

# NGARE NYTHING WRUA SUB-CATCHMENT MANAGEMENT PLAN (2023-2033)

**EWASO NG'IRO NORTH  
BASIN AREA**



Prepared by:  
WRUA members and others  
(Feb 2023)



Embassy of the Kingdom  
of the Netherlands



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## ACKNOWLEDGEMENTS

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Preparation and Review of NGARE NYTHING WRUA Sub-Catchment Management Plan (SCMP) was made possible through a collaborative effort between various stakeholders and the WRUA itself. NGARENYTHING WRUA is grateful to all individuals and institutions (stakeholders) who contributed materially or in kind making the process of SCMP Review and development exercise a success. Appreciation is first extended to SNV who facilitated in the financial inputs into the process, both to the community and the facilitators/trainers. The Water Resources

Authority (WRA) offered the technical support, expertise, coordination and logistical support in the entire activity. Secondly, the excellent coordination and facilitation provided by WRA ENNB Office (Nanyuki) and Middle ENNSBO (Isiolo) is gratefully acknowledged. As well, the support and valuable input in terms of local information from the local stakeholders proved pivotal in shaping the final outcome of this process and this is gratefully acknowledged. The internal stakeholders who were present and very much proactive are appreciated and encouraged. Some of these internal stakeholders include, Lewa conservancy, Flower farms represented by Kisima Farm LTD and Bloomingdale roses, Ngarendare Forest Trust, and Administration. A big thank you to all the WRUA members who patiently participated in the SCMP process, their enthusiastic support remains ever appreciated. Their total presences in the Hall, during transect walk and inquisitive questions and cooperation goes beyond our expectations in such forums.

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## EXECUTIVE SUMMARY

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NGARENYTHING Sub-Catchment Management Plan (SCMP) has been reviewed and enhanced to structure and guide the management of NGARENYTHING sub-catchment area, located within the ENNBA River Basin and stretches from Mt Kenya forest down to Ewaso Ngiro River, traversing Meru, Laikipia and Isiolo counties. The review and development of the Plan is the implementation of the provisions of the following policy and legal documents; Water Act 2016, Water Resources Management Rules 2021, and WRUA (Water Resources Users Association) Development Cycle 2014 (WDC) all which provide for the regulation and management use of water resources.

The SCMP was developed through a participatory process involving NGARENYTHING WRUA members and representatives from its stakeholders both internal and external. The process was guided by Water Resources Authority (WRA) and was funded by SNV. The SCMP will be implemented by NGARENYTHING in collaboration with other stakeholders under the supervision of the Water Resources Authority (WRA) administered through its Sub Basin Office, Middle Ewaso North Sub Basin with its office in Isiolo town, Isiolo County. The office shall be responsible for oversight role, providing technical standards, expertise and enforcing adherence to the law during the implementation of the SCMP activities.

NGARENYTHING sub-catchment covers an estimated area of 196.922 km<sup>2</sup> that fully lie within the Isiolo, Laikipia and Meru Counties. Therefore, the activities which are proposed in this SCMP are expected to be synchronized with those of the County Government of Isiolo Laikipia and Meru to ensure synergy during implementation of the Plan. The SCMP implementation will involve stakeholders from; public, private, civil society, development partners, and Inter-Governmental Organizations among others with emphasis put on creating a sustainable linkage between the WRUA and its implementation partners.

The main water resources related issues reported in NGARENYTHING sub-catchment include poor water resource infrastructure, catchment degradation, water pollution, encroachment on riparian land, illegal water abstraction, over abstraction and poor monitoring and information system, poor governance, climate change . The identified major cause of catchment degradation is soil erosion resulting from poor farming practices, deforestation and overgrazing. Most of water infrastructures in place are concentrated only in the Upper zone while Lower one has limited water structures. There is an urgent need for fair distributions of these water infrastructures in all demarcated zones equitably.

Water pollution is caused by direct watering at the water sources, encroachment of riparian land and sediment and nutrient/chemical transport from agricultural land. Encroachment on riparian land is as a result of lack of awareness on need to protect riparian and accessibility of water for irrigation. In addressing the challenges, various solution strategies have been proposed which include capacity building on water resource management, active participation of the WRUA in catchment and water resources protection, promotion of water resources provision, institutional strengthening and inclusion of sustainable livelihood activities with catchment conservation activities. Community awareness creation and WRUA capacity assessment should be a continuous exercise since lack of awareness and weak WRUA issues were raised as major concerns within the Wrua establishment and Management.

The budget and work plan for the activities has been formulated to address these areas in a Period of ten years starting February 2023 and ending in March 2033. The estimated budget to implement this SCMP is at **Ksh 409,883,380.00** the time of developing the SCMP. Inflation rates are applicable over the time of implementation. This budget will be contributed directly or indirectly by the aforementioned stakeholders. It is envisaged that by the end of the ten-year period there will be a balance of natural resource use and conservation within the NGARENYTHING sub-catchment with a focus on water management and use.

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ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
%	Percentage	PM	Procedure Manual
°C	Degrees Celsius	QMS	Quality Management System
AIDS	Acquired Immuno Deficiency Syndrome	RGS	Regular Gauging Station
APS	Abstraction and Pollution Survey	RQO	Resource Quality Objective
ASAL	Arid and Semi-Arid Lands	SCMP	Sub Catchment Management Plan
ASL	Above Sea Level	SWOT	Strengths, Weaknesses, Opportunities, and Threats
BH	Borehole	USGS	United States Geological Survey
BHN	Basic Human Need	WAP	Water Allocation Plan
BWRC	Basin Water Resource Committee	WDC	WRUA Development Cycle
CBOs	Community Based Organizations	WRA	Water Resources Authority
CIDP	County Integrated Development Plan	WRM	Water Resources Management
CMS	Catchment Management Strategy	WRUA	Water Resource Users Association
CMU	Catchment Management Unit	m <sup>3</sup> /day	Cubic Meters per Day
CoK	Constitution of Kenya	MCM	Million Cubic Meters
EC	Electrolytic Conductivity	MCM/yr.	Million Cubic Meters per Year
EDCP	Effluent Discharge Control Plan	MoA	Ministry of Agriculture
HIV	Human Immunodeficiency Virus	MoH	Ministry of Health
i.e.	‘that is’	MWI	Ministry of Water and Irrigation (currently Ministry of Water and Sanitation)
IWRM	Integrated Water Resources Management	NEMA	National Environmental Management Authority
KARLO	Kenya Agricultural and Livestock Research Organization	NIB	National Irrigation Board
KFS	Kenya Forest Service	NGOs	Non-Governmental Organizations
KM <sup>2</sup>	Kilometers Squared	NWRMS	National Water Resource Management Strategy
KMD	Kenya Meteorological Department	p.a	Per Annum
		PDB	Permit Data Base

## GLOSSARY

TERM	DESCRIPTION
<b>Annual sustainable yield</b>	It is defined as the average amount of ground water that can be pumped without adversely affecting the quantity or quality of ground water in a year.
<b>Aquifer</b>	An underground geological formation able to store and yield water.
<b>Available water</b>	This refers to the surface and ground water potential within the sub-catchment that can meet basic human needs
<b>Ecosystem Services</b>	These refer to varied benefits from the properly functioning natural environment.
<b>Erosivity</b>	It is the measure of the potential ability of soil to be eroded by rain or surface runoff.
<b>Ground water -</b>	Means the water of underground streams, channels, artesian basins, reservoirs, lakes and other bodies of water in the ground, and includes water in interstices below the water table.
<b>Mean Annual Precipitation</b>	It is the average rainfall for a given year.
<b>Naturalized flow</b>	It is the measured river flow adjusted to take account of net abstractions and discharges upstream of the gauging station.
<b>Non-point Pollution</b>	This refers to water pollution that is caused by widely dispersed sources of pollutants such as runoff from agricultural areas draining into a river.
<b>Permit</b>	It is an official document giving someone authorization to abstract water under Water Act, 2016.
<b>Pollution</b>	It is the direct or indirect alteration of chemical, physical and biological properties of water rendering it harmful or potentially harmful
<b>Ground Water Recharge</b>	Refers to the process where water moves downward from surface water to groundwater.
<b>Reserve</b>	This is the amount needed to satisfy the environmental and basic human needs (Downstream)
<b>Resource Quality</b>	It refers to the total condition of the water body which includes all aspects of the water body including chemical, physical, and biological characteristics.
<b>Resource Quality Objective</b>	This is a description of the desired state of a water body with respect to all aspects of the resource quality ( <i>see Resource Quality</i> ).

<b>SCMP Investment</b>	In this context, it refers to the financial resources or capital costs required to enable the WRUA undertake specific projects outlined in the Sub-Catchment Management Plan.
<b>Transfers</b>	It is the amount of water being conveyed for use in another catchment
<b>Water Allocation Plan</b>	Refers to a document that sets out the rules for water use within a sub-catchment for long term resource sustainability
<b>Water Demand</b>	This is the established current and future water needs in the sub catchment
<b>Water Resource Management</b>	Refers to the conservation, protection, development and utilization of water resources.
<b>Water user</b>	Refers to a person using water from a water resource
<b>WRUA</b>	It is an association of water users, riparian land owners, or other stakeholders who have formally and voluntarily associated for the purposes of cooperatively sharing, managing and conserving a common water resource
<b>WRUA Development Cycle</b>	This is a guideline that provides an overall framework for channeling investment into water resource management at the local level, mainly through WRUAs.
<b>WRUA operational budget</b>	Refers to expenses and revenues associated with the WRUA undertaking its normal operations such as holding meetings and running their day to day office operations.
<b>Sub catchment Demand classification</b>	<p>Three types of demands are recognized as; ecological, livelihood and commercial. Each type of demand is sub-divided into three classes of importance: high (1), medium (2) and low (3) as shown in below.</p>

**Sub Catchment  
Resource Status  
Classification**

Each sub-catchment or aquifer can be described as one of three states, alarm, alert or satisfactory, where alarm denotes a state that requires careful attention and satisfactory denotes a state that does not currently experience stress.

Category	State of the resource
<b>Category 1</b>	<b>ALARM</b>
Surface Water	Resource is periodically scarce Water reserve threatened
Groundwater	WQ or levels declining
Water Quality	Catchment severely degraded Pollution levels high Risk to human life is high
Conflicts	Potential for conflicts is high
<b>Category 2</b>	<b>ALERT</b>
Surface Water	Trend is towards scarcity
Groundwater	Trend is towards over abstraction
Water Quality	Declining trend in water quality
Conflicts	Ingredients for conflicts, e.g. ethnic, religious, language divisions
<b>Category 3</b>	<b>SATISFACTORY</b>
Surface Water	Water resource sufficient in quantity & quality
Groundwater	No measured impacts
Water Quality	WQ adequate, low risk
Conflicts	Low risk of conflict

### 1.1 SCMP Development

Sub-Catchment Management Plan (SCMP) is a tool developed to support protection, conservation and management of water resources and related natural resources within the sub-catchment to ensure sustainable and balanced water resources utilization for both socio-economic benefits and ecosystem management. SCMP is developed through a consultative process with key stakeholders to gather consensus on strategy and framework for water resources and catchment conservation and management at the sub-catchment level to ensure sustainable use of the available water resources.

SCMP focuses on problems related to protection, conservation and management of water resources, ecosystem and other related natural resources including socio-economic activities that majorly depend on natural resources within the sub-catchment. It presents analysis of the problems and identifies sustainable solution strategies for proper management of water resources (quantity and quality), improvement of catchment conditions and enhancement of livelihoods. In addition, it analyses institutional capacity for effective and efficient implementation of the identified sustainable solution strategies.

The SCMP provides a framework for which various stakeholders can participate in a coordinated integrated water resources management activity.

### 1.2 Policy and Legislative Framework

Kenya's Vision 2030 adopted in 2006 has 5-year plans that were aligned towards achieving the out-phased Millennium Development Goals (MDG) and now the Sustainable Development Goals set by the United Nations General Assembly in 2015. Among the 17 Goals is the attainment of clean water and sanitation (GOAL 6). Water resources management has been specifically addressed by Article 42 of the Constitution of Kenya (CoK), confers on every person a right to a clean and healthy environment which includes the right to have the environment protected for the benefit of present and future generations. Article 191 (1) c of the CoK directs the role of National government to be that of providing national legislation that are necessary for the protection of the environment. The Water Act, 2002 initiated the start of water sector reforms which have been and are still being implemented across the water sector. Key among the requirements of the reform was to devolve water service provision and resource management to the lowest level of the

economy. This has been achieved through the creation of institutions that have cascaded well-coordinated roles from the national to the regional level. The establishment of Water Resources Management Authority (WRMA) in 2005, which later was renamed to Water Resources Authority (WRA) in the dispensation of the Water Act 2016 and the acknowledgement of the WRUA as legal entities in the management of water resources confirms the efforts in place to achieve the goals of the reforms. Section 6, of the Act directs the regulation of use and management of water resources to be a responsibility of the WRA as an agent of the national government. Article 61 (1) d of the CoK provides for the involvement of the public in the management, protection and conservation of the environment.

The legal framework was also established with the enactment of the Water Act which gives the legal provisions and the Water Resources Management (WRM) rules, 2007 which outlines the rules that govern the use and management of water resources in all its diversity. The Fourth Schedule Part ii (10) of the CoK confers to the county governments the function of implementing specific national policies pertaining natural resource and environment conservation which include soil and water conservation also forestry. Section 29(1) of the Act provides for the possibility of establishing a Water resource users association (WRUA) which shall be a community-based association for collaborative management of water resources and conflict resolution. A Sub-Catchment Management Plan (SCMP) is a tool that has been adopted by the government and implemented through the WRUA to facilitate the lowest public participatory implementation of the mandate of managing water resources. It is within this clarity that this plan is developed and implemented for the benefit of implementing national plans for the benefit of all citizens.

### **1.3 SCMP Objectives**

The overall objective of this SCMP is to balance water resource utilization and conservation by enabling the water resource to be protected, enhanced and where appropriate restored through a participatory agreed platform for planning and implementation.

### **1.4 Timeframe for the SCMP**

This SCMP is valid to a maximum period of 10 years of implementation from the date of adoption. A SCMP shall be reviewed at any time of compelling need especially when sub catchment dynamics are changed by some intrinsic or external variables such as introduction of high impacting projects that adversely change the state of sub catchment with regard to water resources and livelihoods of the residents.

## **1.5 SCMP Implementation Strategy**

The SCMP will be implemented in a collaborative approach with key stakeholders. Roles and obligations of each stakeholder has been defined in the activity plan. However, it is expected that implementation of activities will be through the WRUA with technical support from partners, donors and the relevant government departments. The implementation process shall be participatory and shall consider inclusion of the marginalized groups like women, youths, vulnerable groups and children and will deliberately encourage and support their involvement through strategic inclusion, support and capacity building. Capacity building will be a continuous process during project implementation. However, focus committees shall be established within the WRUA to lead in implementation and coordination of the plan.

## **1.6 SCMP development process**

This SCMP was developed on Feb 2023 through a consultative process with key stakeholders. The process started with planning phase in which the SCMP development methodology was defined and stakeholder identification carried out. The planning phase was followed by data and information gathering and analysis. This step was to provide an overview of the sub-catchment and help on situation analysis before further engagements with the stakeholders. The third step was stakeholder engagements which was carried out from 13<sup>TH</sup> - 17<sup>th</sup> Feb 2023. The main objective of this step was to identify additional information on major water resources related problems, possible sustainable solutions to the identified problems and carry out problem analysis in order establish priority activities. Data analysis was then carried out and results used in preparation of a draft Sub-Catchment Management Plan. The draft SCMP was then discussed with a wide range of stakeholders and thereafter adopted as the plan to be implemented by the WRUA in collaboration with other stakeholders. The stakeholders included WRUA members, administration, WRA. The SCMP development process was financed by The Laikipia, Isiolo, Samburu Transforming the Environment Through Nexus Project (LISTEN).

