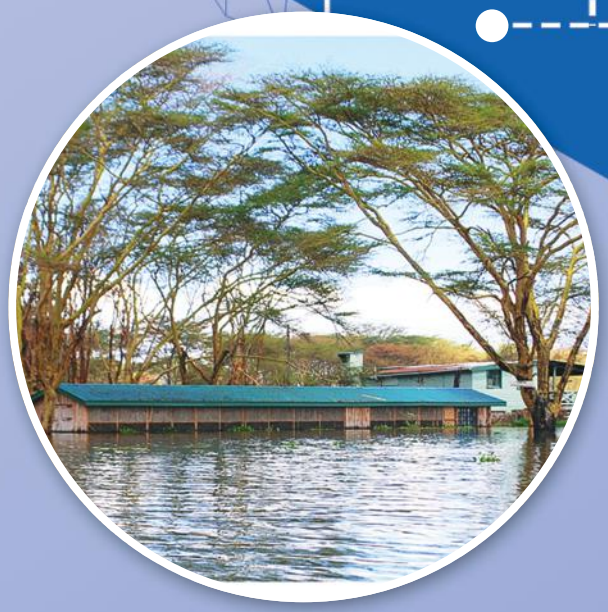
nema
mazingira yetu | uhai wetu | wajibu wetu

KENYA STATE OF ENVIRONMENT REPORT

2019 - 2021



THEME: **ENVIRONMENT & NATURAL RESOURCES GOVERNANCE**

MAY 2021

UNDP

KENYA STATE OF ENVIRONMENT REPORT 2019-2021

THEME

ENVIRONMENT AND NATURAL RESOURCE GOVERNANCE

State of Environment and Natural Resource Governance in Kenya

A publication of the National Environment Management Authority (NEMA) Kenya

First Published in 2021
ISBN: NEMA to provide

This is a Government of Kenya Publication and for bibliographic and reference purposes this publication should be cited as: Government of Kenya (2021). Kenya State of Environment Report 2019 -2021, Nairobi, Kenya.

To obtain copies of this publication and all correspondences, please contact:

The Director General
National Environment Management Authority
P.O. Box 67839 -00200 Nairobi
Tel +254-20-2307281
Email: dgnema@nema.go.ke
Website: www.nema.go.ke

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

This report was prepared using funds provided by the Government of Kenya and the United Nations Development Programme (UNDP)

Contributors: This report is the result of the contributions of many institutions, organizations and individuals. The National Environment Management Authority is indebted to the many institutions and persons that contributed to the accomplishment of the report. The National Environment Management Authority acknowledges the generous financial support by United Nations Development Programme (UNDP).

This work would not have been actualized without the dedicated efforts of the lead authors and all contributors. The editors, designers and all the others who contributed in one way or another are deeply appreciated.

The Key contributions were from the following authors;

Name	**Lead Chapter /Responsibility**	**Affiliation**
Dr. Charles N. Lange	Coordination of report Development; *Forward, Preface and acknowledgement Introduction & Final document editorial*	National Environment Management Authority (NEMA)
Francis Inganga	Energy sector	National Environment Management Authority (NEMA)
David Koros	Climate Change	Kenya Meteorological Department
Evans Masachi	Minerals	Ministry of Mining
Sylvester Maithya	Fisheries	National Environment Management Authority (NEMA)
Daniel Mbithi	Forests Resources	Kenya Forest Service
Solomon Kyalo	Biodiversity Resources	Kenya Wildlife Service
Francis Masai	Biodiversity Resources	Directorate of Resource Survey and Remote Sensing
Ben Opaa	Land tenure	National Land Commission
Rose Nyamori	Water Resources	Water Resources Authority
Geoffrey Ominde	Programme Coordinator	United Nations Development Programme
Raphael Mutitu	Assistant Programme Coordinator and Logistics	United Nations Development Programme
Brian Muthoka	Challenges and Governance	Council of Governors
Eunice Fedha	Strategies	Council of Governors
Hosea Wanderi	Heritage Resources	National Museums of Kenya
Paul Nguru	Agriculture and Livestock	National Environment Management Authority (NEMA)

Table of content

Foreword

Kenya's land area of 582,646 Km^2 is endowed with fascinating environmental landscapes and diverse natural capital assets comprising flora, fauna, water, and minerals. These country's natural assets are critical foundations for sustainable development for the country. For instance, the country's unique geographical features, heritage sites, and diverse wildlife species are essential tourism products that support the country's economic growth. Further, the natural resources are key drivers of Kenya's development policies, such as the big four agenda and the Vision 2030. For example, environmental and natural resources are critical sources of food, raw materials for the manufacturing sector and offer safeguards for managing risks associated with the spread of zoonotic diseases. Recently, it has been estimated that natural resources contribute about 42% of the country's Gross Domestic Product (GDP) and support about 70% of the country's population's livelihoods.

These valuable natural assets, however, face significant conservation challenges. For instance, Kenya has been classified as a water-scarce country. These water resources are reported to be declining (water resources available in 2010 was 586 m3 per capita per year against the global benchmark of 1000m3). More so, wildlife species that once spread across landscapes have declined in numbers, with some Red-listed as threatened by the International Union for the Conservation of Nature (IUCN). The country forest cover remains below the constitutional threshold of 10% tree cover while land degradation remains widespread.

Recognizing the value of the environment and natural resources in the economic development of the country and the challenges these resources face, the Government of Kenya, in collaboration with local and international stakeholders' places environment and natural resources governance as a national priority. As a result, over the years, as a sign of commitment to strengthening environmental and natural resources governance for enhancing conservation of these resources, Kenya has developed several relevant policies, enacted a range of relevant legal frameworks, and established institutions meant to advance the conservation of the environment and natural resources in the country.

To monitor the scenarios of environmental and natural resource changes, the Government of Kenya, through the National Environment Management Authority (NEMA), produces the State of Environment Report every two years as provided under EMCA section 9 (2) (P). The State of the Environment, which has been produced since 2003, serves as a vital tool for guiding Kenya's environmental situation. It spells strategies that would provide sustainable management of the environment and natural resources. The strategies mainstreamed through this report form the building blocks for many policy documents and agendas for the country both at the national and County level. I am informed that this report developed by key experts in environment and natural resources focuses on providing salient governance aspects that require attention to ensure sustainable conservation of our country's environment and natural resources. I want to indicate that my ministry welcomes the report and will strive to mainstream the provisions in the ministry work. I also urge stakeholders to consider familiarizing themselves with the document and incorporating the recommendations to tier activities. Lastly, recommend the team that developed the report for good work.

Keriako Tobiko
Cabinet Secretary,
Ministry of Environment and Forestry

Preface

Kenya is blessed with rich biodiversity and enjoys a unique tropical climate with varying weather patterns due to differing topographical dimensions that support the biodiversity. The country has a wide variety of ecosystems: mountains, forests, arid and semi-arid areas (ASALs), freshwater, wetlands, coastal and marine. In addition to hosting diverse and unique landscapes and natural resources, these offer many opportunities for sustainable human, social and economic development. These ecosystems are natural capitals that provide essential ecosystem goods and services such as soil formation, nutrient cycling, and primary production.

The socio-economic well-being of Kenyans is intertwined with the environment. Therefore, the country's environmental and natural resources contribute directly and indirectly to the local and national economy through revenue generation and wealth creation in critical sectors like agriculture, fisheries, livestock, water, energy, forestry, trade, tourism, and industry. Monitoring and reporting on the trend of these environmental resources is important for sustaining both ecological and economic benefits for present and future generations. In addition, it provides for the alignment of governance systems to ensure a sustainable environment and natural resources conservation.

The environment and natural resources governance comprise one of the most critical environmental and natural resources conservation components. Fortunately, Kenya has rich history of environmental and natural resources governance. Traditionally, many communities provided cultural practices that safeguarded against the wanton destruction of the environment and natural resources. Later the current environment and natural resources governance regimes were rolled by communities building on community-based approaches. Today environment and natural resources governance continue to recognize community involvement. Whereas the country presents a rich history of environment and natural resources governance, several challenges have been witnessed affecting the country's environment and natural resources. This situation prompted the raising of major concerns on the governance of our environment and natural resource assets resulting in a

reflection on relevant policies and legal frameworks, and institutional arrangements.

To appreciate the ongoing governance efforts, identify successes and areas for further strengthening, a review of environment and natural resources governance has been ongoing. This report reflects on the review by key lead agencies and stockholders in the environment and natural resources. I am informed that the report presents valuable information covering our environment and natural resources, and governance situation.

Therefore, the report presents an essential tool for enhancing knowledge of Kenya's environment and natural resources and providing valuable insights for strengthening governance. I call upon all stakeholders in the environment and natural resources sector to utilize the provision of the report.

Dr. Chris Kiptoo

Principal Secretary, Ministry of Environment and Forestry

Acknowledgement

The Environment and Natural Resources Governance present one of the most valuable components for advancing sustainable environment and natural resources management and conservation.

It is mainly because of effective and efficient governance systems that offer solutions to many challenges that our environment and natural resources face. In Kenya, environment and natural resources remain the backbone of our economy and supports a substantial part of the Kenya Gross Domestic Product (GDP) and a large part of the community socio-economies.

To provide an effective and efficient environment and natural resources governance, information or data on the environment and natural resources is critical. One approach for providing data for guiding effective and efficient governance is by profiling the environment and natural resources. In Kenya, profiling the environment situation started in 2003 following mainstreaming of the provision for preparing the state of environment report in Environmental Management Coordination Act, 1999. Under EMCA, 1999, NEMA coordinates the profiling of the environmental situation in collaboration with stakeholders.

The development of this report, which presents expanded profiling of the environment and natural resources with emphasis on governance mechanisms, serves as an essential tool for supporting and applying an effective and efficient environment and natural resources conservation in Kenya. The report, which contributes from key relevant lead agencies, provides the best information and data for supporting decision-making for environment and natural resources governance. Therefore, I urge all stakeholders involved in the environment and natural resources to familiarize themselves with this report and consider utilizing it.

I am aware that the report's development in environmental monitoring and reporting involved rigorous work of skilled, relevant experts, resources, and time.

Many experts from lead agencies spend many hours piecing technical information together. I take the opportunity to thank these lead agencies and their experts for the time spent to make this report a success. I also wish to thank the United Nations Development Programme (UNDP) for providing financial support in the development of this report. The technical coordination of the information was done by experts from NEMA and would also like to recognize the diligent coordination provided by NEMA technical team.

Mamo B. Mamo
Director General
National Environment Management Authority

Executive Summary

Kenya's unique environments and rich natural resources are critical national treasures for providing valuable ecosystem goods and services for sustainable development. It is estimated that the National Resources contribute about 42% of the country Gross Domestic Product (GDP) and support 70% of peoples' livelihoods. These essential national treasures thrive in a changing space which affects their status. This executive summary report provides two key highlights to appreciate our country's unique, rich environment and natural resources while reflecting on the best approaches for sustainable conservation.

First, the report provides on the situation of environment and natural resources in Kenya. Secondly, the summary report profiles governance aspects that affect sound environment and natural resources conservation and concludes with provisions on strengthening the governance aspects. The critical situations on the environment and natural resources highlighted concerning governance aspects include;

Population, environment and development where Kenya currently stands at 47,564,296 people of which 23,548,056 are Males, 24,014,716 are Females, and 1,524 are Intersex. The registered population is an increase from previous years of census. The increase is more pronounced in urban areas where the population has risen rapidly compared to rural areas, to the extent that it is overstretching the current infrastructure and services. As a result, informal settlements in urban centers have become common, leading to environmental degradation due to increased solid waste, effluents, and changes in environment integrity.

The patterns of population structure presented by the country's demographics have implications on the environment and natural resources conservation and governance. The youth who comprise a significant part of the population are largely jobless and tend to rely heavily on natural resources. Women who are majority compared to men, owing to their roles in family set-up especially in rural areas, tend to be more connected to the environment in activities like fetching firewood and water, among others. Therefore, strengthening youth and women mainstreaming in environment and natural resources governance is instrumental.

Population issues such as demographics divided among others influence the country's economic growth. For Example, 2019 registered a slow economic growth with the Gross Domestic Product (GDP) of 5.4%, compared to 6.3% in 2018. Therefore, economic status influences the status of the environment and natural resources, with poorly performing economies tending to push people to increased reliance on natural resources. Thus people, the economy,

environment, and natural nexus present relationships that require understanding and application for ensuring effective environment and natural resources governance.

