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MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES

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# MASTER PLAN FOR THE CONSERVATION AND SUSTAINABLE MANAGEMENT OF WATER CATCHMENT AREAS IN KENYA

ABRIDGED VERSION

SEPTEMBER 2012



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Funding for this publication was provided by Danida through  
the Natural Resources Management Programme (NRMP)

MINISTRY OF FOREIGN AFFAIRS OF DENMARK  
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Ministry of Environment and Mineral Resources

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We regret any errors or omissions that may have been unwittingly made.

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## FOREWORD

According to international standards, Kenya is categorised as a 'water scarce' country. The country currently has available 400m<sup>3</sup> per capita per annum of renewable freshwater resources in comparison to the 1,000m<sup>3</sup> per capita per annum recommended by the United Nations.

Water scarcity challenges facing our country have worsened in recent decades. While the country had 647m<sup>3</sup> of renewable freshwater resources per capita per annum in 1992, these water resources have declined by more than 200 m<sup>3</sup> per capita per annum since that time.

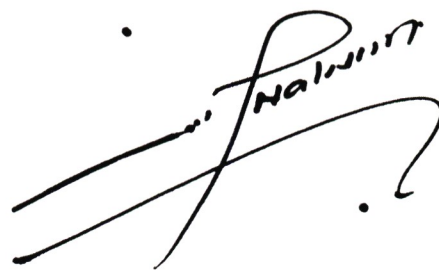
The situation can be attributed to a range of human and environmental causal factors. At independence, many dams and water-pans were dug to supply water for farming, domestic and industrial use. Over time, these have become degraded, silted and even inhabited. Rapid population growth has exerted immense pressure on the quality and quantity of water and other vital natural resources. The State of the Coast Report for Kenya, published by the National Environment Management Authority in 2009, indicated that climate variability and uncertainty has been the chief contributor to the degradation of water catchments, heavy siltation of dams and pans, and deterioration of water quality. Climate change is also contributing to the negative impacts on the country's water resources and presents serious implications for food and energy security and resource user conflicts.

It is necessary to acknowledge the severe degradation of water catchment areas that has affected Kenya's five water towers over the last twenty years. The

Aberdare Ranges, Cherangany Hills, Mau Forest Complex, and Mounts Elgon and Kenya have become so severely impacted by human and environmental processes that even the existence of the rivers that drain the water towers is now threatened.

Our country realises that our economy, society and environment are founded on services provided by ecosystems. Water, biodiversity, quality soils, and air are fundamental to economic productivity and social wellbeing and must be protected to provide every Kenyan's constitutional right to a clean and healthy environment and if Kenya is to become a middle-income country by 2030 as set out in the country's development blueprint Vision 2030.

The Ministry of Environment and Mineral Resources is proud to launch this Master Plan for improved conservation and sustainable management of water resources in Kenya. I believe the conservation, restoration and management of water catchment areas will be greatly supported by the recommendations presented herein for the benefit of ecosystems and urban and rural livelihoods country-wide.



*Hon. Amb. Chirau Ali Mwakwere, EGH, FCILT, MP  
Minister for Environment and Mineral Resource*

## ACKNOWLEDGEMENTS

Tremendous individual and institutional efforts went into the research, fieldwork, analysis and writing of this Master Plan for the Conservation and Sustainable Management of Water Catchment Areas in Kenya.

I would like to acknowledge the vision and leadership provided by the Late Hon. John N. Michuki, EGH, MP, Minister for Environment and Mineral Resources. He emphasized the articulation of a spectrum of challenges and possible solutions while at the same time broadening the scope in which water catchment areas was defined. This enabled broader investigation of diverse drivers of degradation of water catchment areas and inclusion of otherwise less considered ecosystems such as dried up lagas, sand dunes and mountain ranges in the drier parts of the country which rarely appear in many other national documents.

The Ministry collaborated with many stakeholders from the academia, research institutions, civil society groups, and many other stakeholders to put together the report. It is through the valuable support and information provided by all stakeholders that the report was finalized. We wish to acknowledge the contributions of all.

The Taskforce established by the Ministry collated and synthesized the rich information into a document that can now guide practical and transformative actions for the sustainable management of complex ecosystems. Their efforts and commitment is highly appreciated.

The production of the Master Plan benefited from the financial support of the Government of Denmark through the Natural Resources Management Programme. The African Adaptation Programme funded by the Government of Japan through the United Nations Development Programme also supported aspects of the report. We are grateful to all.

Finally, our appreciation goes to all the people of Kenya whose right to a clean and healthy environment will be secured through fulfillment of their responsibilities to manage our natural environment.



*Ali D. Mohamed, CBS*

*Permanent Secretary,*

*Ministry of Environment and Mineral Resources*

## 1.0 CHAPTER ONE



## INTRODUCTION

## INTRODUCTION

Kenya is located between latitude 4°21' North and 4°28' South and between longitudes 34° and 42° East. The country covers a land area of 569,137km<sup>2</sup> and is almost horizontally bisected by the equator and vertically by longitude 38° East. Kenya has a diversity of landforms ranging from glaciated mountain peaks under permanent snow cover to the coastal plain. She is split by the Great Rift Valley into the eastern part – dominated by Mt. Kenya (5,200m) and the Aberdare Ranges (4,000m) – and the western part, which slopes down into Lake Victoria from the Mau Ranges and Mt. Elgon (4,300m).

Kenya, whose population currently stands at 38,610,097 according to the *2009 Kenya Population and Housing Census*, has over the last four decades recorded a high population growth. The rapid population increase has exerted immense pressure on the quality and quantity of natural resources including water, a situation that has been further compounded by climate variability. Recent reports from the Ministry of Environment and Mineral Resources (MEMR) indicate that Kenya's five water towers namely the Aberdare Ranges, Cherangany Hills, Mau Forest Complex, Mt. Elgon and Mt. Kenya have been so severely degraded that the existence of the rivers that drain them is threatened. For Kenya to achieve sustainable development, it is undeniable that the conservation of the five water towers together with their sub-catchments, particularly those in ecologically fragile environments – specifically arid and semi-arid areas and the wetlands – is critical.

The conservation of pristine ecosystems is considered an important aspect of preserving nature to sustain the availability of nature-based environmental resources including biological diversity, clean air, fresh water, quality soils, and overall environmental and habitat health, which are vital for social wellbeing and economic development. Nevertheless, if not managed through efficient resource use and other environmentally sensitive mechanisms, the quest for economic development can deplete natural

resources. For this reason, arguments abound on the need to formulate conservation strategies that put a premium on the principles of environmental conservation and sustainable development, especially in protected areas. These arguments are pertinent to the simultaneous pursuit of divergent agendas – conservation vs. development – which remains a major challenge for many developing countries wherein poverty eradication is a major national priority.

Over the last forty years, Kenya's water catchment areas have been severely degraded (UNEP and MEMR 2009) by several drivers of degradation including rapid population growth, expansion of agricultural land, climate change, poor governance, inappropriate land use practices and limited appreciation of the value of a clean and healthy environment in supporting quality life. That Kenya's dependence on natural resources is inextricably linked to her poverty eradication efforts makes cost-benefit analyses imperative, given the significant benefits accrued from WCA, whose indigenous forests provide numerous ecosystem services. These include trapping and storing rainwater, regulating river flows and preventing flooding, recharging groundwater tables, improving soil fertility, reducing soil erosion and sediment loads in river water, regulating local climate conditions, and acting as carbon reservoirs and sinks (GOK and UNEP, 2009). In addition, they serve as essential wildlife habitats, and are traditionally important to local communities for their cultural and divine significance.

For this reason, the conservation and sustainable management of water catchment areas is of strategic importance to Kenya; not only does it address the need to sustain the availability of environmental goods and services such as clean water, quality soils and habitats, but also other socioeconomic development needs such as employment creation. Accordingly, the Kenya Vision 2030 – the national development strategy for Kenya – lists conservation of water catchment areas among the five priority

programmes in the environment sector (GOK, 2008). Specifically, the social pillar of the Kenya Vision 2030, under which the environment sector falls, recognises the value of a cohesive society that enjoys equitable social development in a clean and secure environment. In addition, the Government has prioritised the environment sector as an important driver of socioeconomic development, and the Constitution of Kenya 2010 acknowledges that the environment is a heritage that must be conserved and managed for present and future generations. Indeed, Part 2 of Chapter 5 of the Constitution provides for the management and conservation of the environment in order to inter alia conserve biological diversity and ensure that the right of all to a clean and secure environment is upheld.

In support of these provisions, on 02 June 2010, the Hon. Minister for Environment and Mineral Resources gazetted an interdisciplinary Taskforce to develop a national Master Plan to guide the country's water catchment conservation programmes. The need arose out of recognition that the persistent and intense cyclical droughts and floods associated with climate change were indeed a proxy indicator of the extensive environmental degradation, and the intensifying scarcity of critical environmental resources as water. The development of this Master Plan is therefore in appreciation of the fact that failure to conserve and protect the water catchment areas is likely to result in massive economic losses, human suffering and disintegration of the country's social fabric as inter-community conflicts over environmental resources intensify.

The **vision** of this Master Plan is for a Kenya with well managed water catchment areas, and its **goal** is to ensure conservation and sustainable management of water catchment areas. The Plan provides a detailed review of existing legislation, policies and other relevant documents on the management of water catchment areas, and identifies gaps and conflicts in existing legislation and policies as well as weaknesses in the institutional framework. In addition, it describes the environmental status, biodiversity and land use of water catchments areas and proposes intervention measures, which are aligned with Kenya Vision 2030 and the Constitution of Kenya 2010.

The Taskforce used various methods and datasets in collecting information and compiling the Master Plan, which defines intervention areas as any existing degraded environment that requires remedial action. From the analysis of the status of the waters catchments in Kenya, key outputs have been detailed in the workplan for the sustainable management of water catchment areas within the framework of the National Water Catchment Conservation Programme (NWCCP). The national program proposed in this Master Plan will be established to guide outcomes that target poverty eradication, economic growth and most importantly a sustained quality environment. The planning, implementation and monitoring of the activities identified in the Master Plan will involve multiple stakeholders as is required in the Constitution of Kenya 2010.



## 2.0 CHAPTER TWO



# ENVIRONMENTAL STATUS, LAND USE AND BIODIVERSITY

# ENVIRONMENTAL STATUS, LAND USE AND BIODIVERSITY

## 2.1 INTRODUCTION

Natural resources derived from the environment drive Kenya's economic growth and development, indeed sustaining the livelihoods of the people. Water is a significant natural resource – and a key factor of production – whose availability in adequate quantities and quality has been challenged by several factors including rapid population growth. The growing human population in Kenya calls for the sustainable management of water catchment areas if the demands of the current and future generations are to be met. Indeed, the intervention measures need to be applied to each water catchment area in its entirety i.e. including the biodiversity and land, soil, forest and water resources (Chapter 5, Constitution of Kenya 2010).

The unabated degradation of environmental resources calls for the conservation not only of the water towers but also of other local catchment areas that are fragile and vulnerable to high population growth. This is particularly so for arid and semi-arid areas, which are critical to the existence of



*Plate 2.1.1: Exposure of rivers due to land use changes. (Source MENR August 2010)*

local pastoral communities, their livestock and wild animals living nearby. Other unique areas including the Shella sand dunes, oases in arid areas and rocky outcrops are significant sources of water catchment and require special restoration and management.

In this Chapter, the environmental status of water catchment areas is assessed and described in terms of the extent of the degradation experienced and the implications with regards to remedial action (GOK, NEAP 2009). The biodiversity status of the catchment areas is discussed in relation to the current land use and economic activities, and water catchment areas that have ceased to be are identified and explanations provided. The analysis forms the basis for the intervention and restoration programme for the Master Plan on Conservation and Management of water catchment areas in Kenya.

## 2.2 WATER CATCHMENT AREAS IN KENYA

A water catchment area refers to an extent or area of land where water from rain and melting snow or ice drains downhill into a body of water, such as a river, lake, reservoir, estuary, wetland, sea or ocean. The water catchment area includes both the streams and rivers that convey the water and the land surfaces from which water drains into these channels, and is separated from adjacent basins by a catchment divide. The operational definition used in the Master Plan considers that the water catchment is concerned with not only the water but also the land and all the resources within the delineated area. Therefore, it considers the country's 5 water towers, namely the Aberdares, Cherangany, Mau, Mt. Kenya and Mt. Elgon that form water drainage areas for Athi, Ewaso Ng'iro North, Lake Victoria, Rift Valley and Tana (Figure 2.2.1).