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## 2 OVERVIEW OF THE SUB CATCHMENT

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The chapter presents; all the problems identified in the sub catchment, their causes, effects and possible solutions.

### 2.1 Problems identified

2.1.1 The following problems were identified by the NGARE NYTHING WRUA members as the main problems that affect water resources management within the sub-catchment:

1. Catchment degradation
2. Water pollution
3. Climate change
4. Overgrazing
5. Floods
6. Resource conflict
7. Lack of community awareness
8. Lack of water infrastructures
9. Weak WRUA
10. Climate change
11. Drought
12. High population

From the above ranking exercise, it shows that Catchment degradation and weak WRUA governance ranked highly and therefore a big concern to the community. There is also need to create awareness and capacity building to the community to help them manage and govern Ngare ything water resources.

## 2.2 Problem Ranking

No	Problem	Code	DF	C	C	LF	P	N	IP	C	P	C	W
.				D			G		L		C		I
1	Drought and Foods	DF	X X	0	0	1	1	0	0	0	1	1	1
2	Catchment degradation	CD	1	X X	0	0	1	0	0	0	0	0	0
3	Conflicts	C	0	1	X X	0	1	1	1	1	0	1	1
4	Lack of finances	LF	0	1	0	X X	1	0	0	0	1	1	0
5	Poor governance	PG	1	0	0	0	X X	0	0	0	1	1	0
6	Nepotism	N	1	1	0	0	0	X X	0	1	1	1	1
7	Increased population	IP	1	1	0	0	1	1	X X	1	1	1	1
8	Culture	C	0	1	1	0	1	0	0	X X	0	1	1
9	Pollution	P	0	1	1	1	0	1	0	0	X X	0	0
10	Climate change	CC	0	1	0	0	0	0	0	0	1	X X	0
11	Water infrastructure	WI	0	1	0	0	1	0	0	0	1	1	X X
	<b>Scores</b>		4	9	1	6	8	3	1	3	7	8	5
	<b>Rank</b>		7	1	11	5	3	9	10	8	4	2	6

## 2.3 Problem analysis

Problems identified	Causes	Impact/Effects	Solution Strategy
<b>Catchment degradation</b>	<ul style="list-style-type: none"> <li>• Elephant destruction</li> <li>• Overstocking</li> <li>• Prolonged draught</li> <li>• human activities</li> </ul>	<ul style="list-style-type: none"> <li>• Soil erosion</li> <li>• Bare land</li> <li>• Conflict between grazers, farmers and wildlife</li> </ul>	<ul style="list-style-type: none"> <li>• Controlled grazing</li> <li>• Reforestation</li> <li>• Awareness creation</li> <li>• Holistic land management</li> </ul>
<b>Climate change</b>	<ul style="list-style-type: none"> <li>• Logging of trees</li> <li>• Wild fires</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of enough rainfall</li> <li>• Severe draughts</li> <li>• Excess rain</li> <li>• Change of rain pattern</li> <li>• Cause of poverty</li> </ul>	<ul style="list-style-type: none"> <li>• Planting of trees</li> <li>• Reseeding of grass</li> <li>• Soil erosion</li> <li>• Adopt to the new rainfall patterns</li> <li>• Promote use of technology on information sharing</li> </ul>
<b>Pollution</b>	<ul style="list-style-type: none"> <li>• Farming on riparian and conserved areas</li> <li>• Car and bike washing along the rivers</li> <li>• Direct animal watering.</li> <li>• Discharge of acaricides and pesticides by farmers and pastoralists</li> <li>• Informal settlements</li> </ul>	<ul style="list-style-type: none"> <li>• Water borne diseases</li> <li>• Un clean water for consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Awareness creation on waste water disposal</li> <li>• Develop (EDCPs) in big farms.</li> <li>• Demarcation of riparian land areas and</li> </ul>
<b>Floods</b>	<ul style="list-style-type: none"> <li>• Heavy and rains</li> <li>• Bare lands no undergrowth</li> <li>• Human activity along the river</li> <li>• Climate change</li> </ul>	<ul style="list-style-type: none"> <li>• Soil erosion</li> <li>• Destruction of infrastructure</li> <li>• Cause death and displacement of livestock and families</li> </ul>	<ul style="list-style-type: none"> <li>• Erect check dams</li> <li>• Rehabilitate the bare lands</li> <li>• Holistic management of the rangelands</li> <li>• Installation of early warning systems</li> </ul>
<b>Weak WRUA governance</b>	<ul style="list-style-type: none"> <li>• Lack of resources</li> <li>• In adequate stakeholder support</li> <li>• Donor dependency</li> <li>• Poor leadership</li> </ul>	<ul style="list-style-type: none"> <li>• Stagnation in development</li> <li>• Lack of mobility</li> <li>• Lack of meetings</li> <li>• No elections</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity building of the management committees</li> <li>• Fund raisings</li> <li>• Adherence to the bylaws on WRUA support\</li> </ul>
<b>Drought</b>	<ul style="list-style-type: none"> <li>• Lack of enough water</li> <li>• Climate change</li> <li>• Prolonged dry spell</li> <li>• Destruction of catchment</li> </ul>	<ul style="list-style-type: none"> <li>• Human and livestock death</li> <li>• Poverty</li> <li>• Conflicts of available resources</li> </ul>	<ul style="list-style-type: none"> <li>• Re afforestation</li> <li>• Protection of catchment areas</li> <li>•</li> </ul>
<b>Conflicts</b>	<ul style="list-style-type: none"> <li>• Lack of enough water</li> <li>• Influx of livestock</li> <li>• Wildlife/human</li> <li>• Farmers/herders</li> </ul>	<ul style="list-style-type: none"> <li>• Displacement</li> <li>• Loss of property and lives</li> </ul>	<ul style="list-style-type: none"> <li>• Increase water infrastructures</li> <li>• Conserve water sources</li> <li>• Enforce compliance and permit conditions</li> </ul>

	<ul style="list-style-type: none"> <li>• Non-compliance on water use</li> <li>• Lack of knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Destruction of infrastructure</li> <li>• Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>• Create awareness</li> <li>• Create income generating activities.</li> </ul>
<b>Insecurity</b>	<ul style="list-style-type: none"> <li>• Cattle rustling</li> <li>• Banditry</li> <li>• Border conflicts</li> <li>• Draught and famine</li> <li>• Poor cultural beliefs</li> </ul>	<ul style="list-style-type: none"> <li>• Displacement of people and livestock</li> <li>• Loss of human and livestock</li> <li>• Trauma to the children and women</li> <li>• Closure of schools</li> </ul>	<ul style="list-style-type: none"> <li>• Development of effective laws</li> <li>• Involvement of other stakeholders in land management</li> <li>• Involve other actors in conflict resolutions on pasture and land</li> </ul>
<b>Culture</b>	<ul style="list-style-type: none"> <li>• Lack of education facilities</li> <li>• Social cultural beliefs</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of knowledge on water use and management</li> </ul>	<ul style="list-style-type: none"> <li>• Promotion of education centres</li> <li>• Awareness creation.</li> </ul>

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## 3 CATCHMENT CHARACTERISTICS

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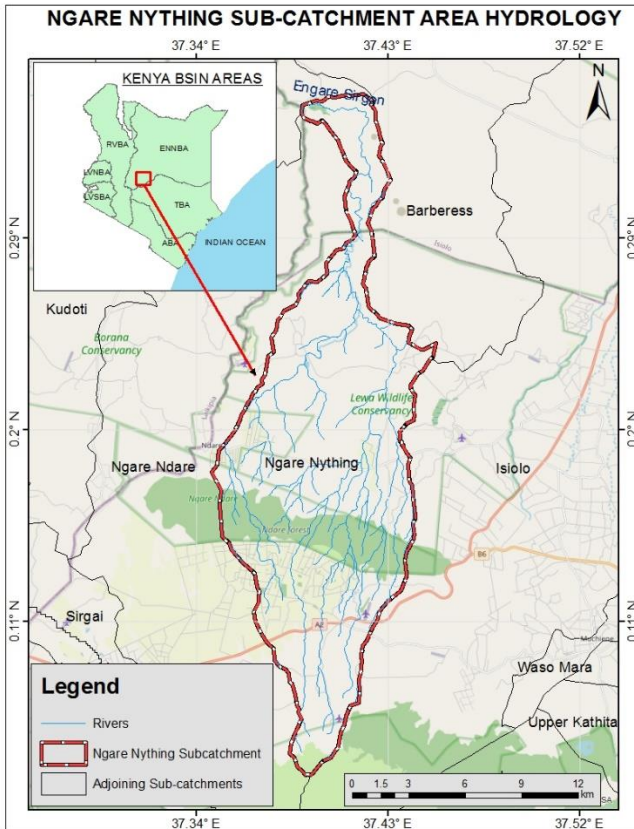
### 3.1 Introduction

This Chapter presents sub-catchment characterization and is based on the physical and biotic variables that institute its ecosystem. These descriptive characterizations include; climate factors (Temperature, rainfall, wind etc.), soil types, hydrology, topography, land cover, drainage and geology. In addition, it presents information on socio-economic activities and demographic trends

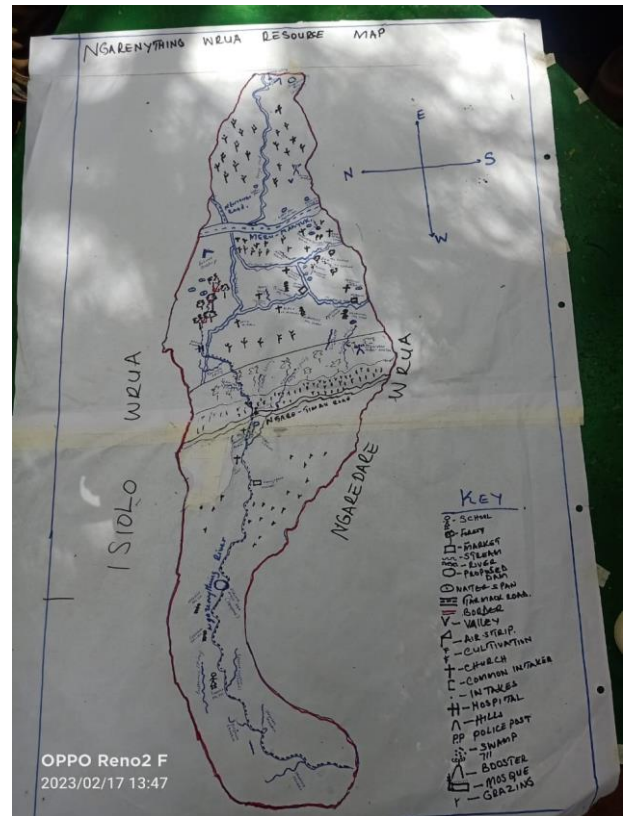
### 3.2 Location

Ngare Nything sub-catchment has a coverage area of about 196.922 km<sup>2</sup>. It is hydrologically located in Ewaso Ngiro North basin, 5DA sub-basin administered through Middle Ewaso Ngiro Sub region with its office in Isiolo. It lies between Longitude 3508'43'' – 35016'10''E and latitude 1015'21'' – 1030'57''N.

It borders the following WRUAs; Kipsing, Isiolo, Ngare Ndare, Administratively, the sub-catchment is located in Laikipia, Meru, and Isiolo county and Isiolo North, Buuri, and Laikipia North constituencies. Two wards fall partly within the WRUA, these include; Burat and Kisima. Five sub-locations overlap the Sub-Catchment, these include; Burat, Ngare Ndare, Mutunyi, Buuru, and Ngusishi.



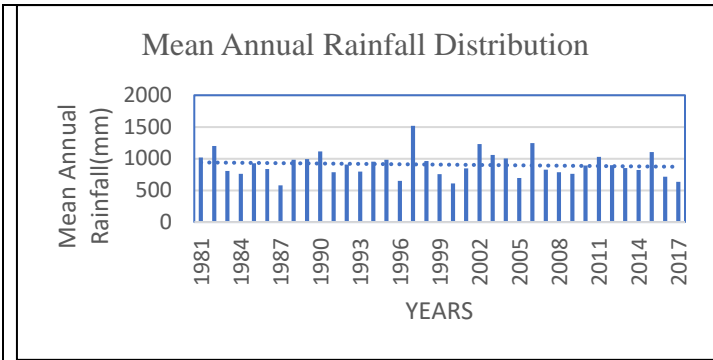
Map 1 Location map



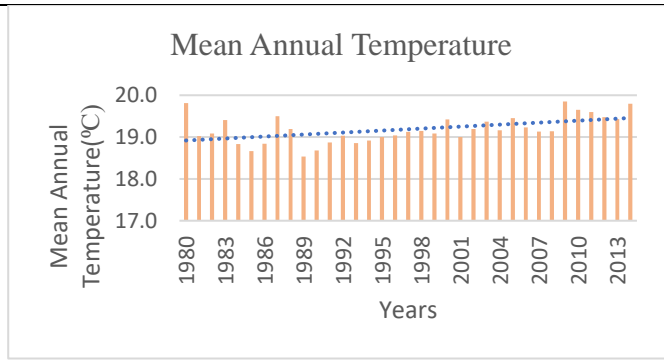
Ngare Nything WRUA resource Map

### 3.3 Climate

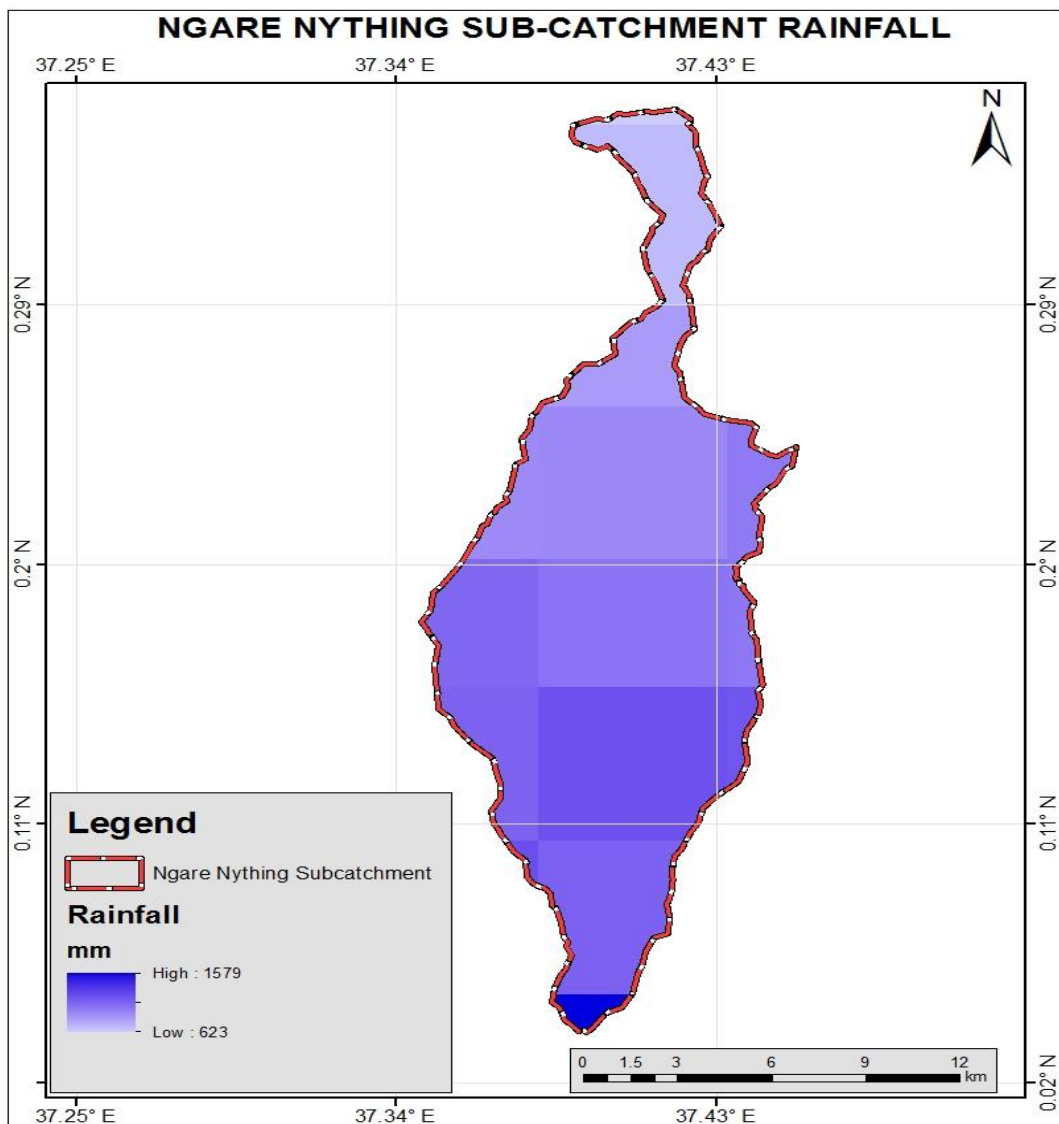
The rainfall pattern in Ngare Nything Sub-Catchment has changed in the recent past with years recording less than the mean annual rainfall becoming more frequent. The rainfall is bimodal in nature with the long rains occurring from March to May and short rains from September to December. The temporal rainfall variability over the years in the Sub-Catchment varies between 640mm to 1510 mm. The figure below shows the temporal rainfall variability within the sub-catchment. The spatial rainfall variability within the Sub-Catchment shows that the South and South side receives most of the rainfall of up-to above 1579 mm while the Northern side receives the least rainfall of 623 mm and below. The map below shows the spatial rainfall variability within the sub-catchment. The mean annual temperature for the sub-catchment ranges from 18.2 – 19.4°C and shows an increasing trend in the recent years as shown below.



