Ministry of Water, Sanitation and Irrigation

Forestry, Land-use and Catchment Management Sectoral Integration Plan

KENYA WATER SECURITY AND CLIMATE RESILIENCE PROJECT

Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning

August 2020

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Forestry, Land-use and Catchment Management Sectoral Integration Plan

KENYA WATER SECURITY AND CLIMATE RESILIENCE PROJECT

Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning

Prepared for:

Ministry of Water, Sanitation and Irrigation
Water Resources Authority

Client contact:
The Chief Executive Officer
Mohamed M. Shurie
Email: info@wra.go.ke

Prepared by:

Implementation Support Consultancy (ISC) to Support Strengthening of Water Resources Management and Planning

aurecon in association with:

CEA · DHI · Otieno Odongo & Partners Consulting Engineers · PEGASYS · RTI International · Rural Focus · WATER4LIFE · Ec Industrial Economics, Incorporated

August 2020

Project report number: C5-2

Recommended citation:
Aurecon AMEI Limited. 2020. *Forestry, Land-use and Catchment Management Sectoral Integration Plan*, Final Report. Technical Report prepared for the Ministry of Water, Sanitation and Irrigation, Republic of Kenya, by Aurecon AMEI Limited, Ebéne, Mauritius, 90 pp.

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Executive Summary

E1. Background, context and objectives

The purpose of this Sectoral Integration Plan with regard to the **forestry, land use and catchment management sectors** in Kenya, is to ensure that the key findings and outputs from the six Basin Plans are properly integrated at sectoral level - in each of the six basins as well as in the country as a whole. The six major river basins of Kenya are Athi, Tana, Lake Victoria South (LVS), Lake Victoria North (LVN), Rift Valley (RV) and Ewaso Ng'iro North (ENN).

E2. Integrated Water Resources Management and Development Plan for the six basins

In order to comprehensively and systematically address the range of water resources related issues and challenges in the six basins and to unlock the value of water as it relates to socio-economic development, ten key strategic areas were formulated as shown below.

Table E1: Basin Plan - Key Strategic Areas and Objectives

Key Strategic Area		Strategic Objective
1	Catchment Management	To ensure integrated and sustainable water, land and natural resources management practices
2	Water Resources Protection	To protect and restore the quality and quantity of water resources of the basin using structural and non-structural measures
3	Groundwater Management	The integrated and rational management and development of groundwater resources
4	Water Quality Management	Efficient and effective management of water quality to ensure that water user requirements are protected in order to promote sustainable socio-economic development in the basin
5	Climate Change Adaptation	To implement climate change mitigation measures in the water resources sector and to ensure water resource development and management are adapted and resilient to the effects of climate change.
6	Flood and Drought Management	To establish and guide a structured programme of actions aimed at ensuring the prevention of, mitigation of, timeous response to, and recovery from, the harmful impacts of floods and droughts across the Basin or specific catchment area.
7	Hydromet Monitoring	An operational and well-maintained hydromet network supported by effective and functional data management and information management systems
8	Water Resources Development	To develop water resources as a key driver for sustainable economic and social development
9	Strengthened Institutional frameworks	To achieve an appropriate balance between operational functionality and the need for effective oversight and governance.
10	Enabling environment to support effective institutions	Improved regulatory responses to strengthen catchment based water resources management

The national estimated budget which is required for implementation of integrated water resources management and development activities up to 2040 in all basins and across all KSAs equals about **29 billion USD**. The **forestry, land use and catchment management sectors** are linked to about **980 million USD** of the National Budget as shown in Table E2, which summarises the proposed implementation budgets from all six Basin Plans up to a planning horizon of 2040, for activities that are relevant to the forestry, land use and catchment management sectors. The KSAs that demand the

largest expenditure from a forestry, land use and catchment management sector perspective are KSA1: Catchment Management and KSA5: Climate Change Adaptation and Preparedness.

E3. Roadmap for sector integration

In order to ensure the successful implementation of the strategies and actions from the six Basin Plans and National Plan as they relate to forestry, land use and catchment management, a Roadmap for Implementation is proposed. This Roadmap proposes that before any actions identified under the KSA implementation plans are implemented, there are preceding critical activities. These are as follows (Figure E1):

1. Immediate KSA activities
    a. Strengthening of institutional capacity and coordination;
    b. Imminent infrastructure feasibility and impact assessments;
    c. Expand on the basin plan knowledge base
2. Financial Resource Mobilisation for the KSA activities
3. Implementation of the short to long-term KSA activities
4. Monitoring and Evaluation of the KSA activities

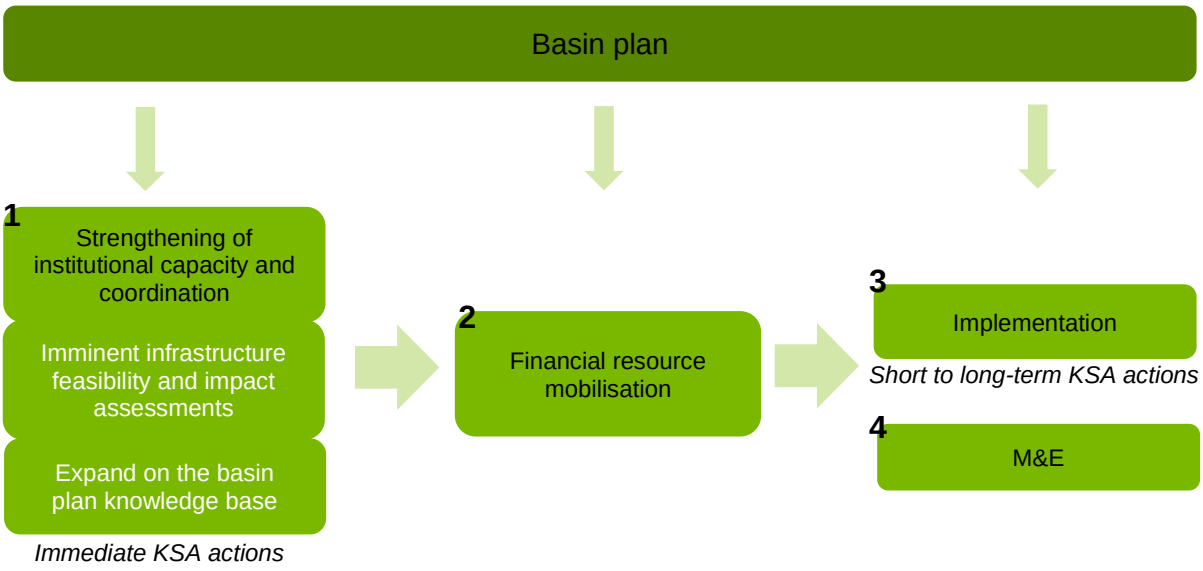

Figure E1: Roadmap for implementation of the Basin Plans

As the strengthening of institutional capacity and coordination is considered an immediate KSA activity, the engagement with role players from various institutions is a priority.

This Sectoral Integration Plan highlights KSAs and themes which are relevant to the **forestry, land use and catchment management sectors** and indicates what immediate actions are required.

Table E2 Summarised IWRM budget for implementation activities linked to forestry, land use and catchment management under specific Key Strategic Areas

Key Strategic Areas and Themes		Budget (USD Million)				
		2020-2022	2022-2025	2025-2030	2030-2040	Total
KSA 1	**Catchment management**	24.4	200.6	172.8	132.3	**530**
	Promote improved and sustainable catchment management					
	Sustainable water and land use and management practices					
	Natural resources management for protection & sustainable use					
	Rehabilitation of degraded environments					
KSA 2	**Water resources protection**	-	3.3	3.3	5.4	**12**
	Conserve and protect ecological infrastructure					
KSA 4	**Water quality management**	5.7	3.3	2.3	3.6	**15**
	Effective data collection, information generation, dissemination, knowledge management					
	Promote sound water quality management governance					
	Efficient and effective management of point and nonpoint sources of water pollution					
KSA 5	**Climate change adaptation and preparedness**	21.0	66.7	69.0	46.5	**203**
	Understand impacts of climate change on water resources at appropriate spatial scales					
	Climate change mitigation					
	Climate change adaptation					
KSA 9	**Strengthen Institutional frameworks**	30.3	15.5	16.8	12.2	**74**
	Promote improved and sustainable catchment management					
	Guidelines, codes of practice and manuals					
KSA 10	**Strengthen enabling environment to support institutions**	31.5	54.1	26.3	35.8	**148**
	Develop institutional capacities to support improved IWRM&D					
	Total	**113**	**343**	**291**	**236**	**983**

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Abbreviations and Acronyms

AGR	Artificial groundwater recharge
AMP	Aquifer Management Plan
ASAL	Arid or Semi-Arid Land
ASM	Artisanal and small-scale mining
AWWDA	Athi Water Works Development Agency
BOD	Biochemical Oxygen Demand
BWRC	Basin Water Resource Committee
CA	Conservation agriculture
CAAC	Catchment Area Advisory Committee
CDA	Coast Development Authority
CFA	Community Forest Association
CGs	County Governments
CIDP	County Integrated Development Plan
CMS	Catchment Management Strategy
CMU	Catchment Management Unit
COD	Chemical Oxygen Demand
CoK	Constitution of Kenya
CWSB	Coastal Water Services Board
CWWDA	Coastal Water Works Development Agency
DEC	District Environmental Committee
DEF	Drought Emergency Fund
DEM	Digital Elevation Model
DO	Dissolved Oxygen
DSS	Decision Support System
EDCs	Endocrine disrupting chemicals
EDE-CPF	Ending Drought Emergencies Common Programme Framework
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ENSO	El Niño–Southern Oscillation
ERS	Economic Recovery Strategy
FEWS NET	Famine Early Warning Systems Network
FMCF	Forest Management and Conservation Fund
FRF	Flood Response Forum
GCA	Groundwater Conservation Area
GCM	Global Climate Model
GDEs	Groundwater dependent ecosystems
GDP	Gross Domestic Product
GIS	Geographical Information Systems
GMP	Groundwater Management Plan
GW	Groundwater

ICZM	Integrated Coastal Zone Management
IDA	International Development Association
IDP	Integrated Development Plans
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
JICA	Japan International Cooperation Agency
KCCAP	Kenya Climate Change Adaptation Programme
KCDP	Kenya Coastal Development Programme
KCSAS	Kenya Climate Smart Agriculture Strategy
KEWI	Kenya Water Institute
KFS	Kenya Forest Service
KMD	Kenya Meteorological Department
KNCPC	Kenya National Cleaner Production Centre
KSA	Key Strategic Area
KWSCRP	Kenya Water Security and Climate Resilience Project
KWT	Kenya Wildlife Trust
KWTA	Kenya Water Towers Agency
LIMS	Laboratory Information Management System
LPG	Liquefied Petroleum Gas
LSRWSS	Large Scale Rural Water Supply Scheme
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MCM	Million Cubic Metres
MoLPP	Ministry of Lands and Physical Planning
MoLRRWD	Ministry of Land Reclamation, Regional and Water Development
MTPs	Medium Term Plans
MWSI	Ministry of Water, Sanitation and Irrigation
NAP	National Adaptation Plan
NAS	Nairobi Aquifer Suite
NAWARD	National Water Resources Database
NCCAP	National Climate Change Adaptation Plan
NEMA	National Environment Management Authority
NEP	National Environment Policy
NET	National Environmental Tribunal
NGO	Non-Governmental Organisation
NIB	National Irrigation Board
NLC	National Land Commission
NMK	National Museums of Kenya
NPEP	National Petroleum and Energy Policy
NPS	Nonpoint source
NRW	Non-Revenue Water
NWHSA	National Water Harvesting and Storage Authority

NWMP	National Water Master Plan
NWQMS	National Water Quality Management Strategy
PDB	Permit Database
POPs	Persistent organic pollutants
PPP	Public Private Partnership
PV	Photovoltaic
RCP	Representative Concentration Pathways
REA	Rural Electrification Agency
RO	Regional Office
RQOs	Resource Quality Objectives
RUSLE	Revised Universal Soil Loss Equation
SANBI	South African National Biodiversity Institute
SCMP	Sub-Catchment Management Plan
SDGs	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SME	Small and Medium Enterprise
SOPs	Standard operating procedures
SRO	Sub-Regional Office
SSWRS	Small Scale Rural Water Supply Scheme
TA	Transboundary aquifer
TARDA	Tana and Athi River Development Authority
TNC	The Nature Conservancy
USAID	United States Agency for International Development
UWSS	Urban Water Supply System
W/S	Water Supply
WAP	Water Allocation Plan
WASREB	Water Services Regulatory Board
WASSIP	Water Supply and Sanitation Improvement Project
WFP	World Food Programme
Wp	Watt peak
WRA	Water Resources Authority
WRM	Water resources management (also integrated WRM)
WRMA	Water Resources Management Authority
WRUA	Water Resource User Association
WSB	Water Services Board
WSP	Water Service Provider
WSSP	Water Sector Strategic Plan
WSTF	Water Sector Trust Fund
WT	Water Tribunal
WWDA	Water Works Development Agency
WWF	World Wildlife Fund

1 Introduction

1.1 Background and context

Kenya is a water-scarce country and its water resources are currently threatened by various issues. Addressing these issues demand capacity for comprehensive water resources management and planning, coupled with extensive investment in climate resilient water infrastructure. To address these challenges, and to give effect to the constitutional requirement for devolution of functions from National to County level, the Government of Kenya has embarked on a wide-ranging water sector reform programme. As part of this programme, the Government of Kenya received financing from the World Bank toward the cost of implementing the Kenya Water Security and Climate Resilience Project (KWSCRP-1), to be implemented through the Ministry of Water, Sanitation and Irrigation (MoWSI).

This Sectoral Integration Plan constitutes one of the deliverables under Sub-component 2.2 of the KWSCRP-1. This sub-component aims to strengthen the capacity of the Water Resources Authority (WRA) as it relates to water resources management and planning through the development of tools, skills and infrastructure to deliver on its mandate. The outcome will be a stronger WRA institution that has strengthened capacity to carry out its core functions with regard to integrated basin management and planning in a manner that is based on extensive knowledge-driven analysis and that meets the expectations of key stakeholders.

1.2 Objectives of the Sectoral Integration Plan

Integrated Water Resources Management (IWRM) considers the environmental, social and economic aspects of a river basin, and ensures that these aspects are integrated into an overall management strategy. It aims to achieve a sustainable balance between the utilisation, development and protection of water resources.

The purpose of this Sectoral Integration Plan with regard to the **forestry, land-use and catchment management sectors** in Kenya, is to ensure that the key findings and outputs from the six Basin Plans which were developed under KWSCRP-1 are properly integrated at sectoral level - in each of the six basins as well as in the country as a whole.

Figure 1-1 displays the six major river basins of Kenya viz Athi, Tana, Lake Victoria South (LVS), Lake Victoria North (LVN), Rift Valley (RV) and Ewaso Ng'iro North (ENN).

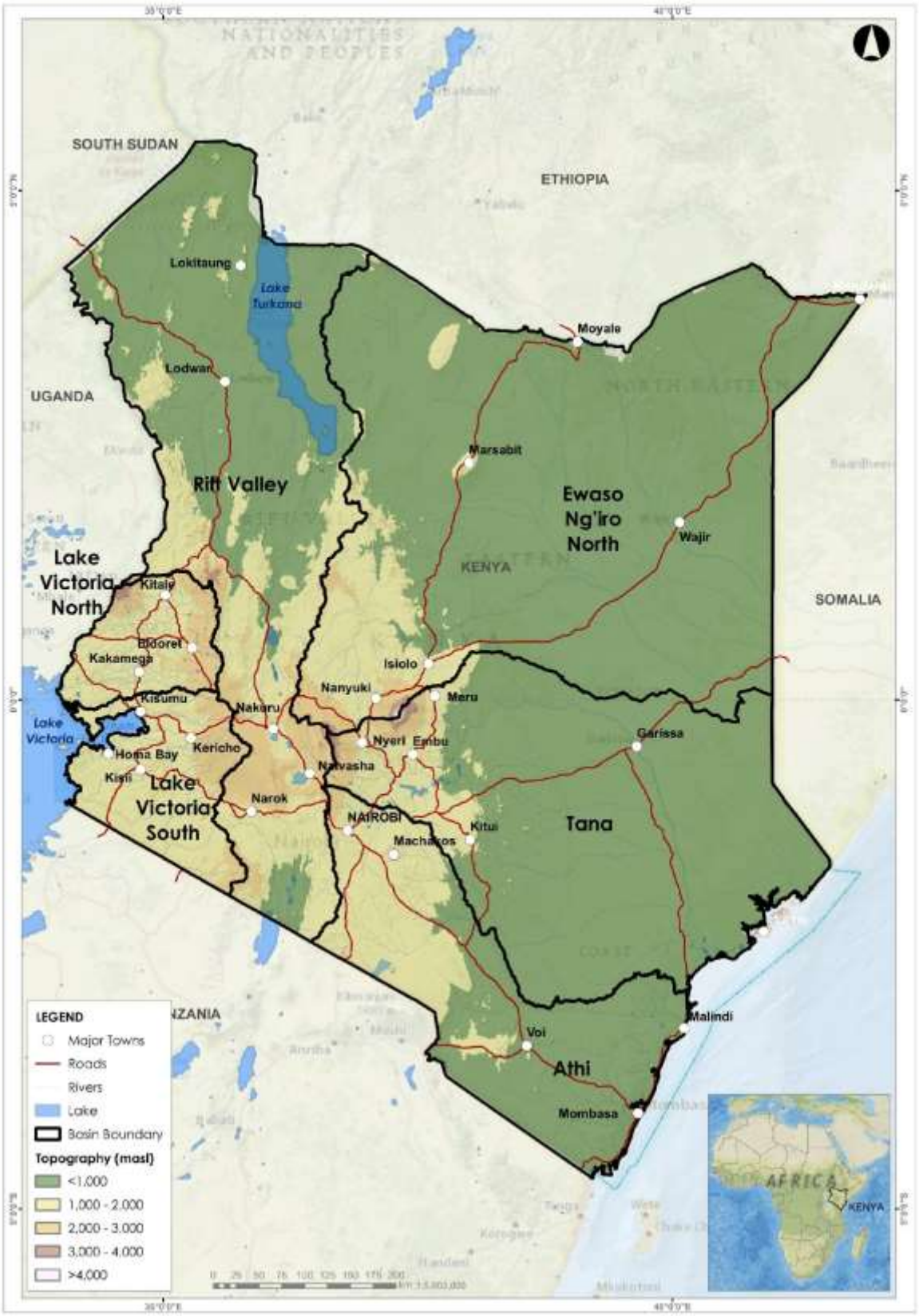

Figure 1-1: Overview map

1.3 Structure of the Sectoral Integration Plan

This report is structured as follows:

Section 2 provides an overview of the forestry, land use and catchment management sectors in Kenya and summarises key issues, challenges and trends in relation to these sectors.

Section 3 presents an institutional overview, from a sectoral and IWRM perspective, in relation to forestry, land use and catchment management in Kenya.

Section 4 presents strategies and themes which relate to the forestry, land use and catchment management sectors in Kenya, under ten key strategic areas.

Section 5 summarises key outputs, presents the broader context and provides high-level budgets and timelines as a proposed way forward for the integration of the Basin Plans with the forestry, land use and catchment management sectors.

Section 6 provides a conclusion.

Section 7 lists references.

2 Sectoral overview

2.1 Introduction

Kenya's natural resource-related sectors, forestry, tourism, agriculture, mining, fishing, and water contribute approximately 42% of Kenya's GDP and 70% of overall employment. Sustainably managed land, catchments and forests have potential to contribute to multi-sector development, meeting green economy objectives and increased food security.

Within a catchment there are various natural resources, i.e. land or soil, water, plants and animals. These resources need to be managed sustainably to benefit society and the environment. Kenya's Vision 2030 realises this and has promoted the sustainable use of ecosystems to reach developmental goals. Although biodiversity has not been effectively quantified, forests are one of Kenya's most important natural assets due to the biodiversity and society they support. The last inventory study estimated a national forest cover of 6.99% of the land area in 2010, which is below the constitutional requirement of 10%. It is estimated that forestry contributes approximately 3.6% to Kenya's Gross Domestic Product (GDP), excluding charcoal and direct subsistence uses (MEWNR, 2015). Forests also support a number of productive and service sectors, including: agriculture; fisheries; livestock; energy; wildlife; water; tourism, trade and industry; which have a combined contribution of between 33% to 39% of the country's GDP. Approximately 80% of the country's energy needs is met with wood biomass, which also provides a number of goods that support livelihoods of many communities. Deforestation in Kenya is estimated at 50,000 hectares annually, which constitutes a loss to the economy of over USD 19 million (MENR, 2016a; MEWNR, 2015).

Land is the most important resource in agricultural production, but limited availability of productive land is a major constraint to the Vision 2030 strategy of a 10% annual economic growth rate. The current strategy is to expand agriculture through increasing productivity, changing land-use, improving access to markets and value addition (Government of Kenya, 2007a). About 16% of Kenya's land is potentially arable and currently dominated by commercial agriculture (cropland 31%, grazing land 30% and forests 22%), urban centres, game parks, markets, homesteads and infrastructure (Government of Kenya, 2010a). The remaining 84% of Kenya's land that is non-arable is arid or semi-arid land (ASAL), which are mainly used as rangelands by ranchers, agropastoralists and pastoralists.

Land management is critical to the social and economic pillars of national development, but land degradation can erode these pillars and lead to chronic poverty for those that are closely linked to natural resource use. Poor land use planning and management can also have detrimental effects on the water resources of a basin. Human encroachment of riparian areas, springs, wetlands and forest areas, as well as unsustainable agricultural, pastoral and livelihood activities that are incompatible with the capacity of the land are some of the major land use issues in Kenya.

Kenya's five water towers (catchments) are largely covered by forests and these areas provide environmental services including climate regulation, water regulation, promote soils that provide natural water purification and water pollution sinks. It is estimated that 75% of the country's renewable surface water originate from these water towers, and therefore serve critical water regulation roles which are important for human livelihoods, irrigated agriculture, and production of hydropower. There is therefore great need and opportunity to intensify management of water catchments to enhance the conservation of water, regulation of river flows, and to reduce siltation and sedimentation of reservoirs (MEWNR, 2015).

This section provides an overview of **catchment management** in support of improved **land use** and **forestry** sectors and how it relates to integrated water resources management. Furthermore, a brief overview of existing issues, challenges and trends are discussed.

2.2 Vegetation cover

Vegetation cover is extremely important from a catchment management perspective, as dense vegetation cover will act to protect the land from erosion and increase the infiltration rates, whilst overgrazed and cleared land is more exposed. The density of vegetation cover reflects the influence of cropping practices, vegetation canopy and general ground cover. Maintaining a dense and diverse vegetation cover is important for catchment management as it reduces erosion. Figure 2-1 shows the spatial variation of vegetation cover in the six basins of Kenya (a high cover management factor indicates poor vegetation cover and vice versa). The central high lying areas of Kenya have good vegetation cover due to natural forests. These forests are regarded as the major water towers and groundwater recharge areas of the basin, protecting the watershed and influencing the quality, quantity and seasonal flow of rivers. The semi-arid to arid plains in the country have limited cover provided by the vegetation. The plains also host cropland and rangeland, with rangeland moving more towards agro-pastoralism and urbanisation. Along the coastal zones, areas of rainforest, swamp forest and mangroves occur.

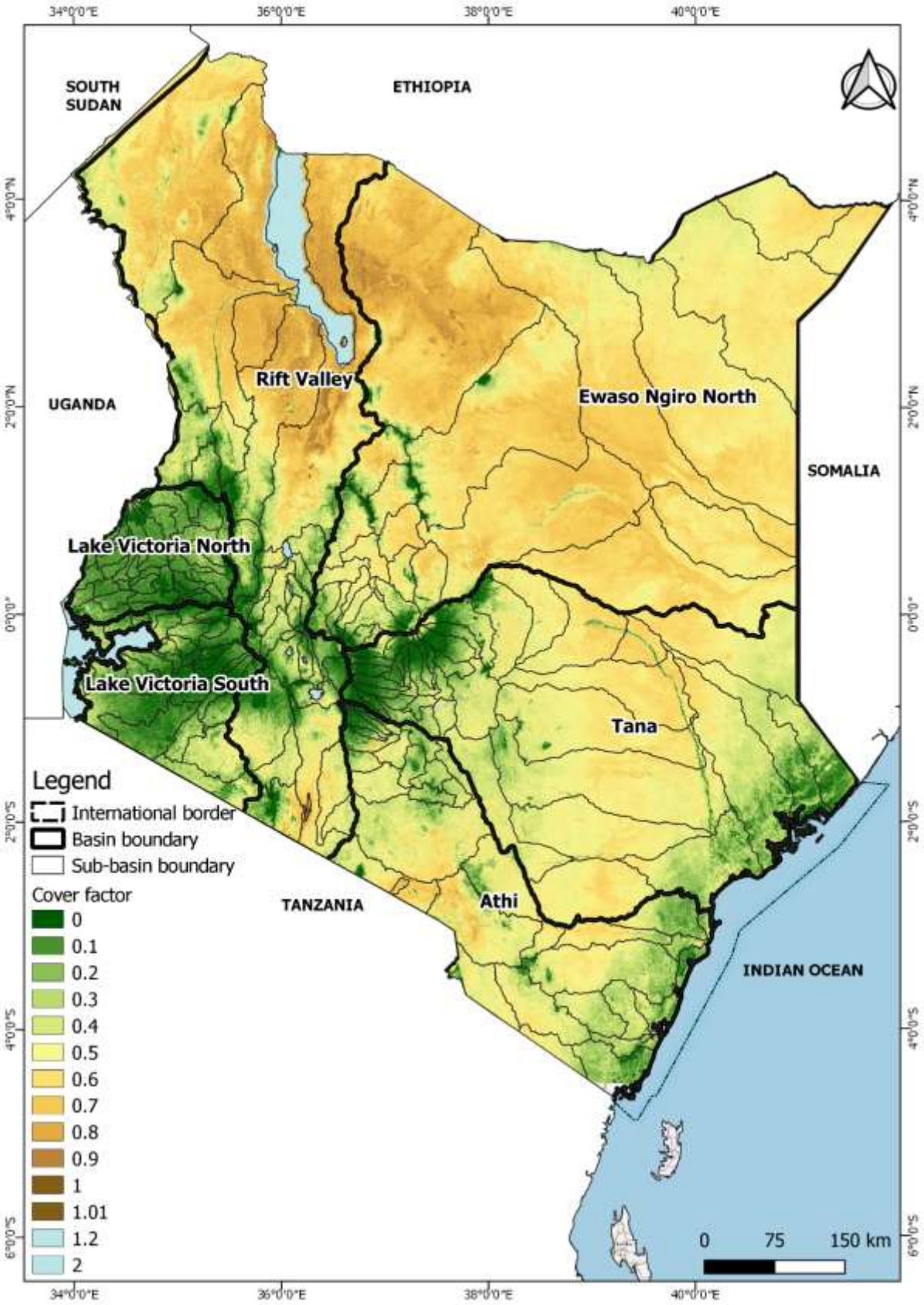

Figure 2-1: Vegetation cover of Kenya (based on 2014 NDVI imagery)

2.2.1 Vegetation cover change

Vegetation cover change over the period from 2001 to 2013 (WRMA, 2015b) indicate that most areas in Kenya have experienced significant vegetation loss during this period. In the Athi Basin for example, the forest reserves in the headwaters of the basin (i.e. Aberdares, Dagoretti, Ngong Hills, and Namanga Hill forest reserves) had significant vegetation loss. Other areas of significant vegetation loss in the Athi Basin include Ol Donyo Sabuk in Machakos County, and Gonja, Mrima, Jombo, Marenji in Kwale County. There was also a significant decline in the mangrove coastal forest. In LVN Basin the high population density and favourable annual rainfall patterns of the area has meant that the majority of the basin has been converted to agricultural land. From 2001 to 2013, vegetation gains were seen in the Mount Elgon National Park in the north-east region of the basin although there are a number of areas which had experienced vegetation loss. This is especially evident for areas surrounding Lake Victoria and Cherangani. A number of the water towers in the LVS Basin had significant vegetation cover loss over the period from 2001 to 2013. They include the Mau Forest Complex and the Gwasii Hills forests. Forest cover in Narok (around Kilgoris) and Nyamira was also seen to be lost. The water towers in the ENN Basin experienced significant vegetation cover loss between 2001 and 2013. They include Marmanet, Mukogodo, and Rumuruti in Laikipia County; Mt. Kenya, Aberdare and Bahati in Nyandarua County; Ndere in Meru County; and Mt. Ng'iro in Samburu County (WRMA, 2014). Areas surrounding the Namunyak Wildlife Conservation Trust and the Marsabit National Park have experienced vegetation cover gains. The southern portion of the RV Basin showed vegetation decline between 2001 and 2013, especially in areas surrounding Narok, Nakuru and Nyandarua.

Broad category vegetation change in Kenya over the period 2001-2012 was mapped using data from MODIS MCD12Q1 (Type 1). Changes as summarised by ecoclimatic zone, from humid (zone 1) to very arid (zone 7), are displayed in Figure 2-2.

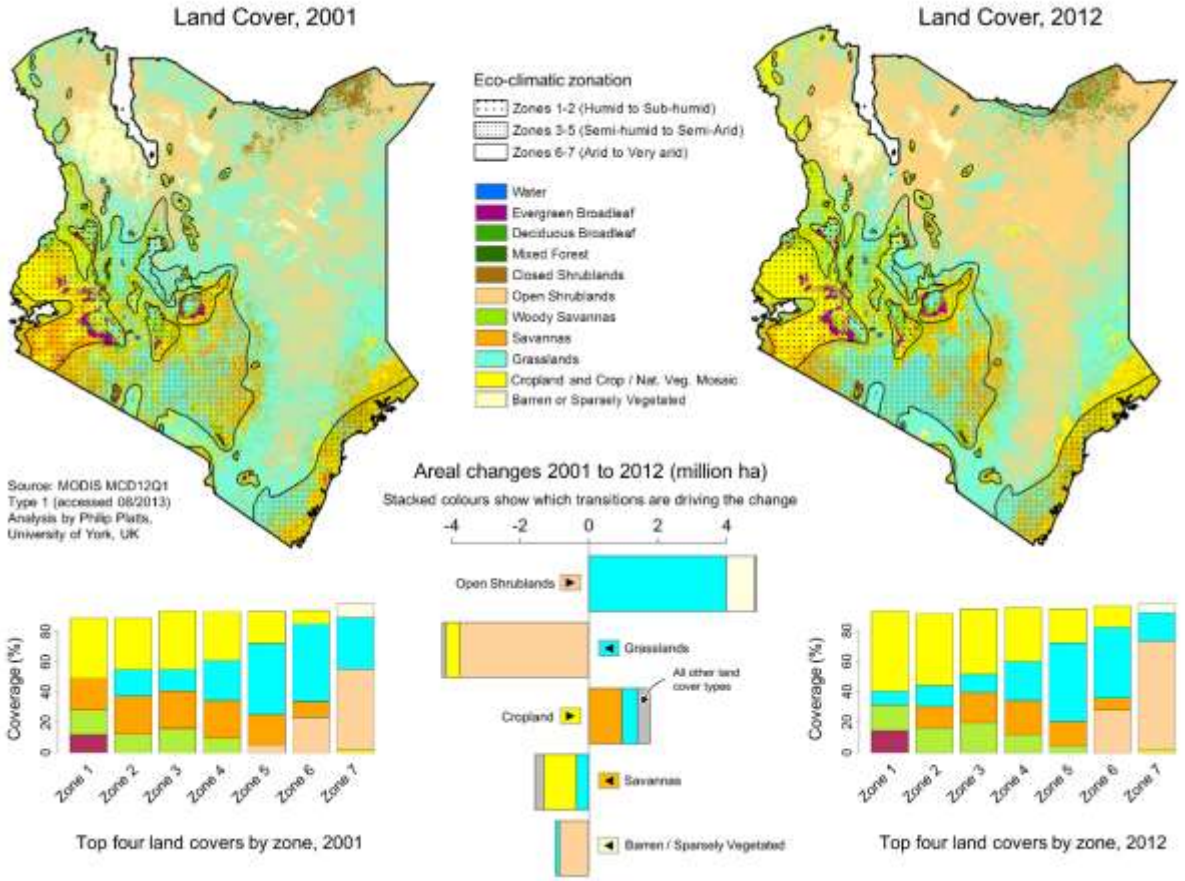

Figure 2-2: Vegetation changes in Kenya from 2000 to 2010 (Platts, 2014)

2.3 Protected areas and forests

Preservation of biodiversity in Kenya is enforced through formalised protected areas in the form of national parks, reserves, sanctuaries, marine protected areas, gazetted water towers and gazetted forests. Terrestrial protected areas cover about 12% of the land surface of Kenya, encompassing freshwater ecosystems such as rivers, lakes, springs and wetlands.

A strong relationship has been found between agro-ecological zones and forest cover in Kenya, with the majority of natural forest occurring around the Semi Humid to Humid zones associated with higher elevations and higher average precipitation zones in the south-western region of the country. Semi-Arid to Semi Humid conditions along the coastline provide a suitable habitat for natural forest as well as mangrove forests.

The formal protection of natural resources is complex, especially in a country such as Kenya where community livelihood often depends on its use. Conflict with communities frequently arise as a result. Another complicating factor is that many different institutions are involved in the management of protected areas, often with conflicting mandates and strategies.

Figure 2-3 displays the locations of protected areas in Kenya.

Table 2-1 lists national parks and reserves and water towers per basin.

Table 2-1: Protected areas

	Athi	Tana	LVS	LVN	RV	ENN
National Parks and Reserves	Nairobi Ol Donyo Sabuk Amboseli Chyulu Hills Tsavo East and West, Shimba Hills Kisite Mpunguti, Mombasa Watamu Malindi Marine	Aberdare Mount Kenya Meru Kora Mwea North Kitui Bisandi Tana River Primate Rahole Arawale Boni Dodori	Masai Mara Ruma Mau Forest Complex	Chepkitale Mount Elgon Saiwa swamp Kakamega	South Island Central Island Sibiloi Lake Nakuru Hell's Gate Mount Longonot	Mount Kenya Samburu Shaba Laikipia Marsabit Malka Mari Buffalo Springs Losai Nyambene,
Water tower (gazetted)	Aberdare Range Chyulu Hills Shimba Hills	Mount Kenya Aberdares Range Nyambene Hills	Mau Forest Complex	Mount Elgon Cherangany Hills Mau Forest Complex	Mount Kulal Mount Nyiro Cherangani Hills Maramanet Loita Hills Mau Forest Complex Mount Kipipiri berdares	Mount Kenya Nyambene Aberdares Range Mount Nyiru Ndotos Matthews Range Kirisia Hills Huri Hills Mount Kulal Mount Marsabit

Figure 2-3:Protected areas

Note**: Protected areas as a sector are discussed in more detail in the **Biodiversity, Protected Areas and Tourism Sectoral Integration Plan.

2.3.1 Forest categorisation

The description and classification of forests vary and efforts have been made to harmonise them. Peltorinne (2004) classified Kenya's forests into the following six main geographical formations:

- The high mountains and high ranges: Elgon, Kenya, Aberdares, Cherangani and Mau
- Western plateau: Kabarnet, Kakamega, Nandi and Trans-Mara
- Northern mountains: Ndotos, Mathews, Leroghi, Kulal and Marsabit
- Coastal forests: Arabuko-Sokoke, Tana, Kayas, coral rag and mangrove forests
- Southern hills: Taita Hills, Kasigau, Shimba Hills, Chyulu Hills and Nguruman
- Riverine forests: Tana and tributaries, Ewaso-Ngiro, Kerio, Turkwell and Galana.

