# REPUBLIC OF UGANDA

## Ministry of Water and Environment

*Directorate of Water Resources Management*

**Kyoga Water Management Zone**

*Pastoralism is the main livelihood in the upstream parts of Lokere Catchment, Napak District.*

SEPTEMBER 2017

# LOKERE

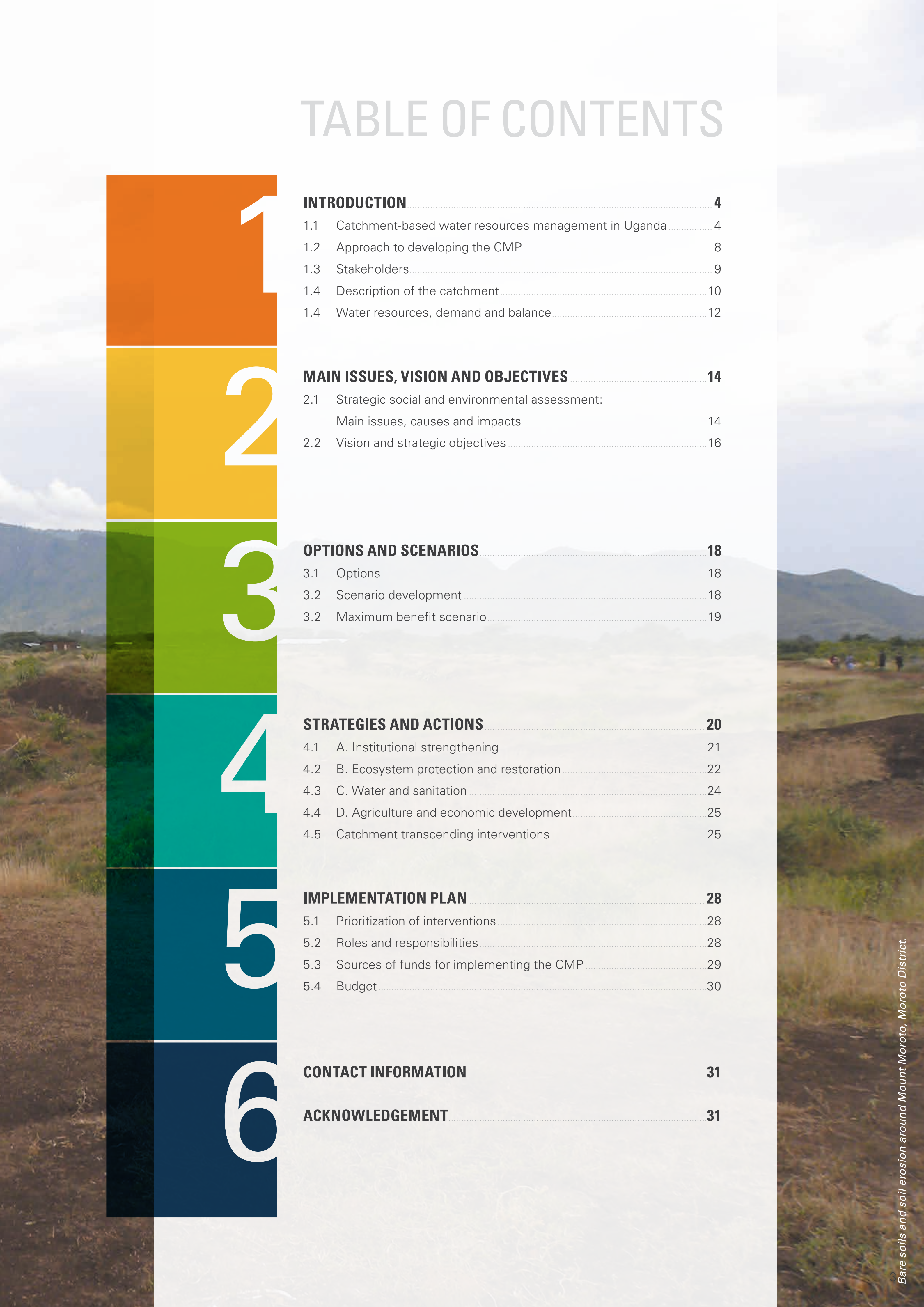
## CATCHMENT MANAGEMENT PLAN

POPULAR VERSION

# LOKERE CMP POPULAR VERSION

# TABLE OF CONTENTS





*Bare soils and soil erosion around Mount Moroto, Moroto District.*

Clay from the Lower Lokere wetlands is used to produce pottery, Katakwi

# 1

# INTRODUCTION

*A Catchment Management Plan (CMP gives guidance on the use and management of the water resources in a specific area. This popular version of the CMP for Lokere Catchment summarises the contents of the main CMP for easy understanding and use by the various stakeholders. With an area of 8,156 km$^2$, Lokere Catchment covers parts of the districts of Kaabong, Moroto, Kotido, Napak, Nakapiripirit, Amuria, Katakwi and Soroti (Figure 1), and has an approximate population of 420,000 (2016 approximation based on Census 2002 and 2014).*

## 1.1 Catchment-based water resources management in Uganda

As part of its water resources management reforms the Directorate of Water Resources Management (DWRM) is implementing Catchment Based Water Resources Management (CBWRM). This process deconcentrates management of water resources along hydrological units called catchments. Catchments are areas that contribute water to a common outlet and are therefore independent of administrative boundaries. CBWRM links the management of land, water, ecosystems, and socio-economic systems, and allows to plan towards using water resources effectively and efficiently to achieve long-term sustainable development by balancing growing water demands with limited water resources. As part of the CBWRM framework the country has been divided into four Water Management Zones (WMZs): Upper Nile, Albert, Victoria and Kyoga. Each of the WMZs contains a number of catchments. Lokere Catchment is located in Kyoga Water Management Zone (KWMZ) (Figure 2).

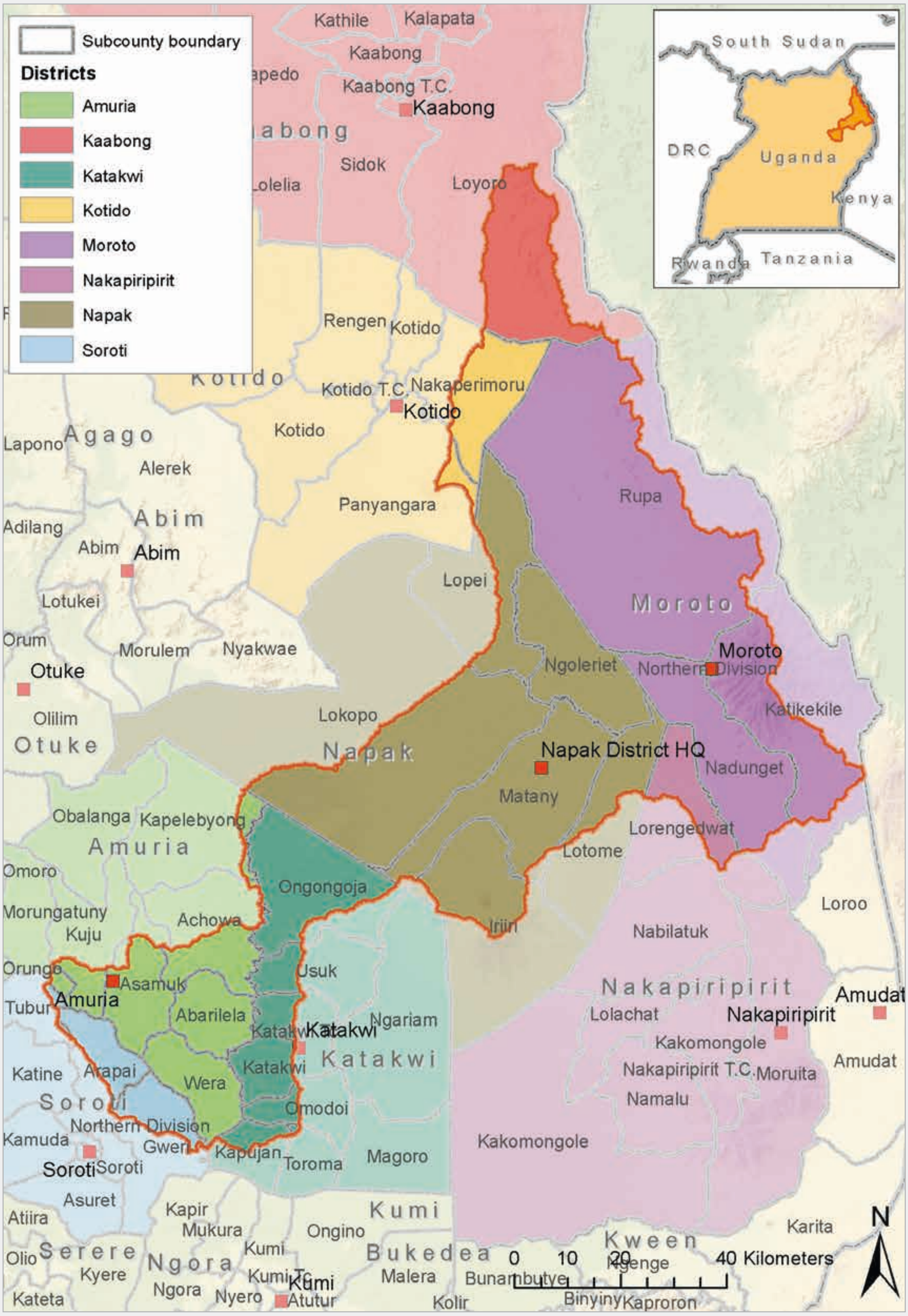



*Figure 1* Districts in Lokere Catchment (Acacia Water 2017).

