

TIMAU 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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Preparation of the Timau WRUA Sub-Catchment Management Plan (SCMP) was made possible through a collaborative effort between various stakeholders and the WRUA itself. Timau WRUA is grateful to all individuals and institutions who contributed materially or in kind making the SCMP development exercise a success. Appreciation is first extended to SNV-LISTEN Project which facilitated the technical and financial inputs into the process. Water Resources Authority (WRA) offered the technical support, coordination and logistical support in this activity.

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EXECUTIVE SUMMARY

Water constitutes a worldwide challenge for the 21st century, both in terms of the management of available water resources and access to safe and adequate drinking water for the world's population. Water is perceived as an integral part of the ecosystem, a natural resource and a social and economic good.

It offers multiple ecosystem services such as;

- Provisioning services such as crop production and energy generation
- Regulating services as in flood mitigation and groundwater recharge
- Supporting services as in soil conservation and nutrient recycling
- Cultural services such as recreation and religious functions

The main challenge for water resource management is to ensure a sustainable management of the multiple services offered by water systems, avoiding over-exploitation and degradation.

The water sector consists of all means and activities devoted to creating net added value from the water resources available in any given country. The sector operates in a complex interplay between water resources and the socioeconomic and environmental system in a given area.

It comprises two main segments;

1. 'Resources activities' that influence the spatial-temporal distribution (quantity) or the quality managed as an asset.
2. 'Use activities' that use water in transformation processes for social uses (e.g. water supply), economic uses (e.g. agriculture, industry, energy), and environmental uses (e.g. restoration and conservation of ecosystem services).

Chapter Four (Bill of Right) of the Kenyan Constitution 2010 provides the minorities and marginalized groups the rights to reasonable access to water while providing every person the rights to access safe and clean water in adequate quantities for social and economic development. Chapter Five – Part 2 Section 69 indicates that the State shall—

(a) Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
(d) Encourage public participation in the management, protection and conservation of the environment;

The Constitution enacts the principle of local users taking responsibility for the guardianship of their own resource; a resource management strategy that requires community participation in local resource management.

The Water Sector Reforms has recognized the need for participatory water resources management through Water Resource Users Associations (WRUAs); as per the Water Act 2016.

The Sub-catchment Management Plan therefore becomes a community's Action Plan in integrated water resource management. The ultimate aim of the SCMP is to balance resource utilization and conservation to enable water resource to be protected and where appropriate to be restored to its original state. The SCMP will ultimately depend on the decisions made when the community is formulating it. Considering the impact of climate change on water resources which has resulted in flooding, droughts and landslides, and the voluntary nature of

WRUAs, it is necessary that WRUAs are strengthened and livelihood component is incorporated in their activities to achieve sustainable water resource management at the local level.

Timau WRUA SCMP review was made possible through financial support from SNV and technical support from the Water Resources Authority (WRA) - Upper Ewaso Ngiro Sub-catchment and Ewaso Ngiro North Catchment Area regional office. The review process took place in February and March 2023.

The Timau WRUA SCMP was reviewed through a participatory process i.e. collection of views from water users and stakeholders and subsequently a workshop that was conducted at Timau WRUA Hall. The process involved induction and capacity building as well as participatory identification, analysis and prioritization of problems/issues and the possible solution related to water resources and the environment management.

The SCMP adopts the structure of Ewaso Ngiro North Catchment Management Strategy (CMS) which has sixteen (16) Chapters. Chapters 1, 2 and 3 deals with baseline information which aims at providing an in-depth understanding of the SCMP review process, water resources related issues/problems in the Timau Watershed and their possible intervention strategies.

The remaining Thirteen (13) Chapters deals with mechanisms and solutions for the identified problems/needs. Each activity has its proposed budget line that the Association intends to finance internally or through donors and development partners and or other financial institutions.

This SCMP is intended to take 10 years, implementation starting **XXXX 2023** with an estimated budget of **Kshs XXXX**

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ABBREVIATIONS

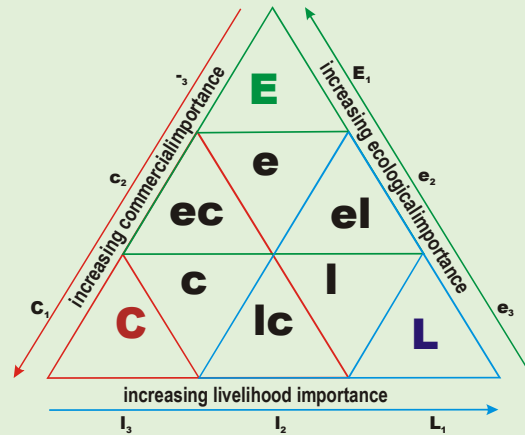
ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
%	Percentage	PM	Procedure Manual
°C	Degrees Celsius	QMS	Quality Management System
AIDS	Acquired Immuno Deficiency Syndrome	RGS	Regular Gauging Station
APS	Abstraction and Pollution Survey	RQO	Resource Quality Objective
ASAL	Arid and Semi-Arid Lands	SCMP	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	m³/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
KM²	Kilometers Squared	NWRMS	National Water Resource Management Strategy
KMD	Kenya Meteorological Department	p.a	Per Annum
		PDB	Permit Data Base

GLOSSARY

TERM	DESCRIPTION
Annual sustainable yield	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.
Aquifer	An underground geological formation able to store and yield water.
Available water	This refers to the surface and ground water potential within the sub-catchment that can meet basic human needs
Ecosystem Services	These refer to varied benefits from the properly functioning natural environment.
Erosivity	It is the measure of the potential ability of soil to be eroded by rain or surface runoff.
Ground water -	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.
Mean Annual Precipitation	It is the average rainfall for a given year.
Naturalized flow	It is the measured river flow adjusted to take account of net abstractions and discharges upstream of the gauging station.
Non-point Pollution	This refers to water pollution that is caused by widely dispersed sources of pollutants such as runoff from agricultural areas draining into a river.
Permit	It is an official document giving someone authorization to abstract water under Water Act, 2016.
Pollution	It is the direct or indirect alteration of chemical, physical and biological properties of water rendering it harmful or potentially harmful
Ground Water Recharge	Refers to the process where water moves downward from surface water to groundwater.
Reserve	This is the amount needed to satisfy the environmental and basic human needs (Downstream)
Resource Quality	It refers to the total condition of the water body which includes all aspects of the water body including chemical, physical, and biological characteristics.
Resource Quality Objective	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>).
SCMP Investment	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.
Transfers	It is the amount of water being conveyed for use in another catchment
Water Allocation Plan	Refers to a document that sets out the rules for water use within a sub-catchment for long term resource sustainability
Water Demand	This is the established current and future water needs in the sub catchment
Water Resource Management	Refers to the conservation, protection, development and utilization of water resources.
Water user	Refers to a person using water from a water resource
WRUA	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
WRUA Development Cycle	This is a guideline that provides an overall framework for channeling investment into water resource management at the local level, mainly through WRUAs.
WRUA operational budget	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.

Sub catchment Demand classification

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.



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
Category 1	ALARM
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
Category 2	ALERT
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
Category 3	SATISFACTORY
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 Authority (WRA) 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, 2021 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. More essential to the structure is the establishment of WRUA which has now been widely adopted across the country and about half have developed SCMPs. 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 Time frame 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

Timau WRUA developed the first SCMP in Sep 2011 with a time frame of 10 years. On expiry of the time frame of the first SCMP, it was necessary to review the SCMP by taking stock of what the current condition is against the initial condition when the initial SCMP was developed. The first SCMP was financed by WSTF within technical support from WRA. This SCMP was developed in 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 a stakeholder engagement workshop which was carried out from XXXX to XXXXX.** The

main objective of this step was to gather additional information through participatory process on major water resources related problems experienced within the sub-catchment, identify possible sustainable solutions to the problems and carry out problem analysis in order to establish priority activities to be implemented. Information compilation, further data analysis and report writing was then conducted from XXXXX to XXXXX and the output was a draft Sub-Catchment Management Plan for Timau sub-catchment. The draft SCMP was then circulated to a wide range of stakeholders and thereafter adopted as the plan to be implemented by the Timau WRUA in collaboration with other stakeholders. The stakeholders in SCMP development included WRUA members, Water Resources Authority, the local National Government Administration Officer, Consultants and representatives from the County Government of Meru and Laikipia (Agriculture, Public Health and Ward Administration), The SCMP development process was financed under the SNV.

2 OVERVIEW OF THE SUB CATCHMENT

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

2.1 Problems identified

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

1. Weak Governance,
2. Poor water resources infrastructure;
3. Illegal abstraction;
4. Catchment degradation;
5. Water pollution;
6. Encroachment on riparian land;
7. Poor monitoring and information system.
8. Water scarcity.
9. Human/Wildlife Migration.
10. Lack of enforcement
11. Drought

2.2 Problem Ranking

Problems Identified	Code		WS	WP	IA	CD	HC	IWI	CC	PWG	PMI
Water Scarcity	WS	WS	1	0	1	1	1	1	1	1	1
Water pollution	WP	WP	1	1	1	1	1	1	1	0	1
Illegal abstraction	IL	IA	1	0	1	0	0	1	0	1	1
Catchment Degradation	CD	CD	1	0	1	1	0	0	0	1	1
Human Conflict	HC	HC	1	0	1	1	1	1	1	1	1
Inadequate water infrastructure	IWI	IWI	1	0	0	1	0	1	0	1	0
Climate change	CC	CC	1	0	1	1	0	1	1	1	1
Poor WRUA governance	PWG	PWG	1	1	0	0	0	0	0	1	0
Poor monitoring information	PMI	PMI	1	0	0	0	0	1	0	1	1
		SCORE	8	1	5	5	2	6	3	7	6
		RANK	1	9	4	4	6	3	5	2	3

2.3 Problem analysis

Problem(s)	Causes	Impact/Effects	Solution Strategy
Weak Governance	<ul style="list-style-type: none"> • Inadequate resources to carry out WRUA mandates • Poor understanding on role and responsibilities of WRUA; • Limited contact and feedback between management and members • Inadequate financial resources to support WRUA operations; • Low/poor participation of community members in WRM and WRUA activities • 	<ul style="list-style-type: none"> • Ineffective WRUA; 	<ul style="list-style-type: none"> • Enhancing the capacity of the WRUA management in governance through trainings and exposure trips to well managed WRUAs
Poor water resources infrastructure	<ul style="list-style-type: none"> • Uncoordinated construction of storage facilities without proper technical designs; • Poor operation and maintenance of storage facilities; • Frequent structure failure; • Siltation of storage facilities thus reducing storage capacity; • Unprotected infrastructures 	<ul style="list-style-type: none"> • High costs of managing and establishing water resources' infrastructures 	<ul style="list-style-type: none"> • Put in place community-based measures and procedures that will support integrated development and management of water infrastructures
Illegal abstraction	<ul style="list-style-type: none"> • Weak enforcement of water resources management rules; • Ignorance/unwillingness to comply to the regulations; • Poor management of water project by committees • Low awareness on WRM Rules and regulations; 	<ul style="list-style-type: none"> • Violation of reserve flow and water scarcity that lead to water related conflicts 	<ul style="list-style-type: none"> • Create awareness on compliance and enforce water use regulations to prevent illegal abstractions

Problem(s)	Causes	Impact/Effects	Solution Strategy
	<ul style="list-style-type: none"> • Bureaucracy in the permitting process; • Emerging commercial users with increasing demands; • Fear of the unknown permit application process and costs 		
Catchment degradation	<ul style="list-style-type: none"> • Deforestation as a result of charcoal burning, forest fires, illegal logging increased demand for agricultural land; • Soil erosion due to poor farming methods and • Overgrazing; • 	<ul style="list-style-type: none"> • Decline in ecosystem services in quality and quantity 	<ul style="list-style-type: none"> • Catchment restoration and rehabilitation of degradation hot spots
Water pollution	<ul style="list-style-type: none"> • Sedimentation • Untreated Discharge from Car washing at water sources; • Direct watering of livestock at the dam due to poor design of water project • Farming activities on riparian land • Open defecation around dams; • Poor handling and disposal of agrochemical containers. 	<ul style="list-style-type: none"> • Water insecurity and emergence of related conflicts 	<ul style="list-style-type: none"> • Prevent and manage cases that lead to pollution
Encroachment on riparian land	<ul style="list-style-type: none"> • Lack of awareness on need to protect riparian land; • Perceived high land productivity at the riparian; • Increased demand for farming land; 	<ul style="list-style-type: none"> • Riparian land degradation through; erosion, loss of biota and levee breakups 	<ul style="list-style-type: none"> • Promote sustainable use of riparian land by introducing alternative livelihoods;

Problem(s)	Causes	Impact/Effects	Solution Strategy
	<ul style="list-style-type: none"> • Small scale farming enticed by nearness to water for irrigated agriculture. • Lack of awareness on extents of riparian land. • Riparian wood and grass harvesting • Deteriorating water quality due to fertilizers and agrochemicals used in the farms; 		
Poor monitoring and information system	<ul style="list-style-type: none"> • Lack of sub-catchment Monitoring and Information Sharing Plan; • Lack of water resource monitoring facilities/equipment; • Lack of awareness on need to monitor; • Lack of support from relevant stakeholder • Lack of WRUA capacity to monitor (human resource and finances) • Poor water resource management and planning within the sub catchment; • 	<ul style="list-style-type: none"> • Unreliable planning and decision making • 	<ul style="list-style-type: none"> • Development and implementation of Monitoring and Information Sharing Plan;
Problems identified	Causes	Impact/Effects	Solution Strategy
Water scarcity	<ul style="list-style-type: none"> • Drought • Illegal abstraction • Population growth. • Catchment degradation. 	<ul style="list-style-type: none"> • Conflicts • Food security • Wildlife-human conflicts <p>diseases</p>	<ul style="list-style-type: none"> • Catchment protection • Planting water friendly trees • Aligning of abstraction • Illegal abstraction illegal • Water harvesting facilities i.e

Problem(s)	Causes	Impact/Effects	Solution Strategy
			towers,dams etc. <ul style="list-style-type: none"> • Attentive
Human/Wildlife Migration	<ul style="list-style-type: none"> • Lack of water • Lack of livestock food • Unemployment • Conflicts. • fire 	<ul style="list-style-type: none"> • Inter community conflicts • lack of development • deaths of livestock and wild animals • lack of awareness. • wildlife-human conflicts 	<ul style="list-style-type: none"> • Migration ban of human and livestock in water catchment areas. • Human and wildlife conflict management.
Drought	<ul style="list-style-type: none"> • lack of rains • water scarcity. • Lack of proper management by the government 	<ul style="list-style-type: none"> • food insecurity • malnutrition • human-wildlife conflict • deaths (both human and animals) • Lack of employment 	<ul style="list-style-type: none"> • Plant drought resilient trees • Catchment rehabilitation • Agriculture modern practices (drip irrigation.). • Plant friendly trees

3 CATCHMENT CHARACTERISTICS

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

Timau sub-catchment has a coverage area of 221 km². It is hydrologically located within Ewaso Ng'iro North Basin, 5BE06 sub-basin administered through Upper Ewaso Ng'ro (Nanyuki) Sub region with its office in Nanyuki. The topography of the sub-catchment is largely diverse with the altitudinal range between the highest (3800m asl) and lowest point (1770m asl).