Van Breugel et al. (2011) developed another classification system as shown in Table 2-2. Figure 2-4 presents typical photographs of these forest types in Kenya.

Table 2-2: Forest Types and approximated areas in Kenya (Van Breugel et al., 2011)

Forest type	Forest sub-types	Approximate area (ha)	% of total forest area
Guinea-Congolian rain forest/Western plateau	Natural forest (mixed indigenous)	144,615	3.5
Afro-montane forest	Natural forest (mixed indigenous)	1,359,860	32.9
	Bamboo	85,693	2.1
Coastal forest	Natural forest (mixed indigenous trees)	295,871	7.2
	Mangroves	48,522	1.2
Dryland forests	Natural forest (mixed indigenous trees)	1,875,316	45.4
	Riverine forest	135,231	3.3
Stocked forest plantations /planted forests	Indigenous and exotic trees	186,716	4.5

Source: (MENR, 2016a)

Another forest classification system often used by KFS differentiates between Natural, Bamboo, Mangrove and Plantation forests.

2.3.2 Forest ownership

Forest ownership in Kenya falls into three categories:

- Gazetted/state forests
- Community forests
- Private forests

The majority (79%) of the natural forest land in Kenya is under community and private ownership while about 21% is public. Plantations have an almost equal ownership share between private (47%) and public (53%) management. The locations of gazetted and community forests are shown in Figure 2-5. Forest areas not mapped are regarded as private forests.

Figure 2-4: Example photographs of different forest types in Kenya (Source: MENR, 2016b)

2.3.3 Socio-economic contributions and ecosystem services

Kenya's forestry sector's contribution to the national economy is largely unrecorded as most forest-based products are used for subsistence or are traded in informal markets. Forests contributed about 1.4% to Kenya's GDP in 2014 according to national statistics. FAO's State of the World's Forest (2014), estimated that Kenya's forestry sector contributes USD 365 million to the GDP annually. It should be noted that these contribution estimates do not include forestry's contribution to household energy (charcoal production), non-timber products and ecosystem services (MENR, 2016b).

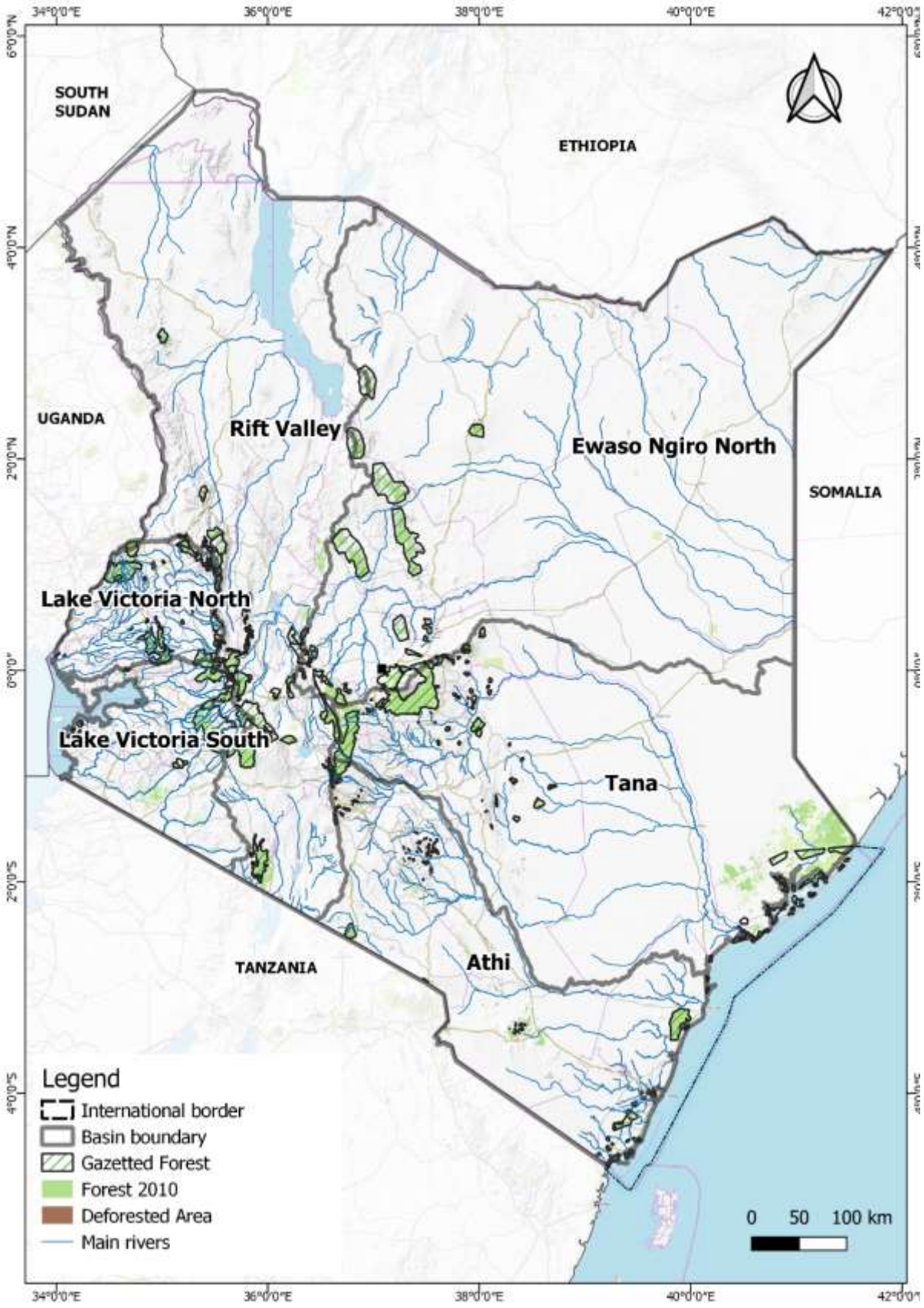

Figure 2-5: Legal Status of Forests in Kenya

Forest trees provide a number of important ecosystem services such as food provision, which is highly valuable during extreme periods such as droughts. Forests also play an irreplaceable role in providing for traditional medicines, cultural- and spiritual needs, due to their importance for cultural ceremonies by local communities (e.g. Kaya Forest), as several indigenous communities have depended on forests for centuries.

Forests provide wood fuel which is the predominant form of biomass energy in Kenya. Charcoal is the main source of energy in urban households and provides domestic energy for 82% of urban and 34% of rural households. The charcoal industry is major contributor to job creation in the informal sector, employing 700,000 people, who in turn support approximately 2.3-2.5 million dependants. In the manufacturing sector, forest based material is used in industries such as sawmilling, pulp and paper industry, and furniture manufacturing, employing approximately 100,000 jobs across the three industries. The formal forest sector employs 18,000-50,000 people directly and 300,000-600,000 indirectly, with the potential achieved through enhancing value chains (KFS, 2013; MENR, 2016b)

Forests support a wide variety of ecosystem services which provide key input to other sectors such as agriculture, tourism, wildlife, water and energy. Forests are biodiversity havens and are rich in flora with about 7,000 indigenous plant species and create critical habitat for wildlife species. Ecological functions of trees, such as nutrient cycling and erosion control, support highland activities such as pastoralism and agriculture. In the coastal regions, mangrove forests are essential breeding grounds for fish and protect the coastal areas from degradation. Other services forests provide include the provision of products and services such as food, energy, soil and water conservation, nitrogen fixing, provision of shade, and materials for construction. Forests and trees contribute in numerous ways to the livelihoods of Kenyans, especially of women and marginal groups in rural areas.

Forested catchment areas in Kenya are the predominant sources of the nation's water. In relation to runoff, forested catchment areas can experience many advantages compared to deforested areas, such as reduced infiltration, water quality improvement due to reduce sedimentation, and reduced river flow seasonality through higher baseflow. Forested catchment areas in Kenya are estimated to provide more than 15,800 million m^3 of water per year, representing over 75% of the country's renewable surface water resources.

2.3.4 Deforestation

The forested areas in Kenya, as previously discussed, are threatened by over-exploitation and unsustainable use. Between 2000 and 2010, deforestation in the water towers amounted to an estimated 50,000 ha, leading to reduction in water availability by approximately 62 million m^3 per year (MENR, 2016b).

The majority of Kenyans live in high- and medium-potential Agro-Ecological Zones (AEZs) that are suitable for agriculture. Most forests with closed canopies are also located in these AEZs. Causes of deforestation and forest degradation are multiple, complex and vary over geographical and social regions. The general trend is that the major drivers of deforestation are related to agricultural expansion and urbanisation. Most Kenyans (80%) rely on wood biomass, predominantly sourced on-farm, for their energy requirements. This high resource demand exerts considerable pressure on the tree and forest resources of the country. Conversion technologies for timber manufacturing and charcoal production are also dated and inefficient leading to overharvesting of trees to meet the demand. Key factors related to the accelerated loss of biodiversity are deforestation and forest conversion for other land uses (MEWNR, 2015; MENR, 2016b). Additional current drivers of deforestation include illegal logging, grazing pressure, encroachment by farmers (Kirisia Forest), cultivation and trade of narcotics and drainage of wetlands for agricultural purposes.

Table 2-3 presents a summary of direct- and indirect drivers of deforestation.

Table 2-3: Direct and Indirect drivers of deforestation

Category	Direct drivers	Indirect drivers
Governance	• Inadequate application of basic silvicultural and ecological principles for forest management. • "Tragedy of the commons" resulting in conflicts over natural resources.	• Inadequate integration of the forest sector with other stakeholders. • Unclear forest responsibilities and weak conflict-management capacity. • Weak forest governance and institutions. • Corruption, illegal logging, weak enforcement. • Inadequate benefit sharing from forest resources. • Diverse perceptions of importance of forests. • Communal land tenure systems and their application. • Lack of private ownership, unclear tenure and access to forest resources.
Policy	• Overgrazing and inadequate regulation of grazing in forest reserves and community lands.	• More focus shifted to water towers, paying • less attention to dryland woodlands, including • the coastal and riparian forests.
Economic drivers	• Clearing of forest for agriculture. • Degradation of forest. • Charcoal and fuel wood from unsustainable production. • Infrastructure and urbanisation. • Conversion of communal forest to agriculture. • Mining within forest areas. • Illegal logging.	• Demand is higher than supply. • Heavy bureaucracy and poor efficiency obstructing competitiveness. • Limited knowledge of tree growing (and necessary silviculture) as an enterprise. • Poverty, high prices for agriculture products, subsidised fertiliser, tax exemption for certain agricultural machinery resulting in unhealthy competition for land. • Fixed timber prices at low levels. • Rapidly increasing population has heightened the demand for land. • Few or no livelihood options have created overdependence on agriculture and mounting pressure on forest lands.
Technology drivers	• Poor uptake of new technologies. • Poor awareness of deforestation impacts. • Poor knowledge of tree planting.	• Uncertain availability of timber and wood for processing enterprises. • Low investment in wood processing resulting in ineffective processing.
Cultural and environmental drivers	• Unsustainable utilisation, including overgrazing. • Conflict at multiple levels. • Fires are deliberate, accidental, poorly managed and they destroy forests. • Wildlife damage impacting regeneration.	• Traditional farming methods in a context of increased population and overstocking of animals.

Source: (MENR, 2016b)

Error! Reference source not found. displays the change in forested areas across Kenya and highlights key hotspot areas. It shows that between 1990 and 2015, forest areas have reduced by a total of 25% and in 2015 only constituted 4.2% of Kenya's land area as opposed to 6% in 1990.

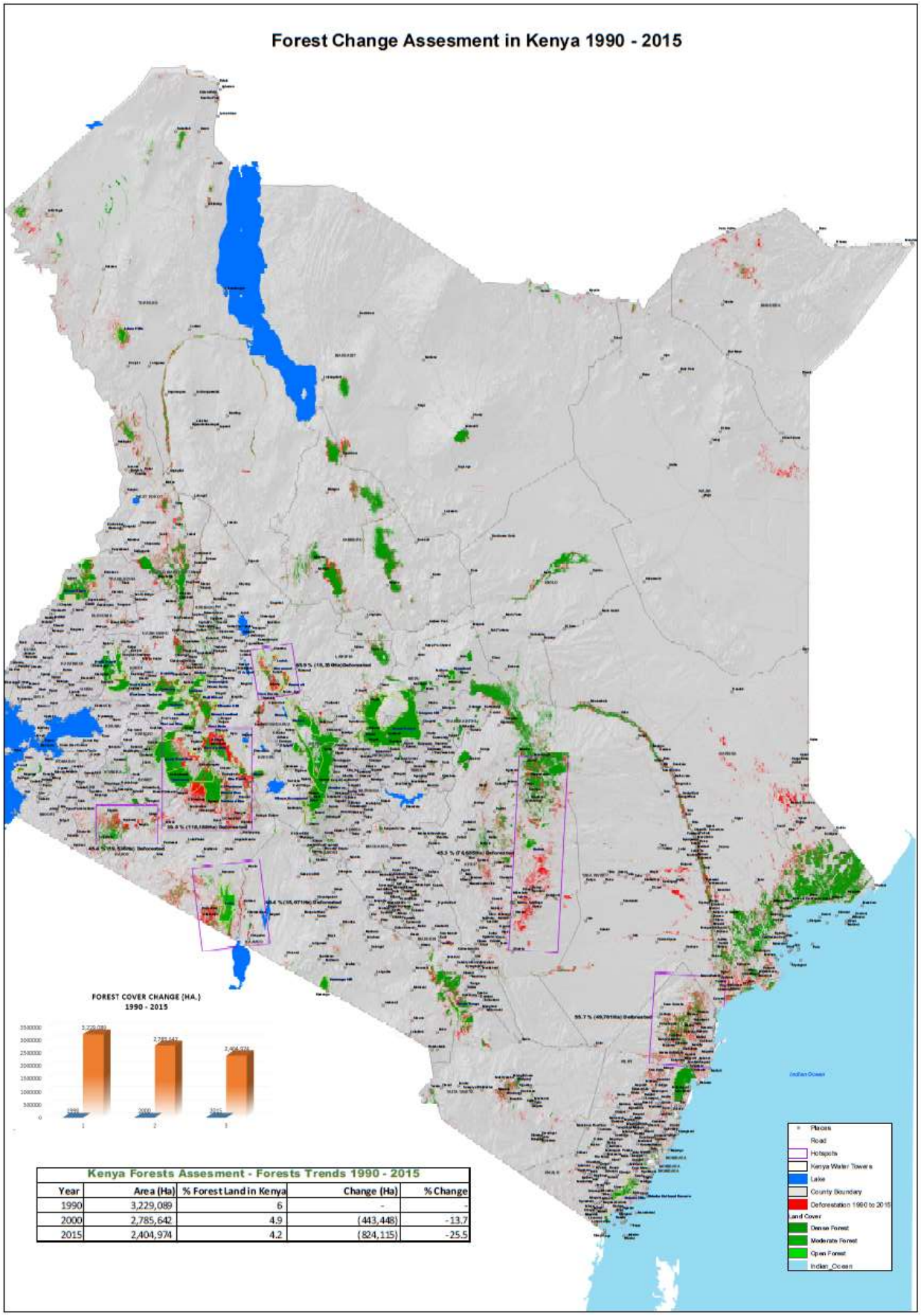

Figure 2-6: Forest change in Kenya: 1990 to 2015 (WWF, 2016)

2.4 Land use

Land use is defined as the economic and cultural activities practiced on the land, whilst land cover denotes the physical state of the land and describes the quantity and type of vegetation.

Figure 2-7 shows the major land use and land cover types in Kenya. The major land use in Kenya is agriculture, both large scale and small scale, with linkages to most of the population livelihoods. Pastoralism is also important in the ASAL regions.

The Athi Basin includes the country's two largest cities, Nairobi and Mombasa, and therefore has a significant portion of urban and built-up areas. Typical impacts associated with built-up environments include erosion of river banks, encroachment of wetlands and riparian zones, poor solid waste disposal and pollution. The dominant land use in the basin are croplands and rangelands. The Tana Basin has a high population density and scattered urban and built-up areas in the upper sections of the basin with the dominant land use as rain-fed agriculture and rangeland. The LVS Basin has a high population density and scattered urban and built-up areas. The dominant land use in the basin is rain-fed agriculture and rangeland. The productivity is often low due to land fragmentation and rainfall variability. Land use in the LVN Basin is dominated by agricultural use, with small urban and industrial areas. The basin has the highest population density of all the river basins in Kenya. The dominant land use in the basin is croplands. The RV Basin has a high population density and scattered urban and built-up areas in the middle sections of the basin with the dominant land use being rain-fed agriculture and rangeland. The ENN Basin has a low population density and therefore few and scattered urban and built-up areas, except in the most upper part of the basin. The dominant land use in the basin are rangelands.

2.4.1 Land use sustainability

To assist with the assessment of land capability and sustainable land use in the respective basins, a GIS-based land capability tool was developed based on the USDA Land Capability Classification. Placing soils into these classes allows for an understanding of the crop and management constraints.

From the assessment, it became apparent that most basins have a land capability of 1-3 (i.e. arable land), except in general the tops of hills and mountains and steep slopes which have a land capability of 5-8 (i.e. non-arable land). Overlaying the Land Capability map with the current land use in Kenya, provides an indication of the level of sustainable land use in Kenya under current conditions. Land use is perceived to be sustainable when crops occur on arable land, and unsustainable where crops occur on non-arable land.

In the Athi Basin the mountainous regions have unsustainable land uses as does Ngong Hills. Other non-woody vegetation in the southern part of the upper basin also occurs on non-arable land. Otherwise, forest, grassland, shrubs and herbaceous vegetation occurs on suitable land. The northern part of the central Athi Basin has non-woody vegetation and crops on non-arable land, while there are small areas along the coast with unsustainable land uses. Most of the Tana Basin has sustainable cropland use, except in the upper zone of the basin. While large parts of the LVS Basin have sustainable cropland use, areas in the upper Nyando and Sondu river catchments, Mau Forest Complex, as well as areas in the central part of the basin in Kisii and Nyamira Counties have unsustainable land use. In LVN Basin the mountainous regions have unsustainable land uses, particularly around the lower slopes of Mount Elgon and on the boundary of the upper basin. Most of the RV Basin has sustainable cropland use, except in the upper zones of the catchments. Most of the ENN Basin has sustainable crop land use, except some parts in the upper south-western parts of the basin and areas near the border with Ethiopia in the north-east.

Figure 2-7: Land cover and land use in Kenya

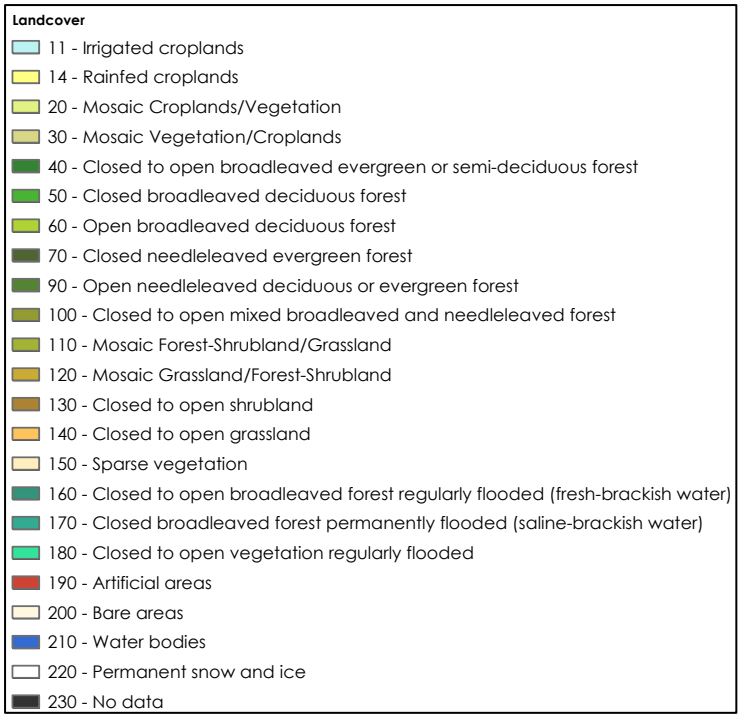

Figure 2-8: Landcover legend (GlobCover, 2009)

2.4.2 Land use change

The last inventory for land use change in Kenya was undertaken in 2010 (KFS, 2013). This inventory examined land use change in Kenya according to six land use categories over the 20-year period from 1990 to 2010. Six broad land use classes were defined based on the UNFCCC Good Practice Guide (IPCC, 2003) and the Guidelines for Agriculture, Land Use and Forestry (IPCC, 2006).

The definitions of these classes are described below:

- **Forest Land:**

  This includes all land with woody vegetation consistent with thresholds used to define Forest Land in the national greenhouse gas inventory. It also includes systems with a vegetation structure that currently fall below, but in situ could potentially reach the proposed national values used to define the Forest Land category in Kenya as follows:

  - Minimum Tree Crown Cover = 15 %
  - Minimum Land Area = 0.5 ha
  - Minimum Tree Height = 2 m

- **Cropland:**

  Includes arable and tillage land, and agro-forestry systems where vegetation falls below the thresholds used for the Forest Land category.

- **Grassland:**

  Includes rangelands and pasture lands that are not considered Cropland. Also includes systems with woody vegetation and other non-grass vegetation, such as herbs and bushes that fall below the threshold values used in the Forest Land category. This category also includes all grassland from wild lands to recreational areas as well as agricultural and silvipastoral systems.

- **Wetlands:**

  Includes land that is covered or saturated by water for a portion of- or the entire year, and is not classified under the Forest Land, Cropland, Grassland or Settlement categories.

- **Settlements:**

This includes all developed land, including transportation infrastructure and human settlements of any size, unless they are already included under other categories.

- **Other land:**
  Includes bare soil, rock, ice, and all unmanaged land areas that do not fall under any of the five previously mentioned categories.

Table 2-4 (change in land area) and Table 2-5 (change in percentage of land area) present the results of the land use change analysis for each of the defined land use classes.

Table 2-4 Land use coverage 1990-2010 (km^2)

Land use	1990	2000	2010
Forestland	46,709	34,921	41,364
Cropland	92,581	96,610	100,718
Grassland	427,282	428,716	423,266
Settlements	571	869	1,259
Other land	10,043	15,746	10,447
Wetlands	14,718	15,042	14,849
Total	591,903	591,903	591,903

Table 2-5 Land use coverage 1990-2010 (Percentage of Land Area)

Land use	1990	2000	2010
Forestland	7.89%	5.90%	6.99%
Cropland	15.64%	16.32%	17.02%
Grassland	72.19%	72.43%	71.51%
Settlements	0.10%	0.15%	0.21%
Other land	1.70%	2.66%	1.77%
Wetlands	2.49%	2.54%	2.51%
Total	100%	100%	100%

Source: (KFS, 2013)

From the results of this analysis, it can be seen that there has been a steady increase in the percentage area of Croplands and Settlements. However, between 1990 and 2000, Kenya lost approximately 1.2 million ha, equivalent to one quarter of its forest land. On the positive side, reforestation and conservation efforts did help increase forest cover over the period from 2000 to 2010, from 5.9% in 2000 to a total of 7% in 2010 (MENR, 2016a).

2.5 Catchment management

Water resources degradation is intimately linked to land degradation and influenced by various catchment management and land use factors. Implementing effective catchment management therefore requires a bigger picture perspective and an understanding of the role of natural resource use within a water resources context. People, animals and plants constitute those components of a catchment that make use of the physical resources of land and water. Misuse of these resource elements will therefore lead to unstable natural and social systems, often resulting in further land and water degradation. Integrated catchment management acknowledges the relationships between households, villages, communities and the broader catchment and envisages that individuals take ownership of their role in catchment management – as opposed to a top-down approach led by legislation and regulations. This is the cornerstone of Integrated Water Resources Management.

A key issue in many catchments in Kenya relates to the influence of population pressures on the existing landscape-biodiversity dynamics. With an increasing demand for natural resources and under the influence of historic-political and socio-economic drivers, the human footprint has pushed many natural systems beyond a stable threshold. Any disruption to the natural system impacts the human population, more so in rural areas where communities still live and work very closely to the natural environment.

The objective of catchment management is to enable communities, county governments and other relevant governing bodies and institutions to implement integrated catchment management interventions through increased knowledge. As water is the common link among resource users in a catchment, it is appropriate that the catchment is used as a planning unit for resource management. Integrated catchment management is aimed at deriving the greatest possible mix of sustainable benefits for future generations and the communities in a catchment, whilst protecting the natural resources upon which these communities rely. This approach seeks to maintain a balance between the competing pressures exerted by the need to maintain natural resources in the long-term, against the need for continuous economic growth and use of these resources.

2.5.1 The key principles of Catchment Management

Land and water degradation, together with the subsequent impacts on users, cannot easily be separated or managed independently of one another. The utilisation and management of land and water resources should thus be done in an integrated manner in order to ensure the sustainability of both.

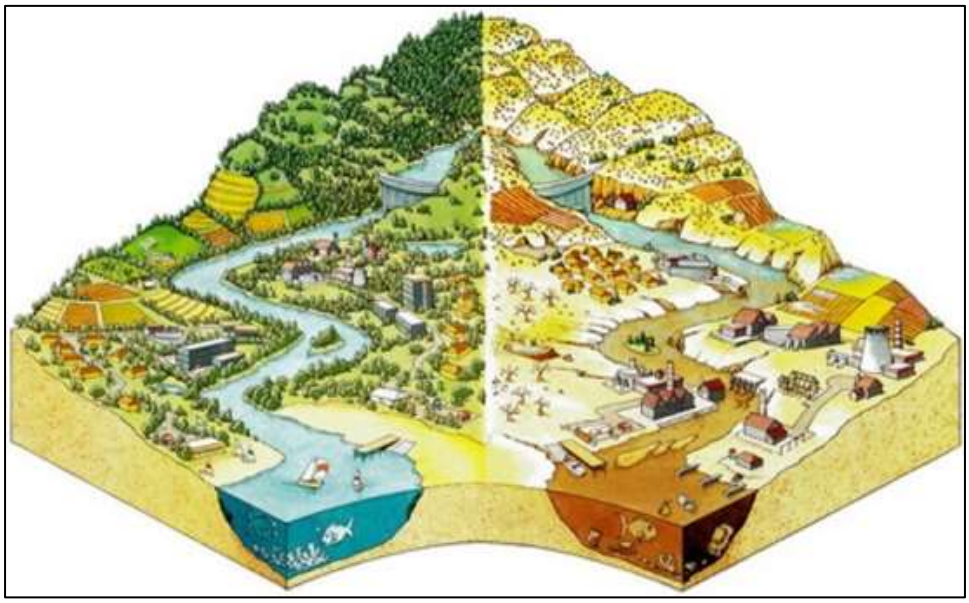

Figure 2-9: Illustration of good (left) and poor (right) state of land and water resources in a catchment

Land degradation is not just the physical degradation of the soil, but the disturbance of the biophysical environment through human activity. This occurs through activities such as overgrazing, deforestation, alien invasive infestation, poor solid waste management and other similar disruptive actions, and leads to a disturbance of the natural system, which in some cases pushes a system beyond a critical threshold. The impacts of land degradation are long-term and damaging to not only the biophysical environment, but also the socio-economic environment of communities. A loss of soil fertility will lead to low crop yields, which in turn lead to food shortages and reduced income generation, whilst increased runoff due to exposed soil and soil erosion leads to gully erosion and sedimentation of water bodies, leading to biodiversity threats and water resources depletion and degradation, and a reduced capacity to use the water resource e.g. for irrigation or hydropower. In general, the impact that is readily felt in rural communities is a reduced standard of living, which leads to chronic poverty.

Soil degradation (the long-term decline on soil productivity) is exacerbated through the physical decline in soil structure or through accelerated erosion via water and wind. Soil, termed sediment once eroded, also becomes a significant non-point pollution source for water resources. Soil erosion and sedimentation is one of the biggest problems facing mankind globally due to the serious environmental, economic and social consequences, including loss of productive land, siltation of reservoirs, reduction of water quality for human use and impacts on aquatic ecosystems.

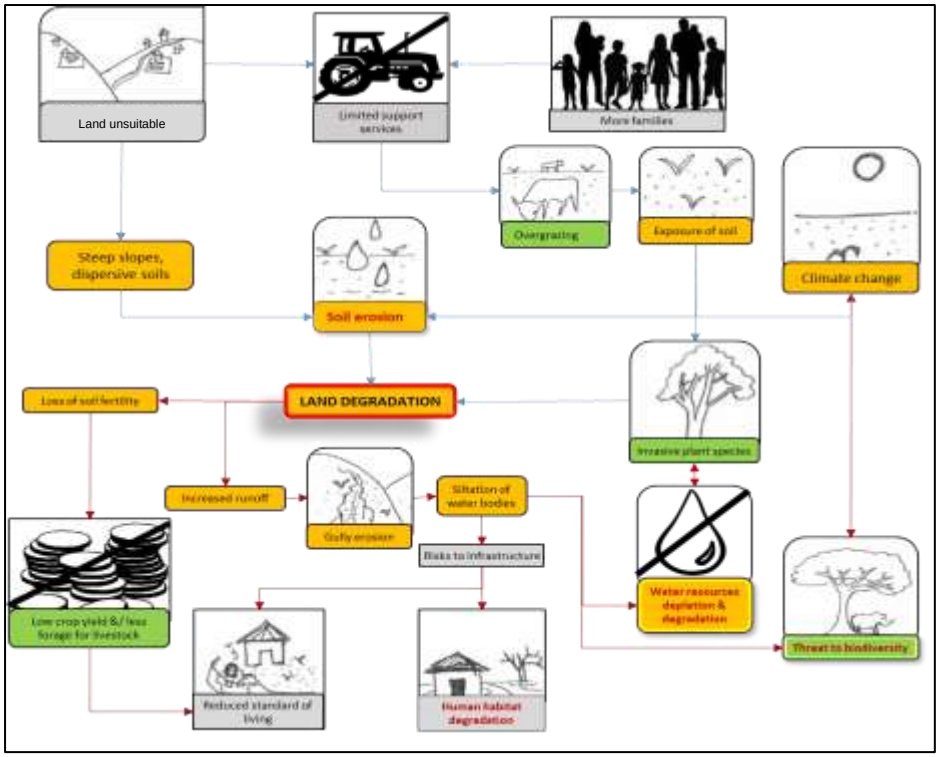

Figure 2-10: An example of the interconnected links of land degradation

The above implies that a co-ordinated and integrated approach and actions are required across all scales of a catchment and through all levels of catchment management - from individual land users, through local and regional structures to national level. Integrated Catchment Management addresses soil, water, biodiversity and people issues at a catchment scale as shown in Figure 2-11.

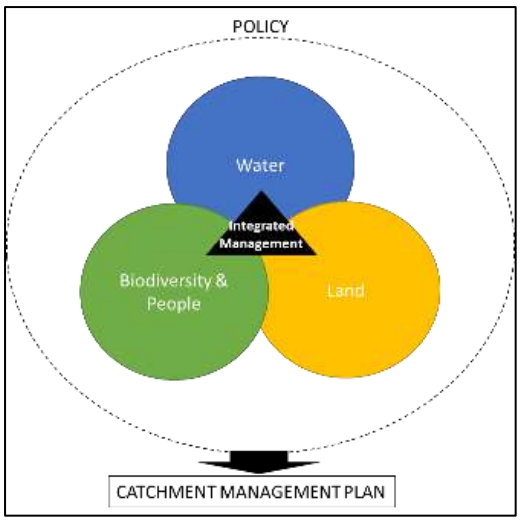

Figure 2-11: The interaction of different management strategies for catchment management

In its widest possible sense, Integrated Catchment Management recognises the need to integrate all environmental, economic and social issues within a catchment (at any scale) into an overall management philosophy, process and strategy or plan. It is thus aimed at deriving the greatest possible outcome of sustainable benefits for future generations and the communities in the area of concern whilst protecting the natural resources upon which these communities rely. Often, water resource management paradigms have assumed that sustainability of water resources can be achieved merely through focused efforts to control water use and protect the integrity of water resources within a catchment context. However, in more recent times it has been acknowledged that this approach ignores the complex issues of land use patterns and the varied roles played by stakeholders, which impact on the water use and water resources. In order to achieve integrated catchment management and derive the best outcome of benefits while protecting resources, requires careful planning, the physical implementation of activities in day to day practices and livelihoods, and a strong legislative, regulatory and institutional framework to support the planning process and implementation.

There are several concepts and principles that are important to integrated catchment management. These are discussed below:

2.5.1.1 Catchment and River Basin Scale

A water resource at a particular location is the product of runoff or groundwater recharge that originates in, and reflects conditions and events throughout, a geographically defined drainage area known as a catchment (“local scale”) or basin (large scale, multiple catchments). The way humans use and abuse land inside the catchment has a decisive impact on the quantity and quality of the water resource and on the health of the aquatic ecosystems reliant on that resource. In this way the hydrological cycle, land-use and aquatic ecosystem functioning form a continuum bounded by the extremities of the catchment. This calls for recognition that naturally occurring water can usually be effectively and efficiently managed only within river basin (regional scale management) or catchment (local scale management) boundaries, because of the need to technically account for all aspects of the hydrological cycle, including the way humans change aspects of the cycle by land use.

2.5.1.2 Integrated management

Catchment management is a philosophy, a process and an implementation strategy, to achieve a sustainable balance between utilisation and protection of water resources in a catchment. Catchment management recognises the interdependence of land-use, water and the environment, and aims to manage these components in an integrated manner in order to ensure the sustainable utilisation of environmental resources and the protection of such resources.

2.5.1.3 Sustainability

Sustainability in the use and development of natural resources systems means that the system can cope with and recover from stresses and shocks and maintain or enhance its capability and assets both now and in the future, while not undermining the natural resource base. Sustainable use of resources therefore must deliver basic environmental, social and economic services to all residents of a community without threatening the viability of the natural built and social systems upon which the delivery of these systems depends. The key to achieving sustainability is adopting a long-term and forward-looking approach to improving quality of life. This ensures that future and cumulative impacts of current development activities are anticipated and managed for continued productivity. It is generally accepted that sustainable development requires a process and ultimately consensus-building among all stakeholders. This must be inclusive of all role-players, government institutions, stakeholders, clients, non-governmental organisations and community-based organisations as partners who together define the problems, design possible solutions, collaborate to implement them, obtain specific products, and monitor and evaluate the outcome. Figure 2-12 illustrates how water and land use activities overlap in an example catchment.