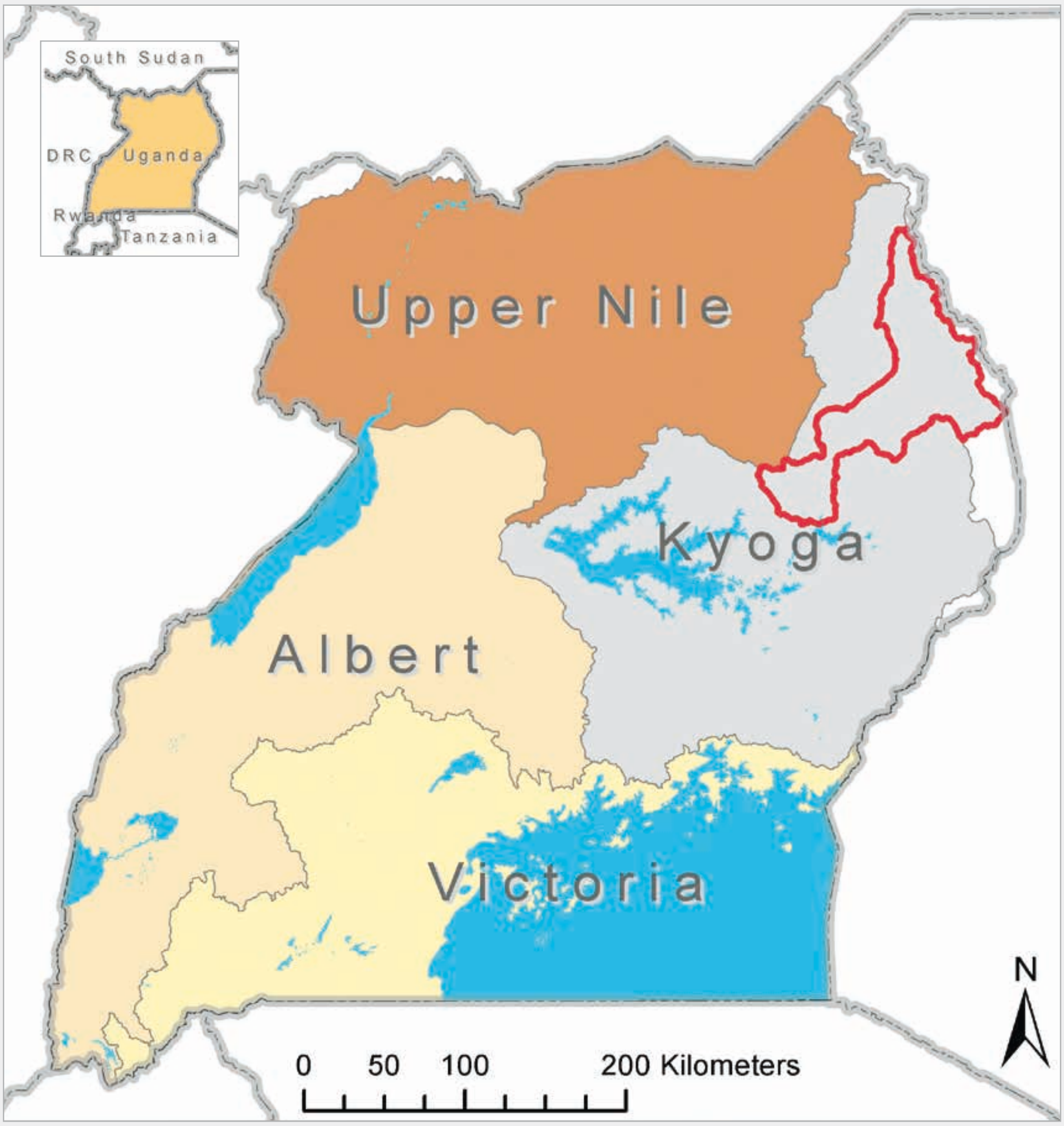



***Figure 2*** *Lokere Catchment in Kyoga Water Management Zone in north-eastern Uganda (Acacia Water 2017).*

*Grazing sheep in Kotido District. Pastoralism is the main livelihood in the upstream parts of Lokere Catchment.*

CBWRM recognises that many water use and management issues are interrelated, and is founded on early, open and inclusive stakeholder involvement. DWRM is the lead for all CBWRM aspects, including stakeholder involvement, at national level. The WMZs coordinate CBWRM at regional level, but most important is the Catchment Management Organisation (CMO). The CMO is the structure where catchment stakeholders organize the implementation of the CMP (Figure 3).

## COMPOSITION OF THE CATCHMENT MANAGEMENT ORGANIZATION (CMO)

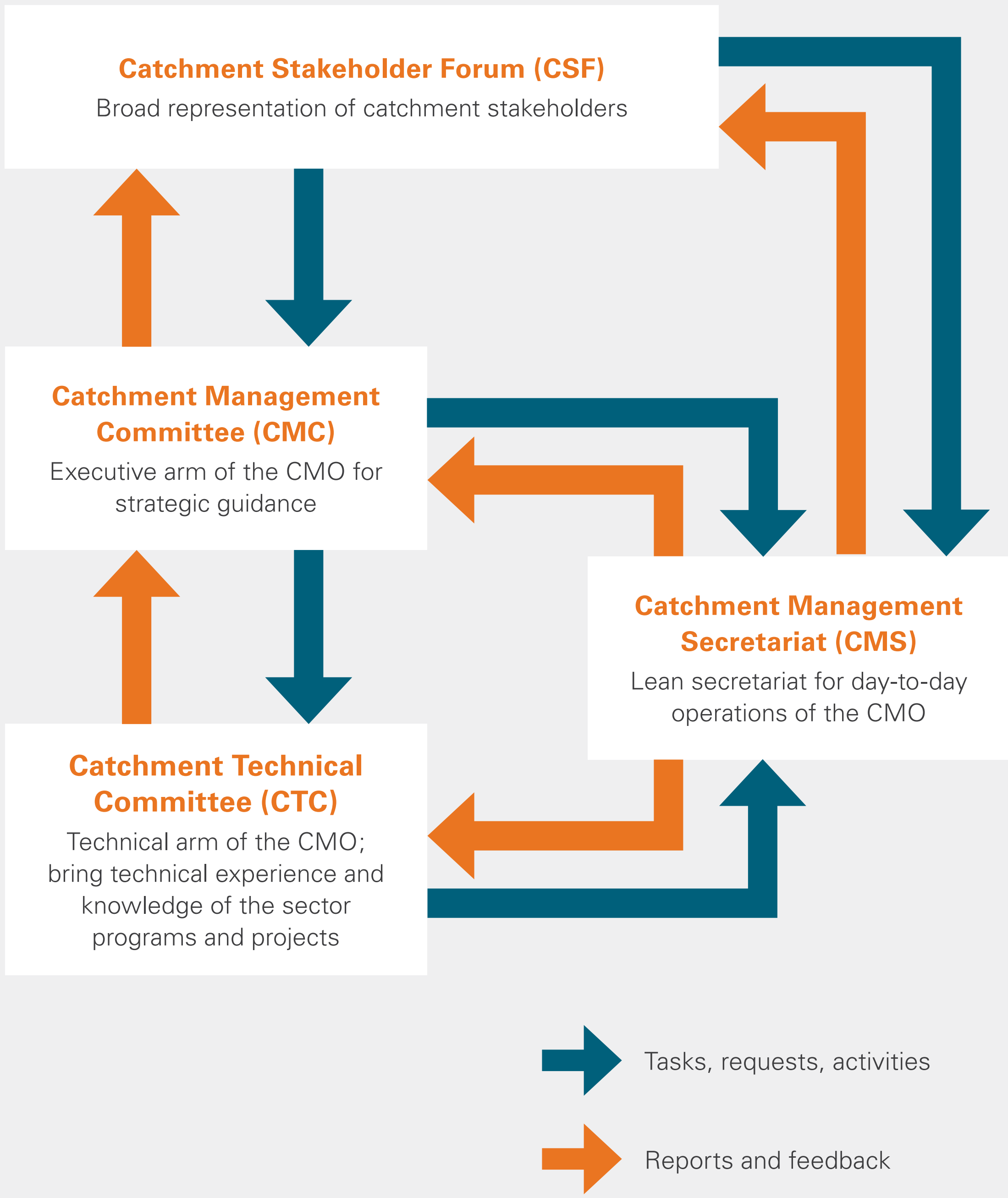



***Figure 3*** *Relation between the different elements of the Catchment Management Organization (MWE 2017).*

## 1.2 Approach to developing the CMP

The preparation of the catchment management plan for Lokere followed the step wise approach of the Uganda Catchment Management Planning Guidelines (MWE 2014) (Figure 4).

