

MARA RIVER WATER USERS ASSOCIATION

NYANGORES RIVER SUB-CATCHMENT MANAGEMENT PLAN

(SCMP)

June 2011



LAKE VICTORIA SOUTH CATCHMENT AREA



ACKNOWLEDGEMENT

This SCMP has been produced with support from various people and partners. First and foremost the Mara River Water Users officials, community members and stakeholders within the sub catchment have been of great support, conscious all the time that this is their plan. Secondly, the support received from World Wide Fund for Nature, WWF for the financial and logistical assistance made the RWUA and community members meaningfully contribute to this SCMP document. Third, we acknowledge most sincerely the financial support of USAID Pro-Mara Program Implemented by ARD Inc for coming in to assist mobilize Mara RWUA members from the upper catchment to meaningfully participate in the water resources management of Nyangores River and for the printing of this document. To all we say thank you.

ABBREVIATIONS

LVEMP	Lake Victoria Environmental Management Programme
MARA RWUA	Mara Water Resources Users Association
MWI	Ministry of Water and Irrigation
SCMP	Sub-catchment Management Plan
USAID	United States Agency for International Cooperation
WDC	RWUA Development Cycle
WRMA	Water Resources Management Authority
WRMA-RO	Water Resources Management Regional Office
RWUA	River Water Users Association
WWF	World Wide Fund for Nature

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1. INTRODUCTION

1.1. Overview of SCMP Development

1.1.1. SCMP Development

The development of Nyangores river Sub catchment management plan (SCMP) is a culmination of an intensive and interactive process that was initiated in September 2010. The planning and its conceptualization, however, took several months. The first workshop was organized between 2nd and 5th November 2010.

1.1.2. Methodology for SCMP Development

Participatory process was used to develop this SCMP ranging from multidisciplinary stakeholder participation to the use of participatory methodologies. Thus, in a nutshell, it illustrates the three (3) steps for the WRMA supported SCMP development. The process includes preliminary works, workshop proper and validation processes.

Preliminary Works

Formation of teams and data collection was the basis of preliminary works undertaken during the development of this SCMP. The formation of teams, chapter and content tackled is illustrated in Table 1.1.

Table 1.1: SCMP chapter, contents and teams

Chapter	Contents	Teams
1-3	1. Introduction 2. Overview of the sub catchment 3. Catchment Characteristics	Willi Memo Wilson Kones
4-7	4. Initial SCMP 5. Water Balance & Water Demand Management 6. Water Resource Allocation 7. Water Resource Protection	Willis Memo Reuben Ngesa Dr. Margaret Abira Peterlis Opango
8-10	8. Catchment and Riparian conservation 9. Institutional Development 10. Infrastructure Development	Reuben Ngesa Kenedy Onyango Willis Memo
11-13	11. Rights Based Approach 12. Water Resource and Catchment Monitoring 13. Financial Management	Pertelis Opango Dr. Margaret Abira Reuben Ngesa Willis/Opango

Table 1.1. shows that the teams were formed around four (4) chapter clusters. The chapter break down follows the WDC approach; Chapter 1-3, Chapter 4-7, Chapter 8-10 and lastly Chapter 11-13.

Data Collection

A team of two (2) WRMA staff, one (1) staff from Ministry of Water and Irrigation (MWI), three (3) members of Mara RWUA and three (3) representatives from WWF namely; one (1) staff and two (2) interns working with WWF, were formed to collect and gather data between 4th and 7th October 2010. Data collection involved both literature search and field work. Literature review examined and searched the available information on the different elements or chapters of the SCMP. Other sources including Internet, CMS, Water Act 2002, NWRMS documents among other were reviewed. Besides, field work provided additional information and baseline data requirement, resource mapping and stakeholder analysis.

1.1.3. Community Involvement

The community meetings involved Nyangores river catchment members and key stakeholders in synergetic engagement with a view to derive significant outcomes particularly those concerning community resource mapping, transect walk, stakeholder mapping and analysis. In essence, we expected to confirm with communities, not only the status of their resource and location of the existing water resources, but also the reaffirm the IWRM concept which indicates why different users are involved in WRM. Similarly, problems were identified, analysed and prioritized. Examination of the causes of these problems, their effects and finally the solutions epitomized of community involvement in the SCMP development process. Some aspects of community involvement included meeting with Mara RWUA and Nyangores community members and community mobilisation as described below.

Meeting with Mara RWUA and Nyangores Community Members

The teams coming from community Mara RWUA and Nyangores were involved in a four-day workshop. The aim of this workshop was to ensure community participation in development of their SCMP. The community provided first hand information based on their experience in the area. Thus, together with field and literature search as explained in preliminary works the outcome from the workshop was to assist the team with compressive information and data for SCMP write up.

Community Mobilization

A total of 35 members were mobilised with support from WWF to participate in the first RWUA meeting whose outcome was to gather data to enhance the development of a draft SCMP for Nyangores sub catchment. In the process a transect walk conducted with the team identified problems and stakeholders within the sub catchment. In addition, the sub catchment and community resource map was developed indicating vital physical features, available water sources, pollution hotspots and economic activities.

1.1.4. SCMP Development Workshop

A four-day Mara RWUA and stakeholder's workshop was organised by WWF in collaboration with Nyangores catchment members and WRMA Lake Victoria South. The workshop was held from 2nd to 5th November 2010 at Constituency Development Fund (CDF) Hall in Bomet Municipality, Bomet County. During this time, focus group discussion was used to identify the problems and possible solutions to them. Pair wise ranking approach was employed to prioritize these problems identified in the upper, mid and lower sections of the

catchment. In addition, plenary sessions were used to provide consensus on critical issues and harmonised the current status as viewed in the groups.

1.1.5. Writers Retreat

A 2-day retreat was organised by WRMA-LVSC from 6th to 8th June 2011 at CREP Centre in Awasi Township. The objective of the retreat was to evaluate and update the draft Nyangores SCMP in readiness for validation by stakeholders. A small team (4No.) of technical officers undertook the task to review the document.

1.1.6. Validation

The validation of the SCMP document was based on the final draft SCMP of 8th June 2011. A one-day validation meeting was organized by USAID ProMara Program in collaboration with WRMA-LVSC, on 23th June in Twigs Hotel, Bomet Municipality to provide feedback to the community members as well as to approve the document. Several comments were made and taken into account. The list of participants approving the document is attached as **annex 2**.

1.2. Stakeholder Participation in SCMP Development Process

The Nyangores members in collaboration with key stakeholders and WRMA- LVSC were involved in the development of this SCMP. Earlier, the funding arrangement was facilitated by World Wide Fund for Nature (WWF) East Africa Region Program (EARP) with significant contribution from WRMA. In addition, WRMA provided the technical input into the chapters. Between 25th and 26th May 2011, USAID ProMara Program Implemented by ARD Inc. funded a Nyangores RWUA SCMP completion workshop for the upper catchment members. The aim of the workshop was not only to ensure the views of the upper catchment are integrated in the SCMP document but also to enable their participation in the RWUA activities.

Some of the other key stakeholders involved were; Ministry of Environment and Mineral Resources, Bomet District-NEMA office, Ministry of Agriculture -Bomet district, Ministry of Water and Irrigation, the Bomet Municipal Council, (BMC), Kenya Forest Service, (KFS), WWF, Provincial administration especially the office of the chief and assistant chief and the Mara River Water Users Association.

1.2.1. SCMP Development Implementation Schedule

Table 1.2 presents the SCMP Development implementation schedule leading to the development of the Nyangores SCMP.

Table 1.2: Implementation schedule

Activity	November-December 2010				April-June 2011	
	WK 1	WK 2	WK 3	WK 4	WK 5	WK 6
1.0: Preliminary Works						
1.1: Formation of Teams	■					
1.2: Data Collection		■				
2.0: Community Meetings						
2.1: Meeting with Key stakeholders			■			
2.2: Meeting with Mara RWUA and Nyangores community Members				■		
3.0: Writers Retreat					■	
4. Validation						■

The above schedule shows the SCMP development took six (6) weeks.

2. OVERVIEW OF SUB -CATCHMENT

This chapter describes the problems identified within the sub catchment. It prioritizes these problems through pair wise ranking and suggests strategies of dealing with them.

2.1. Problems Identification

The problems were identified through observation during transect walk and interview with various stakeholder institutions. In addition, stakeholder"s workshop held between 2nd and 5th November in CDF Hall in Bomet, corroborated the general observation of the problems experienced within the sub-catchment. Further, the workshop organised by USAID ProMara Program in collaboration with WRMA-LVSC on 25th and 26th May 2011 in Olenguruone provided perspectives on the following problems within the upper catchment of Nyangores River catchment.

The Nyangores community is increasingly facing problems that may be summed up to include those resulting from sub catchment degradation and organisational weakness. Thus, the accumulation of the following problems is likely to lead to low level of water quality and quantity; lack of awareness on the RWUA, inadequate financial resources, water Pollution, soil erosion, and planting eucalyptus trees on riparian land, riverbank/springs encroachment and poor solid waste management. In addition other problems were identified as listed below;

- Deforestation;
- Lack of enforcement of legal requirement;
- Water scarcity;
- Illegal water abstraction;
- Water use conflict;
- Lack of rain water harvesting awareness;
- Unsustainable quarrying and sand harvesting;

2.1.1. Lack of Awareness on the Water Users Associations

Ignorance and lack of information is causing not only low membership but also low support for RWUA activities.

2.1.2. Inadequate Finances for Water Users Associations Operations and Activities

The Nyangores RWUA has to deal with inadequate financial base since most members do not pay their membership fees in time. At the same time lack of critical membership recruitment and poor financial mobilisation is hampering significantly the RWUA progress and growth

2.1.3. Water Pollution

Faced with a major problem along Nyangores river stretch, water pollution is mainly caused by discharging waste into water body, car washing, and bathing, washing of clothes, animals drinking directly from the river, use of Agro chemicals, cattle dips and quarrying.

These problems were identified to be serious around at Kipsegan area where the major pollution is by a cattle dip. Around the Olbutyo Bridge a lot of animal movement and bathing takes place. Similarly, at Tenwek Bridge, around Chepkongony Primary School at the confluence of Ainapngetunyek and

Chepkositonik rivers and also along Bomet-Nyongisa Bridge car washing, bathing and a cattle dip, washing of clothes and bathing is rampant. *More information is provided in chapter 7.*

2.1.4. Soil Erosion

The resultant effect of soil erosion has led to low crop yields, siltation in the river/dams and destruction of infrastructure i.e. roads and blockage of water supply system. In Nyangores the RWUA members identified the causes of soil erosion as Poor farming practices, cultivation of hilltops and overstocking.

Severe soil erosion is experienced at the East Masare where poor farming practice and overstocking is the main cause. Around Kiromwok location blue gum and soil erosion due to the steep area is a major problem. Along Bomet-Longisa Bridge problems of poor land cultivation is the main cause of soil erosion.

During validation meeting of 23rd June 2011, other areas identified as hotspot included Bararget sub location, Sisimto village in Kapsimbeiywo location.

2.1.5. Planting Eucalyptus Trees on Riparian Land

During the workshop, the **Water Users Associations** members and key stakeholders observed that the reason people plant eucalyptus trees around water sources is because of its high water demand which makes them grow fast. They are able to enjoy the economic value of the tree. However, the effects of planting eucalyptus trees on riparian land were identified as reduced water flows, human conflicts and lowering ground water levels. Other effects are;

- Drying up of springs;
- Reducing ground water quantity;
- Causing effects in bio-diversity, and Destruction of water course.

The problem is rampant around Tulwet, Mosonik, Tenwek hospital, Mogombet community water project and at the confluence of two rivers Ainapngetyek and chepkositonik within Kiromwok location.

2.1.6. Riverbank / Springs Encroachment

Nyangores RWUA members observed that most springs are encroached upon. The effects of riverbank and spring encroachment was cited as the main cause of poor river water quality, reduced water quantity of springs and eroded riverbanks. The following hotspots were identified; the spring at Kimolewet along chogoo location, a Chepkesui Bridge where the spring is experiencing not only the problem of water pollution but also effects of blue gum plantations, and Kagawet River is seasonal due to encroachment by blue gum tree plantations.

These problems were identified to be caused by; weak enforcement of existing environmental legislations, conflicting regulations, negative attitude towards enforcing regulations and inadequate water resources information. Population pressure was also acknowledged as a serious threat.

2.1.7. Poor Solid Waste Management

Nyangores members identified poor solid waste management generated from the urban centres, industrial centres, hospitals and agricultural activities as serious problem. (See more information in chapter 7)

2.1.8. Deforestation

Unsustainable wood harvesting, over reliance on trees as source of income and opening land for farming and settlements were cited as some of the causes of deforestation within Nyangores sub catchment area. This disastrously exacerbates soil erosion, low water levels and erratic weather patterns.

2.1.9. Lack of Enforcement of Legal Requirement

Legal requirements are evident in the several Acts of parliament. These include Environmental Management and Coordination Act, EMCA, 1999, Water Act 2002, Agriculture Act, and Forest Act among others. These Acts make provisions for the management of riparian land, prohibits washing of cars, bodies and clothes in rivers. However, these practices are not enforced by relevant departments. Water permit is required in instances where works are installed. Water measuring and control devices must be installed. But, these measures are scantily undertaken within the sub catchment

2.1.10. Water Scarcity

Water scarcity in Nyangores is caused by drought and water pollution. This means that a lot of time wasted to fetch water.

2.1.11. Riverine Degradation

Soil erosion and silt from eroded river banks are the main causes of riverine degradation in Nyangores sub catchment. This brings about effects such as shortage of clean water, high rate of pollution. It means that the few watering point get congested with disastrous consequences. This includes waste of economic time among others.

2.1.12. Illegal Water Abstraction

Lack of water permit and non-compliance with the permit conditions especially the requirement for installation of measuring and control devices remain the main cause of illegal water abstraction. The participants during one of the workshop cited Chepalungu water supply an institution with 873 connections, serving 9 institutions and four (4) locations as the main culprit. However, this problem is widely experienced with other major abstractors as well. There is need to legalize the illegal abstractions.

2.1.13. Water Use Conflict

Shortage of water at watering points is the main cause of water use conflict in Nyangores sub catchment. This has a resultant effect of massive time wastage that would have been used economically.