Land Tenure which involves the system of rights and institutions that govern access to land and other resources has been found to play a crucial role in ensuring sustainable development, poverty control, and land and natural resources protection. The country has historically witnessed several land tenure challenges, some of which remain unresolved and bordering on tenure security.

The implications being sustainable environment and natural resources conservation and governance issues. The conservation of the environment and natural resources under different land tenure systems (communal, private, and trust lands) presents different outcomes, indicating that mainstreaming land tenure in the environment and natural governance at national and County levels is paramount. Despite the issues surrounding land tenure, the Government has made efforts to strengthen land tenure systems previously. A fundamental approach is through legal frameworks and institutional reforms, for example, the adoption of the National land policy in 2009, the passage of the Constitution of Kenya 2010, and the establishment of the National Land Commission, which provide mechanisms for addressing and administering complicated land tenure systems in the country. Implementation of these Government efforts on land tenure provide for a pathway to addressing the many challenges that affect various sectors depended on land tenure for sustainable environment and natural resources governance.

Climate change is one of the fundamental phenomena that shape the situation of the environment and natural resources. It has been discussed in this report to underscore the need for climate change mainstreaming in environment and natural resources governance. Climate change manifestation is shifting climatic conditions in Kenya, with many areas now facing frequent and severe droughts and major flash floods. These climate change manifestations are changes in ecological conditions that affect natural resources and environmental patterns while influencing natural resource exploitations. Scientific data present climate change manifestation through precipitation and temperature data that have shown clear evidence of change.

Further evidence provides that climate change is causing significant shifts in plant and animals distributions patterns.

More so, climate manifestation is placing a trail of land degradation across the country as witnessed by emerging patterns of soil erosions as flash floods sweeping landscapes, spreading desertification, and shifting land cover. The

implications of the changes due to climate change are diminishing status of the country's unique environment and rich natural resources, which subsequently affect the sustainable development of many aspects of the society livelihoods. To address the impacts of climate change, the Government has been initiating adaptation, mitigation, and resilience efforts across the country in partnership with various partners with notable efforts in the legal frameworks and institutional reforms to address climate change better. Key governance reforms undertaken include establishing the climate change Act, 2016 that provided for institutional arrangements to better respond to climate change. The critical institutional structure is establishing the Climate Change Directorate within the Ministry responsible for the environment to spearhead various aspects of climate change and loading more climate-related duties to the National Environment Management Authority (NEMA in section 17 of the Act.

Further provisions on public and private entities on climate change are provided for by law. The Act also includes County Governments' overall contributions in climate change and various mechanisms for climate change finance. It is a significant milestone in environment and natural resources governance as continued implementation of the provisions of the climate change Act, 2016 offers an opportunity to control the impacts of climate change on the environment and natural resources. Therefore, continued implementation of the Climate Change Act, 2016 and customizing it to counties for supporting the environment and natural governance is encouraged.

From the natural resources front, **Water Resources** are among the most critical national treasures. Water is life, and true to this saying, areas with sufficient water supply present ecosystems with ecological conditions that support high diversity and abundance of biodiversity and even high population levels. On the contrary, dry landscapes with limited water resources have low biodiversity and a sparse population. The extreme landscapes like the Chalbi Desert of Marsabit County barely support living organisms. In Kenya, water resources vary across the country.

Projections from the water master plan indicate that the country has limited natural renewable water resources estimated at 42.1 BCM/year, consisting of 20.6 BCM/year of surface water and 21.5 BCM/year of groundwater recharge. Projections of the available water from the basins point to decreasing water availability across the country in the future, with some basins such as the Athi basin barely meeting the water demand since 2009. The other basins that currently appear sustaining water demand face declining water resources scenarios for the future subject to the governance of these resources. In 2010, the per capita water resources available was 586 m3 per year against the global benchmark of 1000m3. The water resources situation has been subject to catchment conservation. Unfortunately, it has

been facing destructions and contaminations with pollutants resulting in water resources flow and quality. While water resources have been worrying, following devolution, governance issues have emerged with concerns on the exploitation of transboundary water resources with catchment on one County but flowing across several counties. These concerns exist despite provisions on various legal frameworks such as the Constitution of Kenya 2010 and Water Act 2016, including critical institutions such as the Water Resources Authority (WRA) to offer governance oversights.

Further reflection on transboundary water resources is vital to tame agitation. Some engagements between the County and national Governments are ongoing and should be supported and concluded to provide a clear governance framework. It is further essential that a transboundary natural resource governance program be undertaken to clearly understand the gaps and best approaches to these resources' governance for mainstreaming legal frameworks and institutional arrangements.

Under Agriculture, Livestock and Fisheries fall the unique fish resources, bees, termites, and indigenous vegetables, among other resources that support the sector. These resources comprise critical resources for supporting ecosystems' perpetuity through ecosystem services such as pollination, control of pests, and food supply to humans and other living organisms. In addition to being a key source of food, the fishery industry serves as an essential source of income for many people. Fishing thrives in freshwater ecosystems, predominantly major freshwater lakes, and marine ecosystems in the Indian Ocean. Whereas fishing has been a mainstay for many years, previously fish output started to present declining trends. In 2019, the sub-sector realized a decline in total fish production from 154,671 thousand tonnes in 2018 to 146.5 thousand tonnes in 2019. The declining fish output has been attributed to overfishing and changing aquatic ecological conditions. The numbers of fishing communities have been increasing and therefore increase in fishing activities which cause overfishing. Secondly, most aquatic ecosystems, especially freshwater lakes, have recorded pollution patterns that may affect marine life, including fish.

Similarly, terrestrial ecosystems face increasing pesticide applications that have implications on bees and other valuable insects and animals. The ensuing patterns of valuable natural resources point to some challenges in their governance. Whereas there is a recent and elaborate legal framework covering fisheries known as Fisheries Management and Development Act, 2016 with requisite institutional arrangements such as the Kenya Fisheries Services, the sub-sector continues to witness some management issues in the governance of the sub-sector.

Further, other resources that border on agriculture, such as bees, among other useful plants and animals' governance, appear to require reflection for

identifying areas for strengthening governance for guaranteeing sustainability. Notable areas of consideration are reviewing laws that govern them, capacity development, and research data generation.

The other aspects of agriculture and livestock that take the form of agriculture subsistence and commercial crop and animals' husbandry have presented patterns that have implications for the environment and natural resources. For instance, more natural land is being replaced with crop farming, and many pastoral areas have witnessed overstocking. The results are largely land degradation, soil fertility decline, and loss of biodiversity and environmental aesthetics. Agriculture and livestock are key drivers of Kenya's economic development. However, often conservation interests are not mainstreamed to agriculture and livestock.

It results in the degradation of the environment to the extent that restoration of the degradation becomes a challenge casting a doomed future on environment conservation in the agriculture sector. Agriculture and livestock are key sources of Greenhouse gas emissions and thus drivers of climate change.

Previously recognizing the value for mainstreaming conservation in agriculture and livestock, conservation and smart agriculture initiatives are ongoing. The initiatives remain to be adopted country-wide. In view of this, consideration for strengthening conservation in agriculture and livestock governance is advocated for, including research for further innovations that protect the environment.

Mineral Resources comprise another essential natural treasure. The country is endowed with high-value minerals like gold, niobium, copper, zinc, and gypsum, bringing huge revenue to our country. For instance, a total of KSh 30.4 Billion was collected as revenue in 2018 for the mining sector, and it was a 5.9% growth from the previous year.

Some of the known mineral-rich belts in the country include Migori for gold and Taita County for gemstones. Other areas remain to be fully assessed and profiled.

The sector is believed to be underexploited and, once fully exploited, will positively transform Kenya's economy.

This vital natural resource remains underexploited mainly due to several factors ranging from governance challenges to limited investments, capacity, and research data issues. The value of these resources makes the sector receive a lot of interest, creating some governance challenges. The Mining Act of 2016 was delivered to address many minerals governance issues previously witnessed. The Act provides for aspects of legal and institutional arrangements necessary for enhancing minerals sector governance. The law is still under implementation and is believed to pave the way for effective

management of the sector to advance sustainable development and address mining issues affecting other sectors. Owing to the nature of mineral exploitations, it often results in significant environmental impacts. The minerals sector governance requires a comprehensive management arrangement covering both administrations of the minerals explorations and exploitations while at the same time looking into the associated environment and natural resources impacts. More important, though, is research to generate data for guiding sound management of minerals in the country and capacity building both human and infrastructure, particularly on certification laboratory.

On the other hand, **the energy sector** plays a critical role in the socio-economic development of a country. The Kenya Vision 2030 identified energy as one of the infrastructure enablers of its social and economic pillar. Currently, the energy sector relies wholly on the importation of all petroleum requirements. However, with the discovery of oil in Northern Kenya, this trend is likely to change soon. Commercial energy is dominated by petroleum and electricity, while wood fuel provides energy for domestic use, especially in rural communities. At the national level, wood fuel and other biomass account for about 68% of the total primary energy consumption, followed by petroleum at 22%, electricity at 9%, and other fuel sources (including coal), standing at less than 1%. Solar energy is also highly used for drying and, to some extent, for heating and lighting. The total supply of non-renewable feedstocks was 75,559 Tera Joules (TJ) in 2019. Total supply continued to reduce due to a ban on illegal logging of Government forests in the review period. Households demanded about 95 percent of non-renewable feedstocks in 2019. 98.3 percent of all electricity supplied was produced domestically, where 88.5 percent was renewable in the review period. In 2019, the total electricity demand locally was 31 3874.13 TJ. From an environmental and natural resources perspective, the energy sector, mainly non-renewable energy, is a significant source of Greenhouse gas emissions which fuel climate change manifestations. Secondly, the use of wood fuel is a substantial cause of environmental destruction. Thousands of tonnes of wood fuel consumed every year are trees that come from our forests, destroying our unique environment and natural resources. The efforts towards the supply of renewable energy are still ongoing. However, they remain scarce in most parts of the country due to the high cost of acquisition and maintenance of electricity beyond many people's capability. Therefore, the championing of the environment and natural resources governance requires mainstreaming energy and vice versa. It will help identify areas of improvement to support the environment and natural resources governance while advancing the energy sector.

The **Biodiversity resources** comprise another important national treasure that brings pride to the country. The country harbors thousands of flora and

fauna species spread across the country. It is currently estimated that the country hosts about 1,100 species of birds, over 7,004 species of plants, over 25,000 species of invertebrates, over 769 species of fishes, over 250 small mammals, many large mammals, and over 260 species of reptiles. The country's biodiversity primarily thrives in the country's protected areas such as national parks, national reserves, and conservancies. Some biodiversity also occurs outside protected areas in community settlement lands. This rich Kenya's biodiversity treasure has successfully thrived owing to historically active biodiversity governance. Biodiversity governance in Kenya comes from a community perspective since time immemorial. Many Kenyan communities held taboos, beliefs, and practices that provided for safeguarding animals and plants. These cultural biodiversity conservation governance practices exist even to date, and owing to their contribution to biodiversity conservation, they are recognized in the existing biodiversity conservation frameworks. Examples of these are coastal Kenya Kaya forests and Maasai landscapes, where they co-exist with wildlife. Through the National Museums and Heritage Act, 2006, Kaya forests are recognized and mainstreamed in the cultural practices associated with Kaya forest's heritage governance. Similarly, the Wildlife Management and Conservation Act, 2013 mainstream community wildlife conservation in the biodiversity governance system.

The cultural and community biodiversity governance took stage at a pretty early and timely period when the country was still well endowed with biodiversity. The first protected National Park came to be in 1946, and subsequently, others followed soon after. Today over 50 gazetted protected areas are spread across the country and several community conservancies. Whereas the biodiversity governance faced challenges in the 1970s, resulting in mass killings of elephants, the country quickly instituted reforms resulting in a return to solid biodiversity governance. Later legal reforms followed, resulting in the enactment of the Wildlife Management and Conservation Act, 2013, that came with significant governance alignments responding to the provisions of the Constitutions of Kenya 2010 and emerging issues in biodiversity conservation. Other related legal frameworks reforms that responded to biodiversity governance include the Environmental Management and Coordination Act which happened in 2015, among others. Fortunately, extensive research from a range of agencies has also been happening to guide biodiversity governance.

