access point fo cattle watering (per access point)	536
Pilot project implying integration of livestock (per farm)	5000
Rainwater harvesting technology	**Unit cost (USD)**
Sunken pit	300
Roof water harvesting	3,571
Rainwater tanks, including VAT, installation & overheads (per m3)	340
Agriculture and irrigation	**Unit cost (USD)**
Demonstration farm (per ha)	7,143
Development of large irrigation schemes (per ha)	5,500
Development of small irrigation scheme (<100ha) (per ha)	5,975
Environment	**Unit cost (USD)**
Baseline survey and boundary making with 1 community stakeholder	9,734
Reforestation programme: replanting/infilling 1 ha degraded forest area with appropriate seedlings	2,047
Manage/rehabilitate 1 gully in the ecosystem	354
Facilitate construction of terraces in 1 farm	239
Implement a tree nursery (per ha)	1733
Wetland restoration and management (per ha)	1161
1 km of demarcation of protected area	510
Construct 1 km of gabions	17,857
1 km of river pegging	250
Plant riparian vegetation (per ha)	867
Procure 50000 seedlings	0.10
Forest restoration and management project (per ha)	700
Support the construction of bio-gas digester (per digester)	357
Construction of 1 firewood efficient stoves, train and equip artisans to construct/maintain firewood efficient stoves	495
Water supply and sanitation	**Unit cost (USD)**
Construction of 1 well spring (including protection)	1671
Construction of 1 Borehole	6339
Rehabilitation of 1 well spring (including protection)	517
Rehabilitation of 1 borehole	517
Water sources protection (1 source)	769
Construction of public latrine (1 public latrine)	3982
Construction of piped water system (per habitant)	177
Lumpsum estimation per water treatment plant	500,000
Sanitation (per habitant)	100
Put in place 1 central faecal sludge treatment site for public institutions	53,571
Put in place 1 cesspool	26,786
Procure 1 cesspool emptiers	53,571
Construct 1 sewage systems	53,571
Establish and protect 1 lagoons	53,571
Solid waste management	**Unit cost (USD)**
Lumpsum estimation for one solid waste treatment site	53,571
Procure 1 dump truck	125,000
Hydropower	**Unit cost (USD)**
Micro-hydropower per kW	4,200

Annex II

Identified sites for establishment of multipurpose reservoirs in the Mpologoma Catchment

Table 8.2: Identified sites for the establishment of multipurpose reservoirs in the Mpologoma Catchment

Site Name	District	Sub-coun	Parish	Village	Latitude	Longitude	River	Sub-basin location	Description / Details
Potential dam sites identified under the Sio Malaba Malakisi pre-feasibility study (NBI, August 2010)									
Bulusambu dam (Doho) (Manafwa river)	Mbale	Busoba	Bunanimu	Bulusambu	0.955840°	34.134749°	Manafwa	M3	**Feasibility studies have been undertaken and concluded the project is feasible. However, the project currently faces setbacks due to issues with the communities and is not funded. Studies undertaken by MAAIF and MWE (DWD) concluded that without this dam, the second phase of the extension of Doho rice scheme cannot be implemented.** Potential volume is 19.4 Mm3 Dam Height (m)= 10 Crest length (m) = 1174 Irrigation command area (ha) = 963 Hydropower capacity (kW) = 62 Multipurpose use: flood control, hydropower generation, irrigation, livestock watering, domestic use
Amagoro dam site	Tororo-Busia	Magola		Malawa-B	0.589363°	34.078402°	Malaba	M7	Potential volume is 170 Mm3 Dam Height (m)= 15 Crest length (m) = 2000 Irrigation command area (ha) = 32,755 Hydropower capacity (kW) = 879 Multipurpose use: flood control, hydropower generation, irrigation, livestock watering, domestic use
Nyamatunga dam site	Tororo	Mella		Nyamatunga	0.692306°	34.284326°	Nyamatunga	M5	Potential volume is 2 Mm3 Dam Height (m)= 14 Crest length (m) = 314 Irrigation command area (ha) = 385 Hydropower capacity (kW) = 10 Multipurpose use: irrigation, livestock watering, domestic use
Angolola dam site	Tororo	Mella		Angolola	0.693802°	34.304498°	Malaba	M5	**Funding has also been found from the African Development Bank to undertake detailed feasibility studies (detailed design, ESIA, resettlement action plan, etc.) for the development of irrigation associated with a watershed management components for the Angolola dam site** Potential volume is 13 Mm3 Dam Height (m)= 22 Crest length (m) = 580 Irrigation command area (ha) = 2505 Hydropower capacity (kW) = 103 Multipurpose use: flood control, hydropower generation, irrigation, livestock watering, domestic use
Pokach dam site	Tororo			Iyoryangi	0.656766°	34.063877°	Osia	M7	Potential volume is 11.1 Mm3 Dam Height (m)= 10 Crest length (m) = 1071 Irrigation command area (ha) = 2141 Hydropower capacity (kW) = 44 Multipurpose use: flood control, hydropower generation, irrigation, livestock watering, domestic use
Awuyo dam site	Tororo			Awuyo-A	0.629087°	33.967031°	Ongoro	M7	Potential volume is 7.3 Mm3 Dam Height (m)= 10 Irrigation command area (ha) = 9634 Hydropower capacity (kW) = 159 Multipurpose use: flood control, hydropower generation, irrigation, livestock watering, domestic use

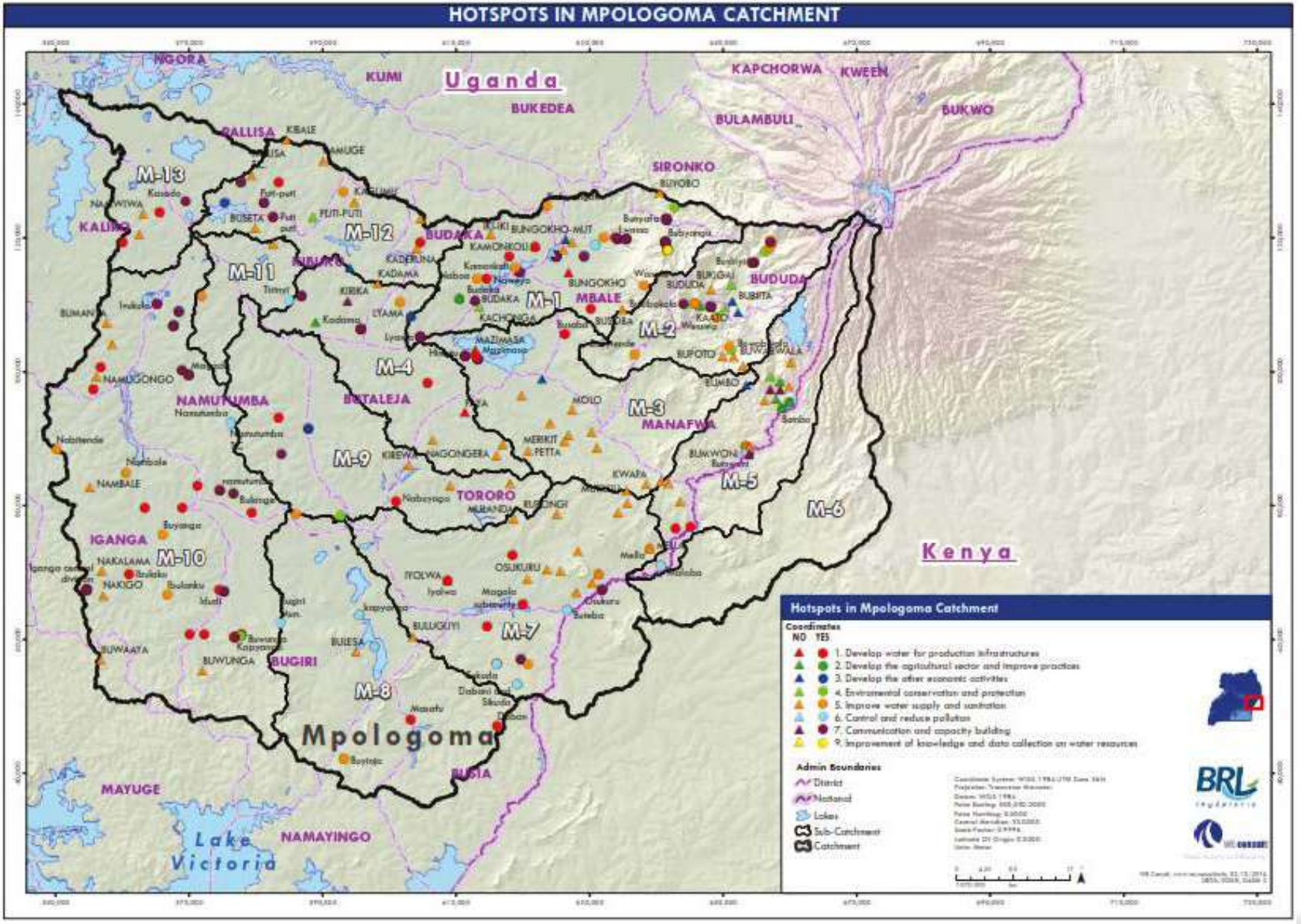
Site Name	District	Sub-county	Parish	Village	Latitude	Longitude	River	Sub-basin location	Description / Details
Nyabanja dam site	Tororo	Nabuyoga		Nyabanja	0.729772°	33.907849°	Dumbu	M9	**Funding has also been found from the World Bank Cooperation in international Waters for Africa [CIWA] and Swedish International Development cooperation Agency [SIDA] to undertake a feasibility study and detailed designs for the construction the Nyabanja dam in Tororo district** Potential volume is 11.8 Mm3 Dam Height (m)= 12 Irrigation command area (ha) = 5531 Hydropower capacity (kW) = 47 Multipurpose use: flood control, hydropower generation, irrigation, livestock watering, domestic use
Buhamosi dam site	Busia	Masaba			0.365462°	33.934599°	Maingo	M-8	This site was identified but not physically visited. The description and proposed designs was purely based on the topographical, geologic and soil maps of the site. Potential volume is 4 Mm3 Dam Height (m)= 8 Multipurpose use: irrigation, livestock watering, domestic use
Busigumba dam site	Bugiri	Buswale			0.447784°	33.916637°	Lumboka	M-8	This site was identified but not physically visited. The description and proposed designs was purely based on the topographical, geologic and soil maps of the site. Potential volume is 8 Mm3 Dam Height (m)= 8 Multipurpose use: irrigation, livestock watering, domestic use
Otiroki dam site	Tororo	Kwapa			0.872900°	34.109921°	Nankwasi	M-3	This site was identified but not physically visited. The description and proposed designs was purely based on the topographical, geologic and soil maps of the site. Potential volume is 6.4 Mm3 Dam Height (m)= 8 Multipurpose use: irrigation, livestock watering, domestic use
Kikhadi dam site	Tororo	Kirewa			0.836727°	34.078460°	Atapere	M-3	This site was identified but not physically visited. The description and proposed designs was purely based on the topographical, geologic and soil maps of the site. Potential volume is 8.3 Mm3 Dam Height (m)= 10 Multipurpose use: irrigation, livestock watering, domestic use
Potential dam sites identified under the Identification and assessment of potential sites for multi-purpose storage reservoirs upstream of the proposed Bulusambu dam site, Manafwa river (NBI, December 2012) - BRLi processing of hydrological characteristics									
Ikyenga	Mbale			Ikyenga	0.932671°	34.200465°	Manafwa	M-2	**Dam retained by the study through multicriteria analysis** Dam Crest Length (m)= 750 Dam Height (m)= 12 Reservoir Extent (sq.m)= 979,642 Reservoir Capacity (CM)= 4,451,408 Catchment Area (sq.km)= 453.5 Possible Uses: Irrigation, Fishing, Sediment Control, Flood Control, Tourism
Kyemula	Mbale			Kyemula	0.940393°	34.208142°	Manafwa	M-2	**The Kyemula dam reservoir is expected to inundate a national road as well as a number of settlements located near the Manafwa river banks. As a consequence, the Kyemula site was eliminated due to the higher environmental and socio-economic costs that would be associated with its development.** Dam Crest Length (m)= 650 Dam Height (m)= 12 Reservoir Extent (sq.m)= 1,549,131 Reservoir Capacity (CM)= 7,433,285 Catchment Area (sq.km)= 451.4 Possible Uses: Irrigation, Sediment Control, Flood Control