2.1.14. Lack of Awareness on Rain Water Harvesting Techniques

From the observation and survey of Nyangores sub catchment, it could be said that there is inadequate rain water harvesting structures within Nyangores sub catchment. The main cause being high poverty levels and lack of awareness on existing rain water harvesting technologies. The main effect of this is the rampant soil erosion as majority takes their livestock for watering in the main river. The other effect is that there is over dependence and over abstraction on and of the water resource

2.1.15. Unsustainable Quarrying and Sand Harvesting

From the observation of the catchment and interview conducted during the transect walk, unsustainable quarrying and sand harvesting happens due to the high demand for building materials and high poverty incidence. Similarly, from the stakeholder's workshop, it was reported that the effect of this activity is increasing siltation of the river, degradation of environment, soil erosion, and pollution by the operating machines. It also leads to lowering of water table. Some of the hotspots identified are around Tulwet and Mosonik centres.

2.2. Effects

Pair wise ranking was used to prioritize problems within the sub catchment. The following were the problems in order of priority; Inadequate finances for RWUA operations and activities, water Pollution, soil erosion, planting eucalyptus trees on riparian land, riverbank/ springs encroachment, poor solid waste management, deforestation, lack of enforcement of legal requirement, water scarcity, riverine degradation, illegal water abstraction, water use conflict, lack of rain water harvesting awareness and unsustainable quarrying and sand harvesting. A little explanation would suffice on these problems.

Thus, Nyangores RWUA members agreed that all of them were affected by the problems stated above. However the downstream users from Kaboson were the most affected as they receive the river water which is silted and polluted.

The main bodies affected by the above named problems are: wildlife, fisheries, towns, pastoralists, tourists, small and large scale farmers. For instance, local people reported that hippos used to swim certain sections of the river, but now the water can be only knee-high during the dry season, and hippos are starting to migrate.

2.3. Strategy to Solve These Problems

Some strategic options for providing actions for improving baseline information are;

- WR Mapping;
- GIS and;
- Conducting socio-economic baselines

3. CATCHMENT CHARACTERISTICS

3.1. General Description of the Sub-catchment

3.1.1. Hydrology

The Nyangores sub-catchment covers a total area of 696Km². The altitudes within sub-catchment range between 2951m around the sources in the Mau Escarpment to 1706m downstream in Kaboson and the amount of precipitation varies according to these altitudes. The Mau Escarpment receives most rainfall with a mean annual rainfall between 1,000 and 1,750 mm. The rainfall seasons are bi-modal, with the long rains starting in mid-March to June with a peak in April, while the short rains occur between September and December. The Nyangores sub-catchment is largely hilly in topography with 50% of the total area above the altitude of 2202m. The Nyangores River has two tributaries; Chepkositonik and Ainop'ngetunyek. Along the longest tributary, the Nyangores runs approximately runs 94km before joining Amala River at Kaboson to form the main Mara River. There is one functional river gauging data station within sub-catchment namely (1LA03) at Bomet and there is a rainfall station at Bomet Water Supply Station just adjacent. The flow data from the station spans between 1963-2000 periods. The basin is endowed with plenty of water sources with an average flow of 8.6 m³/s at 1LA03 (Gauging Station at Bomet).

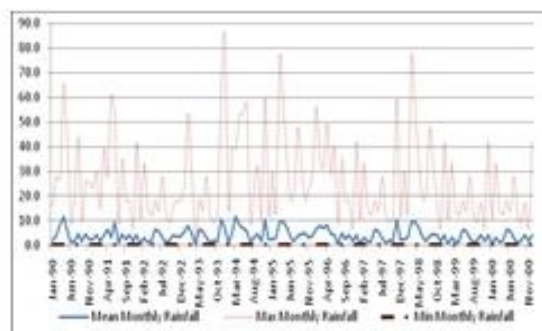
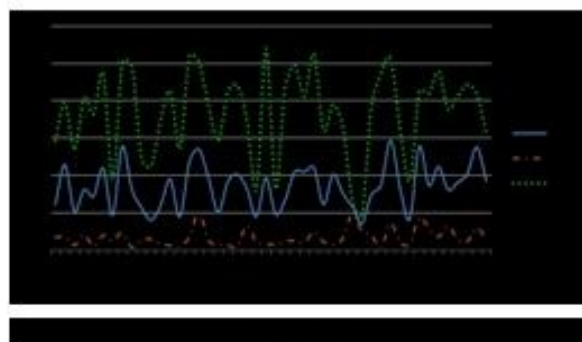
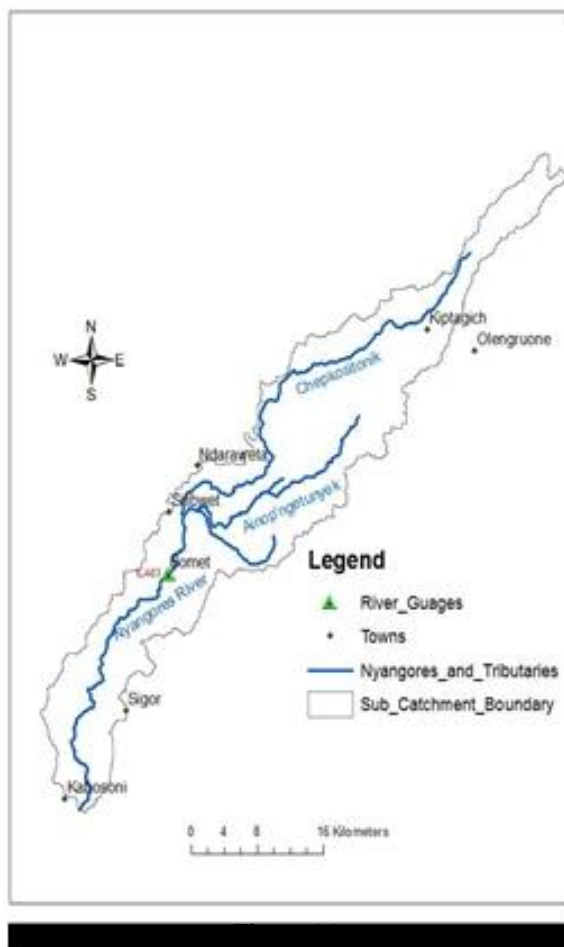


Figure (c)

Fig 3.1: (a) Map showing the Nyangores Sub-catchment, (b) Flow Variation at 1LA03 (Bomet, 1963-2007), (c) Rainfall Variation at Station 9035365 (Bomet Water Supply, 1990-2000)

The volcanic geology (major rock types in the area are dolomite and calcite) in the upper part and middle part of the sub-catchment support a number of groundwater springs both deep and shallow. The major soil types in the Nyangores subcatchment are the cambisols. Cambisols are characterized by structural stability, high porosity, good water retention and moderate to high fertility, all of which make them suitable for agricultural activities.

Sediment loads in the Nyangores River at Bomet are on average 128 tonnes/day, but they can range from 6.3 to 424.3 tonnes/day depending on the flow level (Kiragu 2009).

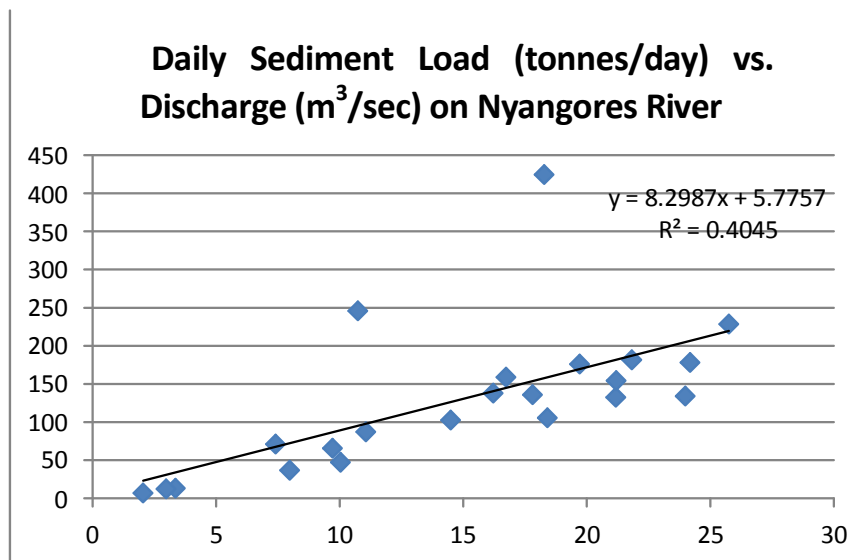


Fig 3.2: Daily sediment load in relation to flow level at the Bomet Bridge on Nyangores River (Kiragu 2009)

3.1.2. Land use

In general, the major land use/covers in the Nyangores River Basin include closed forest, and tea in the upper mountain slopes, and agricultural land.

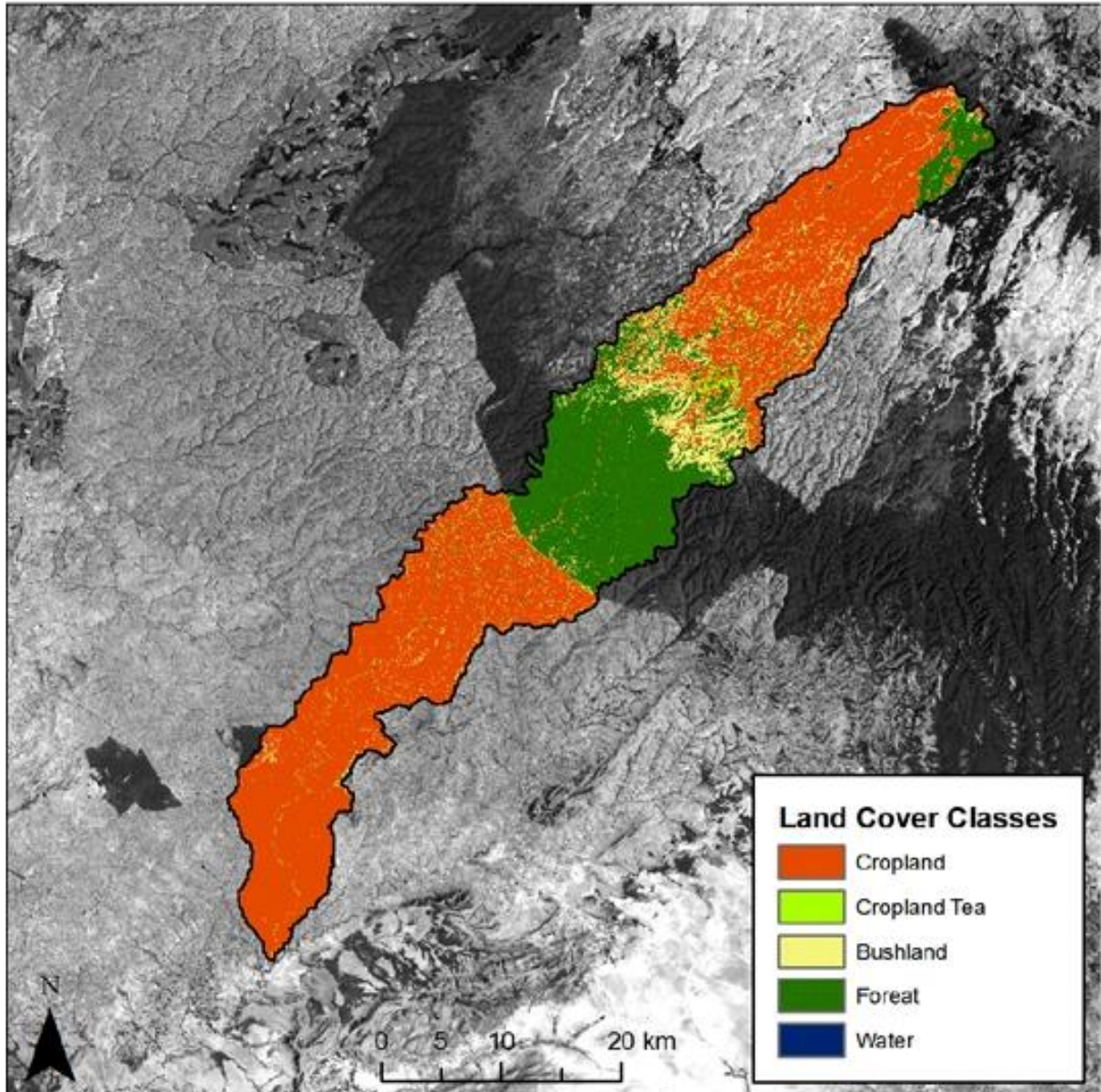


Figure 3.3. 2010 land cover map of the Nyangores Basin. The basin is covered by 64% crop land, 26% forest, 9% bushland, and 1% tea. Image courtesy of the USAID Global Water for Sustainability Program

Data for the entire Mara River Basin indicate that, by 2000, the rangelands had been reduced by 24% to only 7,245 km² due to encroachment by agriculture, whose area has increased by 55%. Similarly, except for the water body, all the other land use/covers have undergone change in the 15 years. The natural vegetation has been declining as closed forests reduced by 23% due to forest clearing for tea and/or as timber harvests, which have increased opened land by 82%.