Figure 2.2.1 The main water catchment areas

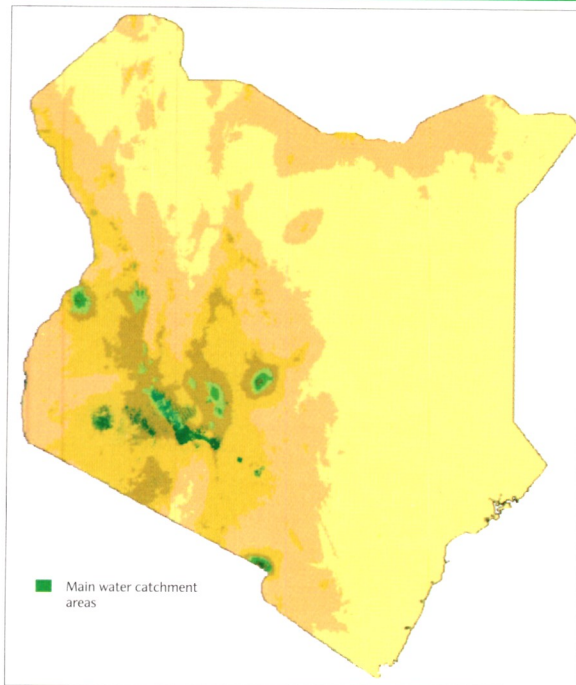


Plate 2.2.1. Endau Hills: a significant water catchment area in the drylands (Source: KEFRI)

There are other smaller significant water towers and catchment areas in the country, including low mountains and hills in the drylands, which provide important sources of freshwater to the surrounding areas and are therefore vital to the pastoralist communities. These catchment areas include the hills in Machakos and Kitui, the Chyulu, Igembe, Manga, Maragoli, Ngong, Shimba and Taita Hills, and Mts. Kulal, Marsabit, Ndoto and Nyiru. Other significant catchments include the sandy reserves at the Kenyan Coast such as Shella Dunes of Lamu, and oases in the arid areas such as Loiyangalani in Marsabit. Plate 2.2.1 shows the Endau Hill in Kitui, a significant water catchment area within the drylands.

### 2.3 PHYSIOGRAPHY, HYDROLOGY AND CLIMATE

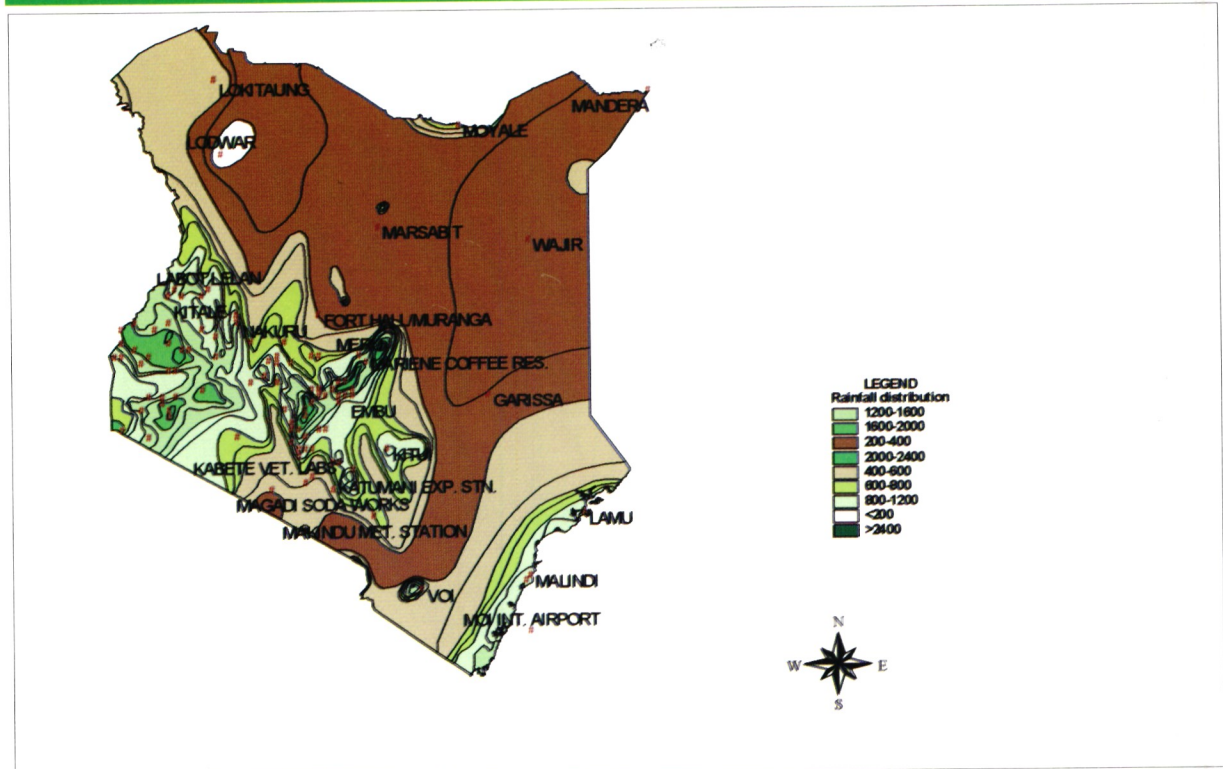
Kenya is a country of diverse topography, hydrology and climate. Her five key physiographic features

namely the lake basin, the plateaus, the Rift Valley, the coastal land, and the highlands characterise the country's climatic regions. The hydrology is characterised by four major rivers (Gucha-Migori, Nyando, Nzoia and Tana) which discharge in excess of 1,000m<sup>3</sup>/day; other rivers with significant perennial flow are the Mara, Sio, Sondu and Yala. A comparison of the rivers in different basins countrywide demonstrates the need for intervention upstream of the catchments in order to improve their conditions.

Surface water availability varies greatly, with the Lake Victoria basin accounting for 60% of the country's surface water and the Tana catchment accounting for 20%. Interestingly, the area under Lake Victoria basin comprises 8% of the total land area in Kenya, while Ewaso Ng'iro North, which occupies 36%, accounts only for 2% of the total surface water.

Kenya's rainfall depicts very strong seasonality in harmony with the latitudinal migration of the Inter-Tropical Convergence Zone (ITCZ). There are bimodal and tri-modal rainfall distributions, with rainfall peaks generally occurring in April/May (long rains) and October/November (short rains) for bimodal rainfall regimes, and in July/August (mostly in western Kenya) for tri-modal rainfall regimes. In most areas, the long rains account for over 50% of the annual totals but in the southeastern lowlands of Kenya, the short rains are more significant and more stable.

Figure 2.3.1 Rainfall distribution in Kenya



## 2.4. POPULATION AND LIVELIHOODS

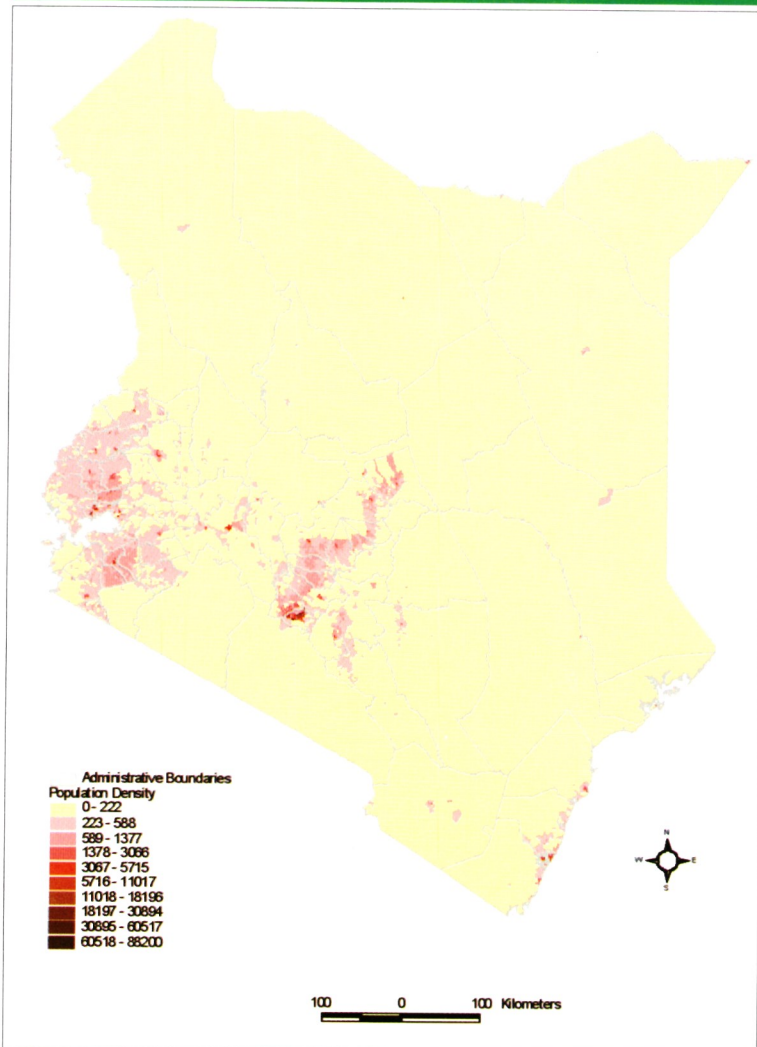
Population, land use and livelihoods in Kenya are intricately linked, seeing as the Kenyan population is heavily dependent on land as a principal source of livelihood. Therefore, as the population continues to increase so does the pressure on land resources. According to the 2009 Kenya Population and Housing Census, there were 38,610,097 people in the country in 2009 aggregated into 8,767,954 households (2009 Kenya Population and Housing Census, GOK 2010). Figure 2.4.1 shows the population distribution and areas in Kenya with high population density, which as a result, are susceptible to degradation.

The population is growing at a fairly high rate relative to the size of the country and the level of socioeconomic development (Figure 2.4.2). At the current growth rate of 3.0%, the country is expected

to increase to about 60 million people by the year 2030. Figure 2.4.3 illustrates how this increasing population will continue to present a big challenge to the realisation of sustainable development.

The population structure in Kenya indicates that the country has a large proportion of young people, specifically 11,145,872 people between the age bracket of 15 to 29 years and 10,632,571 children between the age of 0 and 14 years (GOK, 2011: Economic Survey 2011, Kenya National Bureau of Statistics, 2011). As these children and youth grow, they will require gainful employment but with the current unemployment rate, very few employment opportunities exist. As a consequence, these will need to seek employment in the informal sector, whose main activities tend to rely heavily on natural resources such as forestry for carpentry, beekeeping and fishing thereby increasing pressure on the country's natural resources.

Figure 2.4.1 Population distribution in Kenya



### 2.4.1 Urbanisation and Settlement Trends

More than 75% of the population is concentrated in the high potential areas comprising only 20% of the land surface (Jaetzold and Schmidt, 1983), and these tend to be forest areas and sources of Kenya's major river basins. As the population increases, so will the demand for land, resulting in further encroachment of forests and pressure on natural resources as people increasingly settle in water catchment areas. In turn, this will result in loss of wetlands, increased demand for pasture, clearing of vegetation, decrease in agricultural productivity due to change of land use, and an increase in water abstraction rates.

In most ASAL, settlement patterns are characterised by nomadic pastoralism, and the location of administrative headquarters and famine relief centres, which guarantee socioeconomic security. In the River Tana and Athi basins, settlement along the river is common among farming and pastoralist communities due to the availability of water.