Despite the historically rich biodiversity governance instituted over many years, the biodiversity treasures still face many challenges, indicating that continued strengthening of governance systems is still required. The country still witnesses the decline of some species, invent and aggressive spread of invasives that affect native biodiversity, climate change impacts and challenges of encroachment and destruction of biodiversity protected areas by humans, and some human-wildlife conflicts, among other issues. Further, many research work investments in biodiversity, information access, and

regular updating to guide sound governance remain wanting. Moreover, coordination of biodiversity governance among key players despite clear legal frameworks faces challenges in managing duplication of efforts, ensuring a good investment of resources, and allowing for mutual partnerships.

It calls for a reflection of the current biodiversity governance status with a view for further legal and institutional reforms to better respond to some issues that still affect sound biodiversity management and conservation. Biodiversity is a tourism product generating the country's foreign exchange that supports sustainable development. Thus, effective biodiversity governance is critical for realizing biodiversity conservation for supporting sustainable development in line with national, regional, and global aligned agendas.

The **Forest Resources** though form part of biodiversity resources, in this report are profiled separately to underscore their critical role in contributing to environment and natural resources treasures promotion and national development agenda. Forests stand as the foundation of the trophic niches or food chains in nature. Therefore, they play a critical role in shaping biodiversity and ecosystem conservation, and landscaping. Currently, the country is estimated to have about 7.29% forest cover growing from below 7% previously. It is below the constitutional threshold of 10% tree cover. According to an assessment report from Kenya Forest Service, the forest cover across counties vary from the highest with about 38% forest cover at Nyeri County to the least at Siaya County, estimated to be 0.42% forest cover. The presented patterns of forest cover nationally and at the County level indicate that forests in Kenya have been facing conservation challenges. Previously, as provided in various reports, the country witnessed rampant deforestation where many forests faced destruction following tree harvesting for multiple uses, with the most notorious destruction attributed to illegal charcoal burning and commercial logging. In the 1990s, the situation of the forests become worrying, with reports around this period indicating that forest cover was nearly approaching below 5%. This situation alarmed conservationists and the Government, resulting in a review of governance systems in the forest sector.

Therefore, the period that followed from 2000 onwards was characterized by significant governance reforms focusing on legal and institutional strengthening. During this period, the Forests Act of 2005 came to be to strengthen forest governance and created a new institutional arrangement under the Kenya Forest Service. About ten years later, the Forests Act, 2005 underwent a review to become Forests Conservation and Management Act, 2016 aligning forests governance to the Constitution of Kenya 2010 and other innovations. The Constitution of Kenya 2010 provides some aspects of forest governance under the County Governments as provided in schedule 4 of the constitution. To ensure a smooth transition of the devolved forest functions,

engagements between the County Governments and national Government agencies, specifically Kenya Forest Service, have been ongoing under the transitional implementation plans (TIPs).

To provide for the good governance of the critical forests resources for sound conservation to support ecosystems goods and services and sustainable development, the ongoing engagements under TIPs require a conclusion, providing comprehensive forest governance through national and County Governments and other levels of cooperation.

The **Heritage Resources** mirror the biodiversity and forest resources scenarios. Over 300 heritage sites are known, which are the central part of the heritage resources recognized. Their governance is under the National Museums, and Heritage Act, 2006, with the National Museums of Kenya being the leading institution overseeing the heritage sites. However, other legal frameworks such as the Wildlife Management and Conservation Act, 2013; Forest Conservation and Management Act, 2016 and Environmental Management and Coordination Act, 1999 and a range of County laws, among others, contribute to safeguarding heritage site conservation. Several institutions involved in environmental and natural resources conservation, such as Kenya Wildlife Services, Kenya Forest Service, and National Environment Management Authority, contribute in advancing heritage resource governance. Critical issues on heritage resources conservation are related to those affecting biodiversity and forests predominantly, illegal encroachment, destruction of the sites, and grabbing. Though efforts have been dedicated to safeguarding the heritage resources, the noted issues continue to present challenges demonstrating that heritage resources governance still requires reflection to identify areas of improvement. It is over ten years now since the National Museums and Heritage Act, 2006 was enacted, meaning a review to address new and emerging issues is imminent.

More so, given the broad coverage to heritage resources, a re-look at related agencies mandates with the intention to address overlaps and conflicts is advocated.

Also briefly profiled in this report is the **tourism** to reflect on how the sector can be mainstreamed in environment and natural resources governance to address their potential impacts. The environment and natural resources primarily drive the tourism sector. These comprise beautiful landscapes, mountains that have rich and diverse wildlife that are essential tourism products. Millions of tourists visit Kenya every year to enjoy the country's unique environment and natural resources. In the course of tourism promotion, some environmental and natural resource impacts have been observed. For instance, there have been off-road drives in parks damaging some vegetation, an upsurge in hotels that increase solid waste and effluent discharge, stress to animals when tourists overcrowd, including dis-figuring

natural landscapes when hotels over-crowd. Previously some of these issues have been raised and handled.

Nevertheless, the situation due to Covid 19 came slowing tourism. As the covid pandemic gets sorted out in the future, tourism is expected to bounce back. Therefore, it is worthwhile that tourism governance mechanisms covering the related laws and governance institutions for strengthening management of tourism-related issues that may degrade our unique environments and rich natural resources are handled beforehand. Finally, previous concerns arose regarding collecting tourism fees by selected County Governments, agitating for taking over from the national Government and delineating such tourism sites from other counties. It presents a governance challenge that requires reflection too.

The **Solid Waste** scenario largely important because it is a major challenge that affects the environment and natural resources. Currently, Kenya faces an increasing challenge in the management of solid waste, particularly at urban centers. Most urban centers are characterized by many illegal dumpsites that form major sources of environmental pollution. No properly engineered sanitary land-fill has been established in the country.
Despite the worrying solid waste situation, the country has several solid waste governance instruments such as the Waste Management Regulations of 2006 under EMCA, 1999. Furter a waste management bill is under development and e-waste regulations under EMCA, 1999 are on the final stages of gazettement. County Governments are responsible for solid waste management as provided in the Constitution of Kenya 2010.

Conclusion and Recommendations

The environment and natural resources that shape Kenya's economic landscape face conservation challenges that may compromise tier sustainability. The challenges are primarily due to status governance accorded to these treasures. The country as over the years, instituted many legal and institutional arrangements for strengthening environment and natural resources governance. These efforts have yielded some impressive contributions to the environment and natural resources conservation. However, the situation of the environment and natural resources conservation remains a concern. It demonstrates that if the country is to realize effective and efficient conservation of her environment and natural resources, regular governance situation analysis is critical to capture lapses and identify areas of investments. Effective and efficient governance offers the best opportunity for realizing national environment and natural resources conservation aspirations in line with national, regional, and global agendas. The key to supporting effective and efficient governance lies in qualitative research data. Therefore, continuous research for supporting various aspects of environment and natural resources governance is critical. More so, environment and natural resources governance requires the involvement of

stakeholders in this regard. Modalities for stakeholders' active participation for implementations requires devising and mainstreaming in the environment and natural resources governance and perhaps customizing geographically and in unique situations.

Acronyms and Abbreviations

AEWA	Africa Eurasian Waterbirds Agreement
ADR	Alternative Dispute Resolution
AMCEN	African Ministerial Conference on the Environment
AMSL	Above Mean Sea Level
ASDS	Agriculture Sector Development Strategy
ASAL	Arid and Semi-Arid Lands
BCM	Billion Cubic Meter
CEEC	Center for Energy Efficiency and Conservation
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CLB	Community Land Board
CFA	Community Forest Association
CITES	Convention on International Trade in Endangered Species
COMESA	Common Market for Eastern and Southern Africa
CMS	Convention of Migratory Species
CSO	Civil Society Organization
CWIS	Citywide Inclusive Sanitation
EAC	East Africa Community
EBA	Endemic Bird Area
EEZ	Exclusive Economic Zone
ENNCA	Ewaso Ngiro North Catchment Area
JKIA	Jomo Kenyatta International Airport
GDP	Gross Domestic Product
DFID	UK Department of International Development
GFP	Global Forest Principles
GHG	Green House Gases
DG	Development and Governance
DRSRS	Directorate of Resource Surveys and Remote Sensing
FAO	Food and Agriculture Organization
GIS	Geographical Information System
GIS	Geographical Information System
GPS	Geographic Positioning System
GoK	Government of Kenya
GW	Giga Watts
IBA	Important Bird Area
IED	International Institute for the Environment and Development
IGAD	Inter-Governmental Authority on Development

INBAR	International Network on Bamboo and Rattan
IPCC	Inter-Governmental Panel on Climate Change
IUCN	International Union of Conservation of Nature
IWRM	Integrated Water Resource Management
LIS	Land Information System
LTA	Land Title Act
LRTU	Land Reform Transition Unit
LVNCA	Lake Victoria North Catchment Area
KARLO	Kenya Agricultural and Livestock Organization
KFS	Kenya Forest Service
KNLP	Kenya National Land Policy
KNEB	Kenya Nuclear Electricity Board
KSS	Kenya Soil Survey
KWH	Kilowatt Hour
KWS	Kenya Wildlife Service
LCPDP	Least Cost Power Development Plan
MAT	Mutually Agreed Terms
MCM	Million Cubic Meter
MIA	Moi International Airport
MoL	Ministry of Lands
MTA	Material Transfer Agreement
MW	Megawatts
NCCRCP	National Coordination Committee on the Response to the Coronavirus Pandemic
NCCRS	National Climate Change Response Strategy
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NLC	National Land Commission
NRI	Natural Resources Institute
NRM	Natural Resources Management
NRW	Non-Revenue Water
PAMU	Problematic Animal Management Unit
PFM	Participatory Forest Management
PFMP	Participatory Forest Management Plans
PIC	Prior Informed Consent
REA	Rural Electrification Authority
REPLA	Regional Enhanced Livelihoods in Pastoral Areas
RTA	Registration Title Act
SEAA	System of Environmental Economic Accounting
SIDA	Swedish International Development Agency

SHP	Small Hydro Power Projects
SNA	System of National Accounts
SPP	Species
SDG	Sustainable Development Goal
TIP's	Transition Implementation Plans
TWH	Terra Watt Hour
USAID	United States Agency for International Development
UNCSD	United Nation's Convention on Sustainable Development
UNFCC	United Nations Framework Convention for Climate Change
USD	United States Dollars
WIO	Western Indian Ocean
WHC	World Heritage Conventions
WHO	World Health Organization
WRA	Water Resources Authority
WRUA's	Water Resource Utilization Associations

List of Figures

List of Tables

Chapter1: Introduction

Environment and natural resources in Kenya are valuable national assets that the country must sustainably manage for present and future generations. They offer a range of benefits and opportunities for local and national economic development, improved livelihoods, and the provision of environmental goods and services. Despite being the foundation on which sustainable development is anchored, many environmental degradation issues and challenges face the country. Notable drivers of environmental degradation are high population growth rates, inappropriate technology, unsustainable consumption and production patterns, and increased incidences of poverty and climate change. Further, urban environmental degradation, through improper waste management and sanitation systems, industry and transport-related pollution, stratospheric ozone depletion, and biodiversity loss adversely impact air, water, soil quality, and human health and well-being. These have led to changes in the relationship between people and ecosystems (GoK, 2018). If this trend is left unchecked, it will lead to further severe environmental degradation that may perpetuate deprivation and poverty.

Kenya's economic development has to be sustainable from several points of view, including environmental perspectives. Suggestions are that effective environmental governance is critical for finding solutions to the country's environmental challenges for supporting sustainable development. It includes putting institutional and non-institutional mechanisms to ensure that the long-term sustenance of environmental resources. Environmental governance comprises the rules, practices, policies and institutions that shape how humans interact with the environment and natural resources. Good environmental management considers the role of all actors that impact the environment (Governments, Non-Governmental Organizations, the private sector, and civil society). This approach needs to follow environment and natural resources governance principles, such that improved governance enhances the contributions of ecosystems and biodiversity to equity and sustainability (Bugembe, 2016).

1.1: Principles of Environment and Natural Resources Governance

The environment and natural resources governance profiled in this report are founded on the following principles.

Inclusive decision-making: The principle ensures that decisions regarding the environment and natural resource governance consider the views of groups at risk of marginalization.