Site Name	District	coun	Parish	Village	Latitude	Longitude	River	Sub-basin location	Description / Details
Manafwa I	Manafwa			Kufu	0.944103°	34.278718°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)= 750 Dam Height (m)= 14 Reservoir Extent (sq.m)= 1,067,581 Reservoir Capacity (CM)= 7,138,679 Catchment Area (sq.km)= 349.7 Possible Uses: Irrigation, Fishing, Sediment Control, Flood Control
Manafwa II	Manafwa			Manafwa TC	0.958988°	34.287062°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)=750Dam Height (m)=12 Reservoir Extent (sq.m)=549,922 Reservoir Capacity (CM)=2,889,265 Catchment Area (sq.km)=310.7 Possible Uses:Irrigation, Sediment Control, Flood Control
Buwagogo	Manafwa			Buwagogo S/C HQs	0.963739°	34.305395°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)= 1000 Dam Height (m)= 12 Reservoir Extent (sq.m)= 1,119,187 Reservoir Capacity (CM)= 6,177,060 Catchment Area (sq.km)= 289.4 Possible Uses: Irrigation, Fishing, Sediment Control, Flood Control
Mutukula	Bududa			Marongori Village/Mutukula TC	0.981265°	34.312455°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)= 1000 Dam Height (m)= 14 Reservoir Extent (sq.m)= 581,469 Reservoir Capacity (CM)= 3,245,559 Catchment Area (sq.km)= 236.8 Possible Uses: Irrigation, Fishing, Sediment Control, Flood Control
Bukigai	Bududa			Bukigai TC	1.000613°	34.352827°	Manafwa	M-2	Dam Crest Length (m)= 800 Dam Height (m)= 12 Reservoir Extent (sq.m)= 479,801 Reservoir Capacity (CM)= 2,262,643 Catchment Area (sq.km)= 173.5 Possible Uses: Hydropower, Irrigation, Flood Control, Sediment Control
Bumayokha	Bududa			Bumayokha	1.023404°	34.380000°	Uluguso and Ukhaa	M-2	**Bumayokha dam site is very close to Bumayokha trading centre and its possible uses are limited to majorly hydropower potential. This dam has not been retained.** Dam Crest Length (m)=250 Dam Height (m)=24 Reservoir Extent (sq.m)=154,76 Reservoir Capacity (CM)=1,421,374 Catchment Area (sq.km)=59.1 Possible Uses:Hydropower, Sediment Control

Site Name	District	Sub-coun	Parish	Village	Latitude	Longitude	River	Sub-basin location	Description / Details
Manafwa I	Manafwa			Kufu	0.944103°	34.278718°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)= 750 Dam Height (m)= 14 Reservoir Extent (sq.m)= 1,067,581 Reservoir Capacity (CM)= 7,138,679 Catchment Area (sq.km)= 349.7 Possible Uses: Irrigation, Fishing, Sediment Control, Flood Control
Manafwa II	Manafwa			Manafwa TC	0.958988°	34.287062°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)=750Dam Height (m)=12 Reservoir Extent (sq.m)=549,922 Reservoir Capacity (CM)=2,889,265 Catchment Area (sq.km)=310.7 Possible Uses:Irrigation, Sediment Control, Flood Control
Buwagogo	Manafwa			Buwagogo S/C HQs	0.963739°	34.305395°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)= 1000 Dam Height (m)= 12 Reservoir Extent (sq.m)= 1,119,187 Reservoir Capacity (CM)= 6,177,060 Catchment Area (sq.km)= 289.4 Possible Uses: Irrigation, Fishing, Sediment Control, Flood Control
Mutukula	Bududa			Marongori Village/Mutukula TC	0.981265°	34.312455°	Manafwa	M-2	**The dam site is located in close proximity to townships/settlements, and/or national road connecting Mbale to Bududa through Manafwa district. Developing this site would require prohibitive compensation costs of inundated land.** Dam Crest Length (m)= 1000 Dam Height (m)= 14 Reservoir Extent (sq.m)= 581,469 Reservoir Capacity (CM)= 3,245,559 Catchment Area (sq.km)= 236.8 Possible Uses: Irrigation, Fishing, Sediment Control, Flood Control
Bukigai	Bududa			Bukigai TC	1.000613°	34.352827°	Manafwa	M-2	Dam Crest Length (m)= 800 Dam Height (m)= 12 Reservoir Extent (sq.m)= 479,801 Reservoir Capacity (CM)= 2,262,643 Catchment Area (sq.km)= 173.5 Possible Uses: Hydropower, Irrigation, Flood Control, Sediment Control
Bumayokha	Bududa			Bumayokha	1.023404°	34.380000°	Uluguso and Ukhaa	M-2	**Bumayokha dam site is very close to Bumayokha trading centre and its possible uses are limited to majorly hydropower potential. This dam has not been retained.** Dam Crest Length (m)=250 Dam Height (m)=24 Reservoir Extent (sq.m)=154,76 Reservoir Capacity (CM)=1,421,374 Catchment Area (sq.km)=59.1 Possible Uses:Hydropower, Sediment Control

Site Name	District	Sub-coun	Parish	Village	Latitude	Longitude	River	Sub-basin location	Description / Details
Busongi	Bududa			Busongi	1.047843°	34.377404°	Manafwa	M-2	**Dam retained by the study through multicriteria analysis** Dam Crest Length (m)= 200 Dam Height (m)= 26 Reservoir Extent (sq.m)= 132,154 Reservoir Capacity (CM)= 1,117,060 Catchment Area (sq.km)= 50.51 Possible Uses: Irrigation, fishing, Sediment Control, Flood Control
Bunamukwa	Manafwa			Bunamukwa	0.965869°	34.316322°	Sala	M-2	**Dam retained by the study through multicriteria analysis** Dam Crest Length (m)= 450 Dam Height (m)= 12 Reservoir Extent (sq.m)= 190,116 Reservoir Capacity (CM)= 1,034,342 Catchment Area (sq.km)= 42.2 Possible Uses: Sediment and Flood Control.
Kufu	Manafwa			Kufu TC	0.937007°	34.290415°	Kufu	M-2	Dam Crest Length (m)= 1000 Dam Height (m)= 12 Reservoir Extent (sq.m)= 420,222 Reservoir Capacity (CM)= 2,464,246 Catchment Area (sq.km)= 36.6 Possible Uses: Sediment Control, Flood Control
Bwebwoya	Manafwa			Bwebwoya	0.958742°	34.338649°	Sala	M-2	**Dam retained by the study through multicriteria analysis** Dam Crest Length (m)= 400 Dam Height (m)= 20 Reservoir Extent (sq.m)= 264,467 Reservoir Capacity (CM)= 1,954,446 Catchment Area (sq.km)= 35.3 Possible Uses: Sediment Control, Flood Control, Irrigation
Ishanzo	Bududa			Ishanzo TC	1.031965°	34.326601°	Tsutsu	M-2	**Comparing the potential storage capacity of this dam with other dams in Bududa district, this dam has been eliminated.** Dam Crest Length (m)= 300 Dam Height (m)= 12 Reservoir Extent (sq.m)= 70,724 Reservoir Capacity (CM)= 408,644 Catchment Area (sq.km)= 30.5 Possible Uses: Sediment Control, Flood Control, Irrigation
Matsantsa	Bududa/Mbale Border			Matsantsa	0.977543°	34.277715°	Pasa	M-2	**Dam retained by the study through multicriteria analysis** Dam Crest Length (m)= 600 Dam Height (m)= 24 Reservoir Extent (sq.m)= 273,99 Reservoir Capacity (CM)= 2,922,498 Catchment Area (sq.km)= 29.4 Possible Uses: Hydropower, Irrigation, Flood Control and Sediment Control, Water Supply
Bumalo II	Bududa			Bumalo	0.969604°	34.294354°	Liisi	M-2	Dam Crest Length (m)= 750 Dam Height (m)= 22 Reservoir Extent (sq.m)= 210,598 Reservoir Capacity (CM)= 1,617,761 Catchment Area (sq.km)= 17.0 Possible Uses: Sediment Control, Flood Control
Bumalo I	Bududa			Bumalo	0.981377°	34.302706°	Liisi	M-2	**Comparing the potential storage capacity of this dam with other dams in Bududa district, this dam has been eliminated.** Dam Crest Length (m)= 750 Dam Height (m)= 20 Reservoir Extent (sq.m)= 87,767 Reservoir Capacity (CM)= 627,559 Catchment Area (sq.km)= 15.0 Possible Uses: Irrigation, Sediment Control, Flood Control
Shilongo	Mbale			Shilongo and Nasasa	0.976881°	34.232390°	Mahuba	M-2	**Dam retained by the study through multicriteria analysis** Dam Crest Length (m)= 650 Dam Height (m)= 20 Reservoir Extent (sq.m)= 106,938 Reservoir Capacity (CM)= 818,571 Catchment Area (sq.km)= 8.8 Possible Uses: Irrigation, Sediment Control, Flood Control