**Table 3-1 Temporal Rainfall Variability**

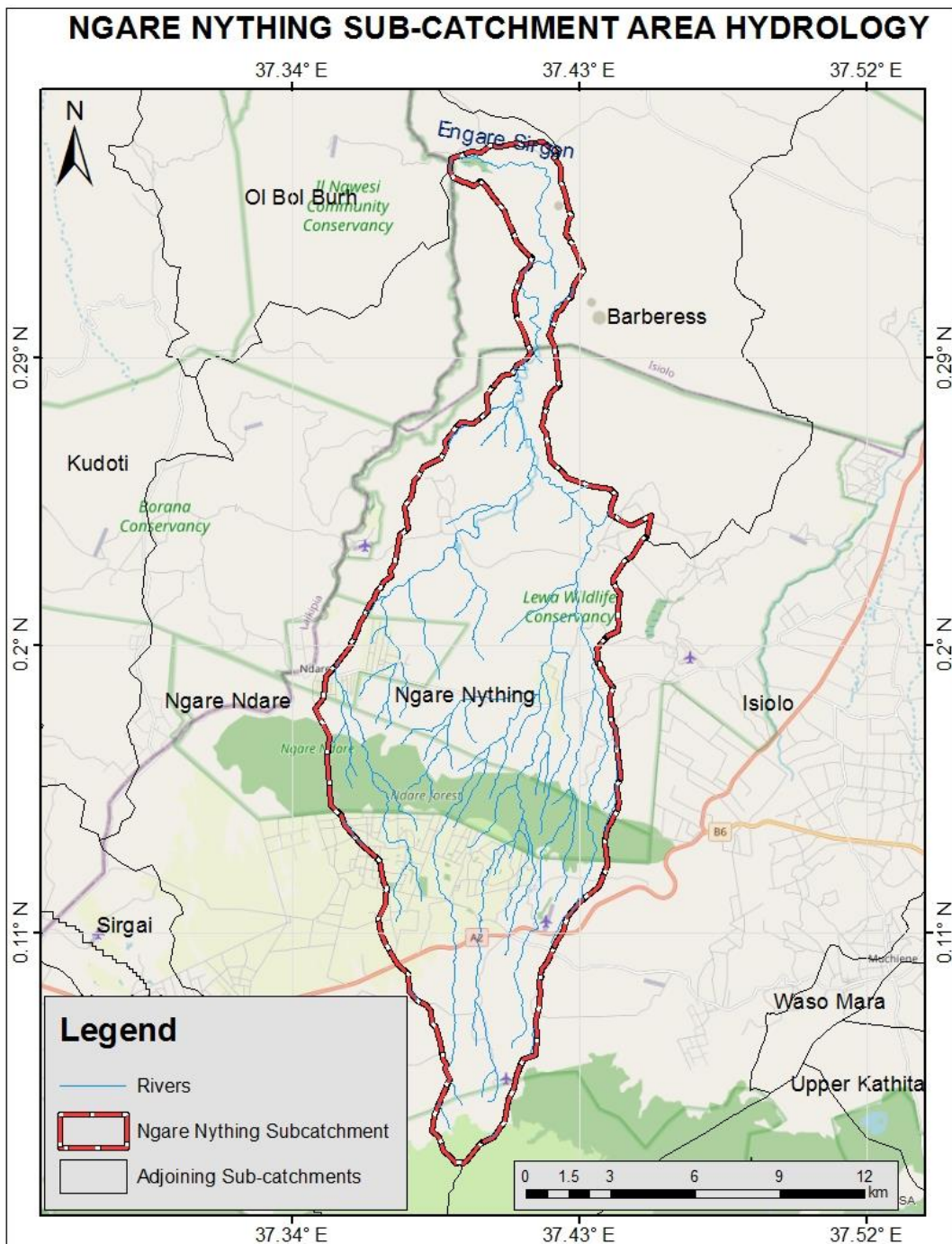


**Table 3-2 Mean Annual Temperature**



### 3.4 Hydrology

The sub-catchment has a dense river networks with the main river being Engare Sirgan.

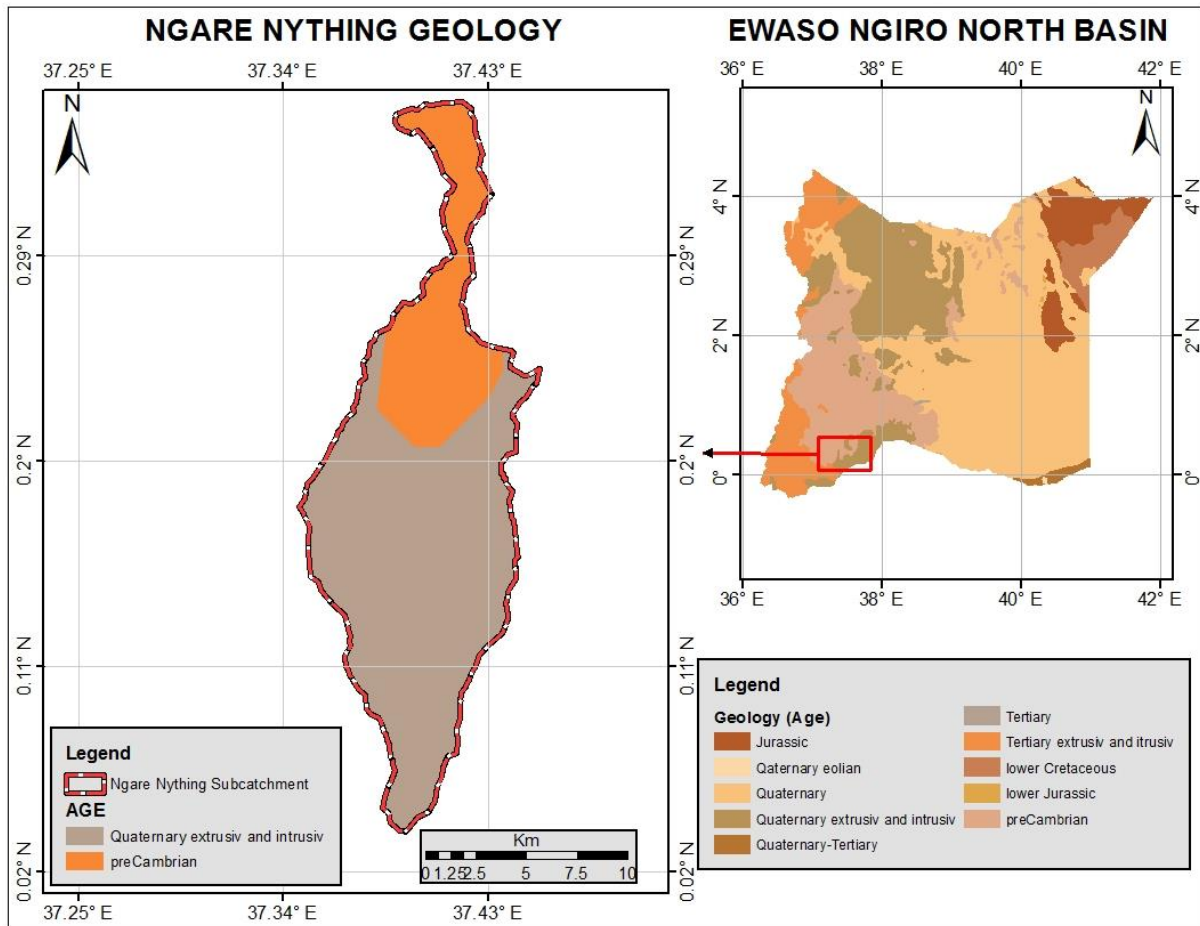


MAP 2 Hydrological map of Ngare Nything

### 3.5 Ground Water

Groundwater in this area is confined to weathered and fractured rocks, and where the area is highly faulted. The area is highly faulted thus has moderately good groundwater potential.

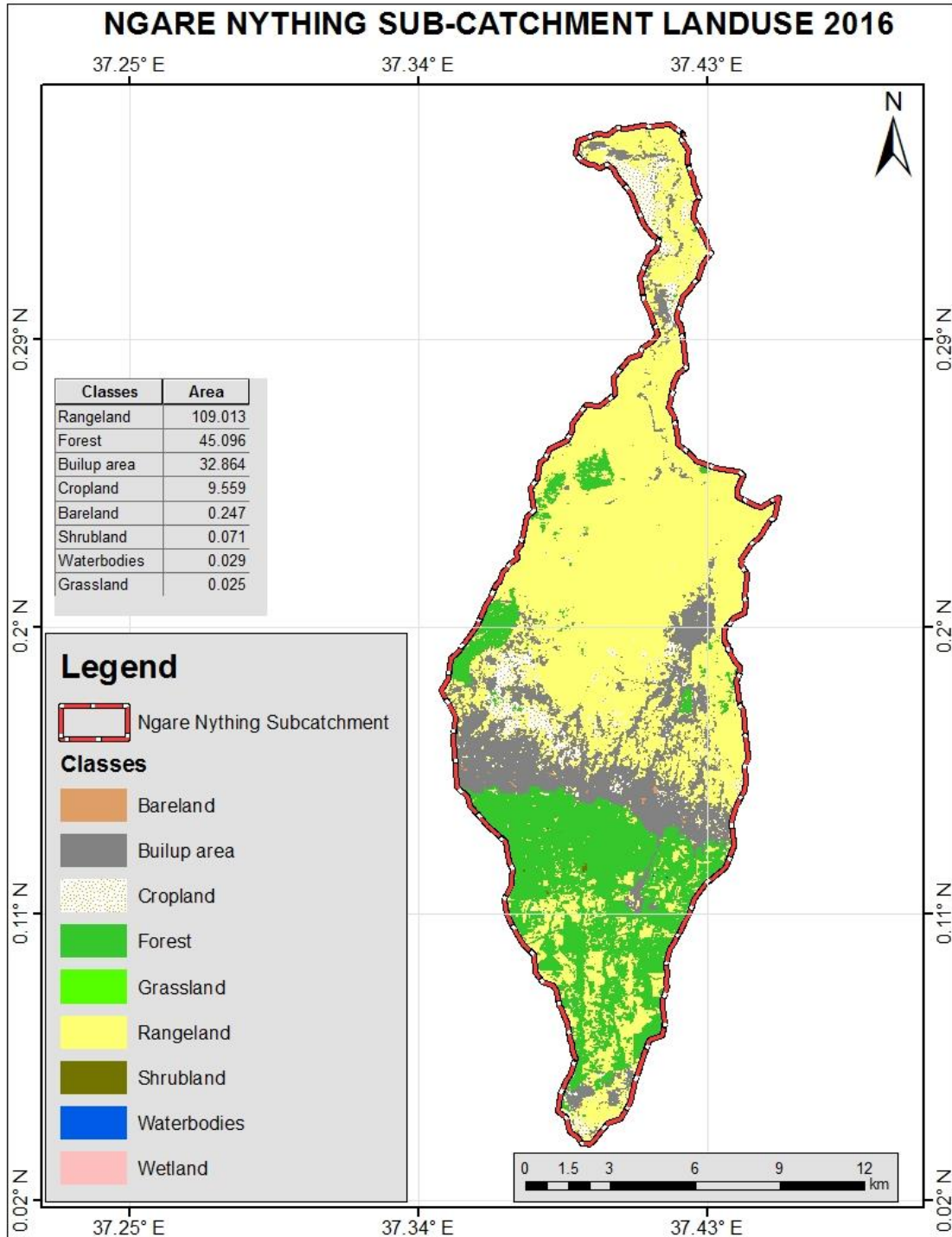
### 3.6 Geology



**MAP 3: Geological Coverage by Age within Ngare Nything**

### 3.7 Land Use

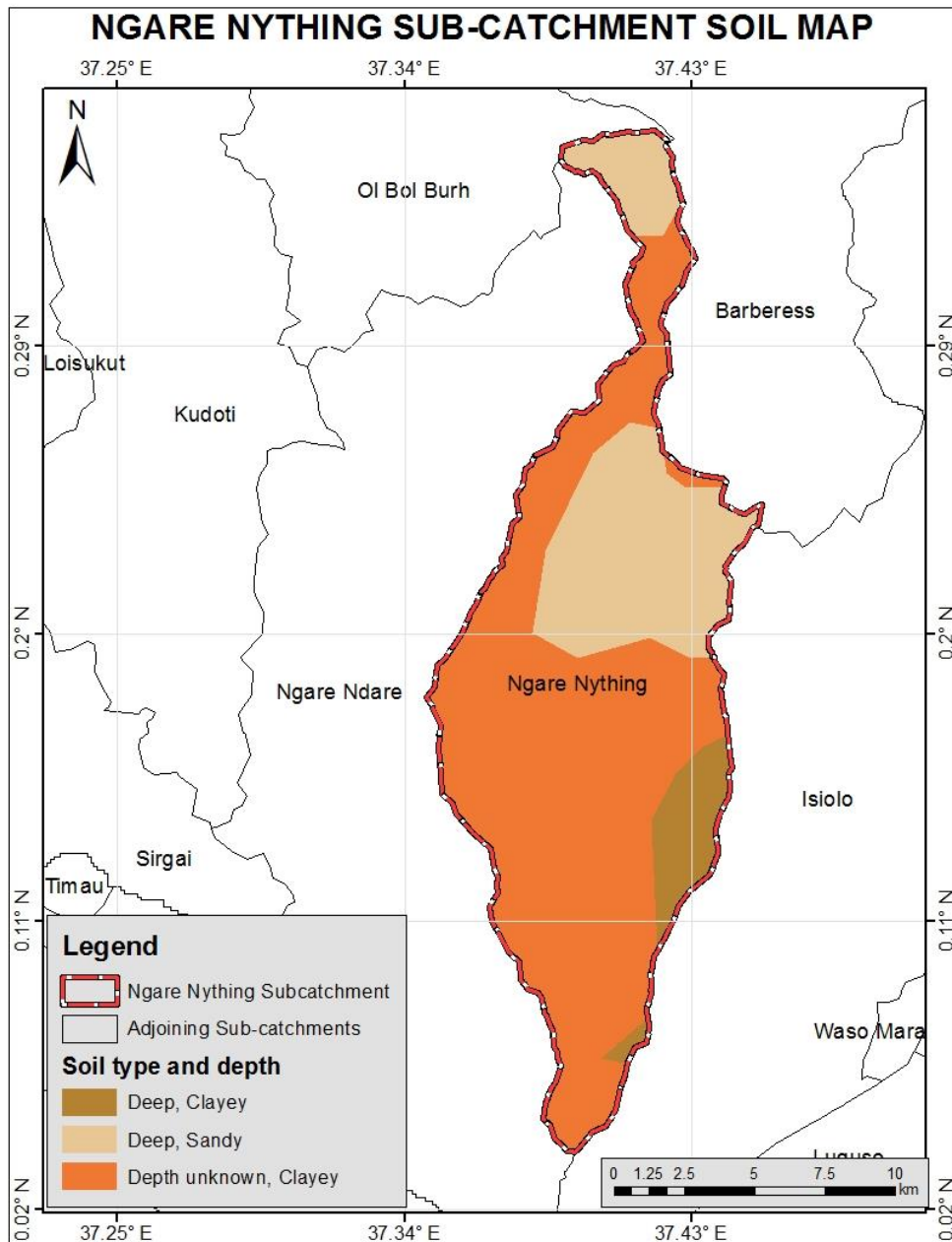
The sub catchment is largely under rangeland, forest, build-up area, crop land, bare land, shrub land, wetland, and water bodies.