Figure 2.4.2: The trend of Kenya's population (1950 – 2050)

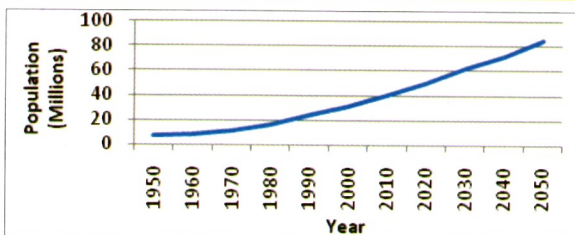
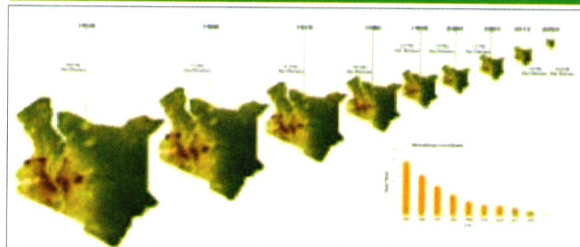


Figure 2.4.3: Illustration of the shrinking land resource base projected to 2050



(Source: Kenya: Atlas of Our Changing Environment)

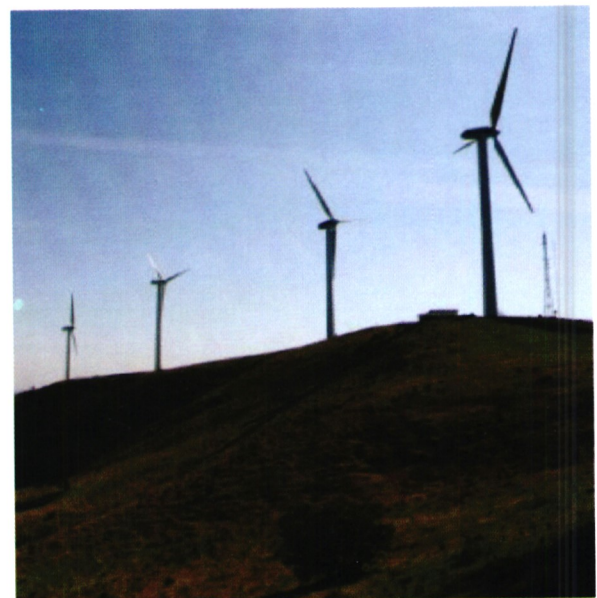
Thanks to rural-urban migration, engendered by population movements in search of employment opportunities, Kenya's urban population is growing at a high rate. Currently, 32% of the population lives in urban areas (GOK, 2009: Kenya Population and Housing Census), resulting in an increase in the degradation of some areas as the demand for basic facilities such as housing, water and waste disposal increases. To cater for the growing urban populations, the number of urban areas is also increasing rapidly – currently there are 277 urban areas in the country, with a population of 2,000 people and above (2009 Kenya Population and Housing Census). Certainly, this means that settlement areas and social amenities will need to increase commensurately as people move into forested areas and convert land currently used for agriculture as has been the case in the Karura and Ngong Forests, Kiambu, Kitengela and Athi River.

#### 2.4.2 Energy and Livelihoods

In comparison with other sources of energy including hydro-, geothermal, wind and solar power, it has been established that biomass (fuelwood) is the most relied upon, with 67% of Kenya's population using firewood and another 17% charcoal for cooking (GOK, 2011: Economic Survey 2011, Kenya National Bureau of Statistics). The dependency on fuelwood as a source of energy is a major threat to forests particularly in the rural areas where 86% of the population use firewood and another 10% use charcoal for cooking. Nearly three out of four

households (74.3%) use kerosene for lighting, 19% use electricity and 3.7% use firewood. If alternative sources of energy are not identified to meet the needs of a growing population, then this high usage of wood fuel poses a great threat to water catchment areas.

Kenya is well endowed with a great alternative energy resource potential including geothermal in the Rift Valley, wind around the lakes such as Kano Plains and Marsabit, solar countrywide and coal in the Mui basin.



*Plate 2.4.2.2 Renewable wind energy on Ngong Hills  
(Source: Ministry of Energy 2011)*



*Plate 2.4.2.1 High dependence on wood fuel  
(Source: MEMR)*



### 2.4.3 Wildlife and Livelihoods

Kenya's tourism industry, largely dependent on wildlife, is a significant source of foreign exchange revenue (Gachenge, 2008) and one of the largest contributors to the economy. Indeed, the sector contributed close to Kes. 100 billion to the country's economy and generated up to 45% of Kenya's foreign exchange earnings from tourism and related activities in 2010. The sector has grown from strength to strength as the number of people visiting parks and game reserves increased steadily over the years, from 1,533,438 people in 1999 to 2,495,135 in 2007.

Some of the wildlife tourist sites are dependent on the water catchment areas; the sites near the Rift Valley including Maasai Mara and Lakes Nakuru and Elementaita draw their water from the Mau Forest Complex. The importance of these and other tourist attractions including Mt. Kenya, the Aberdares, Lake Bogoria, Shimba Hills, Saiwa Swamp and the marine parks, also emphasises the need for the conservation of water catchment areas.

### 2.4.4 Agriculture and Livelihoods

Agriculture is the mainstay of Kenya's economy, contributing approximately 24% of the GDP (GOK, 2011) and employing an estimated 3.8 million people directly in crop and livestock production and fishing, and another 4.5 million in off-farm informal

sector activities. The Agriculture Act (Cap 318) of 1986 (revised) gives the Ministry of Agriculture the mandate to ensure adoption of sustainable agricultural practices in order to protect and conserve the environment in the country. Some of the strategic thrusts under the Agriculture Sector Development Strategy are transforming land use to ensure better utilisation of high and medium potential lands, increasing productivity and development of ASALs for crops and livestock production.

The Government's policy for the fisheries' sub-sector is to maximise production by proper utilisation of resources. To expedite commercial aquaculture growth, the Government introduced the construction of fishponds under the Economic Stimulus Package (ESP) in the 2009/2010 financial year (GOK, 2010: Economic Stimulus Package), and constructed 20,000 fishponds in 160 constituencies during this period. ESP targeted fish farming as an alternative source of livelihood, in addition to reducing demand for fish from the conventional sources including Lakes Victoria, Naivasha, Turkana, Baringo, Jipe, Tana River and the Indian Ocean. However, fish farming has a negative impact on water conservation particularly in areas where some fish farmers practise fish farming in water catchment areas such as wetlands (see Plate 2.5.6.1).



*Plate 2.4.3.1: Kenya's arid lands are richly endowed with wildlife (Source: KWS)*



*Plate 2.4.4.1: Inappropriate agricultural methods pose a threat to the sustainability of the ecosystem and human health*

### 2.4.5 Livestock and Livelihoods

The production and distribution of livestock in Kenya is largely influenced by rainfall patterns, and since only 20% of the country is arable (Figure 2.5.1.1), the ASAL are most suitable for livestock production and wildlife conservation. Traditionally, nomadic pastoralism constitutes the dominant and the mainstay of the economy in the drylands, and this makes vegetation important for the provision of grazing and browsing resources. With the alteration of hydrological regimes in catchment areas, frequent prolonged drought, poor land use and deforestation in some ecosystems, the livestock sector is seriously at risk, as are the other important activities in these ASAL – tourism and sand mining.

### 2.4.6 Indigenous Knowledge

The role of indigenous knowledge in biodiversity conservation and sustainable management of water catchment areas can be great. The management of natural resources by nomadic pastoralists and certain communities (such as the Mijikenda, Maasai and Luo) as part of their cultural beliefs and practices, indicates their deep understanding of their ecosystems. This knowledge, which has been accumulated through an intimate relationship with nature, is invaluable in decision making on resource use, conservation and development options.

### 2.4.7 Women and Youth

It is important to note that gender dimensions in the use of water catchments influence their conservation. For instance, it has been observed that in areas where women are involved in conservation activities, the environmental status is well managed, a reality attributed to the fact that women are more involved in rural activities than men. Then again, women spend a lot of time in search of water, firewood and other domestic chores, leaving them with little time for activities related to conservation. Mainstreaming gender into policies, plans and budgets, affirmative action will ensure that women have good representation in various activities within the water catchment areas. Indeed, the Economic Survey 2011 advocates for an enhanced role of women groups in the conservation and protection of water catchment areas in view of the key role

that they have increasingly played in development activities.

Unemployment is one of the major challenges facing the youth, who currently comprise 32% of Kenya's population, as only about 500,000 young people join the labour market annually. This valuable human resource needs to be exploited in the conservation of water catchment areas, as was successfully done during the implementation of the Ministry of Youth Affairs and Sports' *Trees for Jobs* initiative, where many young people were involved in tree planting and nurturing, and bush clearing. Full exploitation of the tree-planting programme through the registered 16,350 youth groups, 4,300 women groups and 4,200 selected Green Schools in the country expands possibilities for the accelerated restoration of WCAs, and significantly supports the Government's policy aimed at planting 7.6 billion trees by the year 2030.

## 2.5 ECOSYSTEMS AND BIODIVERSITY STATUS

The term ecosystem is generally used to denote the physical and biological components of an environment considered in relation to each other, and these include plants and animals together with their environment: surrounding air, water, soil, sunlight, rocks etc. Ecosystems vary greatly in size and the elements that make them up but each is a functioning unit of nature (Campbell 2009). There is such a high level of interdependence among species and elements in an ecosystem that damage to, or the disappearance of, one part of an ecosystem is sure to have an impact on all the other parts. Extremes of ecosystem diversity include wetlands, marine and forests but even within these ecosystems there are different formations, each with a distinctive species association determined by species-level biodiversity (NMK, 1992).

Biodiversity or biological diversity is a measure of the relative diversity among organisms present in different ecosystems, and by the same token, forest biodiversity refers to the whole web of life –

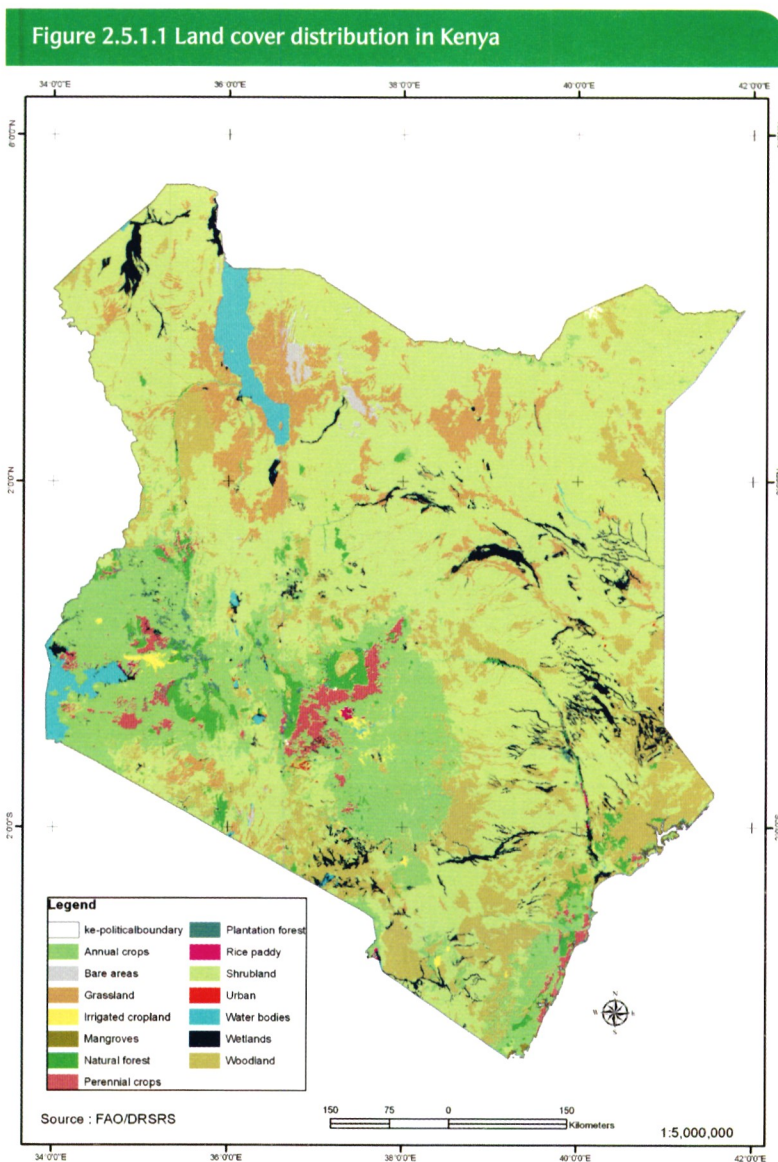
including trees, shrubs, herbs, fungi and animals – that is supported in a forest. Although accounting for only 2% of Kenya's land area, closed canopy forests harbour a large percentage of the nation's biodiversity.