Administratively, the sub-catchment is wholly located in Meru and Laikipia County. It traverses two constituencies namely; Buuri and Laikipia North. Four wards fall partly within the WRUA, these include; Timau township, Ethi. Five Sub-locations overlap the sub-catchment, these include; Chumvi ,Timau ,Rugirando ,Kiambogo and Mutarakwa sub location

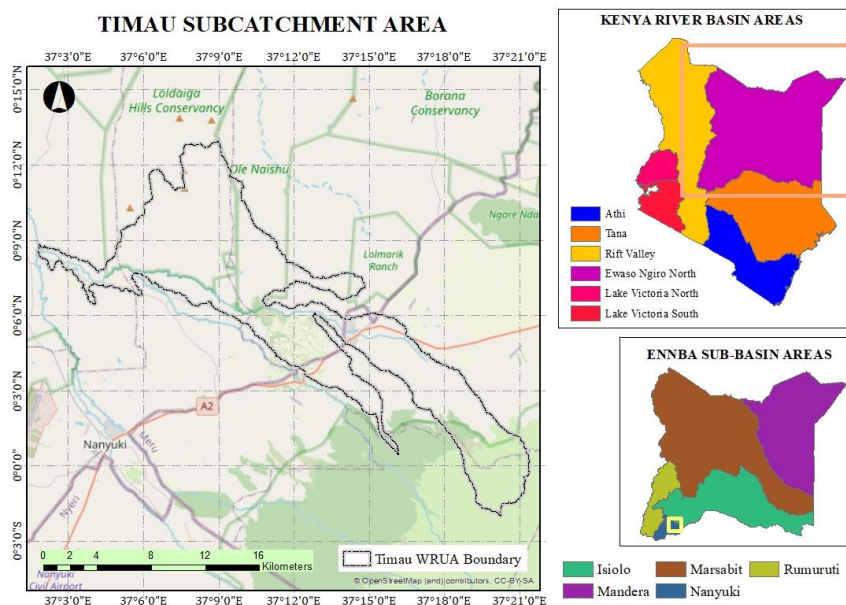


Figure 3-1 TIMAU WRUA Location Map

3.3 Climate

The rainfall pattern in Timau 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 in the months of; March to May and short rains from October to December. The temporal rainfall variability over the years in the Sub-Catchment varies between 508 mm to 1194 mm. The spatial rainfall variability within the Sub-Catchment shows that the Southern side receives most of the rainfall of up-to above 1286 mm while the Northern side receives the least rainfall of 686 mm and below. The mean annual temperature for the sub-catchment ranges from 16.7 – 18.1°C and shows an increasing trend in the recent years.

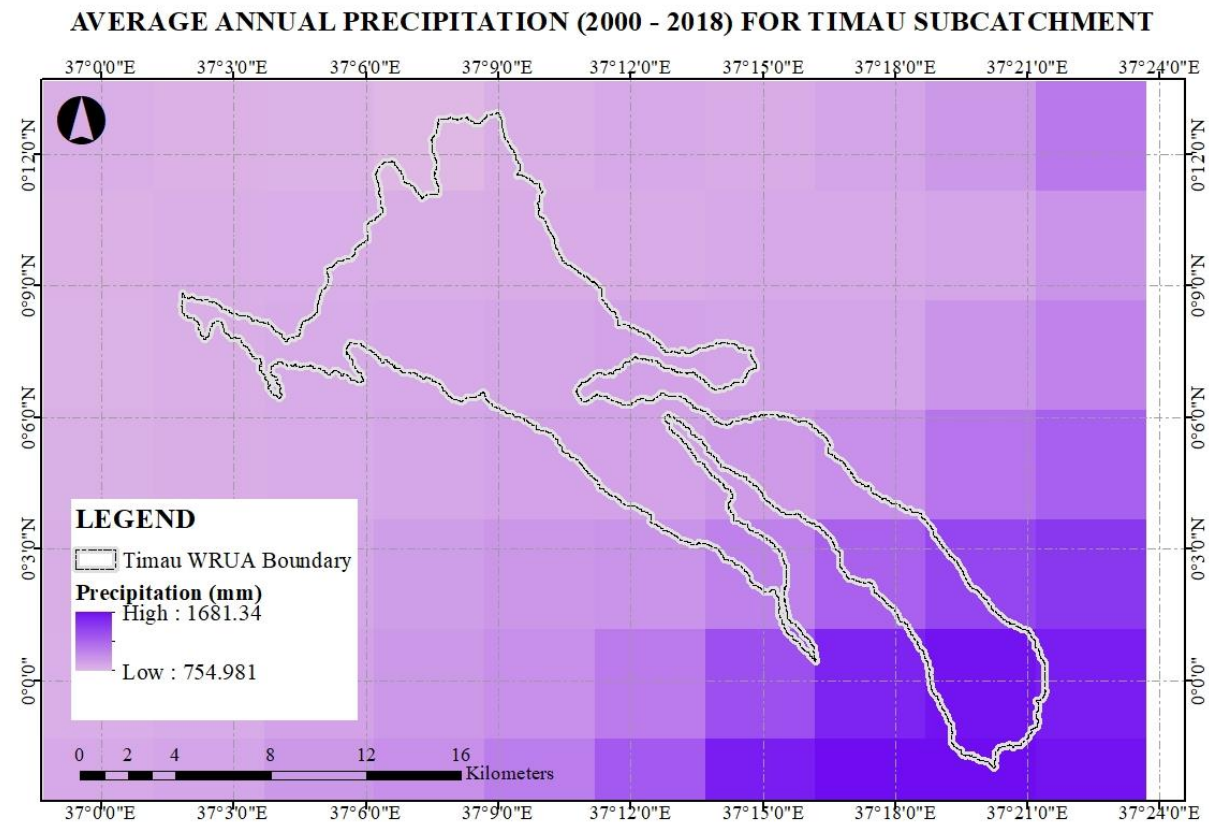
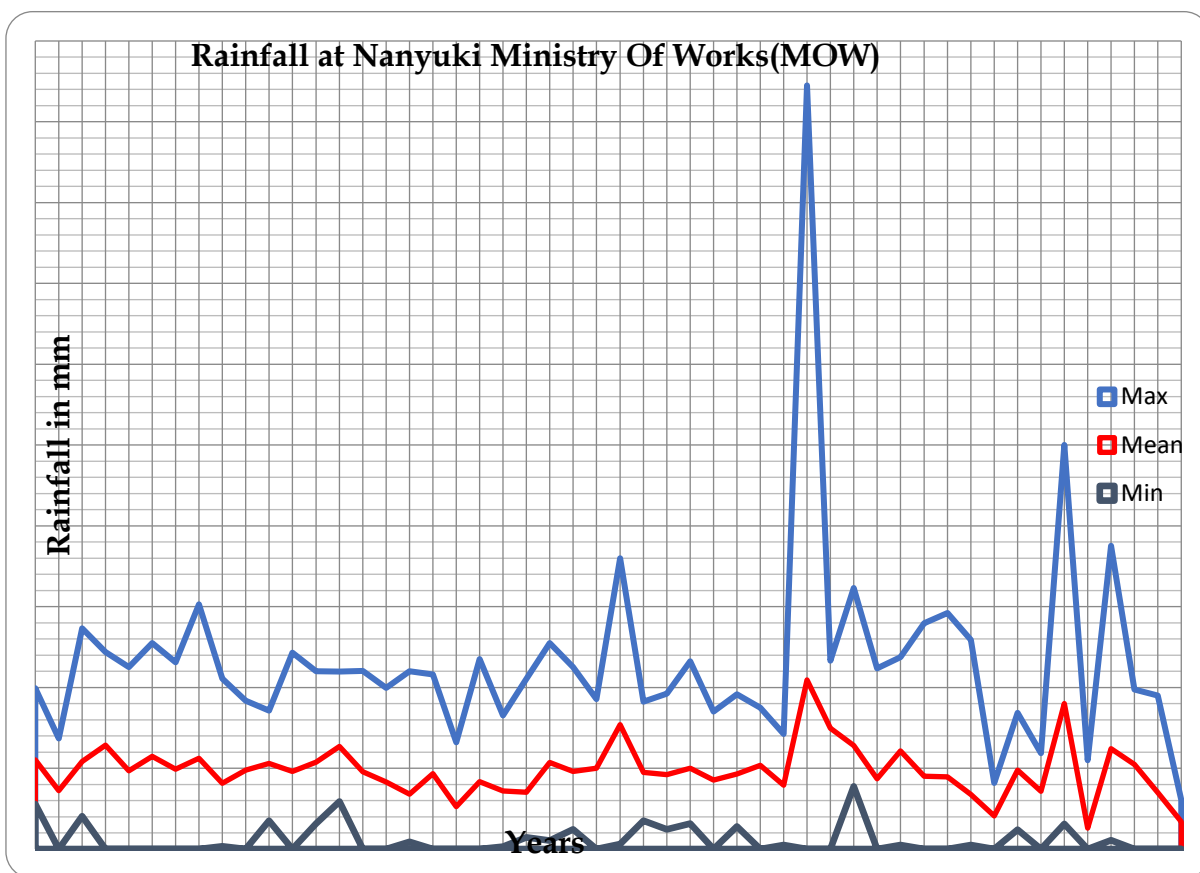
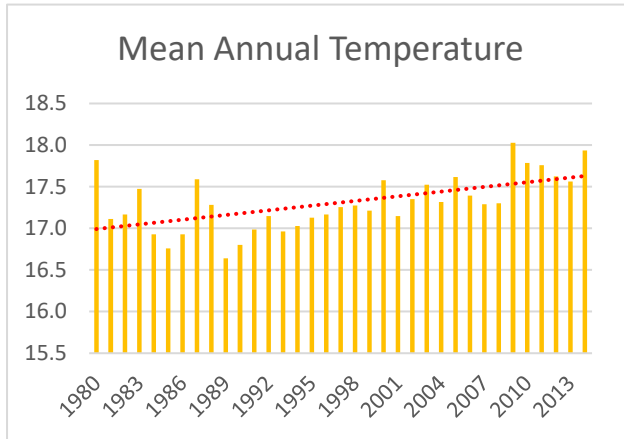
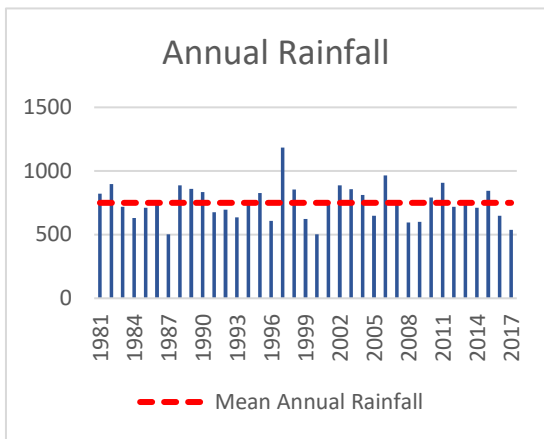


Figure 3-2 TIMAU WRUA Spatial Rainfall Distribution

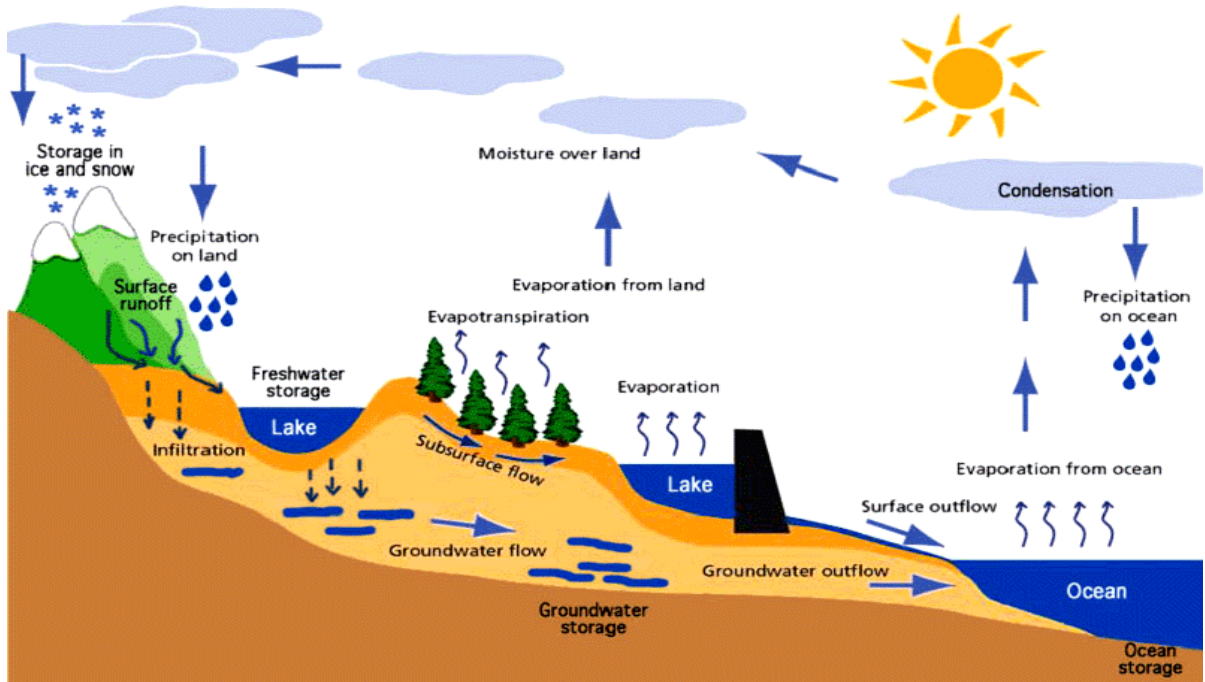


Analysed trend lines for rainfall at Nanyuki MOW from 1964 to 2013

3.4 Hydrology

3.4.1 Rivers

The Sub- Catchment has a dense river network. River TIMAU is main river in the Sub-catchment. The river flow from the Northern to Southern part of the Sub-Catchment.