MAP 4 Land cover 2016

### 3.8 Soils

The soils in the sub-catchment comprise of clay of known depths are unknown, deep clay, and deep sand. Majority of the sub-catchment is dominated by clay of unknown depth covering majority of the sub catchment.



**MAP 5 Soil Classification Map of Ngare Nything**

### 3.9 Stakeholder Mapping and Analysis

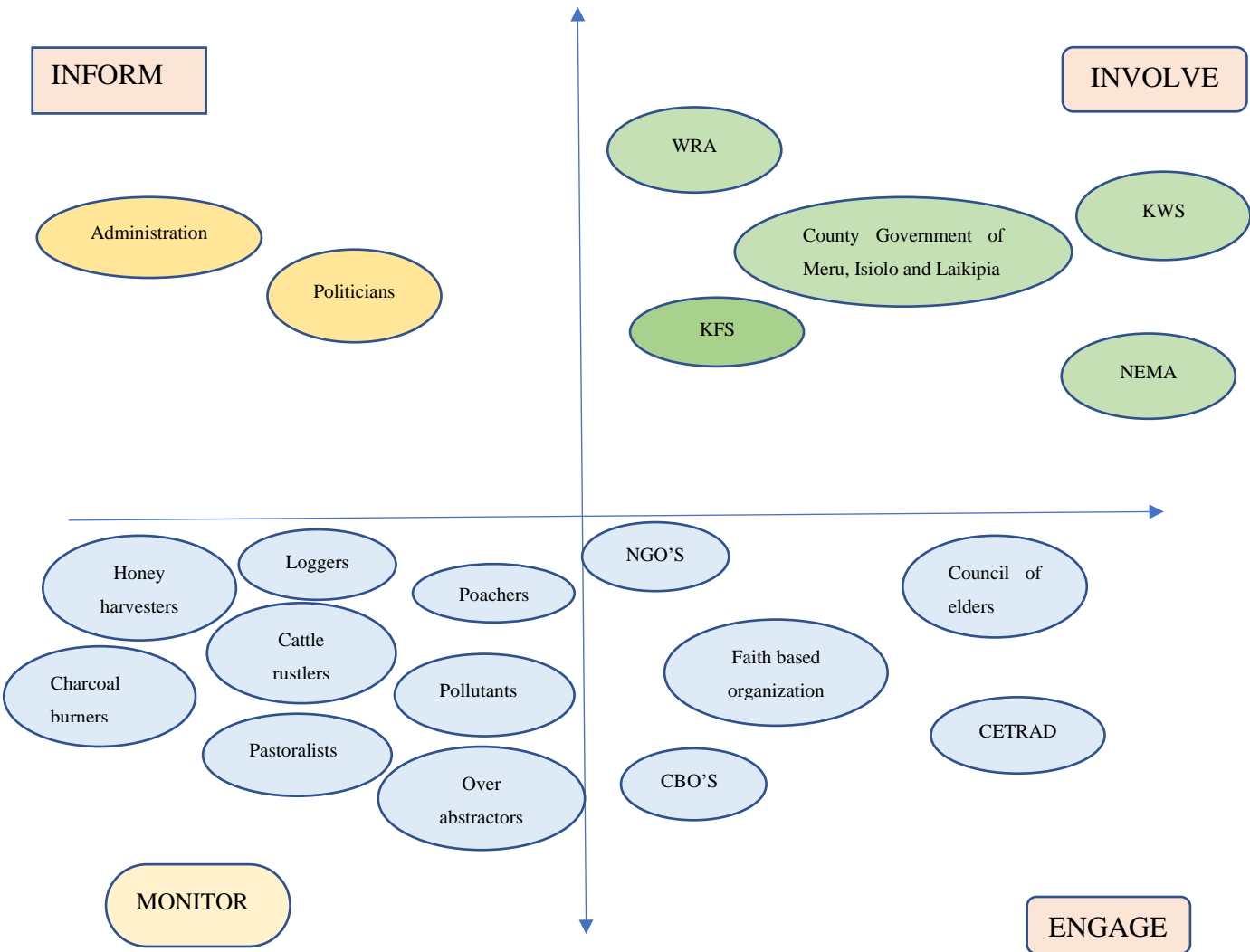
#### 3.9.1 Stakeholder mapping

- Which stakeholders by sector are within the sub catchment?

	Name	Location	Roles and responsibilities
1	NN-forest trust	Within the sub catchment(Mbuju)	<ul style="list-style-type: none"> <li>• Forest protection</li> <li>• Conservation</li> <li>• Tree planting and nurseries</li> </ul>
2	WRA	National	Manage water resources and establishment of WRUAs
3	WSTF	Counties, National	Fund WRUAs
4	MKWEF	Nanyuki	<ul style="list-style-type: none"> <li>• Manage water resources, Fund WRUAs</li> <li>• Build capacity</li> </ul>
5	KFS	National	Protection and conservation of the forest
6	NRT	Regional(offices in Lewa)	<ul style="list-style-type: none"> <li>• Fund WRUA and water projects.</li> <li>• Provide security.</li> <li>• Mitigate on climate</li> <li>• Employer</li> </ul>
7	KWS	National (offices at Soi)	Wildlife and ecosystem conservation
8	Mt Kenya trust	Ngara Ndare	Environmental and wildlife conservation
9	NEMA	National	Environmental management
12	Rural Focus	Nanyuki	Consultant on training
13	World vision	Isiolo	Fund water projects(Wash programmes) Do spring protection Capacity building Education (build classes)

16	LWC	Within	Environmental and wildlife conservation, Education,Health,Water
17	County governments	Meru,Isiolo, Nanyuki	<ul style="list-style-type: none"> <li>• Funding water Projects.</li> <li>• Build capacity.</li> <li>• Develop infrastructure</li> <li>• Employer</li> <li>• Support WUA</li> </ul>
18	Administration	National (offices in kisima and subuiga)	<ul style="list-style-type: none"> <li>• Security</li> <li>• Support WRUAs</li> <li>• Conflict resolution</li> <li>• Enforce laws.</li> <li>• Give information</li> </ul>
19	Commercial farms.	Kisima Bloomingdale roses	<ul style="list-style-type: none"> <li>• Support WRUA activities</li> <li>• employer</li> </ul>
21	Metrological Weather department	County	Weather forecast
21.	Faith based	Gundua,	Spiritual nourishment Education sponsorship
22	CETRAD	Nanyuki	Wrua trainings, Data collection ,
23.	Meru council of elders	Nchiru shrine,711	Conflicts resolution,
24	SNV	Nanyuki	Wrua trainings Water catchment protection Construction of water infrastructures.

### 3.9.2 Stakeholder Analysis on Influence and Level on Interest



#### 3.1 Targets

Collect baseline information

#### 3.2 Proposed outputs

Enough data collected based on hydrological, land use, population, economic activities data, and map water resources for planning

### 3.3 Activity plan and Budget

- Develop the activity plan clear with; major activities, specific activities, stakeholders involved, estimated budgets and implementation periods.

<b>CH3: Catchment Characteristics</b>			
<b>Target</b>			
<b>Output</b>			
<b>Activity</b>	<b>Sub-activity</b>	<b>Budget*1000</b>	<b>Year of Implementation</b>
3 . 1 Collect baseline information (hydrological, land use, population, economic activities data, map water resources)	<ul style="list-style-type: none"> <li>• Develop ToR</li> <li>• Engage consultant</li> <li>• WRUA training on data collection and participation in field work</li> </ul> Produce GIS map	1,200,000	YR 2
<b>TOTAL</b>		<b>1,200,000</b>	

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## 4 MANAGEMENT APPROACH

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### 4.1 Introduction

The sub catchment's demand-the uses water resources are committed for- and resource classification basing on the water availability trend; Alert, Alarm, Satisfactory status. The WRUA's institutional structure and management organs are also documented in this section.

### 4.2 Sub-Catchment demand Classification

- Management Unit
- Between; ecological, Commercial and Livelihood, in which classification does the sub catchment fit?

### 4.3 Sub-Catchment resource Classification

- Refer from basin plans

### 4.4 WRUA institutionalisation

#### 4.4.1 WRUA formation

- When was the WRUA formed?

Ngare Nything/Sirgon river water users association was established in 1997 and registered under the Ministry of Culture and Social Services. It started its operations on 28th Jan 1997. The WRUA legalised entity and registered under the Societies Act.

The Association was formed as a result of observation from resident members a need to form a unified body at community level to address the negative arising water issues alongside government sectors.

Historically the river was perennial. In more recent years, with increasing abstractions upstream, the river became ephemeral, putting the pastoral communities and the wildlife into conflict for the scarce water. The pastoral communities felt aggrieved and frequently took issue with abstractors upstream.

In 1996, as part of a water resource survey for Lewa Wildlife Conservancy, the idea of a water users association was mooted. Initial meetings between the water users resulted in the official formation and registration (with Ministry of Social Service) of the association and the opening of a bank account.

The Association promotes community approach through the WRUA in determining solutions to water resource related conflicts regarding accessibility, poor utilization management in addition to enhancing sense of ownership the government acknowledges that effective and efficient management and service delivery is best attainable through community groupings.

The Ngare Nything/Sirgon River rises from dispersed springs on the slopes of Mount Kenya within Kisima Farm, Meru county, and flows down to a confluence with the Ngare Ndare near Il Ngwesi in Isiolo county. The river is part of the Ewao Ngiro North River basin. Ground water replenished in several catchments is discharged at different points in the Sub-Catchment. Kisima springs; the main feeder of Ngare Nything River serves the whole population of Subuiga, Ntirimiti, Ex-lewa, Manyagallo and part of the adjacent population of Ngare Ndare all who are incorporated in its 27 member projects. About four projects have not started abstracting water. Various water abstractions from the river deliver water to numerous community water projects (for domestic and irrigation purposes), Kisima farm for domestic and commercial irrigation, Lewa Wildlife Conservancy, individual small scale farmers, and pastoral communities. The river flows to a confluence with Ngare Ndare River near archers post which flows through the forest. The river, for easy managerial aspects, is divided into upper, middle and lower zones to a point where it meets Ngare Ndare River. Some members, e.g. Kisima and Lewa have dams to store excess floodwater, which ease up pressure on the river during dry spells. There are other springs found on adjacent lands e.g. MBuju, Mwangania, Mithetene, Elijah, Murone and Ntumburi.

The reason for the dual name (Ngare Nything/Sirgon) is because the river is known as the Ngare Sirgon by the pastoral communities (the Ngare Nything is actually the adjacent catchment of a short river that rises in the Ngare Ndare forest and disappears below the lower forest boundary. The name means “disappearing river”. The government has however named the Ngare Sirgon as the Ngare Nything.

#### **4.4.2 Institutional management structure**

To promote stakeholder participation in planning and development of water resources by government water. The institutional management is structured to have a management committee that consist of five office bearers of the society comprising representatives from the upper and lower catchment areas elected after the stipulated period of three years. These do the day to day running of the WRUA activities.

The management committee has five other committee of five members namely:

- 5 No Procurement
- 5 No Finance
- 5 No Monitoring
- 5 No Disaster and floods
- 5 No Livelihood enhancement

## NWRUA INSTITUTION FRAME WORK



### 4.5 Targets

- a) Develop and strengthen WRUA capacity

### 4.6 Proposed outputs

- a) WRUA members familiarised with their area of jurisdiction

### 4.7 Activity plan and Budget

CH4: Management Approach				
Target		<ul style="list-style-type: none"> <li>Sensitization of members to the WRUA;</li> <li>Zonal exchange visits</li> </ul>		
Output		<ul style="list-style-type: none"> <li>WRUA members familiarised with the WRUA area of jurisdiction</li> </ul>		
Activity		Sub-activity	Budget*1000	Year of Implementation
4.1	Awareness creation of new members	4.1.1 Hold 1 Public Baraza per zone annually to inform people of WRUA existence and mandates (3 Baraza per year for 10 years)	3,000,000	Every Year
4.2	Catchment familiarization	4.2.1 catchment familiarization tour by committee members every three years (3 times within the SCMP period)	900,000	Y1Q1, Y4Q1, Y7Q1
<b>TOTAL</b>			<b>3,900,000</b>	

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## **5 WATER BALANCE AND WATER DEMAND MANAGEMENT**

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### **5.1 Introduction**

This Chapter looks at; surface water and groundwater resources' availability, apportionment of resource, the water allocation balance.

#### **5.1.1 Surface water**

Sub-catchment currently is served by one RGS, which is under the WRA management. The WRUA also monitors flows with 3Vnotches that are installed at the upper stream. This data is collected, stored and shared in weekly basis.

The river discharge is measured at RGS 5DA01 at Manyangaro bridge. This station was established by WRA.

However Lewa Conservancy, Borana farm among other partners have engaged Rural Focus to undertake a baseline water resource .this report will guide in determining potential of both surface and ground water within the sub catchment.

### **5.2 Ground water**

This Sub basin (5DA) has an estimated Ground Water Potential of 9.16 MCM/year, this is informed by the ISC- KWSCRIP studies undertaken in the year 2018. The sub-catchment's aquifer is endowed with a Ground water sustainable yields of 1.02 MCM/year.

### **5.3 Water Apportionment**

Water Apportionment is the process of assigning priorities to various water use categories. The existing water regulations give priority to reserve and domestic water demand. Water resources are apportioned to other uses depending on demand and resource availability.

### **5.4 Water Allocation balance**

### **5.5 Targets**

Conduct a detailed study to establish available water resources and water demand for NGARENYTHING sub-catchment

### **5.6 Proposed outputs**

- Detailed Water Resources Availability and Water Demand Status Report for the sub-catchment

## 5.7 Activity plan and Budget

<b>CH 5: Water Balance and Demand management</b>				
<b>Target</b>		<ul style="list-style-type: none"> <li>Conduct a detailed study to establish available water resources and water demand for Ngarenthing sub-catchment.</li> </ul>		
<b>Output</b>		<ul style="list-style-type: none"> <li>Detailed Water Resources Availability and Water Demand Status Report for the sub-catchment</li> </ul>		
<b>Activity</b>		<b>Sub-activity</b>	<b>Budget*1000</b>	<b>Year of Implementation</b>
5	Establishment of water resources availability and demand	5.1.1 Data Collection (primary and secondary) and analysis – Consultancy services to prepare a Detailed Water resources Availability and Water Demand Status Report	1,400,000.00	Y2Q2
		5.1.2 Dissemination of findings in through workshop	200,000.00	Y3Q1
<b>TOTAL</b>			<b>1,600,000</b>	

## 6 WATER ALLOCATION AND USE

### 6.1 Introduction

This chapter looks at the authorised abstractions and type of use. Water is allocated to different types of uses depending on demand and water resources availability.