Rainfall and altitude are the two major factors that determine the distribution and growth of plants, thereby conceiving ecosystems with characteristic flora and fauna by which they are distinguished. In

order to address issues related to the environmental status and biodiversity of the water catchment areas, prior knowledge of the ecosystems in which these water catchment areas are found is imperative, as this helps in monitoring rehabilitation and restoration activities.

### 2.5.1 Land Cover and Land Use

Kenya is endowed with diverse ecosystems including montane forest, dryland, wetland, marine and terrestrial mangrove ecosystems that are rich in flora and fauna. Figure 2.5.1.1 shows the land cover distribution.



(Source: FAO DRSRS Africover Project 2000)

The five major water towers namely the Aberdare Ranges, Cherangany Hills, Mau Complex and Mts. Elgon and Kenya, are also the main forest ecosystems within which are natural vegetation types with characteristic biodiversity, largely determined by elevation and rainfall. The natural vegetation types for the major water towers are:

- **Afro alpine** occurring above 3,800m a.s.l, found on Mts. Kenya and Elgon, and the Aberdares only, and characterised by freezing temperatures, strong wind, shallow wet or marshy peaty soils on rock, and the absence of trees except *Senecios*, tussock grasses, *Carex* bogs, wiry herbs, mosses and lichens. There is minimal human or animal disturbance at these elevations and the major threat would be the effects of climate change.
- **Mountain scrubland and moorland** occurring at 2,500–3,800m and found in all water towers. It is characterised by very cold temperatures, thin wet or marshy peaty soils on rock,

tussock-forming grasses and sedges, mosses, lichens and ferns are also common. There is minimal human and animal disturbance at these elevations and like in the Afro Alpine, the major threat would be the effects of climate change.

- **Bamboo woodland and thicket** occurring at 2,100–3,300m a.s.l. with rainfall above 1,200mm and recognised by the occurrence of bamboo in pure stands in closed canopy or patches or mixed with scattered trees but usually forming over 80% cover. This is a crucial vegetation type because most rivers, streams and springs start here and so does serious destruction by humans and animals through the intensive harvesting of bamboo and other woody species and cultivation.

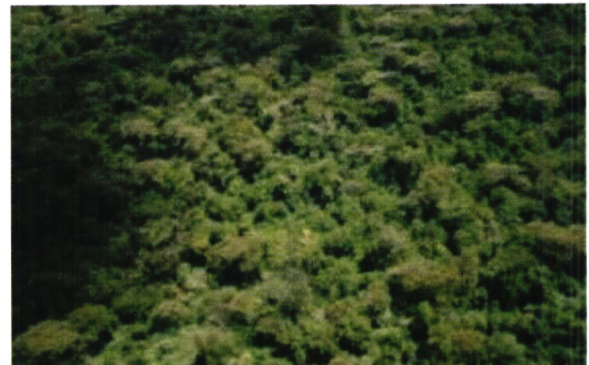
- **Drier montane forest** occurring at 1,800-2,900m a.s.l., with annual rainfall totals of 700-1,350mm. This vegetation type, found in the drier, cold (leeward) slopes of mountains, is an important source of several rivers and springs. Unfortunately, there has been much destruction particularly through illegal logging, grazing, cultivation and settlements, charcoal burning and fires among others, resulting in severe degradation.

- **Moist montane forest** occurring at 1,600-2,450m a.s.l., with rainfall over 1,800mm. This forest ecosystem is found in the wetter (windward) slopes of mountains, and is characterised by a continuous stand of trees over 10m tall with closed canopy,

relatively moist or wet floor, usually with carpet forming *Selaginella kraussiana*, lichens and epiphytic ferns – the tree fern, *Cyathea manniana*, is common along streams. This ecosystem, being an important source of several rivers and springs, faces potential destruction, as it is most suitable for the production of many staple crops such as potatoes and cabbages. Indeed, many of these areas have been cleared of natural vegetation and converted to agricultural land and plantations of exotic species.

## 2.5.2 Biodiversity of Key Forest Water Catchment Areas

Kenya is among the world's top 50 countries in terms of species richness (IUCN, 1996), and has one of the highest numbers of total mammal species in Africa. In addition to being the heart of biodiversity



*Plate 2.5.2.1 A well conserved moist montane forest (Source-DRSRS)*



*Plate 2.5.1.1 Pure stands of bamboo in the Aberdares and Mau Forests (Source: DRSRS)*

wealth, Kenya's water catchment ecosystems are the backbone of much of the country's economic activities on which many livelihoods depend.

The Mau Forest Complex is an example of the wealth in biodiversity of catchment areas, as it hosts several indigenous valuable plant and animal species such as the Bongo whose race is endemic to Kenya, mammal species that are of international and regional conservation concern, and nationally endangered species including the potto, spotted necked otter and the striped hyena. The forest has a rich variety of birds representing the richest montane avifauna in the Eastern African region, and in other smaller species such as invertebrates, reptiles and amphibians.

Another biodiversity-rich water catchment is Mt. Kenya, a unique ecosystem with great cultural and biological significance, recognised as a Forest Reserve in 1932, established as a National Park in 1949, and designated a Biosphere Reserve under UNESCO Man and Biosphere Programme in 1978. In addition, the National Park and forest reserve area was in 1997 listed as a World Heritage Site for its notable landscape and outstanding flora and fauna. Mt. Kenya has various altitudinal zones of vegetation including moist forest, dry highland forest, bamboo, afro-alpine moorland and finally the snow and glacier belt. The floral diversity of these forests includes 882 plant species and subspecies belonging to 479 genera in 146 plant families. With much of Central Kenya forests gone, Mt. Kenya has become a refuge for rare and endangered plant and animal species once common in the region. These forests are also rich in medicinal plants and endemic species including rare orchid species.

### 2.5.3 Threats to Biodiversity of Forests and Water Catchment Functions

With forest ecosystems being vulnerable to natural shocks, mismanagement and unsustainable use, many are facing the threat of depletion, and as a result, the ecosystems and biodiversity of water catchments have been increasingly degraded. The rapidly growing population and increasing developmental needs within the high potential areas where catchments are concentrated have increased

demand for fertile land, water, and energy, therefore putting considerable pressure on the resource base. The continued mining of catchment resources jeopardises biodiversity and essential ecological services and this will certainly increase poverty levels. In view of the two-way causal relationship between catchment degradation and poverty, it goes without saying that the majority of poor people depending directly on catchment resources for sustenance will be the most directly affected by degradation of the capital base.

### 2.5.4 Dryland Water Catchment Ecosystems

Drylands, which make up approx. 80% of Kenya's land surface, are characterised by hot and dry climate with low, brief, erratic and sporadic annual rainfall, poor soils and scanty vegetation cover. Extensive areas of Kenya's drylands are low-lying plains covered with thickets of thornbush, grassland and scattered trees – mainly *Acacia* and *Commiphora* species. These plains are dotted with isolated hills and low mountains, which when of sufficient height, trap and hold clouds or force moisture-laden winds into high altitudes where cooling causes condensation. These hilltops, which hold unique islands of forests supporting different flora and fauna, are important water catchments and biodiversity conservation areas and play a critical role in climate change mitigation.

The impact of hilltop forest cover on microclimate (i.e. soil, temperature and soil moisture conditions) is significant, as it moderates the effects of temperature and wind, and significantly changes the humidity regime. These microclimates provide a much wider range of environmental conditions that are nonexistent under other dryland vegetation cover, and as a result support a wider range of species. The fact that these hilltop forests prevent rapid runoff of rainwater and help replenish springs and streams in the valleys below, makes them water catchments vital for the existence of pastoralists, domesticated and wild animals. For this reason, the conservation of such biodiversity hotspots is of paramount importance.

Table 2.5.4.1 Dryland catchments

MOUNTAIN/HILL	CATCHMENT/RIVER	COUNTY
Mt. Marsabit	Local	Marsabit
Mt. Kulal	Local	Marsabit
Hurri Hills	Local	Marsabit
Mathews Range	Ewaso Ng'iro, Milgis	Samburu
Ndoto Mts	Local, Milgis	Samburu
Nyiru Mts	Local	Samburu
Kirisia Hills	Ewaso Ng'iro, Milgis	Samburu
Namanga/Ol Doinyo Orok	Local, Cross-Border, TZ	Kajiado
Emali Hills	Local	Kajiado
Chyulu Hills	Mzima, Tsavo, Galana	Makueni, Kajiado, Taita
Machakos Hills	Athi	Machakos, Makueni
Ol Doinyo Sabuk	Athi	Machakos
Endau Hill	Local	Kitui
Mutitu Hill	Local	Kitui
Mumoni Hill	Local	Kitui
Tugen Hills	Perkerra, Kerio, Suguta,	Baringo
Karasuk/Loima Hills	Turkwell	Turkana
Kasigau Mt.	Local	Taita-Taveta
Maungu Hills	Local	Taita-Taveta



Plate 2.5.4.1 Dry ecosystems of northern Kenya (Source: MEMR)

### 2.5.5 Threats to Biodiversity and Water Catchment Functions of ASAL Areas

The increased pressure on natural resources in the ASALs has led to the degradation of fragile ecosystems and resulted in a marked increase in resource-based conflicts as competition for scarce resources stiffens. Sadly, there are no formal regimes to manage and support the multiple functions of hilltop forests in a holistic manner, and the current formal knowledge base tends to focus either on adaptation to climate within farming or livestock systems or on biodiversity conservation in protected areas. Seldom does it focus on local level interaction between the two on which both people's adaptation options and biodiversity conservation depended, and this needs to be addressed.

### 2.5.6 Wetland Water Catchment Ecosystems

Kenya's wetland ecosystems, which cover between 3-4% of the total land surface, are considered the most diverse and productive, probably second only to forests. Their importance and value range from ecological/environmental to socio-economic functions, as they support a number of livelihood systems and cultural practices among Kenyans countrywide.

The Kenyan landscape and wetlands are associated with rich biodiversity assemblages, unique to the different wetland types, and in some cases with endemic flora and fauna. The wetlands, stated as the richest sinks of carbon (IPCC, 2010), have special benefits to the overall ecosystems and livelihoods. They control floods and prevent soil erosion by storing excess amounts of water during heavy rainfall, thereby reducing floodwater volumes downstream.

Wetlands are natural habitats for a variety of plants and animals some of which are endemic, endangered and migratory. They are therefore in-situ banks for genetic resources. This makes them unique sites for tourism, cultural activities and scientific research. As a source of hydroelectric power and raw materials (reeds such as *Papyrus sp.* and *Phragmites sp.*) for the cottage industry, wetlands support industrial growth. In addition, the edible plants, animals and fish that thrive in wetlands are a source of food.

#### 2.5.6.1 Threats to Biodiversity and Water Catchment Functions in Wetlands

Despite the high productivity and provision of many benefits, wetland ecosystems are still facing serious threats. The main threats are those arising from poverty, poor policies, population pressures – specifically rapid human population growth, immigration, urbanisation and industrialisation. These lead to several problems in the wetlands including reclamation, pollution from domestic and agricultural discharge, eutrophication, overexploitation of resources, excessive extraction of water and invasion by alien invasive species. With time, these problems have intensified, resulting in serious ecological imbalances.

Given the fragility of wetlands, there is an urgent need to strike a balance between the environmental functioning of wetlands and their sustainable use for livelihoods. For this reason, there is desperate need for management regimes that guide the use, conservation and sustainable management of wetland biodiversity resources in Kenya.

Serious cases of pollution include Lake Nakuru, which is threatened by industrial and domestic waste, Lake Naivasha by agrochemicals from horticultural enterprises and Tana River by agrochemicals and urban waste. In addition, Lake Victoria and associated wetlands are under threat of destruction by industrial effluent from sugar and paper industries, agrochemicals and domestic waste. Indeed, most wetlands



*Plate 2.5.6.1: Fish farming is done in wetlands and this may compromise the quality of water*

are increasingly showing symptoms of nutrient enrichment such as algal blooms, fish kills, prolific growth of macrophytes and murky foul water.