- Step 1 in which the catchment was delineated, a catchment information system was developed, and a catchment knowledge base was built;
- Step 2.1 in which a water resources planning analysis was conducted, which studied the status of the water resources, the water balance and water demand at present and in the future (key results are given in section 2.1);
- Step 2.2 in which the catchment stakeholder participation framework was developed, which characterized stakeholders and their relations in order to design a stakeholder engagement strategy, both for the

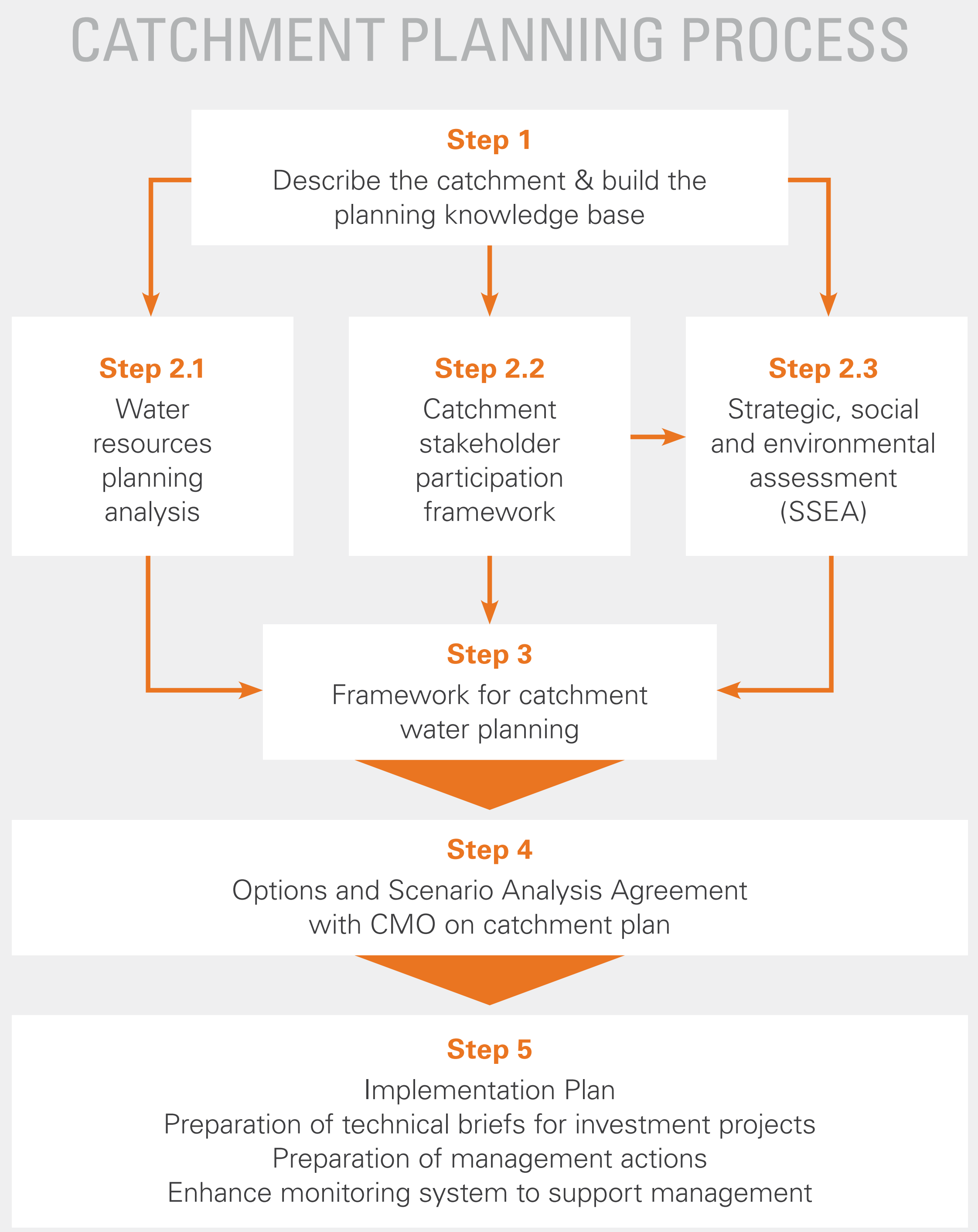



***Figure 4*** *Catchment management planning process (MWE 2014).*

development and the implementation of the CMP. A summary of stakeholders in Lokere Catchment is given in Figure 5;

- Step 2.3 in which the Strategic Social and Environmental Assessment (SSEA) was conducted, which analysed the fragility of economically and socially important natural assets, and identified the main issues today and the potential issues in future;
- Step 3 in which a framework for catchment water planning for Lokere Catchment was developed;
- Step 4 in which the stakeholders developed a vision and formulated strategic objectives for Lokere Catchment that guided the development of options and scenarios. The different options and scenarios were analysed in terms of socio-economics and hydrological impact, guiding the identification of a maximum benefit scenario as described in section 3.2;
- Step 5 in which the a consensus Catchment Management Plan (CMP) with its strategies and actions and the Implementation Plan (IP) were developed, which provides practical guidance regarding interventions, locations, prioritization, costing and stakeholder involvement.

## 1.3 Stakeholders

Stakeholders of Lokere Catchment (Figure 5) were involved throughout the catchment management planning process, for example during knowledge base development, identification of issues, causes and impacts, and developing the vision and mission of the catchment. This was done through CSF meetings, CMC meetings, and field visits.


***Figure 5*** *Stakeholders involved in CBWRM in Lokere Catchment (Acacia Water 2017).*

## 1.3 Description of the catchment

Lokere Catchment is defined by River Lokere, its tributaries and downstream wetlands (Figure 6). The system is set on a large plateau at 400 m Above Sea Level (ASL), and underlain by impermeable rocks. There are two major mountains in the catchment (Mount Moroto and Mount Napak) and a number of hills. Soils are in general fertile, but sensitive to soil erosion. In the downstream areas, such as Amuria and Soroti districts, the rate at which water moves through the soils is generally low causing formation of pools during periods of heavy rainfall.

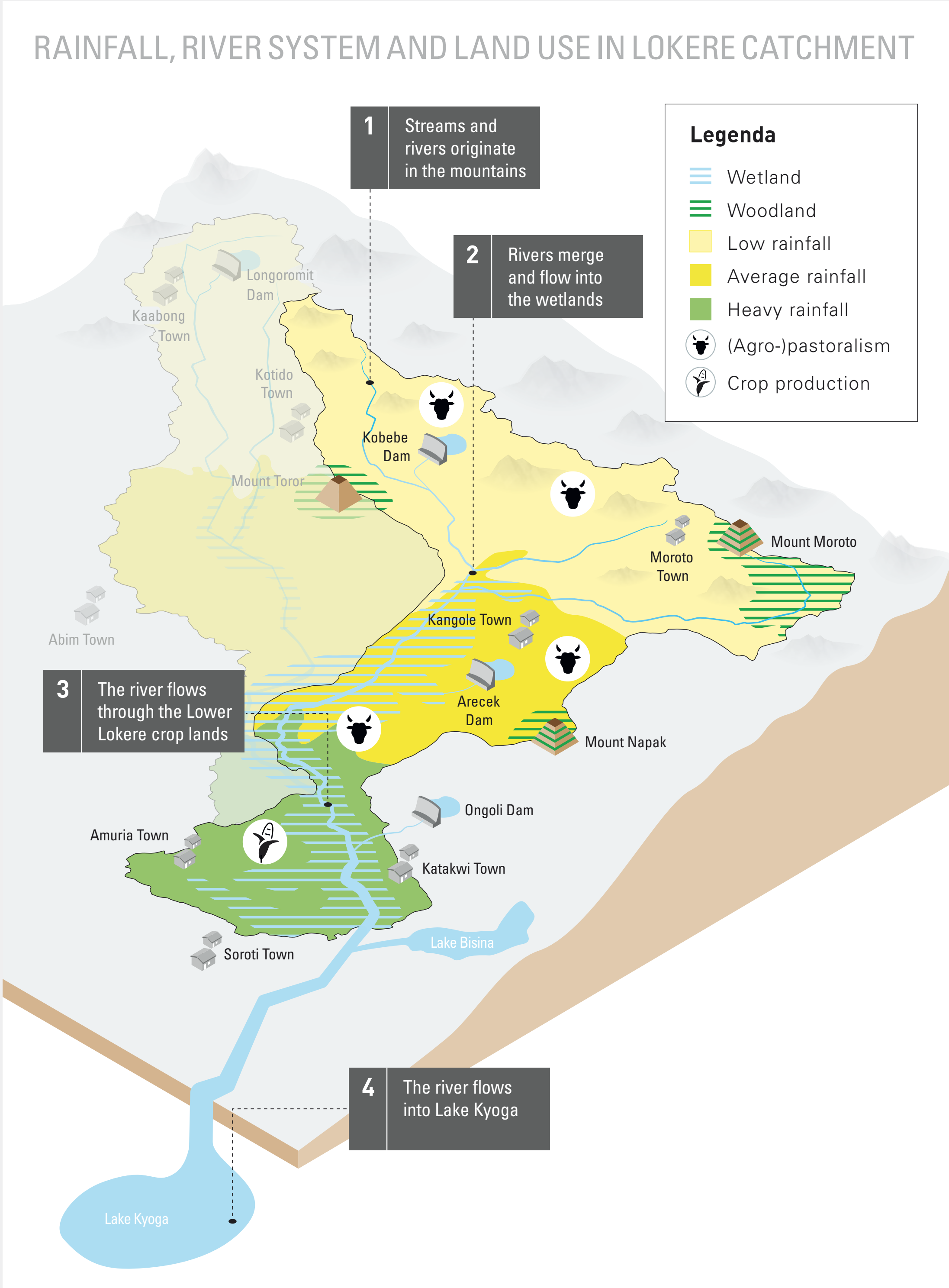



*Figure 6* Schematic representation of Lokere Catchment with its key features (Janssen Information Design 2017).

The total average annual rainfall varies between 550 mm/year in the upstream areas of Lokere and 1,300 mm/year in downstream areas. There is a short rainy season with heavy rainfall events from April to July with typically a 2-week dry spell at the beginning of June, and a long rainy season with less heavy rainfall events from September till December/January (Figure 7). The long rainy season is almost absent in the upstream parts of Lokere. Precipitation is highly variable in space and time, with both intense rainfall events and long dry periods. Climate change projections indicate that temperatures will rise, rainfall intensity will increase and extreme events such as droughts and floods will occur more often.