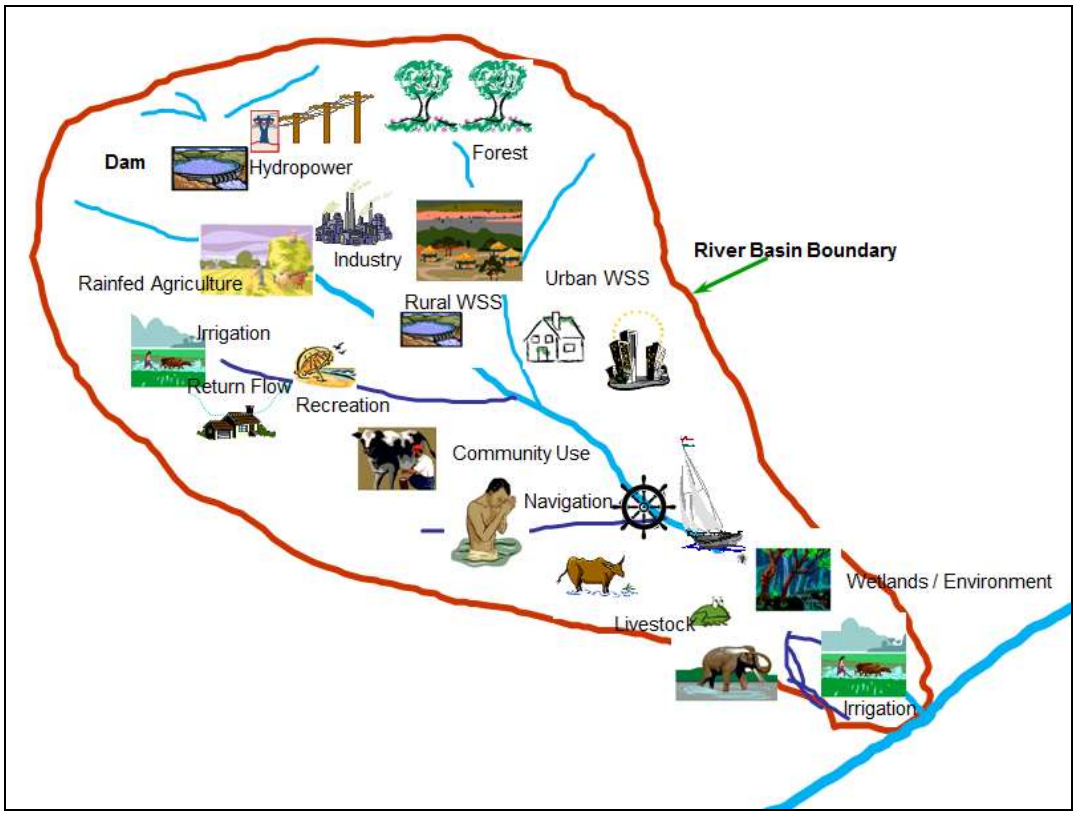

Figure 2-12: Illustration of water and land use activities within a catchment

2.5.1.4 Reasonable utilisation

In order to ensure that natural resources are not depleted or ruined, development must be balanced between economic and social benefits whilst also protecting the resource base that supports these. People want access to more reliable domestic water supply, better sanitation, water for livestock and irrigation, timber and fuel from forests and good soils for productive agriculture. Many of these activities, singly and in combination, can result in adverse impacts on the catchment itself and on the natural resource base of the catchment such as impacts on groundwater recharge, streamflow, flood flows and soil erosion. Water for environmental services especially in wetlands and securing the biodiversity in the plants and wildlife, are all very important to protect and improve the present access to water and land resources. Reasonable utilisation of natural resources must be encouraged so that development

and resource use do not waste or diminish the resource, as for example, discharge of wastewater and pollutants into the catchment.

There are always rules, formal/informal, which determine how people access resources and opportunities (Levine & Pavanello, 2012). These rules, and the ways in which they are enforced, constitute 'institutions'. Institutions could relate to the institutions of the state or organised committees following written constitutions, to informal rules of culture and locally accepted figures of authority. Local-level catchment management strategies address issues that are locally relevant, but depending on the mandate, also legislatively relevant.

Who is responsible for catchment management?

Integrated catchment management requires management of both land and water resources, inclusive of different role players and institutions. Apart from various national ministries and government departments, some of the key institutions involved in catchment management in Kenya are as follows:

- Water resource-based:
  - Water Resources Authority (WRA)
  - Basin Water Resources Committees (BWRCs)
  - Water Resources User Associations (WRUAs)
- Land/Agricultural based:
  - Agriculture, Fisheries and Food Authority (AFFA)
  - Extension officers
  - Pastoralists
- Environmental/Biodiversity based:
  - National Environment Management Authority (NEMA)
  - Kenya Water Towers Agency (KWTA)
  - Kenya Forestry Services (KFS)
  - Kenya Wildlife Services (KWS)
- Governance based:
  - County governments

It is critical that these institutions are aware of each other to achieve sustainable management of catchments across all scales in Kenya.

2.5.2 Erosion

One of the most challenging aspects of catchment management relates to erosion management. Soil erosion involves physical removal of soil in a vertical and or horizontal direction and degrades soil quality (Lal, 2001). Although it is a natural process, it can be exacerbated by human induced change.

Modelling the sediment production potential is based on the relatively constant factors associated with topography and soils. These factors are unlikely to change significantly over the short-term as they relate to the geomorphology of the landscape. Rainfall is dependent on climatic factors, therefore is inherently variable. The management factors (i.e. crop and practice) are more variable, as they are dependent on the conservation management measures and seasonal rainfall. A wider study in Kenya (Dunne, 1979) indicated that land use was a dominant control of sediment yield, although runoff and topography were also recognised as important. It was also determined that sediment yield from agricultural land and grazed land was significantly greater than from forested basins, with variability in cultivated land.

To assist with the assessment of erosion risk in Kenya, a GIS-based erosion risk tool was developed based on the Revised Universal Soil Loss Equation (RUSLE). The outputs of the model provided an

indication of both potential soil loss (i.e. inherent erosion risk) (Figure 2-13) and estimated actual soil loss (i.e. erosion potential taking into consideration current vegetation cover) (Figure 2-14). It is evident that the upper parts of the Athi, Tana and ENN basins, the central and southern parts of the RV Basin, as well as the LVS and LVN basins are characterised by very high inherent soil erosion risks.

When comparing the inherent soil erosion risk to the potential soil erosion risk it is apparent that vegetation cover in protected areas and gazetted forests provides significant protection from soil erosion. This is specifically the case in the LVN and LVS basins as well as in some areas along the slopes of Mount Kenya and the Aberdares, where good vegetation cover reduces potential soil loss. However, in many other areas the lack of vegetation results in very high soil erosion risk.

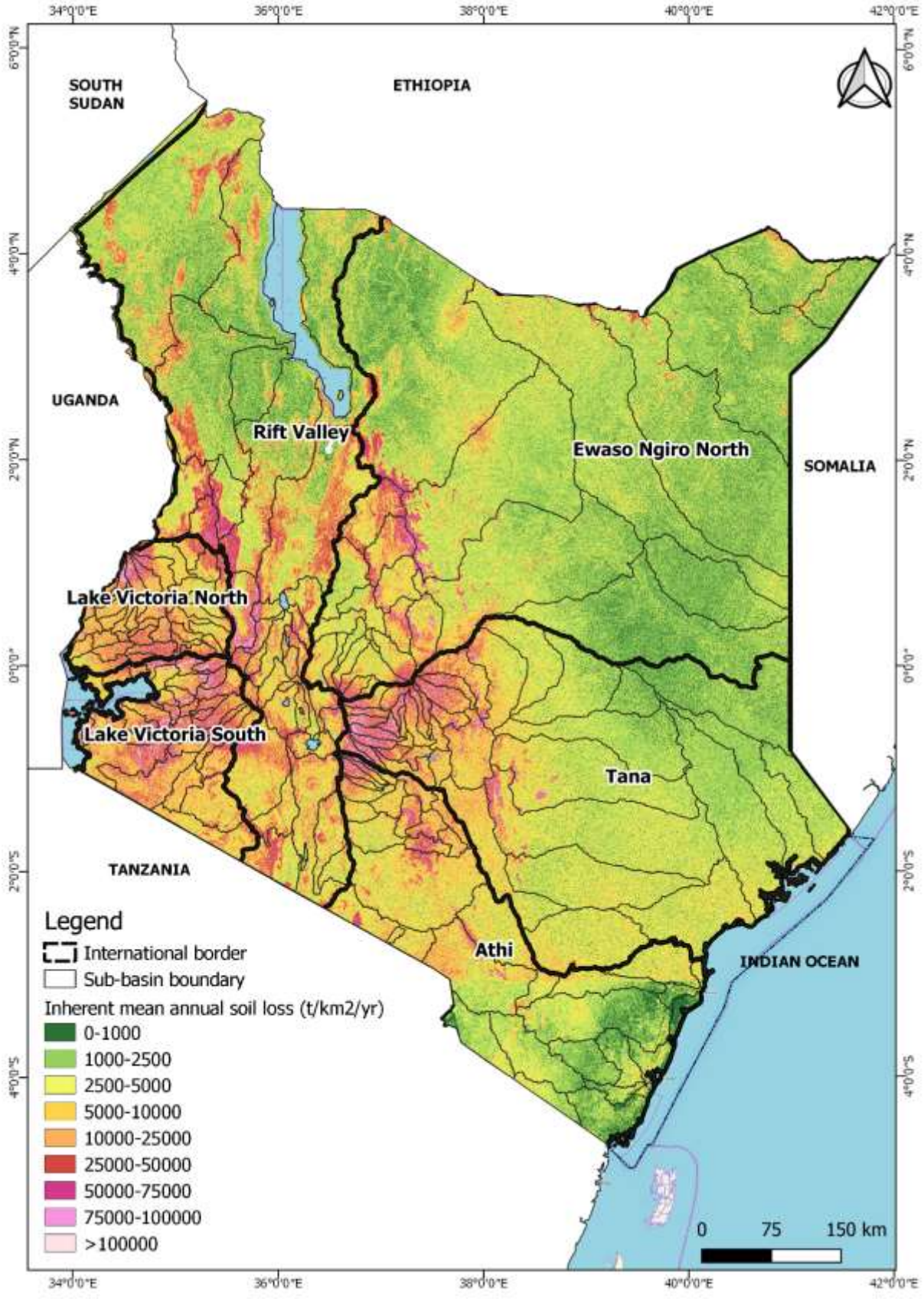

Figure 2-13: Inherent soil erosion risk (C and P factor not included)

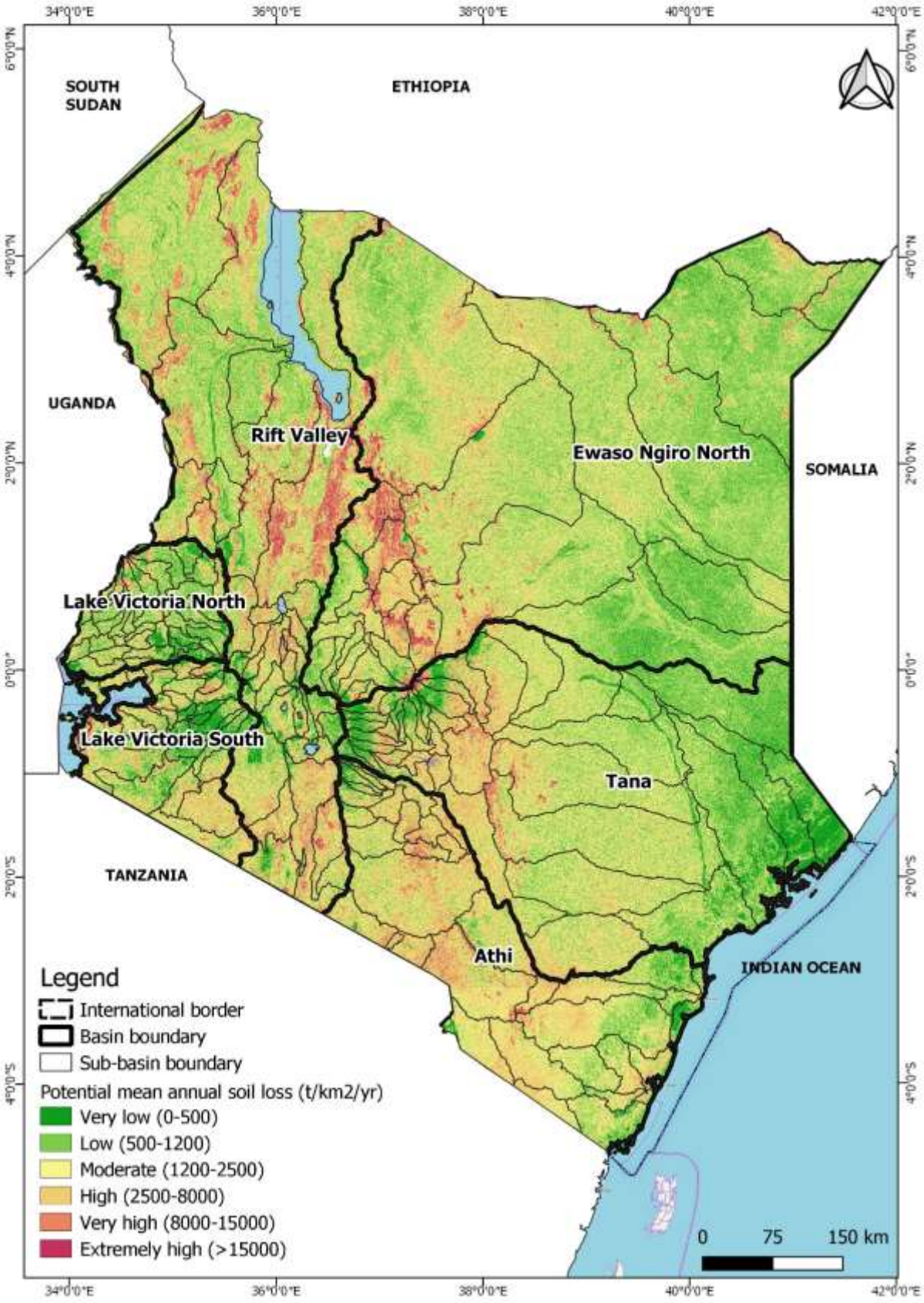

Figure 2-14: Potential soil erosion risk

2.5.3 Catchment management in Kenya

Kenya's rich biodiversity and natural resource base requires management and conservation of a wide range of natural resources. This is achieved through the mandates of several institutions. Table 2-6 provides an overview of the various institutions and the roles they play in catchment management. A few examples are given of the types of issues facing the natural resources and which need to be managed by the relevant institutions. It is clear that there are correlations in the issues needing to be considered and/or managed by the various institutions.

Table 2-6: Institutions involved in catchment management in Kenya

Catchment management focus	Institutions	Role	Issues that strategies/plans/actions address	Plans/Strategies/Activities
Water resources	WRA SROs; CMUs	Hydrological, water resource and land use considerations	• Soil erosion • Sand harvesting • Loss of vegetation • Loss of wetlands • Sedimentation • Solid waste pollution • Salt water intrusion	CMS's
	BWRCs	Water resources management of six main river basins	• Catchment degradation	Basin Plans
	WRUAs	Sub-catchment management	• Unsustainable agricultural practices • Soil erosion	SCMPs
Land/Agriculture	AFFA	Technical input and advice to CGs; Farmer training programs	• High sediment yield • Loss of wetlands due to encroachment • Forests and wetlands under threat due to encroachment from subsistence agriculture • Soil erodibility • Poor farming methods • Land degradation	Farmer training programs
	AFFA extension officers	Catchment management activities, particularly for smallholder farmers		
Environment/ Biodiversity	NEMA	Technical support for environmental management and provide input for CIDPs	• Environmental degradation	Provide input into CIDPs
	KWTA	Manages and protects Kenya's water towers	• Illegal logging, land clearing, tree felling, unsustainable energy consumption • Forests under threat from urbanisation • Vegetation cover decline • Human-wildlife conflicts	
	KFS	Management and conservation of natural forests in Kenya		KFS Forest Farm and Dryland Forestry program

	KWS	Manages National Parks, National Reserves, Marine National Parks and Marine National Reserves	• Change in landcover from dense forests to scrub and grasslands • Mangrove forests deteriorating	
Local governance	CGs	Responsible for CIDPs	• Tree planting is being promoted as an erosion mitigation, but this is not the only technique available • Industry woodlots need to be managed and natural forests should not be replaced with eucalyptus or pine trees • Poor farming management leading to pollution • Uncontrolled quarry activities leading to land degradation • Approach to domestic waste management by communities is poor • Inadequate sewerage systems a great threat to the environment • Environmental degradation due to raw sewer effluents, solid waste and industrial discharge • Deforestation along river banks • Solid waste management	CIDPs

2.6 Key issues, challenges and trends

The water resources of Kenya are currently threatened by many issues. These include human conflict, water quality, soil erosion and sedimentation, climate change, catchment degradation, inadequate monitoring, planning and management, water availability and supply issues, inadequate resources, uneven spatial and temporal distribution of water resources, anthropogenic encroachment on environmentally sensitive areas, inadequate flood and drought management and various other issues. In addition to the above, each basin has location-specific challenges and issues which, coupled with its unique basin characteristics, are important considerations for effective water resources management and planning at basin and sub-basin level.

Key issues for all six river basins in Kenya were identified through the basin planning process and categorised under the following main categories:

- Biophysical issues;
- Socio-economic issues;
- Water resources issues;
- Institutional issues.

Issues identified in conjunction with stakeholders were presented and addressed based on the framework as depicted in Figure 2-15.

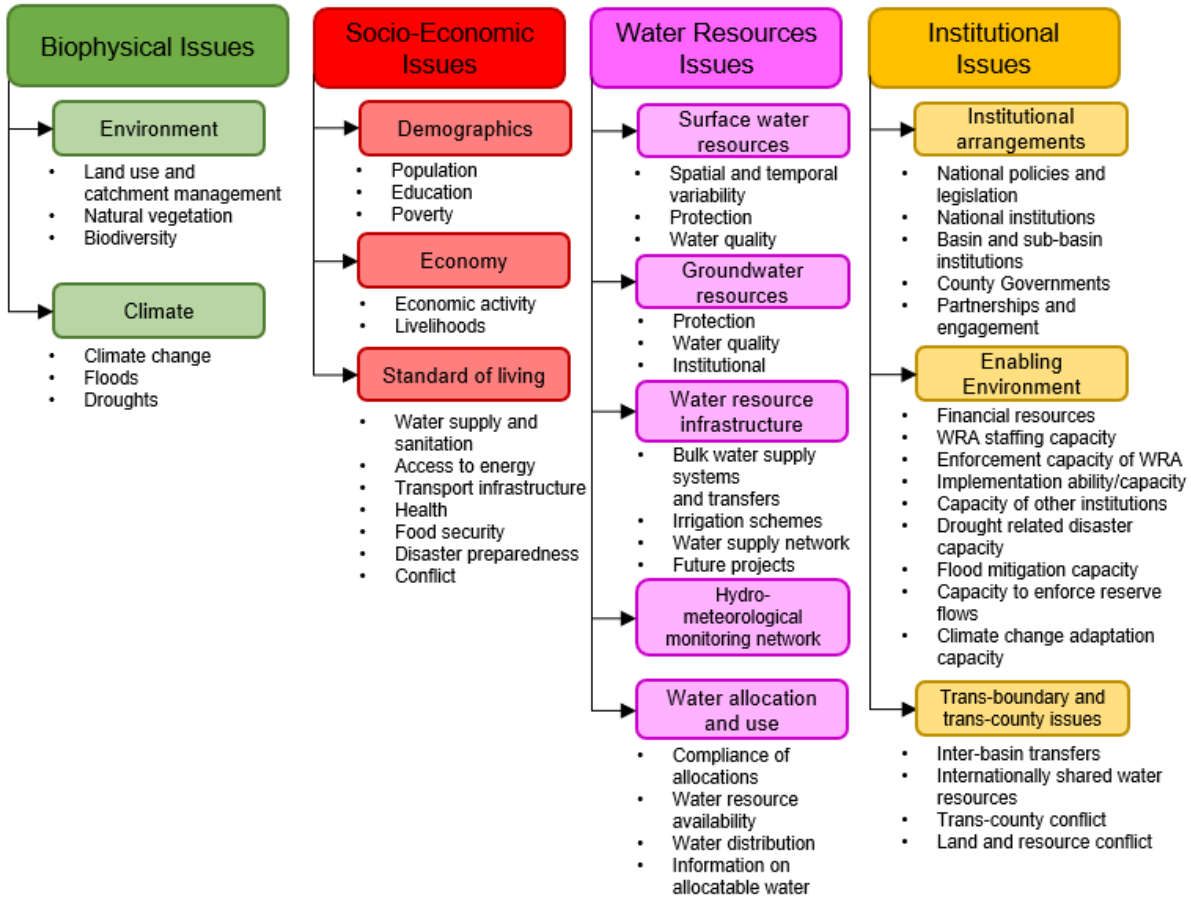

Figure 2-15: Key issues framework

Key biophysical, socio-economic, water resources and institutional issues related to the **forestry, land-use and catchment management sectors** in Kenya are summarised in the following sub-sections.

2.6.1 Biophysical issues

2.6.1.1 Environment

The environment encompasses the land, vegetation and biodiversity of Kenya. Sustainable management of the land is necessary to maintain healthy vegetation and biodiversity. Issues arise through poor land use management and vegetation or biodiversity loss. Along with the loss of natural vegetation, human encroachment is resulting in the loss of biodiversity due to habitat loss. Pollution is contributing significantly to water quality issues, while lack of enforcement regarding minimum environmental flows is also inadequate.

Figure 2-16 presents some of the main environmental challenges and the tree-related ecosystems that can directly or indirectly aid in addressing the identified challenges. Reforestation has the potential to restore ecosystem services and reduce the effects of land use challenges (MENR, 2016a).

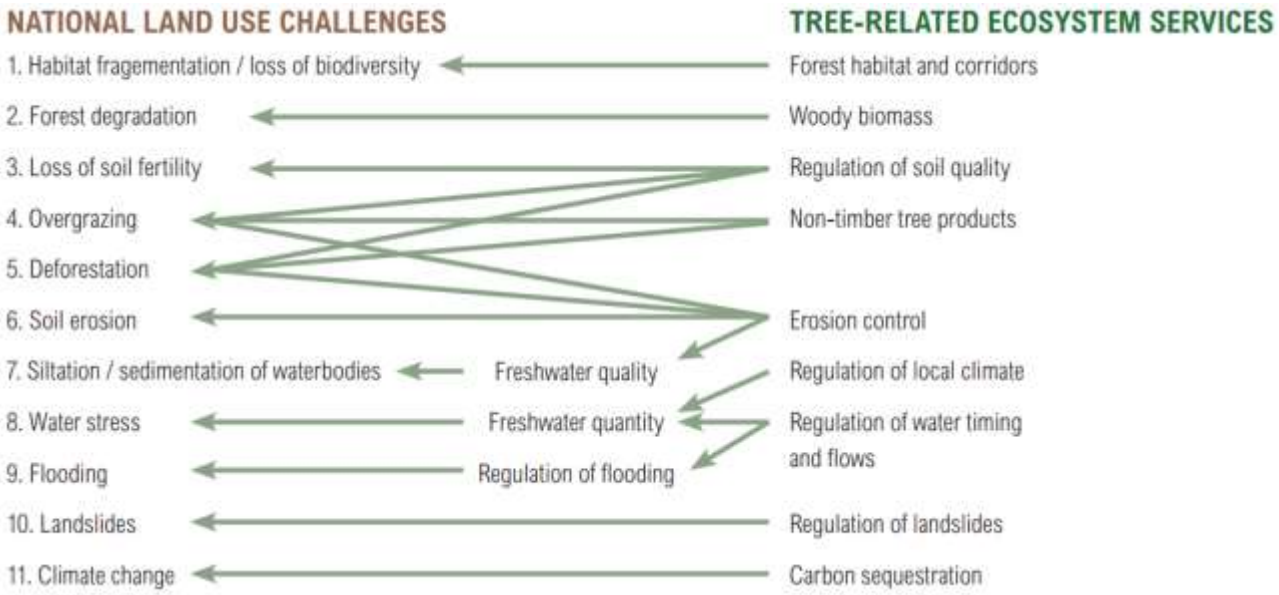

Figure 2-16: Tree-related ecosystem services and national land Use challenges (Source: MENR, 2016)

Some of the major forestry, land use and catchment management environmental issues are listed below:

- Poor land use and catchment management
  - Unsustainable agricultural practices and expansion
  - Mudslides and landslides exacerbated by poor land management
  - Poor rangeland management
  - Unsustainable sand harvesting
  - Unsustainable mining
  - Land use change in ASAL regions from rangeland to crops
- Loss of natural vegetation
  - Deforestation
  - Encroachment of important ecosystems
  - Invasive alien species
  - Overgrazing

- Biodiversity loss
  - Threatened ecosystems
  - Habitat fragmentation/loss of biodiversity
  - Forest degradation
  - Loss of soil fertility
  - Overgrazing/free grazing
  - Deforestation
  - Soil erosion
  - Siltation and sedimentation of waterbodies
  - Water stress (on water bodies and soils)
  - Flooding
  - Landslides

2.6.1.2 Climate

Climate change appears to be taking effect in Kenya. Expected impacts include increased temperature, increased intensity and frequency of extreme climate events as well as unpredictable weather patterns. With more rain falling as heavy storm events, it will be less effective and there will be increased erosion, an increased risk of flooding and greater environmental degradation. Higher evaporative demand will also offset any benefits should rainfall possibly increase, also resulting in less effective rainfall (Omwoyo et al., 2017).

Some of the major climate issues related to forestry, land use and catchment management are listed below:

- Increasing intensity of extreme events
- Increasing temperature and evaporation rates
- Unpredictable and irregular weather conditions
- Increased frequency of droughts

2.6.2 Socio-economic issues

2.6.2.1 Demographics

- Increased population growth and urbanisation has increased the pressure on the environment in urban centres.
- Although there are multiple poverty eradication strategies being implemented in the country there are still challenges with reaching a large and increasing population. Increased poverty makes people more reliant on natural resources with severe impacts on biodiversity and protected areas.
- Subsistence farming and natural resource use are the livelihoods of the rural poor. It is often subsistence farmers who encroach on forests, riparian and wetland areas as these areas receive a good amount of water for crops. Encroachment is usually driven by droughts.

2.6.2.2 Economy and livelihoods

- Those engaging in livelihood activities are usually reliant on natural resources in a catchment. With increasing population and demand, natural resources are being degraded and therefore livelihood activities are not sustainable. Sources of livelihoods vary from pastoralism to subsistence agriculture and crop/livestock farming.

2.6.2.3 Conflict

- Human-wildlife conflicts, principally among communities that live in proximity to wildlife areas such as the national parks
- Illegal encroachment into the water towers and wetlands
- Resource use conflicts from pastoralist communities

2.6.3 Water resources issues

2.6.3.1 Surface water resources

Kenya has many water resources challenges, with insufficient water to meet demand in certain locations and during certain times of the year. Domestic, industrial and irrigation demands are expected to increase in the future. Sedimentation of seasonal rivers and pans is an issue as it limits already scarce water resources.

Forest area, canopy cover and surface litter increase soil shelter from wind and evaporation and conserves the soil productive capacity through the reduction of soil and nutrient loss. Forests play an important role in the reduction of land degradation, flood severity and increase in higher quality runoff through the reduction of sediment erosion (MEWNR, 2015). There is great need for increase catchment-based water resource management to enhance the conservation of water, regulation of river flows, and to reduce siltation and sedimentation of water reservoirs.

A key problem with water catchments in Kenya is that settlements have extended deep into volatile areas, with Ngong Hills as an example, where urbanization has extended onto the mountain. The urbanisation reduces infiltration, increases flooding and reduces dry season release of baser flow into rivers, resulting in the increased seasonality of rivers. Given the difficulties in evicting settlements from catchments, one viable solution is management of the riparian areas and investment in runoff storages such as water pans used in the Makuya and Kakuzi areas.

Some of the major water resources issues related to forestry, land use and catchment management are listed below:

- Water quality issues linked to:
  - Sedimentation as a result of poor land management practices and deforestation
  - Land use changes e.g. urbanisation
  - Encroachment into riparian areas and wetlands
- Water quantity issues linked to:
  - Deforestation of water towers
- Conflict linked to:
  - Changes in stream flow due to upstream land use changes and deforestation
  - Poverty exacerbated by poor land management and lack of natural resources

2.6.4 Institutional Issues

Key institutional issues in Kenya include inadequate capacity at WRUA level, inadequate knowledge of integrated water resource management at County Government levels, and inadequate reporting frameworks to the public. With declining public land available, forestry development has to expand into private and community land, which require incentives and methods of engagement to encourage investments in commercial forestry on private land (MEWNR, 2015).

Some of the major forestry, land use and catchment management institutional issues are defined below:

2.6.4.1 National policies and legislation

- Conflicting policies, regulations and mandates

2.6.4.2 National institutions

- Uncoordinated institutional roles

2.6.4.3 Basin and sub-basin institutions

- Inadequate institutions in forestry sector

2.6.4.4 County Governments

- Limited coordination

2.6.4.5 Data and information

- A critical challenge in planning and managing forests in Kenya, is the lack of updated information on status-quo of key forestry sector indicators such as the forest type and coverage areas, the demand and supply of wood-based products, and monitoring of progress towards achieving national forestry targets. Frequent reporting on the state of forests to the public will create governmental and public awareness on the status and progress of forestry-based initiatives.

3 Institutional Overview

3.1 Introduction

The forestry sector plays a key role in the development and support of other productive sectors of the Kenyan economy. Forest policies and strategies require updated and current information on the status and issues concerning the sector as well as a clear understanding of the drivers of deforestation and land degradation.

Land use and forestry occur within a catchment; therefore, their management needs to be considered at the catchment scale. This section outlines an integrated catchment management approach by reviewing the water, land and forestry sectors institutional arrangements from national to county level, and identifies the challenges for coordination between them. Subsequent to Kenya Vision 2030, which was completed in 2007, many strategies and development plans for the water, forestry and land sectors in Kenya have been developed to provide the direction for the development and the strengthening of these sectors. To ensure that this Sector Assessment is representative and aligned with current plans and strategies related to water resources planning and management and water, land and forestry development, relevant current plans and strategies were reviewed and are briefly described.

3.2 Legislative, Policy and Institutional Framework

3.2.1 Introduction

The Constitution of Kenya (2010) provides the basis for water resources management in the country and recognises this through the right to a clean and healthy environment, through the management and sustainable development of natural resources (which includes both surface and ground water), as well as through the economic and social right "*to clean and safe water of adequate quantities*". Importantly, the State has the obligation to ensure that water is conserved, that development is managed to be sustainable and to ensure that the benefits accrued are shared equitably. Whilst it is noted that the utilisation of natural resources should be for the benefit of the people of Kenya, there is important emphasis placed upon the needs of marginalised communities. Also of importance is the recognition of the link between water and land. As such, this recognition provides the basis for improved integration in the planning, management and sustainable development of natural resources.

3.2.2 National policies

3.2.2.1 Water

Worldwide, there is increased recognition of the importance of water in terms of socio-economic development. This is increasingly emerging through the nexus discussions which acknowledge the interfaces between water, food, energy, and more recently, climatic risks. The findings of the World Economic Forum through their Global Risks Reports which repeatedly reflect water and climate related risks as being the most significant to economic growth.

At national level in Kenya, this sentiment has been mirrored in the development of various forms of national development plans. The **Kenya Vision 2030**, published in 2007, provides the national development blueprint. It is structured around economic, social and political dimensions and notes the important role of water in catalysing growth. National targets outlined in the Vision 2030 that have implications for the water sector include:

- Water and sanitation - to ensure that improved water and sanitation are available and accessible to all by 2030

- Agriculture - to significantly increase the area under irrigation by 2030 for increase of agricultural production
- Environment - to be a nation that has a clean, secure and sustainable environment by 2030
- Energy - to generate more energy and increase efficiency in the energy sector

The **Constitution of Kenya (2010)** provides the basis for water resources management in the country and recognises this through the right to a clean and healthy environment, through the management and sustainable development of natural resources (which includes both surface and ground water), as well as through the economic and social right "*to clean and safe water of adequate quantities*". Importantly, the State has the obligation to ensure that water is conserved, that development is managed to be sustainable and to ensure that the benefits accrued are shared equitably. Whilst it is noted that the utilisation of natural resources should be for the benefit of the people of Kenya, there is important emphasis placed upon the needs of marginalised communities. Also of importance is the recognition of the link between water and land. As such, this recognition provides the basis for improved integration in the planning, management and sustainable development of natural resources.

The **Kenya National Water Resources Management Strategy (2006)** provides the overarching policy framework for water resource management and development in Kenya, despite a number of successive adjustments in the core water legislation. This consistency in policy intent has been critical in guiding the water sector, with legislative amendments being progressively utilised to improve and strengthen the way that policy is affected. At the time of its introduction, the 'Sessional paper no. 1 of 1999 on national policy on water resources management policy and development' (Government of Kenya, 1999) introduced key shifts in policy such as the separation of functions (including water resource management, water service delivery, policy, regulation, financing), the devolution of decision making to regional and local levels, the commercialisation of water (i.e. water to be treated as an economic and social good) and stakeholder participation through community and private sector participation.

3.2.2.2 Land

The Kenya Vision 2030 identified agriculture as one of the key sectors to deliver the desired economic growth rate of 10% per annum and resulted in the development of various policies and strategies for the agricultural and irrigation sectors to guide the development, transformation and strengthening of these sectors. The transformation of smallholder agriculture from that of subsistence to an innovative, commercially oriented and modern agricultural sector has been identified as a fundamental component for achieving agricultural growth. It is realised that this transformation will be achieved through transforming key institutions in agriculture, livestock, forestry and wildlife to promote agricultural growth; increasing productivity of crops, livestock and tree cover; introducing land-use policies for better use of high- and medium-potential lands; developing more irrigable areas in ASALs for both crops and livestock; improving market access for smallholders through better supply chain management; and adding value to farm, livestock and forestry products before they reach local, regional and international markets.

The **National Land Policy (2009)** was established to provide guidance towards equitable and sustainable land use for the wellbeing of Kenya's people and economy. It is a framework to address critical land related issues in the country, including equitable land access, historical injustices and disparities, land use conflicts and sustainable utilization and management of land and its resources. The Policy recognizes land as a significant finite resource that holds cultural heritage, which should be managed sustainably and productively for economic benefit as well provision of livelihoods. Land in Kenya is classified into Public Land, Community Land and Private Land. Communal land is based on traditional customary rights. Several statutes involving land use matters were enacted following the promulgation of the Constitution. However, lack of institutional coordination poses a challenge for effective land use management across the country. The **National Land Use Policy (2017)** was

therefore established in 2017 to provide institutional coordination among the relevant stakeholders. Furthermore, the Policy seeks to optimize the utilization and productivity of land and its resources in a sustainable and equitable manner.

The **National Policy for the Sustainable Development of Northern Kenya and other Arid Lands (2012)** (also referred to as the "Releasing our full potential" policy) refers to previous biased distribution of public investment established under colonial rule. Resources were directed towards the so-called 'high potential' areas of crop production, overlooking the wealth of lowland livestock-based economies and creating the deep inequalities in human development which we see in Kenya today. The defining feature of the ASALs is their aridity therefore the primary policy challenge is how to ensure food and nutrition security in a sustainable manner in environments that are prone to drought, where people's access to and control over critical livelihood resources such as land is insecure, and where unpredictability is set to increase as climate change takes hold. Pastoralists in Kenya are found in all the arid counties and in some of the semi-arid. Pastoralism is the extensive production of livestock in rangeland environments. It takes many forms, but its principal defining features are livestock mobility and the communal management of natural resources. The main objectives of the Policy are to strengthen the integration of Northern Kenya and other arid lands with the rest of the country and mobilise the resources necessary to ensure equity and release the region's potential, to improve the enabling environment for development in Northern Kenya and other arid lands by establishing the necessary foundations for development, to develop alternative approaches to service delivery, governance and public administration which accommodate the specific realities of Northern Kenya and pastoral areas, and to strengthen the climate resilience of communities in the ASALs and ensure sustainable livelihoods.