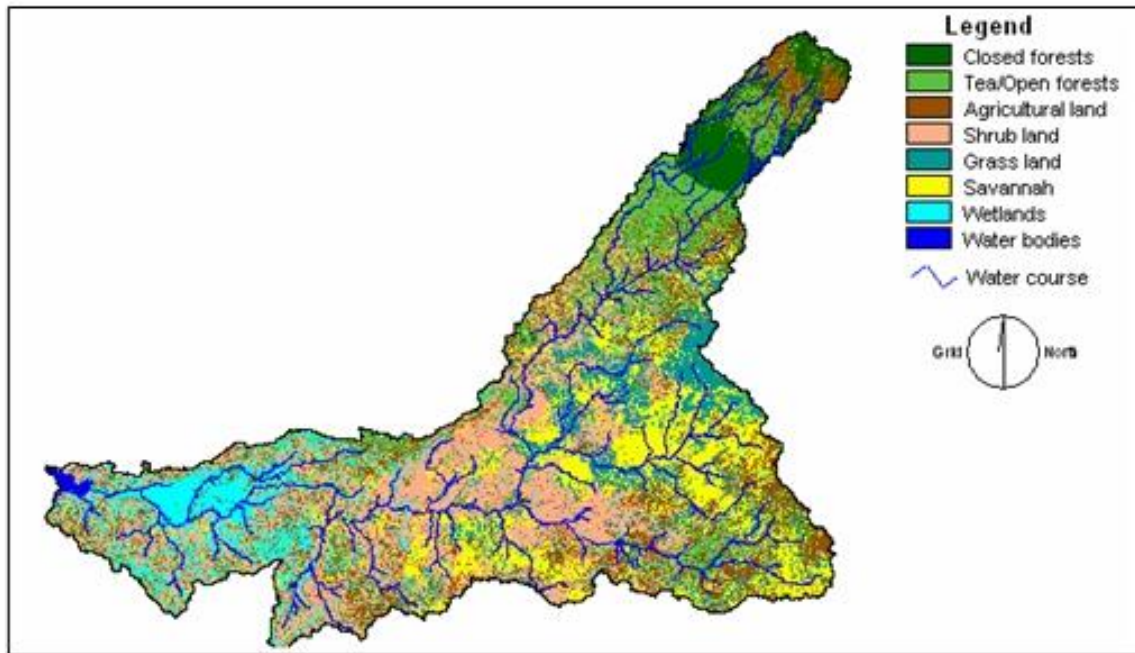


Fig.3.4: Land use/cover in the Mara basin in 2000 (from Landsat ETM)Source: Presentation in Brisbane Australia by Bancy M. Mati, Simon Mutie, Patrick Home, Felix Mtalo and Hussein Gadain

3.1.3. Ecology of the Nyangores River

Little information exists on the ecology of the Nyangores River. However, recent MSc studies and surveys that have been conducted indicate that the river is closely linked to the biological and physical processes at the catchment and local (reach scale) levels (McCartney, 2010, Maldonado, 2010, Omengo, 2010). The Mau forest plays an important role in the supply of organic matter that is utilized by both microbial and invertebrate communities. Clear waters in the forested streams offer perfect conditions for primary production. Macro invertebrate communities in the upper reaches of the Nyangores sub-catchment are diverse, with over 30 taxa in some sites (Maldonado, 2010). At Silibwet, monthly sampling indicated an average of only 19 taxa; however, 82% were considered taxa sensitive to water quality. Overall water quality was good, with dissolved oxygen levels above 80% and average turbidity of 28 NTU (Subaluskus and Dutton, *in preparation*).

Table 3.1: Water Quality and Macro invertebrate Data for the Nyangores River at Silibwet, from September 2008-August 2009

		Mean	Stn Dev
Water Quality	Temperature (°C)	19.37	3.10
	Conductivity (mS/cm)	0.066	0.020
	Dissolved Oxygen (%)	83.69	3.25
	Turbidity (NTU)	28.13	12.14
	Sediment (mg/L)	32.55	13.02
Macroinvertebrate Data	Total Abundance	5397	2611
	# of Taxa	18.78	1.72
	% EPT (sensitive taxa)	82%	8%

Only one fish species, *Clarias* sp. has been recorded upstream of Tenwek waterfall on the Nyangores River (Tamatamah 2009). Fish species that have been recorded downstream of the waterfall include, *Barbus* sp., *Labeo* sp., *Clarias* sp. and *Mormyrus* sp. These fishes have also been recorded for the Amala River (LVBC & WWFESARPO, 2010). Most of these fish species utilize aquatic insects as their preferred food items. These fishes are migratory, especially during the rainy season when they breed (Manyala and Ochumba, 1992).

As already noted, land use change and the intensification of human activities both at the catchment and local levels remain to be major challenges to the ecology of the Nyangores River. Longitudinal changes in water quality parameters and nutrient levels are already clear (Figure 5). Increased sediment levels are likely to reduce primary production and reduce benthic and spawning habitats for macro invertebrates and fish. Increasing nitrogen and phosphorous levels could lead to declining dissolved oxygen in the water, with negative impacts on aquatic organisms. High nutrient levels will also lead to water fouling which will make it unfit for human use. This means that sustainable land use practices that reduce risks to water quality will maintain the ecological health of the river and consequently lead to a sustainable supply of goods and services to people living on the catchment area.

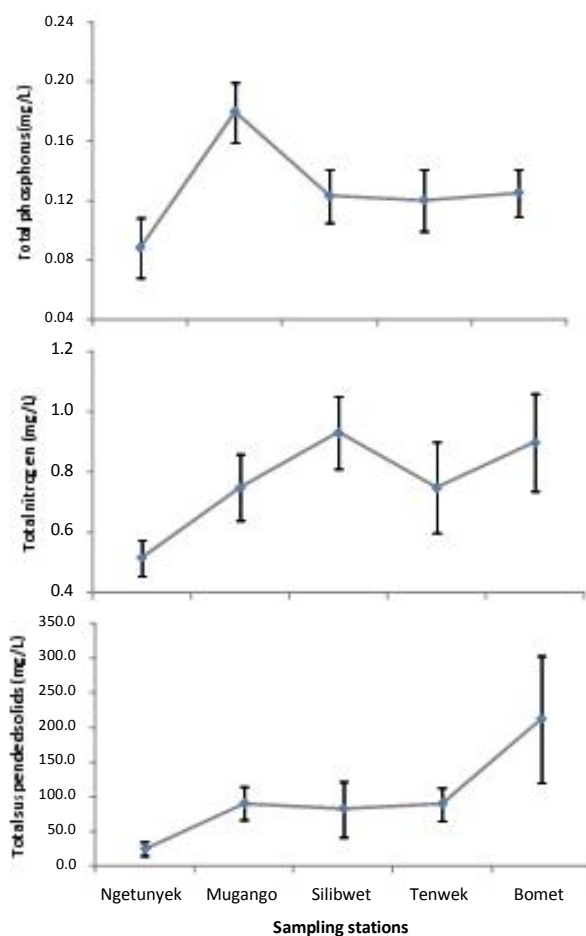


Fig 3.5: Recent longitudinal trends in mean (\pm SE) nutrients and suspended sediment levels in the Nyangores River

3.1.4. Population

Nyangores sub catchment is a part of the Mara Basin which is home to 1.1 million people (775,000 of whom live in Kenya and 325,000 in Tanzania) who are mostly engaged in agricultural and pastoral activities. Bomet municipality are the largest urban centres with about 95,000 residents. In Nyangores Tenwek, Sigor and Kaboson trading centres are also growing rapidly into towns. The rest of the population lives in rural areas, with a very high percentage (up to 64%) being below the poverty line.

Nyangores sub catchment covers Bomet and Nakuru counties. The three divisions were recorded in the 1999 Census to have populations of 120,759, 43,583 and 61,116 respectively (Total population of 225,458 for the Nyangores basin). Based on an assumed growth rate of 2.8 %, the current population of the residents within Nyangores drainage basin is estimated to be approximately 300,000. (2009 census)

3.1.5. Economic Activities

Crop farming remains the dominant economic activity to the majority of the population despite the diversity in spatial extent and land use. About 62% of the households are smallholder farmers (Aboud et al., 2002), with livestock rearing being a second dominant activity, yet agriculture occupies about 28% of the available arable land. The main crops are tea, maize, potatoes, beans, coffee and pyrethrum.

The Nyangores Sub catchment also supports the livelihoods of farmers, some hunter-gatherers in the forested catchment areas, and other people who directly or indirectly rely on tourism. In addition, the use of forest resources remains an important source of livelihoods to the people in the highlands.

3.2. Stakeholder Identification and Analysis

Stakeholder Identification

Stakeholder identification was done by members during the stakeholder workshop held between 2nd and 5th in Bomet Municipal Council. Similarly, more stakeholders were also identified in a workshop held in Olenguruone between 25th and 26th May 2011.

The identified stakeholders were listed as Friends of Mau Watershed, FOMAWA, MWI, NEMA, MOA-Focuses on agricultural production, Kenya Forest Service, WWF, USAID ProMara Program and Provincial Administration. Others are; WRMA, Culture and Society, Livestock, Public Health, Bomet County Council, Community Forest Association, CFS, Bomet Municipality, Various CBO"s and Institutions within the Basin, GTZ and KWS. Other partners such as the Nile Basin Initiative through the Nile Equatorial Lakes Subsidiary Action Programme (NELSAP) and the Lake Victoria Basin Commission (LVBC) under the East African Community (EAC) also recognises the importance of Integrated River Basin Management (IRBM) initiatives for the conservation, sustainable and equitable use of shared freshwater resources and are undertaking steps towards solving the water resources issues within the basin.

Stakeholder Analysis

Stakeholder analysis was done using the power/interest grid as shown in figure 1. It may be noted that as the RWUA become more successful in their work, the actions they take and the projects they may run will affect more and more people. The more

people they affect, the more likely it is that their action will impact people who have power and interest over their projects. These people could be supporters of their work -or they could block it.

	Keep Satisfied	Closely Manage
	MWI	WRMA
	KWS	WWF
	PA , BMC	NEMA
	Politicians	KFS
	MoA	
	Monitor	Keep Informed
	MoL	BCC
	NGOs	CFAs
	CBOs	LVBC /NELSAP
	Low	High
	Interest	

Figure 3.6: Influence/interest Grid

The stakeholders were mapped out using the Power/Interest Grid shown in figure 3.6, and classified by their power over RWUA's work and by their interest in RWUA's work.

Strategies for Dealing with Stakeholders

Those with High Power Low Interest namely; MWI, KWS, PA, Politicians and Ministry of agriculture should be kept satisfied. Those with Low Power Low Interest (Ministry of Lands, NGOs, and CBOS should be monitored. Those with Low Power High Interest (BCC, CFAs, LVBC/NELSAP should be kept Informed. Lastly those with High Power High Interest WRMA, WWF, NEMA, KFS and BMC should be closely managed

3.3. Target

Sub catchment maps and baseline data available to members and stakeholders

3.4. Outputs

Digital maps and data sets

3.5. Proposed Activities

The proposed activities are shown in table 3.4.

Table 3.2: Proposed Activities

Catchment Characteristics				
Target	Sub catchment maps and baseline data available to members and stakeholders			
Output	Digital maps and data sets			
	Activity	Sub-activity	Time frame	Budget
1	Produce map with sub catchment map with major towns, and physical features	Update existing sub catchment map	1 year	60,000
2	Produce showing hydrological features rainfall information	Produce Hydrological and rainfall information maps	1 year	50,000
3	Produce Population and Livelihood Information	Update existing information from CBS	1 year	40,000
		Carry out socio-economic survey		

4. MANAGEMENT APPROACH

This chapter describes the management approach within the sub catchment. It discusses in details the management unit, classification, and status of Management committee of Nyangores catchment. It also examines when the committee was formed, makes an analysis of stakeholders and proposes strategies for dealing with them. It also illustrates the RWUA objectives and situates this within broader ambit of IWRM. Last it states the status of RWUA registration and explains the extent of geographical coverage of the RWUA area

4.1. The Current Status

4.1.1. Management Unit

The management units (MU) for Nyangores sub catchment is based on the criteria for MU zoning as shown in the figure...

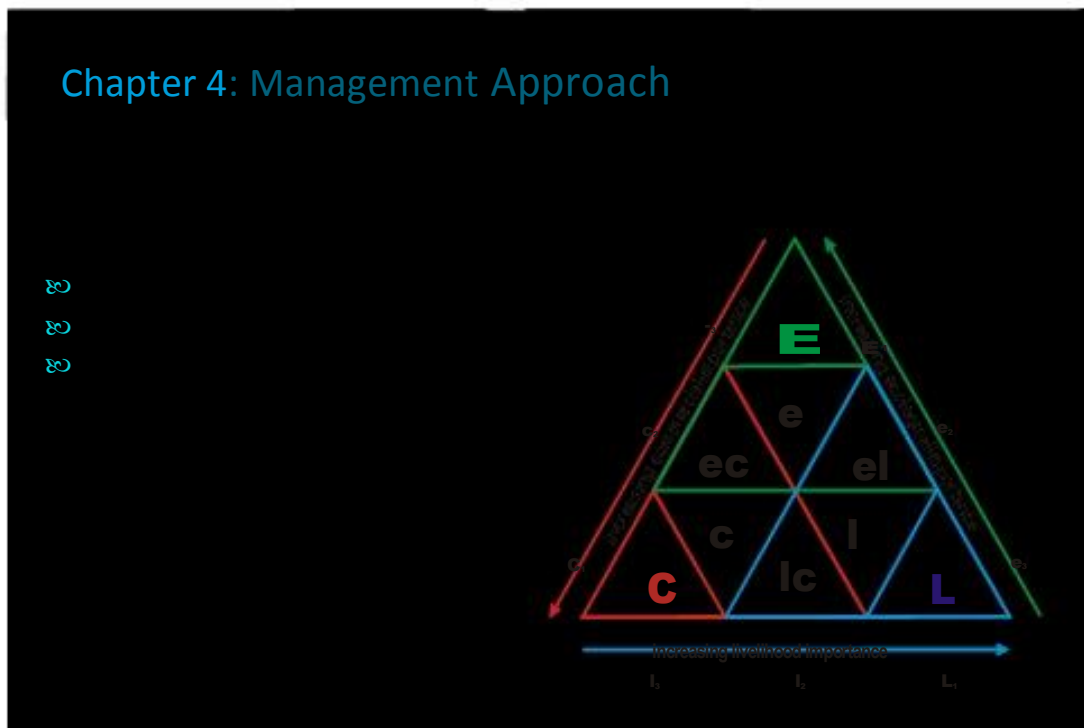


Figure 4.1: Criteria for MU Zoning and Classification

The MU for Nyangores follows the management approach that defines the ecological, livelihood and commercial importance of water resources management. In this regard, Nyangores sub catchment management units is identified as upper, mid and lower.

4.1.2. Classification

Based on the Lake Victoria South management unit, Nyangores is classified within the upper Mara catchment as shown in the figure 4.2.