Settlements in Lokere Catchment are scattered with concentrations around productive agricultural areas, trading centres, and water sources. The upstream and middle parts of the catchment are mainly inhabited by pastoralists and agro-pastoralists; the downstream parts by crop farmers. Cattle, goats and sheep are grazed in open grasslands, wetlands, shrublands, forests and agricultural lands after crops have been harvested. Livestock rearing is complemented with rain fed crop production of mainly sorghum, millet and maize, and flood-irrigated paddy rice. Mining (mainly marble around Moroto) is another important economic activity. Around Moroto marble mining permits are held by large companies from outside the catchment. Sand mining from rivers is small-scale and mainly by communities. Charcoal production for sale to Soroti, Mable and Kampala is also an additional source of income. The population is poor. Recent studies indicate that nearly 80% of the population lives below the poverty line (WfP, 2015).

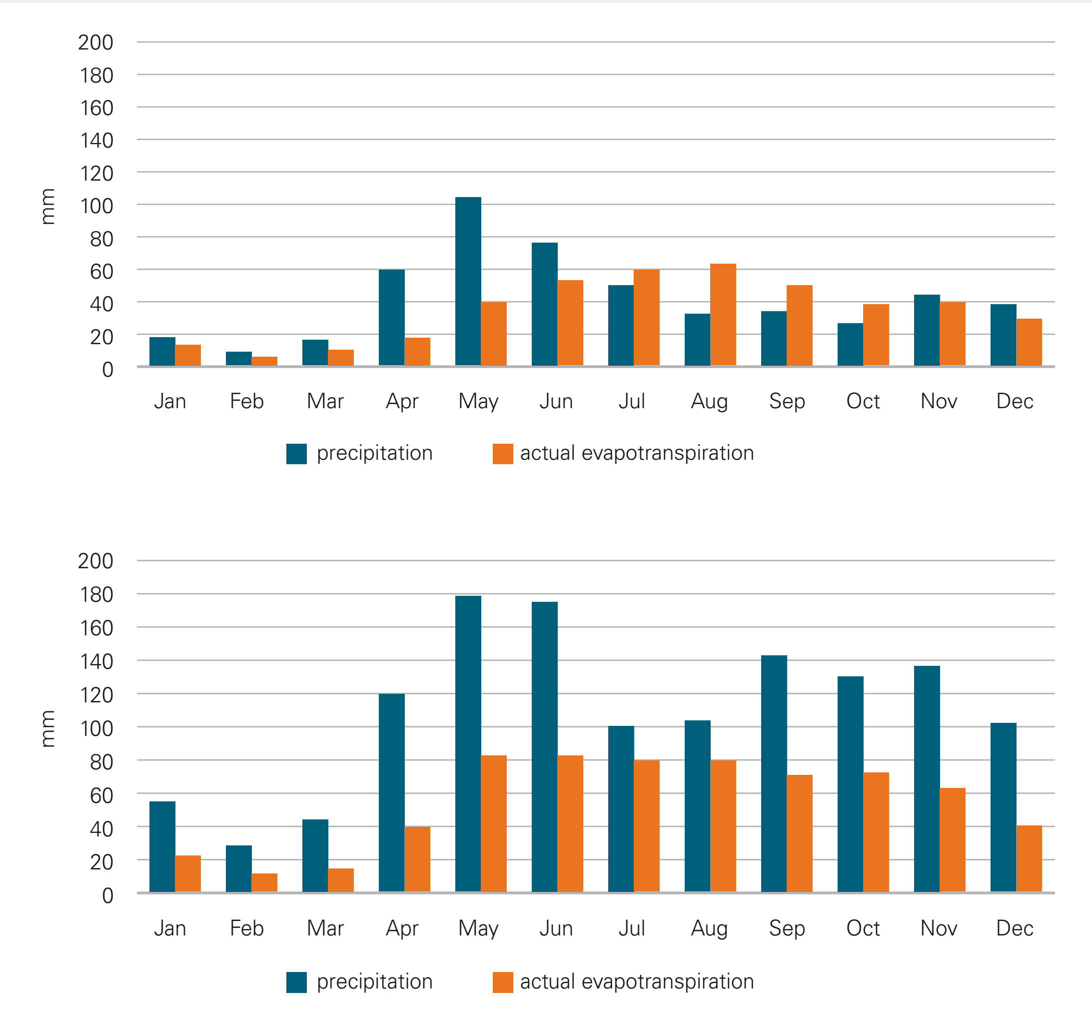



***Figure 7*** *Average rainfall and evapotranspiration in the upstream (top) and downstream (lower) parts of Lokere Catchment (ARC 2, 1983-2015 and MODIS, 2000-2014). Note the seasonal variability and the differences between the up- and downstream parts of the catchment (Acacia Water 2016).*

Land in Lokere Catchment is currently covered approximately by equal shares of forest and woodlands, grasslands and shrublands, and croplands. Extensive wetland systems are present in Lower Lokere. Most lands are communally owned, except in the town centres of Moroto and Katakwi, and the lands in Lower Lokere where individuals possess title deeds. Approximately 1/3 of Lokere Catchment has a protected status and is either under the management of the National Forest Authority (NFA) or the Uganda Wildlife Authority (UWA).

## 1.4 Water resources, demand and balance[1]

In the upstream parts of Lokere rivers react quickly to rainfall, are characterized by large variations in low and peak flow (Figure 8), and contain large volumes of sand and silt due to soil erosion. Downtream, in the wetland areas, there is always water. The wetlands absorb water during the rainy season and release water slowly in the dry season.

Groundwater is concentrated in fractured rock and in a top-layer of loose material covering solid rock and in the riverbeds and floodplains. Chemical groundwater quality is in general good, although around Mount Moroto and Mount Napak locally high fluoride levels are found. Microbiological contamination, on the contrary, is a major concern, also in deep groundwater wells due to poor design, construction, operation and maintenance of the infrastructure. Safe water coverage in Lokere Catchment is low, and varies between 29% in Kaabong and 72% in Soroti.

Current total water use for domestic, livestock and irrigation purposes equals 6 Mm$^3$/year . To cover the water demand, however, 1.3 Mm$^3$/year of extra potable water needs to be supplied for domestic use, 14 Mm$^3$ for livestock watering and 87 Mm$^3$ for irrigation. Apart from these productive uses, estimates indicate that a so-called environmental flow of 238 Mm$^3$/year has to remain untouched to safeguard the adequate functioning of natural systems.

A SWAT hydrological model  was run for 30 years (1984-2013). The model shows that on average 857 Mm$^3$ is available in the catchment, but it varies between 430 Mm$^3$ and 1,680 Mm$^3$ for dry and wet years respectively. Almost 30% of the average precipitation is (temporarily) stored in the ground and in wetlands.

The water resources analysis shows that

- there is sufficient water available in the catchment to fulfill the demand, even during dry years, but water needs to be stored during the rainy season for use in dry periods (Figure 9),
- wetland areas are very important to mitigate droughts and floods, and
- areas used for crop production have a negative impact on water availability, mainly due to poor farming practices.

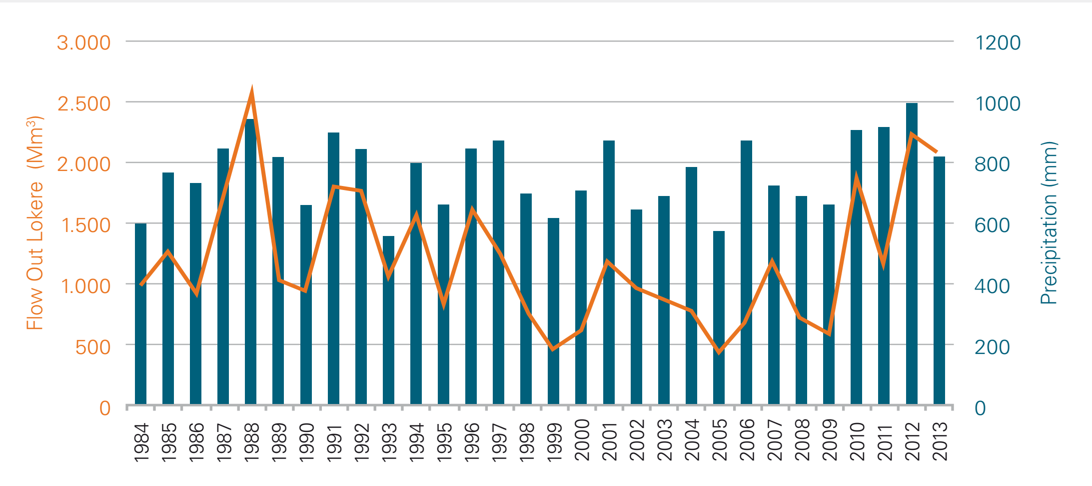



*Figure 8 Rainfall and river outflow from Lokere Catchment from 1984 to 2013 (Acacia Water 2016, based on Arc2 and MWE 2016).*

[1] Due to a lack of data the uncertainty associated with the figures is high. It is important to keep this in mind during planning and implementation.
[2] The model was run simultaneously for Lokok and Lokere. The numbers presented here are for Lokere only, thus excluding Lokok.