### 6.2 Thresholds

#### 6.2.1 Surface water

Sub Basin: 5DA	
CATEGORY	THRESHOLD
Category A:	<50m <sup>3</sup> /day
Category B:	50-<500m <sup>3</sup> /day
Category C:	500 –<5000m <sup>3</sup> /day
Category D:	≥5000m <sup>3</sup> /day

#### 6.2.2 Ground water

*Note: The thresholds for the Aquifers are specific to the aquifer.*

aquifer	
CATEGORY	THRESHOLD
Category A:	<5 m <sup>3</sup> /day
Category B:	>5-<20m <sup>3</sup> /day
Category C:	>20 – <100m <sup>3</sup> /day
Category D:	>100m <sup>3</sup> /day

### 6.3 Water Allocation by source

Ngarenithing WRUA has over 50 project allocations individual, group, commercial farms and institutions

37 Surface water allocations and 24 boreholes

No	Allocation name	quantity	Permit no.	comments
1.	Kieni Kaongoacheke	41.4	OLD PERMIT 22563	
2.	Mwiru Mulana			
3	Mugokongo		Wrma /50/1sl/5DA/10012/S	
4	Kisima domestic			
5	Mwimenyi A		Wrma /50/isl/5da/100s	
6.	Mwimenyi B		Wrma /50/isl/5DA/98/S	
7.	Kisima young		WRMA /50/ISL/5DA/5/S.	
8.	Kisima Flouriculture			

9	Kisima village		WRMA /50/ISL/5DA/121/S	
10.	Muturi WP			
11.	Nasakuja WP		WRMA /50/ISL/5DA/71/S	
12	Ntumburi WP		WRMA /50/ISL/5DA/54/s	
13	Lower Ntirimiti WP		WRMA /50/ISL/5DA/47/S	
14	Kimbarine			
15	Forest line			
16	Canteen line			
17	Professor line			
18.	Nkuru line			
19.	Gaitika			
20.	Kimathi Line			
21.	Mirimau line			
22.	Kisima muroone			
23	Jonathan Moss			
24.	Ntumburi Mutethia		WRMA /50/ISL/5DA/10653/S	
25	Koome Machaka			
26.	Nthagana			
27.	Sussana Rouse			
28.	Kadesh wp			
29	Manyangaro			
30	Ngano			
31	sirikoi			
32	Lewa			
33	Charlie wheeler			
34.	Lepparrua WP			
35	711 Water projects.			

### BOREHOLES

NO	APPLICANT NAME	QUANTITY	PERMIT NO.	COMMENTS
1	Mwirigi borehole			
2.	Kianda borehole			
3.	Taliban Borehole			
4	Nkando borehole			
5.	Gundua Borehole			
6.	Thamba Ngo'mbe borehole			
7.	Bloomingdale roses			
8.	Bloomingdale roses			
9.	Bloomingdale roses			
10.	Bloomingdale roses			
11..	Bloomingdale roses			
12.	AAA Borehole			
13.	AAA Borehole			
14.	AAA Borehole			
15.	James Mancha bh			
16.	Mathenge bh			
17	Kisima fam ltd BH			
18.	Kisima Farm LTD bh			
19.	Major Mbaya BH		WRMA /50/ISL/5DA/10331/G	
20.	Proffesor Muturi BH			

## Storage

### Water storage as mapped.

Name of Water Storage	Name of Owner	Current Status	Storage Capacity (m <sup>3</sup> )	Source of water
Kisima farm Lagoon 1	Kisima Farm LTD	Operational		Rain harveting
Kisima farm Lagoon 2	Kisima Farm LTD	Operational		Rain harveting
Kisima farm Lagoon 3	Kisima Farm LTD	Operational		Rain harveting
Kisima farm Lagoon 4	Kisima Farm LTD	Operational		Rain harveting
Kisima farm Lagoon 5	Kisima Farm LTD	Operational		Rain harveting
Kisima farm Earth dam	Kisima Farm LTD	Operational		
Blomingdale roses lagoon	Bloomingdale roses			

### 6.4 Status of Authorisations & Permits

Compliance with permit status for the abstractors is also not clear. Water use in terms of quantity and quality cannot be determined in the absence of master meters for most of the abstractors. Water use in terms of quantity and efficiency is therefore currently not comprehensively determinable as abstractors' water use is not metered. There is also no monitoring of water use owing to lack of capacity in the WRUA. Lack of a Water Allocation Plan has led to the following:

- Reduced water flows
- Conflicts with water authorities
- Conflicts between upstream and downstream users which has affected WRUA activities
- Destruction of water supply infrastructure and the consequent cost involved to repair/rehabilitate them.

### 6.5 Targets

Draw and adhere to water allocation plan.

### 6.9 Proposed outputs

- Develop the activity plan clear with; major activities, specific activities, stakeholders involved, estimated budgets and implementation period.

## 6.6 Activity plan and budget

<b>CH 6: Water Allocation and use</b>				
<b>Target</b>		<ul style="list-style-type: none"> <li>To conduct abstraction survey and check compliance status with the objective of streamlining and regularising the existing abstractions.</li> </ul>		
<b>Output</b>		<ul style="list-style-type: none"> <li>Abstraction and Compliance Report;</li> <li>Increased compliance</li> </ul>		
<b>Activity</b>		<b>Sub-activity</b>	<b>Budget*1000</b>	<b>Year of Implementation</b>
6.1	Abstraction, Pollution and Compliance Survey	6.1.1 Stakeholder and Community mobilisation/sensitization	30,000	Y1Q2
		6.1.2 Training of survey team & development of survey plans	50,000	Y1Q3
		6.1.3 Data Collection	800,000	Y1Q3
		6.1.4 Equipment and Reagents	100,000	Y1Q3
		6.1.5 Abstraction Survey Report dissemination	300,000	Y2Q1
6.2	Regularization of abstraction	6.2.1 Support existing abstractors in making applications for water permits, and comments on permit application;	200,000	Continuous
		Purchase and Installation of Master Meters (30No)	1,500,000	Y2Q2, Y2Q4, Y3Q2
		6.2.1 Monitoring by WRUA to ensure all abstractors have master meters	300,000	Continuous
<b>TOTAL</b>			<b>3,280,000</b>	

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## **7 WATER RESOURCE PROTECTION**

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### **7.1 Introduction**

This is section of the plan, develops strategies to mitigate, prevent and manage pollution from both point and non-point sources. Water pollution refers to a condition where water within a water body is contaminated due to the presence of undesirable materials. Sources of pollution can be broadly categorized into two; point and non-point source pollution. Point source pollutions are those with traceable points of origin into a water body, an example is the effluent from a factory / course while non-point source example result from agricultural activities that diffuse.

### **7.2 Current status**

#### **7.2.1 Protection of the reserve**

Protection of Reserve-Quantity and Quality

Little efforts are being done to protect the water reserve both in terms of quantity and quality. One major effort has been to reclaim one plot of land (Plot 711) which hosts a spring that recharges the River for the community. Some of the springs that recharge the River are located in personal property making their management difficult. Encroachment on these springs and water waster trees (blue gum) continue to threaten the quantity and quality of water reserve.

Uncontrolled/unregulated abstractions from the river also pose a threat to the reserve quantity. During the second span of this SCMP, the WRUA will ensure that all projects install regulating and control devices and will advocate for common intakes.

The WRUA has sourced for funds and land to do a mega dam will ease the River flows by connecting to some of the water projects pipelines during dry seasons. This will leverage on the River flows during the dry season and still enable farmers to do minimal irrigation.

- What is the state quality and quantity?

Currently the River is dry in the middle and the lower zones hence deterioration of water quality in the two zones.



*Stagnant water that is green in colour.*

## **7.2.2 Protection of water resources**

### Protection of the reserve

A lot of efforts have been put in place to protect the water reserve by Kisima farm and catchment 711. All other water sources are in private ownership with total disregard of conservation. The sources are therefore degraded and require protection. The WRUA has managed to create awareness on the importance of the riparian land and planting of trees in the riparian land have been carried out.

The Ngare Ndare Forest Trust has over time played a significant role in protecting and conserving the water sources in the forest. They have managed to construct cattle troughs and trees have been planted at water sources. The trust has also put in place measures to control the destruction of the forest by human activity through planned grazing initiatives and reforestation. However persistent droughts have curtailed the efforts to conserve the forest and protect the water sources in terms of quality and quantity.

### **Protection of water resource**

- These include; water bodies such as; riparian land, wetlands, springs, pans and forested land. There are several springs that the community so much depend on and therefore require to be protected for sustainability:

- Catchment and groundwater protection areas
- There has been a move by water users to develop groundwater (boreholes) as an alternative to the scarce surface water resources.

### **7.2.3 Pollution and effluent control**

- Pollution surveys
- Environmental Impact Assessments.

#### **EIA**

The concept of EIA was introduced to the community who now appreciate its importance in water resources management. There is need to carry out EA for existing projects and EIA for new projects, including boreholes, and the towns within the Sub Basin.

There are many major sources of pollution within the Ngarenything sub catchment. The markets (Kisima, Manyangalo and Katheru), commercial farms in the upper zone, farming in the riparian land, livestock and wildlife are the major sources of pollution in the sub catchment. Although awareness creation has been carried out and measures put in place to control litter at the Kisima market a lot still needs to be done to address pollution and control effluent in the entire sub catchment.

#### **The state of pollution and effluent management?**

Most pollution experienced in the sub basin is majorly from:

- Direct livestock watering in the lower zone of Luparua.
- Soil erosion in the entire sub catchment due to massive degradation of the catchment.
- People washing clothes/car washing/ and Knapsack sprayers directly into the River.
- Schools due to lack of waste management plans.
- Markets that have no waste disposal mechanisms.
- Effluent from flower farms.

### **7.3 Targets**

Enforce water use and allocation plans.

Create awareness on reserve protection.

Undertake pollution survey and map all hotspots.

### **7.4 Proposed outputs**

Pollution survey and mapped hotspots.

Awareness created on the need to conserve and maintain the quality/quantity of water

## 7.5 Activity Plan and Budget

<b>CH 7: Water resource protection</b>				
<b>Target</b>		<ul style="list-style-type: none"> <li>• Conduct pollution survey and map all pollution hotspots;</li> <li>• Carry out awareness creation on resource protection and pollution control;</li> </ul>		
<b>Output</b>		<ul style="list-style-type: none"> <li>• Pollution Survey Report with Map indicating pollution hotspots;</li> <li>• Community sensitized on resources protection and pollution control;</li> </ul>		
<b>Activity</b>		<b>Sub-activity</b>	<b>Budget*1000</b>	<b>Year of Implementation</b>
7.1	Protection of reserve quantity of Ngare Nything River.	Ensure adherence to the Ngare Nything WRUA Water Use and Allocation Rules.	Budget captured in chapter 6	Continuous
7.2	Protection of reserve quality of Ngare Nything River.	Carry out pollution survey	1,500,000	
7.3	Enforce EDCP on flower/horticultural farms	Hire consultant to do the EDCPs.	500,000	
7.4	Create awareness on waste management at the household and local farm level.	WRUA and stakeholders facilitation done quarterly Community sensitization and awareness creation on Resource protection	2,000,000	Continuous
7.5	Construction of cattle/shoats troughs at strategic points for watering animals and sanitation facilities.	2No troughs, 2No washing basins,2No bathrooms,2No toilets per site.	2,600,000	2024-2025
7.6	Do a pollution survey and pollution control plan.	Undertake the pollution survey and create awareness on the pollution survey plan	1,800,000	
7.7	Carry out EIA/EA for markets.	Undertake the EIA with the relevant stakeholders.	300,000	
<b>TOTAL</b>			<b>8,700,000</b>	

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## 8 CATCHMENT AND RIPARIAN CONSERVATION

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### 8.0 Introduction

This chapter focuses on appropriate catchment management strategies for sustainable yield of water quantity and quality. This is because land and water are integrated and needs to be managed effectively for sustainable productivity. A catchment area is that land area from which water is collected by natural landscape (section 22, Water Act, 2016). On the other hand, Riparian habitat is an ecosystem associated with a body of water or that is dependent on the existence of a perennial, intermittent rain water. The Rules (2007) guides a riparian land area of a river to be a maximum of 30 meters and a minimum of 6 meters on both sides of the river, depending on the width of the river or simply taken to be the highest flooding water mark recorded. The Authority is also empowered to define the extent of the riparian as deem fit on the basis of best protecting the resource. On the other hand, the riparian area of a spring eye is defined as a minimum radius of 3 meters and a maximum radius of 15 meters. The water Rules (2007) further prohibits any anthropogenic activities that may interfere with the pristine nature of the any riparian and catchment at large. Among such prohibited activities include but not limited to; the planting of eucalyptus within the riparian area, destructive mining, farming that destroys riparian and development of structures within the riparian areas. The Authority under the Water Act, 2016 is charged to regulate the use and management of the resource as the county governments are mandated to manage the resources.

### 8.1 Catchment conservation

- The state of catchment conservation?

The main source of Ngare Nything River is a network of springs, most of which are located in Kisima Farm. Other springs that recharge the River are located on personal property through where the River traverses. The source at Kisima is relatively well protected. However encroachment through farming on riparian land and on springs coupled with planting of Eucalyptus spp have resulted in riparian degradation. Catchment and riparian degradation is increasingly leading to reduced water volumes and quality.

Sensitization of communities along the riparian on pegging has not been undertaken. There have also not been any erosion/sediment surveys while soil and water conservation and catchment rehabilitation plans have not been drawn.



*The degraded Riparian reserve and the catchment 711.*

- Erosion/sediment surveys
- Soil and water conservation plans
- Catchment rehabilitation

## 8.2 Riparian conservation

- State of riparian conservation?
- Surveys & conservation of Riparian area

## 8.3 Targets

- Protect Water catchments in the area.
- Build capacity of WRUA to carry out catchment and riparian land protection.
- Rehabilitate degraded land;
- Promote alternative energy sources

## 8.4 Proposed outputs

## 8.5 Activity Plan and Budget

CH 8: Catchment and Riparian conservation					
Target					
Output					
Activity	Sub-activity	Budget*1 000	Year of implementation		
8.1	Sensitise the community on riparian land reserve and delineate.	8.1.1 Awareness creation on the 3 zones (Kisima, Manyangalo and Liparua). 8.1.2 Discourage human activities along the Riparian reserve. 8.1.3 Do riparian land delineation, protect and conserve by planting indigenous trees.	2,862,000	2022-2025	
8.2	Do re-forestation of the catchment.	8.2.1 Plant 5000 seedlings on catchment 711. 8.2.2 Plant 10,000 trees in the entire Sub Catchment. 8.2.3 Rehabilitation/ conservation and management of the spring's sources.	1,000,000	2023-2025	
8.3	Do destocking of livestock/rangeland management	8.3.1 Reduce the No of livestock to the carrying capacity of the land. 8.3.2 Create awareness to the community on the need to conserve and protect the catchment.	1,000,000	Continuous	
8.4	Soil conservation practices	8.4.1 Community sensitization on appropriate land uses. 8.4.2 Identification of 3 soil conservation practices demonstration sites. 8.4.3 Demonstrations on terracing, gabions, contour farming	1,500,000	Continuous	
8.5	Fencing of springs	Fencing 3 no. springs	3,000,000		
<b>TOTAL</b>			<b>9,362,000</b>		

## 9 FLOOD MANAGEMENT

### 9.1 Introduction

The Flooding normally occurs in low lying areas of water bodies such as; rivers, lakes and other reservoirs when the water volumes exceed the waterbody's embankments. The chapter outlines; measures that are key to mitigating the impact of floods and other water related disasters. Primary to the measure is to develop the Integrated Flood Management Plan (IFMP) for affected sub catchments and other plans or strategies that build the community's resilience to other disasters such as; Drought, Landslides, Salinization etc.