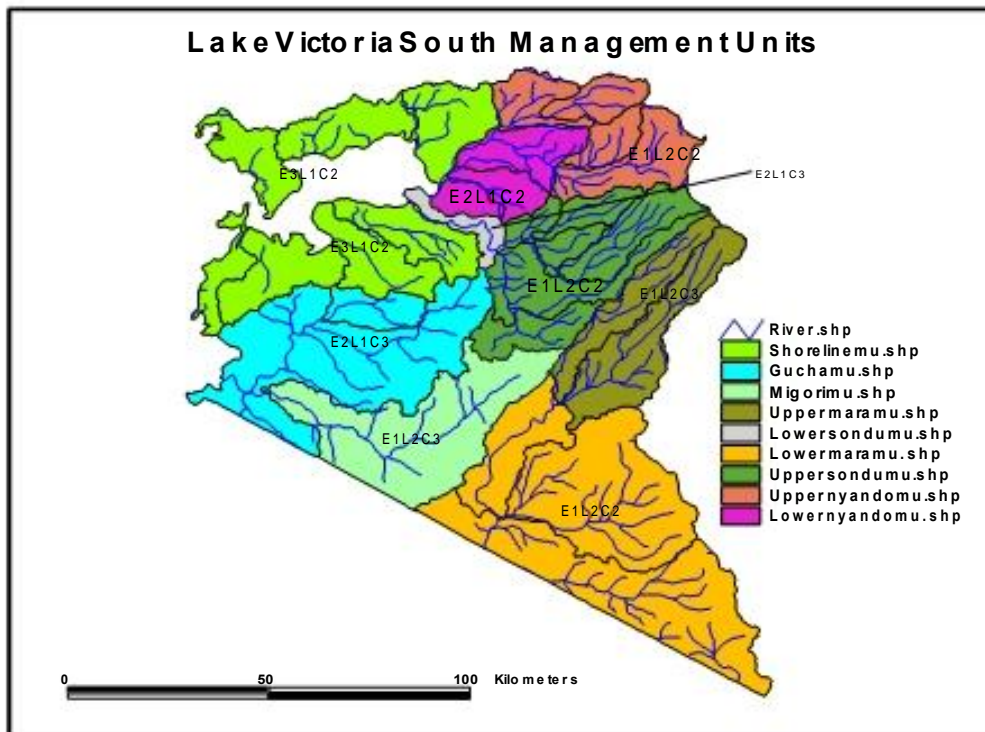


Figure 2: Lake Victoria South Management Units

Similarly, the classification for Nyangores sub catchment was based on the measure of relative importance attributable to the three competing types of uses - commercial, livelihood and ecology is shown in figure 2. The upper catchment lies on E3L2C1, Mid catchment lies on E1L2C3 while the Lower side lies on E3L1C2

4.1.3. Status of RWUA

RWUA Formation

Nyangores sub-catchment water users committee was formed in June 2008 with ministry of Gender, Youth and Social services. At the time of this SCMP, registration with the Registrar of Societies is ongoing. It has 15 management committees" members representing sub-catchment stakeholders and community members. The committee has representatives spread across the sub-catchment covering a stretch of 95 km, from the source up to the confluence of Amala River. It has paid up membership of about 150 members drawn from different zones. It is self financed through membership contributions and donations from well-wishers and also from the Mara River Water Users Association.

Objectives of Nyangores scmp

Given the prevailing bad conditions within the sub catchment, the communities offered to provide proactive solutions to combat the water resources management problems by the formation of a community based organisation to realise self help measures and integrate upstream and downstream users of the water resources of Nyangores River.

The objectives of the association are to; improve awareness level of Nyangores RWUA to community and stakeholders, improve the financial capacity of the RWUA to carry out its integrated water resources management activities, improve water

quality for domestic use and for natural ecosystem and promote soil and water conservation in the catchment. Other objectives are as listed below;

- improve water quantity and provide alternative sources of livelihoods;
- to promote removal of eucalyptus on riparian land;
- Promote solid waste management practices in urban centres;
- Promote riverbank and springs protection;
- Promote rehabilitation of deforested areas;
- promote enforcement of legal requirements; and
- Ensure adequate water availability.

Committee Registration Status

Nyangores RWUA is registered as a self help group with the department of social services in Bomet district. The application for registration with registrar of societies under societies Act in the pipeline

The Boundary of the Nyangores catchment Area

The Nyangores sub catchment area is shown in figure 4.3.

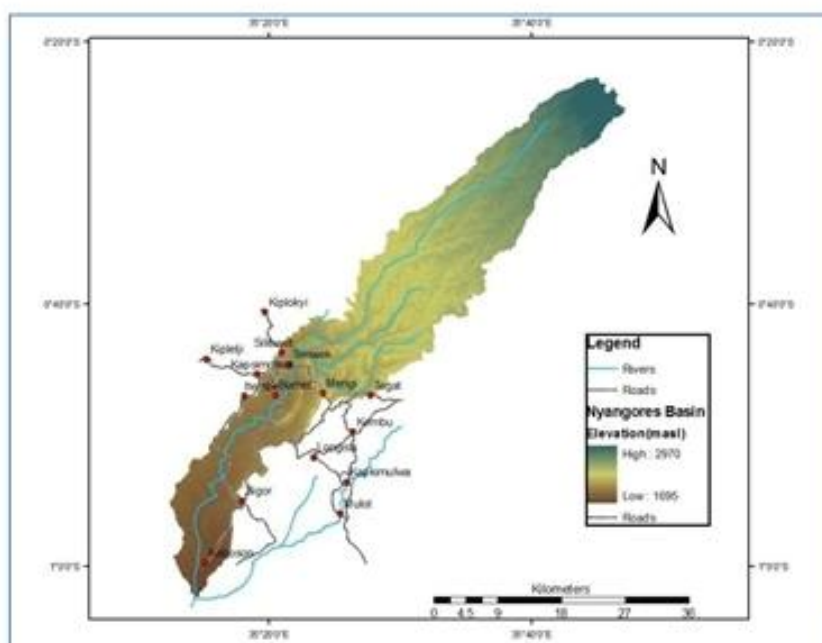


Figure 4.3: Nyangore Sub Catchment Area

The Nyangores sub catchment lies between altitudes of 2970 m and 1695 m asl at the lower catchment at Kaboson.

4.2. Target

Review and finalize zoning Nyangores sub-catchment MU units

4.3. Outputs

- Management units established
- Map of catchment boundary

4.4. Proposed Activities

The proposed activities are summarized in table 4.4.

Table 4.1: Proposed Activities

Target	□ Review and finalize zoning of the Nyangores Sub catchment management units		
Outputs	○ Management units established ○ Map of RWUA boundary		
Activity	Sub activity	Timeframe	Budget
Complete the sub-catchment zoning	Review MU zones for the sub catchment	2 months	50,000
	Draw a map of the zones	6 months	50,000
RWUA status	Finalize registration with Registrar of Societies	3 months	5,000
	Register with WRMA	1 month	1,000
	Sign MoU with WRMA	1 month	5,000

5. WATER BALANCE

5.1. Current Status

This chapter describes the current status of water balance within Nyangores sub catchment. It discusses the water resource potential, reserves and water demand

5.1.1. Assessment of Water Resource Potential

Nyangores River originates from the Nyangores forest (Mau Complex) and runs south east for approximately 94 km before joining Amala River at Kaboson to form the main Mara River. The basin is endowed with plenty of water sources. Nyangores River has an average flow of 8.6 m³/s (743,040 m³/day).

There are two boreholes within the basin which are legal. These are Kipsigis Sacco at Bomet Town and Itembe/Kapkwen. Other sources include four (4) dams, namely, Tenwek, Chengaina, Cheboin and, Kaboson dams. There are 13 pans within the basin. There are about 1,500 unprotected springs within the sub catchment. WWF has protected 23 springs as at up to May 2011. Ministry of Agriculture, Tenwek, waterlines and Bomet municipality have also done a good number of springs.

Eucalyptus trees pose the biggest danger to the springs occasioning reduced yields.

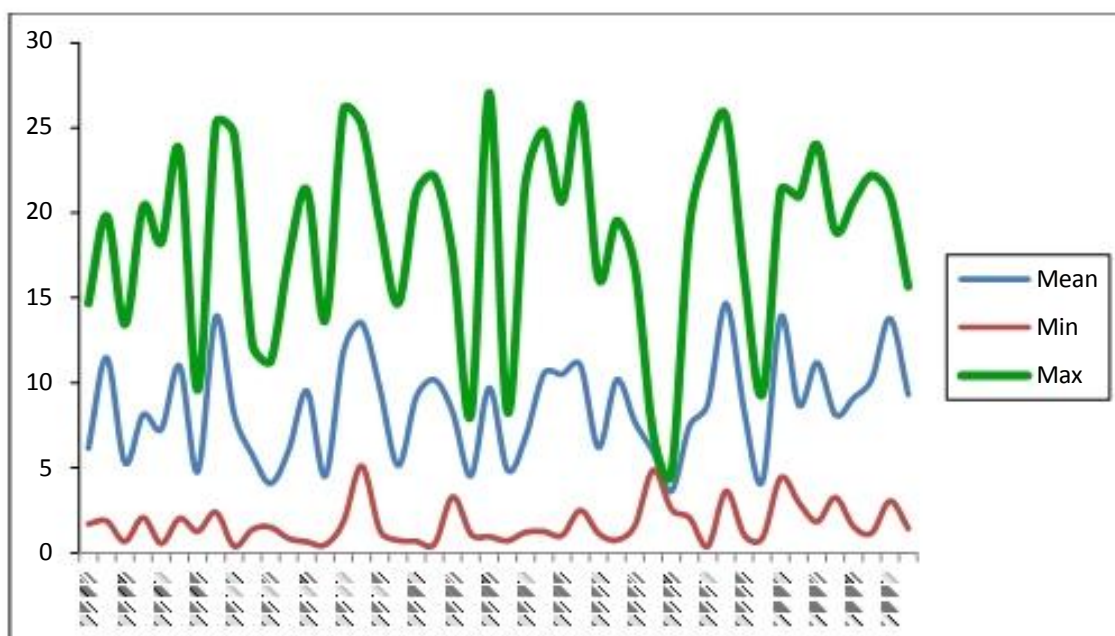


Fig 5.1: Long term annual flows at Nyangores River RGS 1LA03 in m³/s

5.1.2. Assessment of Water Resource Reserve

This refers to the quality and quantity of water that is required for basic human needs and for protection of the aquatic ecosystem. For rivers, the amount of water available 95% of the time (Q95) should be established and assured all the time whereas for ground water, a Q45 of ground water recharge is required.

From the available data from 1963 to 2010, the Q 95 for Nyangores River at RGS 1LA03 is 0.35m³/s.

The Q95 reserve flow, however, is established as an absolute extreme low value of flow that should never be surpassed and which simply provides for basic survival of people and aquatic species during extreme periods of drought. A Q95 flow does not meet the dual objectives of the 2002 Kenya Water Act, which defines the “reserve, in relation to a water source, [as] that quantity and quality of water required (a) to satisfy basic human needs for all people who are or may be supplied from the water resource; and (b) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the water resource.”

In order to meet the objectives of the law, a detailed assessment of the water resource reserve for the Mara River Basin was conducted in 2006/2007 with the participation of WRMA and other stakeholders in the upper and middle reaches of the Mara River Basin. The results of the assessment were approved by the Council of Ministers of the Lake Victoria Basin Commission in May 2009. The assessment distinguished between base flows required during rainy and dry seasons and between normal rainfall years and drought years. It also prescribed the magnitude of occasional floods which were deemed necessary to ensure ecological function. The following recommendations were made for average monthly baseflows in the upper reaches of the basin (specifically for the Amala River above Mulot) to sustain all components of the river ecosystem.

Reserve flows for normal rainfall years:

Dry season base flow = 1.3 m³/s (Q71)

Wet season base flow = 2.0 m³/s (Q59)

Reserve flows during drought years:

Dry season base flow = 0.3 m³/s (Q95)

Wet season base flow = 1.0 m³/s (Q76)

From 21-24 February 2009, part of the scientific team that conducted the Environmental Flows Assessment (EFA) for the Mara re-visited the basin to confirm the reserve recommendations during very low flows. During this assessment, they also conducted surveys for hydraulics, and fish and macro invertebrate biodiversity at Silibwet on the Nyangores River. Because this was not a complete EFA, reserve recommendations for the Nyangores River could not be prescribed. However, detailed information was collected that can be used to develop reserve flow recommendations in the future.



Fig 5.2: Silibwet Bridge on the Nyangores River, where a low-flow Environmental Flow Assessment was conducted from 21-24 February 2009.

The hydraulics engineer measured the current flow of the river during the survey at 0.6 m³/sec. Hydraulic modelling equations were used to predict the water surface level under varying flow conditions (Ndomba 2009). This model can be used to prescribe reserve flow levels that will sustain multiple components of the river ecosystem.

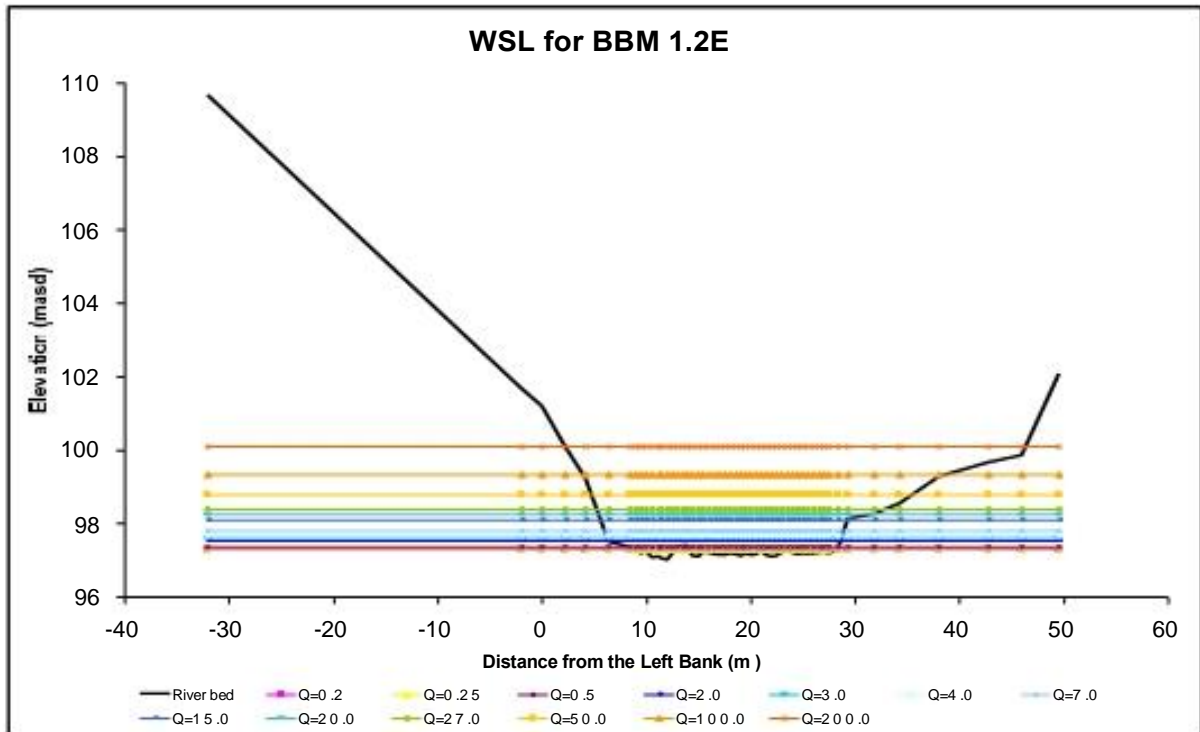


Fig 5.3: Water surface level at Silibwet on the Nyangores at varying flow levels (Q = 0.2 - 200.0 m³/sec) (Ndomba 2009)

The fish specialist documented only one species of fish in the river at this site, *Clarius liocephalus*. The low amount of biodiversity was likely due to the waterfall just 1 km downstream, which acts as a natural barrier to fish movement, and the associated dam, which further compounds this barrier (Tamatamah 2009). This species is in the lotic guild of fish, which means they require relatively high dissolved oxygen levels and are sensitive to reductions in water quality. They also have one breeding season a year that is closely linked to peak flows, and they are vulnerable to changes in the timing of high flow events (Welcomme et al. 2006).