## ANNUAL WATER BALANCE - LOKERE

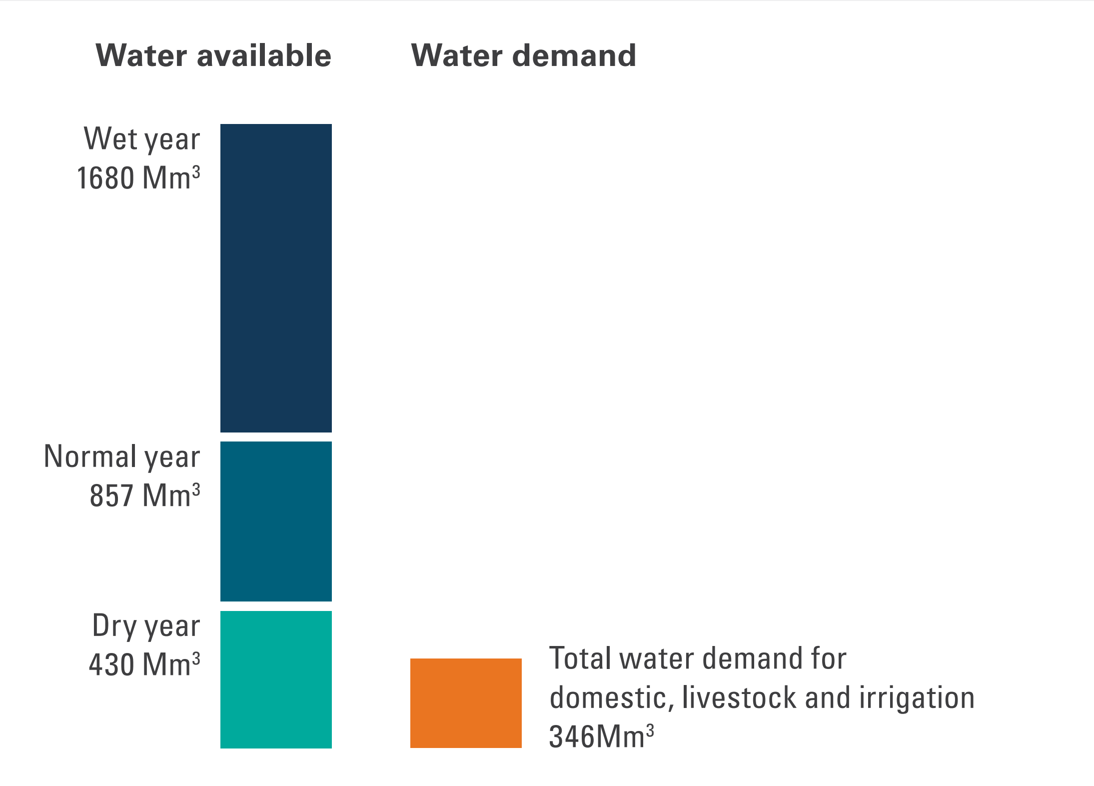



**Figure 9** *Current annual water balance for Lokere Catchment. There is sufficient water in the catchment to fulfill the demand, even during dry years, but water needs to be stored during the rainy season for use in dry periods (Acacia Water 2017).*

*Fishing baskets in Akokorio wetlands, Amuria.*

Girl fetching water from a scoop hole, Acowa, Amuria District.

2

# MAIN ISSUES, VISION AND OBJECTIVES

## 2.1 Strategic social and environmental assessment: Main issues, causes and impacts

During the strategic social-environmental assessment the major social and environmental issues and trends were identified together with the stakeholders (Table 1). Issues are problems that need to be addressed to conserve and protect the water resources.

The power of traditional institutions has eroded over time contributing to the overexploitation of natural resources

*Table 1* *Summary of the main issues in the Lokere Catchment*

| Main issues | Causes | Impact |
|---|---|---|
| Low safe water coverage (between 29% and 72%, source: DDPs) | ■ Low groundwater potential and overabstraction of groundwater<br>■ Many boreholes are non-functional due to poor site selection, design, operation and maintenance<br>■ Microbiologic contamination is a major concern due to poor sanitation and sharing of water points with livestock | ■ Shortages of safe water supply for domestic use<br>■ High incidence of waterborne diseases |
| Food insecurity | ■ Dependency on pastoralism and subsistence farming<br>■ Traditional low-input farming practices<br>■ High incidence of pests and diseases<br>■ Barely production surplus for the market<br>■ High poverty (up to 80%) and low income levels<br>■ The region has the lowest education rates in Uganda, only 6% of women and 12% of men are literate<br>■ Limited access to basic services | ■ Overexploitation of natural resources<br>■ Encroachment into wetlands and forests |
| Shortage of water and pasture | ■ Demand for water and pasture is high and further increasing<br>■ Loss of traditional migration patterns and management systems due to sedentarisation<br>■ Shortages are aggravated by the influx of cattle from the Turkana (Kenya) and Topoth (South Sudan)<br>■ Existing valley tanks and valley dams do not cover livestock demand<br>■ Opening of new lands for cultivation leads to loss of grazing lands<br>■ Land grabing is on the rise | ■ Rise in pressure on and conflicts over resources between different groups of herders, and between farmers and pastoralists, particularly in around Moroto and Soroti towns, and in the wetlands of Napak<br>■ Limited resources to cope with hazards |
| Low agricultural productivity | ■ High variability of precipitation<br>■ Limited investment in soil and water conservation techniques<br>■ Limited use of improved crop production techniques<br>■ Poor agricultural practices undermine soil fertility and water retention capacity<br>■ Poor access to agricultural inputs | ■ Low income<br>■ High vulnerability to disasters |
| Vulnerability to natural disasters (floods and droughts) | ■ Population growth<br>■ Encroachment into wetlands and floodplains<br>■ Shortage of water storage capacity (natural and infrastructure) | ■ Regular crop failure<br>■ Reduced water availability<br>■ Loss of lives and propriety |
| Pressure on resources in and around urban areas | ■ Sedentarization and migration towards rural and urban growth centres<br>■ Move towards crop production to the detriment of traditional pastoralism<br>■ Changing livelihoods and lifestyles, and cultural practices<br>■ Population growth | ■ Increased dependence on alcohol, economic losses increasing power-less-ness<br>■ Loss of traditional natural resources management systems<br>■ Land degradation around urban areas |
| Deforestation | ■ Trees are cut for commercial charcoal production for urban centres, such as Soroti, Mbale and Kampala<br>■ Uncontrolled bush burning<br>■ Access to energy within the region is mostly limited to wood and charcoal, which results in tree cutting | ■ Soil erosion<br>■ Increased frequency of floods and droughts<br>■ Drying up of springs |
| Environmental degradation | ■ Increased human pressure on the land<br>■ The power of traditional institutions has eroded over time leading to overexploitation of resources<br>■ Insecure land tenure due to communally owned lands withholds farmers from investing in conservation techniques<br>■ Encroachment into woodlands, forests and wetlands<br>■ Uncontrolled bush burning, particularly around the Bokora Corridor<br>■ Low popularization of policies and low enforcement of laws and by-laws due to limited capacity of institutions, understaffing of local governments, and limited budget for the environment sector<br>■ Low awareness concerning environmental conservation<br>■ Limited feeling of ownership amongst water users because of their limited involvement in decision making | ■ Soil erosion<br>■ Reduced soil fertility<br>■ Siltation of reservoirs<br>■ Increased frequency of floods and droughts<br>■ Loss of life and property to fire<br>■ Lowering of groundwater levels<br>■ Land degradation and soil erosion, particularly in the agricultural areas around Moroto, Lopei-Lokopo and in Lower Lokere |

## 2.2 Vision and strategic objectives

During the catchment management planning process the stakeholders developed a vision for Lokere Catchment in response to the main issues and their underlying causes, and in line with the Uganda Vision 2040[3]:

**VISION:**
*A sustainably managed Lokere Catchment that supports livelihoods and development by 2040*

**To achieve this common vision, the CMP addresses the following strategic objectives:**

*Strengthen natural resources management systems and structures.*

*Restore degraded natural resources.*

*Ensure sustainable access to water of adequate quality and quantity for domestic use and production.*

*Ensure that farming and animal husbandry systems are productive, drought and climate change proof, and improve household income.*

[3] Uganda's Vision 2040: "A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years".

*Greenness around Mount Moroto during the rainy season.*

*Installation of discharge measurement equipment at Kapir Bridge, Soroti District. Hydrological data can support fact-based decision making.*

# 3

# OPTIONS AND SCENARIOS

## 3.1 Options

To achieve the vision and strategic objectives there is need to undertake measures that address the main issues and reverse the trends that undermine sustainability in the catchment. These measures are known as options (e.g. wetland protection, reforestation, soil conservation). A set of options combined with external factors, government policy, ongoing trends, and projections for the future (e.g. climate change, population growth and sedentarization) forms a scenario (Figure 10).

## 3.2 Scenario development

Scenarios were developed along three lines of intervention: 1) ecosystem protection and restoration, 2) improved water and sanitation services for people, and 3) agriculture and economic development.

- The ecosystem protection and restoration **scenario focuses on restoration of the environment through more sustainable** ways of cattle herding, the protection of woodlands, forests and wetlands and the application of soil and water conservation measures in crop production areas. The options under this scenario aim at reviving the natural functions of the ecosystem through collaborative management and controlled use of natural resources. Restoration of the environment results in the retention of water in the

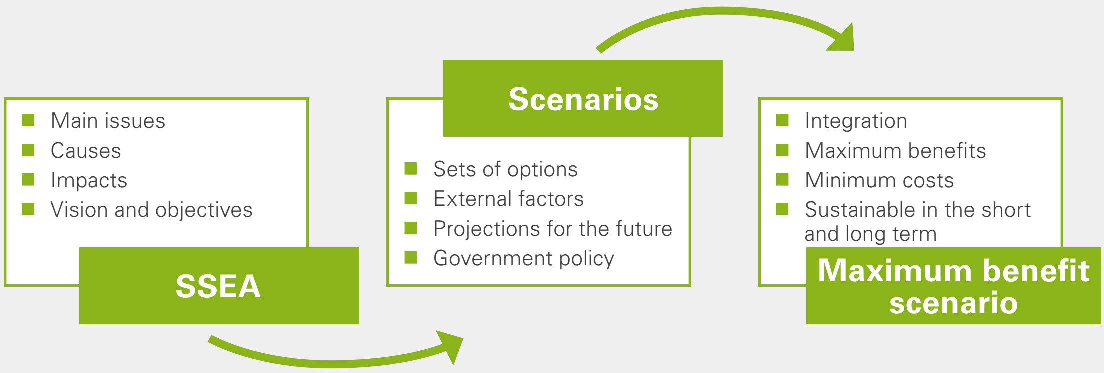



***Figure 10*** *Relation between the Strategic Social Environmental Assessment (SSEA), the scenarios and and the maximum benefit scenario.*

upstream parts of the catchment, reducing the frequency of droughts and floods. The cost of this scenario is mainly in the fact that protective measures will limit access to natural resources that currently provide an important source of income to the population.