3.2.2.3 Environment and Forestry

To ensure sustainable resource use, growth and employment creation, the Kenyan Constitution and economic blueprint Vision 2030, requires the country to work towards achieving a forest cover of at least 10% of the land area. Realizing these targets will require mobilizing communities and the private sector to:

- invest in commercial forestry;
- expand forestry development to arid and semi-arid areas,
- invest in industry for enhanced processing efficiency and value addition,
- strengthen forest governance policies and institutions;
- give greater consideration of forestry in development programmes such as in agriculture, energy, tourism, and water programmes.

The contribution of forests to the national economy has been grossly undervalued, which results in low level resource allocation to the sector (MEWNR, 2015). There is a need to promote the value of forests to the economy, and the associated need for adequate resource allocation through public intervention and other funding mechanisms.

In conjunction with the 'Sessional paper no. 1 of 1999 on national policy on water resources management policy and development', the **National Environment Policy (NEP)** (Government of Kenya, 2013a) provides an important framework in terms of improved river basin management in that the NEP has the goal of ensuring a "b*etter quality of life for present and future generations through sustainable management and use of the environment and natural resources*". As such, this framework policy has relevance to a number of differing sectors that are engaged in the management of natural resources, including water resources. The objectives of this policy that have relevance to the management of the basins include, amongst others:

There is significant alignment in the objectives and principles laid down in NEP with the current approaches utilised within the Kenyan water sector, and this is aligned with best practice.

A key issue to distil from the 'Sessional paper no. 1 of 1999 on national policy on water resources management policy and development' and NEP concerns the recognition of the value and benefits that are accrued from ecological infrastructure. This refers to the naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction (SANBI , 2013). Our ability to ensure that ecological infrastructure is managed and maintained will be an essential dimension of our resilience against climate variability and climate change.

The **National Forest Policy of 2014** provides the policy statements for how the government intends to conserve indigenous forests and manage plantation forests, dryland forests, urban forests and roadside tree planting and farm forestry.

3.2.3 Legislation

The water and environmental legislation in Kenya has developed over time and this has enabled successive adjustments in order to improve the manner in which water (and other natural resources) are managed and sustainably developed.

3.2.3.1 Water

The promulgation of the **Water Act 2016** aligned Kenya's water sector with the 2010 Constitution and enables amendments to support the improved management of water resources. The Water Act (Act No 12 of 2016) revises the institutional mandates of key water sector institutions and sets out the role of counties in the water sector. The Act recognises that water related functions are a shared responsibility between the National Government and the County Governments. The mandate for the provision of water and sanitation services and the development of county water works is delegated to country governments. The Act defines a clear role for the WRA in the regulation of water resources, which provides a potential strengthening in the way that water resource development is regulated. The Act gives priority to domestic water users over irrigation and other water users. However, there are some ambiguities in the Act which require resolution in order to clarify institutional matters.
The national government remains in charge of the regulation of water services and water resources. It also continues to manage national public water works, which extend across more than one county by nature of the water resource they use and are funded from the national government budget.

The Water Act does not allocate detailed functions of national and county governments in water resource management but provides instead for a National Water Resource Strategy to address this.

The Act established some new institutions and made changes to others, as listed below:

- **Ministry of Water, Sanitation and Irrigation (MoWSI)** as the sector leader and coordinator, taking responsibility to policy development
- The **Water Resources Authority (WRA)**: mandated to protect, conserve, control and regulate the management and use of water resources and to support the Cabinet Secretary in policy formulation and the establishment of a National Water Resource Strategy. Their role includes the formulation and enforcement of procedures/regulations, water abstraction permitting and collecting of water use fees, flood mitigation and advising the Cabinet Secretary generally on the management and use of water resources. The Act requires the development of water resources allocation plans at basin level, and the WRA needs to permit the development of any water source (surface or groundwater).
- **Water Services Regulatory Board (WASREB)** for regulation of water services' providers. Its functions comprise: issuing of licenses to water services boards and approval of Service Provision Agreements, developing tariff guidelines and carrying out tariff negotiations, setting standards and developing guidelines for service provision, publishing the results of sector monitoring in the form of comparative reports.

- **National Water Harvesting and Storage Authority** for major water infrastructural development,
- **Water Tribunal** for dispute resolution,
- **Water Sector Trust Fund** for water services development towards the un-served and poor segments of the society in peri-urban and rural areas,
- **Water Works Development Agencies** to replace the Water Service Boards. The Water Act provides the Cabinet Secretary for Water with the power to establish an undefined number of Water Works Development Agencies to manage such national public water works, thus replacing the current Water Services Boards.
- **Basin Water Resources Committees** to replace Catchment Advisory Committees (CAACs).
- **Water Services Providers (WSPs)** who, with the **county governments**, provide water and sanitation services in the counties. Operations must be in accordance with a Service Agreement entered between each WSP and WASREB.
- In rural areas where services are not commercially viable, **counties** are now responsible for facilitating access to services, for developing the required infrastructure for distribution, and for contracting community associations, public benefit organizations or private operators to manage such systems (KEWASNET, 2017)
- The **Water Resource User Associations (WRUAs)**: provide community-based management of water resources and resolution of associated conflicts.

Key water sector institutions are shown below.

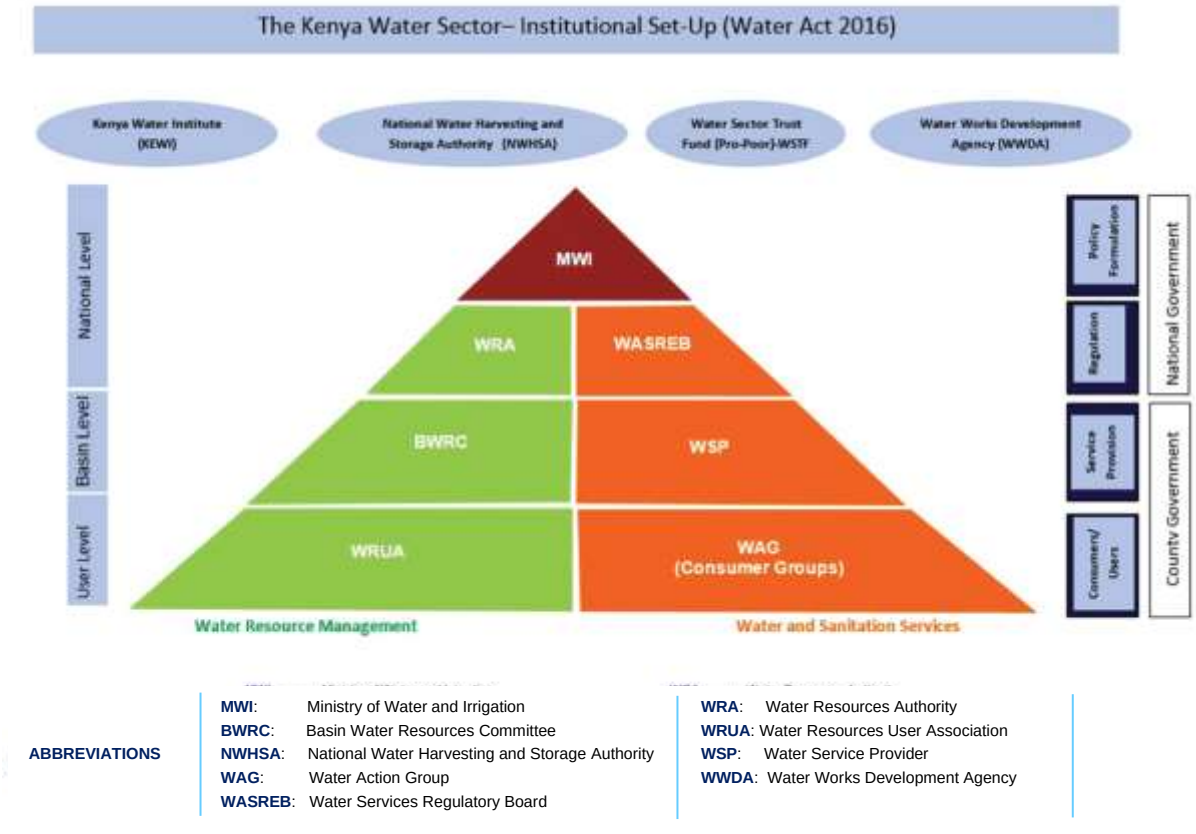

Figure 3-1: Kenya Water Institutions (Water Act 2016)

3.2.3.2 Land

The **Land Act of 2012** outlines the process followed for registering land in Kenya, whilst the **Community Land Act of 2016** outlines the management of community land.

There are a range of legislative instruments that underpin the development of agriculture in Kenya. Amongst these is the **Agriculture, Fisheries and Food Authority Act (Act No 13 of 2013)** which provides for the regulation and promotion of agriculture. This is supported through the establishment of the Agriculture, Fisheries and Food Authority (AFFA) that is charged with, in consultation with County Governments, administering the **Crops Act,** (Act No 16 of 2013) and the **Fisheries Act** (Chapter 378 of 1989).

3.2.3.3 Environment and forestry

The **Environmental Management and Coordination Act, 1999 (as amended 2015) Cap 387 (EMCA)** is the framework law on the environment in Kenya. The EMCA was enacted to provide an appropriate legal and institutional framework for the management of the environment in Kenya. The Act was amended in May 2015 and took effect on 17 June 2015.

The Act aims to improve the legal and administrative coordination of the diverse sectoral initiatives in the field of environment in order to enhance the national capacity for its effective management. In addition, the Act seeks to align the 77 sector specific legislations pertaining to the environment in a manner designed to ensure greater protection of the environment. This is in line with national objectives and sustainable development goals enunciated in the Agenda 21 of the Earth Summit held in Rio de Janeiro in 1992. The ultimate objective is to provide a framework for integrating environmental considerations into the country's overall economic and social development. In terms of environmental management, the EMCA provides a comprehensive legal and institutional framework for the handling of all environmental issues in Kenya and covers all sectoral laws.

EMCA does not repeal the sectoral legislation but seeks to coordinate the activities of the various institutions tasked to regulate the various sectors. These institutions are referred to as Lead Agencies in EMCA.

The EMCA is supported by several subsidiary Regulations such as Solid Waste Management Regulations (2006), Environmental Management and Coordination (Water Quality) Regulations (2006) and Emissions Regulations (2007), as well as other pertinent International Environmental Regulations.

The **Forest Conservation and Management Act No 34 of 2016**, was operationalized on 31st March 2017. This Act makes provision for:

- the conservation and management of public, community and private forests and areas of forest land that require special protection;
- defines the rights in forests and prescribes rules for the use of forest land;
- community participation of forest lands by community forest association, the trade in forest products;
- the protection of indigenous forests and the protection of water resources.

The Act establishes the Kenya Forest Service (KFS) as a body corporate and the Forest Conservation and Management Trust Fund. The Act states the Service's mandate as "to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes"

The Service shall, among other things:

- conserve, protect and manage all public forests in accordance with the provisions of the Act;

- prepare and implement management plans for all public forests and, where requested, assist in preparation of management plans for community forests or private forests in consultation with the relevant owners;
- receive applications for and issue licences and permits;
- establish and implement benefit sharing arrangements in accordance with the provisions of the Act;
- manage water catchment areas in relation to soil and water conservation, carbon sequestration and other environmental services in collaboration with relevant stakeholders;
- prepare regularly a Forest Status Report and a Resource Assessment Report;
- establish forest conservancy areas.

The Act also stated that the KFS shall only give its consent for quarrying operations in a forest areas, only if it does not contain any rare species or is used for protection of water resources. The Act also establishes the Kenya Forestry College and defines Forestry functions of County Governments (FAO, 2016).

The **Agriculture Act cap 318: Agriculture (Farm Forestry) Rules, 2009 (Cap. 318)** require farmers to establish and maintain farm forestry on at least ten percent of every agricultural land holding. One of the objectives of the Rules is to preserve and sustain the environment and combating climate change and global warming. Other declared objectives include: the conservation of water, soil and biodiversity; the protection of riverbanks.

3.2.4 National institutions and mechanisms

3.2.4.1 National Ministries and departments

In the aftermath of the 2017 national elections, the national government in Kenya has undergone some changes in configuration to support a more effective and efficient Government. Whilst there are a number of Ministries that can be seen as enablers (e.g. Education, Justice etc), the key sector ministries from a basin planning perspective for the **forestry, land-use and catchment management** sectors include:

- Ministry of Water, Sanitation and Irrigation (MoWSI)
- Ministry of Agriculture, Livestock and Fisheries (MoALF)
- Ministry of Devolution and ASAL. (MoDASAL)
- Ministry of Lands and Physical Planning (MoLPP)
- Ministry of Environment and Forestry (MoEF)

The State Department of Irrigation Services under **MoWSI** has irrigation mandates of benefit to the agricultural sector. The Irrigation Services Department is the leading agency for irrigation and drainage development including operation and maintenance of the existing large-scale public irrigation and drainage facilities. It has offices, which provide services to irrigators and other stakeholders. Under the State Department of Irrigation, there are four departments: Department of Irrigation and Drainage; Department of Irrigation Water Use Services; Department of Water Storage and Flood Control; Department of Land Reclamation.

The **MoALF** has as its mandate to improve the livelihood of Kenyans and ensure food security by promoting competitive, commercially oriented fisheries, crop and livestock farming through creation of an enabling environment, and ensuring sustainable natural resource management. The Ministry was created in 2013 following the merge of the three ministries of agriculture, livestock development and marketing and fisheries. Its strategic objectives revolve around creating an enabling environment for

agricultural development, increasing productivity and outputs in the agricultural sector, enhancing national food security, improving market access and trade and strengthening Institutional capacity. The Agricultural State Department under the MoALF is responsible for advancing technology and infrastructure development, mechanisation, crop resources and agribusiness. The Livestock State Department looks after veterinary services and livestock resources, while the Fisheries State Department is responsible for aquaculture development. All three state departments drive policy research, regulation and market development in their respective agricultural sub-sectors.

The State Department for Development of the ASALs (SDDA) under the **MoDASAL** is a special vehicle for affirmative action, mainstreaming development issues of ASALs, coordinating, implementing and fast-tracking investment for long term sustainable development. The SDDA strategic focus involves coordination of development for ASALs in terms of the formulation of policies and implementation of strategies for the development of ASALS, resilience building through programmes that will fill the social, economic and environmental gaps to increase the ability of ASALS communities to withstand shocks, and social and cultural integration through frameworks for management and resolution of cultural and resource-based conflicts.

The **MoLPP** is made up of the Department of Lands and Department of Physical Planning. The Department of Physical Planning is considered the lead national authority and advisor on matters of physical planning as well as urban development and management.

The **MoEF** has three directorates applicable to catchment management and forestry. The Directorate of Environment coordinates environmental and forestry policies and the implementation thereof as well as provides guidance on any environment-related issues. The Directorate of Forestry Conservation is mandated to manage and conserve forestry resources through policy formulation, conservation strategies and management of forest resource utilisation. Lastly, the Directorate of Climate Change guides and coordinates climate change-related matters, including implementation of the national climate change plans.

3.2.4.2 National level public entities

Whilst the Ministries have the broad ambit to develop policy, under legislation they have established various national level public entities that have the mandate to perform regulatory and developmental functions. These public entities that function at a national level are tabulated, in Table 3-1.

Table 3-1: National level public entities that have relevance to the integration of IWRM in the forestry, land use and catchment management sectors

Institution	Roles and responsibilities*
Ministry of Water, Sanitation and Irrigation (MoWSI)	
Water Resources Authority (WRA)	- Formulate and enforce standards, procedures and Regulations for the management and use of water resources and flood mitigation. - Regulate the management and use of water resources. - Receive water permit applications for water abstraction, water use and recharge and determine, issue, vary water permits; and enforce the conditions of those permits. - Determine and set permit and water use fees as well as collect water permit fees and water use charges. - Provide information and advice to the Cabinet Secretary for formulation of policy on national water resource management, water storage and flood control strategies.
National Water Harvesting and Storage Authority (NWHSA)	- Development of national public water works for water resources storage and flood control. - Maintain and manage national public water works infrastructure for water resources storage. - Develop a water harvesting policy and enforce water harvesting strategies.

Institution	Roles and responsibilities*
Water Works Development Agencies (WWDAs)	- Undertake the development, maintenance and management of the national public water works within its area of jurisdiction. - Operate water works and provide water services as a water service provider, as a transitional arrangement or as instructed by the WASREB. - Provide technical services and capacity building to such County Governments and water service providers within its area as may be requested.
Regional Development Authorities (RDAs)	- Promote integrated water resources development within jurisdictions to ensure equitable socio-economic development
Ministry of Agriculture, Livestock and Fisheries (MoALF)	
Agriculture, Fisheries and Food Authority (AFFA)	- Administer Crops Act and Fisheries Act in accordance with the provisions of these Acts. - Promote best practices in, and regulate, the production, processing, marketing, grading, storage, collection, transportation and warehousing of agricultural and aquatic products excluding livestock products as may be provided for under the Crops Act, and the Fisheries Act. - Collect and collate data, maintain a database on agricultural and aquatic products excluding livestock products, documents and monitor agriculture through registration of players as provided for in the Crops Act and the Fisheries Act. - Responsible for determining research priorities in agriculture and aquaculture. - Advise National Government and County Governments on agricultural and aquatic levies for purposes of planning, enhancing harmony and equity in the sector. - Carry out such other functions as may be assigned to it by this Act, the Crops Act, the Fisheries Act and any written law while respecting the roles of the two levels of governments.
Ministry of Devolution and ASAL. (MoDASL)	
National Drought Management Authority (NDMA)	Overall leadership and coordination of drought risk management programmes
Ministry of Lands and Physical Planning (MoLPP)	
National Land Commission (NLC)	- Develop a framework for monitoring, oversight and reporting on performance of various public, private, communities, non-state actors and individual land holders in performing their obligations; - Conduct research on matters related to land and the use of natural resources and make recommendations to the relevant authorities; - Prepare reports to bring out challenges in the implementation of National Land Use Policy by the different sectors - Carry out periodic reviews on sectoral performance in the implementation of this Policy to be submitted to all levels, specific agencies, county governments, Parliament and President; - Carry out resource mobilization for the sectors in the implementation of the Policy as the lead advocacy agent
Ministry of Environment and Forestry (MoEF)	
National Environmental Management Authority (NEMA)	- Co-ordinate environmental management activities being undertaken by lead agencies and promote the integration of environmental considerations into development policies, plans, programmes and projects to ensure the proper management and rational utilisation of environmental resources. - Take stock of natural resources in Kenya and their utilisation and conservation. - Establish and review in consultation with the relevant lead agencies, land use guidelines. - Monitor and assess activities, including activities being carried out by relevant lead agencies, to ensure that the environment is not degraded by such activities and environmental management objectives are adhered to.
Kenya Water Towers Agency (KWTA)	- Coordinate and oversee the protection, rehabilitation, conservation, and sustainable management of Kenya's water towers. - Co-ordinate and oversee the recovery and restoration of forest lands, wetlands and biodiversity hot spots. - Promote the implementation of sustainable livelihood programmes in the water towers in accordance with natural resource conservation.
Kenya Forestry	- Increase net forest cover

Ministry of Lands and Physical Planning (MoLPP)	
Service (KFS)	- Enhance conservation, sustainable management and utilisation of forests by improving livelihoods in rural areas

* The roles and responsibilities provided are not comprehensive but provides some of the key functions.

To achieve effective integrated planning and management, there is a need for integrated approaches between different departments and agencies at the national level. However, there are significant challenges in terms of ensuring the alignment in policy and legislation, which requires capacity in the respective institutions, to be able to work in an integrated manner and have the necessary systems to support this integration.

3.2.5 Regional and Local level institutions

3.2.5.1 Agricultural extension services

The various State Departments under the MoALF have extension officers and farmer training programmes for engagement with county governments and local farmers. County Coordination Units (CCUs) and County Steering Committees (CSCs) have been instrumental in establishing sound and constructive linkages between national agricultural structures and county governments following devolution, despite the many challenges resulting from the devolution process. The CCUs and CSCs have the potential to play important roles in facilitating the coordination of agricultural investments and interventions at the county level, and in facilitating the provision of capacity building support towards sector coordination by the county governments. To ensure long-term agricultural sustainability at county level, the CSCs and CCUs need to seek and pursue all possible opportunities to strengthen their collaboration with and integration into the county structures and development agenda.

The Joint Agricultural Sector Consultation and Cooperation Mechanism (JASCCM) was established in 2016 as part of the commitment of the national and county governments to jointly pursue effective development of the agricultural sector. The primary objective of JASCCM is the implementation of sector priorities defined in the 2016 Agricultural Policy and as such it has two primary goals: To transform crop, livestock and fisheries production into commercially oriented enterprises that ensure sustainable food and nutrition security; and to provide a framework for the support and intensification of cooperation and consultation between the National and County governments and among other stakeholders for enhanced development of crops, livestock and fisheries. The purpose of JASCCM therefore is to ensure that agriculture contributes to equitable national economic growth and increased food security through effective implementation of the four key pillars of Agricultural Policy, which are: Increasing production and productivity; Increasing market access; Enhancing National Food and Nutrition Security; and effective Sector and Institutional Reforms.

3.2.5.2 Directorate of Arid and Semi-Arid Lands Divisions

The State Department established field offices under the Directorate of ASALS to coordinate the implementation of programmes and projects in the ASALS counties. Programmes are developed under the Community Social Integration Division, Special Programmes Division and Livelihood Support Division.

3.2.5.3 Technical Implementation Committees for Land use

There are both National and County technical implementation committees that act as the coordinators for implementation of the National Land Use Policy.

3.2.5.4 NEMA Regional Offices

There are eight NEMA regional offices that manage the county field offices in Kenya (Table 3-2). County Environmental Committees (CEC) are the District level bodies chaired by respective County Commissioners and bringing together representatives from all the ministries; representatives from local authorities within the province/district; two farmers/pastoral representatives; two representatives from NGOs involved in environmental management in the province/district; and a representative of each regional development authority in the province/district. To each CEC in the country is attached a County Environmental Coordinator who serves as the secretary to the CEC, and as the NEMA Officer on the ground, is charged with responsibility of overseeing environmental coordination among diverse sectors.

Table 3-2: NEMA regional offices

Region	Regional office	Counties
COAST REGION	Mombasa	Kilifi, Kwale, Lamu, Mombasa, Taita Taveta
CENTRAL	Isiolo	Embu, Isiolo, Kirinyaga, Laikipia, Marsabit, Meru, Tharaka-Nithi
NORTH LAKE	Kisumu	Bungoma, Busia, Kakamega, Kisumu, Siaya, Vihiga
NAIROBI METROPOLI	Nairobi	Kajiado, Kiambu, Machakos, Makueni, Muranga, Nairobi
NORTH EASTERN	Garissa	Garissa, Kitui, Mandera, Tana River, Wajir
NORTH RIFT	Eldoret	Elgeyo Marakwet, Nandi, Trans-Nzoia, Turkana, West Pokot, Uasin Gishu
SOUTH RIFT	Nakuru	Baringo, Nakuru, Kericho, Narok, Nyandarua, Samburu
SOUTH LAKE	Kisii	Bomet, Homa Bay, Kisii, Migori, Nyamira

3.2.5.5 Forest conservancy and extension services

KFS manages forests within ten Conservancies, 47 Ecosystem areas, and 250 Forest Stations. The conservancies are the Western Conservancy, Coast Conservancy, Eastern Conservancy, Central Highlands Conservancy, Mau Conservancy, Nairobi Conservancy and North Rift Conservancy.

3.2.6 Basin and sub-basin institutions

Noting the requirements of Integrated Water Resources Management, institutions have been established at basin and sub-basin levels to improve the day-to-day management of water resources as well as to improve the regulation and oversight required to ensure that water is efficiently used in accordance with water use permits. Under the auspices of the 2016 Water Act, this is achieved through the six Regional and 26 Sub-Regional Offices of the Water Resources Authority (WRA) and the Water Resource User Associations (WRUAs).

Each of the six basins in Kenya has a **WRA Regional Office (RO) and a number of Sub-Regional Offices (SROs).** Each SRO looks after a number of Catchment Management Units (CMUs), delineated based on hydrological and water resource considerations. Water users apply for water permits through the relevant WRA SRO, and the application is then sent to the RO for processing. Class A to C permits are handled at RO level, while Class D permits are handled at Head Office. A hydrological or hydrogeological assessment report conducted by a qualified professional must be submitted by the water user with the application. The water permits are recorded in the Water Permit Database at the RO.

Table 3-3 WRA sub-regions, offices and CMUs

Basin	Sub-Region	WRA SRO	CMUs
Athi (RO: Machakos)	Upper Athi	Kiambu	Ruiru, Ndarugu
	Mbagathi - Nairobi	Nairobi	Mbagathi/ Nairobi
	Middle Athi	Kibwezi	Thwake
	Noltresh - Lumi	Loitokitok	Tsavo
	Coastal - Athi -Mombasa	Mombasa	Coastal Zone/ Mombasa
Tana (RO: Embu)	Upper Tana	Murang'a	Sagana-Gura, Lower Sagana, Upper Thika and Lower Thika
	Thiba	Kerugoya	Tana, Karaba, Ena and Thiba
	Kathita - Mutonga	Meru	Mutonga, Kathita, Ura / Tharaka
	Tiva - Tyaa	Kitui	Tiva and Lower Reservoirs
	Lower Tana	Garissa	Lower Tana, Ijara / Lamu
LVS (RO: Kisumu)	Northern Shorelines / Nyando	Kisumu	Northern Shorelines, Upper and Lower Nyando
	Southern Shorelines / Gucha-Migori	Kisii	Southern Shorelines, Gucha and Migori
	Mara / Sondu	Kericho	Sondu, Upper and Lower Mara
LVN (RO: Kakamega)	Kipkaren – Upper Yala	Eldoret	Kipkaren, Upper Yala
	Elgon – Cherangani	Kitale	Upper Nzoia, Middle Nzoia, Sio-Malaba-Malakisi, Mount Elgon
	Lower Nzoia - Yala	Siaya	Lower Nzoia, Lower Yala
RV (RO: Nakuru)	Lower Turkwel	Lodwar	Lake Turkana Basin, Lokitipi Plains
	Upper Turkwel	Kapenguria	Upper Turkwel
	Lakes Baringo/ Bogoria	Kabarnet	Upper Kerio, Suguta River, Lakes Baringo/ Bogoria
	Lakes Naivasha/ Nakuru	Naivasha	Lakes Nakuru/ Elementaita, Lake Naivasha
	South Rift Valley	Narok	Upper and Lower Ewaso Ng'iro South
ENN (RO: Nanyuki)	Engare Narok – Merghis Upper Ewaso Ngiro	Rumuruti	Ewaso Narok, Nundoto
	Upper Ewaso Ngiro	Nanyuki	Upper Ewaso Ng'iro, Nanyuki
	Middle Ewaso Ngiro North Ewaso Laggas	Isiolo	Middle Ewaso Ng'iro, Lower Ewaso Ng'iro
	Ewaso Daua	Mandera	Daua, Ewaso Laggas, Lower Ewaso Ng'iro
	North Ewaso Laggas	Marsabit	Daua, Chalbi and Ewaso Laggas

At a more localised level, the establishment of the **Water Resource User Associations (WRUAs)** has been essential in ensuring a focus on the operational management functions within a sub-basin. WRA has delineated Kenya into 1 237 sub-catchment areas with the intention of forming Water Resources User Associations (WRUAs) for each. The WRUAs are community-based, voluntary associations made up of water users and riparian owners interested in proper management of their water resources and were established to enable the collaborative management of water resources and to provide essential support in the resolution of conflicts concerning the use of water resources. Crucially, the Water Act 2016 makes provision for BWRCs to be able to finance WRUAs for services rendered under contract. To date, WRUAs have performed important local functions, but have faced an array of challenges that have served to hinder their effectiveness. Many of these are enabling factors such as capacity in terms of having sufficient skills and training, but also include such issues as inadequate equipment and in

sufficient financial resources. These challenges will require redress in order to support the implementation of this Basin Plan and realise the local level capacitation that can unlock the localised socio-economic development required to support Vision 2030. This is supported by the 2016 Water Act that provides in Section 29 (3) that "*basin area water resources management strategy shall facilitate the establishment and operation of water resources user associations*".

Sub catchment management plans (SCMP) is a planning tool that is developed by the Water User Associations (WRUA) under regulation by the Water Resources Authority (WRA). Its main objective is to guide the implementation of water resources management and regulation activities within a defined period of time in any given sub catchment. The activities, in most cases, relate to catchment protection, pollution control and water infrastructure development.

The 2016 Water Act in effect strives to strengthen the management of water resources at the basin and sub-basin level, whilst strengthening the regulatory role of WRA both at national and basin scales. This not only removes the dichotomy that WRA faced as being manager and regulator, but also attempts to create a stronger management regime within the basins and sub-basins, noting that counties have a key role to play in water service delivery as well as ensuring that water is used efficiently within their jurisdictions. To this end, the 2016 Water Act introduced **Basin Water Resource Committees (BWRCs)** as a replacement for the previous Catchment Area Advisory Committees (CAACs), with a more managerial intent than the purely advisory role that was played by the CAACs. At this juncture, during what is effectively a period of transition, the BWRCs will initially provide a more advisory function, however, it will be critically important to learn from the challenges that were experienced with the CAACs so that the BWRCs become more effective in supporting water resource management. The regulatory function of the WRA will continue to be strengthened and, in the transition period, ring-fencing of staff within the Regional and Sub-Regional Offices will be essential to separate staff and functions that are managerial in nature, and as such, supportive of the BWRCs. The BWRCs fall under the WRA, and their responsibilities (which must be delegated by WRA) include the formulation of Basin Water Resources Strategies, management of basins, advice to WRA and the facilitation of WRUA establishment. The BWRCs may contract WRUAs as agents to perform certain duties in water resource management. There are conflicting mandates for the BWRCs in the Water Act (2016) where they have both advisory and management functions. ISC has an understanding that the BWRCs will remain advisory for the foreseeable future with a long-term plan of making the BWRCs have an executive role. There is a need to develop tools to support the operationalisation of the BWRCs, when they are finally established, and to ring-fence WRA staff at the Ros who will provide both technical and secretariat services to the BWRCs. The actual responsibility and how the BWRCs will work with WRA at the regional offices will only be clear once the mandates are agreed upon.

3.2.7 County governments

The 2010 Constitution introduced a decentralised system, with 47 county governments and one national government with specific functions accorded to the two levels. Guided by the overarching objectives and principles of the county governments as set out in the Constitution, specific functions of counties are provided in Schedule Four of the Constitution. Handing over environmental functions to county governments has been a challenge.

3.2.8 Institutional coordination

The coordination of institutions which manage natural resources has had limited success in Kenya. A catchment approach is considered appropriate as natural resources occur within a catchment and have upstream/downstream impacts on natural resources. As described above the institutions involved are based around the natural resources of water, land and forestry/vegetation. Due to the devolution of government, the county governments are involved with local level catchment management, with national input from the MoWSI, MoALF, MoDASAL, MoLPP and MoEF through their local level

institutions. Figure 3-2 indicates the key institutions involved in the coordination of the forestry, land use and catchment management sectors.

3.2.8.1 Water

Basin Water Resource Committees (BWRCs) are responsible for management of the six main basins in Kenya. However, conflicting mandates for the BWRCs have been identified in the Water Act (2016), where BWRCs are assigned both advisory and management functions. Both scenarios cannot be implemented at the same time without conflicts and thus only one scenario can work. This implies that there is urgent need to remove this ambiguity. WRA's transition committee is currently addressing this issue and the outcome of this process will inform what function will be adopted by the BWRCs.

Water Resource User Associations (WRUAs) have been established at a more local level to focus on the operational management within a catchment. These are community based, voluntary associations made up of water users and riparian owners. The WRUAs are formed around Sub-Catchment Areas. These areas require Sub-Catchment Management Plans (SCMPs), developed through access to a grant from the Water Sector Trust Fund or other sources of financing. The SCMP is an IWRM tool for water resource management to support sub-catchment management. There are gaps of dormant or potential WRUAs that need to be addressed to ensure basin coverage of WRUAs is increased. Even among the existing WRUAs, there are capacity concerns and disparities in levels of development and maturity of the WRUAs. This denotes the need for continued capacity building for the existing WRUAs in addition to continued technical support. SCMPs mainly focus on the management of water and land resources.

The Climate Change Act of 2016 makes provision for the establishment of the National Climate Change Council which will give oversight and guidance on the integration of climate into the national development and policy-making processes. The National Climate Change Council will ensure that climate change is treated as a cross-cutting developmental and environmental issue. The coordination of climate change activities is currently the responsibility of the National Climate Change Secretariat (NCCS) in the MoEF. The NCCS works with climate change coordination units in different ministries, departments and agencies to ensure that climate change is mainstreamed in the different sectors of the economy. NEMA is a National Implementing Entity (NIE) for the Adaptation Fund and the Green Climate Fund (GCF). The National Treasury is the National Designated Authority for the GCF. The NDMA oversees adaptation and resilience building in the ASALs.

The GoK has developed various climate change tools to steer climate change response including and not limited to the National Climate Change Action Plan (Government of Kenya, 2013b), NDC submitted to UNFCCC in 2016 and the National Adaptation Plan (Government of Kenya, 2016). The issue arises with inadequate knowledge and ability to implement these adaptation strategies as well as insufficient staff capacity. Available funding and investments for continuous implementation, assessment and maintenance of the strategies poses an issue. WRA does not have a department or desk to specifically address climate change issues, rather climate change is blended into programme and project activities on a case by case basis.

3.2.8.2 Land

Agricultural extension services in Kenya date back to the early 1900s. Extension services refer to a systematic process of working with producers or communities to help them acquire relevant and useful agriculture or related knowledge and skills to increase farm productivity, competitiveness and sustainability (Agriculture and Food Authority, 2017). This extension service is critical in achieving the transformation in smallholder agriculture to an innovative, commercially oriented and modern agriculture that addresses the socio-economic issues in communities.

Various Directorates under the Agriculture, Fisheries and Food Authority (AFFA) provide technical input and advice to County Governments. The Authority also conducts farmers' training programs aimed at

increasing their knowledge on production technologies and prospects for various types of crops, through farmer training institutions. Extension officers are involved in on the ground catchment management activities, particularly for smallholder farmers. These smallholder farmers are most at risk to the impacts of climate change and infertile soils. Conservation agriculture has been promoted as a sustainable alternative for farmers to address the problem of declining soil fertility and provide the dual benefit of enhanced food production and adaptation/resilience to changing climatic conditions (Agriculture and Food Authority, 2017).

Technical advisory services are also offered by the NIB to smallholder farmers, in collaboration with county governments and other organisations. Other players that strengthen extension services include the private sector, NGOs, civil society and community-based and faith-based organizations. Numerous public institutions, such as universities, colleges and farmer and pastoral centres, as well as private institutions provide additional training and capacity building.

Land and water is also important to pastoralists, although the importance of the resource is linked to treating it as common property freely available for all with livestock (Levine & Pavanello, 2012). The management of natural resources is thus inseparable from the management of relationships between the pastoralist clans and ethnic groups. Pastoralists move their herds in seasonal patterns, according to the conditions of each year. This movement is managed to maintain the right balance of species in the best possible condition over the long term through careful control of grazing (Levine & Pavanello, 2012). Management requires a set of rules and requires the right institutional framework. This is mainly set by groups of elders, who constitute customary authorities.

Inadequate management and regulation of the rangelands has resulted in pastoral activities that are incompatible with the capacity of the land, such as overgrazing, which results in vegetation loss and soil erosion. Since 2013, Counties are given mandate to independently plan their land, however this has created siloed planning and has led to loss of coordination regarding the management of natural resources such as wildlife and water. Given the boundless nature of water, there is need for policy action to ensure integration of planning and decision-making at a trans-county level.