### 9.2 Current Status

S/ No	Issue	Area affected	Nature of accidents	Exposed areas.	Pre-disposing factors	Who is affected during occurrence?	Measures to take	What are challenges in management of incidences
1	Floods	Lower zones of Luparua, Ntumburi and Manyangalu	Soil erosion, formation of gullies, submergence of households	Ngarend are and Lewa zones.	Heavy rains, degradation of the land, poor farming methods and unplanned settlements.	Schools, farm land soils, roads, livestock and mothers.	Planting of trees. Reseeding. Building check dams. Construction of gabions.	Lack of finances. Poor land management and planning.
2	Landslide	Upper zone (ntirimiti, kioro kia ndiria and kongoachek)	Crumbing of land.	Manyangalu and Ntumbui	Poor drainage. Degradation.	Transport. Communication.	Planting of trees. Erection of gabions. Construction of check dams.	Lack of alternative fuel resulting in charcoal burning.
3	Drought	The entire Sub catchment	Has become a normal	All areas	Inadequate rainfall.	Food shortage, loss of lives	Lack of rains.	Fall of water table.

			occurrence		Climate change. Overstocking. Deforestation.	wildlife, livestock and human. Increase in conflicts. School dropouts. Early marriages. Unemployment. Influx of migrants.		Violation of the flow reserve. Increase in conflicts.
4	Water borne diseases.	Entire Sub catchment	Always	Entire Sub catchment	Poor waste management. Violation of river reserve. Poor latrine cover in the lower zone. Poor sanitation at the watering points.	Human and livestock	Poor rains. Poor sanitation	Lack of finances. Lack of awareness.
5	Salinization of fresh water ecosystems.	Entire Sub catchment	Average status.	Upper zone	Poor hygiene. Poor discharge of water from the water sources.	Health hazard.	Poor ecosystem	Lack of finances. Lack of awareness. Flooding

*Note: Incident as used in this plan means the occurrence or likely occurrence of a disaster.*

### 9.3 Targets

- To develop an integrated flood management plan;
- To sensitize the community on flood management;
- Implement structural and non-structural measures.

### 9.4 Proposed outputs

- Increased awareness/ capacity among community members on floods and their effects;
- Community flood hazard map;

Community early warning system installed

CH 9: Flood Management			
Target		WRUA and stakeholders capacities are strengthened for effective management of flood and droughtdisasters	
Output		Integrated Flood and Drought disaster Management Plan developed and implemented	
Activity	Sub-activity	Budget	Year of Implementation
9 . 1	Develop flood and drought management plans	6 days' workshop	1,000.000  Q1y3
	Construction of sanddams,dams and waterpans Along Sirikoi ,Engare Sirigon Lepparua, Olchorai	80,000,000	Q2y3 to y7
	Construction of gabions at Lepparua and Olchorai lagga.	4,000000	Q2y4
	Installation of early warning systems/information dissemination (kisima and Manyangaro	1,500,000	Q2y3
		<b>totals</b>	<b>86,500,000</b>

## 10 CLIMATE CHANGE ADAPTATION

### 10.1 Introduction

This Chapter documents reported impacts of climate change within the sub-catchment and seeks to establish possible mitigation measures and adaptation mechanisms to minimize effects of climate change on water resources and livelihoods. It further provides a list of activities to be carried out within the sub-catchment and the associated budget to support implementation of activities.

#### 10.1.1 Indicators of climate change

The indicators of climate change are the observance of the frequency and severity of meteorological events and changes from baseline analysis. These can include the number of flood events in a year, frequency and length of droughts, duration of seasonal shifts in climatic norms, among others. It is also the exceedance of climatic records with regards to extremes.

#### 10.1.2 Global trends in climate change

The changes to atmospheric chemistry and the resulting thermal atmospheric anomaly have already and will further modify the seasonality and characteristics of precipitation and temperature profiles.

**Table: 10-1 Some of the Global trends in rainfall and temperature**

Rainfall	Temperature
<b>i). Increase rainfall variability</b> <b>Decrease in shoulder season length</b> <b>Increased fire danger (drying factor); and</b> <b>Impacts on rivers and wetland ecosystems.</b>	i). Higher mean annual temperature Increase evaporation and decreased water balance Reduced crop quality and food security.
<b>ii). Intensification of rainfall events</b> <b>Increased flooding;</b> <b>Increased challenge to storm water systems in urban settlements;</b> <b>Increased soil erosion;</b> <b>Increased river bank erosion and demands for protection structures;</b> <b>Increased pressure of disaster relief system.</b>	ii). Higher maximum temperatures, more hot days and more heat waves Increased in heat stress on humans and livestock Increased incidence of heat-related illnesses; Decreased crop yields and rangeland productivity Increased Extended range and activity of some pests and disease vectors;
	iii). Higher minimum temperatures, fewer cold days and frost days Reduced risk of cold-related illnesses. Reduced heating energy demand;

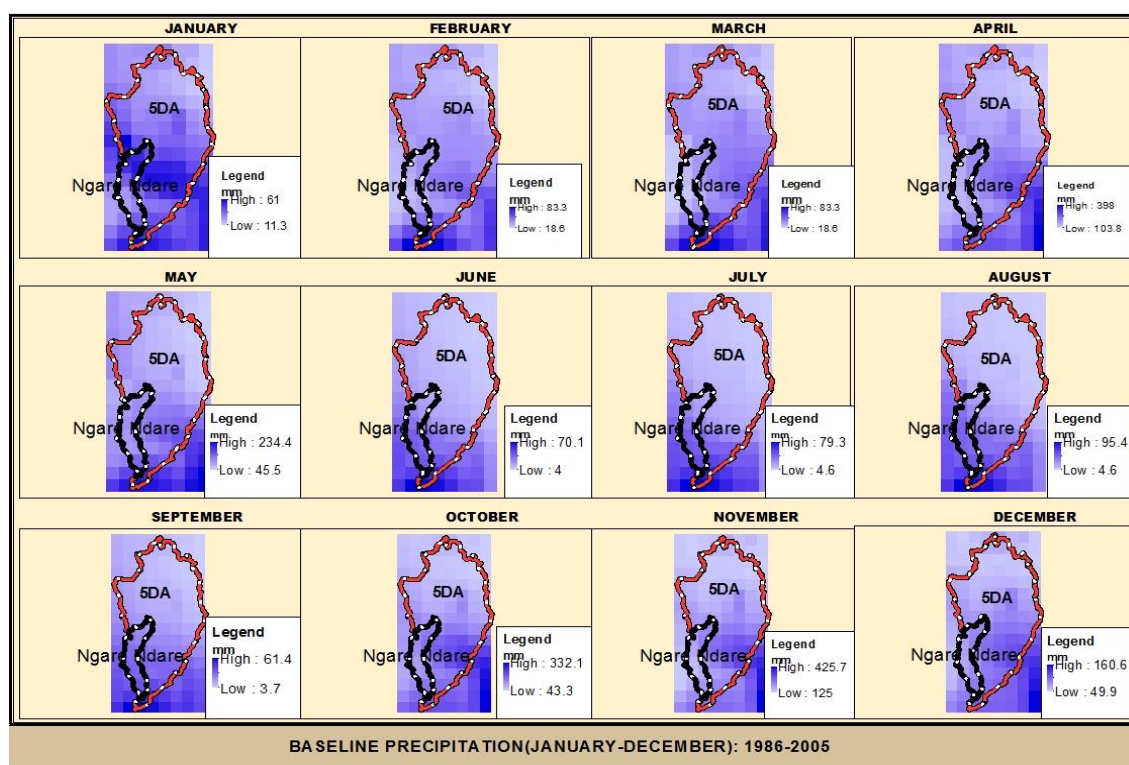
## 10.2 Climatic evaluation findings

ISC under the KWSCR Project analyzed the climate change in Kenya using data from SimCLIM and CORDEX models. SimCLIM data is downscaled to 5km resolution from the IPCC AR5 climate models. It presents the monthly projection from 1996 to 2100 through selected models or a model ensemble, with different environmental sensitivities. CORDEX (A Coordinated Regional Climate Downscaling Experiment) data is downscaled to 45km resolution and has a daily temporal scale to 2100.

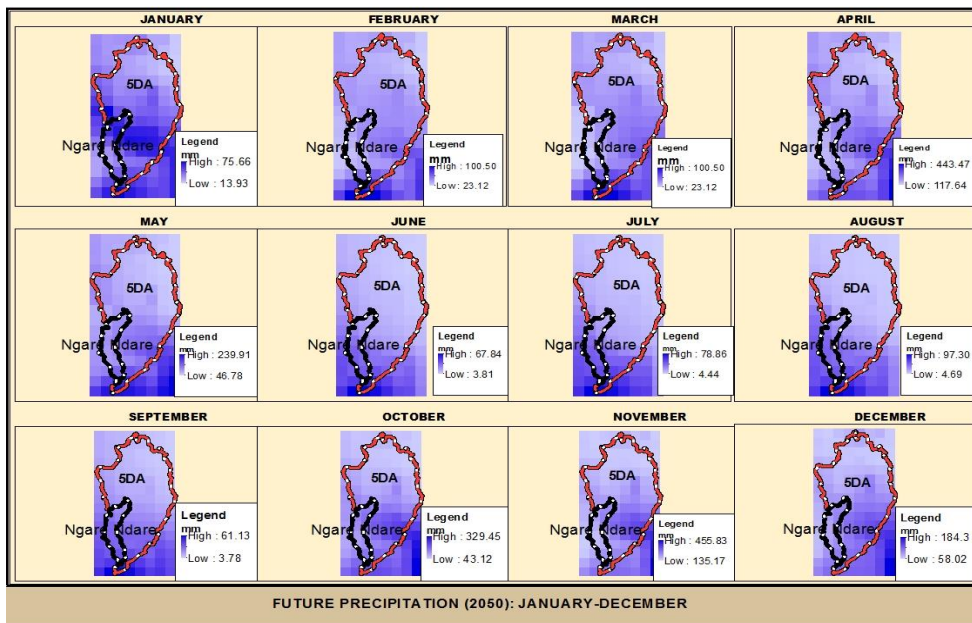
In the analysis, the future climates are presented against the representative concentration pathways (RCPs), which are seen as estimations of the potential curtailment of greenhouse gas emissions over the 21<sup>st</sup> century.

**Table: 10-2 Climatic model scenario; Best case (RCP 4.5) and Worst Case (RCP 8.5)**

	CO <sub>2</sub> (ppm)	CH <sub>4</sub> and N <sub>2</sub> O (ppm)	Resulting radiative forcing (W.m <sup>-2</sup> )	Scenario
<b>RCP 4.5</b>	538	92	4.5	Best case - Medium scenario
<b>RCP 8.5</b>	936	377	8.5	Worst case



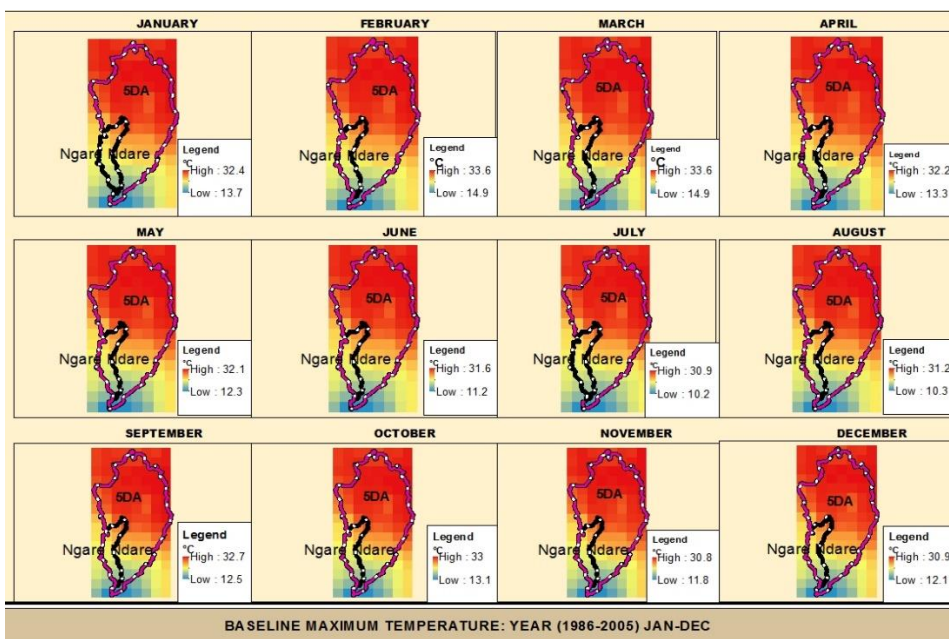
**Map: 10-1 Baseline (1986 - 2005) spatial and temporal (monthly)variation in rainfall in the Sub catchment**



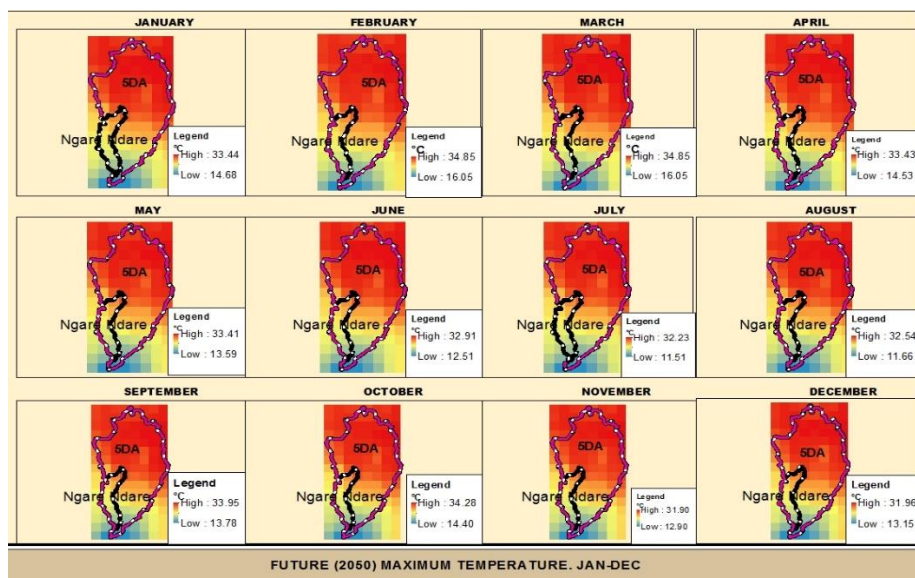
**Map: 10-2 Future (2050) projections of spatial and temporal (monthly) variation in rainfall in the Sub catchment**

Due to the uncertainties inherent in the climate change projections, it is not prudent to draw conclusions at WRUA sub Catchment level. Instead the following observation can be made for sub basin 5DA within which Ngare Nything Sub Catchment is located.

From the rainfall analysis above, it is anticipated that rainfall amounts will increase in both short and long rain period. The rainfall amounts in the long rain period are anticipated to be higher than that received in the short rain period.



**Map: 10-3 Baseline (1986 - 2005) spatial and temporal (monthly) variation of maximum temperature**



**Map: 10-4 Future (2050) spatial and temporal (monthly) variation of maximum temperature**

From the Maximum Temperature analysis shown in the Maps above, it is projected that the sub basin will record a general increase in temperature throughout the year.

### 10.3 Impacts of Climate Change in Ngarenything Sub-Catchment

The following impacts of climate change were reported within the sub-catchment:

Climatic Indicator	Impacts at Community level
Variation in Temperature	Community members within the sub-catchment confirmed that the area has experienced extreme temperature variations in the recent past. The extremely high temperature has led to drying up of some of the water sources and reduced yield on crops and livestock.
Variation in Rainfall Pattern	The community attested that there has been a great variation in the rainfall patterns in the area. This has greatly affected the farming community since they can't plan effectively for the planning seasons due to these rainfall uncertainties. Consequently, this has reduced the crop yield in the area.
Climatic Indicator	Impacts at Community level
Prolonged dry spell	The area has witnessed prolonged dry spell periodically leading to drying up of some water sources and at some instances results to human-wildlife conflict as they compete for the limited remaining water.
High intensity rainfall	The sub-catchment has in various instances experienced high intensity rainfall which lasts less than 4 hours leaving behind massive damage e.g. destruction of crops, flush floods and soil erosion.