Annex III
Map showing hotspots in the Mpologoma Catchment



Annex IV
Table of details of area under the proposed catchment management plan

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
1	1. Develop water for production infrastructures	1.1 Create fish ponds	Promote and create fish ponds	Development of fish ponds	Busia	Daban	Daban A		0.426	34.044	M8
2		1.3 Develop large infrastructure (multipurpose dams)	Implementation of multipurpose dams	Construction of dams to curb flooding	Tororo	Osukuru	Osukuru	Abwanget	0.609	34.185	M7
3			Implementation of drainage system	Formation of channels to direct water movement	Namutumba	Magada	Izirangobi	Mulama	0.900	33.629	M10
4				Formation of channels to direct water movement	Namutumba	Ivukula	Kisowozi	Mpande b	0.966	33.608	M10
9		1.4 Develop upland irrigation	Implement upland irrigation	Water for irrigation can be drawn from this point in Mpologoma/Jaraja river for rice farming	Namutumba	Namutumba	Nawansagwa		0.827	33.790	M9
10				Develop upland irrigated rice to reduce encroachment of wetlands	Pallisa	Puti puti	Limoto	Katome	1.113	33.742	M12
11				Embarking on upland rice growing and help reducing encroachment of wetlands	Bugiri	Buwunga	Buwunga	Mugera a & b	0.548	33.699	M10
12		1.5 Organise irrigation in wetlands (formal schemes)	Undertake detailed design and/or research of funds for implementation of an irrigation scheme	JICA site of rice farming and could be turned in to rice scheme in nawangunga wetland of 500 accres (202 ha) in kizuba village	Namutumba	Namutumba rural	Nawansagwa		0.843	33.750	M9
13			Implement formalized irrigation in wetlands	Proposed for formal scheme or reclamation from rice farming	Busia	Masafu	Bukobe		0.436	33.927	M8
14			Undertake detailed design and/or research of funds for implementation of an irrigation scheme	Kibimba rice scheme	Bugiri	Kapyanga	Kapyanga		0.533	33.878	M8
15			Implement formalized irrigation in wetlands	Provide modern irrigation scheme	Kibuku	Kadama	Nandere	Nandere	0.961	33.860	M4
16				Naigaga wetland encroached by rice farming and rice scheme is ideal for proposed intervention, it's about 5km long, individual farmers divide the plots for farming	Namutumba	Bulange	Bulange		0.714	33.714	M10
17				Proposal for formal rice irrigation scheme, igogero wetland and land consolidation for formation of scheme	IIRR Survey 31/08/2016 - 02/09/2016	Iganga	Ibulaku	Ibulaku	0.631312608718872	33.5483245849609	M10
18				Proposed interventions for formal scheme	IIRR Survey 31/08/2016 - 02/09/2016	Iganga	Idudi	Idudi	0.606847286224365	33.6757545471191	M10
19	1. Develop water for production infrastructures			Namuwondo wetland encroached for rice growing, a rice scheme would be an ideal option as proposed by the farmers	Namutumba	Namutumba rural	Ituba		0.745	33.670	M10
20		1.5 Organise irrigation in wetlands (formal schemes)	Implement formalized irrigation in wetlands	Installation of modern irrigation schemes to reduce on water wastage by the poor methods used to get irrigation water	Namutumba	Magada	Izirangobi	Mulama	0.900	33.629	M10
21				Installation of modern irrigation schemes to reduce on water wastage by the poor methods used to get irrigation water	Namutumba	Ivukula	Kisowozi	Namwenda i	0.996	33.586	M10

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
24	2. Develop the agricultural sector and improve practices	2.1 Development of agro-forestry and conservation agriculture	Introduce/train farmers on new agricultural practices (agroforestry, conservation agriculture)	Concentrate on mulching to preserve soil moisture	Namutumba	Magada	Izirangobi	Mulama	0.900	33.629	M10
25				Promote integrated pest and weed management measures	Namutumba	Magada	Izirangobi	Mulama	0.900	33.629	M10
26				Stop mono-cropping and promote crop rotations and intercropping	Namutumba	Ivukula	Kisowozi	Kimenyulo	0.907	33.620	M10
28			Support fruit tree cultivation (associated with agroforestry practices) through provision of tree seedlings	Provision of seedlings to support farmers on household basis to engage in massive tree planting	Tororo	Osukuru	Osukuru	Abwanget	0.609	34.185	M7
29				NAADs can help through provision of fruit tree seedlings for reforestation	Namutumba	Ivukula	Kisowozi	Mpande b	0.966	33.608	M10
31		2.2 Implement soil and water conservation measures (terracing, bunds, ...)	Implement soil and water conservation measures	Hedge rows to reduce erosion on the hills	Manafwa	Wesswa	Buwesswa	Mufufu	0.992	34.331	M2
32				Hedge rows to reduce erosion on the hills	Bududa	Bushiyi	Matuwa	Matuwa	1.080	34.411	M2
33				Promote the planting of Napier grass to control soil erosion.	Mbale	Bubyangu	Bubyangu	Bukwaga a	1.079	34.270	M1
34				Promote the planting of Napier grass to control soil erosion.	Mbale	Bubyangu	Budanda	Bukwaga a	1.079	34.270	M1
35				Promote the planting of Napier grass to control soil erosion.	Mbale	Lwasso	Bwangulo	Kibagala	1.084	34.218	M1
37		2.5 Promote the use of quality inputs in agriculture	Facilitate the provision and promote the use of quality seeds	Promote cultivation of improved crop varieties that are drought tolerant.	Mbale	Lwasso	Kiwuno	Kibagala	1.083	34.206	M1
38				Use of improved seeds	Iganga	idudi	idudi		0.607	33.676	M10
41			Provide and promote the use of fertilizers to improve agricultural production	Provided with fertilizers to help boost production	Manafwa	Wesswa	Bwesswa	Mufufu	0.992	34.331	M2
42	3. Develop the other economic activities	3.1 Promote development of quality fingerlings and fish seeds production	Facilitate the provision and promote the use of good quality inputs to fish farmer (fingerlings, fish food, etc.)	Fingerlings can also be promoted here	Namutumba	namutumba	nawansagwa		0.827	33.790	M9
43		3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	Promote alternative livelihoods that are environmentally friendly	Creation of jobs for the youths to avoid them from encroaching the wetland and the forest for charcoal burning as an alternative source of livelihood	Pallisa	Kasodo	Najeneti	Najeneti i	1.133	33.677	M12
44		3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	Promote alternative livelihoods that are environmentally friendly	Promote other livelihood options that are environmentally friendly	Pallisa	Kasodo	Nalufenywa	Komolo	1.162	33.698	M12
45	4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Reforestation/tree planting	Reforestation/Tree planting	Mbale	Bubyangu	Bubyangu	Bunabuloli upper	1.068	34.273	M1
46				Reforestation/Tree planting	Mbale	Bubyangu	Bubyangu	Bukwaga a	1.079	34.270	M1
47				Reforestation/Tree planting	Mbale	Bubyangu	Budanda	Bukwaga a	1.079	34.270	M1
48				Tree planting of the indigenous trees	Mbale	Bubyangu	Bumabanba	Bunabuloli upper	1.069	34.273	M1
49				Reforestation/Tree planting	Mbale	Lwasso	Bwangulo	Kibagala	1.084	34.218	M1
50				Reforestation/Tree planting	Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1
51				Tree planting of the indigenous trees	Sironko	Bunyafa	Bugambi	Bugambi a	1.126	34.282	M1
52				Encourage tree planting in gardens to reduce soil erosion	Sironko	Bunyafa	Bugambi	Bumalunda	1.110	34.272	M1
53				Tree planting of the indigenous trees	Bududa	Bukibokolo	Buirimbi	Bushirara	0.996	34.295	M2
54				Reforestation/Tree planting	Bududa	Bukibokolo	Bukibokolo	Rongo	0.996	34.310	M2
55				Tree planting of the indigenous trees	Bududa	Bushiyi	Busiliwa	Busiriwa	1.052	34.387	M2
56				Tree planting of the indigenous trees	Bududa	Bushiyi	Matuwa	Matuwa	1.080	34.411	M2