Fig 5.4: *Clarius liocephalus*, the smoothhead catfish, the only species of fish captured at Silibwet on the Nyangores River (Tamatamah 2009)

Table 5.1: Recommended reserve flows based on the fish community determined after February 2009 field visit (Tamatamah 2009)

Flow category	Silibwet		
	Aver. Vel. (m/s)	Aver. Depth (m)	Aver. Q (m ³ /s)
Dry season low flows for drought years	0.18	0.219	0.8
Dry season low flows for maintenance years	0.28	0.33	2.00
Wet season low flows for drought years	0.28	0.33	2.00
Wet season low flows for maintenance years	0.39	0.45	4.00
Wet season floods in a drought year	0.56	0.63	8.00
Wet season floods in a maintenance year	0.71	0.78	13.00

Additional EFA surveys will need to be undertaken with a team of scientists studying multiple components of the river ecosystem at various flow levels in order to prescribe complete reserve recommendations for the Nyangores River.

5.1.3. Assessment of Water Demand

The assessment of water demand is shown in table 5.2

Table 5.2: Water Demand

Water Use	Number	Rate	Total Demand(m ³ /day)	Remarks
Domestic	300,000	60litres/c/day	18,000	
5 Secondary Schools	400 students	50litres/c/day	100	Boarding schools
10 Primary Schools	800 students	5litres/c/day	40	Day schools
Dispensaries	11	5,000litres/day	55	
Livestock	0.3 LU per capita	50 litres/LU/day	4,500	
Industrial/ Commercial			5000	Estimated
Irrigation	300ha	1litre/ha	24,000	
Total			51,695	

Source: RWUA, 2011

Overall, the water resources for Nyangores sub- catchment are adequate to serve the demand within the catchment. The total demand of 51,695m³/s is available in Nyangores River for about 6 months. Therefore, alternative water sources like ground water, dams and pans will be required to supplement the Nyangores River. More springs should be protected and their catchment restored.

5.2. Targets

- To establish available water in Nyangores sub catchment
- To establish the water demand for the Nyangores sub catchment

5.3. Proposed Outputs

- Inventory of Water Sources
- Register of water abstractors and amounts of water abstracted
- Establish the flows at different reaches along Nyangores River
- Establish ground water availability

5.4. Proposed Activities

Abstraction survey should be carried out to establish the actual surface and ground water abstractions. This will involve detailed assessment of river flows. Additional RGSs will be rehabilitated (refer to chapter 12) and data collection started. An inventory of springs, dams and pans will also be undertaken; Policy decision on how much of the available water can be used by domestic and irrigation abstractors and how much water must be released as the reserve for downstream users in the Mara system. The proposed activities are shown in table 5.3.

Table 5.3: Proposed Activities

Target	<input type="checkbox"/> To establish the available water in Nyangores catchment <input type="checkbox"/> To establish the water demand for Nyangores catchment		
Outputs	<input type="checkbox"/> Inventory of Water Sources <input type="checkbox"/> Register of water abstractors and amounts of water abstracted <input type="checkbox"/> Establish the flows at different reaches along Nyangores River <input type="checkbox"/> Establish ground water availability		
Activity	Sub activity	Timeframe	Budget
Make Inventory of all water sources	Geo-reference the springs, dams pans, well and boreholes	2 months	200,000
	Produce map overlay and register	1 month	50,000
Carry out discharge and water quality measurement at three stations along Amala River	Daily water level measurements	continuous	110,000
	Quarterly discharge measurements (readings)	continuous	50,000
	Data compilation and analysis	continuous	50,000
Carry out ground water availability estimates	Engage consultant to carry out ground water aquifer survey	6 months	300,000
Carry out abstraction survey	Compute the amount of water abstracted	Refer to chapter 6	Refer to chapter 6

Source: RWUA, 2011

6. WATER ALLOCATION

This chapter describes the current status of water allocation. It discusses the current abstraction, Compliance with permits, Development of Water Allocation Plan and Improvements to Water use efficiency

6.1. Current Status

6.1.1. Current Abstraction

There are currently a number of abstractors along the Nyangores sub catchment. The main abstractors are: Bomet water Supply, Tenwek Mission Hospital, Tenwek secondary school, Mogombet Water Supply, Tirgaga Tea Factory, Ndaraweta Secondary school, Kaboson Mission, Kaboson secondary school, Chepalungu Water Supply, Sigor water supply, Chebara Irrigation project-100 hectares-pumping via hydram, Kaboson irrigation project-160 hectare and Tumoi Community Water Supply. The right to abstract is by Water permit whose applications are processed at the WRMA-LVSCA regional and sub regional offices in Kisumu and Kericho respectively. The consumers who use buckets without application of pumps do not need abstraction permits.

6.1.2. Compliance with Permits

Most of the major abstractors currently comply with the water abstraction permits requirement but there is need for the committee to update the list of other abstractors including those with mobile pumps; many of whom do not have abstraction permits.

6.1.3. Development of Water Allocation Plan

Water allocation is the process of apportioning water resources for beneficial use to different users bearing in mind that water is held in trust by the government and the right to use water is conferred by water permit. The committee does not have a water allocation plan for the river

6.1.4. Improvements to Water Use Efficiency

The committee should update the list of abstractors and document the quantity of water used by each abstractor. Visits to projects may take place to allow committee members to verify how water is being used. The information should be presented in a zone by zone format, comparing actual water use versus the estimated water availability developed during the water balance work. From this information, an overall allocation plan should be worked out. Information and demonstrations on improved water use efficiency will be part of the final allocation plan. Metered water use by all consumers (including individual project members) within the catchment may be part of the long term water allocation plan.

After determining the water allocation figures, a plan for meeting the Association’s operational costs from the main abstractors should be developed. This may be as simple as a review of membership and subscription costs or it may be based on a volume of water used principle.

The following would then be produced

- Updated list of Abstractors (and details of permits).
 - Complete List of Abstractor Water Use Data (from Meter Data).
 - Summary of Current Abstraction vs. Estimated Water Availability (factoring in the reserve flow to be protected)..
 - Summary Plan for future abstraction.
 - Demonstration Content for Meetings on Meters and Drip Irrigation prepared.
- Metered Connections on all Individual and Institutional water users.

6.2. Targets

- Develop water allocation plans
- Enforce legal water abstraction

6.3. Proposed Outputs

- Water allocation plan developed
 - Abstraction survey
 - Compliance on abstraction increased
- Water use efficiency survey

6.4. Proposed Activities

Table 6.1: Proposed activities

Target	<input type="checkbox"/> Develop water allocation plans <input type="checkbox"/> Enforce legal water abstraction		
Outputs	<input type="checkbox"/> Water allocation plan <input type="checkbox"/> Abstraction survey <input type="checkbox"/> Compliance to permit conditions on abstraction increased		
Activity	Sub activity	Timeframe	Budget
Surveillance and identification of illegal abstractors (Abstraction surveys)	<input type="checkbox"/> Abstraction survey	3 months	500,000
	<input type="checkbox"/> Prepare inventory and list of illegal abstractors	1 week	10,000
	<input type="checkbox"/> Inspect and monitor measuring devices installed by abstractors	Quarterly	100,000
	<input type="checkbox"/> Inspect water abstracted against water applied for in the water permit	Quarterly	100,000
Dialogue meetings with	Identify and Mobilize abstractors	1 month	50,000
	Hold 3 dialogue meetings with	6 months	300,000

illegal abstractors	abstractors		
Develop water allocation plan	<input type="checkbox"/> Develop TOR and procure a consultant.	1 months	80,000
	<input type="checkbox"/> Develop water allocation plan	3 months	400,000
	<input type="checkbox"/> Hold workshop to adopt water allocation plan	1 month	200,000
Water use efficiency survey	Develop TOR and procure a consultant	1 month	80,000
	Undertake water use efficiency survey	3 months	350,000
Seminar on water use efficiency	mobilize water users	1 month	50,000
	Conduct 3 day seminars on water use efficiency	3 month	300,000

7. RESOURCE PROTECTION

Water resource protection is concerned with the protection of both quantity and quality of water in its natural state. This is beneficial especially to rural communities who may not have access to treated water supplies. Water protection ensures the reserve quantity and quality is met.

7.1. Current Status

The Water Act 2002 defines the reserve as “that quantity and quality of water required to 1) satisfy basic human needs... and 2) protect aquatic ecosystems...” The study conducted to determine environmental flow requirements (the reserve) for Mara River only surveyed the Nyangores River during very low flows. There is therefore need to determine if the reserve recommendations are valid across a range of flow levels.

7.1.1. Protection of Reserve - Quantity

Currently, the intakes of the abstractors are not designed to automatically release the reserve flow to downstream users. The intakes are also sized to cater for the abstractor only and cannot accommodate additional abstractors.

7.1.2. Protection of Reserve - Quality

Sediment load analysis has not been carried out consistently on the river. However, the RWUA has proposed to enter into a MoU with WRMA to participate in water quality monitoring.

7.1.3. Pollution Surveys

Pollution status of the Nyangores River Basin is illustrated in the report of “Hydrometric Network design and guidance of water quality survey for Mara River” compiled under the NELSAP Mara river Basin Project. The surveys conducted include point and nonpoint sources of pollution, and solid waste disposal. An assessment of wastewater and solid waste disposal systems was also carried out.

7.1.4. Sources of Pollution

The pollution of Nyangores River is contributed by two sources, namely point and non-point sources pollution. Point source pollution emanates from wastewater discharged to the receiving waters via a pipe or drain including sewer facilities and slaughterhouse among others. Non point sources arise mainly from erosion occasioned by poor farming practices and quarrying and solid waste from households and the urban/market centers.

Point Source of Wastewater into the Nyangores River

The water quality survey in the Nyangores River Basin indicated that there is considerable pollution from point sources. These are highlighted in the sections presented below:

- a) *Municipal Wastewater.* There are a number of fast growing urban and market centers within the basin, some of which are situated very close to the rivers/tributaries. There is no sewerage system in the centers and the most common mode of human waste disposal is pit latrines with a few individual septic tanks. The towns and market centers include Bomet Municipality, Tenwek, Silibwet, Sigor, Kiptagich, Keringet, Olbutyo, among others.
- b) *Domestic Wastewater.* Septic tanks are a common a means of wastewater disposal in secondary schools, lodges and hotels in the basin. However, most of them are not properly designed. Due to the nature of soil in Bomet, septic tanks and pit latrines tend to fill up with water and overflow in the rainy season.
- c) *Cattle Dips.* These are mostly communal facilities for controlling ticks and other parasites on cattle. Some of the cattle dips like the Kapcheluch Cattle Dip are situated close to rivers.
- d) *Slaughter houses.* Almost all the market centers posses a slaughter house and the number of animals slaughtered daily depends on the size of the market. In some centers e.g. Bomet, there is a pit for the condemned parts of the carcass and the blood, but the water used for washing and cleaning the slaughter houses is disposed off overland, which eventually is subsequently washed into the rivers during the rains.
- e) *Car washing.* Car washing is common in Nyangores River where notorious sites are at Tenwek Bridge, Olbutyo Bridge, and Nyangores at Bomet.
- f) *Solid Waste Disposal.* Solid wastes are generated by domestic (from residential areas), commercial (market centers, hotels), industrial (Tea factories), healthcare (Tenwek Hospital, Longisa Hospital) and agricultural activities (agricultural packages, tins and chemical containers). The wastes which include, garbage and litter accumulate on the streets and other public places like markets. During storm events, they are washed into the rivers.

g) *Jua Kali Garages*. It is common for jua kali sheds in Bomet, Sigor, Olenguruone, Silibwet and other major urban centers to discharge waste oil and grease together with other petroleum products and solids into open channels and drainages that are subsequently flushed into the rivers.

Non - point Sources of Wastewater into the River

Sources of pollution are scattered across residential, agricultural, forested and urban landscape. Pollutants are transported to receiving water bodies in runoff following storm events or carried in irrigation return flows. Non-point source pollution is mainly by inappropriate land use and therefore can be controlled by improved land use management. The identified non-point source pollution in the basin includes the following:

(a) *Small scale subsistence farming*. The upper Nyangores catchment is dominated by small scale subsistence farms. The farms are smaller and farmers use agro-chemicals to increase crop yields. Pollution is caused by poor agricultural practices (misuse of agro-chemicals, farming on steep slopes, and soil and water conservation structures). The practice is more common in sub-basins

Where there are no tea bushes that act as buffer for soil conservation.

(b) *Overgrazing*. This is rampant in lower Nyangores where cattle rearing are the preferred activity due to the prevailing climatic condition. The animals water directly from the river and create cattle tracts which facilitate soil erosion.

(c) *River bank erosion*. Encroachment of riparian land through riverine cultivation and quarrying along River Nyangores contributes to the release of total suspended solids (TSS) into the rivers.

(d) *Deforestation of Mau Forest*. The encroachment of forest areas has exposed those areas to extensive soil erosion and surface water run-off.