Recognition and respect for legitimate tenure rights: The principle recognizes that customary and collective rights contribute strongly to effective and equitable natural resource governance. It is achieved by enabling local stewardship of lands and resources, providing a foundation for sustainable livelihoods, and contributing to the fulfillment of human rights and cultural survival.

Devolution: The principle ensures that Government control over the use of natural resources is increasingly shared with local communities.

Diversity of cultures & knowledge: The principle incorporates the complementarity of different cultures and knowledge in the management of changing realities of nature and its resources

Strategic Vision: The principle includes defining the desired outcomes and impacts of effective natural resource governance on people and ecosystems within set timeframes and recognizing the input of various stakeholders

Empowerment: The principle recognizes that all actors have the capacities and support they need to contribute effectively to decision-making, claim rights, and meet responsibilities.

Coordination & coherence: This principle provides the need of actors involved in natural resource governance to come together around a coherent set of strategies and management practices.

Sustainable Resources & Livelihoods: This provides for the need for streamflow of resources or revenues as a basis for the financial sustainability of the actions required to manage and conserve natural resources as well as equitable benefit-sharing.

Social and environmental accountability: This principle ensures effective means are in place for relevant authorities or powerful actors to be held responsible for their actions, especially those with social and environmental impacts.

Protection of the vulnerable: Specific attention is paid to how natural resource governance decisions or changes could affect environments that may be particularly vulnerable and people who may be marginalized in economic, social, or political terms

Rule of law: Ensures that both the laws on environment and natural resources governance themselves and their application is fair, transparent, and consistent, especially as they affect youth, women, indigenous and local communities, and natural resources.

Access to justice: Ensures the ability of people to seek and obtain remedies for grievances from formal or informal judicial institutions in accordance with human rights standards.

Chapter 2: Overview of Environment and Natural Resources in Kenya

2.1: Population and Environment

The first Kenya population census undertaken in 1948 gave an estimated population of 5.4 million people, while the 2009 Population census recorded an estimated 38.6 million people. The population has been increasing by 1 million people per year from 1999 and was estimated at 43 million people in 2014 (KNBS, 2015). The population in 2019 was 47,564,296 of which 23,548,056 are Males, 24,014,716 are Females and 1,524 are Intersex. Females account for 50.5% of the total population (KNBS, Economic Survey Kenya, 2019)

This rapid population growth poses serious environmental challenges such as increasing demand for land resulting in degradation, depletion of natural resources, a decline of natural assets, goods and the impairment of ecological services. Slightly less than one-third of the population lives in urban areas indicating a substantial increase from the 19.3 percent recorded in 1999 (NCPD, 2013). The growing urban population has over the years overstretched the existing infrastructure and services, leading to the growth of informal settlements characterized by environmental degradation, high levels of poverty, and delinquency (NCPD, 2013).

In 2012, the Government of Kenya passed a landmark policy to manage its rapid population growth. The new population policy aimed to reduce the number of children per woman from 5 in 2009 to 3 by 2030. The policy also includes targets for child mortality, maternal mortality, life expectancy, and other reproductive health measures. Kenya's long-term development plan, Vision 2030, recognizes that rapid population growth could severely derail progress in reaching its primary goal: "to achieve a high quality of life for all Kenyans that is sustainable with available resources."

The NCPD, Sessional Paper No. 3 of 2012 on Population Policy for National Development, 2012 was initiated to succeed session paper No.1 of 2000 to update the policy with current population dynamics with environmental issues being a crucial part of the policy review. The National Council on Population and Development has currently initiated the National Population Policy for sustainable development draft 2020 as an update to session paper No.3 of 2012. Suppose Kenya continues to make substantial investments in reproductive health and family planning; such gains are likely to impact environmental and natural resource governance positively. In that case, fertility levels may continue to decline, and Kenyans will likely achieve better basic levels of health and move towards the sustainable balance of population and natural resources. With additional investments in health and education and economic initiatives to facilitate job creation, Kenya may experience the

rapid economic growth known as the demographic dividend, critical for environmental conservation. It will ease dependency on natural resources.
Kenya's high potential agricultural land is about eighteen percent of the total land area yet presents the highest population densities. If the population growth rate continues to increase, the country will not produce enough food for its population. The consequence being food insufficiency and ultimately turn to the environment and natural resources, causing conservation challenges. To ensure food security for an increasing population, steep hillsides and riparian land cultivation has been ongoing among other ecologically sensitive areas. These areas are less resilient to environmental shocks and suffer environmental degradation and loss of productivity. The housing sector has not kept pace with the population growth patterns, especially in urban areas, and as such most Kenyans have been forced to live in informal settlements. In most cases, unplanned settlements such as slum areas do not have waste disposal systems and safe potable waste systems resulting in environmental pollution through illegal waste disposal.
The higher the population, the higher the population density per given area, causing over-crowding and the settlement of people in space without due regard to environmental and natural resources concerns. It is further reflected by the current scenarios of people building on steep slopes that are vulnerable to soil erosion and encroachment into forested areas for settlement and agriculture. In addition, it inevitably leads to environmental degradation, floods, and excessive soil erosion. Therefore, systematic consideration of population dynamics is essential for developing sustainable development strategies, goals, targets, policies, and environmental programs. Paradigms of the new development agenda suggest the need to ensure a harmonious balance between populations (social dynamics), economic and environmental development with a focus on sustainable consumption and production. Further, the rate of population growth and changing age distribution are of importance to the attainment of both national development goals because each age group in a population behaves differently, with distinct economic consequences (NCPD, 2017; NEMA, 2021)

2.1.1 Poverty and Ecosystem

There has been a persistent decline in the ecosystems which supply most of the essential services to humanity. The Millennium Ecosystem Assessment study in 2007 showed that more impoverished communities and those living in marginalized areas are most affected since they are most directly reliant on ecosystem services for their well-being (UNDP-UNEP, 2006). Poor people in both rural and urban areas are less resilient to natural and man-made disasters. Consequently, this leads to conflict over natural resources at personal, community, regional, and national levels. Illegal logging, for

instance, robs Governments of revenues while at the same time deprives local communities of ecological goods and services.
Further, poverty leads to deforestation through the inappropriate use of wood and other cooking, heating, housing, and crafts resources. It deprives vulnerable groups' essential goods while accelerating the downwards spiral of poverty and environmental degradation. UNEP (2006) found that most poor rural households meet their domestic energy requirements from wood fuel while urban residents depend on charcoal.

2.1.2 Youth and Environment

Youths, especially young children, are more vulnerable to environmental risks. These risks are in the form of access to clean and safe drinking water and sustainable consumption. Young people are expected to live longer and therefore carry the consequences of current environmental decisions into the future. Future generations stand to be affected by such decisions, including the extent to which concerns such as the depletion of resources, loss of biodiversity, and long-lived radioactive wastes are addressed. The youth, therefore, have a pivotal role to play in national development, primarily environmental management.
The Kenyan youth engage in self-employment as observed in well nurtured and established tree nurseries and seedlings along roadsides in urban and rural areas. Such tree seedlings have supported reforestations in many rural areas and the greening of urban centers. However, in some cases self–employed youth engage in curio business for tourists, soapstone quarrying, sand-harvesting, charcoal business, and general crafts industry that cause severe environmental degradation in some areas (NEMA, 2010).
The participation and governance of youth in environmental protection should come right from the grass-roots level through involvement in conservation projects to policy-making and other activities such as those supported by Non-Governmental Organizations and youth summits. The role of youth should fit within policy-making through advisory bodies such as youth councils and relevant youth affairs in-line ministries.

2.1.3 Gender and Environment

For many years, the relationship between human society and the physical environment is assumed to be gender-neutral, i.e., similarly affecting both women and men. The differentiated socio-cultural construction of men and women's roles means that the linkages between people and the physical environment impact differently on both sexes. The different roles men and women play in the family, community, and workforce are likely to have different responses, priorities, and power over resources regarding environmental protection. Therefore, men and women will interact with the

environment differently and are presented with unique opportunities to protect it.

Gender roles in most communities in Kenya dictate that women and children are more exposed to environmental risks daily. It is because of their dominance in agricultural labor provision and their responsibility of carrying out domestic chores of fetching fuelwood, water, and grazing livestock. In most households, women are also responsible for water and waste management. Such roles have made women in some communities become effective managers of environmental resources. For example, traditional herbal healers have spearheaded re-afforestation programs as best illustrated by the Green Belt Movement in many areas of Kenya highlands through women groups.

Women, particularly in rural and marginalized communities, are often restricted from public positions, political participation, and various resource responsibilities. On the other hand, men who do not necessarily consider the views and needs of the female household managers make most of the decisions. It may intensify conflict and competition over natural resources since women and men have different responsibilities and experiences, which affect their knowledge and use of natural resources.

In Kenya, an inclusive, sustainable development has embarked on environmental conservation by building substantially on the relationship between environment and gender roles. The association has been integrated into policy-making, particularly in participatory decision-making and stakeholder involvement that require gender equity. Gender equity is essential in addressing significant sustainable development challenges, mostly using and managing natural resources and preventing environmental degradation and pollution. The legal framework on this is from the 2010 Kenya Constitution, *Chapter 4 on the Bill of Rights*, and *Chapter 5 on Land and Environment of Kenya* (COK, 2010). The Supreme laws of the land in these sections promote gender equity and equality in access to land resources and other socio-economic services that enhance women's participation in decision-making in all matters that affect their well-being.

Further, one of the goals of gender mainstreaming in the Sustainable Development Goals (SDGs) is for environmental protection by promoting equal opportunities for men and women as participants and beneficiaries of environmental protection by considering their different positions and knowledge in regard to the environment. It has mainly focused on women empowerment since they are directly involved in environmental activities such as agriculture, including activities related to forestry.

2.1.4 Economy and Development

Economic activity remained vibrant in 2019 though the performance was slower relative to 2018. The real Gross Domestic Product (GDP) was provided at 5.4 percent in 2019 compared to 6.3 percent in 2018. The growth was spread across all sectors of the economy but was more pronounced in service-oriented sectors. The agriculture, Forestry and Fishing sectors accounted for a sizeable proportion of the slowdown, i.e., from 6.0 percent growth in 2018 to 3.6 percent in 2019. It was mainly based on suppressed long rains that disrupted the normal planting season in key agricultural zones. Similarly, the manufacturing sector grew by 3.2 percent in 2019 compared to 4.3 percent growth in 2018, partly owing to constrained supply of raw materials from agricultural activities.

In the agriculture sector, a relatively lower supply of essential food crops in 2019 manifested in a moderate increase in their prices compared to 2018. However, the industry benefitted from a modest increase in potatoes, rice, wheat and significantly improved production of drought-resistant crops such as sorghum and millet in 2019. During the year under review, the production of cash crops showed mixed performances. Production of coffee rose from 41.4 thousand tonnes in 2018 to 45 thousand tonnes in 2019 and somewhat cushioned the sector from a steeper decline. On the other hand, the volume of tea produced declined from 493 thousand tonnes in 2018 to 458.8 thousand tonnes in 2019. Similarly, total cane production declined by 12.5 percent to 4.6 million tonnes in 2019, further exacerbating the underperformance in the cash crops sub-sector.