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude		
57				Tree planting of the indigenous trees	Bududa	Bushiyi	Matuwa	Bushibuya upper	1.068	34.405	M2
58				Tree planting of the indigenous trees	Manafwa	Buwabwala	Busambatsa	Nabafu	0.935	34.359	M2
59				turn the area in to a forest by planting indigenous trees	Manafwa	Wesswa	Bwesswa	Mufufu	0.992	34.331	M2
60				On Nabuboolo hill, after triggering mudslides, turn the area in to a forest by planting indigenous trees	Manafwa	Wesswa	Shibanga	Bunamuwenje east	0.978	34.341	M2
61				Reforestation/Tree planting	Butaleja	Himutu	Tindi	Muhuyu	0.927	34.000	M3
62				Reforestation/Tree planting	Kibuku	Tirinyi	Tirinyi	Tirinyi ii	1.007	33.781	M4
63				Reforestation/Tree planting	Namutumba	Ivukula	Buwaliro	Budomero	0.986	33.615	M10
64				Establishment of woodlots	Namutumba	Ivukula	Kisowozi	Mpande b	0.966	33.608	M10
65				Reforestation/Tree planting	Namutumba	Ivukula	Kisowozi	Mpande b	0.966	33.608	M10
66				Reforestation/Tree planting	Pallisa	Kasodo	Nalufenywa	Komolo	1.162	33.698	M12
76			Create and equip tree nurseries to increase available tree seedlings and develop alternative livelihoods	Provision of tree seedlings for reforestation	Busia	Sukuda	Sukuda	Tiira tr.c	0.515	34.076	M7
78		4.2 Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly	Define and implement adequate restoration projects	Passing restoration orders for walugogo wetland	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
79	4. Environmental conservation and protection			Restoring of swamps	Bugiri	Buwunga	Buwunga	Mugera a & b	0.548	33.699	M10
80		4.2 Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly		Restoring of swamps by reclaiming them from the farmers who are misusing and damaging them	Bugiri	Buwunga	Buwunga	Mugera a & b	0.548	33.699	M10
82		4.3 Clear demarcation of wetlands and forests	Set up a clear demarcation of wetlands and organize access according to their situation (degraded or not)	Demarcation of the wetland.	Namutumba	bulange	bulange		0.740	33.689	M10
83			Land management	Boundary opening of wetlands so that these land disputes can be solved	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
84			Set up a clear demarcation of wetlands and organize access according to their situation (degraded or not)	Demarcation of the wetland.	Namutumba	namutumba rural	itumba		0.745	33.670	M10
86			Implement the policy and laws to enforce integrity of wetland area	Land owners/community members should be stopped from cultivating in the swamp	Kibuku	Kadama	Nandere	Nandere	0.961	33.860	M4
87		4.4 River bank protection (cultivation and sand mining)	Create and uphold a buffer zone to project lake and river's banks from cultivation	Land owners/community members should be stopped from cultivating along Namatala river	Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1
88	4. Environmental conservation and protection		Promote river banks and lakeshore stabilization through revegetation with grass and tree planting activities	Restoration of the river banks through tree planting	Bududa	Bushiyi	Busiliwa	Bukhone	1.053	34.389	M2
89			Create and uphold a buffer zone to project lake and river's banks from cultivation	River bank protection (cultivation)	Busia	dabani and sikuda	busia and elim		0.482	34.071	M7
90				Gazetting of river bank areas in order to reduce river bank cultivation	Tororo	Osukuru	Osukuru	Abwanget	0.609	34.185	M7
91				Create a buffer zone for the river from community farming	Namutumba	bulange	kisiro		0.711	33.833	M9
100	5. Improve water supply and sanitation	5.1 Improve access to safe water supply	Promote and enhance practices to improve access to a safe water resource water	Grass planting to protect the water sources	Bududa	Bukibokolo	Bukibokolo	Rongo	0.996	34.310	M2
101				Grass planting to protect the water sources	Bududa	Bukibokolo	Bukibokolo	Rongo	0.996	34.310	M2

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
102				Grass planting to protect the wells	Manafwa	Wesswa	Bunamuwenje	Bunamuwenje central	0.978	34.339	M2
103				Grass planting to protect the wells	Manafwa	Buwabwala	Busambaza town board	Nakhele	0.937	34.356	M2
104				Grass planting to protect the water sources	Bududa	Bushiyi	Busiliwa	Bukhone	1.053	34.389	M2
105				Grass planting to protect the wells	Bududa	Bushiyi	Matuwa	Matuwa	1.081	34.412	M2
106				Grass planting to protect the wells	Bududa	Bushiyi	Matuwa	Matuwa	1.077	34.414	M2
107				Grass planting to protect the wells	Bududa	Bushiyi	Matuwa	Bushibuya upper	1.071	34.411	M2
108				Water source protection is needed, e.g. tree planting, improved farming etc.	Busia	Sukuda	Sukuda	Syonga	0.509	34.043	M7
109				Separate water sources for different uses	Busia	Sukuda	Sukuda	Syonga	0.509	34.043	M7
110				Protect the wells by planting vegetation surrounding them	Bugiri	Kapyanga	Namukonge	Namalehna/nawandeig	0.545	33.690	M10
111				Cleaning the water sources	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
112		5.1 Improve access to safe water supply	Promote and enhance practices to improve access to a safe water resource water	Gazetting water uses for specifically animals to differentiate water access points from those being used by the people	Bugiri	Kapyanga	Namukonge	Namalehna/nawandeig	0.545	33.690	M10
114	5. Improve water supply and sanitation		Develop new waste water treatment plant with adequate water treatment technology	Treatment of water using chlorine and water guard	Bugiri	Kapyanga	Namukonge	Namalehna/nawandeig	0.545	33.690	M10
117		5.3 Promote sanitation facilities in rural areas and small towns	Construct public latrines	Construction of latrines far away from the water sources	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
118				Construction of latrines to improve on sanitation	Bugiri	Kapyanga	Namukonge	Namalehna/nawandeig	0.545	33.690	M10
119		6.1. Improve management of solid wastes	Organise and develop infrastructures and mechanisms for solid waste disposal and management	Put in place mechanisms for solid waste disposal and management	Mbale	Industrial division	Industrial division	St. Andrews	1.075	34.176	M1
120					Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1
121					Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1
122					Tororo	Malaba	Malaba ward		0.641	34.264	M5
123					Namutumba	Namutumba council	central ward		0.837	33.685	M10
124					Namutumba	Namutumba town council	central ward		0.834	33.684	M10
125					Bugiri	Bugiri municipality	nkusi	Mpologoma nkusi	0.565	33.752	M10
126	6. Control and reduce pollution			Encourage sorting of waste before disposal and better management	Kibuku	Tirinyi	Tirinyi	Tirinyi i	1.001	33.764	M11
134		6.2 Control wastewater discharge and pollution from industries (sugar factories, tanneries, etc.) and artisanal activities (slaughterhouses, Waragi breweries, etc.)	Strengthen adherence of factories to effluent discharge standards and strengthen monitoring mechanisms. Put incentives to promote compliance to meet standards. Harmonize regulatory frameworks	Waste treatment of the Kibimba rice factory needs to be improved	Bugiri	kapyanga	kapyanga		0.533	33.878	M8
135				Tilda rice factory should stop contaminating the water through chemicals being spread	Bugiri	kapyanga	Namukonge	Kayango	0.576	33.858	M8
136				the tannery industry needs to construct a treatment plant before disposal	Busia	dabani and sikuda	busia and elim		0.482	34.071	M7
137	6. Control and reduce pollution			Malaba wetland and river is polluted with effluents from Busia sugar and allied factory, a treatment plant is encouraged to constructed	Busia	buteba	manakoli		0.582	34.138	M7
138				Conduct a site clean up to (environment remediation) (former mining activity)	Busia	Sukuda	Sukuda	Syonga	0.509	34.043	M7
139				Refill ng of the gold mines after mining	Busia	Sukuda	Sukuda	Tiira tr.c	0.515	34.076	M7