(e) *Urban storm runoff*. Within the fast growing urban centers of Bomet, Tenwek, Olenguruone, Silibwet, Sigor, Tendwet, Olbutyo, and Longisa, there are large areas with impervious surfaces like roads and pavements. In these areas water does not easily infiltrate into the ground and instead water runs off into storm water drains. The water in these drains carries wastes directly to the rivers.

(f) *Road construction and quarrying*. Construction of Silibwet-Olenguruone, BometLitein, generates loose soils which are washed in to the rivers when it rains. Quarrying particularly at the hill tops in e.g. Sanchora hill in Longisa division accelerate hill top degradation which results soil erosion.

(g) *Bathing in the river*. This is very common in parts of Nyangores and residents even carry household goods, clothes, utensils to wash in the river.

7.1.5. Environmental Impact Assessments

An Environmental Impact Assessment Study (EIA) is a systematic assessment of the potential impacts that a proposed project may have on the natural and human environment and an analysis of mitigation options. The advantage of the EIA process is that through its constituent management plan it mitigates potential impacts on the quantity and quality of a water resource. The RWUA members and stakeholders have an obligation to give feedback to the lead expert conducting an EIA on the concerns regarding project impacts on the water resource.

In the Nyangores basin only large scale projects have in-built environmental management plan. The cumulative effects of smaller seemingly harmless projects should be considered.

7.1.6. Pollution & Effluent Control

There are no major pollution and effluent control plans. At the institutional level, Tenwek hospital has prepared an Effluent Discharge Control Plan.

7.1.7. Catchment and Groundwater Protection Areas

Catchment and groundwater protection areas have not been delineated.

7.2. Targets

- Expand determination of reserve flows for the Nyangores River
- Control of point (3) and non-point (7) sources of pollution
- Proper collection and disposal of solid waste

7.3. Proposed Outputs

- Specific reserve flows established for Nyangores River during normal and drought years
- Point and non-point sources of pollution surveyed
- Awareness on water pollution enhanced
- Communities sensitized on the use of sanitation facilities

7.4. Proposed Activities

Table 7.1: Proposed Activities

Target	<ul style="list-style-type: none"> <input type="checkbox"/> Expand determination of reserve flows for the Nyangores River <input type="checkbox"/> Control of point (3) and non-point (7) sources of pollution <input type="checkbox"/> Proper collection and disposal of solid waste
Outputs	<ul style="list-style-type: none"> <input type="checkbox"/> Specific reserve flow established for Nyangores River during normal and drought years <input type="checkbox"/> Point and non-point sources of pollution surveyed <input type="checkbox"/> Awareness on water pollution enhanced

	<ul style="list-style-type: none"> ○ Communities sensitized on the use of sanitation facilities ○ Clean and healthy environment 		
Activity	Sub activity	Timeframe	Budget
Determine the reserve flows for the Nyangores River	<ul style="list-style-type: none"> <input type="checkbox"/> Form team of specialists in key components of environmental flow assessment <input type="checkbox"/> Assess flows at sites in Nyangores sub catchment <input type="checkbox"/> Conduct assessment workshop to finalize recommendations 	9 months	1,000,000
Carry out pollution survey and create awareness on water pollution control	<ul style="list-style-type: none"> <input type="checkbox"/> To contract an expert to carry out pollution survey <input type="checkbox"/> Conduct sensitization meetings on pollution control 	3months	500,000
			150,000
Identification and registration of proper dumping sites.	Timely collection of solid waste.	6 months	750,000
Liaise with the relevant authorities	Training the stakeholders on segregation of waste products	3 months	150,000
Reduce, re-use and recycle of solid waste.	Mapping and planning on waste collection	2 months	50,000
Monitor implementation of EDCPs	<p>Hold consultative meetings with WRMA to identify areas for monitoring and agree on frequency</p> <p>Undertake monitoring</p>	3 years	300,000

8. CATCHMENT PROTECTION

This chapter describes the current status of the catchment in general. In specific, it discusses the surveys and conservation of riparian area, erosion/sediment surveys, soil and water conservation plans and Catchment rehabilitation. It proposes targets, outputs and activities.

8.1. Current Status

8.1.1. Surveys & Conservation of Riparian area

Currently, the riparian farmers plough up to the river while eucalyptus trees are planted near water sources such as springs and rivers. Surveys for riparian areas have not been done. More needs to be done for the entire basin to ascertain their status. Areas earmarked for riverbank protection have been identified along Nyangores. Protection of riparian areas such as spring sources has been done by the Association in collaboration with various partners but more needs to be done for there are a lot more springs and water sources that need protection and conservation. The following springs were identified Chepkirib in mrookyot, Kapmunyor in Sigor area, Kapsigirio, kipgeigei, Ainabwenk, Kipsegon, Chepchirik, mariango, Ngerian, Kaptorongo, Ngomwet, Kiptenden, Kweleta, Mugango, Kipkulumben and Cheberir springs.

8.1.2. Erosion/Sediment Surveys

Various erosion hot spots have been identified and some measures are being undertaken to address the issue. Priority areas include areas prone to erosion such as Tenwek, Mugango, Kyogong that are prone to erosion from overgrazing and deforestation but more needs to be done in terms of survey to determine the best approach to be used to address the problem. It is not known whether sediment load survey has been done. Sediment load survey will enable us know the sources of erosion and the magnitude to indicate where more emphasis should be laid.

8.1.3. Soil and Water Conservation Plans

Soil and water conservation plans have not been made, however, the RWUA members are working closely with the Ministry of Agriculture to come up with soil and water conservation plan. Farms which need the intervention will be identified and also demonstration farms identified.

8.1.4. Catchment Rehabilitation

There are several activities geared towards this activity which has taken place. However, more needs to be done. The following are some of the catchment activities currently on going: community a forestation initiatives, Spring protection, soil and water conservation initiatives, river bank protection initiatives, Awareness creation through various fora and Promotion of IGAs that support conservation.

NALEP currently operates in Mugango (Bomet Central division) with regard to soil and water conservation.

The main rehabilitation works that need to be undertaken are: formation of catchments management committees, terracing and contour ploughing. Other rehabilitation works includes; cover cropping after harvests, mixed cropping, leaving grass strips, river pegging and rehabilitation of eroded areas

8.2. Targets

- Protection of riparian, forested areas and catchment areas
- Promote soil and water conservation within the sub catchment

8.3. Proposed Outputs

- Erosion and sediment surveys
- Riparian land (hotspots) survey
- Soil and water conservation plan

8.4. Proposed Activities

Based on the current status of the sub catchment, the following activities were recommended

- Awareness creation on the status of the sub catchment
- Conduct surveys and prepare plans especially riparian land, erosion and sediment, soil and water conservation plans
- Catchment rehabilitation by Planting of indigenous trees on riparian land and forested areas
- Carry out sensitization meetings on requirements of riparian distance

Marking and vegetating the riparian land

- Conduct soil erosion control measures
- Cut and remove eucalyptus trees from spring/river banks and replace with fruit trees
- provide alternative energy saving techniques

Table 8.1: proposed activities

Target	Protection of riparian, forested areas and catchment areas Promote soil and water conservation within the sub catchment		
Outputs	<input type="checkbox"/> Riparian land survey report <input type="checkbox"/> Erosion and sediment surveys <input type="checkbox"/> Soil and water conservation Plan		
Activity	Sub activity	Timeframe	Budget
Awareness creation	Form catchment/spring/soil management committees.	1 Month	50,000
Conduct surveys and prepare plans	Conduct survey and peg riparian areas that require conservation	6 months	300,000
	Conduct erosion/sediment	6 months	450,000

	surveys and prepare soil and water conservation plans;		
Catchment rehabilitation by Planting of indigenous trees on riparian land and forested areas	Training of tree nursery management committees.	3 Month	100,000
	Establish 35 tree nurseries	2 months	200,000
	Establish of wood lots on farm and hilltops.	4 Months	250,000
Carry out sensitization meetings on requirements of riparian distance	Mobilize communities	1 month	40,000
	Sensitize and capacity build communities and members on riparian distance	2 Months	100,000
Marking and vegetating the riparian land	Riparian area demarcation and placing the beacons/pegs	1 year	300,000
	Procure water friendly seedlings	3 months	450,000
	Plant seedlings on the degraded riparian areas (labour)	1 year	150,000
soil erosion control	Lay out of soil conservation structures	6 months	500,000
To remove the eucalyptus trees from spring/river banks and replace with fruit trees	carry out sensitization meetings	3 months	100,000
	Removal of blue gums	1 year	200,000
	purchase and plant 60,000 fruit tree seedlings	1 Year	500,000
provide alternative energy saving techniques	Produce and market fuel efficient Jikos	1 year	500,000
	Promote use of fuel efficient Jikos	1 Year	30,000

9. INSTITUTIONAL DEVELOPMENT

This chapter describes the current status of the committee Capacity building and the stakeholder coordination activities in general. The capacity building section gives an exposition of membership sensitization, mobilization, communication, facilities and human resource development. In specific, it discusses details of membership sensitization, mobilization facilities and human resource development. The target and outputs are provided in part 2 and 3 respectively. Based on the condition of the catchment committee several activities have been proposed

9.1. Current Status

9.1.1. Committee Capacity Building

Membership Sensitisation

Based on the transect walk conducted during the members and stakeholders workshop it was found that substantially the committee members are not known. Even to the members themselves, the roles and responsibilities of a committee is not on their fingertips. This renders the position of the members in playing their role in water resources management in great jeopardy. With a membership of over 100 there is not only a great potential of a robust membership, but also a critical mass to play significant water resource manager role within the basin.

Mobilisation

Nyangores catchment committee is soundly mobilised in matters of water conservation. With the help of other players, especially WWF and USAID ProMara Program the committee members are taking up initiatives that address catchment degradation and river bank rehabilitation from the three segments of the sub catchment.

Communication

Currently the Association do not operate a post office address. It only receives correspondences through a private address. There is need for a formal post office address. The committee has an e-mail address. Besides, Management Committee members pass information to the grassroots. In fact, communication system of passing information to the both members and communities are needed so as to adapt to the changing trends in information dissemination.

Human Resource Development

The association has put in place the leadership structure as part of its human resources development. But this is as far as it goes. It does not have employed staff to carry out day-to-day operations while the organizational activities are implemented by board members representing the sub catchment. Often, the member of the board sits in the bigger Mara RWUA board.

Facilities

Survey on the existing facilities of the Catchment committee shows that currently the Association have not facility it may call its own. Some of the facilities which the Committee would have include; office space, computers, telephone, communication facilities and furniture among others. Which the magnitude of water resources management it is important these facilities be available

9.1.2. Stakeholder Coordination Activities

Roles and Responsibilities

The identification of stakeholder roles and responsibilities was based on experiences from those the RWUA have been collaborating and partnering with. In this regard, the Association indicated during a SCMP development workshop, that they collaborate with various stakeholders and partners. Some of them and their roles are listed in table 9.1.2:

Table 9.1: Stakeholder, Responsibility Matrix

Stake holder	Responsibility
Water Service providers such as Chemosit water supply, Chepalungu,	Water service provision Ensure Water use efficiently Participate in WRUA operations
Schools and other institutions	users and part of direct beneficiaries Participate in implementation of the SCMP
Ministry of Water and Irrigation	Policy formulation Enforcement of the Water Act
Water Resources Management Authority, WRMA	<input type="checkbox"/> Issues water permit <input type="checkbox"/> training on water resources management
Lake Victoria South Water Services Board	Technical advice Water service provider licensing Asset development
National Environmental Authority, NEMA	<input type="checkbox"/> In charge of environmental legislation EMCA enforcement <input type="checkbox"/> Issue EIA certificates for major developments <input type="checkbox"/>
Ministry of Environment and Natural Resources	Policy formulation for forest resource management and exploitation <input type="checkbox"/> Policy formulation <input type="checkbox"/> Technical advice on forest oriented ventures
Ministry of Agriculture	Policy formulation on land use and conservation Farm planning methods Enforcing the agriculture Act
Ministry of Social services	Policy formulation on gender issues
World Wide Fund for Nature, WWF	<input type="checkbox"/> Capacity building and assist in putting up soil conservation structures <input type="checkbox"/> Provision of baseline data <input type="checkbox"/> Partner in the implementation of SCMP

	<ul style="list-style-type: none"> <input type="checkbox"/> Support the process for reserve flow establishment and water allocation plans <input type="checkbox"/> Support stakeholder mobilisation and awareness <input type="checkbox"/> Support the setting up on demonstration sites for best management practices on land use and water conservation issues <input type="checkbox"/> Support documentation of best practices and sharing of lessons learnt <input type="checkbox"/> Support on Trans-boundary Water Resources Management issues in conjunction with LVBC - EAC
Other institutions	These will be approached in the various areas that they may be of assistance
USAID ProMara Program Implemented by ARD Inc	<ul style="list-style-type: none"> <input type="checkbox"/> Improvement of Land and resources Tenure <input type="checkbox"/> Restoration/protection of critical catchments, forest and biodiversity <input type="checkbox"/> Improvement of livelihood of catchment residents <input type="checkbox"/> Mara-Mau outreach centre
Kenya Forest Service, KFS	<input type="checkbox"/> Management of forest of the Mau complex
Ministry of Public Health	<ul style="list-style-type: none"> <input type="checkbox"/> Sanitation and hygiene <input type="checkbox"/> Control diseases caused by poor hygiene
Bomet County	<ul style="list-style-type: none"> <input type="checkbox"/> Delivery of services to residents <input type="checkbox"/> Infrastructure development
Bomet Municipality	<ul style="list-style-type: none"> <input type="checkbox"/> Provision of water supply and sanitation <input type="checkbox"/> Provide residents with goods and services including waste management <input type="checkbox"/> Spring protection within the Municipal locality <input type="checkbox"/> By-laws development for water resources management
Tenwek Hospital	<ul style="list-style-type: none"> <input type="checkbox"/> Ensure safe disposal of medical waste <input type="checkbox"/> Participate in RWUA activities
Kenya Wildlife Service, KWS	<input type="checkbox"/> Protection of wildlife in the protected areas
Narok South County Council	<ul style="list-style-type: none"> <input type="checkbox"/> Spring protection within the council <input type="checkbox"/> By-laws development for water resources management
Lake Victoria Basin Commission	<ul style="list-style-type: none"> <input type="checkbox"/> Support harmonisation of procedures and standards for water quantity and quality monitoring <input type="checkbox"/> Support trans-boundary water resources users forum

Source: Nyangores RWUA, 2011

The table shows that there are many stakeholders within the sub catchment undertaking different levels of activities. These activities are seen in the myriad roles ranging from water resources management, water service provision, legislation on water and environment and harmonisation of laws and procedures. Other roles include;

It will be important that stakeholder coordination be undertaken recognising their roles and responsibility. The mechanism of coordination will encompass annual stakeholder meetings to encourage them to participate in water resources management.