Horticultural activities were mainly supported by growth in exported fruits (8.3 percent) and cut flowers (7.8 percent) in 2019. However, the volume of vegetables exported declined by 15.2 percent during the same period owing to unfavorable weather conditions that characterized the first half of 2019, resulting in lower production

In 2019, there was a mixed performance in the selected indicators on the environment and natural resources. Overall expenditure on water and related services is expected to grow by 47.3 percent from KSh 31.1 billion in 2018/19 to KSh 45.8 billion in 2019/20. Area stocked under Government Forest plantation increased significantly from 141.6 thousand hectares in 2018 to 147.6 thousand hectares in 2019. The value of mineral produced declined by 5.5 percent from KSh 30.8 billion in 2018 to KSh 29.1 billion in 2019. The fishing sector recorded a 7.8 percent decline in earnings to KSh 23.5 billion in 2019 from KSh 25.5 billion in 2018 following a drop in the volume of fish landed. During the long rains (March to May) season, the country experienced a prolonged dry season (KNBS, 2019)

Chapter 3: Land Tenure and Environment

3.1 Introduction

Land tenure is the system of rights and institutions that govern access to land and other resources. The rights are derived from statutory and customary laws and institutions of marriage, power and control, and inheritance (Mwakubo, 2002). Whether customary or statutory, tenure regimes are rarely static, and the evolution of customary tenure, as well as the impact of directed land reform, constitute two significant strands of land tenure research. Land reform in Africa - more properly labeled land tenure reform - typically refers to evolutionary or legal changes in land tenure - nudging customary tenure systems in the direction of private property regimes - rather than in the distribution of land itself. Such changes are intended primarily to serve efficiency goals by enhancing tenure security and thereby (at least theoretically) by improving both conservation and productivity. Land tenure potentially affects sustainable land use by improving production incentives and increased investments into soil and water conservation. Changes in access to agricultural holdings and the ability to exclude others from enjoying the benefits accruing from the land result in changes in resource use. It is in turn, affects labor and capital demand, productivity, and therefore income and sustainability. The possible adverse effect of indigenous land rights systems on the efficiency of input use and the incentives for land improvement is generating increased interest among stakeholders, including policymakers. Concern has been heightened by the low use of modern inputs and by widening degradation of croplands on which negligible investments to improve land quality are being made (Matlon, 1994). New discourses on how land tenure can be viewed more from use and access than ownership remain a major challenge. It has contributed to land fragmentation and loss of productivity, necessitating the pursuit for resilience.

3.2: Land Tenure and Environmental Management

The management of a resource refers to its control and regulation. As far as natural resources are concerned, management is central to the broad objective of conservation since the utilization of the resources depends on how they are controlled (Migai, 2006). The task of a land/resource tenure system is to establish a control system for utilization based on the resource in question. Resource tenure systems arise because natural resources are scarce and must be distributed equitably among all claimants. As regimes of control, resource tenure systems are, therefore, social institutions whereby acquiring and utilizing natural resources are regulated. They evolve to mediate conflicting interests among users. Essentially, natural resource management is concerned with ownership: the right to use the help and the

right to determine the nature and extent of use by others. Ultimately, these are decisions that have to be made by the owner or manager of the resource since it is the entity that possesses and exclusively controls the resource. It is in this context that the various regimes of land/resource tenure become important. Typically, there are individual tenure, public tenure, and community or customary tenure. These regimes define the bundle of rights to occupy, use or benefit from land and land-based resources under a particular system of law and authority. In each case, rights are linked to corresponding duties, which may include environmental conservation.

Further, each of these regimes has different implications for the resource being managed. What makes anyone regime suitable for any given resource depends on many factors, such as the social, economic, and cultural circumstances affecting or conditioning that resource. Therefore, a particular resource may be most effectively managed by a group of users since they depend on it for their basic needs.

3.1 Land and Development

The centrality of land as the main factor of production and achievement of socio-economic, political and cultural development is well elaborated in many policy documents in Kenya. The Kenya Vision 2030, which is the country's development blueprint, asserts and affirms the importance of land resources in achieving the country's development agenda. Globally, land has become an indicator and measure of wealth. It is in line with Goal 15, target 1.1 and 1.2 of Sustainable Development Goals (SDGs). Goal no.15 focuses on Life on Land, emphasizing the need to protect important sites for terrestrial and freshwater biodiversity, which is vital for ensuring long-term and sustainable use of terrestrial and freshwater natural resources for human development.

Furthermore, healthy mountain ecosystems are fundamental to ensuring ecosystem services to both upland and lowland communities. In the 21st century, a lot of attention has been given to sustainable land and natural resources management portfolios due to their recognition and conflicts that emanate from poor land and natural resource governance. The land is a key driver to conflicts and remains a politically sensitive and culturally complex issue in Kenya. Therefore, good land governance is crucial for sustainable land and natural resource management, peace, and human security.

As a highly complex issue, land and environment are constitutionally elevated, not only to show the importance of these two mutually reinforcing variables but also to depict the interlinkages therein. This close link between land and environmental/natural resources sets the tone for Chapter Five of the Constitution of Kenya, 2010. To clarify, Article 260 of the Constitution broadly defines land as the earth's surface, under the surface, marine waters, a natural resource on the surface or under the surface, and the air space. Similarly, natural resources mean the physical non-human factors and components, whether renewable or non-renewable. Natural resources,

therefore, constitute and are consequently land. The definition of both land and natural resources is broadly summarized in Table 1-3.

Table 1-3: The Meaning of Land and Natural Resources

The Meaning of land and natural resources as per Article 260 of the constitution of Kenya	
Land	**Natural Resources**
Includes	**Means the physical non-human factors and components, whether renewable or non-renewable, including**
a) The surface of the earth and the subsurface rock	a) Sunlight;
b) Any body of water on or under the surface;	(b) Surface and groundwater;
c) Marine waters in the territorial sea and exclusive economic zone;	(c) Forests, biodiversity and genetic resources; and
d) Natural resources completely contained on or under the surface; and	(d) Rocks, minerals, fossil fuels and other sources of energy
e) The air space above the surface	

Land governance can be defined as how the property rights to land and public management of land are administered and managed (Deininger et al., 2012). Land governance is also about decisions made regarding land access, user rights, and development of policies, procedures, processes, and institutions governing land and other natural resources (Obayelu, 2015). Thus, effective land governance is about land administration and management to achieve sustainable land management goals and conflict transformation. The general principles of good governance in Kenya are set out in Article 10 of the Constitution, mirrored in the National Land Policy and various land laws.

Kenya National Land Policy (2009) defined land tenure as terms and conditions under which rights to land are acquired, retained, used, disposed of, or transmitted. Formal land rights are usually secured through various Acts of parliament, while the informal land rights, the Government has been trying to developing laws and regulations to formalize them (Ogutu, et al., 2016). Additionally, the Constitution of Kenya (2010) designates all land to belong to the people of Kenya collectively. Article 232 provides key principles for good governance that relate to the behavior and conduct of public officers while discharging their duties, including land management and administration. This section provides the land governance aspects, detaining the historical context of land management, policies and legislative regimes, and the institutional frameworks that govern land and land-based resources in Kenya.

3.3: Historical Context of Land and the Land Question in Kenya

During the pre-colonial and post-colonial era, the land question, defined as the *concerns by the people towards land ownership, access to interest in land,*

and sustainability of the land resource in Kenya is/was characterized by indications of a breakdown in land administration, disparities in land ownership, tenure insecurity, and conflicts. The land question has bedeviled Kenyans for over a century, dating from the period of colonialism. Even the successive independent Governments of Kenya have toiled with the land question for over fifty years.

According to National Land Policy (2009), contemporary manifestations and impacts of the Land Question in natural resources result from inadequate environmental management and conflicts over land and land-based resources. It is, therefore, crucial to address historical land injustices regarding natural resources, including land. Section 38 of the Land Laws (Amendment) Act 2016 defines a historical land injustice as a grievance occasioned by a violation of a right in land on the basis of any law, policy, declaration, administrative practice, treaty, or agreement. It resulted in displacement from their habitual place of residence. Moreover, the injustice must have occurred between l5th June 1895, when Kenya became a protectorate under the British East African Protectorate, and 27th August 2010 when the Constitution of Kenya was promulgated, and that injustice has not been sufficiently resolved and subsists up to the period specified. This section implies that the violation of rights may result from law, policy, declaration, administrative practice, treaty, or agreement, which may have occasioned the loss of livelihood of the inhabitants during the period as mentioned above, constitutes a historical land injustice.

3.3.1: Colonial Period 1895 To 1962

The land question in Kenya dates back to the 1895s during the pre-colonial, independence, and post-independent era. Kenya became a British protectorate in 1895, and the land was converted into Crown Land and vested in the Commissioner in trust for the British Crown. Colonialists were interested in Kenyan land due to its agricultural prospective and productivity, which greatly influenced the interest in land. Therefore, the colonialists introduced English law, which replaced the African customary law to regulate how land was owned and utilized. The African customary law provides that land is communally owned. Therefore, the English law declared Indigenous Africans as declared tenants-at-will of the Crown, and they were dispossessed of their land. It was the beginning of land problems in Kenya. Subsequently, two systems of land registration developed over time: registration of deeds and registration of title. Some of the laws that governed land during the colonial era include:

The Crown Lands Ordinance No. 21 of 1902: This vested the Commissioner of the Protectorate power to sell freeholds in crown land within the protectorate to any purchaser in lots not exceeding 1,000 acres.

The Crown Land Ordinance, 1915: Upon repeal of **The Crown Lands Ordinance No. 21 of 1902, t**he 1915 Ordinance adopted the registration

model and brought an advanced system of registration of deeds and the provision of accurate survey and deed plans.

The Documents Act (registration of deeds (1901): The records kept under this registration system served to show that the transaction in question took place but said nothing about the validity or legitimacy of the transaction in place.

Land Titles Act (1908) – It provided for a registration system in favor of individual title claimants within the coastal region provided prove of claims to the properties they owned.

The Government Lands Act Cap 280 (GLA): Its objective was to provide for, among other things, deed plans and achieve better administration and registration of Government plans in land and Government dealings thereof. All grants of Government land and transactions relating thereto were required to be registered under this Act.

Registration of Titles Act (RTA of 1920) -Introduced the process of transfer of land through registration of transfer (the Torrens principles).

3.3.2: Early Independent in Kenya - 1963

The main characteristics of Land Governance in Independent Kenya were outdated land laws, irregular allocation of land, squatting and landlessness, unsustainable land utilization, and inadequate access to land, especially by minority and marginalized groups. Several legislations were enacted to guide land administration. The Government Lands Act (Cap 280) established a new system of administration and registration of Government land and created procedures to guide Government land allocation. Similarly, The Trust Land Act, (Cap 288) was enacted to deal with the administration of Trust Land that vested the Trust Lands in County Councils, to hold "for the benefit of the persons ordinarily resident on that land". The Commissioner of Lands was given powers to administer Trust Land on behalf of the County Councils. A system provided by the Registered Land Act, Cap 300 introduced registration in the native areas to provide a conversion process whereby titles that were issued under previous registrations would be re-issued under the provisions of the Registered Land Act. The Act sought to achieve individualization of title to customary law.

The Registered Land Act**,** Cap. 300 of 1963 sought to unify the different systems of land registration in Kenya. In this regard, the Government Lands Act, Land Titles Act (LTA), and Registration of Titles Act (RTA) were converted and transferred. It also sought to formalize the African land tenure system through adjudication, consolidation, and registration. Despite the Act being passed in 1963, it continued to operate along with the other statutes, leading to double registration and rampant fraudulent transactions. These laws were inefficient, ineffective, and inconsistent and rendered the land administration process bureaucratic and expensive; thus, resulting in inordinate delays, apart from lending themselves to corrupt practices (Policy, 2009). These

governance failures, therefore, necessitated the establishment of various Commissions to look into the issue of land, which includes:

The Akiwumi Commission Report – 1998 After the white settlers left, Kenyans from different origins purchased the same Land with Government assistance, but indigenous people resisted the move. It resulted in animosities, political tensions, and ethnic violence within these areas. The Akiwumi Commission was established to investigate tribal clashes, the causes of the violence, and the actions of police and other law enforcement agencies. The Report concluded that the tribal clashes were politically motivated and fanned by ethnicity and land ownership conditions.

The Njonjo Commission Report-1999

The Njonjo Commission focused on coming up with principles of a National Land Policy framework, the constitutional position of land, and a new institutional framework for land administration. The Commission recommended that public land should be held and managed by a National Land Authority, in trust for the Citizens so that the radical title to such land should vest in the National Land Authority**.**

The Ndungu Commission Report - 2003/2004

The Ndungu Commission was to inquire into the extra-legal allocation of public lands and lands reserved for public purpose to private individuals and corporate entities and provide recommendations to the Government to restore those lands.

The Ndungu Report, 2004 identified 40 statutes that deal with land administration, ownership, and use that make it difficult for many Kenyans to understand the substantive land law. The Commission recommended the Comprehensive land title insurance scheme be put in place. Similarly, the Government should prepare an inventory of all public land in the country, and harmonize land legislation, to prevent double issuance of titles and formation of the National Land Commission, with powers to allocate public land, and to supervise the management and allocation of trust land. The findings are categorized as follows: Urban, state corporations and Ministries lands; Settlement schemes and Trust Land; Forestlands, National Parks, Game Reserves, Wetlands, Riparian reserves, protected areas, Museums, and Historical Monuments:

Urban, state corporations, and Ministries lands.