The main land use changes that have affected wetlands in Kenya include deforestation of critical areas including the Mau, Mt. Kenya and the Aberdares forests, occasioning the destruction of various catchments such as the Tana River and Lakes Victoria, Nakuru and Baringo. The encroachment of catchments is a major problem that has been observed on the Yala Swamp, Lakes Naivasha, Baringo, Victoria and Ol Bolossat, and Tana River, as is the reclamation of many wetlands including the Yala Swamp and Tana Delta.

#### 2.5.6.2 Invasive Species

A species is regarded as invasive if, having been introduced by human action into a location where it is not native, it becomes capable of establishing a breeding population without further intervention by humans and becomes a pest, threatening the local biodiversity. Invasive aquatic species, both floating and submerged, pose serious threats to the country's lakes, rivers, dams and swamps, as they impede fishing, navigation and interfere with general water flow. The Convention of Biological Diversity (CBD) recognises the significance of aquatic invasive species as a threat to biodiversity conservation, and is committed to the prevention and control of their spread globally.

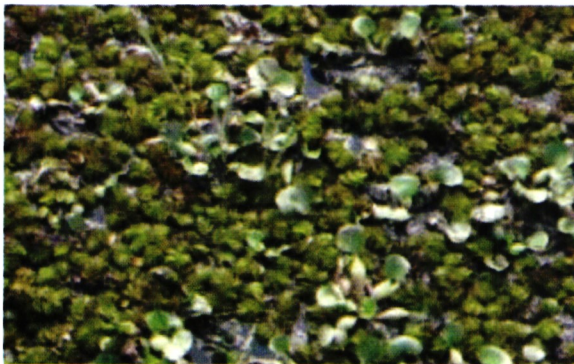


Plate 2.5.6.2: Invasive species (*Salvinia molesta* and *Eichhornia crassipes*) that have colonised L. Naivasha

Water hyacinth (*Eichhornia crassipes*) on Lake Victoria has choked the socio-ecological functions of the lake, as has *Salvinia molesta*, which occupies large areas of Lake Naivasha, and occurs on Rivers Nairobi and Ramisi, Masinga Dam and other aquatic ecosystems. *Prosopis juliflora*, commonly known as *Mathenge*, is yet another alien invasive species that has invaded dryland areas such as Baringo and the northeastern region.

The management of widespread invasions on transboundary water resources such as the water hyacinth on Lake Victoria requires intergovernmental coordination. It is also important to involve the neighbouring farming communities, which through using many agricultural inputs, provide ideal sources for nutrient loads that support growth of these weeds. This calls for the harmonisation of land use regulations in the catchment areas and around lakes.

## 2.6 STATUS OF WATER CATCHMENTS

The water catchments have a varied environmental status that is continually changing in terms of environmental status due to both anthropogenic and natural influences and can be categorised according to different levels of degradation. Detailed studies have been done on the status of water catchments areas; Table 2.6.1 provides a highlight of changes in vegetation cover and land use, threats to selected water catchments and sub-catchments for the major river systems.

## 2.7 ENVIRONMENTAL STATUS OF TRANSBOUNDARY WATER CATCHMENTS

One of the complex water resource crises that Kenya faces stems from the fact that more than half of her rivers, lakes and aquifers – including Lakes Victoria and Jipe and Rivers Mara, Daua, Malaba, Malakisi, Sio

Table 2.6.1: Changes in Vegetation cover and Base Flow of selected catchments

SN	Catchment	Selected sub catchment	Size/Location/ Remarks	Percentage decrease in forest cover (1976-2009)	Decrease in base flow 1926-2000 (Mean %)	Remarks
1	Mt. Marsabit Forest	Mt Marsabit	Local Forest catchment	20		Change in settlement patterns and change to sedentary livelihoods leading to a loss
2	Tinderet Sub catchment	Nyando	Main catchment area for Nyando River	25		Expansion of cropland
	Malewa Sub Catchment	Wanjohi	A significant water catchment for Naivasha	48	44	Subsistent agriculture
3	Mt. Kenya	Likii and Thiba	A major catchment for river Tana	29	49	Forest cover reduction due to agricultural activities
4	Kinale Sub catchment	Ndarugu	Found in Kikuyu escarpment. Significant for water source to Nairobi	3	14	Clearing indigenous forests for large scale tea plantations
5	Cherangany	Upper Nzoia	The main catchment for river Nzoia	46		Encroachment, high water use, illegal logging, charcoal burning, firewood collection, illegal grazing, cultivation
6	Nzoia River	Wuoruoya	A catchment with several subcatchment experiencing different levels of threat	25	6	Expansion of cropland causing flooding downstream
7	Njoro River	Njoro	Is the main catchment for Lake Nakuru	69	11	Forest clearance for agricultural activities
11	Shella Dunes catchment	Shella Sand dunes	A significant but threatened catchment at the coast			Water front development activities
12	Taita Hills		A local catchment area for Voi River	78		Subsistence farming and high population pressure
13	Mt Kulal		A local catchment area in a dryland	6		Logging for fuel wood, building materials and construction, removal of the understory and grass fires,



*Lake Paradise Marsabit Forest in 2005 with water  
(Source: KEFRI)*



*Dry Lake Paradise in Marsabit Forest 2010  
(Source: MEMR)*

**Plate 2.7.1** Changes in the levels of the water in Lake Paradise, Marsabit Forest Reserve



*Degraded Shella catchment and associated human  
encroachment (Source: NMK)*

**Plate 2.7.2** Shella Dunes catchment

and Lumi – are shared with neighbouring countries. The environmental status of Lake Victoria may be described by the water level and quality, land use and vegetation cover in the catchment. Land surrounding the lake includes that of transboundary Mara in which agricultural land has increased by 55% between 1986 and 2000 through the combined encroachment of forests and savannah grasslands – these have reduced by 23% and 24% respectively. In the Sio Malaba Malakisi catchment, there is evidence of continuing land degradation and loss of soil fertility, deforestation and absence of reforestation activities and the use of biomass as the main source of energy. Other evidence showing the environmental status of Lake Victoria transboundary sub-catchment include

the lack of clean water for household use, insufficient water for grazing, exploitation and degradation of wetlands based on the perception that they are public property available to all.

## 2.8 WATER CATCHMENT CONSERVATION AND CLIMATE CHANGE

There is growing scientific consensus and evidence that global climate change is taking place and will influence the future of the global economy, ecosystems and livelihoods of the rich and poor. The National Climate Change Response Strategy (GOK, 2010) has presented evidence of climate change in Kenya including increases in minimum temperature by 0.5°C to 1.0°C since 1960 for the Western, Northern and Northeastern, Central and Southeastern Districts of Kenya. In addition, there has been a notable increase in maximum temperature by 0.5°C to 1.3°C since 1960 in the same regions, with the coastal strip experiencing the highest increase by a maximum of 2°C. These changing temperatures and rainfall will continue to have profound effects on water catchments.

### 2.8.1 Rainfall Variability and its Impact

An analysis of daily and monthly rainfall for the December-February, March-May, June-August, and

September-November seasons since 1960 showed factors that influence rainfall in Kenya (GOK, 2010: National Climate Response Strategy). The analysis indicated that neutral to slightly decreasing trends are manifested in the annual rainfall series over most areas, mainly due to an associated general decline with time of rainfall in the main rainfall season of March-May (Long Rains) over most areas. Furthermore, the analysis revealed a general positive trend (increase) in rainfall events of the September to February season, suggesting a tendency for the Short Rains (October-December) season to be extending into what is normally the hot and dry period of January and February over most areas.

The status of water catchments discussed in this Chapter gives evidence that the catchments of Kenya have been undergoing degradation in terms of water quantity, quality, availability, hydrological regimes, and biodiversity and ecosystem health. These changes have been exacerbated by increasing

human, livestock and wildlife populations in the catchments and the associated increase in demand for developmental resources. Due to their critical significance, the ongoing discussion emphasises the need for conservation and sustainable management to prevent the complete loss of water catchment areas.

In particular, it has been noted that the following problems exist:

- i. degraded water catchment areas
- ii. land degradation and soil erosion in water catchment areas
- iii. poor management of water resources
- iv. water insecurity
- v. poor waste management
- vi. livelihood insecurity stemming from the degradation of water catchment areas
- vii. overdependence on biomass energy
- viii. limited involvement of women and youth in water catchment conservation, which may be a cause for their degradation



## 3.0 CHAPTER THREE



# GOVERNANCE FRAMEWORK FOR WATER CATCHMENT AREAS

# GOVERNANCE FRAMEWORK FOR WATER CATCHMENT AREAS

## 3.1 INTRODUCTION

Effective environmental governance at all levels is critical for finding lasting solutions to environmental challenges facing society. The term governance has been defined in many different ways that vary according to the scope and locus of decision-making power (ECOSOC, 2006). The World Bank, initially defined governance as the exercise of political power to manage a nation's affairs but recent developments have shown that governance is much wider than the political realm, and many governance functions in society are beyond the exclusive remit of Governments. In recent times, the term governance has been used in reference to a set of rules and the institutional arrangements for their implementation and enforcement.

## 3.2 INTERNATIONAL AND REGIONAL FRAMEWORKS FOR GOVERNING CATCHMENT AREAS

With Kenya as part of the global community, her framework for governing water catchment areas is influenced by international and regional agreements and treaties, to which she is party. Of the international conventions addressing environmental governance, the United Nations Conference on Environment and Development (Agenda 21, 1992) remains the most comprehensive international policy document; others include the Convention on Biological Diversity, United Nations Framework Convention on Climate Change and the Kyoto Protocol. In addition, the United Nations Convention to Combat Desertification, Ramsar Convention on Wetlands, the World Heritage Convention, and the Convention on International

Trade in Endangered Species of Wild Fauna and Flora address the protection and conservation of forests.

Regionally, Kenya is bound by the African Union's and the East African Community's agreements relating to environmental governance, specifically the Revised African Convention on the Conservation of Nature and Natural Resources, and the EAC Treaty and Protocol on Environment and Natural Resource Management respectively.

## 3.3 THE IMPERATIVES OF THE CONSTITUTION OF KENYA 2010

The Constitution of Kenya recognises and addresses issues of environmental governance, giving the environment and its management due prominence in the preamble, which as a rule provides the background within which the specific constitutional provisions are to be interpreted and applied. The preamble to the Constitution notes that Kenya's environment – and by implication her water catchment areas – is her heritage and should be sustained for the benefit of future generations. As catchment areas serve critical functions in maintaining the country's water supply, it is important that they are conserved to guarantee the availability of quality water for both present and future generations.

The Bill of Rights in the Constitution recognises the environment as a fundamental right, an inextricable part of the country's democratic framework with a bearing on socioeconomic and cultural policies. Indeed, Article 42 of the Constitution guarantees all people the right to a clean and healthy environment, a right that places an obligation on the State and all Kenyan citizens to protect the environment for the

benefit of current and future generations. Other constitutional obligations placed on the State – and for which this Master Plan provides a policy and action framework – in delivering the right to a clean and healthy environment include:

- a. improving public participation in the protection and conservation of catchment areas
- b. ensuring sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and equitable sharing of benefits that arise thereof
- c. protecting genetic resources and biological diversity
- d. promoting the achievement and maintenance of a tree cover of at least 10% of Kenya's land area
- e. utilising the environment and natural resources for the benefit of the people of Kenya
- f. establishing systems of environmental impact assessment, audit and monitoring of the environment
- g. protecting and enhancing intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of communities
- h. eliminating processes and activities that endanger and degrade the environment.

As the Constitution has changed the nature of governance in Kenya to a devolved government, this Master Plan proposes avenues for the conservation of water catchment areas at national and county levels. In appreciation of the principal role of land in sustainable development, the constitutional provisions on land, the National Land Policy and the enactment of laws on land management will greatly influence the processes of conserving water catchment areas and the successful implementation of this Master Plan.

### 3.4 LEGAL AND POLICY FRAMEWORKS FOR THE CONSERVATION OF WATER CATCHMENT AREAS

No legislation or policy in Kenya comprehensively addresses the governance of water catchment areas, primarily due to fact that this issue straddles several sectors ranging from water to wetlands to land. Recognizing this challenge, the Master Plan seeks to provide a harmonious framework for the governance of water catchment areas in the country. The analysis of the legal and policy framework therefore needs to examine laws and policies governing resources relevant to water catchment areas viz. the environment, water, wetlands, forests and land, in addition to those governing wildlife, agriculture and physical planning. Vision 2030 as the overall national development plan until 2030 provides the overriding policy anchorage for the Master Plan.