Hydrological cycle

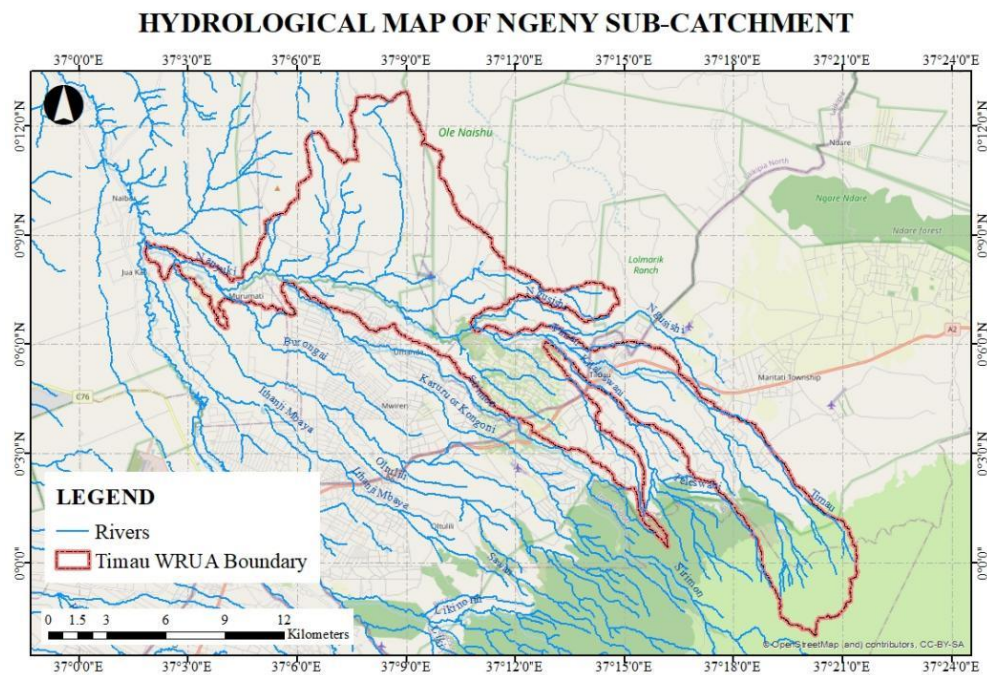


Figure 3-3 TIMAU WRUA Hydrology Map

3.4.2 Springs

At least 11 springs exist within the sub-catchment. The springs are distributed throughout the sub-catchment with the upper zone having the highest number of springs. These springs have not been developed but are key abstraction points. Cumulatively, the springs whose flows were measured are estimated to discharge about 0.71 litres/second (61 m³ /day).

About 90% of the springs have been developed. Springs are main source of domestic water within Timau sub-catchment.

Table: 3-1 Springs and protection status identified in Timau

No.	Name	Status (Protected or Unprotected)	Areas
1	Ngusishi spring	Unprotected	Public
2	Kithima Kia Mbiti	Unprotected	Public Forest
3	Ciumburugo spring	Unprotected	Public forest
4	Gitumbe spring	UnProtected	Public forest
5	Rugirando	unprotected	Public forest
6	Katharatandi	UnProtected	Public forest
7	Gathua Spring	Un-protected	Private
8	Siraji Spring	UnProtected	Private
9	Kianda Springs	UnProtected	Private
10	Ntuarachio spring	UnProtected	
11	Batian Springs	Unprotected	private
12	Aden Cape Spring	Unprotected	private

3.4.3 Wetlands

The wetlands within the sub-catchment are: Vijana ushindi wetlands ,Kamene wetlands and Gitetema wetlands . All the wetlands are on public land.

The wetlands are threatened by human activities like logging and grazing. Timau WRUA should make efforts to conserve the wetlands and stop any form of illegal activities including encroachment. . This wetland would require gazettement to ensure it is protected from encroachment.

3.5 Ground Water

Groundwater in this area is abundant sand originates from the weathered and highly fractured basalts of Mt Kenya, the basaltic aquifer receives replenishment from the melting ice on the mountain that infiltrates through faults and fissures, the area has numerous faults the north western tip has shallow aquifer within the thick soils and sands.

Table: 3-5 Borehole status identified in Timau

BOREHOLE	STATUS	AREAS
a) Ngusishi borehole	Domestic	Ngusishi

b) Drimwangara	In use	Private
c) Kirinyanga jeed	In use	Private
d) Ngadaraka borehole	Not in use	Private
e) Simon Mbudi	In use	Private
f) Batian borehole	In use	Private
g) Batian borehole	In use	Private
h) Ngaritata	In use	Private
i) Embori farm	Not in use	Public
j) Embori farm	Not in use	Private
k) Igaste rain	In use	Private
l) Igaritata Ngusishi	Not in use (2)	Private & public
m) Timau 1&2	In use (3)	Public
n) Level 4 hospital	Not in use	Public
o) DCC Borehole	In use	Public
p) Timau Primary	In use	Public
q) Catholic	In use	Private
r) Monica Igwandia	In use	Private
s) Rugert hurt	In use	Private
t) Olapangi	In use	Public
u) Kariunga primary	In use	Public
v) Moramati Dispensary	In use	Public
w) KHE	In use	private

3.6 Geology

Geology of this area comprises mainly of Mount Kenya suites of rock that includes olivine basalts, pantelliritic trachyte, Mugearites alkali trachyte, olivine trachyte. Overlying these volcanic rocks is a thick layer of clay-loamy soils. Further north west of the area exists a thick alluvial deposit from river flow

TIMAU SUBCATCHMENT GEOLOGICAL ROCK FORMATIONS

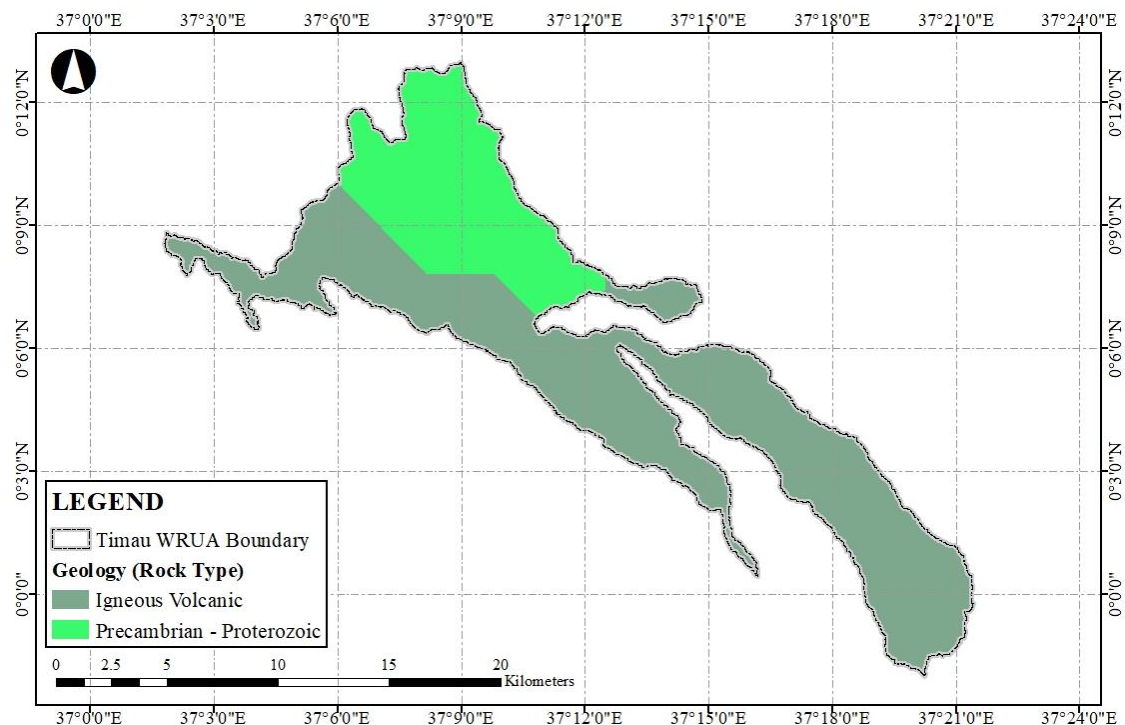


Figure 3-4 TIMAU WRUA Geology Map

3.7 Land Use

Land use within the sub-catchment can broadly be categorized as small holder mixed farming, large scale agriculture, ranching, wildlife conservation, and pastoralism. Pastoralism is mainly practiced in the lower zone while the other land uses are dominant in the upper and middle zones. Small holder mixed farming comprises of both rain-fed and irrigated agriculture and livestock keeping. Ranching, commercial agriculture, and wildlife conservation are practised by large land-holders.

Catchment	Area	Total Area (Ha)	Low	Moderate	High	Very High
Slope (Percent)			<5	5-12	12-40	>40
Land use Name						
Forest	8.98	1900.79	901.36	839.27	159.97	0.19
Shrub Land	27.23	5762.24	2259.49	2444.79	1057.68	0.29
Grass land	45.36	9598.16	4590.75	3828.54	1178.49	0.38
Cropland	16.53	3498.72	2524.15	937.44	37.14	0.00
Built-up areas	0.78	164.86	142.89	21.30	0.67	0.00
Bare ground	0.95	200.56	154.88	40.40	5.28	0.00
Water	0.17	35.79	34.74	1.06	0.00	0.00
Aquatic vegetation			0.86	0.00	0.00	0.00
Total	100	21161.12	10609.11	8112.79	2439.22	0.86

Figure 3-4 TIMAU WRUA Land cover Table

3.8 Land use potential

Timau sub-catchment has a mean annual rainfall of between 508 mm to 1194 mm per annum and may be categorised as low to high potential area. It falls within Zone(s) LH5, UH3, UH2 and UH1 as shown in the table below.

AGRO-ECOLOGICAL ZONES OF TIMAU SUB-CATCHMENT

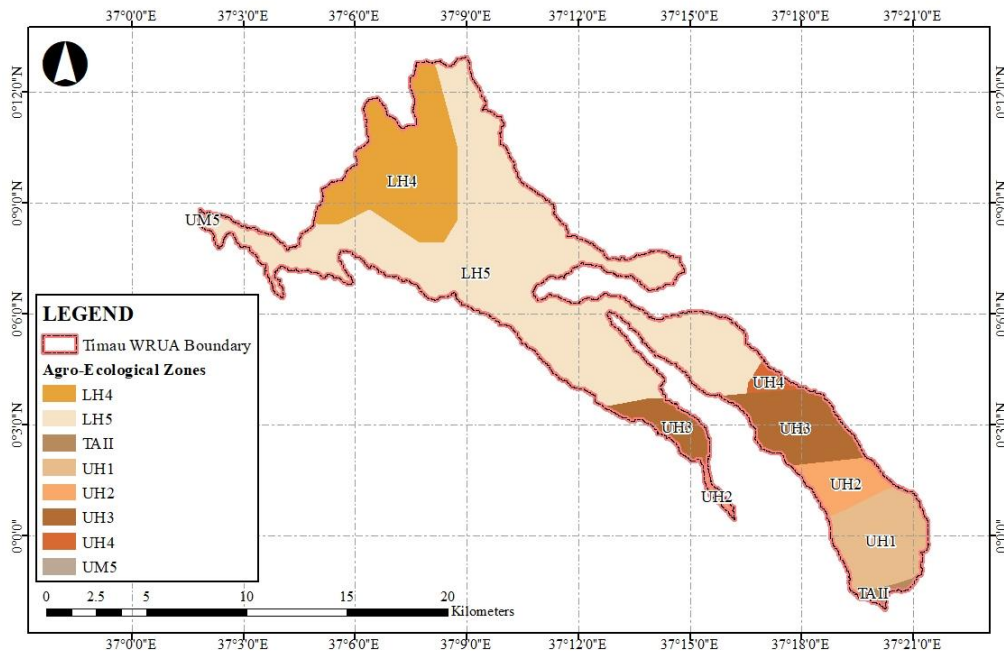


Figure 3-5 TIMAU WRUA Agro Ecological Zone Map

AEZ No.	Agro-ecological zone	Belts of Z	Zone	Possible crops and Cropping systems
I		UH1	Sheep Dairy	Tea-Dairy
II		UH2	Pyrethrum	Wheat, Maize, Beans, Irish Potatoes
III		UH3	Wheat Barley	Beans and other pulses, Maize, Wheat, Cotton, Cassava
IV		UH4	U Highland Ranching Zone	Barley, Cotton, Maize Groundnut, Sorghum
V		LH5	L Highland Ranching Zone	Livestock, beans pigeon peas, S. Potatoes Sorghum, Millet

3.9 Soils

The soils in the sub-catchment comprise of deep clay, clay of unknown depth, and Sandy of unknown depth. The larger area of the sub catchment is covered by clay of unknown depth soil.

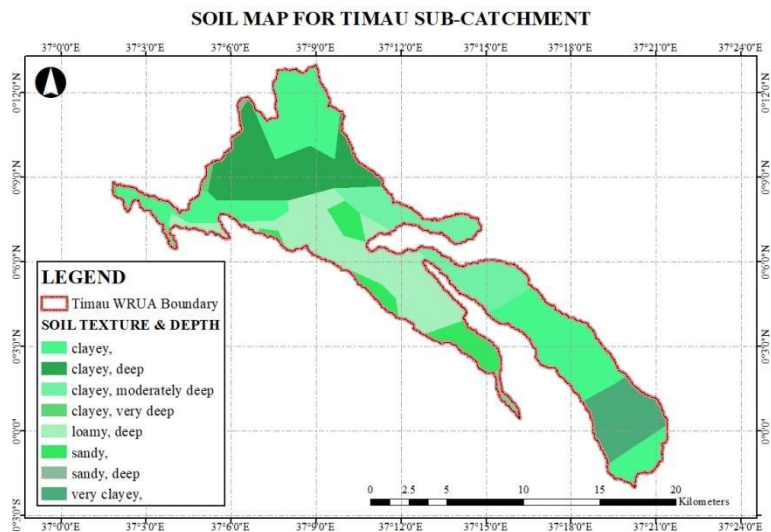


Figure 3-6 TIMAU WRUA Soil Map

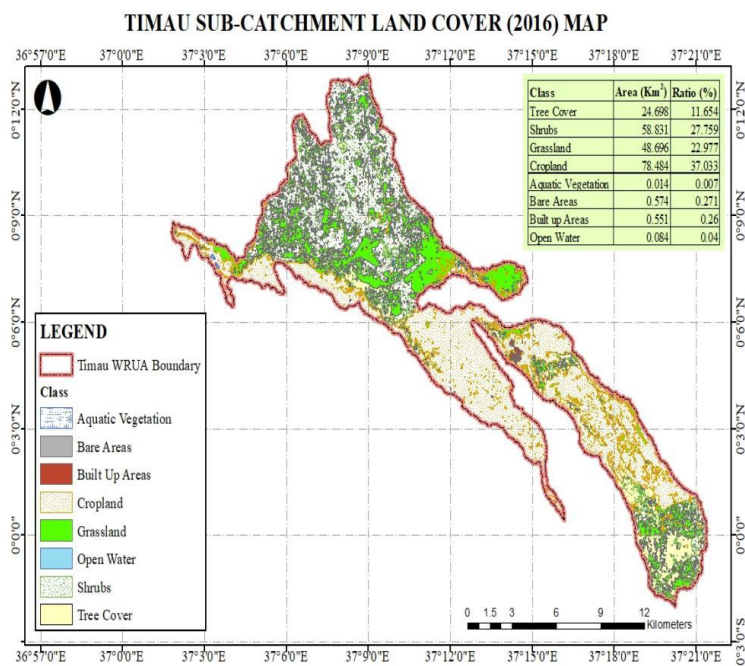


Figure 3-7 TIMAU WRUA LAND COVER Map

3.10 Demographics

The catchment cuts across 9 sub-locations which have a combined population of 16,577 people as of the 2009 population census and 17,148 people in the 2019 population census, as shown in Table 2-3.