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
140			Identify and implement appropriate treatment systems to manage the various wastes emitted by factories	Put in place a proper mechanism for treatment of Waragi residue for its disposal	Namutumba	Ivukula	Buwalira	Budomero	0.986	33.615	M10
141		6.2 Control wastewater discharge and pollution from industries (sugar factories, tanneries, etc.) and artisanal activities (slaughterhouses, Waragi breweries, etc.)	Strengthen adherence of factories to effluent discharge standards and strengthen monitoring mechanisms. Put incentives to promote compliance to meet standards. Harmonise regulatory frameworks	Strengthen enforcement of issuing of permits to the distillers to regulate entry into the business as well as adhering to the set environment management actions	Namutumba	Ivukula	Buwalira	Budomero	0.986	33.615	M10
142				Regular monitoring to ensure compliance to relevant environment management actions by the distillers	Namutumba	Ivukula	Buwalira	Budomero	0.986	33.615	M10
143		6.2 Control wastewater discharge and pollution from industries (sugar factories, tanneries, etc.) and artisanal activities (slaughterhouses, Waragi breweries, etc.)	Strengthen adherence of factories to effluent discharge standards and strengthen monitoring mechanisms. Put incentives to promote compliance to meet standards. Harmonise regulatory frameworks	Strengthen enforcement of issuing of permits to the distillers to regulate entry into the business as well as adhering to the set environment management actions	Mbale	Bukasakya	Nabitiri	Bugema c	1.059	34.160	M1
144				Regular monitoring to ensure compliance to relevant environment management actions by the distillers	Mbale	Bukasakya	Nabitiri	Bugema c	1.059	34.160	M1
145	6. Control and reduce pollution		Identify and implement appropriate treatment systems to manage the various wastes emitted by factories	Put in place a proper mechanism for treatment of Waragi residue for its disposal	Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1
148			Develop new waste water treatment plant with adequate water treatment technology	Malaba wetland and river is polluted with effluents from Busia sugar and allied factory, a treatment plant is encouraged to constructed	Busia	buteba	manakoli		0.582	34.138	M7
152	7 Communication and capacity building	7.1 Raising awareness campaigns (different subjects identified existing laws and regulation, impact of malpractices, etc.)	Sensitisation on wetlands conservation and wise use of wetland	Sensitization on wetlands	Namutumba	bulange	mpumila	Mpologoma, buyoboya village	0.794	33.753	M9
153			Awareness creation on environment regulations and enforcement	Massive sensitisation on environmental laws	Tororo	Osukuru	Osukuru	Abwanget	0.609	34.185	M7
154			Sensitisation on the mining and industrial pollution, and their consequences for environment and human health	Sensitization on the chemicals used by miners that mercury which is used to purify the gold adversely affects the quality of water, soil and human health	Busia	Sukuda	Sukuda	Tiira tr.c	0.515	34.076	M7
155			Promote soil and water conservation measures	Promote soil and water conservation measures	Butaleja	Himutu	Tindi	Magugu	0.922	34.017	M3
156			Sensitise the population about boundaries (forest, wetlands, etc.) and buffer zone (riverbanks).	Awareness creation on the importance of buffer zones along river systems	Bududa	Bushiyi	Busiliwa	Bukhone	1.053	34.389	M2
157			Awareness creation on the land management	Awareness creation on the land management	Manafwa	Wesswa	Buwesswa	Mufufu	0.992	34.331	M2
158			Sensitisation on wetlands conservation and wise use of wetland	sensitization of public on sustainable utilization of the wetland	Namutumba	bulange	bulange		0.740	33.689	M10
159			Sensitise the population about boundaries (forest, wetlands, etc.) and buffer zone (riverbanks).	Dialogue between the government and the local people as they know where the boundaries are meant to pass for the wetland	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
160				Sensitization on how boundary demarcation is done for wetlands and what they base on	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
161				Sensitization on how boundary demarcation is	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
				done for wetlands and what they base on							
162	7 Communication and capacity building	7.1 Raising awareness campaigns (different subjects identified existing laws and regulation, impact of malpractices, etc.)	Sensitisation on wetlands conservation and wise use of wetland	sensitization of people on wetland regulation	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
163			Sensitisation campaigns on environment conservation and management for industries	More awareness creation campaigns on environment conservation and management, for Waragi distillers	Namutumba	Ivukula	Buwalira	Budomero	0.986	33.615	M10
164			Sensitisation on wetlands conservation and wise use of wetland	sensitization of public on sustainable utilization of the wetland	Namutumba	namutumba rural	itumba		0.745	33.670	M10
165			Sensitisation on the importance and benefits of the trees and tree planting activities	sensitization of the people on the benefits of the trees	Namutumba	Ivukula	Kisowozi	Mpande b	0.966	33.608	M10
166			Sensitisation on water sanitation and water source protection practices	Sensitization on water sanitation	Namutumba	Ivukula	Kisowozi	Namwenda i	0.996	33.586	M10
167			Sensitisation on water sanitation and water source protection practices	Sensitization on water usage and water source protection	Bugiri	Kapyanga	Namukonge	Namalehna/nawandeig	0.545	33.690	M10
168			Awareness creation on landslide preparedness	Awareness creation on disaster (landslide) preparedness	Mbale	Bubyangu	Bubyangu	Bunabuloli upper	1.068	34.273	M1
169			Sensitisation on the importance and benefits of the trees and tree planting activities	sensitization of the people on the benefits of the trees	Sironko	Bunyafa	Bugambi	Bumalunda	1.110	34.272	M1
170			Sensitisation of people on environment management and conservation, and sustainable use of natural resources	Sensitization of people on environmental management	Sironko	Bunyafa	Bugambi	Bumalunda	1.110	34.272	M1
171	7 Communication and capacity building		Sensitisation on the importance and benefits of the trees and tree planting activities	sensitization of the people on the benefits of the trees	Sironko	Bunyafa	Bukiiti	Bumalunda	1.112	34.271	M1
172			Sensitisation of people on environment management and conservation, and sustainable use of natural resources	Sensitization of people on environmental management	Sironko	Bunyafa	Bukiiti	Bumalunda	1.112	34.271	M1
173			Sensitisation on the importance and benefits of the trees and tree planting activities	Awareness creation on the importance of trees.	Mbale	Bubyangu	Bumabanba	Bunadudu	1.069	34.273	M1
174			Awareness creation on environment regulations and enforcement	Awareness creation on environment regulations and their enforcement	Mbale	Lwasso	Kiwuno	Kibagala	1.083	34.206	M1
175			Sensitise the population about boundaries (forest, wetlands, etc.) and buffer zone (riverbanks).	Awareness creation on the importance of buffer zones along river systems	Mbale	Lwasso	Kiwuno	Kibagala	1.083	34.206	M1
176				Awareness creation on the importance of buffer zones along river systems	Mbale	Lwasso	Kiwuno	Nabweya top	1.086	34.202	M1
177			Sensitisation of community members on other sources of income	Sensitization of community members on other sources of income	Budaka	Lyama	Lyama	Nakisenye	0.952	33.940	M1
178			Sensitisation campaigns on environment conservation and management for industries	Awareness creation campaigns on environment conservation and management for Waragi distillers	Mbale	Bukasakya	Nabitiri	Bugema c	1.059	34.160	M1
179			Awareness creation on environment regulations and enforcement	Awareness creation on environment regulations and their enforcement	Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1
180			Sensitise the population about boundaries (forest, wetlands, etc.) and buffer zone (riverbanks).	Sensitize people on the importance of leaving a buffer zone from the Namatala swamp	Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
188		7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Train farmers on proper farming methods	Education and sensitisation of farmers on good farming practices	Kibuku	Kadama	Nandere	Nandere	0.962	33.860	M4
189	7 Communication and capacity building		Train farmers on proper fishing farming methods	Promote proper fishing methods	Kibuku	Kadama	Nandere	Nandere	0.961	33.860	M4
190			Education of population on the environment conservation	Education of population on the environment conservation	Kibuku	Tirinyi	Tirinyi	Tirinyi ii	1.007	33.781	M4
191			Extension workers are provided to educate people on good farming methods	Employee extension workers to help in awareness creation and education of the community members on good farming methods	Kibuku	Tirinyi	Tirinyi	Tirinyi ii	1.007	33.781	M4
192			Extension workers are provided to educate people on good farming methods	Extension workers are provided to educate people on good farming methods	Butaleja	Himutu	Tindi	Muhuyu	0.927	34.000	M3
193			Train farmers on good irrigation techniques and creation of demonstration sites for small-scale irrigation technologies and rainwater harvesting	Train farmers on good irrigation techniques	Butaleja	Himutu	Tindi	Muhuyu	0.927	34.000	M3
194			Train farmers on proper fishing farming methods	Extension workers are provided to educate people on good fishing methods	Butaleja	Himutu	Tindi	Muhuyu	0.927	34.000	M3
195			Extension workers are provided to educate people on good farming methods	Extension workers are provided to educate people on good farming methods	Butaleja	Himutu	Tindi	Magugu	0.922	34.017	M3
196			Train farmers on proper fishing farming methods	Extension workers are provided to educate people on good fishing methods	Butaleja	Himutu	Tindi	Magugu	0.922	34.017	M3
197			Creation of demonstration sites for training on farming practices	Creation of demonstration sites for training on farming practices	Bududa	Bukibokolo	Buirimbi	Bushirara	0.996	34.295	M2
198	7 Communication and capacity building		Education of population on the environment conservation	mass education on environmental management	Bududa	Bushiyi	Busiliwa	Busiriwa	1.052	34.387	M2
199			Creation of demonstration sites for training on farming practices	Creation of demonstration sites for training on farming practices	Manafwa	Wesswa	Buwesswa	Mufufu	0.992	34.331	M2
200			Creation of demonstration sites for training on farming practices	Creation of demonstration sites for training on farming practices	Bududa	Bushiyi	Matuwa	Matuwa	1.080	34.411	M2
201			Train farmers on proper fishing farming methods	Sensitization of farmers on proper farming and fishing method (fish farming)	Pallisa	Kasodo	Kasodo	Nangodi c	1.135	33.624	M13
202			Develop sustainable utilization of wetland resources and improve community livelihoods in wetlands; Develop integrated/combined activities for wise use of wetlands: Fish farming; horticulture, tourism, bee keeping, rice culture....	Encouraging and training people to start fishing Ponds	Pallisa	Puti-puti	Limoto	Limoto a	1.132	33.730	M12
203			Train farmers on proper fishing farming methods	Sensitization of farmers on proper farming and fishing method (fish farming)	Pallisa	Puti puti	Limoto	Katome	1.113	33.742	M12
204		7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Train farmers on proper fishing farming methods	Sensitization of farmers on proper farming and fishing method (fish farming)	Pallisa	Puti-puti	Limoto	Limoto a	1.132	33.730	M12
205			Train farmers on proper farming methods	Sensitization of farmers on proper farming methods	Pallisa	Kasodo	Nalufenywa	Komolo	1.162	33.698	M12
206				Training to improve farming methods	Iganga	idudi	idudi		0.607	33.676	M10
207				Provide technical advice on weed control	Namutumba	Magada	Izirangobi	Mulama	0.900	33.629	M10
208			Creation of demonstration sites for training on farming practices	Creation of demonstration farms in the area to train farmers in modern sustainable farming methods	Namutumba	Ivukula	Kisowozi	Kimenyulo	0.907	33.620	M10