An analysis conducted by OCHA Kenya stated that there were over 112 deaths due to conflict of resources in pastoralist areas between January and May of 2011. Compared to the 68 deaths during the same period in 2010, this indicated an increase in deaths due to conflict.

Soil conservation as a component of conservation agriculture practices is critical from an agriculture/water resources management perspective. A new policy framework on Soil Management in Kenya, compiled by the MoALF, is currently in Final Draft form and will soon be in place.

The key institutions involved with soil management in Kenya include the MoALF, the National Agricultural Soil Management Agency (to be established with the mandate of overseeing and regulating the nations' soils' resource use and management), KALRO, Universities and other institutions of higher learning, AFFA, KEPHIS, MENR, NEMA, KEBS, Radiation Board and the NLC.

Overall there is a need to upgrade existing laboratory facilities as well as construct new facilities at ROs and SROs in order to improve operational efficiency of the WRA. For example, the WRA laboratory facilities in Murang'a SRO are not equipped to analyse certain parameters regarding water quality such as Total Suspended Solids (TSS).

Partnerships are very important for different categories of users within the basins. Initial discussions with WRA indicate that there are a few partnerships in place, majority being nationwide partnerships with key strategic partners whose focus is nationwide. Given the strategic need to have more localised partnerships e.g. with industries in the basins etc., more effort needs to be vested in ensuring this becomes a reality. This is particularly needed as some of the potential partners have already entered into agreements with other players on the ground such as KFS, NEMA, Kenya Water Towers Agency (KWTA), NGOs etc.

3.2.8.3 Environment and Forestry

The mandate of the MoEF is to protect, conserve and manage the environment and natural resources for socio-economic development. This is achieved through various departments and divisions; and government agencies, i.e. the National Environment Management Authority (NEMA); Kenya Water Towers Agency (KWTA) and Kenya Forest Service (KFS).

At the local scale NEMA has Environmental Committees who provide technical support for environmental management and provide input to CIDPs through the County Field Offices.

The KWTA looks after Kenya's water towers. The Forest Management and Conservation division under the KFS is charged with the management and conservation of the natural forests in Kenya, of which most form water towers. Strategic outputs involve increasing percentage cover through tree planting and gazetting new forests; as well as improving livelihoods. The Division includes forest biodiversity conservation, participatory forest management and fire management, natural forest management, licencing and eco-tourism.

The KFS Forest Farm and Dryland Forestry program provides technical support to the Counties, advisory services for forest management, promoting biomass energy development and utilization, promote dryland forest conservation and promote participatory forest extension methodologies including farmer field schools. Issues in the forestry sector are weak institutions arising from weak governance structures and inadequate capacity for law enforcement and weak stakeholder participation in forest management and governance. This is exacerbated by inadequate funding of the forestry sector from the exchequer, civil and public sectors. Since the enactment of the new Constitution in 2010, nationally and within the basin, the level of public support to the conservation of forests has increased significantly but has not been matched by an equal measure of resource allocation in all sectors. For example, the Forest Management and Conservation Fund (FMCF) established in the Forests Act 2005 and the Forest Management and Conservation Act No.34 2016 (The Forest Conservation and Management Act, 2016) to promote the development of forests, maintenance and conservation of indigenous forests, the promotion of commercial forest plantation, provision of forest extension services, the establishment of arboreta and botanical gardens, and a variety of other purposes outlined in Forest Act is yet to be fully operationalised. Furthermore, there are conflicting institutional mandates as is evident from the overlapping mandates, programmes, projects, and conflicting policies and legislation. Overall, forest conservation has witnessed increased cases of political interference in the management of forests, poor governance as well as inadequate and/or weak structural/institutional capacity for forest law enforcement and governance.

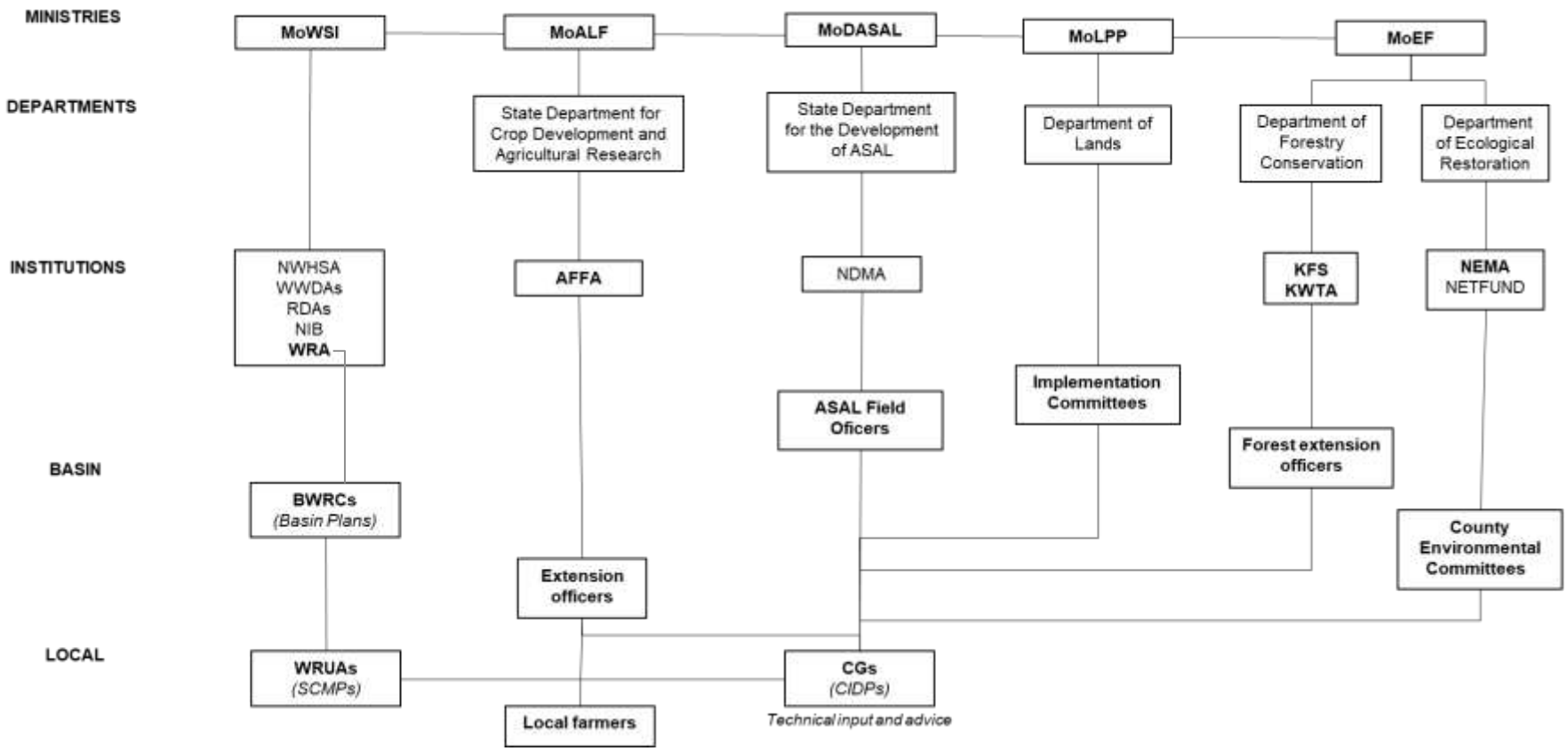

Figure 3-2: Key institutions involved in the forestry, land use and catchment management sectors in Kenya

3.3 Existing Planning

3.3.1 Water resources management and development

3.3.1.1 National Water Master Plan

The NWMP 2030 was completed in 2013 and covers all six river basins in Kenya. For each basin, the NWMP 2030 provides information related to water resources, water demands, high level water allocations, economic evaluations of proposed interventions and implementation programmes. In addition, the NWMP 2030 presents development plans related to water supply, sanitation, irrigation, hydropower and water resources. The aim of the plan was to form a framework for the development and management of Kenya's water resources in line with the country's social and economic development goals. The specific objectives of the NWMP 2030 were set based on the National Water Policy 1999, as well as the targets identified in the Kenya Vision 2030. The NWMP 2030 includes nine Sectoral Development Plans covering different sectors.

3.3.1.2 Catchment Management Strategies (2015 – 2022)

Each of the six basins have a Catchment Management Strategy (CMS) for the period 2015-2022. The CMS provides a vision and framework for the management of water resources and related land resources in the basins and outlines how the concept of integrated water resources management should be implemented at catchment level. It proposed water resources and related strategies for:

- **Protection of the right to water:** Management approaches; Water balance and demand management; Water allocation and use management
- **Water resource protection:** Water resource protection; Catchment protection and conservation
- **Resource augmentation adaptation and development:** Flood and drought management; Climate change adaptation; Water resources infrastructure development; Rights based approach; Livelihoods enhancement
- **Implementation, information management and financing:** Institutional strengthening; Monitoring and management; Financing and implementation

Strategic activities relating to agriculture fall under the catchment protection and conservation strategy and include promotion of productive and sustainable agricultural practices and harmonization of programmes in rehabilitation of land use, agriculture, forests, wildlife and settlement.

3.3.1.3 Sub-catchment management plans

WRA has delineated Kenya into 1 237 sub-catchment areas with the intention of forming WRUAs for each. These WRUAs are at varying stages of development across the country (

Table 3-4). The sub catchment management plan (SCMP) is a planning tool that is developed by the WRUAs under regulation by the WRA. Its main objective is to guide the implementation of water resources management and regulation activities within a defined period of time in any given sub catchment. The activities, in most cases, relate to catchment protection, pollution control and water infrastructure development. Being the lowest planning tool developed to implement the National Water Master Plan and the basin area plan, it is directly held in the custody of the WRUAs who are in charge of its implementation. The plan is a resource mobilization tool that the WRUA uses to source for implementation funds and other resources.

The constitution 2010, Fourth Schedule Part 2, section 10, outlines water resource management as a function of the county government. This devolvement of the conservation role to the counties creates a

direct linkage between the SCMP and the County Integrated Development Plan (CIDP). The county sets aside funds for the management of catchments that are absorbed through the implementation of SCMP or directly through CIDP identified activities. The regulation of the process to ensure the catchments are well protected and the harmony of the two planning perspectives rests with the Authority.

The six Basin Plans have been used as a reference document in the preparation of the SCMPs. As SCMPs are the resource mobilization tool for the WRUAs, these will have an impact on the land and water resources within protected areas and tourist destinations.

Table 3-4: Stages of formation of WRUAs and number of SCMPs developed

	Athi	Tana	LVS	LVN	RV	ENN
No. sub-catchments	309	240	137	106	175	270
WRUA formed	150	170	106	94	83	92
SCMPs developed	53	77	46	34	48	50

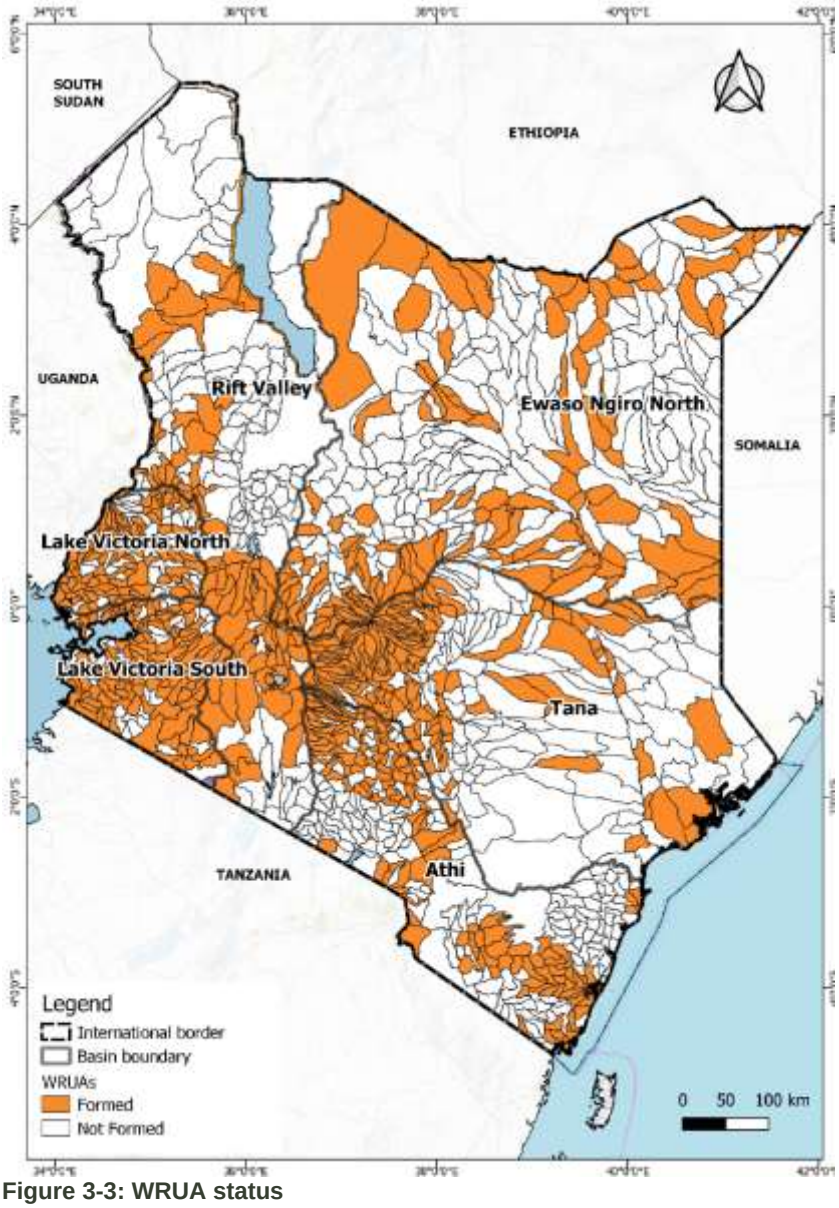

Figure 3-3: WRUA status

3.3.1.4 Regional development plans

The regional bodies within the six basins (Table 3-5) are responsible for development activities within their respective areas of jurisdiction. The development plans of these regional bodies will need to be updated with the proposed development options from the National Plan and will need to consider forestry, land use and catchment management as critical measures to ensure the sustainability of the proposed developments.

Table 3-5: Regional development bodies

Basin	Development Authority
Athi	Tana and Athi River Development Authority (TARDA)
	Coast Development Authority (CDA)
Tana	Tana and Athi River Development Authority (TARDA)
	Coast Development Authority (CDA)
LVS	Lake Basin Development Authority (LBDA)
LVN	Lake Basin Development Authority (LBDA)
RV	Kerio Valley Development Authority (KVDA)
	Ewaso Ng'iro South Basin Development Authority (ENSDA)
ENN	ENN River Basin Development Authority (ENNDA)

3.3.1.5 Projects planned by Water Works Development Agencies

Following the enactment of the Water Act 2016, Water Services Boards (WSBs) have transformed into Water Works Development Agencies (WWDAs).The WWDAs have ongoing and proposed projects that vary from rehabilitation of water supply schemes, extension of service lines, construction of storage tanks and drilling and equipping of boreholes in all the counties, to major dam and water resource projects. The projects planned by WWDAs will need to be updated with the proposed development options from the Basin Plans.

Table 3-6: Water Works Development Agencies

Basin	Development Agency
Athi	Athi Water Works Development Agency (AWWDA)
	Tanathi Water Works Development Agency (Tanathi WWDA)
	Coast Water Works Development Agency (CWWDA)
Tana	Tana Water Works Development Agency (Tana WWDA)
	Coast Water Works Development Agency (CWWDA)
	Northern Water Works Development Agency (NWWDA),
	Tanathi Water Works Development Agency (Tanathi WWDA)
LVS	Lake Victoria South Water Works Development Agency (LVSWWDA)
	Rift Valley Water Works Development Agency (RVWWDA)
LVN	Lake Victoria North Water Works Development Agency (LVNWWDA)
RV	Rift Valley Water Works Development Agency (RVWWDA)
ENN	Northern Water Works Development Agency (NWWDA)

3.3.1.6 Upper Tana-Nairobi Water Fund

The Nature Conservancy (TNC) has developed a business case for the Upper Tana-Nairobi Water Fund. Current partners and investors are: Nairobi City Water & Sewerage Company, Kenya Electricity Generating Company (KenGen), Pentair Inc, Coca Cola, East Africa Breweries Ltd, International Centre

for Tropical Agriculture (ICTA), Global Environment Facility (GEF), The Government of Kenya, Water Resources Management Authority (WRMA), Tana & Athi Rivers Development Authority (TARDA), International Fund for Agriculture (IFAD) and Frigoken Kenya Ltd. The fund's business case showed that a $10 million USD investment in water fund-led conservation interventions is likely to return $21.5 million USD in economic benefits over a 30-year timeframe.

3.3.2 Land management and development

3.3.2.1 Agricultural Sector Development Strategy (2010-2020)

The Agricultural Sector Development Strategy (ASDS) (Government of Kenya, 2010a) is the overall national policy document for the sector ministries and all stakeholders in Kenya. The overall development and growth of the sector is anchored in two strategic thrusts: increasing productivity, commercialization and competitiveness of agricultural commodities and enterprises; and developing and managing key factors of production. This will require support from enabling sectors such as the water and environmental sector. Strategic objectives include the need to rehabilitate and protect water catchments due to issues such as increased runoff, flash floods, reduced infiltration, erosion and siltation, and limited water resource base. Improved water security will also assist in achieving the overall goal of increased agricultural productivity.

3.3.2.2 SDDA Strategic Plan (2018-2022)

The SDDA Strategic Plan (ref) focuses on four key areas: coordination of development in ASALS, resilience building, social and cultural integration and governance. Lessons learnt from the previous planning period (2013-2017) were the need to strengthen collaboration mechanisms to support coordination of activities in the ASALS and the need for a coordinated multi-sectoral approach to implementation of development programmes in the ASALS for maximum benefit to the communities.

3.3.2.3 Kenya Climate Smart Agriculture Strategy (2017-2026) and Implementation Framework (2018-2027)

The Kenya Climate Smart Agriculture Strategy is based on the fact that the changes in climate and weather patterns will expose the rain-fed farming systems, especially the arid and semi-arid lands, to more climate related vulnerabilities. This will predispose farming communities to food insecurity and poverty through loss of the productive assets and the weakening of coping strategies and resilience. On the other hand, the agriculture sector contributes to the climate change problem through emissions arising from inefficiencies in crop, livestock, fisheries and forestry production systems. These inefficiencies lead to greater levels of enteric fermentation in livestock, poor manure and agro-based waste management systems, improper land preparation systems, inefficient input and resource use in crop management systems as well as inefficiencies that raise emissions from agro-based machinery. Innovative and transformative measures are therefore urgently required to assist stakeholders in the sector across the agricultural value chains to cope with effects of current and projected change in climate patterns. Climate smart agriculture (CSA) has been identified as a viable approach to provide solutions towards increased agriculture sector productivity while addressing impacts of changing climate. CSA involves farming techniques which are meant to reduce water supply needs and increase resilience to changes in rainfall.

3.3.2.4 Agricultural Sector Transformation and Growth Strategy (ASTGS) and National Agriculture Investment Plan (2019-2024)

Kenya's National Agriculture Investment Plan (NAIP) for 2019-2024 is the five-year investment plan accompanying the country's 10-year Agriculture Sector Transformation and Growth Strategy (ASTGS). The NAIP is designed to accelerate Kenya's agricultural transformation in alignment with the Big Four

Presidential Agenda, Comprehensive Africa Agriculture Development Programme (CAADP), the United Nations Sustainable Development Goals (SDGs) and Kenya's Medium-Term Plan III. The ASTGS introduces nine flagships under three anchors and enablers. Those linked to the water sector are as follows:

- Anchor 2 – Increase agricultural output and value addition
  - FLAGSHIP 4: Unlock 50 new large-scale private farms (bigger than 2,500 acres) and sustainable water supply for more than 150,000 acres of irrigation from existing infrastructure
- Anchor 3 – Boost household food resilience
  - FLAGSHIP 6: Boost the food resilience of 1.2 million farming and pastoralist households in arid and semi-arid lands (ASALs) through community-driven intervention design
- Enablers
  - FLAGSHIP 9: Monitor two key food system risks - those addressing sustainability and climate, and a second category for crisis management for pests, diseases and global price shocks

3.3.3 Forestry management and development

3.3.3.1 National Forestry Programme (2016-2030)

According to the National Forestry Programme (2016-2030) most of the forest land in Kenya is under community and private ownership while 23% is public. As forestry is a devolved function, county governments have the responsibility of implementing specific national government policies on natural resources and environmental conservation. Counties therefore have a shared responsibility in meeting the national target of 10% forest cover and are expected to raise their current individual forest cover. The relevant programmes under the NFP (2016) are under the theme "Forests for water" and involve watershed conservation and management and soil conservation and management. These will be implemented with lead agencies and key stakeholders.

3.3.3.2 KFS Strategic Plan (2017-2022)

According to the KFS Strategic Plan (2017-2022) the KFS flagship projects involve rehabilitation of water towers (i.e. Mau Escarpment, Mt. Kenya, Aberdare Ranges, Cherangany Hills and Mt. Elgon) and management of water catchments; conservation and management of mangroves forests; farmland and dry land tree-planting initiative; forest plantation development; forest protection and security programme; promotion of bamboo establishment and utilization; and control of invasive species. Tree planting is being promoted in order to realise the 10% forest and tree cover increase by 2030 and promotes commercial tree species in ASALs in order to control desertification and improve livelihoods.

The Forest Management and Conservation division under the KFS is charged with the management and conservation of the natural forests in Kenya, of which most form water towers. Strategic outputs involve increasing percentage cover through tree planting and gazetting new forests; as well as improving livelihoods. The Division includes forest biodiversity conservation, participatory forest management and fire management, natural forest management, licencing and eco-tourism.

3.3.3.3 NEMA strategic plan (2019-2024)

The NEMA strategic plan provides a situational analysis of the previous strategic plan and outlines future objectives and strategies. The objective of promoting a sustainable blue economy and promoting green and circular economy will require cooperation with the agriculture and water sectors. Key challenges with the previous strategic plan period (2013-2018) were inadequate funding, low implementation of the devolved environmental functions, overlap in mandates with lead agencies and poor land use planning.

3.3.3.4 Adaptation Plan (2015-2030)

The Kenya National Adaptation Plan (NAP) (GoK, 2016) provides a background of Kenya's national circumstances, including socio-economic circumstances; and future climate scenarios that the country needs to consider in decision making, planning and budgetary processes. A vulnerability analysis is also presented against the identified hazards in the NCCAP, namely drought, floods, and sea level rise. It proposes macro-level adaptation actions and sub-actions in 20 planning sectors (including agriculture), categorising them into short-, medium- and long-term time frames. For each sector, the NAP identifies gaps, estimates costs of the macro-level actions projected to 2030, and identifies key institutions required for their implementation. It also proposes adaptation indicators at county, sectoral and national levels for monitoring and evaluation (M&E).

3.3.3.5 National Climate Change Action Plan and National Adaptation Plan (2018-2022)

The Kenya National Climate Change Action Plan (NCCAP) (GoK, 2013) framework is highly relevant to the link between agriculture and water resources planning and management. Climate change is a major risk enhancer in relation to water security and agriculture. The NCCAP supports efforts towards the implementation of the Kenya Constitution 2010 and the attainment of Vision 2030. It addresses the enabling aspects of finance, policy and legislation, knowledge management, capacity development, technology requirements and monitoring and reporting. The comprehensive NCCAP document is supported by almost sixty technical reports developed by teams of international consultants guided by Kenya based thematic working groups and under the oversight of a multi-sectoral multi-stakeholder taskforce.

3.3.3.6 Forest and landscape restoration programmes

Forest restoration has been made a high priority on the GoK's agenda, and this is reflected in a number of different legislations and policies. From a number of initiatives, it is clear that Kenya has a strong commitment to landscape restoration and has been putting in place the building blocks for improving its tree cover and restoring its landscapes and associated ecosystem services: Several high-level initiatives and laws have been put in place that are strongly linked to restoring lands. These include:

- The 2010 Constitution calls for reforesting and maintaining a tree cover of at least 10% of the country.
- The National Climate Change Response Strategy calls for growing 7.6 billion trees on 4.1 million hectares of land during the next 20 years.
- Kenya's Vision 2030 has a flagship project underway for rehabilitating and protecting indigenous forests in the five water towers (Mount Kenya, the Aberdare Range, the Mau Forest Complex, Mount Elgon and the Cherangani Hills), with the goal to increase forest cover and volume of water flowing from the catchment areas.
- The Trees-for-Jobs Programme intends to plant one billion trees to increase forest cover and at the same time create employment for youth.

In addition to these initiatives, Kenya is also involved with REDD+ Readiness Preparation. One of the priority topics in the national REDD+ Readiness process is based on the enhancement of forest carbon stocks and proposes several strategy options to restore forests, including providing support to the GoK's target for reforesting and maintaining a tree cover of at least 10% of the country.

To help reach set targets, the GoK in September 2014 established a multi-stakeholder Technical Working Group led by the KFS to carry out this assessment of the country's forest and landscape restoration opportunities (MENR, 2016a). The Landscape Restoration Technical Working Group (LRTWG) includes a large number of stakeholders from multiple sectors. Over the subsequent two years, the LRTWG held a series of landscape restoration workshops that focused on analysing different

landscape restoration options for the country and identified the most pressing land use challenges currently affecting Kenya.

A list of restoration options was identified that could help address these challenges and restore the ecosystem services that are currently lacking. The various landscape restoration options identified include:

- Reforestation and rehabilitation of degraded natural forests
- Agroforestry and woodlots on cropland
- Commercial tree and bamboo plantations
- Tree-based buffers along waterways, wetlands and roads
- Silvopastoral and rangeland restoration
- Afforestation in community grounds e.g. markets schools, etc

The LRTWG was additionally tasked with mapping and quantifying where these different restoration options could potentially be implemented in order to help inform a national restoration target that will contribute to the many national priorities. Through extensive work and stakeholder engagement, the LRTWG produced several maps indicating potential areas for landscape restoration. Maps have been made available to the public through an interactive website and allows users to explore these opportunities (MENR, 2016a; KFS, 2017a).

Based on the results of a spatial analysis, the LRTWG suggested a phased approach for meeting national restoration commitments. A proportion of the restoration opportunity areas were to be targeted for a 2030 timeline, and the remaining areas would be restored in the future. Three scenarios were analysed, which represent different proportions of each restoration option to be implemented by 2030.

Table 3-7 presents the ‘Conservative Scenario’, for which a relatively low proportion of each restoration option would be implemented by 2030. The final target of 5.1 million ha for the ‘Conservative Scenario’, would increase Kenya’s total tree cover by 9%, bringing the total tree cover of the country above the 10% constitutional mandate.

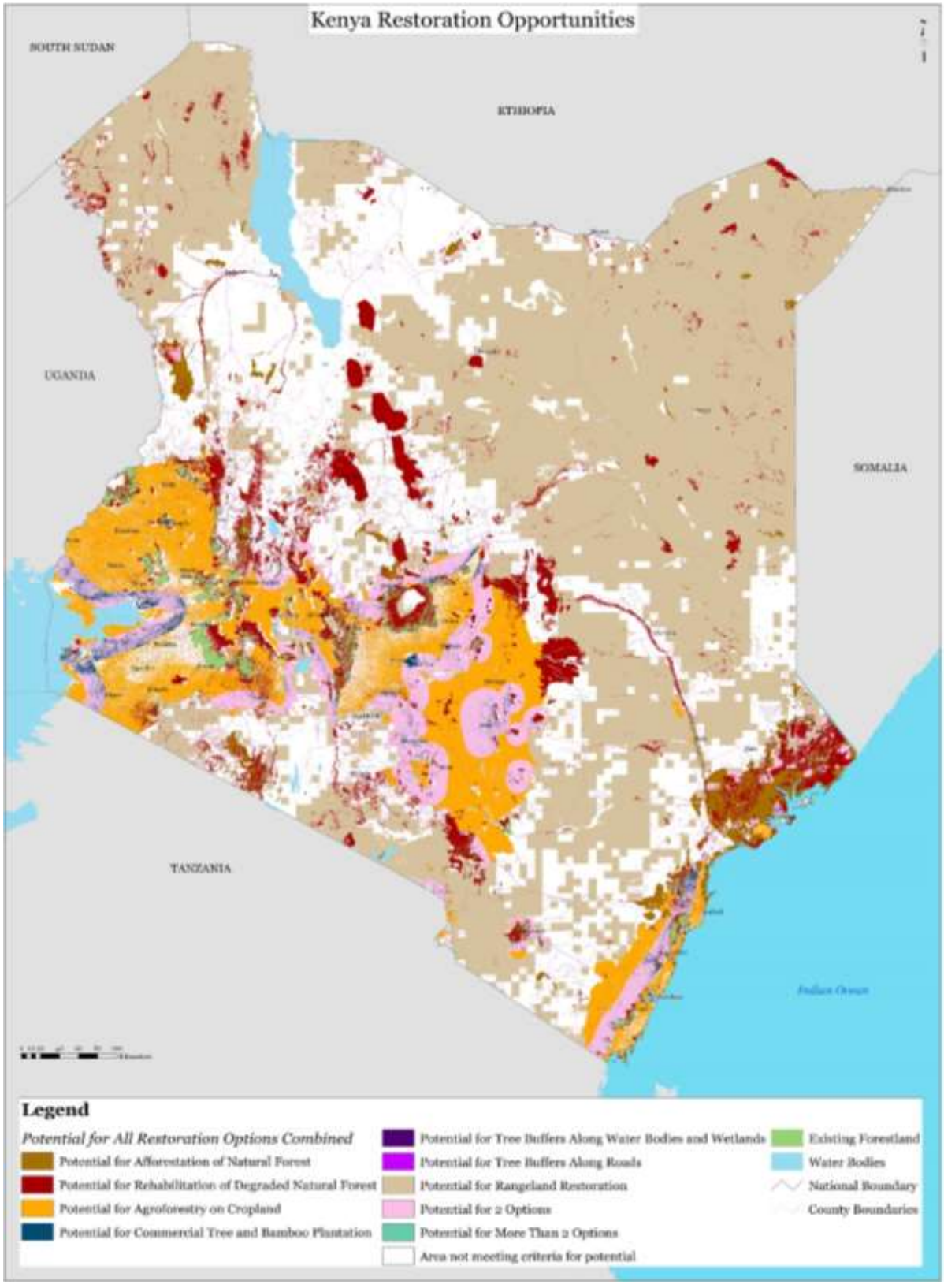

Figure 3-4: Kenya Forest Restoration Options (Source: KFS, 2017a)

Table 3-7: LRTWG suggested phased approach for meeting national restoration commitments

CONSERVATIVE SCENARIO

RESTORATION OPPORTUNITY	TOTAL AREA (MILLION HA)	RESTORATION POTENTIAL (MILLION HA)	PROPORTION IMPLEMENTED BY 2030	TOTAL RESTORATION TARGET FOR 2030 (MILLION HA)
Forest Lands	**4**	**5.2**		**1.0**
Afforestation/reforestation of natural forests and tree-based ecosystems		1.3	10%	0.1
Rehabilitation of degraded natural forests		3.5	20%	0.7
Buffer zones along water bodies and wetlands		0.1	50%	0.1
Commercial tree and bamboo plantations in unstocked forests		0.3	25%	0.1
Croplands	**9.9**	**7.6**		**2.1**
Farm forestry with less than 10% tree cover		2.7	50%	1.4
Farm forestry with tree cover between 10% and 30%		2.2	20%	0.4
Commercial tree and bamboo plantations or agroforests on cropland		2.7	10%	0.3
Rangelands	**42.6**	**25.7**		**1.9**
Silvo-pastoral and grasslands restoration		25.7	7.5%	1.9
Roads		**0.3**		**0.2**
Tree buffers along roads		0.3	50%	0.2
Other (Wetlands, Settlements, Barelands)	**2.7**	**n/a**	**n/a**	**n/a**
TOTAL	59.2	38.8		5.1

Source: (MENR, 2016a)

3.3.4 County integrated development plans

County Integrated Development Plans (CIDPs) are prepared every five years by counties as a road map for development. The plan touches on all sectors devolved to county governments, providing a plan towards improvement. Catchment protection and water and sanitation services are devolved functions and as such feature in all CIDPs. A review of the CIDPs showed that planned activities related to natural resources include forest and riparian area restoration and catchment restoration. The key development aspects of each CIDP which are relevant to natural resources in the counties are briefly described in Table 3-8.

Table 3-8: Key aspects of the CIDPs in relation to forestry, land use and catchment management

Basin	County	Natural Resources
Athi	Kiambu CIDP (2018-2022)	Programmes include promoting a clean environment through county environmental monitoring and management, enabling policy, solid waste management and environmental education. To increase forest cover and for sustainable management of natural resources programmes include forest conservation and management to increase forest cover to 20%, map cover, relocate people, wildlife conservation and security, reclaiming quarry sites.
	Nairobi CIDP (2018-2022)	Proposed strategies include fencing National Parks, a river rehabilitation programme, legal and policy enforcement, tourism promotion and a reforestation and afforestation programme. New projects include riparian, wildlife and migratory management plans.
	Machakos CIDP (2018-2022)	Programmes include enabling policy, catchment rehabilitation, tree planting, alternative energy sources, awareness on rain water harvesting, rehabilitation of degraded rivers, solid waste management.
	Kajiado CIDP (2018-2022)	Programmes include policy development, climate change training, solid waste and pollution control, forest and riparian area restoration and rehabilitation of quarries.
	Makueni CIDP (2018-2022)	The county views natural resources as natural assets for economic production or consumption. Sustainable management of these resources involve mineral mapping and development, environmental conservation and enhanced tourism infrastructure development.
	Taita Taveta CIDP (2013-2017)	Taita Taveta has lakes, rivers, springs, wetlands, forests, wildlife and minerals on which multiple sectors are dependent. Water levels in lakes are fluctuating, water quality of lakes, rivers and wetlands is deteriorating, and riparian areas, wetlands and forests are being encroached on. The county intends to follow best practices for Integrated Watershed Management and eco-tourism and alternative tree farming is being promoted.
	Kwale CIDP (2013-2017)	Programmes include developing a mineral resources map, gazette mineral deposits, land accessions, enabling policy for environmental protection, environmental education, demarcation of protected areas, develop tree growers' initiatives, rehabilitate degraded land.
	Kilifi CIDP (2018-2022)	Programmes include improved governance, forest resource conservation and management, wildlife and sensitive ecosystem conservation and waste management. A flagship project is the water to energy project.
	Mombasa CIDP (2018-2022)	Natural resources are overutilized and degraded. Programmes to improve this are development of disposal sites and waste management equipment, rehabilitation of quarries, management of hazardous waste and improved governance.
Tana	Nyeri CIDP (2018-2022)	Programmes include environmental protection and conservation (i.e. reforestation).
	Murang'a CIDP (2018-2022)	Programmes include environmental management and protection (i.e. solid waste management, noise and air pollution control), natural resources conservation and management (i.e. forest conservation, water and catchment area protection) and climate change resilience.
	Kiambu CIDP (2018-2022)	Programmes include promoting a clean environment through county environmental monitoring and management, enabling policy, solid waste management and environmental education. To increase forest cover and for sustainable management of natural resources programmes include forest conservation and management to increase forest cover to 20%, map cover, relocate people, wildlife conservation and security, reclaiming quarry sites.