Name	2009 population	Sub-location Area(Km ²)	2009 population density	2019 population	2019 population density	Area in catchment (Km ²)	2009 population in catchment	2019 population in catchment
Kithithina	6589	22.84	286.6	7,987	349.75	12.32	3,530	4,308
Kiambogo	10825	18.41	584.	3,085	167.55	7.32	4,274	1,226
Mutaraka	4878	47.36	102.31	7,225	152.56	37.32	3,818	5,693
Maritati	5611	117.2	47.55	6,597	56.29	2.92	139	164

Mt. Kenya	0	276.4	0	463	1.68	15.21	0	25
Umande	4887	246.56	20.15	5,557	22.91	72.95	1,470	1,671
Chumvi	3606	241.14	14.85	5,422	22.48	32.13	477	723
Ngenia	5966	53.63	110.5	6,770	126.23	22.12	2,445	2,793
Naibor	2220	50.15	44.27	2,854	56.91	9.58	424	545
Total						212	16,577	17,148

Figure 3-8 TIMAU WRUA Demography

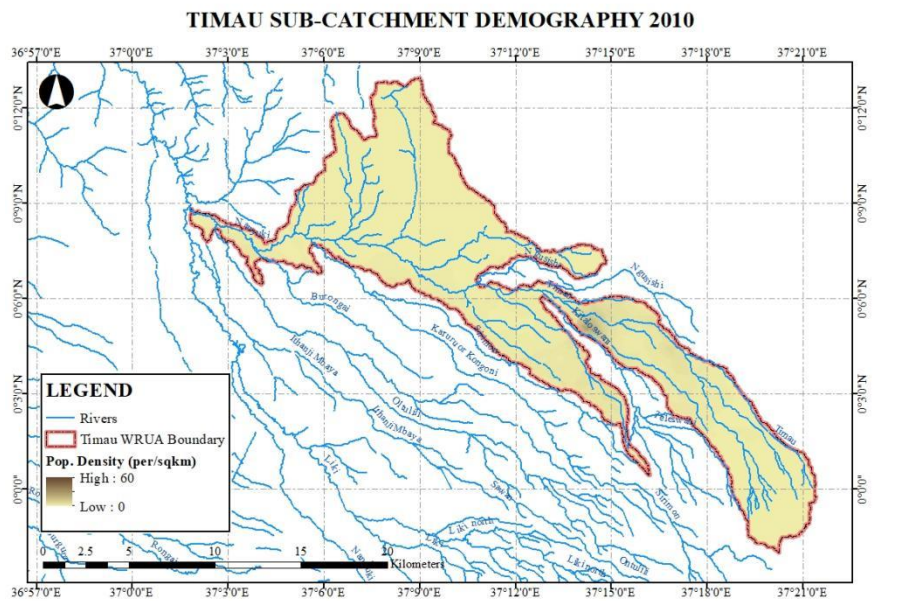


Figure 3-9 TIMAU WRUA Demography map 2010

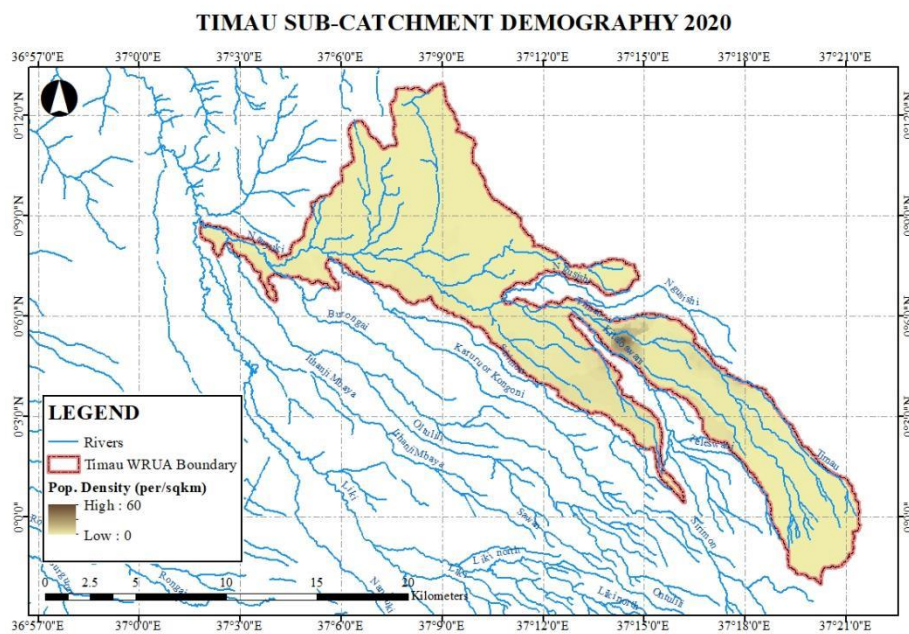


Figure 3-10 TIMAU WRUA Demography map 2020

3.11 Stakeholder Mapping and Analysis

3.11.1 Stakeholder mapping

The following stakeholders were mapped, and their area of interest established.

Table: 3-2 Stakeholder and interest areas

Stakeholder	Area of Interest
Mt. Kenya trust fund	Rain Water Harvesting at household level and tree planting
Kenya Forest Service	Forest protection afforestation, supply tree seedlings to WRUAs, capacity building and establishment of woodlots
National Environment Management Authority	Catchment protection and pollution control
County Government of Laikipia and Meru	Water Supply Catchment conservation Disaster management Storm water drainage Agriculture Health Environment conservation
National Government Administration Office(r)	Conflict resolution Mobilization of community members Awareness creation and coordination Law enforcement
LISTEN	Governance Conflict resolution Tree planting SCMP Spring protection Rehabilitation of boreholes equipping and installation of solar systems
Mt. Kenya Trust fund	Tree planting
Community Forest Association	Tree planting
LWF (The Laikipia Forum)	Community empowerment; Capacity building in Catchment conservation
CETRAD	Disaster management Construction of storage facilities
Ewaso Nyiro North Development Authority	Construction of water pans, Boreholes
National Drought Management Authority	Rehabilitation of water project Drought response programs Capacity building for resilience Construction of water storage Provide Community Early Warning system at community level Provide animal feeds during drought

Stakeholder	Area of Interest
Water Resources Authority	Capacity building on water rights, Water Act, monitoring, conflict resolution, catchment protection Technical support Resource mobilization on behalf of WRUA
Water Sector Trust Fund	Financing of SCMP activities Support capacity building through training
Constituency Development Fund	Catchment conservation Construction of office
Kenya Wildlife Service	Wildlife management Management of human conflict

3.11.2 Stakeholder Analysis on Influence and Level on Interest

Stakeholders analyzed based on their influence capacity and interest within the sub catchment.

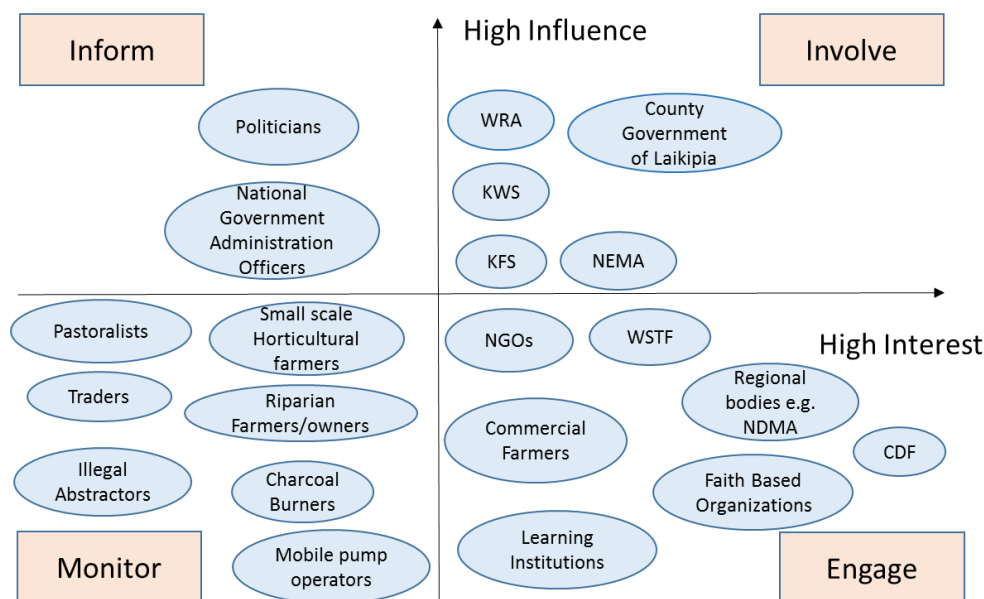


Figure: 3-1 Stakeholder influence and interest clustering

3.12 Targets

1. Gather baseline information to update sub-catchment characterization

3.13 Proposed outputs

1. Updated Baseline Report with a detailed sub-catchment management plan.

3.14 Activity plan and Budget

CH3: Catchment Characteristics			
Target		Gather baseline information to update sub-catchment characterization	
Output		Updated Baseline Report with a detailed sub-catchment map	
Activity	Sub-activity	Budget*1000	Year of Implementation
3 1	Collect baseline information (hydrological, land use, population, economic activities data, map water resources)	3.1.1"Develop ToR, Engage consultant, WRUA training on data collection and participation in field work, Produce GIS map "	1.500 YEAR 1
TOTAL		1.500	

4 MANAGEMENT APPROACH

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

The Authority has defined a Water resource demand classification System (WRCS) which specifies the level of importance attributed to the resource in each Catchment Management Unit with respect to three broad types of demands, namely; ecological, livelihood and commercial.

Timau sub-catchment largely consists of Commercial and Livelihood zones and to a small scale has Ecological zones where wetlands exist.

4.3 Sub-Catchment resource Classification

The Timau Sub-catchment is categorized in the ALERT status and is situated in Upper Ewaso Ngiro Management Unit, hydro-logical unit 5BE, within the Upper Ewaso Ngiro Sub-region ALERT means that the surface water resources are tending towards scarcity, groundwater trend is towards over-abstraction, water quality is deteriorating and there is potential for water related conflicts.

4.4 WRUA institutionalization

4.4.1 WRUA formation

Timau WRUA was formed in 2005 with 78 members mainly composed of water projects (49) , 6 commercial farmers, and individuals (33). The WRUA has a 13-member management committee and was legally registered with Attorney General's office as an Association in 2005 with a registration certificate No. 25656. The number of WRUA members has increased since its formation. Timau WRUA has a constitution and by-laws that governs its operations. The WRUA has a bank account with Equity Bank, Timau Branch. It entered into MOU with WRA in the year 2015 and has a revised MOU of 2022.

The WRUA was formed with the following objectives as defined in the WRUA constitution:

- To promote good practices that can enhance water quality and quantity;
- To promote catchment conservation;
- To provide a forum to discuss, prevent and resolve water use conflicts;
- To promote dialogue between the water users and the government in regard to water policy and enforcement of the water Act in respect to area catchments;
- To promote stakeholder participation in planning and development of water resources by government water boards;
- To promote legal water use.

The initial WRUA area boundary as defined during WRUA formation covered only two locations namely, XXXXXXXXXX. However, the WRUA boundary has been revised to align it to hydrological unit and now covers XXXX location. Timau WRUA will therefore use its boundary map to orientate itself on the new WRUA boundary and recruit members from the additional area of the Upper zone.

Since formation Timau WRUA has collaborated with some stakeholders in implementation of activities as follows:

- WRA
 - ✓ Development of the first SCMP which was financed by WSTF;
 - ✓ Formation of WRUA
- WSTF in association with WRA
 - ✓ Implementation of activities defined in the initial SCMP
 - ✓ SCMP
- CFA
 - ✓ Planted trees
- Timaflo Limited
 - ✓ Capacity building
- National Government Administration Officers (Chiefs/sub-chiefs)
 - ✓ Conflict resolution downstream and upstream users when all water was piped to downstream leaving the people living around the spring without water);
- Mt. Kenya Trust fund

A review of the initial SCMP show that the Timau WRUA was able to implement some of the activities. However, most of the activities were not implemented due to lack of financing. The activities implemented as per the initial SCMP include:

- Training on financial management;
- Awareness creation on Rights-Based Approach in Water Resources Management;
- Baseline survey of water resources within the sub-catchment;

4.4.2 Institutional management structure

Timau WRUA carried elections in late 2018 and elected new members to office. The previous committee faced several challenges like weak governance, inadequate capacity in resource mobilization and weak enforcement. The effect is that Timau WRUA remained invisible and its presence was only felt during implementation of activities.

The WRUA has an established governance structure composed of executive committee and three sub-committees namely Procurement, Finance and Monitoring and Evaluation. According to WRUA development cycle (WDC) requirements, the WRUA is expected to have two other additional committees namely flood/drought management and livelihood enhancement. The Timau WRUA has current membership **of 25 members.**



Figure: 4-1 Current Organizational structure

There is need in implementing this structure since its according to the revised version of WDC.

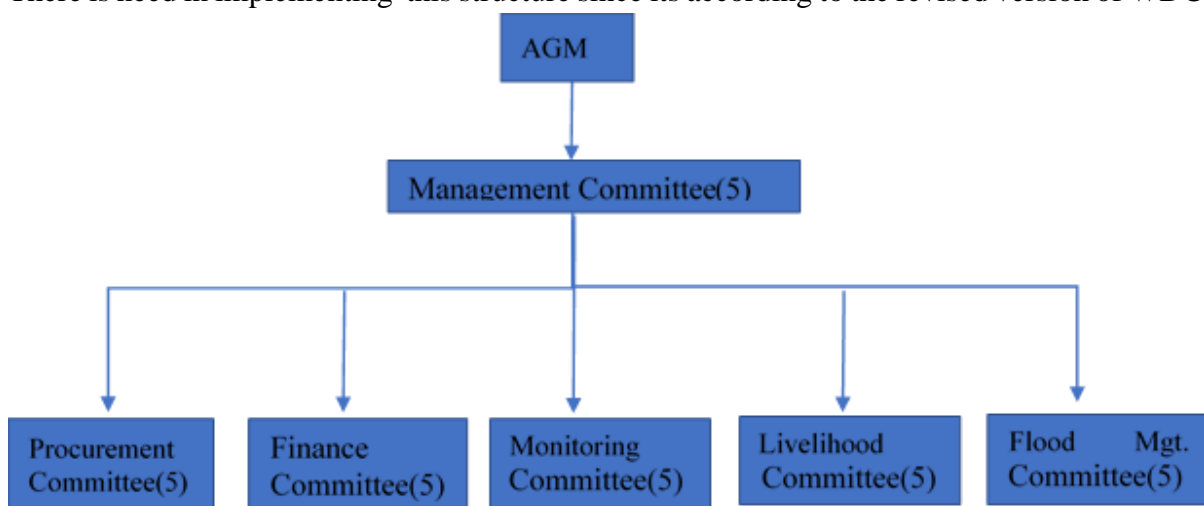


Figure: 4-2 Revised/Proposed Organizational structure

4.5 Targets

1. To strengthen the WRUA's leadership and Governance through awareness and membership mobilization.

4.6 Proposed outputs

1. Annual audit reports focusing on institutional development management and leadershi

4.7 Activity plan and Budget

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

CH4: Management Approach				
Target		To strengthen the WRUA's leadership and Governance through awareness and membership mobilisation.		
Output		Annual audit reports focusing on institutional development management and leadership.		
Activity		Sub-activity	Budget *1000	Year of Implementation
4	Awareness creation and recruitment of new members	4.1.1 Hold 3 Public barazaa per zone annually to inform people of WRUA existence and mandates (9 baraza per year for 10 years)	2340	YEAR 1
1		4.1.2 Recruitment of new members to be continuous	0	YEAR 1
4	Catchment familiarization	4.2.1 catchment familiarization tour by committee members every three years (3 times within the SCMP period)	600	YEAR 1
2				
4	Audit	4.3.1 Hire consultant to undertake institutional audit	200	YEAR 1
3				
TOTAL			3,140	

5 WATER BALANCE AND WATER DEMAND MANAGEMENT

5.1 Introduction

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

5.2 Surface water

RESOURCE AVAILABILITY - TIMAU SUB-CATCHMENT

Item	Criteria	Discharge (m ³ /day)	Volume (MCM/yr)
Reserve	Q95	2,420	0.88
Normal Flow	Q80	5,388	1.97
Normal Flow available for Domestic use allocation	Q80 – Q95	2,968	1.08
Flood Flow	Q50	11,079	4.04
Flood volume available for allocation	Cumulative flood volume		0.94
Flood discharge available for allocation	Flood volume/292 days	3,225	

5.3 Ground water

This Sub basin (5BE) has an estimated Ground Water Potential of 10.76 MCM/year, this is informed by the ISC- KWSCR studies undertaken in the year 2018. The sub-catchment's aquifer is endowed with sustainable yields of 0.97 MCM/year.