ID	Option	Options	Sub-options	Identified activities	District	Sub-county	Parish	Village	Latitude	Longitude	Sub-catchment
209	7 Communication and capacity building			Creation of demonstration farms in the area to train farmers in modern sustainable farming methods	Namutumba	Ivukula	Kisowozi	Mpande b	0.966	33.608	M10
210			Train farmers on the use of soil and water conservation measures like construction of contour bunds, water retention trenches, mulching, etc.	Train farmers on the use of soil and water conservation measures like construction of contour bunds, water retention trenches, mulching, etc.	Mbale	Bubyangu	Bubyangu	Bukwaga a	1.079	34.270	M1
211			Train farmers on proper farming methods	teach farmers of proper farming methods on limited land	Mbale	Bubyangu	Bubyangu	Bukwaga a	1.079	34.270	M1
212			Train farmers on the use of soil and water conservation measures like construction of contour bunds, water retention trenches, mulching, etc.	Train farmers on the use of soil and water conservation measures like construction of contour bunds, water retention trenches, mulching, etc.	Mbale	Bubyangu	Budanda	Bukwaga a	1.079	34.270	M1
213			Education of population on the environment conservation	Education of population on the environment conservation	Mbale	Lwasso	Bwangulo	Kibagala	1.084	34.218	M1
214			Train farmers on proper farming methods	teach farmers of proper farming methods on limited land	Mbale	Lwasso	Bwangulo	Kibagala	1.084	34.218	M1
215			Extension workers are provided to educate people on good farming methods	Extension workers are provided to educate people on good farming methods	Budaka	Lyama	Lyama	Nakisenye	0.951	33.941	M1
216			Extension workers are provided to educate people on good farming methods	Extension workers are provided to educate people on good farming methods	Budaka	Lyama	Lyama	Nakisenye	0.952	33.940	M1
217			Train farmers on proper fishing farming methods	Extension workers are provided to educate people on good fishing methods	Budaka	Lyama	Lyama	Nakisenye	0.952	33.940	M1
218			Extension workers are provided to educate people on good farming methods	Extension workers are provided to educate people on good farming methods	Butaleja	Naweyo	Nasinyi	Jami	1.040	34.074	M1
219			Train farmers on proper fishing farming methods	Extension workers are provided to educate people on good fishing methods	Butaleja	Naweyo	Nasinyi	Jami	1.040	34.074	M1
220	7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Train farmers on proper farming methods	Promote the use of good farming methods	Mbale	Bukasakya	Tsabanyanya	Shibiniko	1.060	34.123	M1
225	8. Improvement of institutional context (related to water sector, at catchment level)	8.3 Support the preparation of ordinances and by-laws by district local governments	Preparation of ordinances and by-laws by district local governments	Bylaws on Tilda rice firm stop blocking and diverting the water so that the villagers can also benefit	Bugiri	kapyanga	Namukonge	Kayango	0.576	33.858	M8
226				Formulation and implementation of strict bylaws to deter people from encroaching	Manafwa	Wesswa	Bwesswa	Mufufu	0.992	34.331	M2
227				Policy bylaws on environmental management" there should be enforcement limiting farming in wetlands	Bugiri	Buwunga	Buwunga	Mugera a & b	0.548	33.699	M10
228				Creation and enforcement of the strict by laws to govern and regulate the usage of wetlands and riverbanks.	Mbale	Lwasso	Kiwuno	Kibagala	1.083	34.206	M1
229				Creation and enforcement of the strict by laws to govern and regulate the usage of wetlands and riverbanks.	Mbale	Lwasso	Kiwuno	Nabweya top	1.086	34.202	M1
233		8.4 Improve coordination between different institutions involved in law enforcement (technical, political,	Strengthen enforcement mechanisms	Active environmental laws should be put to work	Tororo	Osukuru	Osukuru	Abwanget	0.609	34.185	M7
234				Strengthening implementation of policies and regulations	Iganga	Iganga central division	Bulubwandi	Lubaale	0.609	33.491	M10
235		environmental police, NEMA)		Enforcement of existing laws on tree cutting.	Namutumba	Magada	Izirangobi	Mulama	0.900	33.629	M10
236				Enforcement of existing laws on tree cutting.	Mbale	Bubyangu	Bumabanba	Bunadudu	1.069	34.273	M1
240	9. Improvement of knowledge and data collection on water resources	9.2 Collection of information on natural resources and activities in the catchment (assess the extent of informal irrigation, ...)	Develop early warning systems for landslides	Improve monitoring and early warning systems for landslides.	Mbale	Bubyangu	Bubyangu	Bunabuloli upper	1.068	34.273	M1

Annex V

Table indicating the pilot projects in Mpologoma Catchment

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
1. Develop water for production infrastructures	1.1 Create fish ponds	Promote and create fish ponds	Development of fish ponds	National wetlands management project - Wetland use and livelihood assessment - Budaka District - 2013	Budaka	Kamonkoli	Kamonkoli	Nyanza	M1		Consolidation of the existing facility by purchasing sign nets , fishing nets, and PVC pipes to ensure sustainable activity. Development of fishponds over 750 ha or 300 acres in the nearby sites. Large scale investment to expand the area over 4000 ha.
1. Develop water for production infrastructures	1.3 Develop large infrastructure (multipurpose dams)	Implementation of drainage system	2.4Km of storm water drainage management.	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Lwakhakha Town		Lwakhakha Town Council Hotspot	
1. Develop water for production infrastructures	1.3 Develop large infrastructure (multipurpose dams)	Implementation of drainage system	Appropriate stormwater and runoff management	National wetlands management project - Wetland use and livelihood assessment - Mbale District - 2013	Mbale	Bukasakya					
1. Develop water for production infrastructures	1.4 Develop upland irrigation	Implement upland irrigation project	Paya community upland rice project	Framework Management Plan for Doho Namatala wetland - 2014	Tororo	Paya			M4		To ensure sustainable use of the Doho Namatala wetland resources and its catchment for improved community livelihood
1. Develop water for production infrastructures	1.4 Develop upland irrigation	Implement upland irrigation	The agriculture cluster project		Tororo, Bugiri, Iganga and Budaka				M1, M7, M8, M10		Area: 500 ha Short to medium term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Extent irrigation scheme	Extension of Doho - Namatala irrigation scheme (1/2)	Extension of Doho Namatala irrigation scheme	Mbale	Bwiryia			M3	Manafwa river, wetland	Currently being developped by MWE in sub catchment M3, on 500 ha. Shot term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Extent irrigation scheme	Hisega-Katchonga (extension of Doho-Namatala irrigation scheme (2/2))	Extension of Doho Namatala irrigation scheme	Butaleja	Kachonga			M3	Manafwa river, wetland	Area: 500 ha Cultivation of rice Implementation agency: DWD Medium to long term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Extent irrigation scheme	Bingo-Nwajo (extension of Doho-Namatala irrigation scheme (2/2))	Extension of Doho Namatala irrigation scheme	Butaleja	Nawajo			M4	Manafwa river, wetland	Area: 800 ha Cultivation of rice Implementation agency: DWD Medium to long term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Extent irrigation scheme	Nagwiwa (extention of Doho-Namatala irrigation scheme (2/2))	Extension of Doho Namatala irrigation scheme	Butaleja				M4	Manafwa river, wetland	Area: 500 ha Cultivation of rice Implementation agency: DWD Medium to long term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Extent irrigation scheme	Busoke-Busolwe (extension of Doho-Namatala irrigation scheme (2/2))	Extension of Doho Namatala irrigation scheme	Butaleja				M4	Manafwa river, wetland	Area: 500 ha Cultivation of rice Implementation agency: DWD Medium to long term implementation

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement modern and formal irrigation schemes	Kitubesi irrigation scheme (>400ha) to be funded by JICA,		Bugiri	Buwunga			M10	Stream, wetland	Area: >1000 acres (>405 ha) Cultivation of rice Implementation agency: JICA, GoU Shot term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement modern and formal irrigation schemes	Busawa cooperative association irrigation scheme (6000 ha)		Bugiri	Buwunga and Nabukalu sub-counties			M10	Igogero wetland	Area: 6000 ha Horticulture and cultivation of riceImplementation agency: MAAIFTo be funded by Islamic Development Bank. Short term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement modern and formal irrigation schemes	An irrigation scheme in Pallisa and Kibuku of more than 1000 ha, is also being planned by MAAIF and the government of Korea		Pallisa and Kibuku				M12/M13	Stream, wetland	Area: ~1000 ha Cultivation of rice Implementation agency: MAAIF To be funded by Korea Rural Community Corporation (KRC). Short to medium term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement modern and formal irrigation schemes	Lwoba irrigation scheme		Butaleja	Lwoba					Area: 600 ha Medium term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement modern and formal irrigation schemes	Pre-feasibility study for irrigated rice production in Uganda under the Agriculture Technology and Agribusiness Advisory Services (ATAAS) Project		12 districts targeted including 6 in the catchments (Iganga, Bugiri, Namatumba, Palissa, Tororo, Butaleja).				M7, M8, M10, M11, M12, M13		Many small scale development (~5ha) targeted for pre-feasibility and feasibility Cultivation of rice Short to medium term implementation
1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement modern and formal irrigation schemes	Bungokho Modern Rice Irrigation Scheme (pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Mbale	Bungokho				Bungokho (pilot project)	Pilot project To ensure sustainable utilization of the Doho - Namatala Wetland resources and its catchment for improved community livelihoods
1. Develop water for production infrastructures	1.6 Develop rice/aquaculture schemes	Implement rice/aquaculture scheme to develop new agricultural practices	Integrated Paddy-cum-Fish option may be combined with other sustainable measure such as promotion of Azolla and Duck as practiced in Asia.	National Wetlands Management Project - Wetland use and livelihood assessment - Butaleja District - 2013	Butaleja						
1. Develop water for production infrastructures	1.6 Develop rice/aquaculture schemes	Implement rice/aquaculture scheme to develop new agricultural practices	Introduce Integrated Paddy-cum-Fish culture as proposed by the land owner in Wangale.	National wetlands management project - Wetland use and livelihood assessment - Butaleja District - 2013	Butaleja						