## 10.4 Targets

Increase awareness on Climate Change

- Sensitize the community on activities that promote both adaptability and mitigation towards climate change.

## 10.5 Proposed Outputs

- Increased awareness
- Adaptation activities promoted

### Activity Plan and Budget

CH 10: Climate Change adaptation				
Target				
Output				
Activity		Sub-activity	Budget*1000	Year of Implementation
10.1	Create awareness on climate change and adaptation.	<b>10.1.1</b> Training of trainers from group leaders on climate change. <b>10.1.2</b> Conduct seminars on climate change in religious institutions. <b>10.1.3</b> Sensitize and promote climate change activities in chiefs Barraza's	2,000,000	continuous
10.2	Conservation of the environment	<b>10.2.1</b> Establish nurseries and promote tree growing. <b>10.2.2</b> Carry out soil conservation plans. <b>10.2.3</b> Do terracing where possible. Plant cover crops. <b>10.2.4</b> Do reseeding of the pasture lands. Sensitize on mulching of crops.	5,000,000	2023-2032
10.3	Create awareness on modern methods of farming	<b>10.3.1</b> Sensitize on drought resistant crops. <b>10.3.2</b> Use modern economical water use methods. <b>10.3.3</b> Control overstocking by encouraging holistic land management.	2,000,000	Continuous
10.4	Promote rain water harvesting structures at household level	<b>10.4.1</b> Create awareness on water harvesting structures at the household level. <b>10.4.2</b> Procure 100 rain water harvesting tanks for the most vulnerable in the community (5,000lts)	5,150,000	2024-2032
<b>TOTAL</b>			<b>14,150,000</b>	

### **11.1 Introduction**

The objective of this chapter is to provide an inventory of existing water resources infrastructure and their current status. This section also assesses the potential infrastructural development that can be implemented within the sub catchment based on other laid plans such as; the national Master plan and the CIDP. For purposes of this SCMP, water resources infrastructure encompasses all structural facilities constructed within the sub-catchment with the aim of protecting, conveying or conserving water resources. These facilities may include:

- Water storage structures; pans, Dam reservoirs etc both on-farm and off-farm
- Water abstraction structures (weir intakes, springs, boreholes and wells)
- Water conveyance structures; canal, pipe lines etc

### **11.2 Current status**

The current status of water resources infrastructure is discussed in terms of existing and proposed infrastructure. The sub catchment area has very limited water resources infrastructures as witnessed during the transect Walk. This is discussed and analysed below

#### **11.2.1 Existing water infrastructure**

Information on the existing water resources infrastructure was obtained from, the transect walk and through plenary discussions with WRUA members, WRA staff and the invited stakeholders. The currently available water infrastructure serves the entire community however some are privately owned and therefore their access and use are highly controlled.

The existing infrastructure suffers several challenges which includes: siltation, pollution, inadequate capacity and vandalism by the public. These problems have consequently led to decrease in capacities of these structure, water related conflicts and the structures being unsafe.

These problems can be attributed to the poor design of the infrastructures, poor workmanship, inadequate awareness on operation and maintenance of the infrastructure and degradation of the sub catchment. There is therefore need to rehabilitate the existing infrastructure, develop more and create awareness on the need for alternative storage and proper management of the facilities. Some of the designs for water intakes are not modern for self-regulation hence need to be rehabilitated to suit the current modern structures.

Rainwater harvesting through roof catchment is minimally practiced in the area and is mainly done at household level. There are very limited Government institutions in the sub catchment. The few have no water infrastructures to harvest water. The area also lacks meaningful large water pans, dams etc. There are several boreholes and shallow wells scattered within Upper, Middle and lower zone. Most of them are permitted by WRA. Some of the water infrastructures identified are as follows.

Existing water infrastructure							
Item	Infrastructure	location	use	owner	Functional state	Who installed and when	Compliance with WRM regulations.
1	6 No pans at kisima		Irrigation	Kisima farm	3 operational	Kisima farm -----	compliant
2	4 No bloomdale		Irrigation	Bloomdale	All operational	Bloomdale	compliant
3	AAA CHUI 2 No		Irrigation	Kisima farm	All operational	AAA CHUI	compliant
4	Ndurumuru		Domestic	Community	Non operational	<i>Done during colonial era</i>	<i>---none-----</i>
5	Kongo Aceke		Domestic	Community	Not operational	<i>colonial</i>	<i>---none-----</i>
6	Community water pans 3000 No			Community	1500 operational	Meru county, individuals	none
Planned infrastructure							
1	Community water pans 3000 No		Domestic and livestock	Community		Dependent on the donor	
2	Storage tanks at HH level		Domestic and livestock	Community			
3	Common intakes 4 no		Domestic	Community			
4	Wetland rehabilitation	Kisima 711	Recharge area	Community			

### 11.3 Planned infrastructure

There are proposed water infrastructure developments in the area by the County Governments of Meru, and Isiolo. The numbers, capacity and their locations are not yet confirmed. This will be addressed once actual activity/work is done within the sub catchment area or when the SCMP is being reviewed. However the following infrastructures by WRUA members for future undertaking

#### 11.1 Targets

- Awareness creation on proper maintenance of water storage infrastructure;
- Rehabilitation of existing storage infrastructure;

- Identification of potential site for water storage infrastructure;
- Promotion of alternative water sources i.e. roof rainwater harvesting and Spring protection;
- Capacity build the water management committee on O&M of water resources infrastructure;
- Increase water storage capacity in the sub catchment through rehabilitation:

#### 11.4 Proposed outputs

- Increased water infrastructures in all zones

#### 11.5 Activity Plan and Budget

CH 11: Water Resource Infrastructure Development				
Target				
Output				
Activity	Sub-activity	Budget*1000	Year of Implementation	
11.1	Construction of 2 No recharge dams	11.1.1 Hire professionals to do the survey and design works for the dams. <b>1,500</b>	140,500,000	2023
		11.1.2 Hire contractors to do the excavations and construction of the Chooge dam <b>97,000</b>		2024-2028
		11.1.3 Hire contractors to do the excavations and construction for Elagata Dorop dams. <b>37,000</b>		2024-2028
		11.1.4 Avail for supervision by WRUA members WRA staff and a clerk of works. <b>5,000</b>		
11.2	Construction of 4 dams at the lower zone for domestic, livestock and wildlife watering.	11.2.1 Hire professionals to do the survey and design works for the dams. <b>(1,500)</b>	21,500,000	2023
		11.2.2 Hire contractors to do the excavations and construction of dams at Leparua. <b>(20,000)</b>		2023-2029
11.3	Promote rain water harvesting tanks at household level	11.3.1 Procure and install 4,000 No tanks of 5,000 lts at HHs (45,000)	18,000,000	
11.5	Promote lagoons at HHs levels for irrigation purposes.	11.5.1 Do 800No lagoons at HH level for irrigation.	34,000,000	2024-2028
<b>TOTAL</b>			<b>214,000,000</b>	

### 12.1 Introduction

This chapter addresses the approach to rights on water allocation and use within the sub basin in consideration of the special cases or vulnerable groups within the community. Water is considered both as a social and economic good and therefore, everybody has a right of access to the water resource. The People living downstream, the poor, elderly, women and children and physically challenged are the most vulnerable in accessing safe adequate water.

Water is a basic human right. It's also a fundamental right as stated in constitution of Kenya Article 43(1) (d) provides that every person has a right to clean and safe water in adequate quantities.

### 12.2 Current Status

In line with the principles of IWRM, attempts have been made to have all-inclusive gender balanced NGARENYTHING WRUA and to that effect, the WRUA management committee is composed of 30% women representation. However, the vulnerable within the Sub Catchment are not given a priority in the decision-making process.

Some of the livelihood activities and infrastructure development should target the vulnerable groups. The WRUA constitution allows for only one representative for each project and in most cases, the management committees of the member water project do not include vulnerable groups

The WRUA management committee needs to have information and therefore be more active on the needs of the vulnerable groups who include the disabled, people living with HIV/Aids, the elderly, the child headed families and the poor.

Environmental flow is important for ecological balance and human basic need for people living downstream. The quantity of the environmental flow has been comprised by various activities being undertaken within the riparian area and over abstraction. There is limited knowledge on how to maintain the environmental flow leading to water use conflicts and migration of people.

#### 12.2.1 Rights based Approach

The competing- and sometimes conflicting- demands on water give rise to questions of equity and justice in light of IWRM. Adding the lens of the rights-based approach to this thinking offers opportunities to streamline water governance

and provide coherence both in the sphere of environmental sustainability and in terms of human development. Women within the sub catchment bear the greatest burden in undertaking most water related chores. This ranges from the household level to the farmland. The women need to be encouraged to be part of decision-making process within the WRUA and to participate fully by offering themselves for elective positions when vacancy arises.

The youth need to be encouraged to join the WRUA through Barazas. The WRUA management committee should devise ways on initiating income generating activities geared towards the youth in order to attract them in joining the WRUA and having a keen interest in IWRM. This would ensure sustainability of the WRUA.

The PLWDs should also be included in the decision-making process within the WRUA organs. They should be encouraged to join the WRUA. The water utilities within the sub catchment should be re- designed to cater for the interest of the PLWDs. This would ensure inclusivity and harmony within the WRUA.

Recruitment drives for PLWDs should be undertaken within the sub catchment.

The elderly within the sub catchment suffer from mobility challenges and this poses a great threat in access to clean water in adequate quantities.

NGARENYTHING WRUA will undertake a mapping exercise to document the elderly and the PLWDs within the Sub catchment and thereafter develop strategies geared towards ensuring that the two groups are able to access water. This could be in the form of provision of rain water harvesting tanks at the household level. The WRUA intend to collaborate with the Civil Societies to carry out advocacy on Rights-Based Approach in water resources management.

### **12.2.2 Cross cutting Issues**

The Sub Catchment just like any other sub catchments within the country is affected by the HIV/ COVID 19 scourge. This is not well documented within the WRUA and no study has been undertaken to determine the level of devastation it has caused over the years. Victims are sometimes very silent and this poses a challenge in trying to address their issues. People living with HIV/AIDS normally undergo stigmatisation though there have been major improvements in creating

awareness on the need for people to live harmoniously with this group. The WRUA will also reach out to this group and assist them in improving water availability within their households through provision of rain-water harvesting tanks.

Mainstreaming gender issues within the WRUA is a priority. This is a government policy on affirmative action and therefore NGARENYTHING WRUA will endeavour to fulfil this.

Issues of corruption within the WRUA will not be tolerated. The WRUA will follow the ethics and anti-corruption policy as outlined within the Kenya Constitution 2010. Chapter six of the Kenya constitution will guide leadership within the entity.

### **12.3 Targets**

- To capacity build and create awareness on the WRUA on RBA within the context of IWRM;
- Advocacy and inclusion of the vulnerable groups within the WRUA;
- Improve access to water among the vulnerable members of the WRUA.

### **12.4 Proposed outputs**

- Increased awareness on RBA mainstreaming in WRM issues;
- Nominated representatives of the vulnerable persons within the management structure;
- Improved access to water among the vulnerable.

## 12.5 Activity plan and Budget Activity plan and Budget

Activity code	Activity	Sub-Activity	Budget (Kshs)	Period of Implementation
12.1	Capacity building of WRUA on RBA in WRM	12.1.1 Hold 3 No. workshop to build capacity of WRUA committee on RBA, and importance of maintain reserve flow;	893,000	
		12.1.2 Conduct exposure visits to groups that have successfully incorporated RBA in WRM	434,000	
12.2	Awareness creation on RBA	12.2.1 Hold sensitization Barazas (1 per sub-location X 6 sub-locations for 10 years)	900,000	
		12.2.2 Hold sensitization meetings for the vulnerable groups and recruit them into the WRUA (1 Baraza per location X 3 locations twice within the SCMP period	90,000	
		12.2.3 Hold sensitization meetings for the water projects on friendly designs that incorporate ease of access by people living with disabilities (2No. per zone X 3 zones three times within SCMP period)	141,000	

12.3	Advocacy and inclusion of the vulnerable groups in WRM	12.3.1 Hold a 2-day meeting to review the constitution/by-laws to make provision for special consideration for the vulnerable groups	101,000	
		12.3.2 Develop criteria for identification and classification of the vulnerable groups and identify and recruit representatives	224,100	
		12.3.2 Provide rainwater harvesting tanks of 2,300 litres capacity to 1 5 households per zone X 3 zones X 10 years = 450 tanks)	11,705,500	
		<b>TOTAL</b>	<b>14,488,600</b>	

### 13.1 Introduction

Livelihood is a means of securing the basic necessities -food, water, shelter and clothing- of life". Livelihood is further defined as a set of activities performed to live for a given life span, involving securing water, food, fodder, medicine, shelter, clothing and the capacity to acquire above necessities working either individually or as a group by using endowments (both human and material) for meeting the requirements of the self and his/her household on a sustainable basis with dignity to the environment. This Chapter seeks to establish the current livelihood activities carried out in the sub-catchment and the impact on water resources and catchment conservation. The objective is to address issues related to livelihood activities for the sake of enhancing livelihood for maximum returns/improved productivity or where the activities are detrimental to catchment and water resources conservation, make recommendation for alternative livelihoods.

#### **Current Status**

Various livelihood activities are carried out within the sub-catchment. Details of the livelihood activities, where they are practiced within the sub-catchment and any concerns are presented below.

Among the activities the communities engage to make a living not limited to the following include;

- Subsistence farming
- Business
- Commercial farming/ Floriculture
  - Horticulture
  - Sweet potato farming
  - Irish potato farming
  - Bee keeping
  - Poultry farming
  - Pastoralism
  - Ranching
  - Dairy farming
  - Eco-Tourism
  - Beads work

### **13.2.1 Livelihood Activities Practiced**

Among the activities the communities engage to make a living not limited to the following include;

*Subsistence farming-* Subsistence farming is the largely practised livelihood activity in the sub catchment. The main crops grown include; onions, carrots, vegetables and potatoes. With the seasonality of the rivers and shift in rainfall patterns in the area, farming is mainly done on the riparian land through illegal and legal water abstraction

Streams. This has led to degradation of the riparian land. Therefore need to sensitize the community on sustainable agricultural practises to help the farmers reap the full benefit from their farms even without encroaching the riparian.

*Livestock farming-* Livestock farming is practised in large scale in lower and middle section of the sub catchment. The lower section of the sub catchment is composed of the pastoral community who keeps large herds of goats, sheep and cows. Dairy and poultry farming is also practised in small and large scale in the area. The milk is sold to local vendors. Majority of the farmers in the sub catchment practise free range cattle keeping. This has led to overgrazing in the area and consequently increased soil erosion. There is need to train the farmers on sustainable livestock farming to reduce the negative impacts on the sub catchment.

*Bee keeping-* A few farmers within the sub catchment practise bee farming in small scale. This is mainly concentrated on the forested areas of the sub catchment. The health benefits obtained from honey has posed a great demand of the product from these limited resources. There is need to promote modern bee farming technologies in the area.

*Commercial farming-* Commercial farming is mainly practised in the upper and mid sections of the sub catchment. Crops grown for commercial purposes include; Flower farming, Wheat, daily farming, Cabbages, Tomatoes, Potatoes and onions. These products are sold in the local market and some exported to the neighbouring towns. Dairy and Poultry farming is at low phase the commercial farming in the upper zones of the sub catchment has greatly reduced water levels in the lower zones. There is need to promote conservation agriculture in the area and modern farming methods.

### **13.2 Targets**

- To Generate a business plan and enhance all current livelihood activities

### **13.3 Proposed outputs**

- Business plan generated and enhanced livelihood.