#### 3.4.1 The Environment

In 1999, Parliament enacted the Environmental Management and Coordination Act (EMCA) to provide an overarching legal and institutional framework for the management of the environment. Hitherto environmental issues were dealt with in a sectoral and uncoordinated manner. The Act, which contains principles to govern the management of the environment for purposes of promoting sustainable development, establishes the National Environment Management authority (NEMA) as the principal body for supervising and coordinating environmental management and implementing government policies on the environment. As the framework law in environmental matters, the Act addresses the conservation of water catchment areas including wetlands, hilltops, hillsides, mountain areas and forests, and requires the conduct of Environmental Impact Assessment in situations where extraordinary construction activities or major land-use changes are to be undertaken.

### 3.4.2 Water Resources

The legal and policy framework for the water sector has undergone fundamental reforms over the last decade, first in Sessional Paper Number 1 of 1999 on Water Resource Management and Development (Water Policy, 1999). The Policy set the stage for reforms geared towards enhancing institutional responsibility and coordination, efficiency, sustainability and public participation, and provided the basis for the enactment of the Water Act (Cap 372) of 2002, which made several reforms to the water sector. The Act lays out mechanisms for the management, conservation, use and control of water resources and for the regulation of rights to use water and of water supply and sewerage services, setting detailed rules and institutional infrastructure to realize its objectives.

As provided for in the Act, the Minister for Water and Irrigation published the first National Water Resources Management Strategy (2007-2009), and upon its expiry, developed a new strategy (2010-2016). The Strategy, finalised based on the provisions of the Constitution, points out that water catchment areas are to be held by the national government in trust for the people of Kenya and administered by the National Land Commission. It seeks to promote integrated approaches to water resources and catchment management using tools such as the Catchment Management Strategies (CMS) that the Act requires to be developed for every catchment area.

The Water Resource Management Authority (WRMA), the principal institution responsible for water resource management, classified Kenya into six catchment areas namely Lake Victoria North, Lake Victoria South, Athi, Tana, Ewaso Ng'iro and Rift Valley. As provided for in the Act, the Minister for Water and Irrigation, upon the recommendation of WRMA, gazetted Water Resource Management Rules 2007, which address several issues including water quality and catchment management strategies and rules that give guidelines on water permit acquisition and adherence to conditions and enforcement of the user fee charges. Other water related Acts that impact

on the management of water catchment areas are the Fisheries Act, the Irrigation Act, the Continental Shelf Act and the Maritime Zones Act.

### 3.4.3 Wetlands

Wetlands significantly affect the national economy, in terms of supporting both direct livelihoods and vital ecological functions such as water provision and maintenance of hydrological cycles. Sadly, wetlands have not always been accorded the recognition and protection they warrant, but this changed with the adoption in 1971 of the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention). The Convention, which Kenya acceded to on 05 June 1990, requires contracting parties to conserve and wisely use wetlands, and designate suitable wetlands within the country for inclusion into the list of wetlands of international importance. In line with the parties' obligations to include wetland conservation into their natural resource planning, Kenya produced her first Draft Wetlands Policy in 2008 following stakeholder consultations that commenced in the early 90s. Even now, no single legislation or policy in Kenya comprehensively addresses the governance of wetlands, and for this reason, it is dealt with piecemeal in the EMCA, Physical Planning and the Water Acts.

### 3.4.4 Forests

In view of the fact that forests support the five water main water towers in Kenya (the Aberdares, Cherangany Hills, Mau Complex, Mts. Elgon and Kenya), their conservation and sustenance is critical to the availability of quality water. It is in appreciation of the vital role played by forests in supporting livelihoods, mitigating climate change, and protecting water catchments that the Forest Act was enacted in 2005 to sustainably manage forests and related products. Further, the Constitution in Article 69 provides for the State to work towards increasing the country's forest cover to 10% of the land area of Kenya.

### 3.4.5 Land

Although land forms the basis of livelihoods for the majority of the people of Kenya, until 2009, the country did not have a comprehensive and clearly defined National Land Policy, and it is only in 2009 that the Sessional Paper on National Land Policy was adopted to guide the efficient, sustainable and equitable use of land. The Policy requires land-use planning, reviews of the policy and legal framework for land-use planning, and the participation of the public in the planning process be recognised and improved. Similarly, the Physical Planning Act (Cap 286) of 1996 regulates the preparation and implementation of physical development plans in all parts of the country, and as such, it is critical to the regulation of land use.

### 3.4.6 Wildlife

Although still relevant, the policy framework for the management of wildlife resources is very old, having first been developed in 1975 through Sessional Paper No. 3 of 1975, *A Statement on Future Wildlife Management Policy in Kenya*. Thereafter, the Wildlife (Conservation and Management) Act of 1976 was enacted to provide a legal and institutional framework for the implementation of the Policy. The Act establishes the Kenya Wildlife Services (KWS), whose duty it is to advise the Government on the establishment of protected areas, and for managing the majority of the protected areas. The decision by the Government to designate KWS as the focal point for the implementation of the Ramsar Convention on Wetlands in Kenya makes the Act relevant to the conservation and management of wetlands, which critical water catchment areas.

In 2008, efforts to revise the Act culminated in the development of the draft Wildlife Policy, which provides a framework for the protection, conservation and management of wildlife, habitats and ecosystems in Kenya for the present and future generations. The proposed changes to the Act aim to address existing inadequacies that have contributed to the current threats and challenges facing wildlife conservation in Kenya including human-wildlife conflict and the disjointed approach to wildlife conservation.

### 3.4.7 Agriculture

The agricultural sector, which constitutes the greatest use of land in Kenya, significantly affects livelihoods and sustainability considering that it is the single largest employer of the country's labour force and user of freshwater resources. The Agriculture Act (Cap 318), the principal legislation governing agricultural activities, is geared towards promoting agricultural development in Kenya. As the Act provides, the Minister for Agriculture gazetted the Agriculture Farm Forestry Rules on 27 October 2009, with the aim of "promoting and maintaining farm forest cover of at least 10% of every agricultural landholding and to preserve and sustain the environment in combating climate change and global warming." Further, the Agricultural Sector Development Strategy 2010-2020, adopted to guide the sector's development and expansion, identifies the implementation of the National Climate Change Response Strategy as key to the development and conservation of catchment areas.

### 3.4.8 Legislation on Regional Authorities

Since the 1970s, the GOK has created six Regional Development Authorities (RDAs) with the mandate to plan and coordinate the implementation of rural development activities to ensure equitable resource development and promote regional socioeconomic development through integrated planning and management. The RDAs are the Tana and Athi Rivers Development Authority (TARDA), Kerio Valley Development Authority (KVDA), Lake Basin Development Authority (LBDA), Ewaso Ng'iro North Development Authority (ENNDA), Ewaso Ng'iro South Development Authority (ENSDA), and Coast Development Authority (CDA).

### 3.4.9 Land Reclamation

Kenya has not had a land reclamation policy, hence the significance of the recent formulation of the draft National Land Reclamation Policy whose aim is to transform Kenya's arid and semi-arid areas into vibrant economic development areas, and sustainably exploit their potential for economic development. The ASALs, which cover 80% (467,200km<sup>2</sup>) of the country's landmass of 584,000km<sup>2</sup>, have been expanding due to land degradation and increased

settlements stemming from migration. The draft policy intends to promote the reclamation of degraded lands, wastelands, wetlands and restoration of fragile eco-systems, promoting rehabilitation and construction of water harvesting structures including water development technologies.

## 3.5 INSTITUTIONAL ARRANGEMENTS

The governance of catchment areas is scattered across several sectors and legislations, as is evident from the various Acts establishing diverse institutions all charged with certain aspects of water resource management. In practice, these Acts have rarely coordinated their activities and fully implemented their mandates over water catchment areas due to the lack of clarity on which institution has overall responsibility for the governance of these areas.

### 3.5.1 Ministries

There are several Ministries responsible for various aspects of water catchments, namely those responsible for agriculture, water and irrigation, local government, land, fisheries, forestry and wildlife. With the main aim of these Ministries being policy formulation, each has a role in the governance of water catchment areas. However, given that the governance of water catchment areas transcends the mandate of any one particular ministry, inter-ministerial collaboration is imperative. In appreciation of the multi-ministerial nature of various issues, collaborative efforts have been undertaken including the establishment of the Agricultural Sector Coordination Unit (ASCU) to ensure coordinated development and implementation of policies and strategies for improving the agricultural sector, and the coordinated of the rehabilitation of the Mau Forest Complex under the Prime Minister's Office.

### 3.5.2 National Environmental Management Authority

The Environmental Management and Coordination Act creates the National Environmental Management

Authority (NEMA) as the principal instrument of government for implementing policies relating to the environment, and supervising and coordinating all matters relating to the environment. In discharging its mandate, NEMA coordinates lead agencies, recognising that whereas it has the overall coordinating and supervisory responsibility, the lead agencies have the legislative or administrative responsibility for the management of certain elements of the environment. However, as regards water catchment areas, the lack of clarity on the lead institution results in duplication and institutional rivalry between NEMA and sectoral institutions mandated to manage certain aspects of water catchment areas.

### 3.5.3 Water Resource Management Authority and Other Water Institutions

The Water Act creates a comprehensive institutional structure for the management of water resources in Kenya, with the Water Resource Management Authority (WRMA) being the apex body responsible for the management of water resources. WRMA has divided the country into six catchment areas, and in accordance with the requirements of Section 15 of the Water Act facilitated the development of Catchment Management Strategies (CMS) to enable the management of water resources and related land use within the catchment area. The Act provides for the establishment of two institutions: Catchment Area Advisory Committees (CAAC) to advise WRMA on water resource conservation, use and apportionment, and Water Resources Users Associations (WRUAs) to provide fora for the resolution of conflicts and cooperative management of water resources in catchment areas.

### 3.5.4 Kenya Forest Service

The Forest Act establishes the Kenya Forest Services and vests it with the overall responsibility of managing and protecting forests in Kenya, and formulating policies and guidelines for the management, conservation and utilisation of all types of forests among others. Considering that KFS is empowered to establish forest conservancy areas for the proper

and efficient management of forests, it is evident that it has a role to play in the management of forests in water catchment areas.

### 3.5.5 Kenya Wildlife Services

The Kenya Wildlife Service was established under the provisions of the Wildlife (Conservation and Management) Act to formulate and implement policies for the conservation, management and utilisation of wildlife resources, manage national parks and reserves, prevent the destruction by wildlife of agricultural and animal husbandry activities of ranching communities. The KWS is empowered to administer and coordinate international treaties relating to wildlife conservation, and protect ecologically vulnerable ecosystems and wetlands including those designated as Ramsar sites namely Lakes Nakuru, Elementaita, Naivasha, Baringo and Bogoria.

## 3.6 CHALLENGES WITH CURRENT GOVERNANCE ARRANGEMENTS

With the existence of the wide array of laws, policies and institutions related to the governance of water catchment areas, there are several challenges plaguing the current governance framework including:

- a. **Multiplicity and Conflicts within Laws:** There are numerous laws governing the management of water catchment area but none of these comprehensively address water catchment management. Instead, the provisions have to be gleaned from numerous laws, some of which contradict each other to such an extent that their implementation has proved difficult thereby reducing effectiveness in governance.
- b. **Weak Institutional Linkages and Synergies:** Despite the existence of a wide array of institutions relevant to the management of water catchment areas, there are very few linkages and synergies between these institutions. The lack of an integrated approach and the ambiguity on the overall institutional responsibility for the management of water catchment areas has resulted in their encroachment as well as massive deforestation.
- c. **Lack of a Comprehensive Policy Framework:** Despite the existence of several policies, the lack of an overall policy framework for the environment sector hampers effective governance of water catchment areas. The Draft Environmental Policy developed in 2008 has never been finalised and adopted, and there is no single government policy framework specific to water catchment areas despite the recognition by Vision 2030 of the importance of conserving these areas. The development of this Master Plan is a response to this policy gap.
- d. **Non-Alignment to the Constitutional Directives:** As the current legal and policy framework relevant to the governance of water catchment areas was put in place before the adoption of the Constitution, several of its provisions contradict the Constitution. The imperatives of a devolved system of government calls for the realignment of arrangements for governing water catchment areas to suit devolved system of government.