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
1. Develop water for production infrastructures	1.6 Develop rice/aquaculture schemes	Develop integrated/combined activities for wise use of wetlands: Fish farmings ; horticulture, tourism, bee keeping, rice culture….	Integrated Fish Farming and Irrigation Development Project for Wise-Use of Wetlands in Mbale District (pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Mbale	Bukasakya					Pilot Project To ensure sustainable utilization of the Doho-Namatala Wetland resources and its catchment for improved community livelihoods
2. Develop the agricultural sector and improve practices	2.1 Development of agro-forestry and conservation agriculture	Introducing new agricultural practices among farmers community	Introduce Integrated Pest Management (IPM) for rice production.	National wetlands management project - Wetland use and livelihood assessment - Butaleja District - 2013	Butaleja					Doho Rice Scheme	
2. Develop the agricultural sector and improve practices	2.1 Development of agro-forestry and conservation agriculture	Introducing new agricultural practices among farmers community	Agroforestry and diary Project (pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Manafwa	Kaato and Buwagogo					Pilot project. No information is available about the implementation and progress of the project status.
2. Develop the agricultural sector and improve practices	2.2 Implement soil and water conservation measures (terracing, bunds, ...)	Establish agricultural management practices to limit soil deterioration	Manage/rehabilitate five gullies in the ecosystem	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho			M5	The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	
2. Develop the agricultural sector and improve practices	2.2 Implement soil and water conservation measures (terracing, bunds, ...)	Establish agricultural management practices to limit soil deterioration	Manage/rehabilitate five gullies in the ecosystem	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages	M5	River Lirima hotspot	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.
2. Develop the agricultural sector and improve practices	2.2 Implement soil and water conservation measures (terracing, bunds, ...)	Establish agricultural management practices to limit soil deterioration	Facilitate construction of terraces in 20 farms/ 200 meters	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho			M5	The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	
2. Develop the agricultural sector and improve practices	2.2 Implement soil and water conservation measures (terracing, bunds, ...)	Establish agricultural management practices to limit soil deterioration	Facilitate construction of terraces in 20 farms/ 200 meters	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages	M5	River Lirima hotspot	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
2. Develop the agricultural sector and improve practices	2.5 Promote the use of quality inputs in agriculture	Facilitate the provision and promote the use of quality seeds	The project for promotion of Best Rice Varieties and Fish Farming Practice for Implementation of Wise Use Concept (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Kibuku	Kirika					Pilot project
2. Develop the agricultural sector and improve practices	2.5 Promote the use of quality inputs in agriculture	Facilitate the provision and promote the use of quality seeds	The project for promotion of Best Rice Varieties and Fish Farming Practice for Implementation of Wise Use Concept (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Kibuku	Nandere					Pilot project
2. Develop the agricultural sector and improve practices	2.5 Promote the use of quality inputs in agriculture	Facilitate the provision and promote the use of quality seeds	Participatory rice variety selection	National wetlands management project - Wetland use and livelihood assessment - Budaka District - 2013	Budaka	Budaka, Naboa	Budaka, Nageye	Chali , Naggeye			Best varieties of rice are selected through participatory process by establishing a demonstration farms in Chali village in Budaka Subcountry. Best variety suited to thevillage will be chosen by comparing yield and quality of rice plant. The yield will be compared by using various indicators such as Panicle number per m2, Spikelet number per panicle, Total number of spikeletsper m2 and 1000-grain weight.
3. Develop the other economic activities	3.2 Develop fish farming	Identify and implement fish farming project	Nyanza fish farming and wetland conservation support project (pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Budaka	Kamonkoli				Nyanza ((pilot project))	Pilot Project To ensure sustainable utilization of the Doho-Namatala Wetland resources and its catchment for improved community livelihoods
3. Develop the other economic activities	3.2 Develop fish farming	Identify and implement fish farming project	Merikit Community Fish farming Project (pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Tororo	Merikit Sub County				Merikit ((pilot project))	Pilot Project To ensure sustainable utilization of the Doho-Namatala Wetland resources and its catchment for improved community livelihoods
3. Develop the other economic activities	3.3 Develop small hydropower production	Implement small hydropower plant	Soono Hydro-Electric Development and Watershed Management project	Pre-feasibility studies for the development of multi-purpose storage reservoirs in the Sio-Malaba-Malakisi river catchment. NBI, 2010	Manafwa	Bumbo		Sono (Uganga-Kenya border)	M5		No details

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
3. Develop the other economic activities	3.3 Develop small hydropower production	Implement small hydropower plant	Bunjosi Hydro-Electric Development and Watershed Management project	Pre-feasibility studies for the development of multi-purpose storage reservoirs in the Sio-Malaba-Malakisi river catchment. NBI, 2010	Manafwa			Ugana-Kenya border	M5		This site was identified but not physically visited. The description and proposed designs was purely based on the topographical, geologic and soil maps of the site.
3. Develop the other economic activities	3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	Assist in tourism development. Promote the conservation of tourism resources. Provide support to communities around/along tourists sites to engage in income generation activities.	Assist in tourism development	National wetlands management project - Wetland use and livelihood assessment - Budaka District - 2013	Budaka	Lyama	Lyama	Nakisenye			The area is believe to have potential for tourism development by leveraging the good scenery developed by the traditional farming activity. Locating in a strategic position, being along the highway to Mbale and relative proximity from Kampala, the area is competitive and advantageous. The activity for tourism may be integrated with other project components by selling the fish products and rice with low chemical inputs with improved quality rice both produced in the district.
3. Develop the other economic activities	3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	Develop bee-keeping activities and organize provision of adequate equipment	Bee keeping project for income generation and wise use of wetlands in Kabwangasi Pallisa District. (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Pallisa	Nasenyi in Kabwangasi				Kabwangasi Pallisa (pilot project)	Pilot Project
3. Develop the other economic activities	3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	Develop bee-keeping activities and organize provision of adequate equipment	Provision of tree nursery for rural energy to be integrated with bee keeping.	National wetlands management project - Wetland use and livelihood assessment - Butaleja District - 2013	Butaleja					Papyrus Area	
3. Develop the other economic activities	3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	Develop integrated/combined activities associated to wise use of wetlands: Fish farmings ; horticulture, tourism, bee keeping, rice culture….	Lyama integrated Fish, Horticulture and Tourism support project for wise use of wetlands in Budaka district. (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Budaka	Lyama				Lyama (pilot project)	Pilot Project To ensure sustainable utilization of the Doho-Namatala Wetland resources and its catchment for improved community livelihoods

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
3. Develop the other economic activities	3.5 Provide alternative livelihoods and promote environmentally sustainable socio-economic development (tourism, bee keeping, etc.)	Develop integrated/combined activities associated to wise use of wetlands: Fish farming; horticulture, tourism, bee keeping, rice culture….	Strengthening the livelihoods of Nalwanza wetland stakeholders through Tree planting and Bee keeping to protect the river banks and wetland from siltation and eroding (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Bududa	Nalwanza and Bukigai				Nalwanza wetland	Pilot Project
4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Reforestation/tree planting with rapid growth or indigenous species	Tree planting project for wise use of wetlands in Limoto (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Pallisa	Putiputi				Limoto (pilot project)	Pilot project To restore the wetlands and promote re-vegetation of the river banks and to promote sustainable utilization of the Doho- Namatala wetland resources
4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Reforestation/tree planting with rapid growth or indigenous species	Replanting/infilling the degraded forest area with appropriate seedlings, 10ha	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho			M5	The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	
4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Promote tree planting activities among the communities	Facilitating households to plant at least 10ha tree seedlings (timber and fuel wood) for domestic use	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho			M5	The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	
4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Promote tree planting activities among the communities	Facilitating 1 school to plant at least 2ha tree seedlings	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho			M5	The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	
4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Reforestation/tree planting with rapid growth or indigenous species	Replanting/infilling the degraded forest area with appropriate seedlings, 10ha	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages	M5	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.	

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Promote tree planting activities among the communities	Facilitating households to plant at least 10ha tree seedlings (timber and fuel wood) for domestic use	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages	M5	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.	
4. Environmental conservation and protection	4.1 Development of tree nurseries and tree planting activities	Promote tree planting activities among the communities	Facilitating 1 school to plant at least 2ha tree seedlings	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages	M5	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.	
4. Environmental conservation and protection	4.2 Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly	Define and implement adequate restoration projects	Manafwa banks and Nabaloosi wetland management project (pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Manafwa	Kaato, Wesswa and Buwagogo S/Counties			M2		Pilot project To restore the wetlands and promote re-vegetation of the river banks
4. Environmental conservation and protection	4.2 Build a wetland classification according to their ecological interest and develop a wetland management and development strategy accordingly	Define and implement adequate restoration projects	Namatala/Manafa Papyrus wetland Restoration Project (pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Butaleja	Namawa B (Kachonga), Lelesi (Bughaji)			M2	Namatala/Manafa Papyrus wetland	Pilot project To restore the wetlands and promote re-vegetation of the river banks
4. Environmental conservation and protection	4.3 Clear demarcation of wetlands and forests	Implement the policy and laws to enforce integrity of wetland area	Regulate use of wetland resources - Compliance monitoring	Framework management plan for Doho Namatala wetland 2010	Mbale, Pallisa, Tororo, Budaka, Butaleja, Manafwa					Doho Namatala wetland	
4. Environmental conservation and protection	4.3 Clear demarcation of wetlands and forests	Set up a clear demarcation of Local and National Forest Reserves	Baseline survey and boundary marking with community stakeholders - Sisal plants, aloe plants as boundaries	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho			M5	The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
4. Environmental conservation and protection	4.3 Clear demarcation of wetlands and forests	Set up a clear demarcation of Local and National Forest Reserves	Baseline survey and boundary marking with community stakeholders - Sisal plants, aloe plants as boundaries	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages	M5	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.	
4. Environmental conservation and protection	4.6 Use of renewable energy / alternative energy sources and development strategy	Develop biogas production as an alternative source of energy in pilot areas	Strengthening the livelihood of Bunamubi community through dairy production and Bio gas construction as the alternative source of energy (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Bududa	Bukigai				Bunamubi	
5. Improve water supply and sanitation	5.1 Improve access to safe water supply	Develop and construct water schemes	Lay main 2000m pipeline for distribution to the Market Centre from the existing Tororo - Manafwa GFS, 1000m distribution pipeline, 5 community stand taps, 5 overhead water storage tanks each 24,000Ltrs	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho				The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	Lay main 2000m pipeline for distribution to the Market Centre from the existing Tororo - Manafwa GFS, 1000m distribution pipeline, 5 community stand taps, 5 overhead water storage tanks each 24,000Ltrs
5. Improve water supply and sanitation	5.1 Improve access to safe water supply	Develop and construct water schemes	Lay main pipelines for distribution to community stand taps from the Lirima GFS, Install overhead storage tanks	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages		River Lirima hotspot	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.
5. Improve water supply and sanitation	5.2 Upgrade / improve existing waste water treatment plants and make sure effluents meet national standards	Strengthen adherence of treatment plant to effluent discharge standards and strengthen monitoring mechanisms. Put incentives to promote compliance to meet standards. Harmonize regulatory frameworks	Strengthen adherence to effluent discharge standards. Strengthen monitoring mechanisms. Put incentives to promote compliance to meet standards. Harmonize regulatory frameworks	Sio-Malaba-Malakisi Transboundary Integrated Water Resources Management & Development Project							