9.2. Targets

Nyangores RWUA capacity built in order to effectively implement integrated water resources management activities within the sub catchment

9.3. Proposed Outputs

- Established RWUA office
- Registration of members increased
- Data and information on community and stakeholder’s awareness on WRUA roles and responsibilities available

9.4. Proposed Activities

Based on the current statues of the RWUA institutional development, the following activities will be taken to enhance the capacity of RWUA members and stakeholders in undertaking water resources management within the sub catchment.

- Conduct mobilization and sensitization of community members and stakeholders on roles and responsibilities of a RWUA in water resources management
 - Purchase 2 acres plot and develop the office infrastructure
 - Equip the office
 - initiate income generating activities and circulate communication materials
 - To organize and make exchange tour to successful RWUAs for skills acquisition
- Support Stakeholder coordination forums

Table 9.2: Proposed Activities

Target	Nyangores WRUA member’s capacity built in order to effectively implement integrated water resources management activities within the sub catchment
Outputs	<ul style="list-style-type: none"> <input type="checkbox"/> Registration of members increased <input type="checkbox"/> Data and/or information on community and stakeholder’s awareness on WRUA roles and responsibilities available <input type="checkbox"/> Established WRUA office <input type="checkbox"/> Linkages amongst collaborators created

Activity	Sub activity	Timeframe	Budget
Conduct mobilization and sensitization meetings on roles and responsibilities in water resources management	identify and mobilize communities and stakeholders to join RWUA	1 month	20,000
	Carry out sensitization meetings/workshop, and barazas	1 month	100,000
	Conduct registration of members into the RWUA	continuous	50,000
Purchase 2 acres plot and develop the office infrastructure	<input type="checkbox"/> To identify and purchase the land	1 year	600,000
	<input type="checkbox"/> Carry out construction work		2,000,000
	<input type="checkbox"/> To purchase of office equipment/ furniture/motor bike		1,000,000
	<input type="checkbox"/> Carry out recruitment and pay of staff		500,000
Equip office	<input type="checkbox"/> Establish and/or acquire postal address, e-mail	1 month	108,000
	<input type="checkbox"/> Procure office furniture, computer and telephone	3 months	200,000
initiate income generating activities and circulate communication materials	<input type="checkbox"/> To identify and initiate the viable enterprises	3 months	200,000
	<input type="checkbox"/> Training on business management skills	3 months	60,000
	<input type="checkbox"/> Publication of I.E.C materials	Quarterly	100,000
To organize and make exchange tour to successful RWUAs for skills acquisition	<input type="checkbox"/> Make visits to the identified RWUAs	1 month	150,000
	<input type="checkbox"/> Report writing and documentation	1 month	10,000
Support Stakeholder coordination forums	<input type="checkbox"/> Carry out annual stakeholder meetings	yearly	300,000

10. INFRASTRUCTURE DEVELOPMENT

This chapter discusses the issues of water storage through the construction of water conservation structures to ensure sustainable water availability to meet current and future demand.

10.1. Current Status

10.1.1. Storage at Different Levels

The upper part of the catchment is endowed with plenty of rainfall while the lower part experiences semi arid conditions. This therefore creates a suitable condition for rain water harvesting at the upper catchment and development of water pans in the lower part.

Currently there are only two dams and a number of pans, most of them are silted. These include Tenwek Mission dam and Chebara dam. However, during validation workshop of 23rd June 2011 participant's further identified the following dams; Cheboin dam, Keringet, Kamanyowa, Kapkores and Kapsimbeiywo. Rainwater harvesting at household level is not widely practised.

The main source of water for domestic use in the upper catchment is unprotected springs which include Bararget, Milimet, Kapkwen and Kapkoin. There is need to protect 10 additional springs in mid and upper catchments. Weirs are constructed across the river to aid water abstraction by major abstractors such as Kaboson Irrigation Project, Tenwek Mission Hospital and all the water supplies with a provision to allow reserve flow.

Boreholes and shallow wells are mainly used in the mid and lower parts of the catchment. As the demand for water increases so the need for storage to meet the demand.



Tenwek Dam

Tenwek Community protected spring

Figure 9.1: Field Photos

10.1.2. Groundwater Storage

The data on groundwater storage is not available

10.1.3. Flood Mitigation

Flood is not a major problem in Nyangores river basin but occasional flush floods are experienced. Storage is not considered an issue in the upper and middle zones due to reliable rainfall.

10.2. Targets

- To improve water storage within the sub catchment of Nyangores River
- To promote awareness and development of roof water harvesting, dams and water pans
- To protect springs to improve water quantity

10.3. Proposed Outputs

- Household water storage and utilization of alternative water sources increased
- Water availability increased
- Improved water quality of springs

10.4. Proposed Activities

Table 10.1: Proposed Activities

Target	<input type="checkbox"/> To improve water storage within the sub catchment of Nyangores River <input type="checkbox"/> To promote awareness and development roof water harvesting, dams and water pans <input type="checkbox"/> To protect 10 No. springs to improve water quality		
Outputs	<input type="checkbox"/> utilization and exploitation of alternative water sources increased <input type="checkbox"/> water storage increased <input type="checkbox"/> Improved water quality of springs		
Activity	Sub activity	Timeframe	Budget
Develop infrastructure for alternative water sources (dams, pans , roof catchment, boreholes)	Sensitize and build capacity of WRUA members and community on alternative water sources.	1 month	250,000
	Conduct hydro-geological Surveys and designs of pans and 1No. check dams	3months	100,000
	Submission of reports for approval and authorization	1 month	20,000

	Procure contractor and construct check/small dam.	2 Years	4,000,000
	Rehabilitate existing 4No. water pans	1 year	2,000,000
Rain water harvesting	Install 10No. rain water harvesting system within local institutions (schools, churches, dispensaries)	3 Years	1,000,000
	Identify new storage sites	3 months	20,000
Spring protection	Identify springs	3 months	50,000
	10No. spring protection	2 years	1,000,000

11. RIGHTS BASED APPROACH / POVERTY REDUCTION

Water is both a social and economic good. Humans have a right to access water. This means that people's needs of water and also the needs of ecosystems upon which their livelihood depends. This basic right should not be denied. In the rights based approach to resource management, rights holders have entitlements as well as responsibilities while duty bearers have obligations to meet.

This chapter describes the current threats to water rights, conflict, gender and environment issues, and sustainable livelihoods.

11.1. Current Status

The right of access to water resources is enshrined in the National Constitution and in the Water Act 2002. In this SCMP issue of rights based approaches are dealt with in individual chapters (5-10). However, in this chapter it is considered important to expressly address issues that might otherwise jeopardize observance of the rights to water of the people of Nyangores River basin.

11.1.1. Threats to Water Rights

The threats to water rights arise from

- Clearing vegetation to pave way for agriculture
- Charcoal burning by the residents as a means of raising income;
- Sand harvesting by some residents as a means of raising income.

11.1.2. Conflicts

Currently water conflicts are minimal largely because most people can access water, but if the continued degradation is not checked there is a potential for the following conflicts to arise:

- Conflict between industrial and domestic use;
- Water for agriculture and livestock;
- Trans-boundary water resource allocation.

In order to prevent conflicts on water resources the design of programmes should incorporate the concerns and rights of all.

11.1.3. Gender Issues

- Currently all decisions made as far as water resources management is concerned is predominantly male oriented. There is need to get the youth and female gender who are the more marginalised groups into the decision making process to make them identify with the decisions being.
- Currently the RWUA has 20% women and 20% youth representation in its management committee.

11.1.4. Environmental Issues

Environmental issues are not streamlined in the WRUAs activities. There is need to ensure that at all levels environmental issues are addressed and that mitigation measures are articulate and implemented in order to protect water rights

11.1.5. Sustainable Livelihood

The Nyangores basin is one of the most populous areas in Kenya. This has put a lot of pressure on natural resources including water. The rampant charcoal burning, sand harvesting and other livelihood activities are not geared towards ensuring sustainability. There is need to identify and practice alternative livelihood activities. On a small scale some communities are already engaged in dairy goat rearing and fruit farming

11.2. Targets

Ensure equitable access to water by all water users and uses within the Sub-Catchment.

11.3. Proposed Outputs

- Gender and environmental issues streamlined within the WRUA;
- Sustainable livelihood practiced within the upper zone of the sub-catchment; Protection of human and environmental rights to water

11.4. Proposed Activities

Table 11.1: Proposed Activities

Target	Ensure equitable access to water by all water users and uses within the Sub-Catchment.		
Outputs	<input type="checkbox"/> Gender and environmental issues streamlined within the WRUA; <input type="checkbox"/> Sustainable livelihood practiced within the upper zone of the sub-catchment; <input type="checkbox"/> Protection of human and environmental rights to water		
Activity	Sub activity	Timeframe	Budget
Streamlining of gender concerns in RWUA management	Increase women and youth representation in the management committee by at least 10% through AGM and election process	2 years	30,000
Introduction of alternate (sustainable) livelihood activities	Promote dairy goat rearing introduced to 30 women and 20 more youth	3years	150,000
	Promote fruit farming - 120 additional farmers	3 years	250000
	Green house horticulture - 60 additional farmers	3 years	900,000

12. MONITORING AND INFORMATION

This chapter presents the strategy for ensuring that water resources management and catchment monitoring system capture adequate and accurate data. To ensure this, both hydrometric and ground water monitoring stations should be operational and additional stations established.

12.1. Current Status

Water resource monitoring and network design and rehabilitation is done by WRMA. Riparian community members however are involved in the recording of daily water levels which are then forwarded to WRMA. There are plans to involve the WRUA in collection of some water quality parameters

12.1.1. Water Resource Monitoring

Three river monitoring stations are established but only two are operational. A detailed status of the RGS stations is presented in the sections presented below.

a) *RGS 1LA01 on Nyangores River.* The station is located approximately 100m upstream of Tenwek Bridge. Scanty data is available between 15-Jan-1951 and 12-Nov-77. The station has a good natural control of rock outcrop in the riverbed, straight channel and is not accessible from the left bank.

b) *RGS 1LA02 on Nyangores River.* There is some scanty gauge height data, which shows that the station was operational from 12-Feb-1987 to 28-Feb-1987. From the geo-referenced information, the station was located near Keringet, in the upper Nyangores catchment.

c) *RGS 1LA03 on Nyangores River.* The river gauging station is located 20m upstream of the Bomet Bridge on Bomet-Narok road. The station has three (0-1.5m, 1.5-3m and 3-4.5m) staff gauges that are anchored on posts and struts situated on the right bank of the river. The position of the staff gauges that were installed on 23-October-1963 is in the same place.

. Previously, an automatic water level recorder, a pressure sensor of the „diver type was installed in 1999 by the LVEMP I project.

However, the life battery of the diver expired in 2005. The management unit RGS station 1LA03 has an artificial weir of the rectangular type weir that was constructed to impound river flow for the purpose of water supply to Bomet town. The weir is in good condition but gets completely covered during medium to high flows. During the dry season the weir is exposed and used as a pool and washing place by local residents.

Status of Rainfall and Climatic Network

Water level monitoring schemes should be designed that clearly indicate when reserve flows are being threatened and abstraction levels are required by law to decrease or cease altogether. The RWUA could facilitate communication about reserve levels and any abstraction restrictions to water users in the Nyangores sub-catchment.

- a) **Rainfall Stations.** The Nyangores River Basin has 5 rainfall stations that have a long history (more than 30 years) of data records. The stations are owned by Kenya Meteorological Department, WRMA and Tea Factories. Some stations were abandoned 10-20 years ago, either because of lack of an observer or were no longer required.
- b) **Climatic stations.** There are only three sub-met stations spread in the Nyangores Basin.

12.1.2. Water Quality Monitoring

Currently, the WRUA does not undertake water quality monitoring. WRMA undertakes water quality monitoring at RGS 1LA03 on a quarterly basis. Both physical and chemical parameters are measured insitu and water samples taken for analysis in the laboratory which include biological parameters. Additional water quality stations should be established at 1LA01 and 1LA02.

12.1.3. Water Use Monitoring (Master Meters)

Currently the WRUA does not undertake water use monitoring. This activity is undertaken by WRMA. All ground water abstractors are required to install master meters. Once this is done, the WRUA can be involved in the monitoring of ground water use.

12.1.4. Pollution Monitoring

Currently, the RWUA does not undertake pollution monitoring. For effective monitoring the RWUA manager and committee will patrol the resource and monitor the flows, use, compliance to permit regulations and pollution issues.

12.2. Targets

To establish a river monitoring network and share information amongst all water users

12.3. Proposed Outputs

- Database for river flows, water use, and water quality within the catchment.
- Information shared among the WRUA members and the general public on the status (including financial status) of the Nyangores River basin.