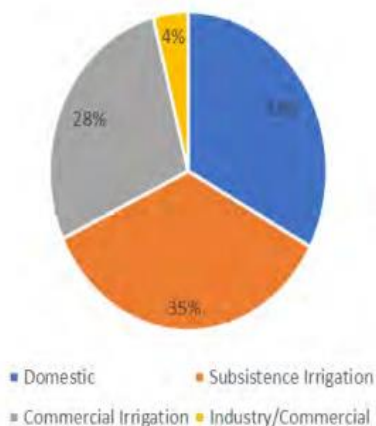
5.4 Water Apportionment

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.

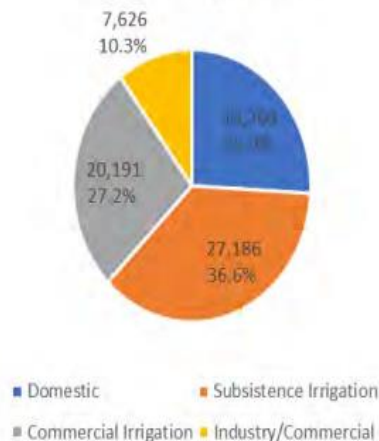
The main water uses in Timau catchment are commercial irrigation, subsistence irrigation and domestic use. Subsistence irrigation is the predominant water use in the area. Domestic use accounts for 33% of surface water abstractors and 26% of the total water abstracted.

Subsistence irrigation follows closely behind accounting for 35% of abstractors and 37% of abstracted volume

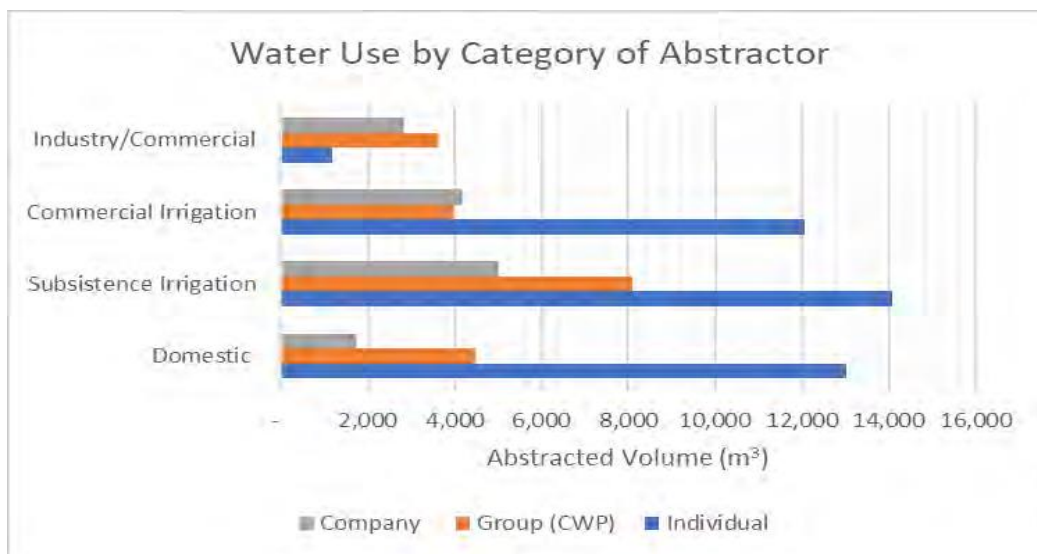
Water use by % of Abstractor



Water Use by Volume



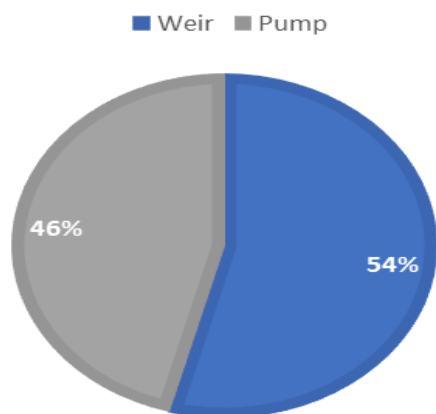
Type of Water Use by Category of Abstractor



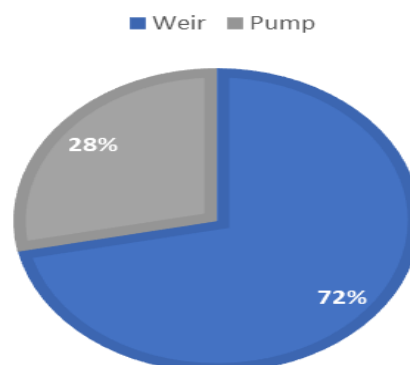
5.4.1 Method of Abstraction

The most common method of abstraction use in-stream works comprising of permanent weirs and temporary weirs (made of sand-bags). Weirs constitute 54% in terms of number of abstractors, and 72% in terms of volume of abstractions. Most of the weir intakes rely on gravity flow. The rest of the abstractions is done through pumps (mostly using portable pumps).

**METHOD OF ABSTRACTION
(% OF ABSTRACTORS)**



**METHOD OF ABSTRACTION
(% OF ABSTRACTED VOLUME)**



○ 5.5 Water Demand

Total volume of water permitted for abstraction as at 30th July 2023 was 8868.45m³ per day. This volume is from surface water. Ground water abstraction has not been fully determined and a study should be undertaken to verify the various boreholes within the sub catchment.

Table 5.5 Total Abstracted Volumes

Category	Community Projects	Privately Owned Projects	Total	Volume
A	0	6	6	9.24
B	44	0	44	1840.5
C	2	0	2	7018.71
Total			62	8868.45

Table 5.5.1 Total No. of abstractors by water use

5.5 Water balance

TABLE 4: WATER ALLOCATION BALANCE - STUDY SUB-CATCHMENT

	Surface Water		Groundwater	Comment
	Normal Flow (m ³ /day)	Flood Flow (m ³ /day)	(m ³ /day)	
Total resource available for allocation	9,471	15,214	6,110	(Based on Naturalised flows)
Existing Allocations(Public, Domestic, Livestock,Subsistence Irrigation, Industrial, Others)	3,367		1515	Based on Permits
Existing Allocations(Commercial Irrigation)		0	2455	Based on Permits
Balance	6,103	15,214	2,140	

5.6 Targets

1. Conduct a detailed study to establish available water resources and water demand for Timau sub-catchment.

5.7 Proposed outputs

1. Abstraction survey report with clear data on water availability and demand.

5.8 Activity plan and Budget

CH 5: Water Balance and Demand management				
Target		Conduct a detailed study to establish available water resources and water demand for Muhotetu sub-catchment.		
Output		Abstraction survey report with clear data on water availability and demand		
Activity		Sub-activity	Budget*1000	Year of Implementation
5.1	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	2300	YEAR 1
		5.1.2 Dissemination of findings through workshop	300	YEAR 1
TOTAL			2,600	

6 WATER ALLOCATION AND USE

6.1 Introduction

This chapter looks at the authorized 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

The Thresholds for Water Abstraction according to Water Resources Allocation Thresholds for Classification of Permits, 2007 are as follows;

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

6.2.2 Ground water

Timau is located in the larger Mt. Kenya Volcanic aquifer. This aquifer has weathered, fractured phonolites and basalts. They lie in the crucial recharge zone of the regional aquifers. Generally classified to be have satisfactory resource status.

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

Sub Basin:	Mt. Kenya, aquifer	Colluvial Aquifer
CATEGORY	THRESHOLD	Threshold
Category A:	<20 m ³ /day	<20 m ³ /day
Category B:	>20 - <50m ³ /day	>20 - <50m ³ /day
Category C:	>50 – 300m ³ /day	>50 – 200m ³ /day
Category D:	>300m ³ /day	>200m ³ /day

6.3 Water Allocation by source

SOURCE	M ³ /DAY	MCM/YR
Groundwater	3969.95	1.45
Surface Water	3367.26	1.23
Total	7337.21	2.68

6.4 Water Allocation by category

Category	M ³ /Day	MCM/YR
----------	---------------------	--------

A	53.74	0.02
B	2189.85	0.80
C	4133.62	1.51
D	960	0.35
Total	7337.21	2.68

6.5 Storage

In Timau Sub-catchment 96% of the surface water abstractions were found to be unmetered accounting for 87% of abstracted volume. However, 40.5% of the boreholes have operational meters while 59.5% do not have. A total of 31 water reservoirs with a combined capacity of 35,144 m³ were mapped across the sub-catchment with 71% being owned by companies.

6.6 Status of Authorisations & Permits

Authorization, Applications & Permits	Number
Authorization Issued	146.6
Deferred	0
Extension of Time Issued	270
Pending HQ Verification	0
Permit Issued	1690.32
Permit Transferred	0
Received Completion Certificate	0
Grand Total	2106.92

6.7 Water Use

Category	Volume Abstracted/ m3/Day	Public (M3/Day)	Domestic (M3/Day)	Livestock (M3/Day)	Subsistence Irrigation (M3/Day)	Commercial Irrigation (M3/Day)	Industrial/ Commercial (M3/Day)	Hydropower (M3/Day)	Others (M3/Day)
A	250.9	0	26.51	1.2	14.6	0	0	0	1.43
B	5,337.555	0	1061.9	62.25	567	135	119.7	0	105
C	3,683.59	0	1187.8	0.5	1525.32	1420	0	0	0
D	7,321.7	0	0	0	0	900	60	0	0
Total	16,593.745	0	2276.21	63.95	2106.92	2455	179.7	0	106.43

6.8 Targets

1. To develop and implement water Allocation and enforcement plans.

6.9 Proposed outputs

1. Water Allocation plan
2. Enforcement plan

CH 6: Water Allocation and use				
		Target	To develop and implement water Allocation and enforcement plans.	
		Output	1. Water Allocation plan	
			2. Enforcement plan	
Activity		Sub-activity	Budget* 1000	Year of Implementation
6.1	Water Allocation Plan	6.1.1 Stakeholder and Community mobilisation/sensitization	404	YEAR 2
		6.1.2 Training of survey team & development of survey plans	500	YEAR 2
		6.1.3 Data Collection	2,752	YEAR 2
		6.1.4 Equipment and Reagents	500	YEAR 3-10
		6.1.5 Abstraction Survey Report dissemination	600	YEAR 3-10
6.2	Regularization of abstraction	6.2.1 Support existing abstractors in making applications for water permits, and comments on permit application;	1,500	YEAR 3-10
		6.2.2 Purchase and Installation of Master Meters (10No)	456.20	YEAR 3-10
TOTAL			6,712.2	

7 WATER RESOURCE PROTECTION

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 are diffuse.

7.2 Current status

7.2.1 Protection of the reserve

While some effort has been made within the sub-catchment to protect springs against pollution, there is no effort whatsoever to ensure that there is reserve flow to support downstream users. During spring development, all water is tapped and nothing is allowed to flow downstream and this in some cases, this has led to conflict where downstream users vandalized the infrastructure. The same case is witnessed in dams where there are no provisions for spillway or compensation flow. Poor design of dams is the main reason for direct access and pollution and just like in the case of springs, has led to water use conflicts.

7.2.2 Protection of water resources

Some springs within Timau sub-catchment have been protected. However, surface water sources largely remain unprotected and are exposed to pollution from both point and non-point sources. Encroachment on riparian land is a major threat to water quality due to siltation and nutrients transport into water resources.

7.2.3 Pollution and effluent control

Pollution is reported to occur mainly in dams and pans due to the following factors; sediment transport from agricultural land as farmers divert runoff to the dams/pans causing siltation and chemical/nutrient loading, direct watering of livestock at the dams/pans leading to pollution from animal waste and siltation (erosion from livestock tracks); washing of clothes and cars inside the dam, open defecation around the dam area and washing of containers used in spraying agro-chemicals inside the dam/pan.

The community has put in some efforts in protecting the quality of some of the springs by fencing and constructing cattle troughs away from the source. Water pollution has to a large extent degraded the quality of water in the sub-catchment especially the surface water stored in dams and pans limiting safe water sources to groundwater.

The reported effects of water pollution within the sub-catchment include waterborne and water related disease, water scarcity as surface water sources are rendered unsafe due to pollution, and water use conflicts. The community therefore limit use of polluted surface water sources to irrigation and livestock watering.

Considering the increase demand for water within the sub-catchment, it is important for the WRUA to carry out pollution survey and map out pollution hotspots, create awareness on need to protect water resources, secure and protect key water sources and advocate for dam designs that incorporate cattle trough and communal water point away from the dam.

To control water resource pollution, the law requires effluent dischargers to develop an effluent discharge control plan as well as obtain an effluent discharge permit from the Water Resources Authority. Moreover, the law requires compliance with the Environmental Impact Assessment performed by the client. In this regard, the Authority is required to perform periodic inspection and monitoring of water quality. This is guided by the pollution survey and EDCP. So far, pollution survey has not been conducted for Timau sub-catchment.

Regarding Environmental Impact Assessment, WRA and the public are expected to provide comments on any EIA project performed within any sub catchment. The EIA are required to provide measures for mitigation against negative impacts to the existing water resources and the environment in general.