- The **improved water and sanitation services for people scenario** purely aims at increasing safe water coverage. Under this scenario, safe water supply for current and future population is ensured through the expansion, rehabilitation and construction of new piped water supply networks in rural and urban growth centres, and the drilling of new wells for rural water supply. Evaluation of this scenario shows that it will lead to a widespread (local) over-exploitation of the groundwater resources. The improved supply increases the well-being of the people on in the short term, but does not ensure reliable supply in future.

- The **productive water infrastructure and farming productivity scenario** focuses on the expansion, intensification and mechanization of both rain fed and irrigated crop production throughout the catchment. The scenario typically provides support for peoples' livelihoods through increased crop and animal produce, the opportunity to cultivate high-value crops, extension of the growing season, and hence the generation of a higher income. Such change, however, comes at a cost. The analysis of this scenario shows a dramatic increase in soil erosion, decrease in water availability, more frequent and intense droughts and floods, and in the long-term a decrease in productivity related to the overexploitation of land and water resources.

## 3.3 Maximum benefit scenario

Options and scenarios were evaluated based upon socio-economic, environmental, hydrologic and financial criteria and discussed with stakeholders. Based on the outcomes a maximum-benefit scenario was formulated. The analysis of the benefits and costs of the three scenarios shows that a single set of options cannot meet the strategic objectives. Interventions of the thematic areas of ecosystem restoration and protection, water and sanitation, and water for production and agricultural productivity must be combined. Only by integrating the different thematic areas can water resources use and management benefit the people in the short term and be sustainable in the long run. Based on this outcome a maximum benefit scenario was formulated.

The **maximum benefit scenario** spearheads ecosystems protection and restoration, while agricultural production per hectare is increased and access to safe water is ensured. The maximum benefit scenario for Lokere Catchment includes the restoration of forests managed by NFA, the protection of wetlands, and the improved management of rangelands and woodlands. Instead of expanding farmlands, crop production is intensified through the implementation of soil and water conservation measures that increase the water retention capacity and the productivity of the soils, and the expansion of irrigated agriculture. This scenario also includes the rehabilitation and construction of reservoirs for livestock watering and irrigation, and the expansion, renovation and construction of new domestic water supply infrastructure. Under this scenario these interventions are planned based on in-depth site specific assessments and implemented in combination with enforced water source protection. This maximum benefit scenario guarantees the preservation of the environmental flow, which is needed to ensure the adequate functioning of the natural ecosystem.

Intercropping improved soil stability and fertility. Experimental plots in Moroto.

# 4

# STRATEGIES AND ACTIONS

*Based on the maximum benefit scenario a consensus catchment management plan was formulated which includes strategies and actions along key thematic areas of intervention:*

- *Institutional strengthening,*
- *Ecosystem protection and restoration,*
- *Water and sanitation, and*
- *Agriculture and economic development.*

*Only a combination of these can ensure that the formulated strategic objectives are met. For example, to increase water security: access to sufficient data is needed for the hydrogeological assessment (institutional), the water source has to be protected (ecosystem protection), water infrastructure has to be expanded (water and sanitation), and livestock should be watered away from sources of domestic water (agriculture and economic development).*

## 4.1 A. Institutional strengthening

To ensure sustainable water resources management in Lokere Catchment it is first and foremost needed to strengthen the institutional environment at all levels (national, regional, local and community level). This involves policy enforcement, regulatory measures, streamlining of procedures, systems and structures, stakeholder involvement in decision making processes, access to information and data, coordination and dialogue between sectors and administrative units, and integration of traditional management practices into governmental guidelines. In addition, building the capacity of the Lokere Catchment Management Committee (established in 2016) in supporting the implementation, monitoring and evaluation of the CMP is critical. A summary of the interventions and specific actions are given in Table 2.

***Table 2*** *Summary of interventions needed to strengthen the institutional environment.*

| Intervention | Activity |
|---|---|
| A1. Strengthen the CMO | ■ Implementation of CMO governance system, including working procedures<br>■ Support and strengthen the CMC<br>■ Establish the CMS<br>■ Support and strengthen the CSF<br>■ Establish and support the CTC |
| A2. Monitor and evaluate implementation of the CMP | ■ Ensure the regular review of the CMP<br>■ Develop policies, such as ordinances and by-laws, in lign with the CMP |
| A3. Coordinate at district level | ■ Prepare districts for CMP implementation<br>■ Organize cross-sectoral district operations<br>■ Guide implementation of the CMP at community level<br>■ Guide development partners on the alignment of projects and programmes with the CMP |
| A4. Sub-catchment, micro-catchment and community action planning | ■ Implement sub-catchment management<br>■ Establish micro-catchment management |
| A5. Funding of the Catchment Management Plan | ■ Support proposal and partnership development<br>■ Establish an innovation fund to support projects and programmes |
| A6. Learning and knowledge management | ■ Raise awareness, at local and district levels, on CBWRM and the CMP<br>■ Build capacity on CBWRM<br>■ Promote general stakeholder learning<br>■ Strengthen knowledge management |

Building the capacity of the Lokere Catchment Management Committee in supporting the implementation, monitoring and evaluation of the CMP is critical

## 4.2 B. Ecosystem protection and restoration

Environmental degradation has caused declining resource productivity and resilience. As such, ecosystem management and restoration is key for enhancing land productivity, reducing poverty and improving the quality of life for communities. Conservation and restoration of wetlands and forests and improved management of agricultural lands and rangelands is critical. Crop production should no longer be allowed in wetlands and floodplains. Tree cover on Mount Moroto and Mount Napak should be recovered and expanded together with the National Forestry Authority (NFA), and the strict environmental protection measures by UWA in the Bokora Corridor and Matheniko Reserve should be perpetuated. Improved soil and water conservation on agricultural lands should be pursued, especially in the upstream parts of the catchment (Kotido agricultural zone, agricultural zone around Moroto, Lopei-Lokopo agricultural zone, Arechek agricultural zone and Lorengechorai agricultural zone), to increase water recharge and retention. The vegetation of rangelands must be protected and enhanced, which can best be achieved through smaller (<50 000 m3) and better distributed water for production facilities to reduce the concentration of cattle, and improved rangeland management practices (e.g. controlled grazing, exclosures, farmer managed tree regeneration). A summary of the interventions and specific actions are given in Table 3.

***Table 3*** *Summary of interventions needed to protect and restore ecosystems.*

| Intervention | Activity |
|---|---|
| B1. Productive and protected forests and woodlands | ■ Improve management of Central Forest Reserves<br>■ Improve tree cover in degraded areas (Figure 11)<br>■ Regulate charcoal production and firewood use<br>■ Promote use of alternative sources of energy |
| B2. Promoting productive and sustainable rangelands | ■ Promote collaborative rangeland management toegther with traditional institutions<br>■ Protect and rehabilitate rangelands |
| B3. Protecting wetlands and flood plains | ■ Sensitize and create awareness on the value of wetlands<br>■ Develop and implement community based wetland management plans<br>■ Restore degraded wetlands |
| B4. Protecting rivers and river banks | ■ Promote riverbank management |
| B5. Flood management systems and infrastructure | ■ Construct flood and water logging management infrastructure |
| B6. Regulation and enforcement of policies and by-laws | ■ Support the enforcement of regulations<br>■ Regulate gold and sand mining<br>■ Regulate marble mining |

***Figure 11*** *Reforestation is an effective means to improve the tree cover in degraded areas. Nursery of tree seedlings, such as the ones on the photo, can be used for this reforestation (SOCADIDO 2017)*

## 4.3 C. Water and sanitation

With safe water coverage below the national average, population growth, and microbiological contamination being a major concern in Lokere Catchment, there is a need for improved water and sanitation services, especially in urban areas such as Amuria, Moroto and Katakwi. Site selection, design, construction, operation and maintenance of water infrastructure (including dams, valley tanks and boreholes) must be optimized as failure, non-functionality and poor water quality are often the result of inexistent or insufficient (hydrogeological) assessments. Locally shallow groundwater should supplement costly and high maintenance boreholes. Sanitation should be improved throughout the catchment and piped water supply asserted to all rural and urban growth centres. Capacity building, improved water resources monitoring and infrastructure development form the core of this area of intervention. A summary of the interventions and specific actions are given in Table 4.