Basin	County	Natural Resources
	Kirinyaga CIDP (2018-2022)	Programmes include solid waste management.
	Embu CIDP (2018-2017)	Programmes include promotion of sustainable management and utilisation of natural resources through the preparation of environmental management plans for 2 sand harvesting societies and 2 quarrying societies and 1 mining societies annually and rehabilitation of disused quarries.
	Tharaka-Nithi CIDP (2018-2022)	Programmes include afforestation, solid waste disposal and management, climate change, natural resources exploration and exploitation. Flagship projects include establishing a Geographical Information System Laboratory.
	Meru CIDP (2018-2022)	Programmes include rehabilitation of catchment riparian areas, forest ecosystem management, freshwater and wetland ecosystem access availability, waste management and pollution control. Flagship projects include efforts to rehabilitate riparian areas by planting bamboo.
	Isiolo CIDP (2018-2022)	Programmes include climate change mitigation and adaptation, solid waste management, environmental conservation (i.e. enhancing ecosystem productivity and sustainability) and environmental conservation (i.e. reducing desertification).
	Garissa CIDP (2018-2022)	Programmes include environmental management systems, management, conservation and sustainable utilisation of forests, restoration of degraded sites and management of invasive species (i.e. *prosopis julifora*), promote sustainable exploitation of mineral resources, strengthening community conservancies and support of national reserves.
	Tana River CIDP (2018-2022)	Programmes include renewable energy, forest management and development, wildlife management, solid waste management, environmental laws and policies (i.e. enforcement and surveillance), and climate change mitigation.
	Kitui CIDP (2018-2022)	Programmes include waste management, environmental management and awareness, tree growing and forest conservation, climate change adaption and mitigation, water catchment conservation and rehabilitation.
	Machakos CIDP (2018-2022)	Programmes include enabling policy, catchment rehabilitation, tree planting, alternative energy sources, awareness on rain water harvesting, rehabilitation of degraded rivers, solid waste management.
	Kilifi CIDP (2018-2022)	Programmes include improved governance, forest resource conservation and management, wildlife and sensitive ecosystem conservation and waste management. A flagship project is the water to energy project.
	Lamu CIDP (2018-2022)	Programmes include pollution control and regulation (i.e. noise and air pollution, surface, ground and sea water pollution control), natural resources conservation and management.
	Nyeri CIDP (2018-2022)	Programmes include environmental protection and conservation (i.e. reforestation).
LVS	Kisumu CIDP (2018-2022)	Programmes include solid waste management, afforestation initiatives, conservation and rehabilitation of degraded landscapes, noise and air pollution control, strengthening environmental governance, climate change mitigation and adaptation, promoting renewable energy.
	Kericho CIDP (2018-2022)	Programmes include solid waste management, environmental management and protection (i.e. safe removal and disposal of asbestos, waste water management, sustainable forest management.

Basin	County	Natural Resources
	Vihiga CIDP (2018-2022)	Programmes include protection and restoration of indigenous trees, soil management, climate change adaptation and mitigation and the reclamation of degraded land.
	Siaya CIDP (2018-2022)	Considerable environmental degradation has taken place in the county, particularly in Lake Victoria. Water levels have reduced, and soil erosion is taking place, resulting in the silting up of wetlands, dams and water pans. Additionally, river banks, arable farmland and forests have been destroyed. This has resulted in the decline in agricultural and fisheries production in the county. The CIDP aims to promote environmental conservation and embrace measures to green the economy.
	Kisii CIDP (2018-2022)	Programmes include spring protection, energy services (i.e. biogas promotion, energy savings Jikos), environmental management (i.e. rehabilitation services, recreational services, river cleaning services, afforestation services, land reclamation, solid waste management, climate change mitigation, natural resources management).
	Nyamira CIDP (2018-2022)	Programmes include land use management and soil fertility, spring protection, environmental protection (i.e. solid waste management and afforestation).
	Homa Bay CIDP (2018-2022)	Programmes include environmental protection and natural resources management services (i.e. waste management services, afforestation, climate change adaption services).
	Migori CIDP (2018-2022)	Programmes include solid waste management, disaster management (i.e. drought and flood management, fire response services), afforestation, climate change adaption and mitigation and energy services (i.e. the expansion of Gogo Dam for hydropower). Flagship projects include the County Afforestation Programme.
	Nandi CIDP (2018-2022)	The county intends to create policies to protect the environment. Environmentally sensitive areas will be mapped, and development of these areas will be prohibited. Degraded wetlands and river banks will be restored. Communities will be sensitised and made aware of these areas. Public open spaces that have been 'land grabbed' will be repossessed and developed. Sustainable liquid and solid waste disposal systems will be promoted. All buildings will meet energy efficient criteria (solar heating systems and roof water harvesting), and other forms of green energy will be encouraged. Climate change considerations will be included in all county policies and plans.
	Bomet CIDP (2018-2022)	Programmes include environmental conservation and natural resources management (i.e. soil and water conservation, riparian protection, forestry management, solid waste management, environmental education and awareness). Flagship projects include the rehabilitation of Chepalungu Forest.
	Narok CIDP (2018-2022)	Programmes include afforestation and climate change mitigation and adaptation.
	Nakuru CIDP (2018-2022)	Programmes include pollution control, solid waste management, climate change management, regulation and protection of riparian land, environmental resource management and promotion of renewable energy sources.
LVN	Bungoma CIDP (2018-2022)	Sector priorities are to increase agricultural production and productivity; increase access to critical farm inputs (including access to water and irrigation), improve agricultural markets and value addition; and strengthen institutional capacity.

Basin	County	Natural Resources
	Busia CIDP (2018-2022)	Agriculture will be modernised by the development of Agriculture and Extension Policy; development of Land Use Policy; increasing investment in irrigation agriculture, crops and livestock diversification and the maintenance of indigenous genetic seed banks. Rain fed agriculture areas with growth potential were identified as Teso South, Teso North and Nambale. Areas of irrigated agriculture and livestock were identified as Samia, the Bunyala Matayos “Blue economy” and Bunyala.
	Kakamega CIDP (2018-2022)	Programmes include: improving agricultural extension services as well as research and training; promotion of climate smart agricultural practices; livestock development; increasing area of land under irrigation; increasing fish productivity and production; and increasing crop production and productivity;
	Trans Nzoia CIDP (2018-2022)	Programmes include land, soil and water conservation, promotion of climate smart agriculture, capacity building, increasing agricultural productivity and profitability, livestock productivity improvement including livestock disease control, promotion of fisheries, promotion of crop diversification, and the establishment of model farms and an Agricultural Training Centre.
	Uasin Gishu CIDP (2018-2022)	Investing in increased agricultural production and productivity will ensure food security and improved nutritional status for the residents of the county. Programmes to achieve this include increasing livestock, crop and fish production and by adding value to agricultural products. Extension services will be improved, post-harvest management will be supported through provision of adequate storage facilities and driers, farm inputs (e.g. seeds, fertilizers and artificial insemination) will be subsidised, especially for small scale farmers, livestock disease will be controlled, irrigation and greenhouse farming will be initiated, agriculture will be mechanized, and fish farming will be promoted.
	Nandi CIDP (2018-2022)	Agriculture is a vital source of income for households and the county; and is a priority for economic empowerment in the county. The goal for the sector is to increase food and nutritional security, commercialisation of agriculture, and effective and efficient marketing systems in the sector. This will be achieved through crop and livestock development, increased access to irrigation, soil and water conservation, and increased agricultural extension and training. Flagship projects planned for implementation throughout the county include the installation of a milk processing plant, a maize milling plant, a coffee milling plant, soil fertility management, poultry hatcheries and artificial insemination services and milk coolers. A category B slaughterhouse will be constructed at Kapsabet, heifer development and a seed multiplication centre will be established at Kaimosi and Kimwani, and the Kaimosi ATC will be revamped, and a seedling nursery, animal feed mill and a Farm Demonstration Unit will be established there.
	Siaya CIDP (2013-2017)	Programmes to improve and grow agriculture include expanding the extension services, increasing the land under irrigation, increasing the quality and quantity of farm produce, improving storage of farm produce, enhancing livestock disease control, improving access to markets, making fish stocks more sustainable, improving storage of harvested fish, making credit more available to farmers. Flagship projects applying to the whole county include subsidising farm inputs and implementing the multi strategic food reserve. Flagship projects located in Siaya are: a mechanisation project, and the modernisation of the Siaya Agricultural Training College.

Basin	County	Natural Resources
	Vihiga CIDP (2018-2022)	Programmes to improve agriculture include improving crop, livestock and fish production and productivity through increased support services, farmer inputs, marketing and value addition and post-harvest management; and the development of co-operatives. Flagship projects are: the upgrading of Mwitoko fish Farm in Luanda; banana value chain development and commercialisation; and county subsidies for farm inputs such as fertiliser and certified seeds.
	Elgeyo Marakwet CIDP (2018-2022)	Programmes include crop development, agricultural extension and training services, sustainable land management, irrigation, livestock development, trade and industry development, cooperative development, veterinary services, tourism development, and trade and industry development.
RV	Turkana CIDP (2013-2017)	Programmes include catchment conservation, soil and water conservation, afforestation, management of alien invasive species, renewable energy, mineral, oil and gas exploration.
	West Pokot CIDP (2018-2022)	Programmes include forest conservation and management, climate change adaption and mitigation, environmental and wildlife conservation and land reclamation.
	Marsabit CIDP (2018-2022)	Programmes include protection and restoration of water towers, soil management, climate change adaptation and mitigation, protection and conservation of forests, dryland and farm tree planting, promotion of alternative energy, protection of wildlife corridors and buffer zones and rangeland restoration.
	Baringo CIDP (2018-2022)	Programmes include environmental conservation and management (i.e. solid waste management, river bank, wetland and spring protection), natural resource conservation, exploitation and management (i.e. forest conservation, catchment protection, soil and water conservation, renewable energy development, mining and quarrying development, climate change adaptation and mitigation and wildlife conservation and management).
	Nakuru CIDP (2018-2022)	Programmes include pollution control, solid waste management, climate change management, regulation and protection of riparian land, environmental resource management and promotion of renewable energy sources.
	Narok CIDP (2018-2022)	Programmes include afforestation and climate change mitigation and adaptation.
	Kajiado CIDP (2018-2022)	Programmes include policy development, climate change training, solid waste and pollution control, forest and riparian area restoration and rehabilitation of quarries.
	Elgeyo Marakwet CIDP (2018-2022)	Programmes include sustainable land management and conservation of the environment, wetland conservation, conservation of water catchment areas, mainstreaming of climate change actions, tourism development, Rimoi National Reserve development, and culture and heritage preservation, promotion of alternative energy sources, and improved solid waste management.
	Nyandarua CIDP (2018-2022)	Programmes include establishing a county Environmental Committee, solid waste management, wastewater management and creating public awareness on environmental issues.

Basin	County	Natural Resources
	Samburu CIDP (2018-2022)	Programmes include solid waste management, water catchment protection and management (i.e. protection of riverine ecosystems along rivers and within Ndoto, Nyiri and Kirisia catchments, protection of key wetlands and springs), sustainable forest management, environmental planning and management. Sustainable land management is promoted through programmes such as rangelands management and soil conservation and management.
ENN	Laikipia CIDP (2018-2022)	Programmes include solid waste management, human-wildlife conflict prevention, natural resource management (i.e. enhanced ecological services), climate change mitigation and adaptation (i.e. policy and reforestation), integrated rangeland management, water development, environment and natural resources (i.e. climate smart technologies, rain water harvesting, green technologies).
	Samburu CIDP (2018-2022)	Programmes include solid waste management, water catchment protection and management (i.e. protection of riverine ecosystems along Ewaso Ng'iro River and within Ndoto, Nyiri and Kirisia catchments, protection of key wetlands and springs), sustainable forest management, environmental planning and management. Sustainable land management is promoted through programmes such as rangelands management and soil conservation and management.
	Marsabit CIDP (2018-2022)	Programmes include protection and restoration of water towers, soil management, climate change adaptation and mitigation, protection and conservation of forests, dryland and farm tree planting, promotion of alternative energy, protection of wildlife corridors and buffer zones and rangeland restoration.
	Meru CIDP (2018-2022)	Programmes include rehabilitation of catchment riparian areas, forest ecosystem management, freshwater and wetland ecosystem access availability, waste management and pollution control. Flagship projects include efforts to rehabilitate riparian areas by planting bamboo.
	Isiolo CIDP (2018-2022)	Programmes include climate change mitigation and adaptation, solid waste management, environmental conservation (i.e. enhancing ecosystem productivity and sustainability) and environmental conservation (i.e. reducing desertification).
	Garissa CIDP (2018-2022)	Programmes include environmental management systems, management, conservation and sustainable utilization of forests, restoration of degraded sites and management of invasive species (i.e. *prosopis julifora*), promote sustainable exploitation of mineral resources, strengthen community conservancies and support of national reserves.
	Wajir CIDP (2018-2022)	Programmes include climate change mitigation and adaptation (i.e. reforestation), environmental protection and conservation (i.e. reforestation, soil conservation and solid waste management). Flagship programmes include establishing a biogas plant at the county abattoir and a county-wide afforestation programme.
	Mandera CIDP (2018-2022)	Programmes include afforestation and climate change mitigation and adaptation

4 Key Strategic Areas

4.1 Introduction

To comprehensively and systematically address the range of water resources related issues and challenges in the basins and to unlock the value of water as it relates to socio-economic development, 10 Key Strategic Areas (KSAs) were formulated as part of each Basin Plan as presented in Table 4-1. The key aim of these KSAs is to provide a clear way forward for the integrated management and development of the water resources of the basins as a pathway towards a future which achieves a sustainable balance between utilisation and development of water resources and the protection of the natural environment, i.e. minimising environmental and social impacts and maximising socio-economic benefits, taking into consideration the availability of water.

Table 4-1: Key Strategic Areas and Objectives

Key Strategic Area		Strategic Objective
1	Catchment Management	To ensure integrated and sustainable water, land and natural resources management practices
2	Water Resources Protection	To protect and restore the quality and quantity of water resources of the basin using structural and non-structural measures
3	Groundwater Management	The integrated and rational management and development of groundwater resources.
4	Water Quality Management	Efficient and effective management of water quality to ensure that water user requirements are protected in order to promote sustainable socio-economic development in the basin
5	Climate Change Adaptation	To implement climate change mitigation measures in the water resources sector and to ensure water resource development and management are adapted and resilient to the effects of climate change.
6	Flood and Drought Management	To establish and guide a structured programme of actions aimed at ensuring the prevention of, mitigation of, timeous response to, and recovery from, the harmful impacts of floods and droughts across the Basin or specific catchment area.
7	Hydromet Monitoring	An operational and well-maintained hydromet network supported by effective and functional data management and information management systems
8	Water Resources Development	To develop water resources as a key driver for sustainable economic and social development
9	Strengthened Institutional frameworks	To achieve an appropriate balance between operational functionality and the need for effective oversight and governance.
10	Enabling environment	To enhance human and institutional capacities for sustainable management of the water, land, ecosystems and related resources

Strategies and themes which are relevant to the **forestry, land use and catchment management** sectors under each KSA are presented below. (The Basin Plans provide a comprehensive list of all themes and strategies under each KSA.)

Implementation Plans for the KSAs constitute the next step towards implementation of the strategies and themes under each KSA and are discussed in Section 5.

4.2 Catchment Management

4.2.1 Introduction

Water resources degradation is intimately linked to land degradation and influenced by various catchment management and land use factors. Implementing effective catchment management therefore requires a bigger picture perspective and an understanding of the role of natural resource use within a water resources context. People, animals and plants constitute those components of a catchment that make use of the physical resources of land and water. Misuse of these resource elements will therefore lead to unstable natural and social systems, often resulting in further land and water degradation. Integrated catchment management acknowledges the relationships between households, villages, communities and the broader catchment and envisages that individuals take ownership of their role in catchment management - as opposed to a top-down approach lead by legislation and regulations. This is the cornerstone of Integrated Water Resources Management. A key issue in many catchments in Kenya relates to the influence of population pressures on the existing landscape-biodiversity dynamics. With an increasing demand for natural resources and under the influence of historic-political and socio-economic drivers, the human footprint has pushed many natural systems beyond a stable threshold. Any disruption to the natural system impacts the human population, more so in rural areas where communities still live and work very closely to the natural environment.

The objective of Catchment Management is to enable communities, county governments and other relevant governing bodies and institutions to implement integrated catchment management interventions through increased knowledge. As water is the common link among resource users in a catchment, it is appropriate that the catchment is used as a planning unit for resource management. Integrated catchment management is aimed at deriving the greatest possible mix of sustainable benefits for future generations and the communities in a catchment, whilst protecting the natural resources upon which these communities rely. This approach seeks to maintain a balance between the competing pressures exerted by the need to maintain natural resources in the long-term, against the need for continuous economic growth and use of these resources.

4.2.2 Strategy

Catchment Management is important for the **forestry, land use and catchment management sectors**. In order to comprehensively and systematically address the Catchment Management issues and challenges in the basins, the table below presents specific Themes and Strategies under Catchment Management which are critical for the forestry, land use and catchment management sectors.

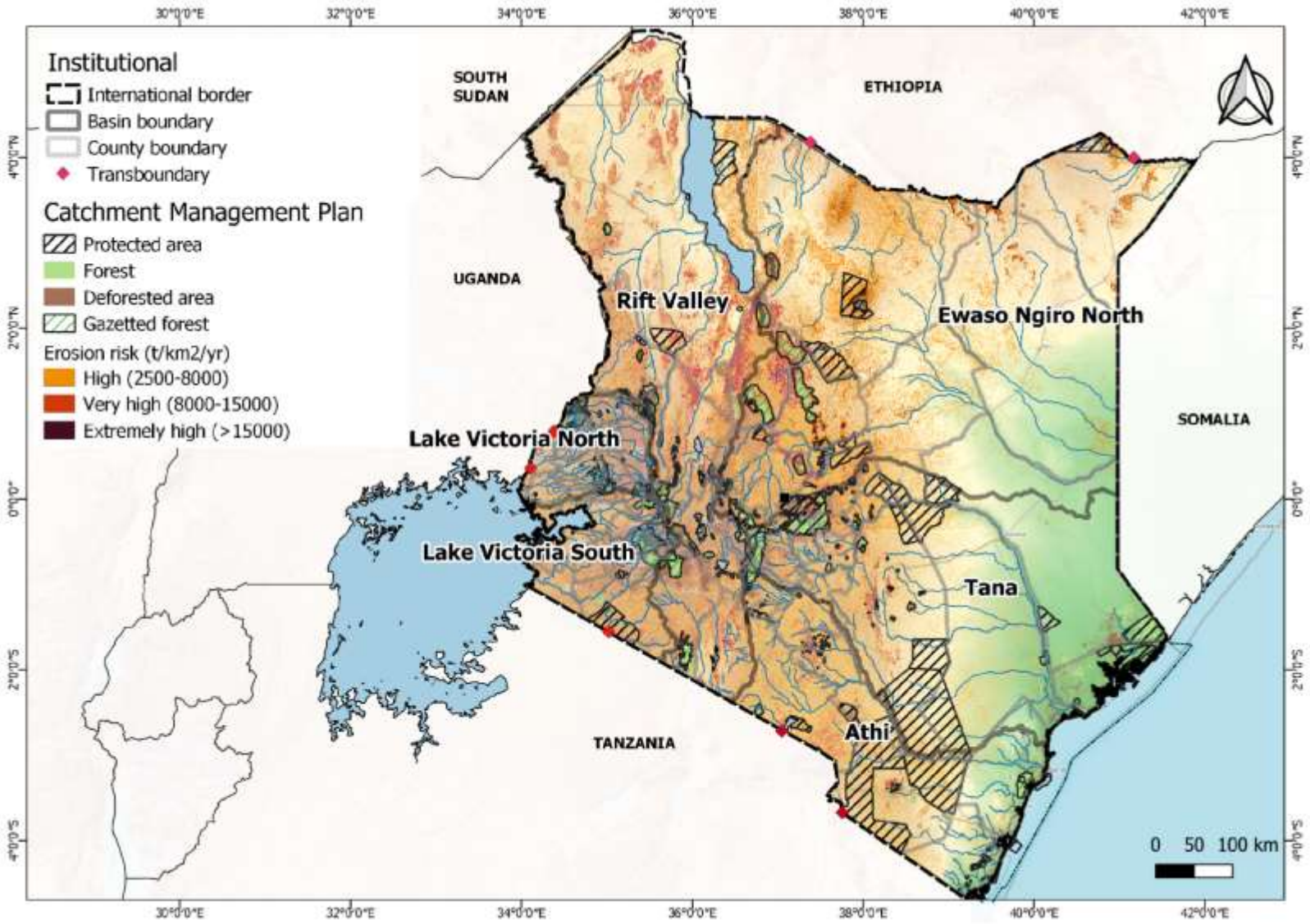

Figure 4-1: Catchment management considerations

Table 4-2: Strategic Framework - Catchment Management

1	**Key Strategic Area:**	**Catchment Management**
1.1	**Theme:**	**Promote improved and sustainable catchment management**
1.1.1	Promote sustainable land development and planning	
NEMA Environmental Sustainability Guidelines for Ministries, Departments and Agencies (MDAs) defines sustainability as meaning "meeting the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability is defined as not being an end goal, but rather a journey that MDAs should take to improve the social equity, environmental, and economic conditions in their jurisdiction. In order to reduce the degradation of land and water resources, a sustainable management approach must be implemented. It is important that resource management activities not only apply to new activities, but rehabilitation of degraded resources is critical in order to ensure sustainable management of ecosystem functions and availability of resources for future generations. Degradation of resources will continue if no action is implemented and resources will be further depleted. MDAs should explore the environmental issues within their operations, develop appropriate interventions and document the same in the form of an environmental sustainability policy.		
1.1.2	Strengthen participatory approaches	
The National Environment Policy (Government of Kenya, 2013a) guiding principles emphasises the inclusion of communities in decision making. These participatory approaches need to be strengthened for sustainable catchment management as communities are closely connected with resources in a catchment. Communities need to take ownership of catchment management activities, and this can be achieved through participatory processes through SCMPs, agricultural extension services and IDPs. The aim of SCMPs is to plan the activities of the sub-catchment in an efficient and sustainable manner to achieve optimum benefits for all in the sub-catchment, through making use of available resources in a sustainable and efficient manner. The process and purpose of a SCMP is to empower the people of the sub-catchment to make decisions and take responsibility for and promote the collective action for the rehabilitation, sustainable management and utilisation of their natural resources. The SCMP is developed by the community of the sub-catchment, for the community of the sub-catchment. The SCMP addresses the resources available to the village community and their needs. Agricultural extension officers and Farmers Field Schools from the AFFA need to be aware of the SCMPs and ensure that catchment management activities fit in with this plan. County Governments are also required to consider the SCMPs in the CIDPs. Appropriate catchment management activities should be considered from theme 1.2. to 1.4.		
1.2	**Theme:**	**Sustainable water and land use and management practices**
1.2.1	Promote water conservation and management at catchment level	
Water conservation and management is considered a priority throughout Kenya due to high water use and limited supply. Water is important for both urban use and agricultural use; therefore, water management and access to water are important. Access can be improved through community or household storage of water and through resource protection. Access to water is also improved through water efficiency and through recycling water. Temporal access to water is also important as the seasonality of water resources in various parts of Kenya lead to various outcomes, such as certain areas experiencing water scarce seasons and human/wildlife conflict as pastoralists move into National Parks in search of water. Water resource management has been identified as a strategic objective in most county IDPs, with strategies involving water harvesting, storage and treatment. Catchment management activities that can also be implemented to promote water conservation and management are as follows (Braid & Lodenkemper, 2019): **1. Water use efficiency and recycling** By improving water efficiency through suitable crop selection, proper irrigation scheduling, effective irrigation techniques, and using alternative sources of water for irrigation, it will be possible to increase		

1	Key Strategic Area:	Catchment Management

water availability and make the water last longer. These also address point source protection of water collection points. These activities should be implemented by smallholder farmers.

- **Water use efficiency**
- **Wastewater recycling**
- **Excess water reuse**

2. Water harvesting and storage

By providing access to additional water by harvesting water (collecting runoff) and storing water. By harvesting water, farmers can increase the area they irrigate, grow crops in the dry season, and support livestock. Water storage at the household or village level improves access to water, and reduces the labour burden, by reducing the number of trips to boreholes. These activities should be implemented in the semi-arid regions of Kenya. Ridging and swales should be implemented on steep hillslopes where small scale farming is being practiced.

- Roof runoff and storage
- Below ground storage
- Road runoff
- Ridging
- Swales

3. Groundwater protection and Infiltration

By providing information to improve groundwater resources, particularly the infiltration of rainwater into the soil, thereby increasing availability of water stored in the rooting zone and groundwater. Increased water availability in the rooting zone reduces dependence on surface water irrigation and provides increased potential for cultivation during dry seasons. Increased groundwater feeds the spring and improves surface water flow lower down the catchment as well as the level of water in wells close-by. These activities should be implemented as a priority in groundwater recharge zones.

- Contour bunds
- Zai planting pits
- Infiltration trenches
- Spring protection and management

1.2.2	Promote soil conservation and management at catchment level

Soil erosion, deforestation, poor agricultural practices, loss of soil fertility, inadequate runoff management and gully formation each contribute to the degradation of land resources with resultant impacts on the catchment both up and downstream. To reduce land degradation, mitigate degradation and implement sustainable land use practices, various aspects of sustainable land management are required. Implementing these techniques and practices will minimise the loss of topsoil (through erosion) and reduce the erodibility of a catchment.

The steeper regions of the landscape which do not have a dense vegetation cover are more prone to high levels of erosion than the lower plains. Improved erosion and runoff control measures and sediment trapping will improve resilience to floods and erosion. In the lower plains rangeland management should be implemented to prevent overgrazing. The movement of livestock up slopes and over rivers also needs to be managed as this can lead to eroded paths.

Although there are many different parties involved in providing soil conservation and management advice, it is recommended that consensus is built, and a consistent message is given by the SCMPs, CIDPs and Extension Officers.

Most of the county IDPs promote soil and water conservation as a key programme, with the objective to promote sustainable land use and environmental conservation. Activities that are promoted are on farm water harvesting structures (i.e. terraces), tree planting during rainy season, use of organic manure, river bank protection, rehabilitation of degraded land and gully control, excavation of water pans, construction of check dams/sand dams

1	Key Strategic Area:	Catchment Management

and desilting of water pans. Catchment management activities that can be implemented to promote soil conservation and management are as follows (Braid & Lodenkemper, 2019):

1. **Rangeland management**
2. **Erosion and runoff control measures**
3. **Gully management and sediment trapping**
4. **Stream/River bank management**

1.2.3	Promote conservation agriculture and improved farm management

One of the most important natural resources is the soil. Healthy and fertile soils produce good yields of crops; whereas poor or degraded soils produce low and unreliable yields. Soil health is a function of rooting depth, nutrient fertility, structure, organic matter content, below-ground biodiversity and water holding capacity – all of which are related. Ensuring soils remain healthy and fertile requires a variety of management techniques including climate-smart farming practices and nutrient management.

Most of the county IDPs promote soil fertility improvement and agroforestry but a more holistic approach would be to consider conservation agriculture and improved farm management as follows (Braid & Lodenkemper, 2019):

1. **Climate-smart agriculture**
    - Conservation agriculture
    - Natural farming (small scale)
2. **Nutrient management**
    - Compost
    - Natural fertilizer
    - Micro dosing
    - Weeding
    - Agroforestry

1.2.4	Promote erosion control measures

Refer to Strategy 1.2.2.

1.2.5	Promote soil fertility management

Refer to Strategy 1.2.2.

1.3	Theme:	Natural resources management for the protection and sustainable use of natural resources
1.3.1	Improved wetlands and lake management	

According to the CMS's wetlands are under pressure from human encroachment for settlement, expansion of crop production, urbanization, property development and livestock grazing. These wetlands need protection from degradation and restoration of their functional capacities.

Although significant wetlands are protected from use (refer to KSA 2), in certain cases seasonal wetlands are utilized by surrounding communities. It is important to not only conserve what is existing, but also improve the farming practices and grazing in wetlands for more sustainable utilisation and reduced impacts (Braid & Lodenkemper, 2019).

1. **Wetland conservation**
2. **Wetland rehabilitation**
3. **Sustainable utilization of wetlands**

1.3.2	Promote alternative/sustainable livelihoods

1	Key Strategic Area:	Catchment Management

Communities rely on natural resources to live and earn an income. Over utilisation leads to the depletion of natural resources. Natural resources need to be managed and utilised in a sustainable manner, to maximise the goods and services received from them, while still maintaining their function and production capacity. Natural forests, grasslands and wetlands are finite resources that must be managed sustainably; similarly, alien vegetation can provide useful resources but needs to be managed to prevent uncontrollable spread.

1.3.3 Improved solid waste management

To ensure that catchment management activities and resource protection activities can be implemented, it is important that activities around the household, farm and village are also sustainable and of a high standard. These include activities such as waste management. Waste management involves the generation, collection, transportation, and disposal of garbage, sewage and other waste products. Responsible waste management is the process of treating solid wastes and offers a variety of solutions for waste with the ultimate aim of changing mind-sets to regard waste as a valuable resource rather than something that must be thrown away. The government is constitutionally bound to provide sanitation services to all of its citizens, this includes the removal and proper treatment of solid waste. In reality this is not being done in many parts of the country, particularly in remote rural areas. Water resources nearby urban areas are particularly at risk, as evident in the county IDPs. It is important to ensure that the mindset of waste management extend to individuals and communities as it is important for a clean and safe environment.

1. **Household waste management**
2. **Village waste management**
3. **Buy back centres**

1.3.4 Improved forestry management

Forests are important to return moisture to the air through evapotranspiration, which then generates rain, as well as to stabilise soils with their root systems; they can also be rich in terms of biodiversity as well as stores of carbon. Sustainable management of forests both natural and plantation, for reforesting of areas where forests have been removed including the selection of beneficial tree species.

The Vision 2030 requires the country to work towards achieving a forest cover of at least 10% of the land area to ensure sustainable resource use, growth and employment creation. The National Forest Policy (Ministry of Environment and Natural Resources, 2014) indicates that the sustainable management of forests includes:

- Indigenous forests
- Plantation forests
- Dryland forests
- Urban forests and roadside tree planting
- Farm forestry

To achieve the national forest cover target of 10% of land area, the major afforestation effort will have to be in community and private lands. Dryland forests offer great potential for intensified afforestation but woody vegetation in the arid and semi-arid areas are unique and require special attention. Most county IDPs promote reforestation through agroforestry, and in some cases water catchment areas are being protected through the use of alien trees (i.e. eucalyptus). Consideration needs to be made to the objective of these programmes as there could be significant long-term challenges associated with planting trees with high water requirements in counties with limited water supply.

Promoting farm forestry and woodland management on community land

- Focus should on training in increased use of improved germplasm and application of good management practices, including species and site matching.
- Re-assessment of tree seed quality and the development of a strategy to reduce current shortages.
- Diversification of planted tree species, to limit impact of shortages, disease outbreaks and insect attacks.

1	Key Strategic Area:	Catchment Management

- Established of good quality seed orchards to reduce dependency on imports.
- Demonstrations plots to showcase show performance of different species and good land use practices.
- Commercial tree nurseries should be promoted as the means for growing seedlings that farmers and institutions can purchase.
- Training for nursery operators to improve quality of production seedlings.
- Provision of free seedlings to farmers introduces dependency lower standard planting and care.

Contract farming and out grower schemes

- High demand for forest products offers an opportunity for wood industry to partner with tree farmers.
- Diversifies the sources of raw materials at potentially lower rates
- Provides farmers and local communities access to financial support over growing period and increase market security.

Contracting system for tree farming

- Establishment and management of plantations on woodlots by trained forest contractors on behalf of potential investors.
- Contractors to be trained in species choice, land management, business administration and management.
- Job creation for foresters, forest technicians and manual workers drawn from rural areas where plantations are to be established.

Community forestry

- Joint forest management executed through the management model Participatory Forest Management (PFM).
- Implementation of PFMPs through management agreements between KFS and community forestry associations a delayed process.
- Community forestry can complement PFM and other existing forestry management models.
- Counties manage significant forest and woodland areas and the devolution of authority to communities brings about new opportunities for management of land

1.3.5	Removal of alien invasive species

Community knowledge base on how to sustainably manage invasive and alien species should be strengthened. This is because there is knowledge but not strong understanding on the general approaches to sustainably manage invasive and alien plant species. The KFS and KWTA need to consider alien invasive vegetation management as invasive alien plant species are a threat to water resources and water availability. By managing them and preventing their further spread, these plants can also provide useful resources and alternatives to rapidly depleting indigenous vegetation.

1. **Controlling alien invasive vegetation**
2. **Utilising and controlling blue gum (eucalyptus) trees**
3. **Utilising and controlling pine trees**
4. **Utilising and controlling Bamboo**
5. **Utilising and controlling Prosopis species**
6. **Utilising and controlling water weed/hyacinth**

1.3.6	Improved fisheries management

Promote the sustainable development and management of fisheries in lakes, dams, wetlands and rivers.

1	**Key Strategic Area:**	**Catchment Management**
1.3.7	Improved energy management	
To ensure that catchment management activities and resource protection activities can be implemented, it is important that activities around the household, farm and village are also sustainable and of a high standard. These include activities such as energy management. Renewable sources of energy should be promoted to generate electric power for use in the household, or community, as a replacement for the burning of wood or charcoal. Most county IDPs promote “green energy” as an alternative fuel to wood and charcoal.		
1.3.8	Improved sand mine management	
Develop policies for sand harvesting. Consider alternative sources of sand.		
1.4	**Theme:**	**Rehabilitation of degraded environments**
1.4.1	Rehabilitation and Restoration Plan	
Develop a restoration and rehabilitation programme. Also refer to Strategy 1.2.2.		
1.4.2	Land restoration and rehabilitation of specific priority areas	
Implement restoration and rehabilitation programme.		
1.4.3	Site specific rehabilitation of degraded riparian areas	
Rehabilitation planning, implementation and associated management is a long-term commitment to a natural resource. The successful rehabilitation of freshwater ecosystems, and thus the overall resilience and sustainability of the system, can only be achieved through engagement of all the stakeholders reliant on the natural capital. Through the Reserve (KSA2) process studies should be conducted to delineate riparian areas of significant water resources. These studies are required to understand the riparian functioning so that an effective rehabilitation strategy can be developed. The level and type of rehabilitation adopted is case/site specific, as rehabilitation planning is largely dependent on the extent and duration of historical and current disturbances, the cultural landscape in which the ecosystem is located and the opportunities available for rehabilitation. Understanding the overall functioning of the system, particularly in a landscape where the community is dependent on the natural resource, is key for the success of any rehabilitation project. This is further supported by ensuring that an adaptive management approach is incorporated into the planning and aftercare of the system, thus ensuring the ecosystem is maintained at a desirable level and offering it resilience to stressors.		
1.4.4	Site specific rehabilitation of degraded wetlands	
Prioritize wetlands in need of rehabilitation. Once these have been prioritised, rehabilitation and restoration plans should be developed, that will result in increased natural vegetation cover. Local CBOs and NGOs should be involved in this process.		
1.4.5	Site specific rehabilitation of Gazetted forests or protected forests that have been degraded	
Gazetted forests or protected forests that have been degraded need to have new trees planted in order to meet the Kenya Vision 2030. When KFS engage in re-planting trees, it should be done considering appropriate soil and water conservation techniques and beneficial/natural trees as a part of an integrated catchment management approach. According to the CMS’s several forest reserves have had significant vegetation cover loss or are under threat of encroachment. There was also a high probability of significant decline of the mangrove along the Indian Ocean Coast between 2001 and 2013. The county IDPs have promoted tree planting for agroforestry, woodlots for alternative energy and provided education about the detrimental effects of deforestation for communities and the environment.		
1.4.6	Mining area rehabilitation	
Mining removes the protective covering from the land and exposes soils to soil erosion as well as pollution impacts. During mining activities exposed soils must be revegetated and soil conservation techniques implemented.		