7.3 Targets

1. Conduct pollution survey and map all pollution hotspots.

7.4 Proposed outputs

1. Pollution survey report with map indicating pollution hotspots.

7.5 Activity Plan and Budget

CH 7: Water resource protection				
Target		Conduct pollution survey and map all pollution hotspots.		
Output		Pollution survey report with map indicating pollution hotspots.		
Activity		Sub-activity	Budget* 1000	Year of Implementation
7.1	Carry out a pollution survey and map all hot spots within the sub catchment area	7.1.1 Preparation of TOR	10	YEAR 1
		7.1.2 WRUA members mobilize and sensitization (zone level)	30	YEAR 2
		7.1.3 Consultancy to carry out Pollution Survey and mapping of Pollution hotspots	3,000	YEAR 3-6
		7.1.4 Report compilation and presentation to the WRUA and stakeholders	1.500	YEAR 2-10
7.2	Community sensitization and awareness creation on Resource protection	7.2,1 Conduct 3 barazaas at zonal level	30	YEAR 2-10
		7.2.2 WRUA officials and stakeholders visit and list hotspots for source protection	60	YEAR -10
		7.2.3 Put community billboard at pollution hotspots (20)	500	YEAR 1-10
		7.3.2 Protection and conservation of 9 Springs	4,286	YEAR 1-10
TOTAL			7,917.5	

8 CATCHMENT AND RIPARIAN CONSERVATION

8.1 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 (2021) guides a riparian land area of a river to be a maximum of 60 meters and a minimum of 10 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 (2021) further prohibits any anthropocentric 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.

8.2 Catchment conservation

The economic and livelihood activities within Timau sub-catchment have impacted both positively and negatively on the catchment and riparian condition. Activities like establishment of woodlots, and pasture which is noted within the upper zone of Timau sub-catchment should be encouraged as they improve catchment condition.

However, several activities with potential negative impacts have been noted within Timau sub-catchment. These include, poor farming methods (cultivation on steep slopes without soil conservation structures in the upper part of the sub-catchment), deforestation (Timau forest) and overgrazing.

Timau area was densely forested in the 1980s but it has changed severely affecting the vegetation cover. Deforestation has been caused by illegal timber logging, clearing of land for cultivation, charcoal making and fires. The forest fires are caused by several activities. Land preparation for cultivation by burning which sometimes the fire extends to the adjacent farms and forest; deliberate burning of forest just before the onset of rains with a belief that it will lead to better grass regeneration, accidental fires during honey harvesting in the forest (wild bees) and deliberate burning of forest due to cultural belief that it attracts the rain and ends drought.

Reduced vegetation has led to a reduction in water quantity and soil erosion. Soil erosion has led to reduced land productivity and siltation of water resources. Deforestation has been blamed for climate change as the community report change in rainfall patterns and intensity that has affected the main economic activity within the area which is rain-fed agriculture. In addition, frequent flooding currently experienced in the sub-catchment is perceived to be as a result of deforestation.

There is need to protect the catchment by conserving and restoring degraded areas for sustainable use and conservation of water resources. There is therefore proposal to sensitize the locals on soil and water conservation, catchment protection and riparian land conservation. Additionally, there is a proposal to construct soil and water conservation structures, promotion of alternative energy source and reforestation.

8.3 Riparian conservation

There is encroachment on riparian land within Timau sub-catchment which can lead to riparian degradation. The activities on the riparian include, farming on riparian land overgrazing , illegal timber logging and planting of eucalyptus trees around water sources .



Conservation of riparian land require a concerted effort with all parties concerned. Protection of riparian land starts with creating awareness on importance of the riparian land in the ecosystem. This is what Timau WRUA intends to do in addition of pegging and planting of water friendly trees within degraded riparian areas.

8.4 Targets

1. Build capacity of WRUA to be able to effectively carry out catchment and riparian conservation

8.5 Proposed outputs

1. Assessment reports on catchment and riparian conservation activities

8.6 Activity Plan and Budget

CH 8: Catchment and Riparian conservation				
Target		Build capacity of WRUA to be able to effectively carry out catchment and riparian conservation		
Output		Assessment reports on catchment and riparian conservation activities		
Activity		Sub-activity	Budget*1000	Year of implementation
8.1	Capacity building for WRUA committee and stakeholders	8.1.1 Hold 2 no Workshops for 2 days on Soil and water conservation structures	600	YEAR 2-4
8.2	Riparian protection	8.2.1 Identify degraded area, mark and peg 50km riparian land	925	YEAR 3-10
		8.2.2 Plant water friendly trees	4,000	YER 3-10
8.3	Awareness creation of laws governing riparian land	8.3.1 Hold 6 No barazaas on locational level per year	500	YEAR 4-10
8.4	Enforcement	8.4.1 Scouting – Employ 7 No. scouts (Upper 2, Middle 2 & Lower 3)	820	YER 5-10
8.5	Reforestation	8.5.1 Identify degraded areas and Plant tree seedling 1000 per year	3,250	YER 3-10
		8.5.2 Make provision for tending the seedlings for 1 year	700	YEAR 3-10
		8.5.3 Tree planting on individual farms fruit trees, woodlots 5000 per year	3,000	YEAR 3-10
8.6	Promotion of alternative energy sources	8.6.1 Installation of 6No. biogas demos (Suitable sites to be identified during implementations)	4,460	YEAR 3-10
		8.6.2 Supply and install 1,000 energy saving jikos at HH and institutions and conduct training on making and installation	3,510	YEAR 3-10
		8.6.3 Conduct training and demonstration on making of charcoal briquette	536	YEAR 3-10
8.7	Awareness creation	8.7.1 Hold 12 no barazas 2 per sub location on soil and water conservation structure	643	YEAR 3-10
		8.7.2 Hold field days on soil and water conservation structures 1 per sub location) 5 for the entire project period.	675	YEAR 3-10
8.8	Construct soil and water conservation structures	8.8.1 Identify degraded land and develop conservation plan	385	YEAR 3-10
		8.8.2 Construction of terraces		YEAR 3-10
TOTAL				

9 FLOOD MANAGEMENT

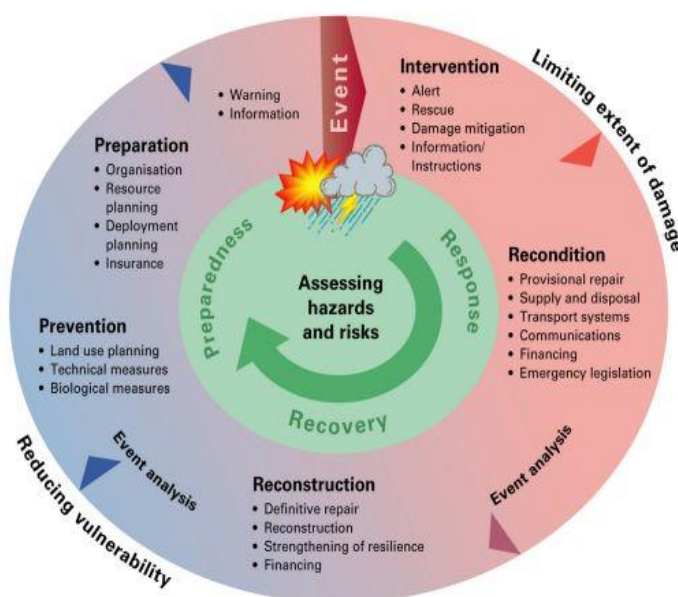
9.1 Introduction

The Flooding normally occurs in low lying areas of water bodies such as; rivers, lakes and other reservoirs when the water volumes exceed the water body'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

9.2.1 Floods

Timau Sub Catchment does not experience frequent flooding though few scenarios have occurred over the past few years especially in areas with high water table. These floods have caused havoc especially to the available infrastructure (water pans, dams, roads, houses and toilets), destruction of crops and farmlands causing low yields and subsequently food shortage, water pollution as a result of flooding of water pans/dams, spring sources, interruption of daily activities-mobility and waterborne diseases. Flooding within Timau Sub Catchment occurs mostly as a result of both human actions and nature. The main cause of this calamity include excessive rainfall, poor farming methods on sloppy land leading to soil erosion, overstocking/over grazing leading to destruction of vegetative cover especially in the lower zone of the sub catchment thereby causing both sheet and rill erosion which causes water to run through little stream lets at high velocity, destruction of riparian land especially around water pans and dams and also deforestation within Mt.kenya Forest for firewood and charcoal making. These factors have led to increased surface run off over the years though at a smaller scale but if not well addressed could lead to massive destruction in the near future.



Flood management cycle

The Sub Catchment does not have early warning systems in place. It is therefore imperative for them to begin initiating the process of developing such systems in order to avert any future

calamities. Such early plans would increase the community awareness on flood and drought issues and make them fully prepared for any eventuality as a result of the calamity. Timau WRUA would then initiate awareness drives in order to sensitize the community on the dangers of floods and ways of mitigating and arresting the situation in case of an occurrence.

The greatest challenge in flood management is the lack of an organized structure within the community to plan, mitigate and link with the established structures of government and other key stakeholders. However, the Timau WRUA will act as link between the community and other stakeholders.

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

9.3 Targets

1. To develop and implement an integrated flood management plan

9.4 Proposed outputs

1. An Integrated Flood Management Plan
2. Community flood hazard map;

9.5 Activity Plan and Budget

CH 9: Flood Management				
		Target	To develop and implement an integrated flood management plan	
		Output	1. An Integrated Flood Management Plan	
			2. Community flood hazard map;	
Activity		Sub-activity	Budget*1000	Year of Implementation
9.1	Community awareness creation on flood management	9.1.1 Hold 3 Barazas (1 per zone) yearly for 10 years	350	YEAR 3/4
		9.1.2 WRUA exchange visit	547	YEAR 5
9.2	Develop and Implementation of Integrated Flood Management Plan (IFMP)	9.2.1 Mapping of hotspots in flood prone areas and preparation of sub catchment flood hazard maps	406	YEAR 6-10
		9.2.2 Engage Consultant to develop IFMP	700	YEAR 7-10
		9.2.3 Presentation and adoption of IFMP	68	YEAR 4
		9.2.4 Implementation of IFMP (Flood control structures)	5,000	YEAR 4
		9.2.5 Installation of Flood Early Warning System	700	YEAR 5-10
TOTAL			10,771	

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

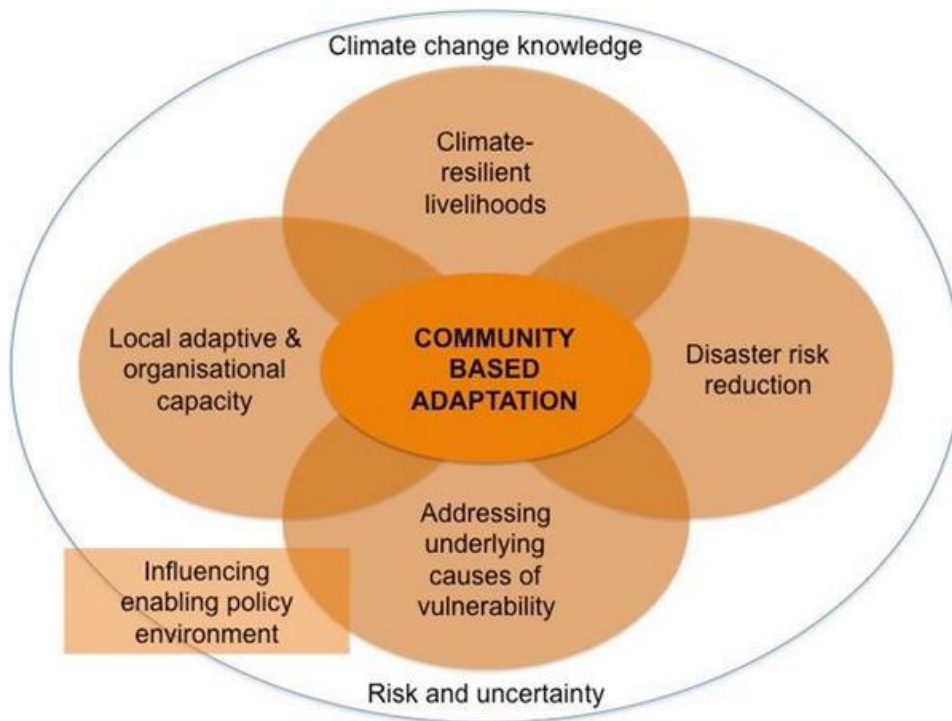
The indicators of climate change are the observance of the frequency and severity of meteorological events and changes from baseline analysis. These can include the number of flood events in a year, frequency and length of droughts, duration of seasonal shifts in climatic norms, among others. It is also 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
i). Increase rainfall variability Decrease in shoulder season length Increased fire danger (drying factor); and Impacts on rivers and wetland ecosystems.	i). Higher mean annual temperature Increase evaporation and decreased water balance Reduced crop quality and food security.
ii). Intensification of rainfall events Increased flooding; Increased challenge to storm water systems in urban settlements; Increased soil erosion; Increased river bank erosion and demands for protection structures; Increased pressure of disaster relief system.	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;



Measures to tackle climate change

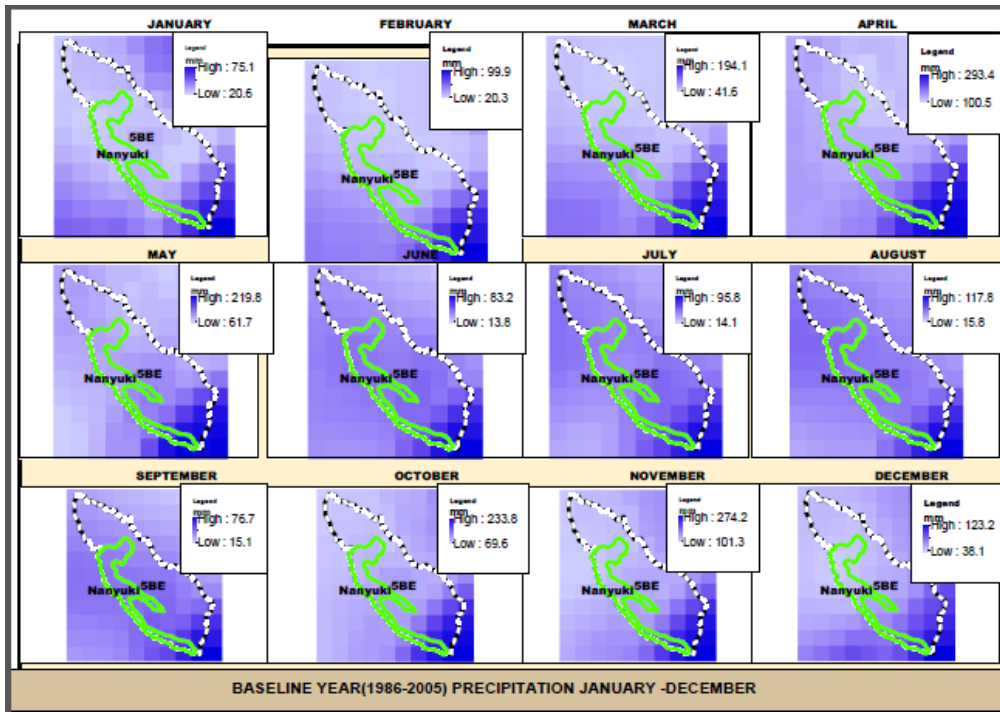
10.2 Climatic evaluation findings

ISC under the KWSCR Project analyzed the climate change in Kenya using data from SimCLIM and CORDEX models. SimCLIM data is down scaled 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 Down scaling Experiment) data is down scaled to 45km resolution and has a daily temporal scale to 2100.