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
5. Improve water supply and sanitation	5.3 Promote sanitation facilities in rural areas and small towns	Develop new waste water treatment plant with adequate water treatment technology	Construction of co-comprising plant, including receiving area, drying beds, ponds for leachate treatment, composting area and storage area;Purchase of skid-steer loaderPurchase of sieving machinery	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Lwakhakha Town		Lwakhakha Town Council Hotspot	
5. Improve water supply and sanitation	5.3 Promote sanitation facilities in rural areas and small towns	Develop new waste water treatment plant with adequate water treatment technology	Anaerobic Lagoons	National wetlands management project - Wetland use and livelihood assessment - Mbale District - 2014	Mbale	Bukasakya					The effluent is discharged in the largelagoons seeded with cow-dung, a richsource of methanogenic bacteria.Process control is carried out bymaintaining the lagoon pH nearneutrality.
5. Improve water supply and sanitation	5.3 Promote sanitation facilities in rural areas and small towns	Construct public latrines	Construction of 3No 4 Stance, 1 urinal flush water borne toilet	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho				The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	
5. Improve water supply and sanitation	5.3 Promote sanitation facilities in rural areas and small towns	Construct public latrines	Construction of 5No 6 Stance, 1 urinal flush water borne toilet	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Lwakhakha Town		Lwakhakha Town Council Hotspot	
6. Control and reduce pollution	6.1. Improve management of solid wastes	Organize and develop infrastructures and mechanisms for solid waste disposal and management	Proposed interventions in the improvement of solid waste management include procurement of garbage skips, of self-loading garbage truck, designated dumpsite.	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Lwakhakha Town		Lwakhakha Town Council Hotspot	• Procurement of 58No. Garbage skips, • Procurement of 1No. 7 ton self-loading garbage truck, • Designated dumpsite and operational costs.
6. Control and reduce pollution	6.2 Control waste-water discharge and pollution from industries (sugar factories, tanneris, etc.) and artisanal activities (slaughterhouses, waragi breweries, etc.)	Promote the use of crop residues as amendments to fertilize fields	Return to Sugar cane produce to be used as soil amendments	National wetlands management project - Wetland use and livelihood assessment - Mbale District - 2014	Mbale	Bukasakya					Considering the value as soil amendments, wastewater at sugar cane may be used as soil amendments.

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
7 Communication and capacity building	7.1 Raising awareness campaigns (different subjects identified: existing laws and regulation, impact of malpractices, etc.)	Sensitization on water sanitation and water source protection practices	Awareness creation on Sanitation	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho				The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	
7 Communication and capacity building	7.1 Raising awareness campaigns (different subjects identified: existing laws and regulation, impact of malpractices, etc.)	Sensitization on water sanitation and water source protection practices	Hygiene promotion through sanitation and hygiene promotion activities.	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Lwakhakha Town		Lwakhakha Town Council Hotspot	
7 Communication and capacity building	7.1 Raising awareness campaigns (different subjects identified: existing laws and regulation, impact of malpractices, etc.)	Sensitize the population about boundaries (forest, wetlands, etc.) and buffer zone (river banks).	Sensitization, Set up demos and training on Demarcation of conservation zones on wetland	Framework management plan for Doho Namatala wetland 2010	Mbale, Pallisa, Tororo, Budaka, Butaleja, Manafwa					Doho Namatala wetland	
7 Communication and capacity building	7.1 Raising awareness campaigns (different subjects identified: existing laws and regulation, impact of malpractices, etc.)	Sensitize the population about boundaries (forest, wetlands, etc.) and buffer zone (river banks).	Sensitisation, Set up demos and training on Demarcation of buffer zones	Framework management plan for Doho Namatala wetland 2010	Mbale, Pallisa, Tororo, Budaka, Butaleja, Manafwa					Doho Namatala wetland	
7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Capacity building on water resources management and systems maintenance	Capacity building on water resources management and systems maintenance - 2 Day training of (50) selected community representatives	Lwakhakha Intervention Implementation Plan - 2016	Manafwa	Bukokho				The upper Lwakhakha hotspot comprises of parts of Soono village and the degraded parts of the Mt Elgon national park that are already being used as farmlands.	Capacity building on water resources management and systems maintenance - 2 Day training of (50) selected community representatives
7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Capacity building on water resources management and systems maintenance	Awareness creation - Water resources management and systems maintenance	Lwakhakha Intervention Implementation Plan - 2016	Manafwa			Bukokho and Soono villages		River Lirima hotspot	The River Lirima hotspot comprises of parts of Bukokho and Soono villages. Rivers Lirima, Taso and Laaso lie in this hotspot.

Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Subcatchment	Other information Location	Description / Details
7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Extension workers are provided to educate people on good farming methods	Agricultural extension officers will be networked with Kibimba Rice scheme to exchange information on rice disease.	National wetlands management project - Wetland use and livelihood assessment - Budaka District - 2013	Budaka	Budaka, Naboa	Budaka, Nageye	Chali , Naggeye			
7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Train farmers on proper farming methods	Training to improve farming methods in the catchment and in the wetland	Framework management plan for Doho Namatala wetland 2010	Mbale, Pallisa, Tororo, Budaka, Butaleja, Manafwa					Doho Namatala wetland	
7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Train farmers on proper farming methods	Prepare educational materials and convene workshops to recommend pesticides with low fish and bird toxicity and to promote safe use of pesticides.	National Wetlands Management Project - Wetland use and livelihood assessment - Butaleja District - 2013	Butaleja					Doho Rice Scheme	
7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Train farmers on proper fishing farming methods	The project for promotion of Best Rice Varieties and Fish Farming Practice for Implementation of Wise Use Concept (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Kibuku	Kirika					Pilot project
7 Communication and capacity building	7.2 Capacity building at farmers and community level (sustainable use of wetlands, good farming practices, use of quality seeds and inputs, etc.)	Train farmers on proper fishing farming methods	The project for promotion of Best Rice Varieties and Fish Farming Practice for Implementation of Wise Use Concept (Pilot project)	Framework Management Plan for Doho Namatala wetland - 2014	Kibuku	Nandere					Pilot project

Annex VI

Areas for implementation of formalised irrigation

ID	Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Latitude	Longitude	Subcatchment	Catchment	Other information Location	Description / Details
1	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Mbale			Bumbobi	0.99	34.17	M1	Mpologoma	Wantsira river	Actual (ha)= 2 Potential (ha) = 9 Crop= Rice, beans Type= Checks
2	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Palissa			Jami	1.06	34.06	M1	Mpologoma	Sekulo river	Actual (ha)= 2 Potential (ha) = 50 Crop= Rice, maize Type= Checks
3	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Undertake detailed design and/or research of funds for implementation of an irrigation scheme	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Palissa			Nangeye	1.03	34.03	M1	Mpologoma		Actual (ha)= 0 Potential (ha) = 650 Crop= N/A Type= N/A
4	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Butaleja			Nahigande	0.89	33.95	M4	Mpologoma	Manafwa swmpa	Actual (ha)= 9 Potential (ha) = 21 Crop= rice Type= bunds
5	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Busia			Busitema	0.56	34.03	M7	Mpologoma	Namukombi river	Actual (ha)= 3 Potential (ha) = 14 Crop= rice Type= bunds
7	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalized irrigation area	National Water Resources Assessment, annex 7.1	Bugiri			Bupala	0.55	33.65	M10	Mpologoma	Kasolwe river	Actual (ha)= 11 Potential (ha) = 30 Crop= rice Type= checks
9	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalized irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Bugiri			Magola 2	0.55	33.7	M10	Mpologoma	Kadoma river	Actual (ha)= 2 Potential (ha) = 8 Crop= rice Type= checks
11	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalized irrigation in wetlands	Increase formalized irrigation area	National Water Resources Assessment, annex 7.1	Iganga			Namawondo	0.75	33.64	M10	Mpologoma	Nawaibete swamp.	Actual (ha)= 2 Potential (ha) = 11 Crop= Rice Type= Bunds
12	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Iganga			Nawangis	0.72	33.57	M10	Mpologoma	Nawanga river	Actual (ha)= 10 Potential (ha) = 25 Crop= Rice Type= Bunds
13	1. Develop water for	1.5 Organise irrigation in	Implement formalised	Increase formalised	National Water Resources	Iganga			Wangobo	0.72	33.62	M10	Mpologoma	Naigombwa swamp	Actual (ha)= 30 Potential (ha) = 66

ID	Category	Options	Sub-options	Identified activities	Source of data	District	Sub-county	Parish	Village	Latitude	Longitude	Subcatchment	Catchment	Other information Location	Description / Details
	production infrastructures	wetlands (formal schemes)	irrigation in wetlands	irrigation area	Assessment, annex 7.1										Crop= Rice Type= Bunds
14	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Kaliro			Butongole	0.91	33.51	M10	Mpologoma		Actual (ha)= 0 Potential (ha) = 8 Crop= N/A Type= N/A
15	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Kaliro			Kaliro 1	0.88	33.5	M10	Mpologoma		Actual (ha)= 0 Potential (ha) = 30 Crop= N/A Type= N/A
16	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Kaliro			Kaliro 2	0.88	33.5	M10	Mpologoma		Actual (ha)= 0 Potential (ha) = 40 Crop= N/A Type= N/A
17	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Butaleja			Nakiga	1.08	33.94	M12	Mpologoma		Actual (ha)= 0 Potential (ha) = 86 Crop= N/A Type= N/A
18	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Palissa			Kariabi	1.16	33.75	M12	Mpologoma	Mpologoma swamp	Actual (ha)= 85 Potential (ha) = 150 Crop= Rice, maize Type= Checks
19	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Kaliro			Namwiwa	1.08	33.54	M13	Mpologoma	Wakoyeyo river	Actual (ha)= 4 Potential (ha) = 8 Crop= Rice Type= Bunds
20	1. Develop water for production infrastructures	1.5 Organise irrigation in wetlands (formal schemes)	Implement formalised irrigation in wetlands	Increase formalised irrigation area	National Water Resources Assessment, annex 7.1	Kaliro			Saaka	1.12	33.59	M13	Mpologoma	Mpologoma swamp	Actual (ha)= 7Potential (ha) = 60Crop= Rice, maizeType= Pumping