4.3 Water Resources Protection

4.3.1 Introduction

Water is critical to social and economic development but also supports key ecological systems which underpin human wellbeing and provides essential ecosystem goods and services. According to the Kenya Water Act (2016), a water resource is defined as *"any lake, pond, swamp, marsh, stream, watercourse, estuary, aquifer, artesian basin or other body of flowing or standing water, whether above or below the ground, and includes sea water and transboundary waters within the territorial jurisdiction of Kenya*". It is important to differentiate between surface and groundwater resources as these are treated differently within the context of water resources protection: surface water resources include rivers (i.e. stream, watercourse), wetlands (i.e. lakes, ponds, swamp, marsh, spring) and estuaries, while groundwater resources refer to aquifers and artesian basins.

The 2016 Water Act also outlines the designation of Basin areas, with functions of Basin Water Resource Committees (BWRCs) within each Basin clearly stated. Furthermore, the Act defines the establishment and functions of Water Resource Users Associations (WRUAs) i.e. associations of water resource users at the sub-basin level in accordance with Regulations prescribed by the Authority. These associations are community based for collaborative management of water resources and resolution of conflicts concerning the use of water resources.

Protection of water resources in Kenya therefore starts at the National level with the WRA developing policies and legislation for protection of water resources. BWRCs then enact these measures to fulfil the water resource quality objectives for each class of water resource in a basin and need to put in place measures for sustainable management of the water resources; whilst at the sub-basin level more local level community-based management occurs through WRUAs.

4.3.2 Strategy

Water Resource Protection is important for the **forestry, land use and catchment management sectors**. In order to comprehensively and systematically address the Water Resource Protection issues and challenges in the basins, the table below presents specific Themes and Strategies under Water Resource Protection which are critical for the forestry, land use and catchment management sectors.

Table 4-3: Strategic Framework - Water Resources Protection

2	**Key Strategic Area:**	**Water Resources Protection**
2.4	**Theme:**	**Conservation and protection of ecological infrastructure**
2.4.1	Integrate environmental considerations into basin development and planning	
Water is critical to social and economic development but is also a critical component in supporting key ecological systems which underpin human wellbeing as well as providing essential ecosystem goods and services. A strategic social and environmental assessment is therefore an important component of the Classification of the basins water resources. The Classification of water resources requires a balance between social and environmental considerations.		
2.4.2	Groundwater protection	
Rehabilitate polluted aquifers, springs and wells as part of Catchment Management Plan. Groundwater source protection zones defined by WRA and gazetted under Water Act 2016.		
2.4.3	Riparian areas protection	

2	Key Strategic Area:	Water Resources Protection
Riparian areas, as defined by WRA, gazetted under Water Act 2002 and WRM Regulations 2007, currently under amendment by Attorney General in accordance with revised definition agreed on at sixteenth meeting held on 2 June 2020 by the National Development Implementation and Communication Cabinet Committee.		
2.4.4	Ecosystem services protection	
Water is critical to social and economic development but is also a critical component in supporting key ecological systems which underpin human wellbeing as well as providing essential ecosystem goods and services. In particular, certain environmentally sensitive areas are reliant on the protection of water resources. Although environmentally sensitive areas are defined by NEMA, this information should be provided to WRA during the Classification of water resources in order for WRA to classify and protect according to the Water Act 2016.		

4.4 Groundwater Management

4.4.1 Introduction

Groundwater has provided and will continue to provide much of the water needed for livelihoods and development for many communities and industries in Kenya. Numerous rural communities and small towns across the Republic depend on groundwater from boreholes and shallow wells for their domestic and livestock needs, and to support other economic activities. Spring flow and baseflow contribute significantly to maintaining streamflow, particularly during dry seasons. Groundwater management is known to be one of the most important, least recognised and highly complex of natural resource challenges facing society (Foster, 2000).

Groundwater in Kenya is currently not managed in a coherent fashion (Mumma et al., 2011). A final Final Draft National Policy on Groundwater Resources Development and Management was published in 2013 (Ministry of Water and Irrigation, 2013), but despite the best of intentions, groundwater remains poorly understood and poorly managed. The policy document highlights a number of specific issues:

- Availability and vulnerability of groundwater resources in Kenya are poorly understood
- Institutional arrangements for groundwater management in Kenya, including management capacity and financing are weak
- Very limited integrated water resources management in Kenya, with groundwater and surface water typically being treated as separate water resources
- Very limited groundwater quality management in Kenya

In addition to the National Policy on Groundwater Resources Development and Management, the National Water Quality Management Strategy (Ministry of Water and Irrigation, 2012) addresses groundwater protection in S. 2.7. It recommended the “Development of Ground Water Protection programs” without defining or describing them. The NWQMS lays out the following “strategic responses”:

- Extraction of groundwater at sustainable rates to avoid seawater intrusion.
- Intensifying groundwater quality monitoring by sinking observation boreholes.
- Establishing a monitoring program for selected production wells to capture any changing trends.
- Requiring all borehole owners to have their water tested periodically as part of the water quality monitoring programme.
- Maintain updated database of borehole data.

A groundwater management strategy is influenced by hydrogeological, socio-economic and political factors and is informed by both policy and strategy. This Groundwater Management Plan is necessary

for the integrated and rational management and development of groundwater resources in the Tana Basin. It aims to capture and integrate a basic groundwater understanding, describes sustainable management measures and presents an action plan with clear objectives and desired outcomes. It also estimates the financial requirements needed for implementation and the timeframe for its implementation. It is not a static instrument. As resources monitoring and data analysis takes place across the planning period, improvements and even whole new aspects may need to be incorporated.

The key objectives of the Plan include:

- Conserve the overall groundwater resource base and protect its quality
- Recognise and resolve local conflicts over resource allocation (abstraction or pollution)

Note: *A Groundwater Management Plan needs to be differentiated from an Aquifer Management Plan: the former considers groundwater management from a Basin perspective, while an Aquifer Management Plan is applied to a single aquifer unit.*

4.4.2 Strategy

Although groundwater plays a significant role in maintenance of streamflow and as a source of potable water in remote areas, it is not considered a priority KSA for the **forestry, land use and catchment management** sectors.

4.5 Water Quality Management

4.5.1 Introduction

Water quality is the physical, chemical, biological and aesthetic properties of water that determine its fitness for its intended use, and that are necessary for protecting the health of aquatic ecosystems.

Water quality management is the maintenance of the fitness for use of surface and groundwater resources, on a sustainable basis, by achieving a balance between socio-economic development and water resources protection. Fitness for use is an evaluation of how suitable water is for its intended purpose (e.g. domestic, agricultural or industrial water supply) or for protecting the health of aquatic ecosystems. The fitness for use evaluation is based on scientific evidence in the form of water quality guidelines or standards for different water uses (e.g. drinking water standards). The business of water quality management is the ongoing process of planning, development, implementation and administration of Kenyan water quality management policies, the authorisation of water uses that impact on water quality, and monitoring and auditing all these activities.

This section provides an introduction of the key water pollutants responsible for the deterioration of water quality in the basin, the point and non-point sources associated with the pollutants, and overview of the water quality status and threats in the basin, and a strategic framework for water quality management in the basins.

4.5.2 Strategy

Water Quality Management important for the **forestry, land use and catchment management sectors**. In order to comprehensively and systematically address the Water Quality Management issues and challenges in the basins, the table below presents specific Themes and Strategies under Water Quality Management which are critical for the forestry, land use and catchment management sectors.

Table 4-4: Strategic Framework - Water Quality Management

4	**Key Strategic Area:**	**Water Quality Management (SW and GW)**
4.1	**Theme:**	**Effective water quality data collection, information generation and dissemination, and knowledge management**
It is not possible to manage what you don't measure. A good water quality monitoring system is essential to support effective management, enforcement and compliance assessment. Added to this, the timely sharing of the right data and information, in the required format, enables the development of relevant and applicable water quality management interventions. Continuous improvement of monitoring networks and laboratory services enables effective enforcement and compliance of laws and regulation and supports an adaptive management approach to water quality management. Targets and activities to support this goal relate to the implementation of the monitoring system designed for Kenya but focused on monitoring of basins. This entails implementation of routine water quality monitoring of rivers and lakes, reservoirs, effluent discharges, urban rivers, and dams/lakes. It also refers to initiation of limited duration water quality surveys to investigate specific problems in collaboration with, for example, academic institutions and selected specialists. It includes the upgrading central and regional laboratories. Lastly, it is essential that all the data gathered by means of routine programs and surveys, be stored and managed in Mike Info to maintain the integrity of the data, and to generate information and routine reports that meet the needs of water resource managers. A number of strategies have been identified to support water quality monitoring.		
4.1.1	Implement routine surface and groundwater quality monitoring	
A national water quality monitoring programme was designed as part of the ISC project. This programme should be implemented in the basins by ensuring that capacitated technical staff have the resources to collect water samples and conduct in-field measurements on schedule, the water testing laboratories can analyse the water samples accurately and on-time, submit the analysis results to the Mike Info WQ database, and the data are reviewed, analysed, reported on, and acted on by basin staff.		
4.1.2	Biological Water Quality Monitoring	
Develop the required capacity to undertake biomonitoring in Kenya to assess aquatic ecosystem health. Identify streams in the basins for piloting biomonitoring and undertake pilot studies. Integrate the results with the water quality monitoring network to assess the overall fitness for use and ecosystem health of water resources.		
4.1.3	Undertake survey of pollution sources	
There is a need to compile an inventory of surface water pollution sources (point sources), and reconcile these against the discharge licences at NEMA and permits at WRA. This data should be used to assess compliance to effluent discharge standards and used in waste load allocation studies to assess the cumulative impact of sources concentrated in a specific river reach or sub-basin. Effluent compliance monitoring should be undertaken at regular intervals.		
4.1.4	Upgrade water quality testing laboratories	
There is a need to upgrade the central and regional laboratories in the six basins to support the national water quality monitoring programme that was designed as part of the ISC project. These include, inter alia, the recruitment of more technical staff, equipping the laboratory and stocking it with reagents, procuring Field Testing Kits, operationalising the LIMS in the central and regional laboratories and participating in proficiency tests to acquire the necessary accreditation and ISO certification to enhance data credibility.		
4.1.5	Institutionalise water quality data storage and management	
A centralised national water quality database was designed with Mike Info. The storage of all historical and new water quality data collected by WRA in the basins should be enforced. This database should also serve as the approved database for all reporting and assessment of water quality data in the basins.		
4.1.6	Design and implement routine water quality status reporting	
Routine water quality status reports should be designed and implemented to report on the water quality status in the basins, identify key water quality concerns, their causes and consequences, and recommend management actions to mitigate negative impacts.		

4	**Key Strategic Area:**	**Water Quality Management (SW and GW)**
4.2	**Theme:**	**Promote sound water quality management governance in the basins**

With so many institutions involved in different aspects of water quality management in the basins, it is inevitable that there may be uncertainty about the mandate of each institution with respect to water quality management. This objective can be met by clarifying the mandates, the and roles and responsibilities of the different institutions involved in the basins. This can be achieved by reviewing the mandates, and roles and responsibilities of institutions. It is also important that there be effective arrangements between role players with regard to water quality management to ensure that cooperative governance of water quality is achieved. This can be accomplished by establishing mechanisms for cooperation between government institutions on water quality management and pollution control issues.

Two strategies have been identified to help alignment, collaboration, and institutional efficiency.

4.2.1	Harmonise policies and strategies to improved water quality management

There are a number of institutions involved in different aspects of water quality and pollution management (e.g. WRA, NEMA, MoA, NIB, counties, basin authority, PCPB, etc.). Their policies, strategies and plans are not always aligned because they are responsible for different aspects of water resources management in the basins. WRA should advocate alignment of strategies to serve a common purpose of rehabilitating urban rivers and streams in the basins.

4.2.2	Coordination and cooperation mechanism on water quality issues established at a catchment level

WRA should establish a coordination and cooperation mechanism to ensure there is alignment of actions to address water pollution management in the basins.

Participate in river clean-up campaigns of rivers. This can be achieved by using the inter-agency task-force to mobilize resources, carry out clean-ups, creating awareness, and where appropriate, demolishing structures in riparian buffers.

4.3	**Theme:**	**Efficient and effective management of point and nonpoint sources of water pollution**

The water quality challenges in the basins will require efficient and effective management of pollution sources, as well as mitigating the symptoms of pollution in rivers, reservoirs, and lakes.

Point sources - Monitoring of compliance with Kenyan domestic and industrial effluent standards should be strengthened. All effluent monitoring data should be stored in a central database (Mike Info in this case). Protocols should be implemented for enforcing standards, and for dealing with non-compliant dischargers. To meet this goal, producers of wastewater should be encouraged to treat wastewater at source. This can be achieved by identifying industrial polluters with no wastewater treatment and not meeting effluent standards and directing them to implement onsite wastewater treatment. It can also be achieved by requiring onsite wastewater treatment at all new industries being established. Consideration should also be given to the design and construction of centralised WWTWs and sludge treatment facilities for large urban centres, and to progressively connect households and large wastewater producers to the sewerage network. Lastly, the focal areas of the Kenya National Cleaner Production Centre (KNCPC) should be supported, and industries should be encouraged to participate in this initiative.

Nonpoint sources - Nonpoint sources of pollution probably have the greatest impacts on water quality in the basins.

Erosion and sedimentation from agricultural lands is probably a major concern and interventions to manage its impacts should be implemented. It has also been the focus of may soil conservation initiative undertaken in Kenya over many years. Reducing erosion and sedimentation also has a large positive impact on water pollution as many pollutants adhere onto sediment particles, and intercepting the particles before they enter water courses, also prevents these pollutants from entering streams, rivers, and lakes. To meet this objective, a number of target sources have been identified dealing with urban stormwater, riparian buffer strips, hydrocarbon pollution, runoff from informal settlements, other agricultural impacts, and runoff from unpaved roads.

The management of stormwater in urban areas is important because it is the conduit for transporting pollutants into urban streams, and eventually nearby rivers and lakes. This requires promoting the use of structural stormwater control and treatment facilities (e.g. instream detention ponds) in urban areas, as well as reducing

4	Key Strategic Area:	Water Quality Management (SW and GW)
stormwater runoff by improved rainfall infiltration systems, efficient drainage network, and improved rainwater harvesting by households, complexes, and commercial buildings. Riparian buffer strips is an important measure to intercepting and filter polluted runoff. The installation and maintenance of riparian buffer zones and vegetated buffer strips should be promoted and enforced. Hydrocarbon pollution from the dumping of used oil into stormwater drains can contaminate large volumes of water rendering it unfit for use. The installation of oil separators at all garages and vehicle workshops should be enforced, and illegal dumping of used oil at informal workshops should be policed and culprits be prosecuted. Informal settlements have a huge negative impact on urban water quality due to indiscriminate disposal of liquid and solid household wastes. A number of strategies have been identified to focus management of water pollution.		
4.3.1	Improve sewerage systems and treatment	
4.3.2	Cleaner production methods	
4.3.3	Urban stormwater, sanitation, and solid waste management, and protection of upper reaches of rivers.	
Control sediment pollution from construction sites and unpaved urban roads in urban areas by adopting best urban stormwater management practices such as erecting sediment traps or screens, sediment detention ponds, etc. Compel county governments to maintain sewerage infrastructure and fix leaks or blockages as a matter of urgency to minimise sewage leaks into stormwater drains. Promote solid waste removal in urban centres and disposal at solid waste disposal sites that meet best national or international design standards. Rehabilitate existing solid waste dumps to intercept and treat poor quality drainage water and prevent it from running into water courses. Compel county governments to delineate and maintain riverine buffer zones to prevent encroachment. Stop encroachment of wetlands.		
4.3.4	Sanitation management in informal settlements	
4.3.5	Management of hydrocarbon pollution	
Control of oil and grease pollution from petrol stations and oil storage facilities by ensuring that all are equipped with functional oil & grease traps, and monitoring nearby surface and groundwater for hydrocarbons. Control dumping of used motor oil at informal workshops by promoting recycling of used oil, and monitoring stormwater drains for hydrocarbon pollution. Protect groundwater against hydrocarbon contamination near petrol stations and dump sites by drilling observation wells at high risk areas and monitoring boreholes for hydrocarbons.		
4.3.6	Sedimentation from unpaved roads	
Control sediment pollution from unpaved roads by erecting sediment traps or vegetated buffer strips next to dirt and paved roads. Maintain stormwater drainage to prevent erosion next to roads and rehabilitate dongas near roads.		
4.3.7	Management of agricultural impacts on sediments, nutrients, and agrochemicals	
Control nutrients pollution from agricultural activities (N & P) in all farmed areas within the Basin by compiling & maintaining inventories of fertilizer use, and monitoring nutrients in receiving water bodies (rivers, reservoirs and lakes). Control agrochemical (pesticides and herbicides) residue pollution from farmlands by compiling an inventory of pesticide usage in the basin and monitoring affected water bodies for residues. Promote efficient use agrochemicals in the agricultural sector. Promote best irrigation management practices and encourage irrigators to retain, treat and recycle irrigation return flows before discharging it to the environment. Encourage adoption of good land management practices such as avoiding overstocking and overgrazing, avoiding cultivation on steep slopes or use terracing, minimum tillage, etc.		

4	Key Strategic Area:	Water Quality Management (SW and GW)
4.3.8	Enforcement of effluent standards	
Use the results of compliance monitoring of effluent discharge licence or permit conditions to prosecute offenders that consistently violate their licence/permit conditions and demonstrate no intention of meeting them.		
4.3.9	Control discharges from sand mining operations.	
Control sediment pollution from sand harvesting operations by enacting by-laws for its control, delineating sand harvest areas away from river riparian, and implementing good sand mining guidelines to mitigate their impacts. See for example the River Sand Mining Management Guidelines of Malaysia for good management practices to consider.		
4.3.10	Rehabilitation of polluted aquifers, springs and wells	
See Strategy 3.4.2		

4.6 Climate Change Adaptation

4.6.1 Introduction

In the face of a changing climate, adaptation and resilience are Africa's and indeed Kenya's priority responses to address vulnerabilities and risks. The 15th African Ministerial Conference on the Environment 2015 strongly promoted investment in building resilience as a top funding priority and an integral part of national development funding. This aligns very well with Kenya's approach of mainstreaming climate adaptation in national and sub-national development planning.

The Kenya National Climate Change Response Strategy (NCCRS) (Government of Kenya, 2010b) acknowledged that the impacts of observed and projected climatic change pose serious threats to sustainable development. These predominantly relate to severe weather and changes in the climate extremes which will reduce the resilience in many sectors of the economy.

The Climate and Development Knowledge Network in their Government of Kenya Adaptation Technical Analysis Risk Report (Government of Kenya, 2012) identified various sectors in Kenya which are at-risk, either directly or indirectly, from climate change. These sectors include agriculture, livestock and fisheries, manufacturing, retail and trade, water, health, financial services, tourism, urban and housing sectors, infrastructure, energy, transport, natural resources and environment, political and social sectors.

The Climate Change Act 2016 aims to strengthen climate change governance coordination structures and outlines the key climate change duties of public and non-state actors. It establishes a high-level National Climate Change Council chaired by the President, a Climate Change Directorate as the lead technical agency on climate change affairs, and a Climate Change Fund as a financing mechanism for priority climate change actions/interventions. Climate desks/units have subsequently been established in certain line ministries staffed by relevant climate change desk officers. The Act is to be applied across all sectors of the economy, and by both the national and county governments. Mainstreaming of climate change has to some extent been undertaken at the county government level, where some counties have taken measures to include climate change in their County Integrated Development Plans (CIDPs) and to develop relevant county legislation.

The National Climate Change Action Plan (NCCAP) 2013 to 2017 (Government of Kenya, 2013b) sets out a vision for a low carbon development pathway for Kenya and lists specific adaptation and mitigation actions for each national planning sector to support this vision. One of the "big wins" identified in the Final Draft NCCAP 2018-2022 relates to "improved water resources management".

The Final Draft NCCAP 2018-2022 (Government of Kenya, 2018) builds on the first Action Plan (2013-2017) and provides a framework for Kenya to deliver on its Nationally Determined Contribution (NDC) under the Paris Agreement of the United Nations Framework Convention on Climate Change. The Final Draft NCCAP 2018-2022 guides the climate actions of the national and county governments, the private sector, civil society and other actors as Kenya transitions to a low carbon climate resilient development pathway. It identifies strategic areas where climate action over the next five years is linked to Kenya's Big Four Agenda, recognising that climate change is likely to limit the achievement of these pillars. One of the "big wins" identified in the Final Draft NCCAP 2018-2022 relates to "improved water resources management". Of particular relevance to water resources management and planning is "Food and Nutrition Security" where food security may be threatened through climate change-driven declines in agricultural productivity. The Final Draft NCCAP 2018-2022 also prioritises seven climate change actions (Table 4-5), three of which (nos. 1 to 3) align very strongly with the planning and management of water resources.

Table 4-5: Priority climate change actions (Government of Kenya, 2018)

1. Disaster Risk (Floods and Drought) Management	Reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods.
2. Food and Nutrition Security	Increase food and nutrition security through enhanced productivity and resilience of the agricultural sector in as low-carbon a manner as possible.
3. Water and the Blue Economy	Enhance resilience of the water sector by ensuring access to and efficient use of water for agriculture, manufacturing, domestic, wildlife and other uses.
4. Forestry, Wildlife and Tourism	Increase forest cover to 10% of total land area; rehabilitate degraded lands, including rangelands; increase resilience of the wildlife and tourism sector.
5. Health, Sanitation and Human Settlements	Reduce incidence of malaria and other diseases expected to increase because of climate change; promote climate resilient buildings and settlements, including urban centres, ASALs and coastal areas; and encourage climate-resilient solid waste management.
6. Manufacturing	Improve energy and resource efficiency in the manufacturing sector.
7. Energy and Transport	Climate-proof energy and transport infrastructure; promote renewable energy development; increase uptake of clean cooking solutions; and develop sustainable transport systems.

The Kenya NAP 2015 to 2030 (Government of Kenya, 2016) builds on the NCCRS and NCCAP and promotes adaptation as the main priority for Kenya, while also proposing that adaptation and development goals complement each other. Some of the key objectives of the NAP which are applicable to the Basin Plans include understanding the importance of adaptation and resilience building actions in development; integrating climate change adaptation into national and county level development planning and budgeting processes; and enhancing the resilience of vulnerable populations to climate shocks through adaptation and disaster risk reduction strategies.

Within the context of the Basin Plans, the objective of this component of the Plan is to understand the degree to which climate change will compromise the water resources sector and how those impacts will in turn alter the exposure to food security and to flood and drought risk. This component will also explore opportunities presented by climate change such as climate financing.

4.6.2 Strategy

Climate Change is important for the **forestry, land use and catchment management sectors**. In order to comprehensively and systematically address the Climate Change issues and challenges in the basins, the table below presents specific Themes and Strategies under Climate Change Mitigation,

Adaptation and Preparedness which are critical for the forestry, land use and catchment management sectors.

Table 4-6: Strategic Framework - Climate Change Mitigation, Adaptation and Preparedness

5	**Key Strategic Area:**	**Climate Change Adaptation and Preparedness**
5.1	**Theme:**	**Understand impacts of climate change on water resources at appropriate spatial scales**
5.1.1	Quantify climate change impacts (rainfall & temperature) on surface water and groundwater resources and demands in the basins at appropriate scales for planning and management	
This is undertaken though research and public consultation processes, and where necessary, engaging with the private sectors for further insights. As the impacts will be felt in a practical sense, this process should focus more on the in-situ impacts, thresholds and exposer accounts rather than as a technical theoretical review.		
5.1.2	Assess relevance, and scale of potential social, environmental and economic climate change impacts as defined in NCCAP in the basins and its relation to water resources planning and management; prioritise areas for interventions	
This will assess climatic trends to evaluate frequency and magnitude of events resulting in flooding events. Furthermore, the highlighting of hotspot area will act as a pre-emptive measure building resilience. Assessment of meteorological data relative to the ENSO cycle may provide forewarning into future drought occurrence and severity. Furthermore, there should be analysis of rainfall onset and cessation, particularly in rainfed agricultural areas and areas highly reliant on surface water rather than reticulation. Assessment of meteorological data relative to the ENSO cycle may provide forewarning into future drought occurrence and severity. Furthermore, there should be analysis of rainfall onset and cessation, particularly in rainfed agricultural areas and areas highly reliant on surface water rather than reticulation. Engage local private sector, NGOs and knowledgeable individuals to facilitate wider experience transfer of adaptation practices. Engage local private sector, NGOs and knowledgeable individuals to facilitate wider experience transfer of adaptation practices		
5.2	**Theme:**	**Climate change mitigation**
5.2.1	Undertake reforestation	
Promote protection of sensitive areas and ensure that natural systems are not compromised. Prevent slash and burn agriculture. Promote active reforestation initiatives and give education of ecosystem services of forests beyond utilisation as a timber resource.		
5.3	**Theme:**	**Climate change adaptation**
5.3.1	Promote climate resilient infrastructure	
Promote the development in low risk areas and increase setback from rivers and ocean interfaces. Build to increased threshold specifications to address future climate impacts for both road and stormwater infrastructure		
5.3.2	Climate-related disaster risk management	
Reduce the risk of disasters linked to climate change e.g. floods, droughts, health-related risks, crop production etc. by understanding the potential threats and risks and by implementing structural and non-structural mitigation measures.		
5.3.4	Promote agroforestry	
Enhance the CO_2 sink by promoting varied land usage to increase biodiversity and minimise soil erosion and increase soil nutrients retention. Actively plant living fences, medicinal and fruit trees.		
5.3.5	Mainstream climate change adaptation in water resources strategy, planning and management at basin and catchment level	
Implementation and enforcement of practical mainstreaming practices and enhance the awareness of potential climate impacts on communities to promote uptake of adaptation.		

4.7 Flood and Drought Management

4.7.1 Introduction

Floods and droughts are caused by extreme climatic events and can have devastating consequences for the socio-economic welfare of rural and urban communities and regions.

Flooding of land surfaces occurs when heavy rainfall leads to runoff volumes that exceed the carrying and storage capacities of stream channels and urban drainage systems. In the process, crop and grazing lands, villages and urban neighbourhoods become inundated, transport infrastructure destroyed, and powerlines flattened. Floods can cause displacement of people, loss of life (human and livestock), increases in water related-diseases, severe soil erosion, land-slides, increased food insecurity and significant losses to the economy of a region.

Drought can be defined as an extended period (consecutive months or years) of unusually low rainfall, depleted soil moisture and groundwater levels and a severe reduction in availability of surface water resources in streams, reservoirs and lakes. Drought can be referred to as a “creeping disaster” since its effects accumulate slowly and may linger for years after the termination of the event. Droughts can decimate dryland crop production, severely curtail irrigated crop production, cause severe loss of life of livestock and game, diminish freshwater fish-stocks, result in severely restricted municipal and industrial water supplies and give rise to substantial losses to the economy of a region.

It follows from the above that systematic preparedness planning for floods and droughts is an imperative to ensure mitigation of and protection against the above negative consequences of extreme floods and droughts.

4.7.2 Strategy

Flood and drought management is important for the broader water sector and is not considered a priority in the **forestry, land-use and catchment management sectors**.

4.8 Hydro-meteorological Monitoring

4.8.1 Introduction

An operational and well-maintained hydro-meteorological network is critical to support the WRA with its key functions related to water resources planning, regulation and management in the basins. The WRA is responsible for all aspects related to the monitoring (quantity and quality) of surface and groundwater in Kenya, including the construction and maintenance of monitoring stations, related equipment, data collection, transmission, capturing and storage, and dissemination.

4.8.2 Strategy

An adequate and efficient hydro-meteorological monitoring network is critical for water resource planning but is not considered a priority in the **forestry, land-use and catchment management sectors**.

4.9 Water Resources Development

4.9.1 Introduction

Water resources planning and development relate to large-scale water resources and related infrastructure which will support socio-economic development in the basins to improve water availability and assurance of supply for current and projected future water use in the basin, while taking into consideration environmental sustainability. The rationale for the development of the basin plans was to assess whether the basin's water resources are sufficient to meet the expected growth in water requirements with 2040 as the planning horizon. The approach entailed an evaluation of the need for and the capacity of large-scale water resources development interventions such as dams and transfers, some of which include multi-purpose projects. Most of the interventions which were considered were already identified as part of previous planning studies. Proposed schemes should be implemented in conjunction with management interventions i.e. water conservation and demand management initiatives. Such an approach, in combination with the phased development of new infrastructure, will allow an adaptive development strategy towards improving climate resilience.

4.9.2 Strategy

Water resource development is critical for water security but is not considered a priority in the **forestry, land-use and catchment management sectors**.

4.10 Institutional Strengthening and Enabling Environment

4.10.1 Introduction

In effect, the key aspect of any institutional reform process is to find an appropriate balance between operational functionality and the need for effective oversight and governance. Despite the various efforts that have been targeted at improving the institutional framework in the basins, there still remain challenges that warrant dynamic and progressive approaches to address them. Thus, this Plan provides the opportunity to integrate institutional reforms with the various elements of water resources management and development, noting that these reforms are an important part of ensuring that this Plan is implemented. Whilst, the various technical dimensions of this Plan are of significant importance, it does need to be highlighted that the ability of institutions to implement, oversee and review approaches accordingly will determine the efficacy of the basin plan.

Noting the variability of the climate and the potential impacts of climate change, the ability of institutions to manage adaptively will become increasingly important. In addition, the importance of the basins in terms of Kenya's socio-economic development cannot be underestimated. This will require strengthened inter-governmental approaches and inter-sectoral partnerships. These will be imperative noting the importance of the water-food-energy nexus, and will need to not only ensure improved levels of inter-sectoral planning, but equally improved effectiveness and efficiency from better implementation alignment as well as coordinated oversight. This is especially important when one notes the ongoing capacity constraints that face most sectors.

Whilst there will be ongoing pressures to develop and use water resources to enable socio-economic growth and development in the basins, the need to ensure that this takes place in a sustainable manner will become increasingly imperative. The shifts towards strengthening the regulatory role of the WRA, aligned to the 2016 Water Act, are important and will have an impact on the institutional roles and responsibilities within the basins. Hence, the drive to enable better coordinated resource development will be balanced by an improvement in the regulatory response by WRA. This will mirror and support the drive at a national level to strengthen catchment-based water resources management.

4.10.2 Strategies

Institutional strengthening and enabling environment are important for the **forestry, land use and catchment management sectors**. In order to comprehensively and systematically address the institutional strengthening and enabling environment issues and challenges in the basins, Table 4-7 and Table 4-8 present specific Themes and Strategies under institutional strengthening and enabling environment which are critical for the forestry, land use and catchment management sectors.

Table 4-7: Strategic Framework – Institutional Strengthening

9	**Key Strategic Area:**	**Strengthen the Institutional Frameworks**
9.1	**Theme:**	**Promote improved and sustainable catchment management**
9.1.1	Strengthen WRA's regulatory role	
The 2016 Water Act, aligned to the CoK (2010), provides for the strengthening of the regulatory functioning of the WRA. Towards this end there is a need to separate out the regulatory and management functions of the Authority and provide different reporting lines for these differing functions. This will enable WRA to focus on its regulatory functions and in the longer-term work towards the delegation of management and operational functions to the BWRCs, when they are established, the County Governments and WRUAs. Acknowledging that the process of establishing the BWRCs may be lengthy, and the need to strengthen the institutional capacity of the Counties and WRUAs will require time, there is need for WRA to establish interim modalities to bridge this gap and to ensure a smooth transition. This will require an optimisation of the ROs and the SROs supported by a capacity building drive (see KSA 10). At the same time, there is a need for the ongoing improvement and strengthening of the regulatory approaches utilised by the WRA. This will include a number of enabling factors (see KSA 10) but also requires a clarification of roles and responsibilities across the entire institutional framework. This will include working with various sector stakeholders to support the improved harmonisation of legislation and regulatory instruments across a range of sectors. This will need to incorporate the development of operational modalities across institutions as well as across administrative and hydrological boundaries.		
9.1.2	Strengthen BWRCs	
The BWRCs have more representation from different stakeholders in each Basin and will thus enable improved engagement across a wider range of stakeholders as well as inter-sectoral issues. There are lessons to be learned from the CAACs and these need to be translated into improved operational modalities for the BWRCs. These lessons include ensuring adequate and sustainable financing, ensuring frequent and well-structured engagements of the members of the BWRCs, WRA providing secretariat and technical assistance services, clear communication and reporting channels between WRA and the BWRCs, modalities for WRA taking on board recommendations of BWRCs, detailed guidelines on appointing members to the committees including qualifications, operationalisation guidelines, prescribed remuneration for the committee members and continued training and capacity building for the members. In addition, strengthening the BWRCs will include WRA providing secretariat services through the ROs and SROs. There is need to provide appropriate channels for enabling recommendations made by the Committee to be taken on board by WRA for further action. This will need to be supported by designated line functions within WRA that do not dilute the WRAs regulatory authority. Training and capacity building will be an ongoing requirement for the BWRCs including a thorough on-boarding upon establishment. This would include not only the more technical dimensions of water resource management, but also a range of skills to enable sound governance.		

9	Key Strategic Area:	Strengthen the Institutional Frameworks
9.1.3	Strengthen county government engagements in WRM in each basin	
The introduction of County Governments into the management frameworks provides an opportunity for improved management at local levels. The key role of county governments to support localised socio-economic development is crucial and therefore there is a very important need to align planning instruments to ensure that the sustainable development of water resources does underpin this developmental agenda. To date, engagements with the County Governments are unstructured, partly borne from a lack of clarity as to institutional mandates, roles and responsibilities. WRA needs to clarify these roles and responsibilities and to introduce more structured strategic planning and operational engagement. The BWRCs will provide a platform for structured engagements with the County Governments, at a governance and strategic level; however, there is need to explore more ways of engaging with the Counties at the basin and sub basin level for day to day issues that may arise. Training and capacity building (see KSA 10) is required for the County Governments as well as awareness creation which can be achieved through a collaborative partnership approach with the counties. In addition, the ongoing development of protocols for the sharing of information and knowledge exchange need to be established to provide the necessary information required for decision making.		
9.1.4	Strengthen WRUAs	
WRUAs play an important role in sub-catchment management, but there are a range of institutional and capacity challenges that require resolution to enable WRUAs to be more effective. The institutional linkages between County Governments and the WRUAs are important and ways to improve and strengthen these will be an important part of improving localised operational water resource management and development. WRUAs have had sustainability issues and exploring approaches that enhance their livelihoods while promoting catchment management will be an added advantage. More importantly, a more sustainable financing approach for WRUAs' activities is most needed to ensure financial sustainability of WRUAs. There is a need to provide training and capacity building to the members periodically on matters relating to WRM. Equally, improvements in information dissemination are needed to ensure community members can understand the message being passed across.		
9.2	**Theme:**	**Guidelines, codes of practice and manuals**
9.2.1	Develop guidelines, codes of practice and manuals	
Technical guidelines, codes of practice and manuals which are relevant to water resources planning and management need to be updated and/or developed based on international best practice and aligned with the policy and legal framework which dictates.		