***Table 4** Summary of interventions needed to improve access to water and sanitation.*

| Intervention | Activity |
|---|---|
| C1. Access to knowledge | ■ Promote capacity building<br>■ Support extension services<br>■ Improve knowledge management amongst district technical staff |
| C2. Monitoring and planning of water services and resources | ■ Reinstate climate monitoring<br>■ Extend and upgrade groundwater monitoring<br>■ Strengthen surface water monitoring<br>■ Establish water quality monitoring<br>■ Establish sediment monitoring<br>■ Establish flood monitoring<br>■ Enforce the water abstraction permit system |
| C3. Management of piped water supply systems | ■ Extend and rehabilitate water supply systems<br>■ Construct new water supply systems |
| C4. Management of rural water supply systems | ■ Rehabilitate and close non-functional water points<br>■ Improve operation and maintenance<br>■ Promote water harvesting for domestic use<br>■ Improve deep borehole drilling<br>■ Promote shallow groundwater development |
| C5. Sanitation and waste management | ■ Upscale sanitation programmes<br>■ Promote waste management |

Site selection, design, operation and maintenance of valley dams, valley tanks and boreholes must be optimized to increase water security

## 4.4 D. Agriculture and economic development

To support sustainable agricultural and economic development, an intensification of rain-fed crop production should be promoted through improved supply of inputs, application of soil and water conservation measures, and strengthened market linkages. Existing water for production facilities should be rehabilitated and their use extended, particularly towards micro- and small-scale irrigation, and new water for production facilities should be built to cover livestock water shortages in normal and in dry years (Figure 12). In addition, alternative sources of income should be explored and promoted in order to reduce pressure on the natural resource base. In the short-term water availability for domestic use and small-scale irrigation can best be improved through low-cost techniques, such as sub-surface and sand dams (Box 1), rooftop rainwater harvesting, compound water harvesting and rock water harvesting. The interventions selected to boost economic development in Lokere Catchment seek to demonstrate the potential and profitability of commercial farming, and provide support to farmers in the form of knowledge, products, services, finance and business. A summary of the interventions and specific actions is given in Table 5.

***Table 5*** *Summary of interventions needed to support agricultural and economic development.*

| Intervention | Activity |
|---|---|
| D1. Improve livestock farming | ■ Research into livestock value chains<br>■ Develop and implement a plan to improve access to water for livestock (and irrigation) – Figure 12<br>■ Improve access to pasture and rangeland management |
| D2. Improve rain fed farming | ■ Promote sustainable and productive rain fed farming through improved supply of inputs and capacity building on soil and water conservation measures |
| D3. Promote micro (<0.5 ha) and small-scale (<2 ha) irrigation | ■ Promote micro- and small-scale irrigation through, for example, support to the suppliers of irrigation technology and by conducting a feasibility study into irrigation from shallow wells |
| D4. Promote medium-scale irrigation (>2 ha) | ■ Conduct a feasibility study and se-up demos around existing water reservoirs |
| D5. Promote road water harvesting | ■ Implement road water management and harvesting through, for example, awareness raising among communities, discussions with UNRA and implementation of pilot projects |
| D6. Promote alternative sources of income | ■ Promote alternative economic activities such as, for example, in tourism |

### Box 1: Sand dams and subsurface dams to increase access to water


*Photo credits RAIN 2015*

Sand dams and subsurface dams are built to store water in seasonal river, and hence increase water availability. A small wall is built in the sand bed of the river where it promotes the sedimentation of sand and blocks the underground water flow. The sand bed then functions as a reservoir from which water can be accessed through shallow wells. Course river sand can contain almost 30% of its volume in water. Water stored in the sand does not evaporate and, compared to surface water, is less prone to contamination. Sand and subsurface dams also increase water availability in the vicinity of the structure, thereby having a generalized positive environmental impact.

Sand and subsurface dams are low-cost effective interventions, but it is important that proper technical supervision is available to ensure that the design suits the environment and the construction is sustainable.

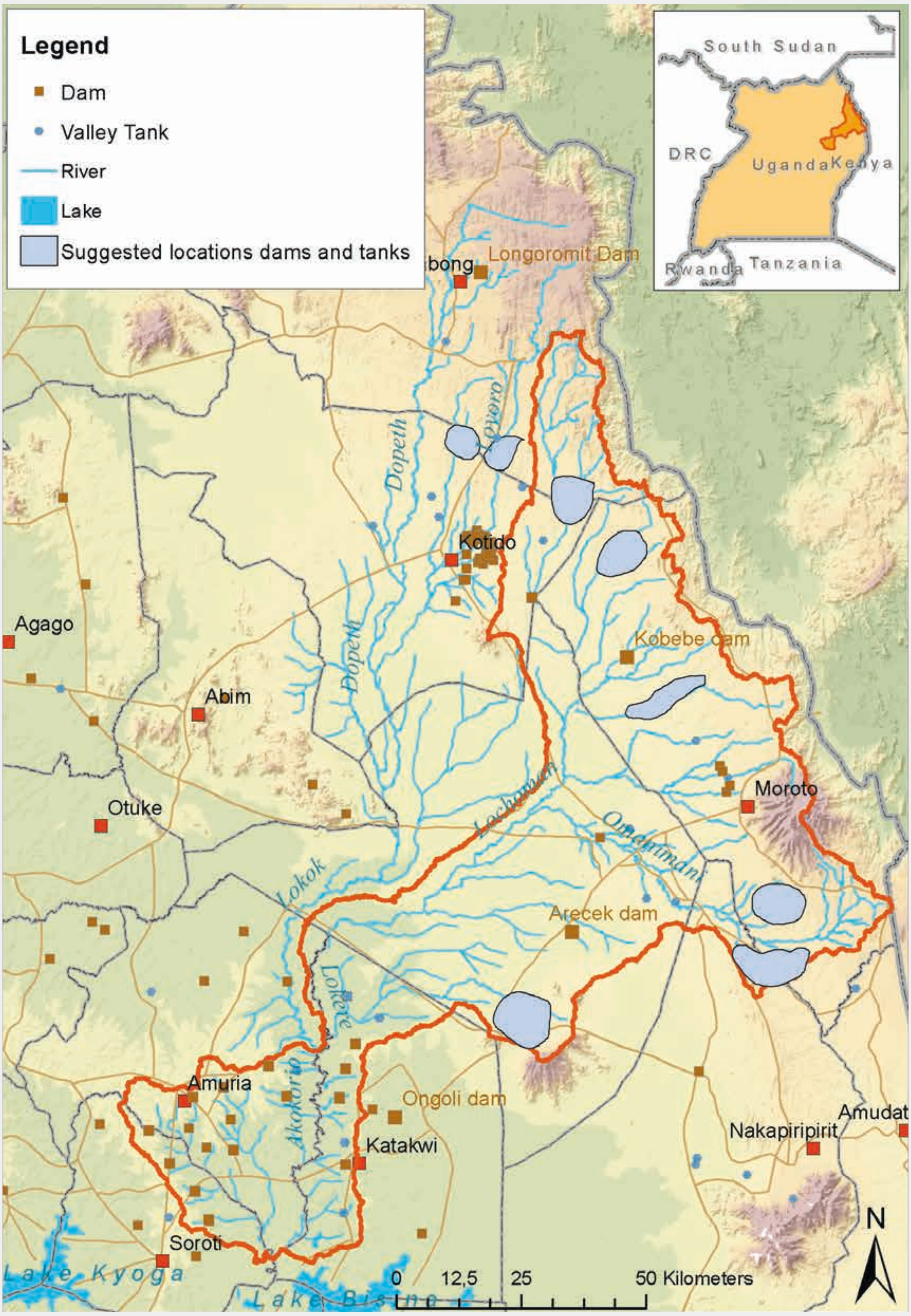



*Figure 12* Locations of existing water for production infrastructure and the priority areas that were identified during the catchment management planning process for the construction of new small-scale valley tanks and valley dams (Acacia Water 2017).

## 4.5 Catchment transcending interventions

The CMP presents interventions which need to be implemented in Lokere Catchment. However, the assessments identified several issues and options which require measures which exceed the borders of Lokere Catchment and are not the responsibility of a Catchment Management Organization, but rather are more applicable to water resources management at national level. Examples of such issues include limited capacity in CBWRM, the large-scale commercial production of charcoal, the limited fact-based knowledge on water safety from shallow wells, the limited supervision of site selection and drilling of wells, the non-functioning of the water user committees approach, and the high-costs associated with maintenance of water infrastructure due to procurement restrictions. A summary of the interventions and specific actions are given in Table 6.

***Table 6*** *Summary of catchment transcending interventions.*

| Intervention | Activity |
|---|---|
| 1. Strengthen country-wide IWRM expertise | ■ Review curricula of engineering schools/universities in line with the IWRM approach,<br>■ Allocate funds to have more students involved in specific water management programmes<br>■ Educate water professionals and train experts at all levels, and employing them for water management and water services in the wider sense |
| 2. Reduce the demand for charcoal | ■ Assess and analyse charcoal vaue-chain<br>■ Develop a national strategy to reduce the demand for charcoal in collaboration with the Ministry of Energy and Mineral Development |
| 3. Promote alternative sources of drinking water | ■ Revise ban on shallow wells<br>■ Promote best site selection, design and construction practices<br>■ Enforce water source protection<br>■ Promote low-cost alternatives to access relatively safe water (e.g. protected springs, protected shallow wells, sand and subsurface dams) |
| 4. Improve drilling practices | ■ Continue the registration of hydrogeology consultants and drillers<br>■ Assess the capacity of these proifessionals<br>■ Strengthen government supervision during drilling<br>■ Offer trainings as part of lasting skills development |
| 5. Improve O&M of water infrastructure | ■ Consider the revision of the guidelines on the water user committees<br>■ Assess possibilities to change volunteering positions into paid ones<br>■ Consider legalizing handpump mechanics associations in the Water Act<br>■ Consider adjusting the Public Procurement and Disposal of Public Assets Act accordingly so that simple works can be commissioned to handpump mechanics associations |

Large-scale commercial charcoal production is the main cause of deforestation in Lokere Catchment

Charcoal is produced in the catchment, but mainly sold to large urban centers, such as Soroti, Mbale and Kampala.