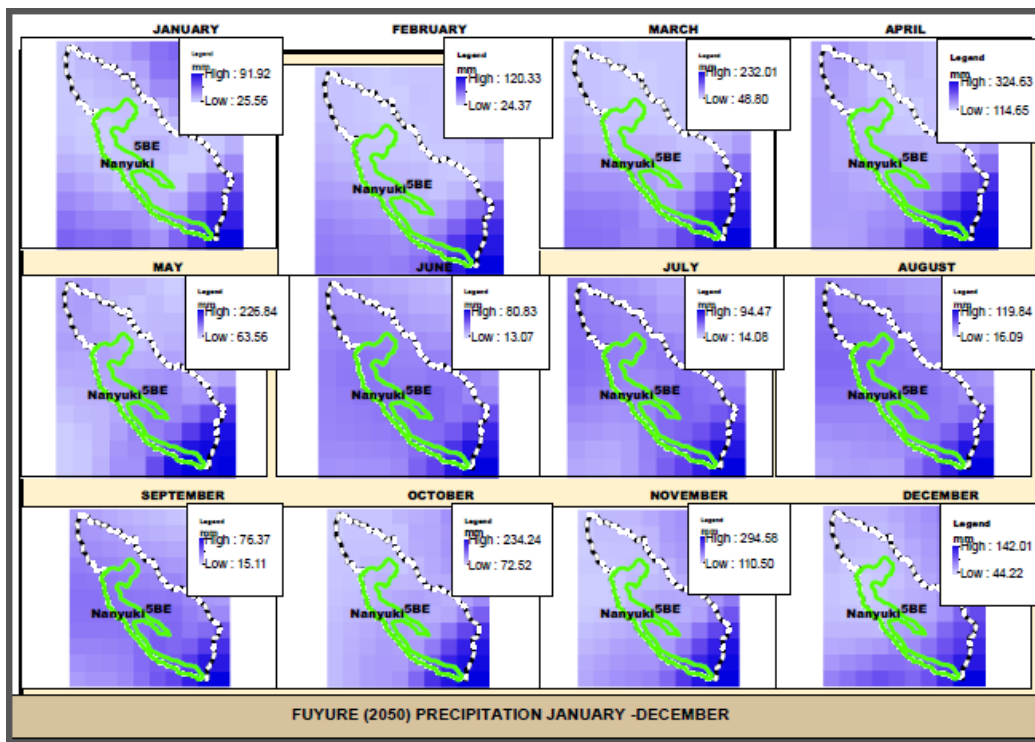
In the analysis, the future climates are presented against the representative concentration pathways (RCPs), which are seen as estimations of the potential curtailment of greenhouse gas emissions over the 21st century.

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

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



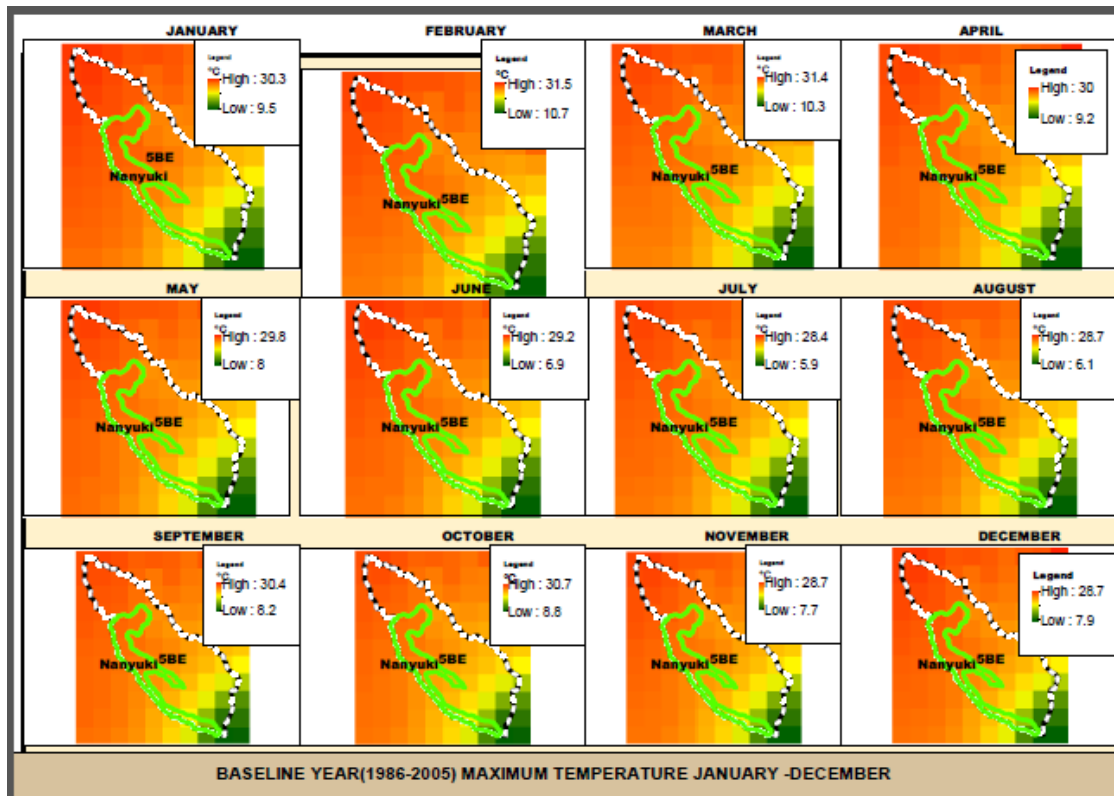
Map: 10-1 Baseline (1986 - 2005) spatial and temporal (monthly) Variation in rainfall in the Sub catchment



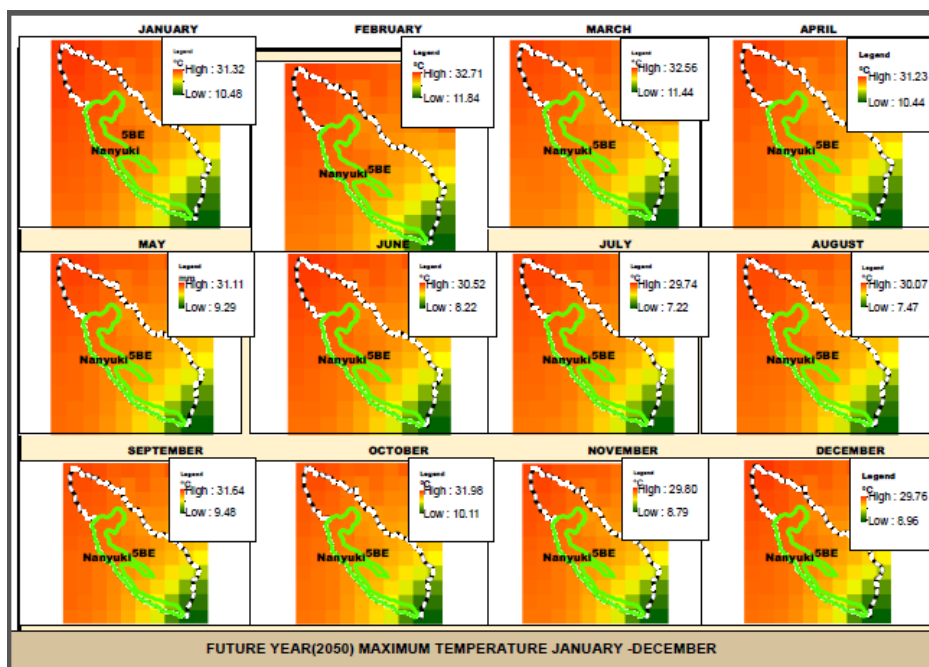
Map: 10-2 Future (2050) projections of spatial and temporal (monthly) variation in rainfall in the Sub catchment

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 5BE06 within which TIMAU Sub Catchment is located.

From the rainfall analysis above, it is anticipated that rainfall amounts will increase in both short and long rain period with their peak months being November and April respectively. The period between the two seasons are anticipated to record a slight decrease in rainfall.



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



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 catchment will record a general increase in temperature throughout the year.

10.3 Impacts of climate change

- Which impacts have been or are expected to be realised locally?

10.4 Targets

10.5 Proposed outputs

10.6 Activity Plan and Budget

CH 10: Climate Change adaptation				
Target		Promote communal measures that embrace both adaptability and mitigation towards climate change.		
Output		1.Climate change mitigation plans that are enshrined in the SCMP		
		2. Reports on climate changed adaptation and mitigation activities		
Activity		Sub-activity	Budget*1000	Year of Implementation
10.1	Awareness creation on climate change	10.1.1 Sensitization barazas on climate change 1 day per zone per year	550	YEAR 4
		10.1.2 Conduct Field days 1 per zone for 3 zones annually (30 field days)	750	YEAR 5-10
10.2	Implement Climate Change adaptation measures (climate resilient)	10.2.1 Establish climate smart agriculture, demo centres per sub-location zone (total of 3 zones)	4,000	YEAR 6-10
		10.2.2 Mapping of areas adversely affected by Climate Change and identification of suitable mitigation and adaptation activities (Consultancy)	700	YEAR 7-10
TOTAL			6,000	

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 infrastructure within the sub-catchment includes flood flow storages by the big farm abstractors and one water pan done by the CDF for the Ngusishi community. Others are colonial water pans that are silted up and no longer operational.

Alternative water sources such as water impounding structures like dam's boreholes and protection of springs were suggested during mobilization meetings. Roof, road runoff harvesting and construction of water kiosks were also suggested. The lower zone is hard hit with the water shortage because it is more arid and has no water projects.

The pre-colonial water projects have broken down, cultivated or silted up. A well planned infrastructure development scheme is the only alternative for this area. A big conservation dam at Akorino that was operational during the colonial era and even today holds some water was suggested for possible rehabilitation as it is on 18 hectares of public land.

Large storage sites have identified and geo-referenced in the forest, with the collaboration of the CFA's TWRUA will allocate funds to do feasibility and design of the mega dam to enable them source for funds. The mega dam will store rain water and recharge the river system during dry seasons

11.2.1 Planned infrastructure

There are proposed water infrastructure developments in the area by the County Government of Laikipia and Meru. The numbers, capacity and their locations are not yet confirmed.

- New boreholes drilled and old ones rehabilitated.
- Dams desilted or rehabilitated.
- New dams constructed.
- Feasibility study and design for a mega dam in the forest done.
- Promotion of roof harvesting.
- Promotion and adoption of rain water harvesting structure.
- Promotion and adoption of water pans at household level for irrigation purposes.

11.3 Targets

1. To rehabilitate and put in place proper management practices to optimize functions of water infrastructures.

11.4 Proposed outputs

1. Water infrastructure rehabilitation plans that are domiciled in the SCMP.
2. Annual Infrastructure rehabilitation and management assessment report

11.5 Activity Plan and Budget

CH 11: Water Resource Infrastructure Development				
Target		To rehabilitate and put in place proper management practices to optimise functions of water infrastructures.		
Output		1. Water infrastructure rehabilitation plans that are domiciled in the SCMP. 2. Annual Infrastructure rehabilitation and management assessment reports.		
Activity		Sub-activity	Budget*1000	Year of Implementation
11.1	Assessment, design and rehabilitation of dams/pans	11.1.1 Survey and design for rehabilitation of XXXX No. existing dams/pans (To be identified during implementation)	3,645	YEAR 2/3
		11.1.2 Desilt and fencing of Akorino, Kirurumo and Kithima kia Munyi dams that were silted up	75,000	YEAR 2/3
11.2	Feasibility Study for additional Storage	11.2.1 Conduct Site identification, Survey, Feasibility Study and EIA	739	YEAR 4-10
11.3	Promotion of alternative water storage	11.3.1 Installation of RWH facilities Carry out demonstration of rain water harvesting tanks for local institutions (30 No. 7,500lts)	6,000	YEAR 4-10
		11.3.2 Construction of Manually Scoop 400m3 and line 30No. pans	9,330	YEAR 6-10
11.4	Promotion of alternative water sources	11.4.1 Borehole for ground water ,monitoring due to excessive B/H Abstraction. 11.4.2 Engage an Expert for design and survey of the common intake -Meetings to sensitize and engage the communities	600	YEAR 6-10
		11.4.3 Protect and conserve Gathua ,Ngusushi market, Kwa major 2 No,Batian, Kwa kaka, Munjuri and Kaiga na gatima springs. 11.4.4 Manually Scoop 400m3 and line 30No. pans	7,200	YEAR 6-10
11.5	Capacity Building on management of infrastructure	11.5.1 Capacity building of dam committees on dam maintenance and management	160	YEAR 6-10
		11.5.2 Capacity building of water projects (springs) on maintenance and protection of source	106	YEAR 6-10
TOTAL			XXXX	

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 Timau WRUA and to that effect, the WRUA management committee is composed of 30% women representation. However, the youth and the vulnerable within the Sub Catchment are given minimal priority in the decision-making process. There is lack of succession within the WRUA structure mainly due to the fact that the youth are not part and parcel of the management committee. This is mainly attributed to economics in that most youth require 'quick' cash and the WRUA model is perceived to be not so 'attractive' to them. Timau WRUA needs to develop incentives geared at attracting the youth.

However, there is a gap in involvement of the vulnerable groups on decision making and project implementation. 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 projects **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 Timau 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 Timau 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. Timau 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.

Timau 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

Timau Sub Catchment just like any other sub catchments within the country is affected by the HIV 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 Timau 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

1. To capacity build and sensitise the WRUA on the streamlining of RBA within the context of IWRM;

12.4 Proposed outputs

1. RBA based audit and progress reports.

12.5 Activity plan and Budget

CH 12: Right based approach/Poverty Reduction				
Target		To capacity build and sensitise the WRUA on the streamlining of RBA within the context of IWRM;		
Output		RBA based audit and progress reports.		
Activity		Sub-activity	Budget*1000	Year 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	YEAR 4
		12.1.2 Conduct exposure visits to groups that have successfully incorporated RBA in WRM	434	YEAR 5-10
12.2	Awareness creation on RBA	12.2.1 Hold sensitization barazas (1 per sub-location X 6 sub-locations for 10 years)	900	YEAR 6-10
		12.2.2 Hold sensitization meetings for the vulnerable groups and recruit them into the WRUA (1 baraza per location 3 locations twice within the SCMP period	90	YEAR 6-10
		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 3 zones three times within SCMP period)	141	YEAR 6-10
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	YEAR 6-10
		12.3.2 Develop criteria for identification and classification of the vulnerable groups and identify and recruit representatives	224	YEAR 6-10
		12.3.3 Provide rainwater harvesting tanks of 2,300 litres capacity to 1 5 households per zone X 3 zones X 10 years = 450 tanks). (To be identified during implementation)	11,706	YEAR 6-10
12.4	Audit	12.4.1 Hire consultant to undertake RBA audit	100	YEAR 1
TOTAL			14,589	

13 LIVELIHOOD ENHANCEMENT

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.