## 13.4 Activity plan and Budget

Activity code	Activity	Sub-Activity	Budget (Kshs)	Period of Implementation
13.1	Enhance current sustainable activity	13.1. days Capacity building on bee keeping for the WRUA members. 4days per zone for the SCMP period.	506,000	
		13.1.2 Fencing of 20No. apiaries	823,700	
		13.1.3 Setting up and operationalization of 20No apiaries with 20 hives each and installation honey refinery	4,447,580	
13.2	Improved dairy farming	13.2.1 Conduct 10 No. Field days on improved dairy breeds and Feeds/pasture (stakeholder facilitation)	750,000	
		13.2.2 Establishment of demo plots	500,000	
13.3	Promote poultry farming through establishment of Hatchery(4000 eggs)	13.3.1 Develop a business plan for poultry farming	150,000	
		13.3.2 Procurement and installation of incubator	450,000	
		13.3.3 Construction of a brooder, procurement of certified eggs from KALRO,	750,000	
		13.3.4 Capacity building of poultry management	1,085,000	
13.4	Sensitization on alternative livelihoods	13.4.1 Hold 6 No. Barazas within the sub locations 1 per sub location over entire SCMP period.	562,000	
		13.4.2 6 No. Exchange visits to other areas. For the entire SCMP period	2,000,000	
		13.4.3 Identification and establishment of high value fruit tree nursery for Avocados-60000, mangoes-10000, macadamia - 5000	3,000,000	
13.5	Establish alternative livelihoods	13.5.1 Purchase and distribute of fruit trees to WRUA members.	787,300	
		13.5.2 Introduction of fish in the dams and water pans ( 1000 fingerlings per dam)	2,500,000	
		13.5.3 Establish sheep breeding sites 1No. Lower Zone	850,000	
		13.5.4 Establishment of seed bulking 1 No. upper zone	960,000	
		13.5.5.Promote energy saving Jikos production and installation.(20 training days)	1,510,000	
		13.5.6 Consultancy services to develop business plans.	250,000	
		<b>TOTAL</b>	<b>15,594,280</b>	

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## 14 INSTITUTIONAL DEVELOPMENT

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### 14.1 Introduction

The WRUA's institutional development caters for the human capacity to run and dispense their mandates and also the fixed facilities that enable their operations and functions. This section of the plan examines the capacity of the WRUA in human resource perspective and the physical asset development by the institution. The capacity of the WRUA is discussed in relation to their; knowledge, skills as well as the facilities that enable them operate effectively to achieve their core mandate. It further addresses the gaps identified in order to strengthen the WRUA capacity to be a self-reliant entity, and to collaborate and network with other stakeholders with mutual interest.

Institutional capacity enhance the skills of WRUA to effectively discharge its mandate.

#### 14.2.1 Institutional Set-up

The revised organizational structure is as shown in Figure 5.

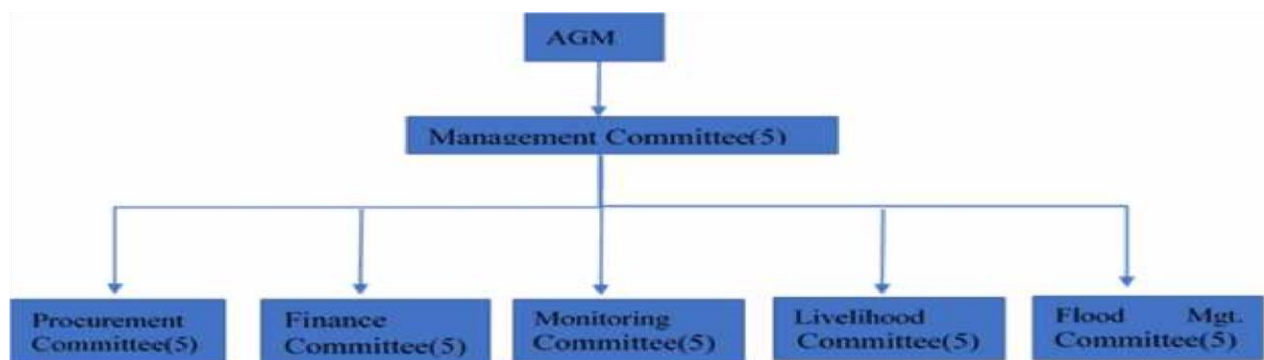


Figure 5: Revised Organization Structure

#### 14.2 14.2.2 Institutional Leadership and Governance **Institutional capacity**

- Training need assessment  
Currently there is a big gap in governance that requires to be addressed through a training needs assessment.
- Skilled manpower.

The WRUA does not have any skilled staff currently.

- Unskilled manpower.  
The WRUA often engage un skilled labour.
- Human resource development

### 14.3 Facilities

Ownership of physical property such as; land, office premises.

There has no physical ownership of any land or structures other than Catchment 711 where the WRUA has been incorporated in management and the Subuiga Dam that was donated to the WRUA though the land ownership is still under Kisima farm.

#### 14.2.3 Institutional Financing

WRUA operations are currently supported by funds from membership fees, quarterly subscription fees and WRUA comments facilitation fee. The amount initially charged by the WRUA per category is as follows:

Member Category	Membership Fee Paid Once (Ksh)	Quarterly Subscription Fee (KSh)	Total Number
Water Projects		300,000 (Annually 1.2m)	28

#### 14.4 WRUA capacity building

The WRUA members highlighted some of the areas that need capacity strengthening in order to be self-sustaining and to effectively manage and regulate water resources. These are; financial management, resource mobilisation, conflict resolution framework, membership acquaintance with the WRUA constitution, governance and leadership, project management and finally, water resource and catchment monitoring information sharing. In addition to these capacity areas, a Training Needs Assessment is necessary to identify some capacity needs of the WRUA which might not have been highlighted before commencement of the training.

### 14.5 Facilities

Ngarenthing WRUA has an established office and partially equipped. This ensures safety of WRUAs records, properties and dissemination of information. The management committee day-to-day affairs of the WRUA. The WRUA has no Executive officer at the moment but there is plan to replace.

Wrua doesn't have any means of mobility and therefore requires to purchase some motorbikes or vehicle.

## 14.6 Targets

- Capacity building on conflict resolution frame work, resource mobilisation and financial management, water resource and catchment monitoring and information sharing, governance and project monitoring;
- Establishment and equipping of WRUA office;
- Recruitment of staff;
- Increase WRUA membership through publicity

## 14.7 Proposed outputs

WRUA office established equipped

- Enhanced WRUA capacity;
- Staff recruited
- Increased WRUA membership

## 14.8 Activity plan and Budget

Activity code	Activity	Sub-Activity	Budget (Kshs)	Period of Implementation
14.1	Construction and equipping of WRUA office and conference facility	14.1.1 Design and construct of an office and conference facility	6,500,000	
		14.1.2 Purchase and installation of office furniture and equipment	1,500,000	
14.2	Capacity Building	14.2.1 Conduct Training Needs Assessment for every new office bearers and staff(3times within SCMP period)	1,200,000	
		14.2.3 Conduct a 3-day training workshop every 3 years	3,200,000	
14.3	Carry out WRUA Publicity	14.4.1 Procure publicity materials (Fliers/Brochures/ branded T-Shirts	1,500,000	
14.4	Engaging of Wrua Staff(E.O and scouts)	Advertise the available job opportunity post.		
		<b>TOTAL</b>	<b>13,900,000</b>	

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## 15 MONITORING AND INFORMATION MANAGEMENT

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### 15.1 Introduction

This chapter seeks to establish the existence of a water resource and climatic monitoring network within the sub catchment. Examine their operational status and the existing framework for data collection, analysis and dissemination between the WRUA and other stakeholders. Key focus is tailored on the input the WRUA can give towards supporting the formal monitoring network. Secondly, there's the need to develop frameworks for community-based resource monitoring.

### 15.2 Current status

Ngarenything Wrua has one RGS station based at Manyangaro this station is manned by WRUA but data is submitted to WRA after every end of the month. The Wrua has more 4 no V notches that are monitored every Monday of the week and information shared through Ngarenything what's app platform informing members of the current water status. The sub catchment also has several rainfall gauging stations but are individual and therefore minimal data accessibility. However there's need for more advanced monitoring framework by the WRUA .the WRUA requires adequate support from relevant stakeholders in setting up proper monitoring network within the sub-catchment. That will cater for several parameters including rainfall, water quality, humidity, evaporation, flood warning systems among others. the effects of inadequate monitoring and information system are poor water resource management, poor sub-catchment planning and water related conflict.

## 15.2 Water use monitoring

Ngarenything WRUA has a register of all abstractors within the sub catchment though some have not complied with registration requirement and also doesn't have legal documentation from WRA.

## 15.3 Data and Information management

. There is need to establish data for weather and groundwater monitoring station within the sub catchment due to increased drilling activities.

## 15.4 Targets

- Strengthen WRUA capacity to carry out catchment and water resources monitoring;
- Develop and implement monitoring and information management plan

## 15.5 Proposed outputs

- Enhanced WRUA capacity to carry out monitoring;

## 15.7 Activity Plan and Budget

Activity code	Activity	Sub-Activity	Budget (Kshs)	Period of Implementation
15.1	Capacity Building of WRUA on Monitoring and Information Management	15.1.1 Conduct 2-day training workshop every three years	1,500,000	Fy 1&2
15.2	Development & Implementation of Monitoring & Information Management Plan	15.2.1 Supply and installation Water level Gauges at Upper zone and down stream	800,000	FY 2,3
		15.2.2 Supply and installation of automated Hydromet station 1 No. at Upper part of Ngarenything	3,000,000	FY 3,4
		15.2.3 Installation of weather gauging equipment's and additional V notches along the river line	1,000,000	FY,3,4
		15.2.3 Purchase data capture and monitoring equipment (GPS, Cameras, Computer and others)	660,000	FY 2 3
		15.2.4 Purchase 2No. Motorbike and a vehicle for use in monitoring. Train scouts and WRUA staffs on riding and maintenance of motor bikes	3,800,000	FY 3,4
		15.2.5 Engage scouts for monitoring activities for 10 years	6,000,000	CONTINOUS
		<b>TOTAL</b>	<b>16,760,000</b>	

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## 16 FINANCING AND IMPLEMENTATION

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### 16.1 Introduction

This chapter discusses the various activities in financial management of the WRUA it takes consideration SCMP budget and WRUA internal revenue to ensure the WRUA governance is strengthened and the activities are sustainable. The trainings will be enhanced with the WRUA developing business plans and ensuring that their livelihood activities are in line with the business plans when implementing. It also ensures that the WRUA makes yearly returns to the Targets, Outputs and activities to be undertaken by the WRUA are enlisted at the end of the chapter.

### 16.2 WRUA financing

Ngarenything WRUA SCMP review was funded by SNV in the Month of Feb 2023.

Currently the WRUA relies on its membership fee, donor funds and well-wishers as source of funding. Members contribute Membership fee Ksh.10,000 and quarterly subscription of based on allocation.

#### 16.2.1 WRUA operational budget

The required operational budget and revenue for Ngarenything WRUA is as illustrated

Item	Monthly Budget (Ksh.)	Annual Budget (Ksh.)y
Office rent	6000	6000.00
Office water and electricity bills	700	8,400.00
Staff salaries	30000.00	360,000.00
Transport	1000.00	12000.00
Communication	1000.00	12000.00
Allowances(meetings)	10,000	120,0000.00
Monitoring allowances	8000	96000.00
Scouting allowances	10,000	120,000.00
<b>Total</b>		<b>734,400.00</b>

As previously stated, the current average annual revenue collected by

NGARENTYHING WRUA is Ksh.1,200,000 (equivalent to Ksh.100,000monthly).

There is proposal to recruit more members and effect changes made in the new in the new constitution will enable the WRUA to easily meet its operational cost. This

is encouraging for this WRUA will be in a position to the run the office more efficient and efficiently.

### 16.3 Mechanisms to meet WRUA’s Operational Budget

SCMP financing demands that a proper resource mobilization strategy be put in place. The strategy should define possible sources of funds to cover the SCMP budget and activities involved in resource mobilization. Some stakeholders has specific area of interest for financing. NGARENYTHING WRUA therefore shall engage with the identified stakeholders for support in SCMP implementation

#### 16.3.1 SCMP investment budget

The SCMP investment budget is **KES 299,701,780.00**

as broken down in the table below. Detailed budget is appended in this plan.

Chapter	Title	Budget (Ksh)*1000
1	Introduction	-
2	Overview of the Sub Catchment	
3	Catchment Characteristics	1,200,000.00
4	Management Approaches	3,900,000.00
5	Water Balance and Water Demand Management	1,600,000.00
6	Water Allocation and Use	3,280,000.00
7	Water Resources Protection	8,700,000
8	Catchment and Riparian Conservation	9,362,000
9	Flood Management	86,500,000
10	Climate Change Adaptation	14,150,000
11	Water Resources Infrastructure development	214,000,000
12	Rights Based Approach /Poverty Reduction	14,488,600
13	Livelihoods Enhancement	15,594,280.00
14	Institutional Development	13,900,000.00
15	Monitoring and Information Management	16,760,000.00
16	Financing and Implementation	6,448,500.00
<b>Grand Total</b>		<b>409,883,380.00</b>

## **16.4 Mechanisms to Raise SCMP investment and Operations Budget**

NGARENYTHING. WRUA operational budget is supported by membership and subscription fee paid to WRUA by the members. Currently the Association is self-sponsored.

Thus, in order to gain and retain a good financial health, NGARENYTHING WRUA has proposed to undertake the following activities as a priority capacity strengthening effort

- Intensify membership recruitment drives
- Review members' contribution with a view of increasing it
- Update payment of membership fees and monthly contributions
- Intensify fundraising from stakeholders and development partners

WRUA can raise its operations budget by:

- Recruitment of additional members' especially corporate members. The WRUA plans to increase its revenue by recruiting water projects, institutions and more individuals. Increase in membership means increase in revenue generated from membership and quarterly subscription fees;
- Ensuring that monthly subscription fee is paid on time. This could be achieved through sending reminders and sensitization of members on the importance of paying monthly subscription fees on time as it is what supports day to day running of the WRUA office;
- Engaging in WRUA Income Generating Activities. The IGA will be implemented using the business plans developed and this will ensure sustainability and revenue;
- Developing proposals to key stakeholders to sponsor/support specified WRUA activities.

Mechanisms to raise SCMP Investment Budget would include:

- Proposal development on thematic areas and submission to identified key stakeholders in the respective sectors;
- Proposal development and submission to Water Sector Trust Fund;
- Collaboration with key stakeholders that are already implementing similar activities within the sub-catchment e.g. County Governments of Laikipia, Meru

and Isiolo in implementation of catchment conservation activities as specified in the County Integrated Development Plan (CIDP)

- In-kind contributions from WRUA members and other key stakeholders;
- Donations (cash or in-kind contribution) from development partners or their implementing agencies.

### 16.5 Targets

To ensure WRUA sustainability and completion of SCMP activities by building capacity and implementation of resource mobilization strategies;

### 16.6 Proposed Outputs

Enhanced WRUA capacity of WRUA in financial management and procurement.

### 16.7 Activity Plan and Budget

Activity code	Activity	Sub-Activity	Budget (Kshs)	Period of Implementation
16.1	Finance Management Training	16.1.1 Conduct Finance Management Training	170,000	
		16.1.2 Training on IWRM	525,000	
		16.1.3 Training on Procurement	170,000	
		16.1.4 Training and Development of Business Plan	157,000	
16.2	Implement Income Generating Activities	16.2.1 Implement Bee keeping, and Fruit Tree nursery and bamboo nursery, water kiosks	4,665,000	
16.3	Conduct membership Recruitment Drive	16.3.1 Hold meetings to recruit new members	253,500	
16.4	Promote transparency and accountability	16.4.1 File Returns to Attorney General	8,000	
		16.4.2 Engage a financial Auditor	500,000	
		<b>TOTAL</b>	<b>6,448,500</b>	



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## **NGARE NYTHING WRUA SUB-CATCHMENT MANAGEMENT PLAN (2023-2033)**

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