*Stakeholder engagement at grass root level is important for the implementation of the plan (Acowa, Amuria District).*

# 5

# IMPLEMENTATION PLAN

*The Implementation Plan (IP) is available as a separate document. The IP is organised as a practical tool indicating interventions per thematic area, activities and sub-activities, locations (where applicable), project lead, possible partners for implementation, priority and budget for implementation as well as for structural operation and maintenance.*

## 5.1 Prioritization of interventions

In the IP interventions are prioritised according to the urgency of implementation:

- Critical, means conditional to any further implementation and should be implemented immediately;
- High priority, which are essential to stopping harmful practices, and should be implemented at short term, i.e. within 3 years;
- Medium priority, which are important to ensure long term sustainable resources management and planned to be implemented at intermediate term, i.e. within 3-5 years; and
- Low priority, which can be implemented in the longer term, i.e. within 5 to 10 years.

## 5.2 Roles and responsibilities

The CMP is implemented by the Lokere Catchment Management Organization (CMO) in close collaboration with KWMZ. KWMZ and/or Lokere CMC take the initiative and provide guidance. However, project implementation can be done by any stakeholder willing to contribute funding, knowledge, skills or other resources. Hence, stakeholders ranging from water users to development partners and corporate sector, can collaborate or contribute to the implementation of the CMP. Table 7 summarizes some of the roles and responsibilities of stakeholder groups in the implementation of the CMP.

Stakeholders can contribute funding, knowledge, skills or other resources to support the implementation of the CMP

***Table 7*** *Summary of roles and responsibilities of key stakeholders in the implementation of the CMP.*

| Stakeholder | Roles and responsibilities |
|---|---|
| DWRM/KWMZ | Coordinate in terms of planning, link national and catchment levels, mobilise funds, supervise CMP implementation, build capacity of the CMOs, provide institutional and technical assistance to the CMOs |
| Lokere CMO/CMC | Promote and coordinate CMP implementation, review the CMP on a regular basis; mobilise resources, monitor and evaluate implementation of the CMP, including impact monitoring |
| District local councils | Facilitate and support CMP implementation, e.g. through incorporation of prioritised interventions in District Development Plans, actively participate in CMO activities, plan/prepare/implement interventions of the CMP, ensure compliance with the CMP |
| Community Based Organizations, Civil Society Organizations, Non-Governmental Organizations | Raise awareness on the CMP, mobilize communities, mobilize resources, implement the CMP |
| Development partners | Mobilize resources, conduct research, prepare proposals, build technical and institutional capacity, support stakeholder involvement, link government with primary users |
| Private sector | Establish CMP proof businesses, invest in CMP proof interventions |
| Water users | Align user and management practices with the CMP, and implement CMP-projects |

## 5.3 Sources of funds for implementing the CMP

The interventions and activities included in the CMP are not “new” but are being or can be financed from existing programmes. The first source of funding is the central government through the relevant ministries starting with the Ministry of Water and Environment as the custodian of the CMPs, other relevant line ministries, local governments, NGOs, UN agencies, development partners, private sector etc. Also, local taxes and Local Economic Development (LED) can be used to fund the implementation of parts of the CMP (Box 2).

### Box 2: Local Economic Development (LED)

Local Economic Development (LED) is a process of strategic planning through partnerships between local government, the business community and NGOs. It aims at encouraging investments that promote sustained growth in a local community. LED focuses on the region’s potential and identifies specifically what local stakeholders can and need to do to ensure that their community reaches its potential (Agency for International Development, undated).

Linking catchment management to the water dependent economic activities (e.g. cattle markets) in the catchment creates a business case for (parts of) the CMP to be financed through Local Economic Development (LED). The local government development planning guidelines for Uganda (MFPED, 2014) recognises LED as one of the pillars of decentralisation.

## 5.4 Budget

A summary of the budget for implementation of the Lokere CMP is presented in Table 8. For further details on the budget and assumptions made, please refer to the main Lokere CMP budget.

***Table 8*** *Summary of the budget for implementing the Lokere CMP.*

| Thematic area of intervention | Intervention | Budget for Implementation (Million UGX) | | | | Budget for Operation and Maintenance (Million UGX/Y) |
|---|---|---|---|---|---|---|
| | | Critical (implement immediately) | High priority (short term, i.e. implement in 3 years) | Medium priority (medium term, i.e. implement in 5 years) | Low priority (long term, i.e. implement in 10 years) | |
| A. Institutional strengthening | A1. Strengthen the Catchment Management Organisation | 657 | 0 | 12 | 0 | 264 |
| | A2. Monitor and evaluate implementation of the CMP | 82 | 0 | 0 | 0 | 214 |
| | A3. Coordinate at district level | 25 | 0 | 0 | 0 | 80 |
| | A4. Sub-catchment and micro-catchment planning | 0 | 0 | 986, | 0 | 2,140 |
| | A5. Mobilize resources to implement the CMP | 0 | 500 | 149 | 0 | 0 |
| | A6. Learning and knowledge management | 39 | 898 | 85 | 0 | 586 |
| SUB-TOTAL | | 803 | 1,399 | 1,232 | 0 | 3,284 |
| A. Ecosystem protection and restoration | B1. Productive and protected forests and woodlands | 0 | 1,485 | 325 | 1,184 | 152 |
| | B2. Promoting productive and sustainable rangelands | 0 | 1,031 | 115 | 303 | 45 |
| | B3. Protecting wetlands and flood plains | 0 | 512 | 354 | 461 | 73 |
| | B4. Protecting rivers and river banks | 0 | 291 | 0 | 79 | 0 |
| | B5. Flood management systems and infrastructure | 0 | 0 | 431 | 22 | 0 |
| | B6. Regulation and enforcement | 0 | 48 | 87 | 0 | 29 |
| SUB-TOTAL | | 0 | 3,368 | 1,312 | 2,050 | 299 |
| C. Water and sanitation | C1. Access to knowledge | 0 | 218 | 136 | 0 | 76 |
| | C2. Monitoring and planning of water services and resources | 0 | 807 | 207 | 0 | 196 |
| | C3. Piped water supply systems | 0 | 66,149 | 0 | 0 | 3,299 |
| | C4. Rural water schemes | 0 | 246 | 9,582 | 1 | 65 |
| | C5. Sanitation and waste management | 0 | 41 | 784 | 122 | 66 |
| SUB-TOTAL | | 0 | 67,460 | 10,710 | 122 | 3,702 |
| D. Agriculture and economic development | D1. Improve livestock farming | 19,067 | 175 | 383 | 64 | 270 |
| | D2. Improve rain-fed farming | 227 | 958 | 81 | 0 | 219 |
| | D3. Promoting micro irrigation (<0.5 ha) and small-scale irrigation (<2ha) | 0 | 0 | 281 | 40 | 0 |
| | D4. Promote medium scale irrigation (>2 ha) | 108 | 0 | 0 | 0 | 0 |
| | D5. Promote road water harvesting | 0 | 0 | 222 | 0 | 44 |
| | D6. Promote alternative sources of income | 0 | 342 | 103 | 126 | 0 |
| SUB-TOTAL | | 19,401 | 1,475 | 1,070 | 230 | 533 |
| TOTAL | | 20,204 | 73,701 | 14,323 | 2,402 | 7,818 |
| GRAND TOTAL | | | | | 110,630 | 7,818 |

*Project team during field visits in 2016, Kotido.*

6

# MORE INFORMATION

This popular version of the Lokere Catchment Management Plan (CMP) summarizes the main findings and the key messages. For more details on the approach, the results of the assessments, the interventions to be implemented, and how that implementation will take place please refer to the main Catchment Management Plan, its corresponding Implementation Plan and the technical reports (Stakeholder Assessment, Water Resources Assessment, Social and Environmental Assessment and Options and Scenarios Report).

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*Photo credits: Acacia Water 2016*

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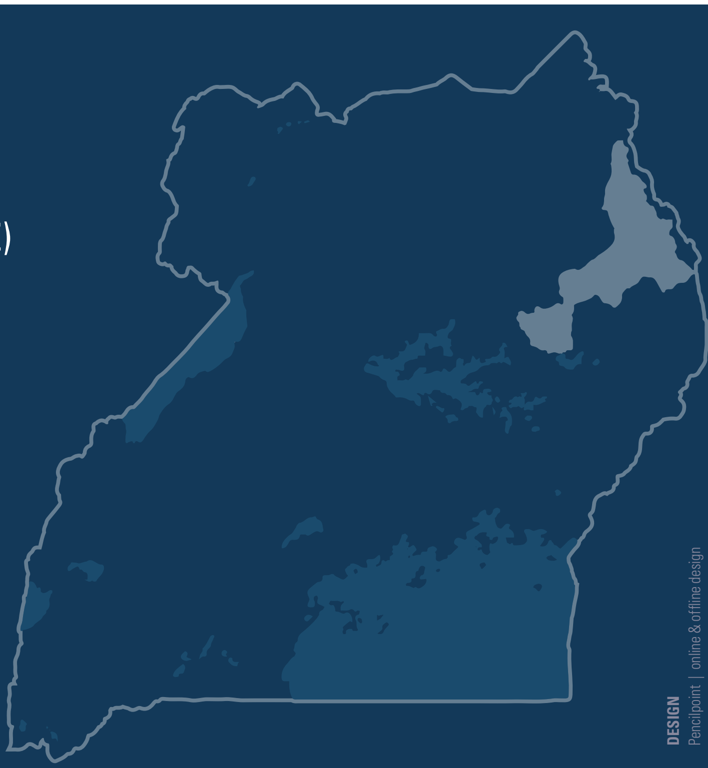

DESIGN
Pencilpoint | online & offline design
Woerden, The Netherlands