12.4. Proposed Activities

Table 12.1: Proposed Activities

Target	To establish a river monitoring network and share information amongst all water users		
Outputs	<ul style="list-style-type: none"> <input type="checkbox"/> Database for river flows, water use, and water quality within the catchment. <input type="checkbox"/> Information shared among the RWUA members and the general public on the status (including financial status) of Nyangores River basin. 		
Activity	Sub Activity	Timeframe	Budget
Rehabilitation and installation of hydrometric network	Installation/rehabilitation of two RGSs and two climatic stations	1 year	500,000
	Installation/rehabilitation of five climatic stations	1 year	200,000
Monitoring	Training on water level, water quality, pollution, climatic monitoring and meter reading	2 months	200,000
	Water quality water level and climatic data collection	continuous	100,000
	Monitoring for compliance to permit conditions(meter readings)	continuous	100,000
Creation of Information Centre	Procurement of centre space	2 months	500,000
	Purchase of computers and other IT equipment	3 months	500,000
	Training on computer packages and ICT	4 month	50,000
Information Dissemination	Radio programmes and advertisements	continuous	300,000
	Production of newsletters, brochures, flyers, calendars and T-shirts	1 year	300,000
	Production of video documentary	1 year	200,000
	Attend community barazas and public holidays	1 year	150,000

13. FINANCING AND IMPLEMENTATION

This chapter describes the current RWUA operational budget, mechanisms to meet RWUA's Operational budget and SCMP investment budget. It also highlights Mechanisms to raise SCMP investment budget. Finally, the chapter proposes targets, outputs and activities that will be undertaken in order to be able to implement water development projects through the RWUA Development Cycle, WDC

13.1. Current Status

13.1.1. RWUA Operational Budget

RWUA operational budget is based on the contributions and payment made to it by the members. Currently the Association is self sponsored. The operational budget consists of three key elements namely; communication, transport, meals and hiring of hall for meeting and conferences as shown in table 13.1

Table 13.1: Nyangores RWUA's Operational Budget

Item	Annual budget (Kshs)
Communication	40,000
Transport	60,000
meals	70,000
Hiring hall for members meetings and conferences	100,000
Total	270,000

Table 13.2: Nyangores RWUA's Revenues

Item	Annual budget (Kshs)
WWF grant	500,000
Subscriptions	120,000
Voluntary member's contributions	100,000
Trading income (Nyangores RWUA will apply to be an agent of WRMA)	50,000
Funds from Development partners (USAID ProMara Program Implemented by ARD Inc)	500,000
Other Sources	3,000,000
Total	4,270,000

13.1.2. Mechanisms to meet RWUA's Operational Budget

- Increase income generating activities of the RWUA to match the annual expenditure through tree nurseries and improved Jikos;
- Proposal writing to development partners such as WWF and CDTF;
- Request for funds from Waters Service Trust Fund, WSTF through WRMA within the WDC funding mechanism

13.1.3. SCMP investment budget

The SCMP investment budget is Kshs 28,739,000. Detailed budget is attached in **Annex 1.**

13.1.4. Mechanisms to Raise SCMP Investment Budget

- WDC (WSTF) Kshs 23,739,000;
- Partners such as WWF, Ksh 500,000
- USAID ProMara Program. Kshs 500,000
- Mara River Water Resource users Association contribution in Kind Kshs 500,000.
- Other donors Kshs 3,500,000.

13.2. Targets

To achieve financial sustainability and accountability

13.3. Proposed Outputs

Financial accounting system in place and WRUA capable of meeting its operational budget

13.4. Proposed Activities

In order to achieve financial sustainability, the WRUA will undertake the following activities as shown in the table 13.4

- Review members contributions with a view of adjustment
- Training of members on procurement, tendering and financial management systems
- Conduct internal and external audits
- Promote income generating activities for the Association

Table 13.3: Proposed Activities			
Target Outputs	To achieve financial sustainability and accountability Financial accounting system in place and WRUA capable of meeting its operational budget		
Activity	Sub activity	Timeframe	Budget
Review members contributions with a view of adjustment	Conduct contribution review meetings	1 month	20,000
	Call an annual general meeting to approve membership contributions	6 months	150,000
Training of members on procurement, tendering and financial	Hold training workshop on procurement, tendering and financial management	3 months	200,000

management systems			
Conduct internal and external audits	Carry out internal audit	1 month	50,000
	Carry out external audit	2 months	100,000
Promote income generating activities for the Association	Market, promote and sell energy saving Jikos	3 months	50,000
	Start Dairy Goat project	6 months	150,000
	Establish and selling of water friendly seedlings	Continuous	100,000
	Bee Keeping	6 months	100,000
Seek donor support by developing proposal	Write proposals for funding	1 month	20,000
	Prepare Request for Funds to WSTF	3 months	30,000

	Target	To establish available water in Nyangores sub catchment																		
		To establish the water demand for the Nyangores sub catchment																		
	Output	Inventory of Water Sources																		
		Register of water abstractors and amounts of water abstracted																		
		Establish the flows at different reaches along Nyangores River																		
		Establish ground water availability																		
	Activity	Sub Activity																		
	Make Inventory of all water sources	assist to geo-reference the springs, dams pans, well and boreholes	1	200,000																
		Produce map overlay and register	1	50,000																
	Carry out discharge and water quality measurement at three stations along Amala River	Daily water level measurements (readings)	1	50,000																
		Quarterly discharge measurements	1	50,000																
		Data compilation and analysis	1	50,000																
	Carry out ground water availability estimates	Engage consultant to carry out ground water aquifer survey	2	300,000																
	Carry out abstraction survey	Compute the amount of water abstracted	3	0																
6	Water Allocation																			
	Target	Develop water allocation plans																		
		Enforce legal water abstraction																		
	Output	Water allocation plan																		
		Abstraction survey																		
		Compliance to permit conditions on abstraction increased																		
	Activity	Sub Activity																		
	Surveillance and identification of illegal abstractors (Abstraction surveys)	Abstraction survey	1	500,000																
		Prepare inventory and list of illegal abstractors	1	10,000																
		Inspect and monitor measuring devices installed by abstractors	1	100,000																
		Inspect water abstracted against water applied for in the water permit	1	100,000																

	Dialogue meetings with illegal abstractors	Identify and Mobilize abstractors for a dialogue meeting	1	50,000																	
		Hold 3 dialogue meetings with abstractors	2	300,000																	
	Develop water allocation plan	Develop TOR and procure a consultant for water allocation plan.	2	80,000																	
		Develop water allocation plan	2	400,000																	
		Hold workshop to adopt water allocation plan	2	200,000																	
	Water use efficiency survey	Develop TOR and procure a consultant	2	80,000																	
		Undertake water use efficiency survey	3	350,000																	
	Seminar on water use efficiency	mobilize water users	3	50,000																	
		Conduct 3 day seminars on water use efficiency	3	300,000																	
7	Resource Protection																				
	Target	Control of point (3) and non point (7)sources of pollution																			
		Proper collection and disposal of solid waste																			
	Output	Point and non point sources of pollution surveyed																			
		Awareness on water pollution enhanced																			
		Communities sensitized on the use of sanitation facilities																			
		Clean and healthy environment																			
	Activity	Sub Activity																			
	Carry out pollution survey and create awareness on water pollution control	To contract an expert to carry out pollution survey	1	500,000																	
		Conduct sensitization meetings on pollution control	1	150,000																	
	Identification and registration of proper dumping sites.	Timely collection of solid waste.	1	750,000																	
	Liaise with the relevant authorities	Training the stakeholders on segregation of waste products	1	150,000																	
	Reduce, re-use and recycle of solid waste.	Mapping and planning on waste collection system within the sub catchment	1	50,000																	
	Monitor implementation of EDCPs	Hold consultative meetings with WRMA to identify areas for monitoring and agree on frequency	1	50,000																	

10	Infrastructure Development																		
	Target	To improve water storage within the sub catchment of Nyangores River																	
		To promote awareness and development roof water harvesting, dams and water pans																	
		To protect 10 No. springs to improve water quality																	
	Output	utilization and exploitation of alternative water sources increased																	
		water storage increased																	
		Improved water quality of springs																	
	Activity	Sub Activity																	
	Develop infrastructure for alternative water sources (dams, pans , roof catchment, boreholes)	Sensitize and build capacity of WRUA members and community on alternative water sources.	1	250,000															
		Conduct hydro-geological Surveys and designs of pans and 1No. check dams	1	100,000															
		Submission of reports for approval and authorization	1	20,000															
		Procure contractor and construct check/small dam.	2	4,000,000															
		Rehabilitate existing 4No. water pans	2	2,000,000															
	Rain water harvesting	Install 10No. rain water harvesting system within local institutions (schools, churches, dispensaries)	2	1,000,000															
		Identify new storage sites	2	20,000															
	Spring protection	Identify springs	3	50,000															
		10No. spring protection	2	1,000,000															
11	Rights Based Approach																		
	Target	Ensure equitable access to water by all water users and uses within the Sub-Catchment.																	
	Outputs	Gender and environmental issues streamlined within the RWUA;																	
		Sustainable livelihood practiced within the upper zone of the sub-catchment;																	

Activity	Sub activity																			
	Protection of human and environmental rights to water																			
Streamlining of gender concerns in RWUA management	Increase women and youth representation in the management committee by at least 10% through AGM and election process	1	30,000																	
Introduction of alternate (sustainable) livelihood activities	Promote dairy goat rearing introduced to 30 women and 20 more youth	2	150,000																	
	Promote fruit farming - 120 additional farmers	2	250,000																	
	Green house horticulture - 60 additional farmers	3	900,000																	
12 Monitoring and Information																				
Target	To establish a river monitoring network and share information amongst all water users																			
Outputs	Database for river flows, water use, and water quality within the catchment.																			
	Information shared among the WRUA members and the general public on the status (including financial status) of Nyangores River basin.																			
Activity	Sub Activity																			
Rehabilitation and installation of hydrometric network	Installation/rehabilitation of two RGSS and two climatic stations	1	500,000																	
	Installation/rehabilitation of five climatic stations	1	200,000																	
Monitoring	Training on water level, water quality, pollution, climatic monitoring and meter reading	1	200,000																	
	Water quality water level and climatic data collection	1	100,000																	
	Monitoring for compliance to permit conditions(meter readings)	1	100,000																	
Creation of Information Centre	Procurement of centre space	2	500,000																	
	Purchase of computers and other IT equipment	2	500,000																	
	Training on computer packages and ICT	2	50,000																	

Nyangores Sub Catchment Management Plan

	Information Dissemination	Radio programmes and advertisements	2	300,000																
		Production of newsletters, brochures, flyers, calendars and T-shirts	1	300,000																
		Production of video documentary	3	200,000																
		Attend community barazas and public holidays	1	150,000																
13	Financing and Implementation																			
	Target	To achieve financial sustainability and accountability																		
	Outputs	Financial accounting system in place and RWUA capable of meeting its operational budget																		
	Activity	Sub activity																		
	Review members contributions with a view of adjustment	Conduct contribution review meetings	1	20,000																
		Call an annual general meeting to approve membership contributions	1	150,000																
	Training of members on procurement, tendering and financial management systems	Hold training workshop on procurement, tendering and financial management	1	200,000																
	Conduct internal and external audits	Carry out internal audit	1	50,000																
		Carry out external audit	2	100,000																
	Promote income generating activities for the Association	Market, promote and sell energy saving Jikos	3	50,000																
		Start Dairy Goat project	3	150,000																
		Establish and selling of water friendly seedlings	1	100,000																
		Bee Keeping	2	100,000																
	Seek donor support by developing proposal	Write proposals for funding	1	20,000																
		Prepare Request for Funds to WSTF	1	30,000																
	Grand Total			28,739,000	23,739,000	500,000	500,000	4,000,000												

ANNEX 2: LIST OF PARTICIPANTS




WATER RESOURCES MANAGEMENT AUTHORITY


TITLE: Meeting Attendance Form	REF. NO: F/18/1
	ISSUE NO: 01
DEPARTMENT: Management Representative	REV. NO: 1
ISSUED BY: MR	DATE OF ISSUE: 19 th May, 2010
AUTHORIZED BY: CEO	PAGE: 1 of 2

SUBJECT: ADOPTION OF NYANGOLEN SCMP
 VENUE: TWIGS HOTEL, BOMET COUNTY
 DATE: 23rd JUNE 2011 TIME: 8:00 a.m.

S/No	NAME	Designation	P/No	Signature
1	DAVE RODOU	NWRUA	072092482	<i>[Signature]</i>
2	MRS RODOU C. MOKET	WRUA	071195154	<i>[Signature]</i>
3	SHEPHERD NGAO	WRUA	071175048	<i>[Signature]</i>
4	JOSEPH BETT	NWRUA	0722786269	<i>[Signature]</i>
5	Rose Chutai	WRUA	072036223	<i>[Signature]</i>
6	MOM MONICA C. RENO	WRUA	07291652140	<i>[Signature]</i>
7	BENARD LANGAT	WRUA	0720521157	<i>[Signature]</i>
8	KIPRONOH VINCENT	WRUA	072016181	<i>[Signature]</i>
9	David Malel	WRUA	072033338	<i>[Signature]</i>
10	PHILIMON KOSIANGI	NWRUA	072042642	<i>[Signature]</i>
11	CICILIA TONETT	NWRUA	072073220	<i>[Signature]</i>
12	PHILIPINE CHEPKWONI	NWRUA	072042779	<i>[Signature]</i>
13	BENSON SETEK	NWRUA	072474636	<i>[Signature]</i>
14	NAURAI C. BIOGRI	NWRUA	071752148	<i>[Signature]</i>
15	CHRISTOPHER BOARICO	NWRUA	071272162	<i>[Signature]</i>
16	RICHARD MARITIM	WRUA	0720638926	<i>[Signature]</i>
17	MICHAEL ROTICH	WRUA	071050371	<i>[Signature]</i>
18	CHEPKEMOI ANN	NEMA	0721344366	<i>[Signature]</i>
19	KIORET ABDOLOM	NEMA	072633222	<i>[Signature]</i>
20	SAMMY M. RODO	WRUA	0729714415	<i>[Signature]</i>
21	MICHAEL KIROU	-WRUA (M)	0729719610	<i>[Signature]</i>
22	hermes Mainek	WRUA	072111504	<i>[Signature]</i>
23	Chibhaya Jerry A	PDO & Project	076233122	<i>[Signature]</i>
24	Matthews K.N. BARMAN	WRUA	0720509247	<i>[Signature]</i>
25	David K. Rotich	WRUA	0720638926	<i>[Signature]</i>
26	Caroline Toroitich	Promotee	07225666	<i>[Signature]</i>

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	AUTHORIZED BY: CEO	PAGE: 2 of 2

27.	JOSPH TOO	MEMBER NYANGORES	0712810771	OK
28.	CORNELIUS ROMOH	MEMBER	072480219	OK
29.	JOHN K. KEECH	ADMINISTRATIVE	0722222222	OK
30.	Vivian S. Sang	DFO - Capalungu	0723920018	OK
31.	Humphrey Mwangi Oson	DFO BOMET	0722966613	OK
32.	JACKSON M. MUIRO	NEMA-BOMET	0722255164	OK
33.	CHARLES JOHEK	WVF	0724799402	OK
34.	STEPHEN MUTHURI	DPHO'S OFFICE	0721140107	OK
35.	FRANCIS KONEO	DFO (M&A)	0722075173	OK
36.	DANIEL KOTIR	WRVA	0716881961	OK
37.	PASKALI CHERONO	C.D.A	07222222	OK
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42.	PATRICK MEFA	WRVA	072012016	OK
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44.				
45.				

Issued by: 
 (Management Representative)

Approved by: 
 (Chief Executive Officer)