Most illegal allocations of public land took place before around 1992, 1997, and 2002, reinforcing the view that public land was allocated politically. Land allocated to state corporations is 'alienated land', but has been illegally issued to individuals or companies in total disregard of the law. Several organizations lost their land to dubious circumstances.

Settlement schemes and Trust Land.

Trust land, including settlement scheme land purchased by the Government with international loans for settlement by African smallholders or carved out of Trust land, has faced similar challenges. It was evident that the establishment of settlement schemes and their subsequent allocation in the early years of independence generally conformed to the original objectives. In later years, though, there was an extensive deviation, with much land allocated for purposes other than settlement and agricultural production.

Forestlands, National Parks, Game Reserves, Wetlands, Riparian Reserves, Protected Areas, Museums and Historical Monuments.

During independence, major gazetted forests at independence were reduced, with most of the reduction having come about due to illegal and irregular excisions, usually made without any reference to legal provisions. While there is a need for a public land inventory and computerization of land records and comprehensive land policy, the Ndungu Commission also urges the establishment of a Land Titles Tribunal charged with reviewing each and every case suspected of illegal or irregular allocation of land, and hence embark upon the process of revocation and rectification of such titles. The Ndungu Commission noted a total of 2,629 plots in various parts of the country were illegally/irregularly allocated, as shown in Table 2-3.

Table 2-3: Summary of Illegally/Irregularly allocated Public Lands

S/No.	No. of Plots/ Allocations	Region
1.	105	Nairobi bypass
2.	551	Nairobi City Council
3.	86	Meru
4.	449	Nakuru
5.	270	Eldoret
6.	100	Nyeri
7.	186	Kisumu
8.	407	Mombasa
9.	56	Nyahururu
10.	67	Kiambu
11.	30	Kisii
12.	17	Kapsabet
13.	187	Kerugoya/ Kutus
14.	118	Kitale
Total	2629	

Source: *Ndungu Commission 2004*

3.3.3: New Era – Kenya Constitution 2010 and Beyond

The National land policy of 2009 recommended establishing the National Land Commission (NLC), an idea adopted by the Committee of Experts (CoEs) that drafted the Constitution of Kenya, 2010. Article 67(1) (a) of the Constitution establishes the National Land Commission, as an independent constitutional commission mandated principally, to manage and administer

public land on behalf of County and National Governments. Further, Section 5(2) (c) of the Land Act 2012 tasks the Commission to ensure that public land under the management of the designated state agencies is sustainably managed for the intended purposes. Other functions of the Commission are laid down in the constitution and relevant land laws, including the National Land Commission Act, 2012, the Land Act 2012, and the Land Registration Act 2012. Apart from the direct land laws, natural resource laws such as the mining Act 2016, EMCA, 1999 and the Petroleum Act 2019, among others, also provides important land governance.

3.4: Institutional landscape for land and Natural Resources in Kenya

Like the legislative and policy landscape, the institutional terrain for land and natural resources in Kenya is dominated by multiple actors and institutions, informed by the specific laws and interests. The systems, however, experience some overlapping roles/mandates depicting governance challenges frame in this sector. The multiplicity of institutions and overlapping functions within the land and land-based resources management signify the possibility of conflicts, lack of accountability and transparency, and jeopardize meaningful participation of the people and the enforcement and coordination elements. The Ministry of Lands and Physical Planning and the National Land Commission constitute the main public players/institutions for land administration and governance.

The Taskforce report on illegal logging of Kenya's forest (2018) elucidated the main governance issues in the forest sector, including corruption, lack of transparency and accountability, and abuse of power. The discrepancy between policy and practice in terms of establishing Community Forest Associations (CFAs) and facilitating the same to discharge their functions remain a governance issue. Similarly, conflicts and lack of proper and functional dispute resolution mechanisms for communities living in /around protected forest areas continue to be challenging. Such conflicts and disputes are within the forestry sector and mark the entire land and natural resources discourse, including the extractives (minerals, oil, and gas). Streamlining and entrenching good governance in land is therefore imperative for enhancing sustainable natural resources management. A summary of the land conflicts/disputes cases and status by the NLC is provided in Table 3-3.

Table 3-3: Land Related Disputes and Conflicts

	Nature of dispute	Total cases received by NLC	Total cases resolved
1.	Boundary/ownership	939	331
2.	Encroachment	335	55
3.	Non compensation	510	66
4.	Succession	240	139

Source: *NLC, First Commissioners Exit report 2019*

Tenure security is one of the factors of ensuring sustainable economic development. With secure tenure, the universal call to end poverty and protect land and its resources are attainable. Secure land tenure perception is a key justification that provides incentives for investment in land resources and, therefore, an impetus for attaining the Sustainable Development Goals (SDG). Kenya has multiple tenure systems which, if not managed properly, may threaten tenure security. The two main tenure systems are; formal land tenure, where individual property rights are registered, and the informal land tenure system governed by traditional norms. Hoza (2018) indicates that the State holds the right to manage public land and regulate customary landholdings. Therefore, the way the State governs land matters a lot to determine its tenure security and, by extension, sustainably harness and safeguard its resources. There have been efforts by the Government on initial land reforms to improve tenure security. A fundamental approach is adopting the National land policy in 2009 and the passage of the 2010 Constitution (Bruce, 2009), which proposes a mechanism to simplify complex land laws and complicated land management systems in the country.

However, these efforts, which include the adoption of the land policy, require operationalization. Development of regulations, guidelines, and rules that have not been developed and enacted provides the means to operationalize the recommendation made in the policy, and other relevant land statutes are necessary. This will help in providing clear guidance on complexity in the land laws, hence improve tenure security. Additionally, there is a need for integration of functionalities of land-related institutions and enhancing coordination and communication. Since land-related problems are historically, economically, technically, culturally, and politically complex, there is a need to cooperate with various Government agencies to obtain an integrated system that can spur socio-economic and ecological development. The approach will enable the attainment of the relevant national, regional and global agendas.

Chapter 4: Climate Change

Climate change refers to climate variability (temperature, wind patterns, and rainfall) observed over comparable periods. Kenya's economy is highly dependent on natural resources, thus highly vulnerable to climate variability and change. Rising temperatures and changing rainfall patterns resulting in increased frequency and intensity of extreme weather events such as droughts and flooding threaten the sustainability of the country's development. It impacts ecosystems, water resources, food, health, coastal zones, industrial activity, and human settlements. Addressing these impacts presents opportunities for innovation, business, and improved livelihoods.

4.1: Evidence of Climate Change in Kenya

Evidence of climate change is based on a statistical analysis of trends in historical records of temperature, rainfall, sea-level rise, mountain glacier coverage, and climate extremes. Rainfall patterns indicate increased irregularity and variability with neutral to slightly decreasing trends in annual precipitation over most areas. Decreasing rainfall trends have been observed in the total annual rainfall and during the long rainfall season March, April, and May (MAM) in recent years. This season contributes a higher proportion of the total rain for most parts of the country. A general increase in rainfall amounts is observed from September to February in some parts of the country. This increase has been attributed to a tendency of the short rainfall season October, November, and December (OND) to extend into the typically hot and dry months of January and February.

In recent years, evidence of higher frequency and intensity of extreme climate events such as droughts and floods has been noted in Kenya. Rainfall and temperature records from the Kenya Meteorological Department have provided clear evidence of climate change in Kenya over the last fifty years. Figures 1-4 and Figure 2-4 show the annual OND short rainfall season increasing trend observed in Kericho and the decreasing trend observed in Dagoretti corner in Nairobi Meteorological stations.

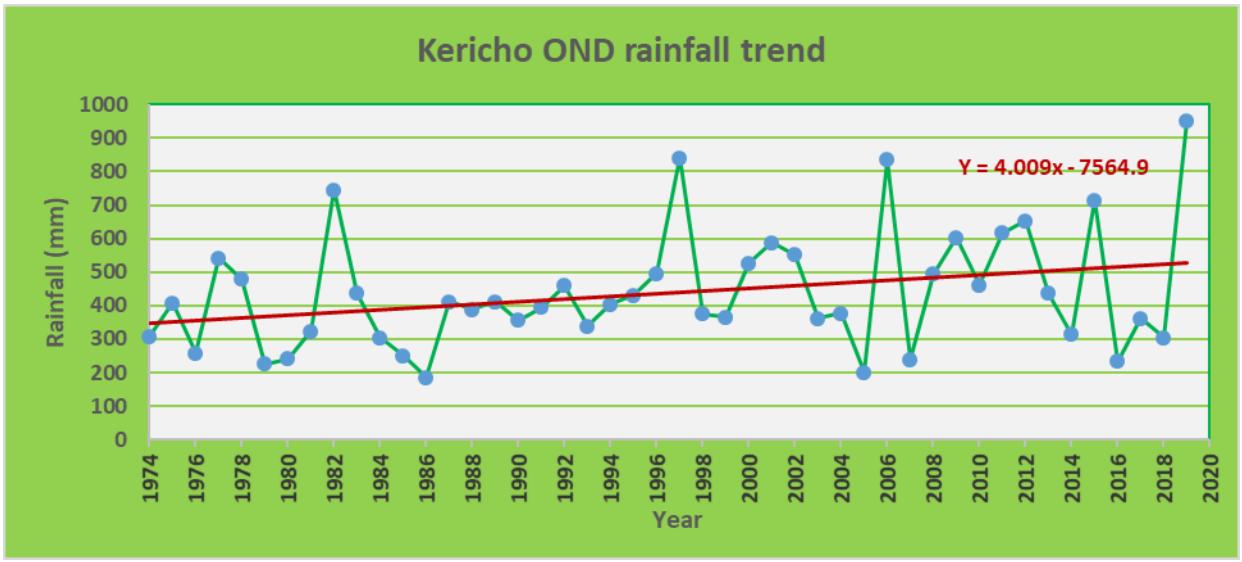


Figure 1-4: Rainfall Trend for Kericho Met. Station
Source: *KMD*

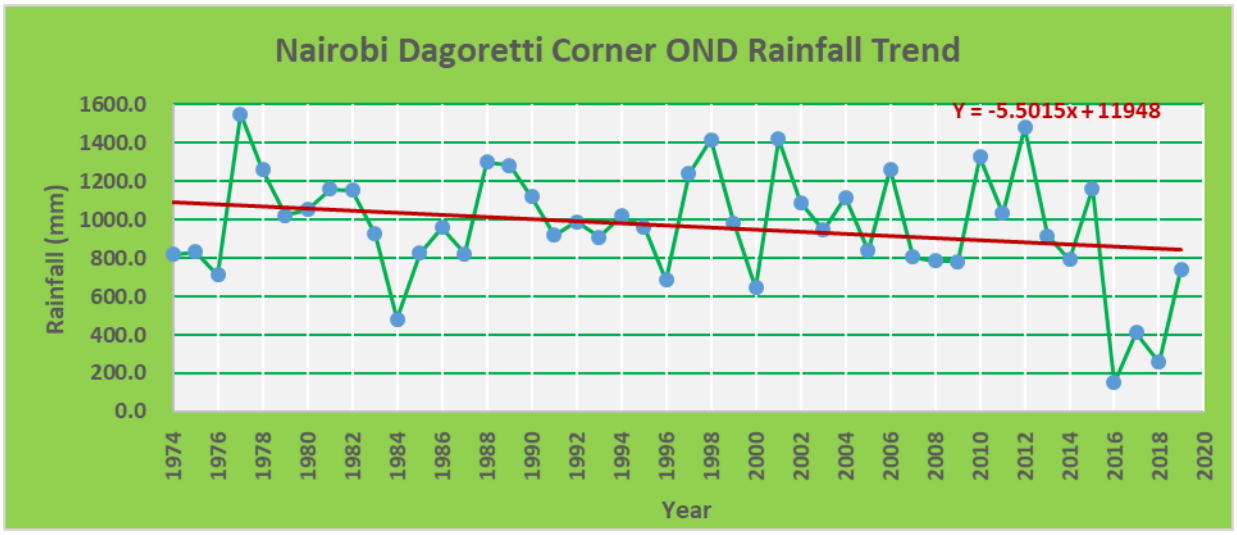


Figure 2-4: Rainfall Trend for Nairobi Dagoretti Met. Station
Source: *KMD*

4.2: Projected Rainfall Characteristics over Kenya in 2030

Figure 3-4 shows the regions from Lake Victoria to the central highlands and east of the Rift Valley likely to experience mild increases in annual rainfall while the north east, coast, eastern and northwestern parts of the country are expected to receive reduced annual rainfall amounts.