Table 4-8: Strategic Framework – Enabling environment to support effective water resources planning and management

10	Key Strategic Area:	Enabling environment to support effective water resources planning and management
10.1	Theme:	Develop institutional capacity
10.1.3	Strengthen partnerships	
The importance of inter-sectoral engagement in water resource management and development has increasingly been recognised. This will support the development of more aligned planning approaches to both management and development, as well as provide additional capacity support when and where appropriate. This could also introduce efficiencies that adjust institutional capacity requirements. To this end, there is a need for the development of a partnership framework that provides the basis for the approach towards partnerships. This will then be implemented through the ongoing development of partnership arrangements over time.		
10.1.4	Strengthen stakeholder engagement	
The importance of stakeholder engagement cannot be over emphasised. The improvement in the development of water resource management and development solutions, the improvement in alignment of operational activities and the development of a sense of ownership of the management regime all provide the basis for more robust and sustainable management. There is a clear understanding that there is a need to improve upon the levels of stakeholder engagement and this cuts across the various institutions that play a role in water resource management and development. In this regard, the development of an agreed upon basin-wide framework for		

10	Key Strategic Area:	Enabling environment to support effective water resources planning and management
engagement is a key first step, supported then by the implementation of this framework. A key element of this, will include improving the functionality of the existing forum.		

5 Key outcomes

5.1 Introduction

This section establishes a link between the findings and outcomes of the basin planning process and the effective implementation of the recommended strategies within the framework of IWRM and with specific relevance to **catchment management**. It contextualises the basin plans and recommends specific themes and interventions along with cost estimates for implementation of actions related to **forestry and land use** in the respective basins.

Between 2012 and 2032 the national demand for firewood, charcoal, timber and poles, is projected to rise by 22%, against a 14% increase in supply. The deficit in the supply of these products is expected to increase from 10.3 million m^3 to 15.0 million m^3, providing a key incentive for forest development particularly on private and community lands (MEWNR, 2013). Supply material of these products are indicated to originate from trees on farms (70%), communal and private forests (21%) and public forests (9%).

With the size of gazetted forest limited, farm forestry and communal woodland management, will be expected to provide the bulk of wood resources for domestic and industrial use. Development incentives for farm forestry will need to strengthen small-scale farmers and producer organisations, to promote the development of self-sustainable and self-financing profitable businesses.

The main challenges associated with water resources development and management in Kenya vary across the country and include water quality, the spatial and temporal variability of water, assurance of supply, impacts of climate change, the expected growth in water demand linked to population growth and socio-economic and irrigation development, challenges associated with the successful implementation of large-scale water resources and related infrastructure, inadequate planning, etc. These challenges are exacerbated by various management and institutional issues. Furthermore, environmental sustainability needs to form an integral part of the decision-making processes during development of Kenya's water resources.

5.2 Context

Within a global context, the adoption of the United Nations Sustainable Development Goals (SDGs) (UN, 2015) is an opportunity to enact an integrated approach to water resources management. Consequently, the Key Strategic Areas (KSAs) which lie at the heart of the six Basin Plans provide various synergies with the SDGs. Furthermore, it is important to note that the successful implementation of the Basin Plans will depend on the degree to which concurrent and future planning in each basin, at various levels, is aligned with the proposed development plans for the water sector. The development plans for the forestry and land use sectors also need to be aligned with the basin plans.

5.2.1 Linkages with Basin Plans

The six Basin Plans which were developed as part of KWSCRP-1 are key deliverables toward the overall objective of the KWSCRP, namely to strengthen WRA's capacity in terms of tools, skills and infrastructure to deliver on its mandate for water resources regulation in the country. It constitutes IWRM and Development Plans for the six river basins, which consider the environmental, social and economic aspects of each basin, address the key issues and challenges, and ensure that these aspects are integrated into overall management strategies. The Basin Plans aim to achieve a sustainable balance between the utilisation, development and protection of water resources and provide a clear pathway for the sustainable utilisation and development of the water resources of Kenya. It is also important to

remember that the Plans are “living documents”, which should accommodate adjustments and/or updates. Ideally the Basin Plan should be reviewed and updated every five years.

The purpose of this Sectoral Integration Plan with regard to the **forestry, land-use and catchment management sectors** in Kenya, is to ensure that the key findings and outputs from the six Basin Plans which were developed under KWSCRP-1 are properly integrated at sectoral level - in each of the six basins as well as in the country as a whole.

5.2.2 Linkages with the UN sustainable development goals

Since adoption of the UN 2030 Agenda for Sustainable Development, the Government of Kenya, as a member of the United Nations, has committed to the integration of the SDGs into national and county policy and planning frameworks. The UN 2030 Agenda is based on global sustainable development goals and covers the five critical pillars: people, planet, prosperity, peace and partnerships. It contains 17 goals and 169 targets that provide broad guidelines for sustainable development. The 17 Goals are all interconnected, and the aim is that these should be achieved by 2030. Although SDG 6 is directly related to water, under IWRM all the SDGs are considered important. This six Basin Plans include actions that not only address specific issues associated with each KSA, but also integrate measures to achieve a number of SDGs. Figure 5-1 shows the Integration of the SDGs into the six Basin Plans.

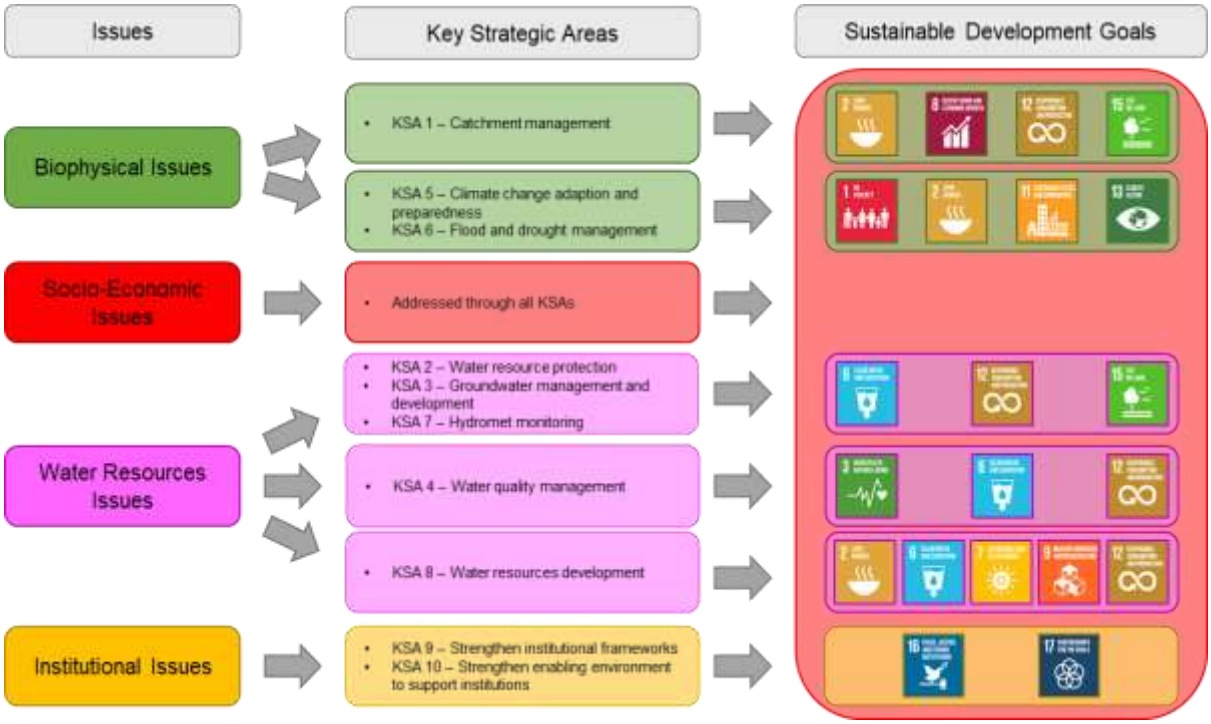

Figure 5-1: Integration of the SDGs into the six Basin Plans

5.2.3 Linkages with other existing plans

The Basin Plans provide a vision and framework for the development and management of the water and related land resources of Kenya’s six river basins. Essentially the plans reinforce the CMSs (2015-2022), supplement the NWMP 2030 and act as a source of information for the development of Sub-Catchment Management Plans (SCMPs), which Water User Associations (WRUAs) will implement. Whereas the basin plans contextualise the SCMPs, the SCMPs remain the resource mobilisation tools that WRUAs will use to source implementation funds and other resources. County governments are also involved in implementation activities, and as such will be required to review the basin plans and SCMPs to ensure that the County Integrated Development Plans (CIDPs) are linked and synchronised

with the overall basin planning initiatives. Relevant Regional Development Authorities as well as Water Works Development Agencies also need to review their proposed and existing projects to align with the investment plan as presented in the basin Plans.

Since devolution of the government the county government holds more responsibility for the management of the land. Whilst the Basin Plans are mobilised through the SCMPs the county governments need to integrate existing environmental programmes with the outcomes of the basin planning process. This would require review of not only the development options, but the relevant KSAs as discussed in Section 4. These KSAs were formulated to address issues in each basin as defined in Section 3. There should also be improved institutional coordination to ensure that the development plans for AFFA, NEMA, KWTA, KFS and CBOs/NGOs are aligned with the outcomes of the Basin Plans.

5.3 Key Strategic Areas, Themes and Budgets

Under the Themes and Strategies which were formulated for the ten Key Strategic Areas (KSAs), prioritised implementation / action plans were prepared for each of the six river basins in Kenya.

Awareness of the interconnectivity of the ten KSAs within the context of IWRM is important to guide the systematic and integrated implementation of actions emanating from the various KSAs. The interrelatedness of the KSAs are depicted schematically in **Error! Reference source not found.**. The interconnectivity ranges from direct impacts or benefits, such as the construction of a dam (KSA 8) which can improve flood control (KSA 6), to multi-dimensional impacts or benefits, such as creating a stone check dam to reduce soil erosion (KSA 1), which also reduces runoff (KSA 6) and improves water quality (KSA 4). These relationships, both direct and indirect, are important to note during implementation. Addressing one issue in a specific area through implementation of an activity may create further issues that were not predicted or could provide additional benefits.

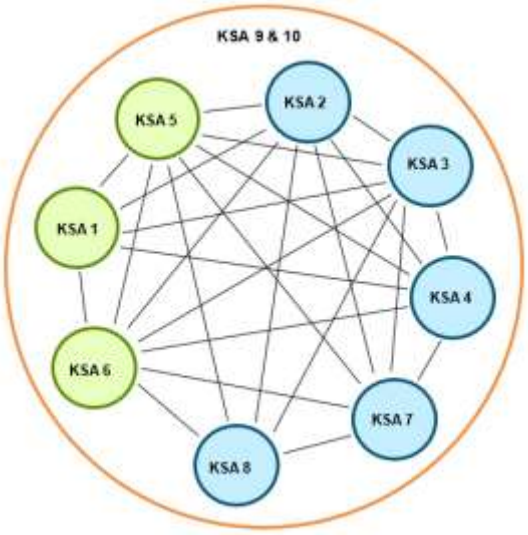

Figure 5-2: Interconnectivity of the KSAs

Table 5-1 presents key themes under each KSA which are relevant to forestry, land use and catchment management, along with estimated implementation budgets, per basin, up to the planning horizon of 2040.

The national estimated budget which is required for implementation of integrated water resources management and development activities up to 2040 in all basins and across all KSAs equals about **29 billion USD**. The forestry, land use and catchment management sectors are linked to about **983 million USD** of the National Budget as shown in Table 5-1, which summarises the proposed implementation budgets from all six Basin Plans up to a planning horizon of 2040, for activities that are relevant to the forestry, land use and catchment management sectors. The KSAs that demand the

largest expenditure from a forestry, land use and catchment management sector perspective are KSA1: Catchment Management and KSA5: Climate Change Adaptation and Preparedness.

It is important to ensure that the implementation of the KSA actions emanating from the Basin Plans are aligned with relevant legislative, policy and institutional principles and guided by internationally accepted standards for good practice to attain the goals of social acceptability, economic viability and technical sustainability.

Table 5-1: Summarised IWRM budget for implementation activities linked to forestry, land use and catchment management under specific Key Strategic Areas

Key Strategic Areas and Themes		Budget (USD million)						
		Athi	Tana	LVS	LVN	ENN	RV	Total
KSA 1	**Catchment management** Promote improved and sustainable catchment management Sustainable water and land use and management practices Natural resources management for protection & sustainable use Rehabilitation of degraded environments	124	110	80	87	46	83	**530**
KSA 2	**Water resources protection** Conserve and protect ecological infrastructure	2	2	2	2	2	2	**12**
KSA 4	**Water quality management** Effective data collection, information generation, dissemination, knowledge management Promote sound water quality management governance Efficient and effective management of point and nonpoint sources of water pollution	7	2	1	1	2	2	**15**
KSA 5	**Climate change adaptation and preparedness** Understand impacts of climate change on water resources at appropriate spatial scales Climate change mitigation Climate change adaptation	39	39	32	35	26	33	**203**
KSA 9	**Strengthen Institutional frameworks** Promote improved and sustainable catchment management Guidelines, codes of practice and manuals	13	12	12	12	13	13	**75**
KSA 10	**Strengthen enabling environment to support institutions** Develop institutional capacities to support improved IWRM&D	25	25	25	25	25	25	**148**
Total		**210**	**189**	**151**	**162**	**113**	**157**	**983**

5.4 Roadmap for Sector integration

In order to ensure the successful implementation of the strategies and actions from the six Basin Plans and National Plan as they relate to forestry, land use and catchment management, a Roadmap for Implementation is proposed. This Roadmap proposes that before any actions identified under the KSA implementation plans are implemented, there are preceding critical activities. These are as follows (Figure 5-3):

1. Immediate KSA activities
    a. Strengthening of institutional capacity and coordination;
    b. Imminent infrastructure feasibility and impact assessments;
    c. Expand on the basin plan knowledge base
2. Financial Resource Mobilisation for the KSA activities
3. Implementation of the short to long-term KSA activities
4. Monitoring and Evaluation of the KSA activities

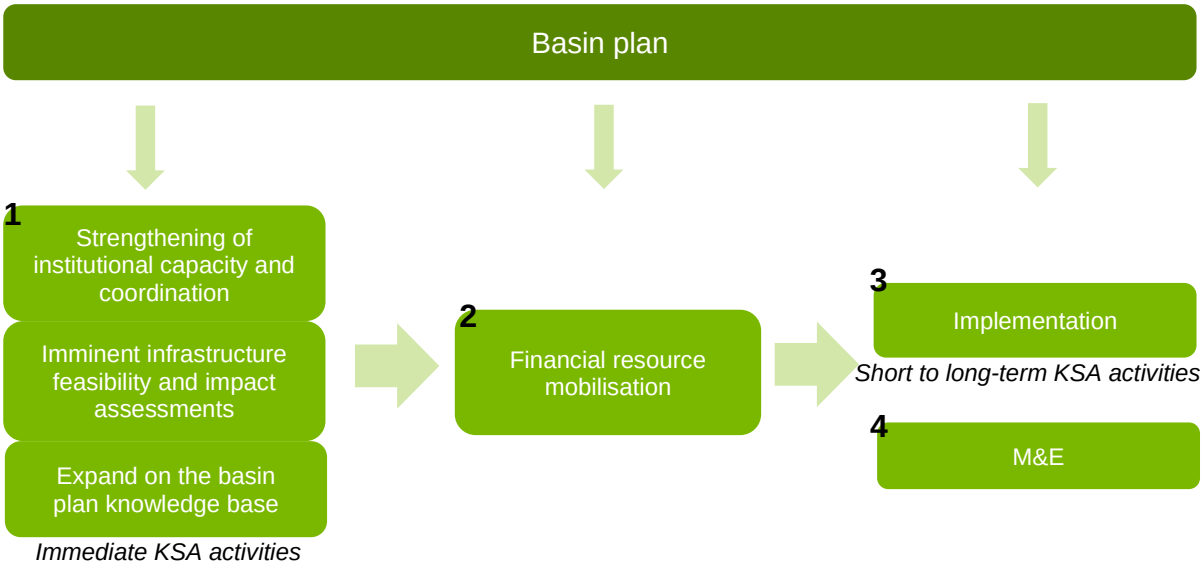

Figure 5-3: Roadmap for implementation of the Basin Plans

5.4.1 Immediate actions

5.4.1.1 Strengthening of institutional capacity and coordination

Strong institutions are necessary for effective governance. Not only must they be strong, but they must be well linked with partner institutions. On a national scale, there are many role players working in similar areas, and poor coordination can result in the duplication of efforts and failure of implementation. It is therefore not surprising that effective implementation must be rooted in strong institutions and partnerships.

Having strong institutions also provides invaluable benefits for securing external financing. When completing a risk assessment, strong institutions with good coordination mechanisms will have a much

lower risk profile than their counterparts, making them an attractive investment opportunity for both development partners and the private sector.

IWRM requires the integration of various activities for the equitable and efficient management and sustainable use of water. There are many role players involved, at different scales (i.e. national to local scale), and before any activity is initiated it is critical to ensure that there are platforms in place for engagement.

The KSAs can also be used as a planning tool for key role players, without these institutions needing to sit in the same room. For example, should KFS want to implement a reforestation program, they can refer to the Basin Plans for information on which institutions and organisations they should collaborate with, and over what timelines implementation should take place.

The main role players in the forestry, land-use and catchment management sectors are MoWSI, MoLPP, MoALF, MoDASAL, MoEF, WRA, NEMA, KWTA, KFS and the county government (Table 5-2).

Table 5-2: Forestry, land use and catchment management implementation plan key role players

		KSA1	KSA2	KSA4	KSA5	KSA9	KSA10
National	MoEF	☑	☐	☑	☑	☑	☐
	MoWSI	☑	☐	☐	☐	☑	☑
	MoALF	☐	☐	☑	☐	☐	☐
	NEMA	☑	☑	☑	☑	☑	☐
	KWTA	☑	☐	☐	☐	☐	☐
	KFS	☑	☐	☐	☑	☐	☐
	KWS	☑	☐	☐	☐	☐	☐
	AFFA	☑	☐	☐	☐	☐	☐
	WRA	☑	☑	☑	☑	☑	☐
	KMD	☐	☐	☐	☑	☐	☐
	NDMA	☐	☐	☐	☑	☐	☐
	NDOC	☐	☐	☐	☑	☐	☐
	CETRAD	☐	☐	☐	☑	☐	☐
	KPLCO	☐	☐	☐	☑	☐	☐
	MoEn	☐	☐	☐	☑	☐	☐
	KENGEN	☐	☐	☐	☑	☐	☐
	MoLPP	☐	☐	☐	☑	☐	☐
	MoTIHUDPW	☐	☐	☐	☑	☐	☐
	NWHSA	☐	☐	☐	☑	☐	☐
	KENHA	☐	☐	☐	☑	☐	☐
	KURA	☐	☐	☐	☑	☐	☐
Basin	BWRC	☑	☐	☑	☐	☑	☑
	CETRAD	☐	☐	☐	☑	☐	☐
Local	WRUA	☑	☐	☑	☑	☑	☑
	CG	☑	☐	☑	☑	☑	☑
Other	CFA	☑	☐	☐	☐	☐	☐
	WWDA	☑	☐	☐	☐	☐	☐
	WSP	☑	☐	☐	☐	☐	☐
	NGO	☐	☐	☐	☑	☐	☐

5.4.1.2 Immediate implementation activities

The timelines of the KSAs have been developed in such a way as to stagger the activity implementation across four planning horizons: immediate (2020 – 2022), short-term (2022 – 2025), medium-term (2025 – 2030) and long-term (2030 – 2040). The 'immediate' time-frame has specifically been developed to provide direction on which activities will be most beneficial to institutional strengthening.

These 'immediate' activities will also require funding, and the key role players and other relevant partners should develop strategies for generating financing. However, it is likely that the financing may have to come from the institutions themselves. This can be considered as a long-term investment – by investing now in strengthening institutional capacity, finances will be more easily mobilised for future activities. These immediate activities are also relatively cheap in comparison to larger catchment size activities, or infrastructure activities.

Table 5-3 presents the 'immediate' activities under the most important KSAs relevant to the forestry, land-use and catchment management sectors.

Table 5-3: Immediate implementation activities related to forestry, land use and catchment management

KSA	Priority activities (immediate)
KSA 1 Catchment Management	
	– Increase awareness of sustainable catchment management with relevant ministries, WRUAs, CGs etc. through training, brochures, social media, internet, factsheets, forums and workshops. – Devolve ownership of catchment management activities to WRUAs through SCMP development. – Embed catchment-based water conservation and management activities related to crop and livestock production in SCMPs – Embed catchment-based soil conservation and management activities related to crop and livestock production in SCMPs – Embed conservation agriculture and improved farm management activities related to crop and livestock production in SCMPs – Coordinate approach to forestry management – roles, responsibilities and mandates
KSA 4 Water quality management	
	– Implement national water quality monitoring programme by ensuring technical staff are capacitated and laboratories can analyse the samples accurately and on time – Ensure data submitted to Mike Info WQ database, and that the data are reviewed, analysed, reported on, and acted on by catchment staff – Develop capacity to undertake biomonitoring in Kenya to assess aquatic ecosystem health. – Identify streams for piloting biomonitoring and undertake pilot studies – Compile an inventory of surface water pollution sources – Upgrade central and regional laboratories to support the national water quality monitoring programme – All historical and new water quality data collected by WRA stored in Mike Info – Advocate for alignment of strategies to serve a common purpose of rehabilitating urban rivers and streams – Establish a coordination and cooperation mechanism to ensure there is alignment of actions to address water pollution management – Embed water quality management activities related to domestic water use, crop and livestock production in SCMPs
KSA 5 Climate change adaptation and preparedness	
	– Quantify climate change impacts (rainfall & temperature) on surface water and groundwater resources and demands at appropriate scales for planning and management – Assess potential social impacts: flooding; droughts; human conflict; migration; vulnerable groups; ocean acidification; agriculture; food production – Assess potential environmental impacts: droughts; sea temperature; rising sea levels; ocean acidification; desertification; lad degradation; loss of biodiversity; deforestation; forest degradation – Assess potential economic impacts: irrigation water requirements; crop type and yield; GDP; public Infrastructure; hydropower; coastal assets; livelihoods and income generation. – Incorporate flexible adaptation infrastructure principles in infrastructure planning and investment plans

KSA	Priority activities (immediate)
KSA 9 Strengthen the Institutional Frameworks	
– Separate regulatory and management functions of the Authority and provide different reporting lines for these. Parallel improvement and strengthening of the regulatory approaches utilised by the WRA. – Updating WRA's standards, policies and regulations in line with the WA2016 – Develop tools and systems to support implementation of the new legislative instruments – Hold stakeholder consultations for developing legislative instruments and implementation tools – Translate lessons learnt from CAACs into improved operational modalities. – Provision of secretariat services through Ros and SROs. – Appropriate channels formed for recommendations from BWRCs to be taken on board by WRA. – Clarify roles and responsibilities. – Undertake training and capacity building for the new legislative instruments – Introduce more structured strategic planning and operational engagement. – Develop a basin or sub-basin level platform for engagement with county government. – Strengthen linkages between county governments and WRUAs. – Develop a Policy on Transboundary Waters incorporating relevant elements of Treaty obligations – Updating WRA's standards, policies and regulations in line with the WA2016 – Complete the development of a National Policy for the Protection of Groundwater with all key stakeholders involved. – Review cross-sector policies, legislation and regulations relating to wastewater; streamline/clarify the roles of the Line Ministries, WRA, NEMA, the Counties and WSPs in relation to wastewater, to eliminate the dual mandates that the WRA and NEMA currently operate under in relation to 'polluter pays' and these agencies' revenue – Develop / Update Guidelines on: – Relevant Codes of Practice for Water Resources Planning and Management – Develop / Update National Manuals relevant to WRPM	
KSA 10 Strengthen the enabling environment to support institutions	
– Development of technical and management capacity through focused training, continuous professional development, bursary schemes, audits, incentive schemes – Develop a partnerships framework – Identify potential partners – Strengthen existing partnerships, particularly on a local level – Undertake stakeholder consultations – Undertake awareness creation and information dissemination activities – Develop and strengthen guidelines for MOU Final Drafting and development – Develop a basin-wide stakeholder engagement framework – Undertake stakeholder analysis – Implement the stakeholder engagement framework – Strengthen stakeholder engagement platforms i.e. forums – Strengthen links with tertiary education / research institutions – Incorporate R&D into WRM planning and decision making – Establish a network of supporting research institutions – Develop strategic partnerships for R&D – Promote innovative financing for basin level institutions (BWRCs, WRUAs, forums) – Develop internal resource mobilization strategies – Develop external resource mobilization strategies – Exploring private sector financing channels – Strategic partnerships for resource mobilization	

5.4.2 Financial resource mobilisation

Resource mobilisation refers to the various activities involved in making better use of existing resources to maximum benefit, whilst ensuring the ongoing acquisition of additional resources to ensure the achievement of organisational intent. These resources include financial resources, but also include human resources and their organisational management, equipment, services, and technical cooperation. The range of these resources and their impact is outlined in the resource mobilisation position paper.

Section 5.4.1. outlined the importance of developing strong institutions. Part of this strengthening refers to developing the human and organisational resources. While this is a vital component, financial resources are needed to strengthen these other resources, as well as implement projects.

A review of successive WRA performance reports reflects the challenges that WRA has faced financially, and shows successive funding gaps (WRA, 2017). These have considerable institutional implications for the WRA that require consideration in developing an approach to not only strengthen the WRA, but to also underpin this with a sustained funding regime. Without this strategic intent to coherently develop the business model together with resource mobilization, the overall sustainability of the institution is at risk.

There are numerous forms of external financing, each with their own type of stakeholders and investment mechanisms.

- Innovative financing avenues can include philanthropic and public, water funds and facilitates, payment for ecosystem services, effluent charges, climate change funding schemes, carbon finance, corporate grants, impact investments and conservation finance.
- The key stakeholders and partners for these avenues can include development agencies, governments, multilateral development banks, public private partnerships, private or state banks, private sector, NGOs, asset managers and international councils and secretariats.
- The investment mechanisms can include grants, subsidies, guarantees, soft/hard loans, guaranteed philanthropy, result based payments, equity, loans, environmental impact bonds and microfinance.

It is important to note that different KSA activities will require different levels of partnership and will therefore have to tap into different financing avenue. Using the resource mobilization strategy as a base, it will be necessary for the WRA or the key implementing agency (as outlined in the KSA) to develop a resource mobilization and financier engagement strategy that is applicable to each specific activity.

The forestry and land-use sectors will need to engage with WRA to ensure that Financial Mobilisation is shared according to aligned objectives.

5.4.3 Implementation and M&E

Having initiated the coordinated strengthening of institutional capacity as well as resource mobilisation as immediate critical actions, other activities in each KSA should be considered for implementation. These activities are typically costlier and have a longer implementation horizon. They also often deal with more physical interventions, and therefore require a stronger local presence and engagement. Implementation Plans for each KSA were developed, which provide a clear intent and prioritised plan of action. The implementation plans present theme priorities (i.e. critical, very important, important), activities (i.e. implementation actions), indicators to measure outcomes of activities, implementation horizon (i.e. immediate (1-2yr), short (2-5yr), medium (6-10yr) or long (11-20yr) term), responsibility for activity (i.e. at the basin scale, national scale, local scale and key stakeholders) and estimated budgets for implementation of individual activities along with possible funding sources per activity identified.

Error! Reference source not found. summarises IWRM budgets for implementation activities linked to forestry, land use and catchment management under specific Key Strategic Areas for a planning horizon up to 2040. Detailed implementation plans are provided in the respective basin plans.

Table 5-4: Summarised IWRM budget for implementation activities linked to forestry, land use and catchment management under specific KSAs up to 2040

Key Strategic Areas and Themes		Budget (USD Million)				
		2020-2022	2022-2025	2025-2030	2030-2040	Total
KSA 1	**Catchment management** Promote improved and sustainable catchment management Sustainable water and land use and management practices Natural resources management for protection & sustainable use Rehabilitation of degraded environments	24.4	200.6	172.8	132.3	**530**
KSA 2	**Water resources protection** Conserve and protect ecological infrastructure	-	3.3	3.3	5.4	**12**
KSA 4	**Water quality management** Effective data collection, information generation, dissemination, knowledge management Promote sound water quality management governance Efficient and effective management of point and nonpoint sources of water pollution	5.7	3.3	2.3	3.6	**15**
KSA 5	**Climate change adaptation and preparedness** Understand impacts of climate change on water resources at appropriate spatial scales Climate change mitigation Climate change adaptation	21.0	66.7	69.0	46.5	**203**
KSA 9	**Strengthen Institutional frameworks** Promote improved and sustainable catchment management Guidelines, codes of practice and manuals	30.3	15.5	16.8	12.2	**74**
KSA 10	**Strengthen enabling environment to support institutions** Develop institutional capacities to support improved IWRM&D	31.5	54.1	26.3	35.8	**148**
	Total	**113**	**343**	**291**	**236**	**983**

5.4.4 Stakeholder engagement

During the National workshop on the 13th and 14th October 2020 stakeholders were given the opportunity to discuss the roadmap for sector integration. They provided inputs for step 1-4 for the forestry, land-use and catchment management sector. The main outcomes are presented in **Annexure A**. The main outcomes from the session were that there needs to be inter-agency committees within public service where institutions work together under management of lead agency (example: County Implementation Committee); however, not necessarily county specific and needs to include from national to local level input. Payment for services should be offered as many institutions require the services that the water sector offers. There needs to be adequate delegation of authority so that those involved in meetings/committees are 'senior' enough to ensure implementation when taking strategy back to their institution.

6 Conclusion

Integrated Water Resources Management is based on the equitable and efficient management and sustainable use of water. It recognises that water is an integral part of the ecosystem, a natural resource, and a social and economic good, whose quantity and quality determine the nature of its utilisation (Global Water Partnership, 2006). This emphasises the importance of an integrated approach towards water resources planning, development and management - focusing on an enabling environment, institutional framework and setting up the management instruments required by institutions to understand mandates, roles and responsibilities to effectively and seamlessly do their job.

The basin planning process provides a status quo of the current water resources management situation and a plan for future management. There is no correct administrative model to ensure successful implementation. However, the principles of IWRM allow for selecting, adjusting and applying a mix of tools for a given situation and agreeing on milestones and timeframes is critical for success.

The Sectoral Integration Plans can be used to implement activities outlined in the Key Strategic Areas of the Basin Plans, particularly where the responsibilities are for sector-specific role players or institutions. Some activities should be implemented sector-wide rather than basin-wide as implementing via a sectoral-wide approach will enable implementation across the country and will not be limited to the hydrological boundaries. It is recommended for WRA to plan for the activities of which responsibility will be given to another institution, as well as how WRA will manage that partnership, such as receiving monthly reports or conducting regular meetings. At the same time, WRA will need to decide whether full responsibility is given to another institution or how and where WRA should maintain involvement. The detailed implementation tables in the Basin Plans provide key role players for each activity, which should guide these decisions.

This Sectoral Integration Plan for the forestry, land use and catchment management sectors is a key deliverable towards the overall objective of the KWSCRP namely to strengthen the Water Resources Authority as it relates to water resource management and planning through the development of tools, skills and infrastructure to deliver on its mandate. The outcome will be a stronger WRA institution that has strengthened capacity to carry out its core functions with regard to integrated basin management and planning in a manner that is based on extensive knowledge-driven analysis and that meets the expectations of key stakeholders.

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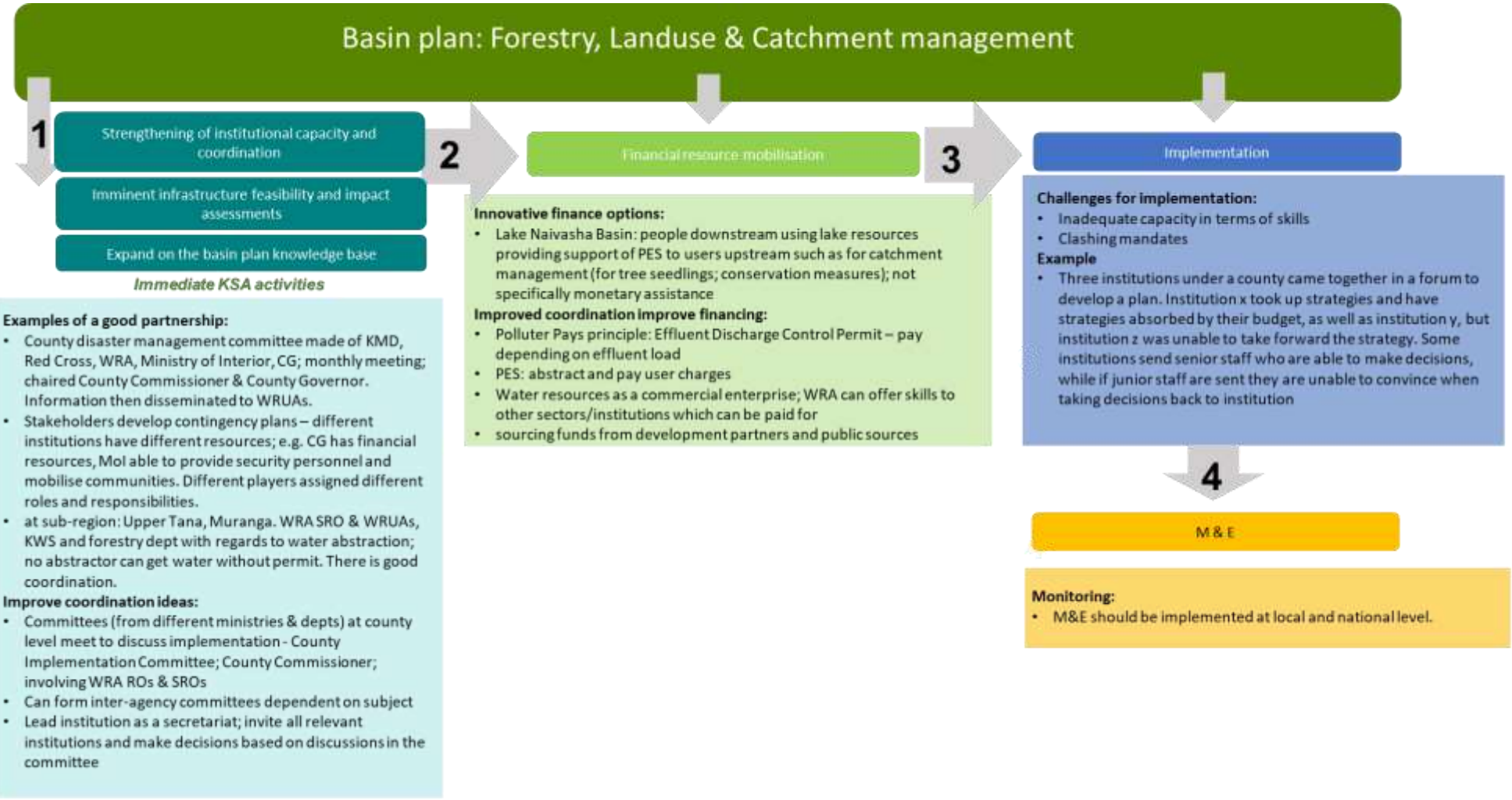
Annexure A: Stakeholder engagement



Document prepared by

Aurecon AMEI Limited
Registration No: C087142-C1/GBL (MAU)
Ebéne House 3rd Floor
33 Cybercity
Ebéne
Mauritius

T +27 21 526 9400
F +27 21 526 9500
E capetown@aurecongroup.com
W aurecongroup.com

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