## 4.0 CHAPTER FOUR



# CONSERVATION AND SUSTAINABLE MANAGEMENT OF WATER CATCHMENT AREAS

# CONSERVATION AND SUSTAINABLE MANAGEMENT OF WATER CATCHMENT AREAS

## 4.1 INTRODUCTION

This Chapter identifies programmes to maintain and enhance the sustainability of natural resources, and that will have knock-on effects on other environmental restoration and conservation efforts. The Plan, which addresses key areas that need immediate attention, aspires to embrace collaborative natural resource management practices through partnerships and participation. This section includes a summary that takes into account the continued biodiversity loss, current conservation practices, unplanned settlements, and natural resources-use conflicts. It identifies the areas that need fast tracking as the development and implementation of tree planting programmes, rehabilitation of silted dams and pans, waste management, and construction of contours. In addition, it estimates the required resources and describes the management structure, monitoring and evaluation framework, and management information feedback mechanisms.

## 4.2 PROBLEMS IDENTIFIED

The factors that have triggered – and continue to drive – the degradation of water catchment areas were identified as:

- a. weak institutional linkages, synergies and limited consultation of stakeholders
- b. conflicting institutional mandates a is evident from the overlapping mandates, programmes, projects, and conflicting policies and legislations
- c. inadequate flow and sharing of information on WCAs
- d. low levels of awareness and limited capacity of stakeholders – particularly at corporate and grassroots level – to implement conservation measures

- e. expansive and severely degraded WCAs
- f. continued application of inappropriate land use and management in WCAs
- g. poor and inefficient water resource management
- h. water insecurity
- i. poor waste management including inappropriate disposal methods
- j. livelihoods insecurity
- k. continued high dependence on a limited range of energy sources particularly wood fuel for industrial and household use
- l. inadequate involvement of gender and youth in WCAs conservation programmes and projects
- m. lack of clear funding mechanisms for WCAs
- n. lack of integrated WCA monitoring and evaluation systems

## 4.3 PROPOSED INTERVENTIONS

### 4.3.1 National Water Catchment Management Programme (NWCMP)

This Master Plan proposes the establishment of the National Water Catchment Management Programme (NWCMP), which will coordinate the prioritised actions and eliminate duplication of activities by various Departments and Ministries, while harmonising the conservation of WCAs. For the effective conservation of WCAs, strong partnerships and public participation at all levels will be necessary in responding to the issues of weak institutional linkages and synergies, and limited consultation of stakeholders.

### 4.3.2 Governance of Water Catchment Areas

In order to strengthen governance of WCAs, the following interventions have been proposed as assigned to various ministries and actors:

- i) review and harmonise conflicting legislations, policies, regulations and standards governing management of water catchment areas
  - ii) strengthen the enforcement of and compliance with relevant legislations, policies and regulations
  - iii) develop and promote application of policy and legislative provisions that support profitable engagement in carbon credit trading and carbon offset programmes with specific objectives of enhancing the protection and conservation of water catchment areas, poverty alleviation and employment creation
  - iv) harmonise institutional arrangements for the sustainable management of water catchment areas
  - v) develop and implement a national programme on resource efficiency.
- iii. establishing and operationalising community-level youth and women WCA conservation groups
  - iv. building capacity on water quality monitoring including training personnel to protect, conserve and sustainably manage watersheds
  - v. strengthening the capacity, skills and competency of WRUAs, CFAs and EMCs to establish tree nurseries through community groups (youths, women, elders groups and other groups), and empowering them to co-manage critical water catchment areas.

### 4.3.3 Communication Strategy

In order to implement the NWCMP, a communication strategy to promote access to and use of information, innovation and technologies needs to be developed. The strategy will take into account various methods for disseminating information, developing curricula for schools and establishing a conservation award system.

### 4.3.4 Capacity Building

Capacity building interventions have been designed to respond to the lack of awareness, skills and competency shortfalls in the application of innovations and technologies relating to environmental conservation and management. The main interventions are:

- i. organising regular educational and sensitisation meetings to enhance community awareness on NWCMP and water catchment conservation of rangelands, forests and wetlands
- ii. strengthening the capacities of communities, corporates and other stakeholders in the conservation and management of water catchment areas

### 4.3.5. Restoration and Management of Water Management Areas

All water catchments areas need to be restored, conserved and sustainably managed in order to address problems related to the degradation of WCAs such as inadequate water catchment protection, unsustainable utilisation of resources, unplanned developments and settlements, non-point pollution from inflows of urban wastes, and soil erosion. The main interventions are:

- i. delineating natural vegetation and degraded areas as baseline information for restoration
- ii. promoting tree planting in forests and on farms, and designing and replicating existing successful programmes aimed at achieving at least 10% cover through youth, women and community groups



Plate 4.3.5.1 Extremely eroded land surface

- iii. adhering to species and site matching principles

#### 4.3.6 Land Use and Management Practices

Soil conservation and land use management interventions are proposed to address some of the problems related to inadequate water catchment protection and unsustainable utilisation of water resources. The main interventions are:

- i. establishing a baseline on biodiversity endowment, vegetation and land cover
- ii. introducing and promoting sustainable land managed technologies and other conservation measures that will enable recovery of areas that have ceased to be water catchments
- iii. gazetting water catchments as environmentally significant areas
- iv. enforcing the Agriculture (Farm Forestry) Rules 2009
- v. constructing waterways and gabions within farms to manage on-farm runoff
- vi. mapping fragile ecosystems in critical catchment areas and updating the soil and geology maps of all catchment areas
- vii. promoting drip irrigation

#### 4.3.7 Water Resources Conservation and Management

Water resource conservation and management interventions have been prepared to promote landscape-wide conservation of catchments. The main interventions are:

- i. implementing inter-basin and intra-basin water transfers to channel water from areas with excess water to areas with water deficit,
- ii. conducting a detailed water-use survey and water resources assessment to establish water balance
- iii. implementing Sub-Catchment Management Plans (SCMPs)
- iv. demarcating and constructing designated livestock water consumption points

#### 4.3.8 Water Storage Infrastructure

Water storage infrastructure interventions have been designed to promote rainwater and storm runoff harvesting. The main interventions are to:

- i. promoting rainwater and storm runoff harvesting through establishment of on-farm ponds for water harvesting and installation of water tanks
- ii. increasing capture and retention of rainwater through the construction of waterways, strategically located boreholes and other water harvesting structures to ensure water availability during dry seasons
- iii. rehabilitating silted and degraded pans and dams, which can result in harvesting 5 billion m<sup>3</sup> of rainwater
- iv. increasing water storage and harvesting through infrastructure development
- v. building capacity on water quality monitoring including training personnel to protect watersheds and monitor water quality
- vi. constructing watering infrastructure (ramps, troughs) to prevent destruction of water pans and boreholes by livestock.

#### 4.3.9 Management of Urban, Rural and Industrial Waste

Proper waste management can contribute significantly to the conservation of WCAs by promoting resource-use efficiency, thereby minimising harmful discharge into the environment and increasing resource productivity. In order to enable the country improve and manage urban and industrial waste and sanitation, the following interventions have been identified:

- i. developing and implementing waste management strategies for all major urban areas
- ii. promoting sorting of waste at source in all types of establishments
- iii. managing urban and industrial waste – as is the case with domestic waste – to generate revenue through the application of resource-efficient technologies and innovations
- iv. upgrading sanitation and sewerage systems to reduce pollution

- v. increasing national coverage of water supply and sanitation according to the Millennium Development Goals (MDG) while developing longer-term targets
- vi. promoting the use of cleaner production technologies including recycling and re-use of water in all types of establishments.

#### 4.3.10 Alternative Livelihoods

Alternative livelihood interventions have been prepared to reduce pressure on natural resource utilisation, enhance conservation and promote livelihoods sustenance. The main interventions are to:

- i. diversify livelihoods to facilitate the sustainable natural resource use in water catchment areas
- ii. establish a contract-based production and market through nature-based conservation programmes to address the persistent drawback of lack of markets
- iii. increase area under irrigation to improve efficiency and food security
- iv. promote the use of non-wood forest products especially gums and resins in the drylands
- v. develop appropriate livestock management strategies for the drylands

#### 4.3.11 Renewable Energy Consumption and Catchment Conservation

Heavy dependence on biomass energy including crop residues and dung is a major driver of degradation in water catchment areas. The indiscriminate harvesting of woodlands and trees in natural forests results in bare land and hilltops, which accelerates soil erosion. The following actions are proposed:

- i. supporting and promoting the use of alternative energy sources such as solar, biogas, offshore wave energy harvesting and wind energy to meet the energy demands especially of rural populations
- ii. supporting tree planting on farms, protecting natural forests, promoting regeneration of natural woodlands

- iii. promoting the use of energy-saving appliances
- iv. developing and promote bio-energy technologies.

#### 4.3.12 Mainstreaming Gender, Youth and Vulnerable Groups

The following interventions have been designed to close this gap:

- i. developing a gender mainstreaming strategy to address the low involvement of the gender and the youth in activities like tree planting, waste management, promotion of indigenous and current forms of soil conservation and alternative sources of energy and livelihood activities
- ii. developing a strategy for the youth, physically-challenged and other vulnerable groups
- iii. building the capacity of women, youth and special interest groups to enable them effectively participate in catchment conservation activities

#### 4.3.13 Funding Mechanisms

This intervention has been prepared to enable the proposed NWCMP secure funds for the implementation of activities proposed in this Master Plan – an estimated Kes. 94 billion will be required. The main interventions are:

- i. identifying current and potential sources of funding
- ii. reviewing and evaluating the current funding mechanisms and streamline their operations



Plate 4.3.11.1 Renewable energy resource  
(Source: Ministry of Energy)

- iii. developing a financial, procurement and management handbook for WCA at all levels
- iv. introducing conservancy levy and payment for ecosystem services
- v. establishing a WCA fund coordinating body
- vi. facilitating carbon credit trading and carbon offset programmes
- vii. putting in place an auditing mechanism to strengthen the management of WCA funds committees at district and county levels
- viii. reviewing, evaluating, developing and streamlining WCA funding mechanisms at all levels

#### 4.3.14 Monitoring and Evaluation Systems in Water Catchment Areas

The purpose of monitoring and evaluation is to measure and assess performance in order to effectively manage the outcomes of the restoration/rehabilitation process. Therefore, monitoring will be an essential part of planning and management, and will be a continuous systematic and critical review process undertaken in a participatory manner through a logical framework. Under this component, the following activities will be undertaken:

- i. developing and operationalising a monitoring and evaluation (M&E) framework and an M&E manual for Natural Resource Users Association (NRUAs)
- ii. supporting publication and dissemination of a WCA annual report
- iii. installing water catchment M&E systems in all catchments
- iv. building the capacity of NRUAs and other legally constituted organisations in monitoring and equip all NRUAs and other legally constituted organisations with monitoring tools
- v. sensitising and training stakeholders on M&E
- vi. mid-term review of the Master Plan after 10 years
- vii. end term review of the Master Plan

## 4.4 RESOURCE MOBILISATION (FUNDING MECHANISMS)

The restoration of water catchment areas requires a substantial amount of financial, technical and human resources – approximately Kes. 100 billion annually. Funding will be required to undertake thorough surveys of all water catchment areas countrywide, to take inventory of the biodiversity in all water catchment areas, and to acquire the appropriate tree species seedlings for rehabilitation. The Government will lead the process of funding the Master Plan, while development partners (both bilateral and multilateral), NGOs/CBOs, the civil society, private sector, and public private partnerships will contribute significantly to narrow the Kes. 800 billion deficit. To this end, a resource mobilisation strategy will be developed in the first phase of the implementation of the Master Plan.

## 4.5 MONITORING AND EVALUATION FRAMEWORK

The objective for applying a monitoring and evaluation framework is to help empower the primary stakeholders by creating opportunities for them to reflect critically on the direction of the management interventions. For this reason, stakeholders should hold regular meetings to share experiences or lessons and evaluate potential impacts arising from any interventions on water catchments. Short study tours, particularly for the leaders, could be organised for capacity building and to facilitate sharing of experiences on what others are doing in water catchment restoration and management. Relevant government institutions (e.g. WRMA, KFS, KWS) should be mandated to conduct and evaluate the status of water catchments on annual basis, ensuring that findings, recommendations/remedial actions are communicated promptly and regularly to the relevant parties.