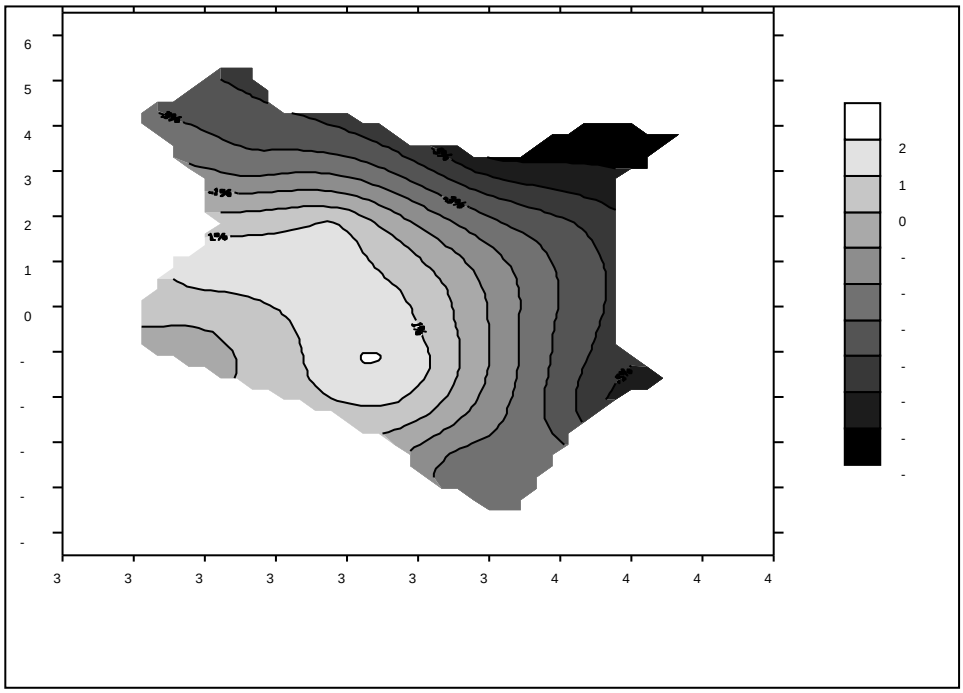


Figure 3-4: Projected annual rainfall trends in Kenya by 2030.
Source: *KMD*

4.3: Current Temperature Situation

Temperature records from the Kenya Meteorological Department over the last fifty years provide evidence of climate change in Kenya, with temperatures generally showing increasing trends in many parts of the country starting from the early 1960s. Mean temperatures are also predicted to increase with a greater frequency of 'hot' days and nights and fewer 'cold' days or nights. The temperature defines a hot day or night exceeded on 10 percent of the days or nights in the current average climate of an area (station), and cold days or nights are defined as the temperature for the coldest 10 percent of the days or nights. In some regions, nighttime warming features more prominently than daytime warming. The evidence shown in Figures 4-4 and 5-4 highlights increasing trends in maximum temperatures observed at Mombasa and Lodwar Meteorological stations, respectively.

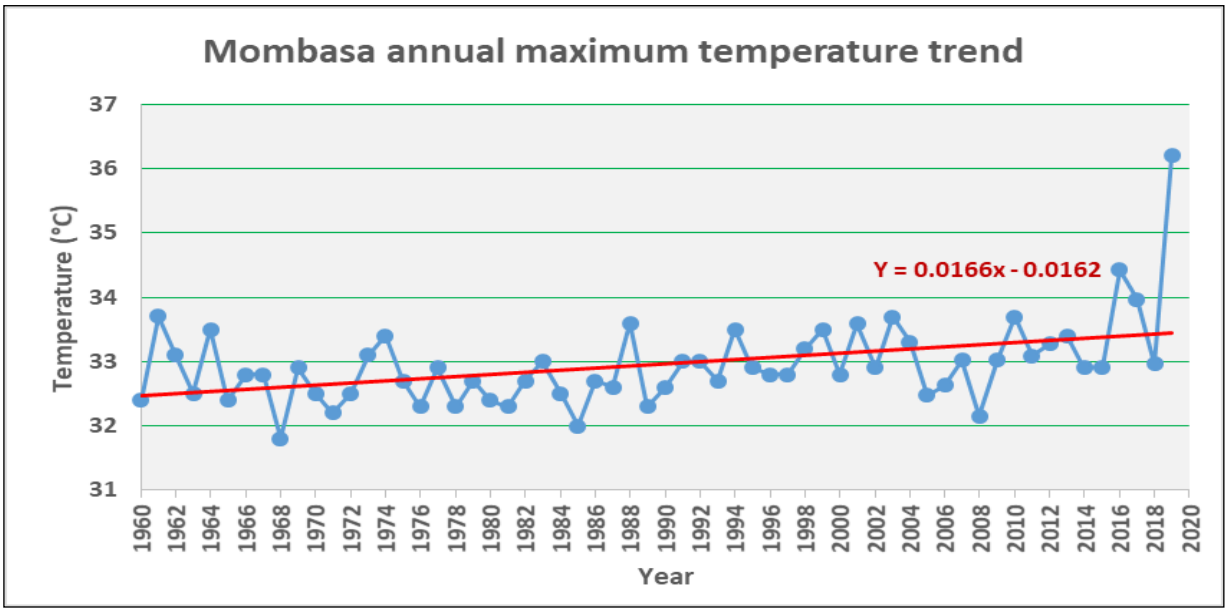


Figure 4-4: Maximum temperature trend for Mombasa Met.station.
Source: *KMD*

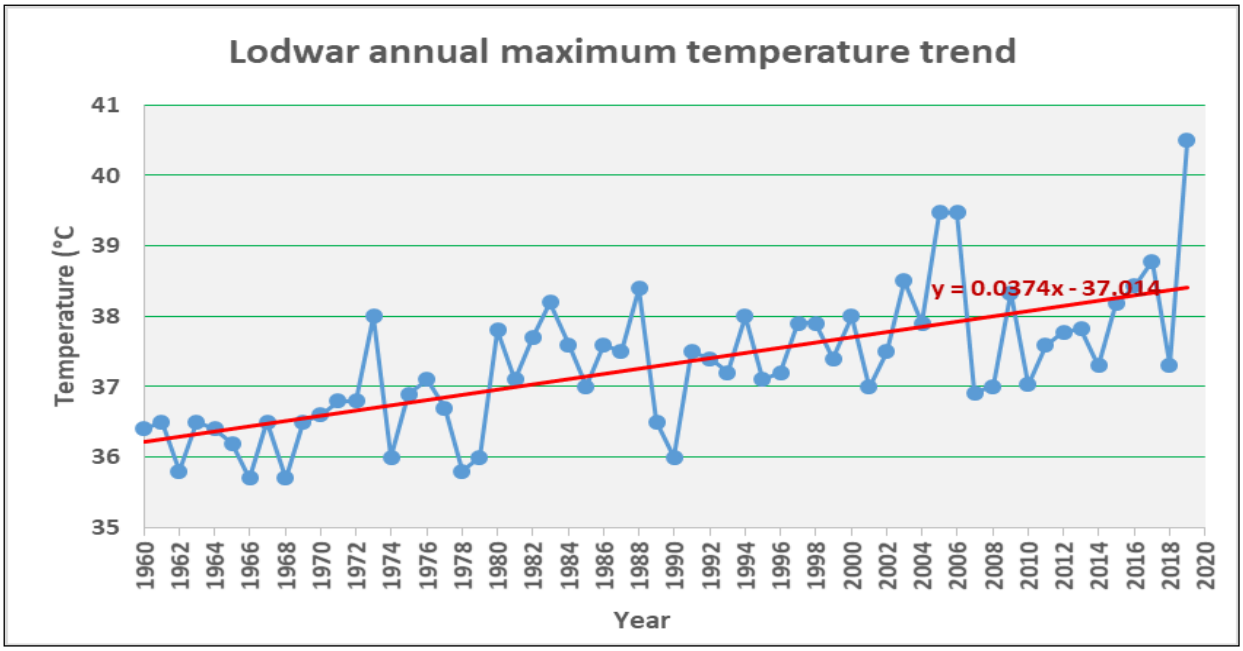


Figure 5-4: Maximum temperature trend for Lodwar Met.station
Source: *KMD*

4.4: Spatial Distribution of Annual Maximum Temperature in the Past, Present and Future

The following maps (Figure 6-4 a, b and c) illustrate annual maximum temperature in the past, present and projected to increase further in future.

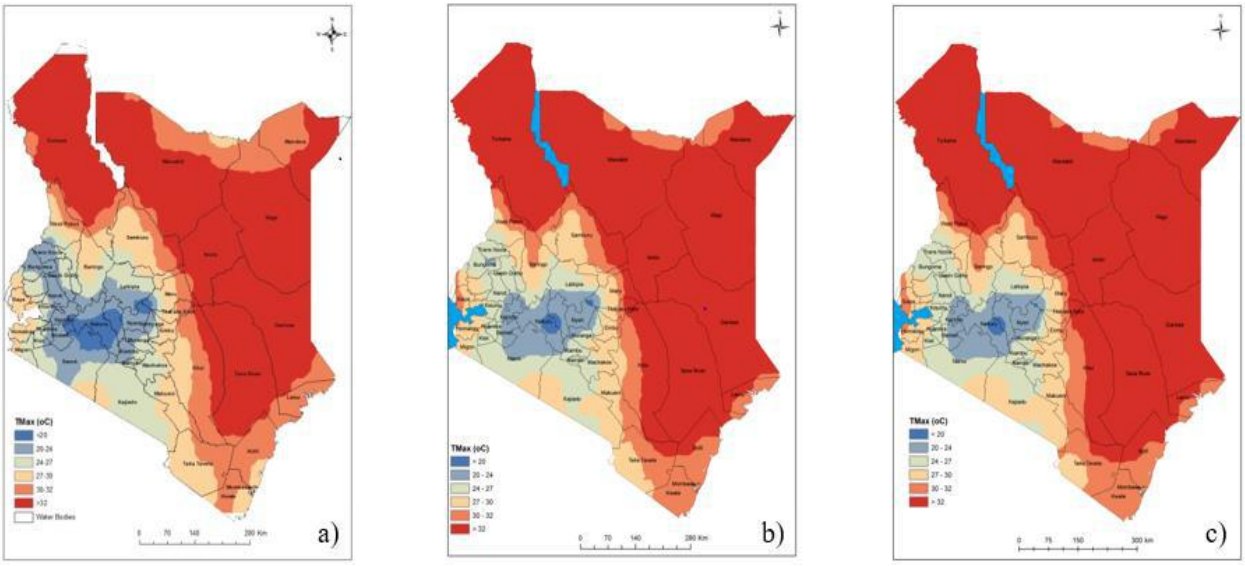


Figure 6-4: (a, b and c). Annual maximum temperatures in the past, current and future (2050) respectively.
Source: KMD (State of Kenya Climate 2019)

Figures 7-4 and 8-4 highlight increasing trends in annual minimum temperatures observed at Nairobi Dagoretti corner, Kakamega and Mombasa Meteorological stations are clear signals of climate change.