13.2 Current Status

13.2.1 Livelihood activities practiced

Timau community largely depend on farming as the main economic activity. This includes both commercial and subsistence farming of maize, wheat and beans. Due to the unpredictable change of seasons, this economic activity is becoming unreliable to the community. Livestock keeping is also a major economic activity within Timau sub-catchment. Dairy and beef farming and rearing of sheep and goats also bring reasonable income to the community. Livestock keeping is mainly on free range system. This system of livestock production poses a risk to water sources in two ways;

- I. Direct livestock watering at the source (due to lack of water troughs) causes water pollution;
- II. Soil erosion from cattle tracks and due to overgrazing that causes siltation of storage facilities.

The community has started adopting new farming technologies such as the 'green houses' and drip irrigation in horticultural farming especially in growing of tomatoes in both commercial and small scale farming. Green house technology with drip irrigation should be greatly encouraged for water demand management and improved water use efficiency.

Other livelihood activities within the sub-catchment, farming on riparian land, timber logging and charcoal making are livelihood activities that are carried out in the sub-catchment that impact negatively on environment.

13.2.2 Charcoal burning

Charcoal burning is mainly practised mostly in the upper zone area. The high demand for charcoal and limited livelihood opportunities in these areas has led to increase charcoal production. Cutting down of trees in these areas has negatively impacted on the sub catchment leading to land degradation. With the observed negative environmental impacts in the area, there is need to sensitize the community on alternative efficient energy sources to reduce the rate of charcoal production in the area.

13.2.3 Subsistence farming

Subsistence farming is the largely practised livelihood activity in the sub catchment. The main crops grown include; beans, maize, 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 . This has led to degradation of the riparian land. There is therefore need to sensitize the community on sustainable agricultural practices to help the farmers reap the full benefit from their farms even without encroaching the riparian.

13.2.4 Livestock farming

Livestock farming is practised in small scale in upper 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. 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.

13.2.5 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.

13.2.6 Commercial farming

Commercial farming is mainly practised in the upper and mid sections of the sub catchment. Crops grown for commercial purposes include; Wheat, Cabbages, Tomatoes, Maize and Potatoes. These products are sold in the local market and some exported to the neighbouring towns. Dairy and Poultry farming is also done commercially in the area. Commercial farming in the area is mainly done through irrigation. 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.

13.3 Proposed Alternative Livelihoods

With the current status of the sub-catchment, there is need to sensitize the community on alternative sources of livelihood that will safeguard the catchment and protect water resources and at the same time improving living standards of the community. The activities identified included: promotion of modern bee keeping technology, improved dairy farming, establishment of sheep breeding sites, Poultry farming and fish farming.

Note: the sub sections are to be deleted where not applicable and other added where necessary.

13.4 Targets

1. To better the living standards of the community through introduction of sustainable means of making a living.

13.5 Proposed outputs

1. Livelihood project specific implementation reports.

13.6 Activity plan and Budget

CH 13: Livelihood enhancement				
Target		To better the living standards of the community through introduction of sustainable means of making a living.		
Output		Livelihood project specific implementation reports.		
Activity		Sub-activity	Budget* 1000	Year of Implementation
13.1	Enhance current sustainable activities	13.1.1 12 days Capacity building on bee keeping for the WRUA members. 4days per zone for the SCMP period.	700	YEAR 3
		13.1.2 Fencing of 20No. apiaries	824	YEAR 3
		13.1.3 Setting up and operationalization of 20No apiaries with 20 hives each and installation honey refinery (To be identified during implementation).	4,448	YEAR 3
13.2	Improved dairy farming	13.2.1 Conduct 10 No. Field days on improved dairy breeds and Feeds/pasture (stakeholder facilitation)	950	YEAR 3
		13.2.2 Establishment of demo plots	100	YEAR 3
13.3	Promote poultry farming through establishment of Hatchery(4000 eggs)	13.3.1 Develop a business plan for poultry farming	100	YEAR 4-10
		13.3.2 Procurement and installation of incubator	200	YEAR 4-10
		13.3.3 Construction of a brooder, procurement of certified eggs from KALRO,	500	YEAR 4-10
		13.3.4 Capacity building of poultry management	2,085	YEAR 4-10
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.	1000	YEAR 5-10
		13.4.2 6 No. Exchange visits to other areas. For the entire SCMP period	300	YEAR 5-10
		13.4.3 Identification and establishment of high value fruit tree nursery for Avocados-600, mangoes-1000, macadamia - 500	1.5	YEAR 5-10
13.5	Establish alternative livelihoods	13.5.1 Purchase and distribute of fruit trees to WRUA members.	1.5	YEAR 4-10
		13.5.2 Introduction of fish in the current dams Chereta Karaba and Majani dams. 1000 fingerlings per dam	500	YEAR 4-10
		13.5.3 Establish sheep breeding sites 1No. Lower Zone	471	YEAR 4-10
		13.5.4 Establishment of seed bulking 1 No. upper zone	360	YEAR 4-10
		13.5.5 Training on energy saving Jikos production and installation. (20 training days)	2,510	YEAR 4-10
		13.5.6 Consultancy services to develop business plans.	250	YEAR 4-10
TOTAL				

14 INSTITUTIONAL DEVELOPMENT

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; 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.

14.2 Institutional capacity

The WRUA suffers from low financial resources to support its operations including office rent and staff recruitment. Inadequacy of finances have been blamed on low membership, low set WRUA fees (membership and annual subscription), reluctance by members to make payments to the WRUA, lack of enforcement by management committee to enforce by-laws that specifies terms of membership, and lack of capacity to mobilize for funds.

The WRUA does not have a staff to support in daily activities of the WRUA. The management committee is therefore in charge of running daily activities especially during project implementation. In order for the WRUA to effectively discharge its mandate, there is need for the WRUA to have an established and equipped office and recruit a staff. Finally, and most important is need to build the WRUA's capacity on water resources management, governance and other areas that can enhance the skills of WRUA to effectively discharge its mandate.

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 trainings

14.3 Facilities

Timau WRUA is fortunate to have a facility. The WRUA has a central office which is located at Timau at the DCC's compound in which there's enough security for the WRUA records and dissemination of information. The management committee runs the day-to-day affairs of the WRUA at the central office. The WRUA has found the need to increase and install modern telecommunication infrastructures to improve communication flow in the WRUA.

14.4 Targets

1. To strengthen the institution's technical capacity through training and asset establishment.

14.5 Proposed outputs

1. Institutional development reports on every project

14.6 Activity plan and Budget

CH 14: Institutional Development				
Target		To strengthen the institution's technical capacity through training and asset establishment.		
Output		Institutional development reports on every project.		
Activity	Sub-activity	Budget*1000	Year of Implementation	
		14.1.1 Purchase and installation of office furniture and equipment	890	YEAR 1
14.2	Capacity Building	14.2.1 Conduct Training Needs Assessment for every new office (3times within SCMP period)	1,800	YEAR 1
		14.2.2 Conduct 3-day training workshop every 3 years	1,800	YEAR 3
14.3	Carry out WRUA Publicity	14.4.1 Procure publicity materials (Fliers/Brochures/ branded T-Shirts	900	YEAR 4-8
TOTAL			5,390	

15 MONITORING AND INFORMATION MANAGEMENT

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

Water Resource Monitoring

Timau River has one (1) RGS 5BE06 though the guage plate was half way damaged and cannot monitor floods, needs minor repair . The 5BE06 is within timau township about 250 m downstream of bridge along Timau-Meru tamarc road. There is one (1) operational rainfall stations within the Timau Sub-catchment which is at the Timau's DCC's compound (Timau WRUA's Office) it is being operated by the WRUA's manager.

Monitoring of the resource has been fully initiated by the WRUA through constant patrols by the river scouts employed occasionally by the WRUA on need basis. For effective monitoring, the WRUA management will periodically patrol the resource and monitor the flows, use, compliance to permit regulations and pollution issues. More resources will be channeled towards monitoring of the gravity pipelines as they account for over 90% of the abstraction from the Timau River.

Water quality monitoring

Currently, the WRUA does not undertake water quality monitoring; however Water Resources Authority undertakes water quality monitoring on quarterly basis. Both physical and chemical parameters are measured in situ and water samples taken for analysis in the laboratory which include biological parameters samples are mainly taken from the existing boreholes.

Pollution Monitoring

Timau WRUA does not undertake pollution monitoring. For effective monitoring the WRUA management will patrol the resource and monitor the use, compliance to permit regulations and pollution issues. The committee will report all what they have monitored to the WRA.

Information Sharing Arrangements

The basic information required for the water resources management is rainfall and stream flow data. This data is affected by environmental changes and therefore for the information to be realistically used, there is need for continuous data collected.

Rainfall data on one hand has less challenge because most of rainfall stations are located in convenient and secure places. However, the distribution of rainfall monitoring stations is not necessarily distributed in a way that meets Kenya

Meteorological Departments (KMD) and Water Resources Authority requirements in all cases.

WRUA project monitoring

The WRUA has set up the monitoring committee which will be monitoring all the projects being undertaken by the WRUA. However, the capacity of the committee needs to be enhanced to improve their competence and skill in monitoring and evaluation of WRUA activities.

Targets

To enhance the Sub-catchment monitoring network and share information amongst all water users

Proposed Outputs

- Generation of a database for river flows, climate, water use, and water quality within the catchment.
- Information sharing among the WRUA members and the general public on the status of the Timau River.

CH 15: Monitoring and Information management			
Target		Enhance the monitoring network and information sharing arrangements.	
Output		Sufficient stream flow and climatic data for planning	
Activity	Sub-activity	Budget*1 000	Year of Impleme ntation
Patrolling the Sub-catchment [Rivers etc]	Scout patrolling water course	450	1 year
	Purchase of Motorbike for River patrol	980	1 month
	Fuel and general maintenance .	450	1 year
	To be done by Manager in collaboration with Management committee	500	10 years
Monitoring	Repair of RGS at Timau	500	1 month
	Work with projects to gauge at intakes.	1000	Continuos
	Gauging staff and equations developed	200	1 year
	Daily records (River flow, rainfall and temperatures) . Monitoring compliance to permit conditions, meter readings, ground water use and developments (to be done by manager)	0	Continuos
Update of water resource use database	IT Consultant and Data Clerk	450	3 months
WRUA training to use database	IT Consultant to train WRUA Staff and 8 Committee members 4 Days	150	
	Food/Hall Hire/ Fare Refunds	250	4 days
Information	Production of Newsletters, Calendars and Brochures annually	500	3 years
Media Broadcasting/Reporting	Announcement of abstraction bans and other relevant WRM issues in a local radio station .	500	3 years
	Production of a video documentary for the WRUA	300	1 year
Flow measuring and regulating	Procurement and install flow measuring devices for water projects	2,573,800 .00	1 year
TOTAL			

16 FINANCING AND IMPLEMENTATION

16.1 Introduction

The understanding of the state of the WRUA's operational budget, ways to meet WRUA's Operational budget and SCMP investment budget is key for the success of the plan. This section details the mechanisms to raise SCMP investment and operational budget. The challenges facing the financing of the institution and SCMP implementation are discussed and solutions sought for the sake of enabling proper facilitation of the SCMP implementation as well as the institution.

16.2 WRUA financing

16.2.1 WRUA operational budget

WRUA operations are currently supported by funds from membership fees, annual subscription fees and WRUA comments facilitation fee. The rates were revised to Ksh.5000 for all categories of members. However, annual subscription fee remained the same and only applicable to water projects. This means that WRUA operations are supposed to be supported by subscription fees paid by 92 water projects. This translates to Ksh. 5,000 per year or Ksh. 417 per month.

There is a proposal to review the by-laws and further increase fees charged by WRUA (membership and annual subscription). In addition, the WRUA intend to recruit more members and implement Income Generating Activities in an effort to improve its finances.

Table: 16-1 Estimated WRUA operational Budget

Item	Monthly Budget (Ksh.)	Annual Budget (Ksh.)y
Office rent	2,000	24,000
Stationary	2,000	24,000
Staff salaries	10,000	120,000
Transport	10,000	120,000
Communication	2,000	24,000
Administration	5,000	60,000
Allowances	10,000	120,000
Total	41,000	492,000

As previously stated, the current average annual revenue collected by Timau WRUA is Ksh. 5,000 (equivalent to Ksh.417 monthly). There is proposal to have even individual members pay Ksh. 500 annual subscription fee. If this is implemented, the WRUA will be able to collect Ksh. 12,500 annually (Ksh. 1,042 monthly). This is too low compared to required amount to support daily running of WRUA.

16.3 Mechanisms to meet WRUA's Operational Budget

Timau 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, Timau 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

Timau WRUA can raise its operations budget by:

- Recruitment of additional members especially corporate members. The WRUA plans to increase its revenue by Increase in membership means increase in revenue generated from membership and annual 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;
- Increasing its membership and subscription fee gradually up to Ksh 2000/- and Ksh 5000/- respectively for corporate membership and individual membership/corporate for Ksh 2000/- and Ksh 1000 respectively.
- Developing proposals to key stakeholders to sponsor/support specified WRUA activities.

16.3.1 SCMP investment 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 and their area of interest have been identified. Timau WRUA therefore shall engage with the identified stakeholders for support in SCMP implementation.

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 Government of Laikipia in implementation of catchment conservation activities as specified in the CIDP;
- In-kind contributions from WRUA members and other key stakeholders;
- Donations (cash or in-kind contribution) from development partners or their implementing agencies.

The SCMP investment budget is **KES XXXXX** as broken down in the table below.

Table: 16-2 Investment proposed budget summary

Chapter	Title	Budget (Ksh)*1000
1	Introduction	-
2	Overview of the Sub Catchment	-
3	Catchment Characteristics	
4	Management Approaches	
5	Water Balance and Water Demand Management	
6	Water Allocation and Use	
7	Water Resources Protection	
8	Catchment and Riparian Conservation	
9	Flood Management	
10	Climate Change Adaptation	
11	Water Resources Infrastructure development	
12	Rights Based Approach /Poverty Reduction	
13	Livelihoods Enhancement	
14	Institutional Development	
15	Monitoring and Information Management	
16	Financing and Implementation	6,449
Grand Total		197,774.28

16.4 Targets

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

16.5 Proposed outputs

2. Audit & Finance Report

16.6 Activity Plan and Budget

16.7 Activity Plan and Budget

CH 16: Financing and Implementation				
Target		To ensure WRUA sustainability and completion of SCMP activities by building capacity and implementation of resource mobilization strategies;		
Output		Audit & Finance Reports		
Activity		Sub-activity	Budget*1000	Year of Implementation
16.1	Finance Management Training	16.1.1 Conduct Finance Management Training	370	YEAR 1-5
		16.1.2 Training on IWRM	700	YEAR 1-5
		16.1.3 Training on Procurement	570	YEAR 1-5
		16.1.4 Training and Development of Business Plan	300	YEAR 1-5
16.2	Implement Income Generating Activities	16.2.1 Implement Bee keeping, fish farming and Fruit Tree nursery and bamboo nursery	6,665	YEAR 1-5
16.3	Conduct membership Recruitment Drive	16.3.1 Hold meetings to recruit new members	400	YEAR 1-10
16.4	Promote transparency and accountability	16.4.1 File Returns to Attorney General	8	YEAR 1-10
		16.4.2 Engage a financial Auditor	800	YEAR 1-10
TOTAL			9,815	



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TIMAU WRUA SUB-CATCHMENT MANAGEMENT PLAN (2023-2033)

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