## 4.6 COMMUNICATION AND PUBLIC PARTICIPATION

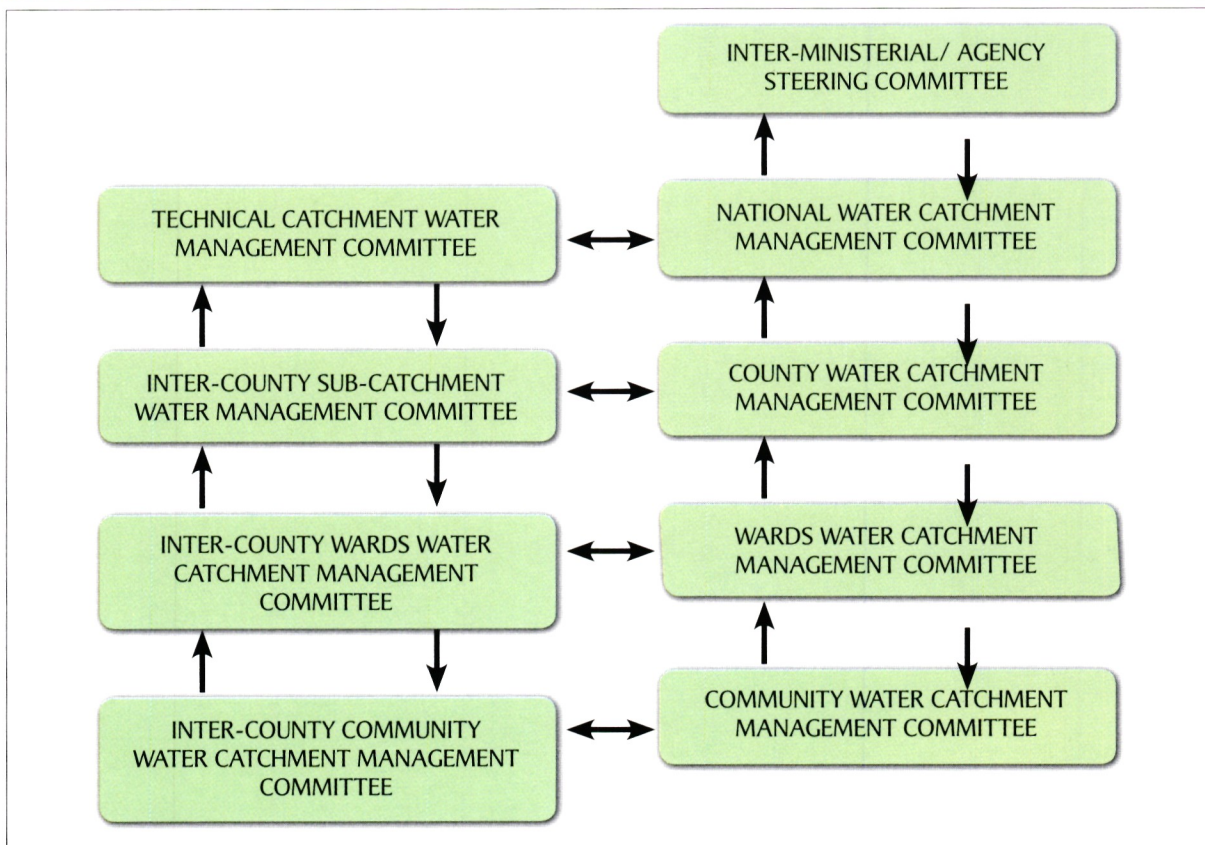
The Government and nongovernmental organisations need to aggressively undertake initiatives to educate the public, particularly communities living adjacent to WCAs, on the importance of water catchment conservation. It is imperative for these communities to be involved in all plans for the restoration and management programmes of the water catchments in order to see and get direct benefits from their initiatives.

## 4.7 ORGANISATION STRUCTURE FOR SUSTAINABLE MANAGEMENT

The management structure clarifies how the implementation of the Master plan will be undertaken, and sets out the planning, organising, directing, controlling, supervision, monitoring and evaluation of water catchment conservation activities. The programme will be managed at various levels, with the two main levels being the National and County levels, which will have supervisory and oversight roles, while the other two will be the wards and community levels.

Figure 4.7.1 below provides the organisational structure envisaged for restoration of the programme.

Figure 4.7.1: Organisational Structure for restoration



## 4.8 INTERVENTION MEASURES FOR TRANSBOUNDARY WATER CATCHMENTS

There are transboundary water catchment areas that require cross-border collaboration in their restoration and management and these include the Mt. Elgon, Lakes Victoria and Jipe, Mara ecosystem, Sio Malakisi, River Dawa, and the Moyale and Namanga Hills. It is important to develop a harmonised and well coordinated joint management work plan to

guide the management of these cross-border water catchment areas. This may be achieved through intergovernmental committees on water catchment areas aimed at ensuring sustained water resource production. The East African Community (EAC) Protocol on Environment and Natural Resource Management, which applies to among others, all activities, matters and areas of management of the environment and natural resources of the Partner States provides an opportunity to address the cross-border issue.

# APPENDICES



## APPENDIX 1.

### GAZETTED MEMBERS OF THE TASKFORCE

Name	Institution
Hassan Noor Hassan (Chairman)	Office of the Deputy Prime Minister and Ministry of Local Government
Dr. Joy Obando (Vice-Chairman)	Kenyatta University
Esther N. Ndirangu	Ministry of Gender, Children and Social Services
Henry Njuguna	Water Resource Management Authority
Beatrice Manyonge	Ministry of State for Planning, National Development and Vision 2030
Lorna Akoth Odero	Ministry of State for Provincial Administration and Internal Security
Zaverio N. Njeru	Ministry of Youth Affairs and Sports
Erastus M. Wahome	Office of The Deputy Prime Minister and Ministry of Finance
Michael Gachanja	East African Wildlife Society
Prof. Moses Imo	Moi University
Dr. Helida Oyieke	National Museums of Kenya Biodiversity
Anne Nyakihu Mukoma	Ministry of Youth Affairs and Sports
Esther Muiruri	Equity Bank
Dr. Alice Kaudia (Secretary)	Ministry of Environment and Mineral Resources
Esther Kathure Magambo	Ministry of Agriculture
Raphael Mwatha	Ministry of Fisheries Development
William Ogolla	Ministry of Regional Development Authorities
Francisca Wamboi	Kenya Wildlife Services
Francis N. Gachathi	Kenya Forest Research Institute
Peter Mule Makau	Eco Bank
Esau Omolo	Kenya Forest Service

## SECRETARIAT WATER CATCHMENT AREA

Name	Institution
Paul Kere	Ministry of Environment and Mineral Resources
Isabella A. Masinde	Technical Advisor Environmental Policy
Dr. Mwangi Kinyanjui	Department of Resource Survey and Remote Sensing
Kimani J. N.	Coordinator Natural Resources Management Programme
Wilfred Amollo	Ministry of Environment and Mineral Resources
King'uru Wahome	Ministry of Environment and Mineral Resources
Faith T. Pesa	Ministry of Environment and Mineral Resources
Ernest Mwangi Maina	National Environmental Management Authority
Aristarico Onyango	Department of Mines and Geology
Philip Munah	Kenya Meteorological Department
Veronica Kioko	Ministry of Environment and Mineral Resources
Mary S. Tiges	Ministry of Environment and Mineral Resources
Lorraine Kojwang'	Ministry of Environment and Mineral Resources

## CHAPTER DRAFTERS AND REVIEWERS

Name	Institution
Hassan Noor Hassan, EBS	Office of the Deputy Prime Minister and Ministry of Local Government
Prof. Joy Obando	Kenyatta University
Henry Njuguna	Water Resources Management Authority
Beatrice Manyonge	Ministry of State for Planning, National Development and Vision 2030
Lorna Akoth Odera, OGW	Ministry of State for Provincial Administration and Internal Security
Zaverio N. Njeru	Ministry of Youth Affairs and Sports

Erastus M. Wahome	Office of The Deputy Prime Minister and Ministry of Finance
Michael Gachanja	East African Wildlife Society
Dr. Helida Oyieke	National Museums of Kenya
Dr. Alice Kaudia, HSC	Ministry of Environment and Mineral Resources
Raphael Mwatha	Ministry of Fisheries Development
Francis N. Gachathi	Kenya Forestry Research Institute
Paul Kere	Ministry of Environment and Mineral Resources
Isabella A. Masinde	Technical Advisor Environmental Policy, Natural Resources Management Programme
Dr. Mwangi Kinyanjui	Department of Resource Survey and Remote Sensing
Faith T. Pesa	Ministry of Environment and Mineral Resources
Lorraine Kojwang'	Ministry of Environment and Mineral Resources

## APPENDIX 2.

### TERMS OF REFERENCE OF TASKFORCE

1. Prepare a work plan for the taskforce activities
2. Study existing legislation, policies and other relevant documents regarding the management of water catchment areas and identify any gaps in the existing legislation, policies and other relevant documents
3. Identify, map and document water catchment areas in the country including areas that have ceased to be catchment areas for reasons to be identified by the taskforce
4. Document the environmental status of each water catchment area
5. Recommend appropriate intervention measures for each water catchment area
6. Prepare an action plan for the implementation of the recommendations
7. Draft a Master Plan for the Sustainable Management of Water Catchment Areas
8. Identify potential sources of resources, both financial and human for undertaking the recommended interventions
9. Elect its chairperson
10. Identify and co-opt other members or any other resource provided that the co-opted members do not exceed one third of the taskforce

## APPENDIX 3.

### RESOURCE DISTRIBUTION BY MEDIUM TERM EXPENDITURE FRAMEWORK

OUTPUTS	MTP1 2008- 2012	MTP2 2013- 2017	MTP3 2018- 2022	MTP4 2023- 2027	MTP5 2028- 2032	TOTAL
Amount in Kes. Millions						
<b>Output 1:</b> Partnerships and participation of stakeholders in the management of water catchment areas improved	879	4,257	4,222	4,222	3,378	16,958
<b>Output 2:</b> Policies, legislations, regulations and standards governing management of water catchment areas reviewed, harmonised and enforced	69	459	349	349	280	1,506
<b>Output 3:</b> A Communication strategy for WCA programme developed and implemented	47	1,026	991	991	944	3,998
<b>Output 4:</b> Capacity of communities to implement WCA programmes strengthened	94	1,242	1,137	1,237	1,137	4,847
<b>Output 5:</b> Restoration and protection of all water catchment areas undertaken	2,780	19,275	11,430	8,130	5,170	46,785
<b>Output 6:</b> Adoption of soil conservation and land use management practises promoted	588	3,290	2,350	2,350	1,763	10,340
<b>Output 7:</b> Water Resource Conservation and management undertaken in all WCAs	2,145	115,720	74,950	72,010	67,365	332,190
<b>Output 8:</b> Water storage infrastructure developed and maintained in all WCA	15,000	101,000	86,000	11,000	11,000	224,000
<b>Output 9:</b> Improved management of urban and industrial waste and sanitation harmonised and enforced	700	64,500	64,500	2,500	1,800	134,000
<b>Output 10:</b> Alternative livelihoods for sustainable resource use in water catchment conservation programmes supported	75	350	350	350	280	1,405

OUTPUTS	MTP1 2008- 2012	MTP2 2013- 2017	MTP3 2018- 2022	MTP4 2023- 2027	MTP5 2028- 2032	TOTAL
Amount in Kes. Millions						
<b>Output 11:</b> Renewable energy technologies identified, developed and promoted	7,350	38,370	38,350	37,350	30,000	151,420
<b>Output 12:</b> Gender, youth and vulnerable groups mainstreamed in WCA activities	404	2,050	2,020	2,020	1,616	8,110
<b>Output 13:</b> Water catchment areas funding mechanisms streamlined and mainstreamed in budgets at all levels	2	689	535	535	533	2,293
<b>Output 14:</b> Water catchment areas monitoring and evaluation systems integrated and strengthened	189	901	917	756	621	3,383
<b>GRAND TOTAL</b>	<b>30,322</b>	<b>353,128</b>	<b>288,100</b>	<b>143,799</b>	<b>125,885</b>	<b>941,234</b>