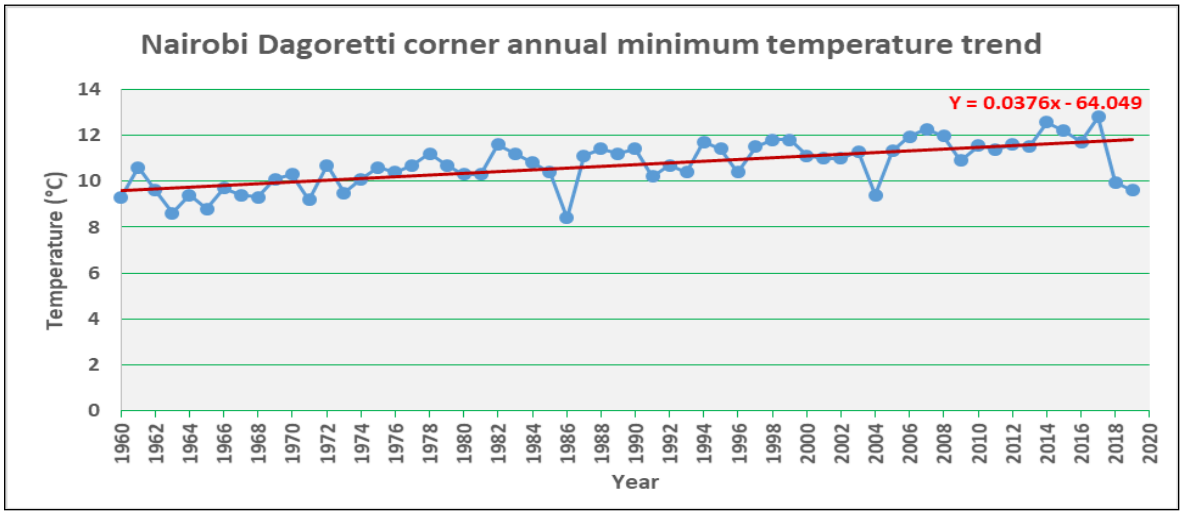


Figure 7-4: Dagoretti Met-Station Annual Minimum Temperature Trend
Source: *KMD*

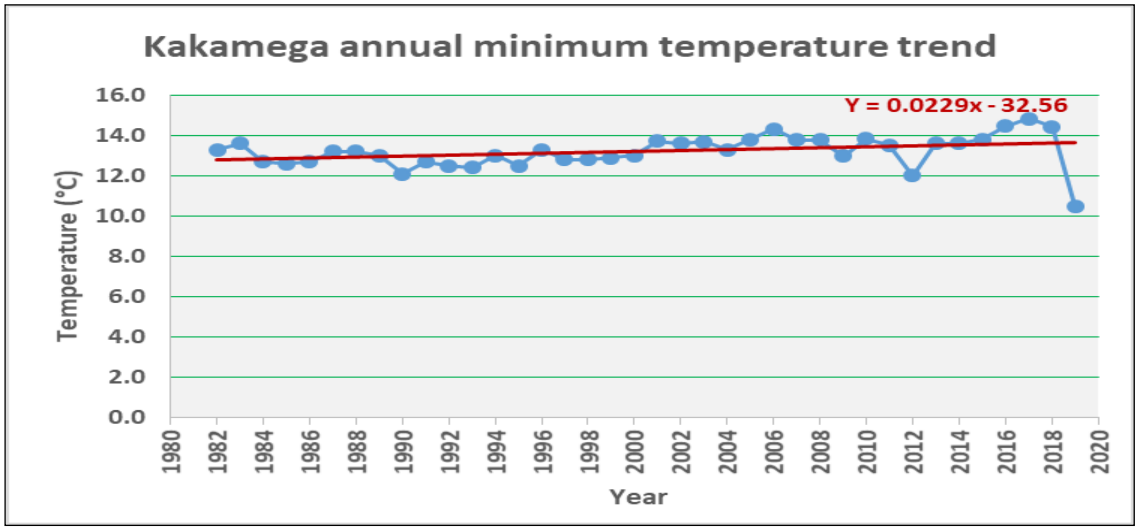


Figure 8-4: Kakamega Met-Station Annual

Minimum Temperature Trend

Source: *KMD*

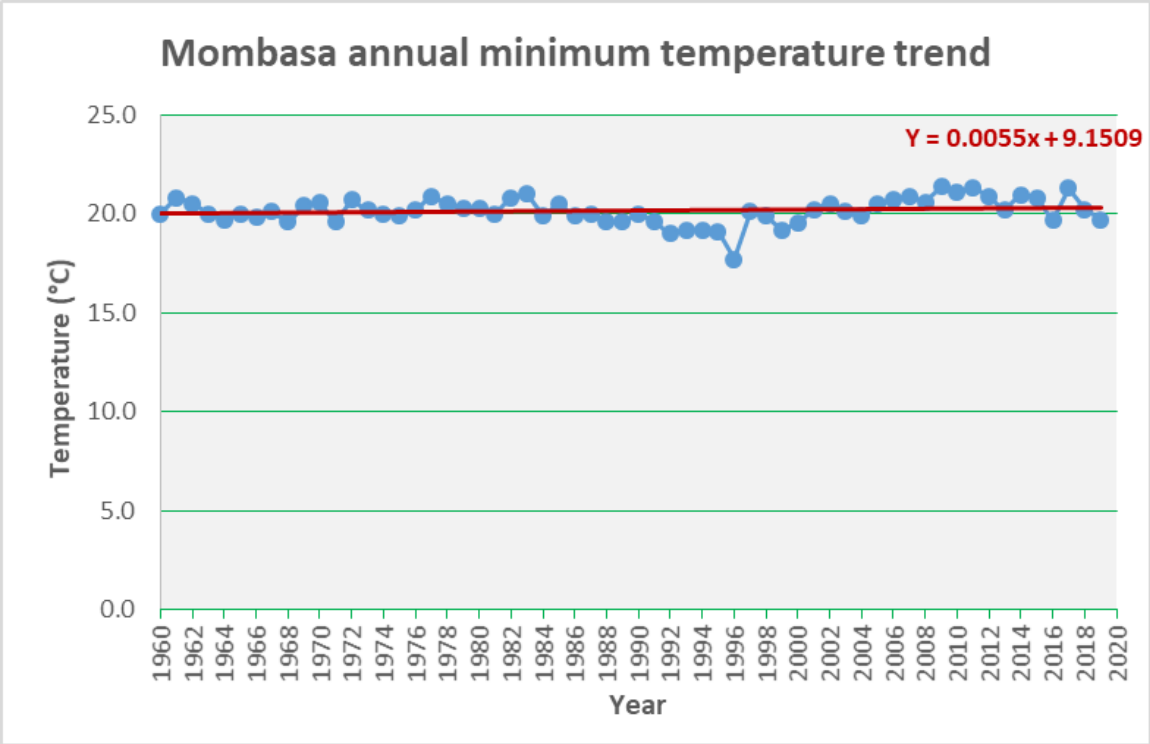


Figure 9-4: Table 4 9: Mombasa Met-Station Annual Minimum Temperature Trend

Source: *KMD*

4.5: Annual Minimum Temperature Distribution for the Past and Future

Figure 10-4 (a, b and c) illustrate an increase in annual minimum temperature in the past, present and expected in 2050. Future IPCC projection scenarios indicate an expected range of global warming of between 0.3°C for a scenario of constant levels of greenhouse gas (GHG) emissions to 6.4°C for the highest case emissions scenario. These shows an increase in minimum temperatures

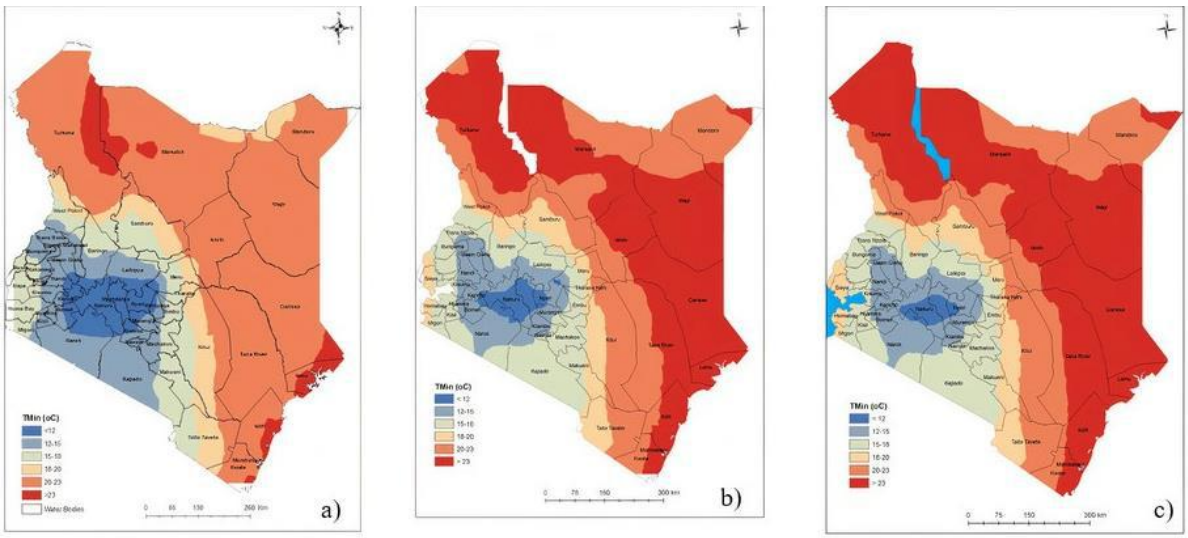


Figure 10-4: (a, b, & c) Illustrates an Increase in Annual Minimum Temperatures.
Source: KMD (state of Kenya climate 2019)

4.6: Greenhouse Effect and Global Warming

Human activities (anthropogenic) are dominant forces responsible for most global warming through changes in (GHGs): CO2, CH4, N2O, CFCs, O3, Aerosols, and Land use/cover changes. GHGs affect climate by altering incoming solar and outgoing infrared radiation energy balance through the 'greenhouse effect.

These gases prevent the escape of heat initially received from the sun by the earth's surface as short-wave energy back to space.

Greenhouse Effect and Global Warming trap heat energy at the earth's surface, cumulative heating takes place over the years, and this is what has been referred to as "global warming." The continuous increase in CO2 and other GHGs, in the earth's atmosphere has led to high temperatures projected to rise by between 0.8 and 1.5°C by 2030.

Figure 11-4 shows an increase in the total national GHG emissions and removal trends between 1995 and 2015.

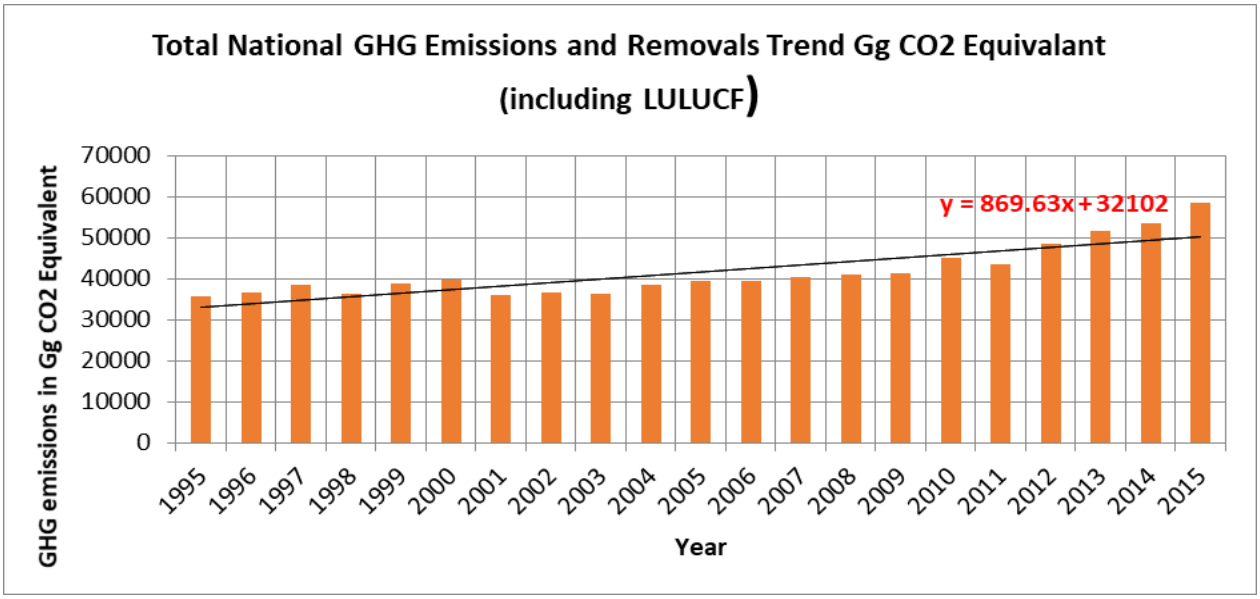


Figure 11-4: Demonstrate Total National Greenhouse Gas Emissions

Source: *Climate Change Directorate (CCD 2015)*

The chief greenhouse gases (GHGs) consist of Carbon dioxide (CO2), Methane (CH4), Nitrous Oxide (N2O), Tropospheric Ozone (O3), and hydrofluorocarbons (HCFCs) as illustrated in Figure 12-4.

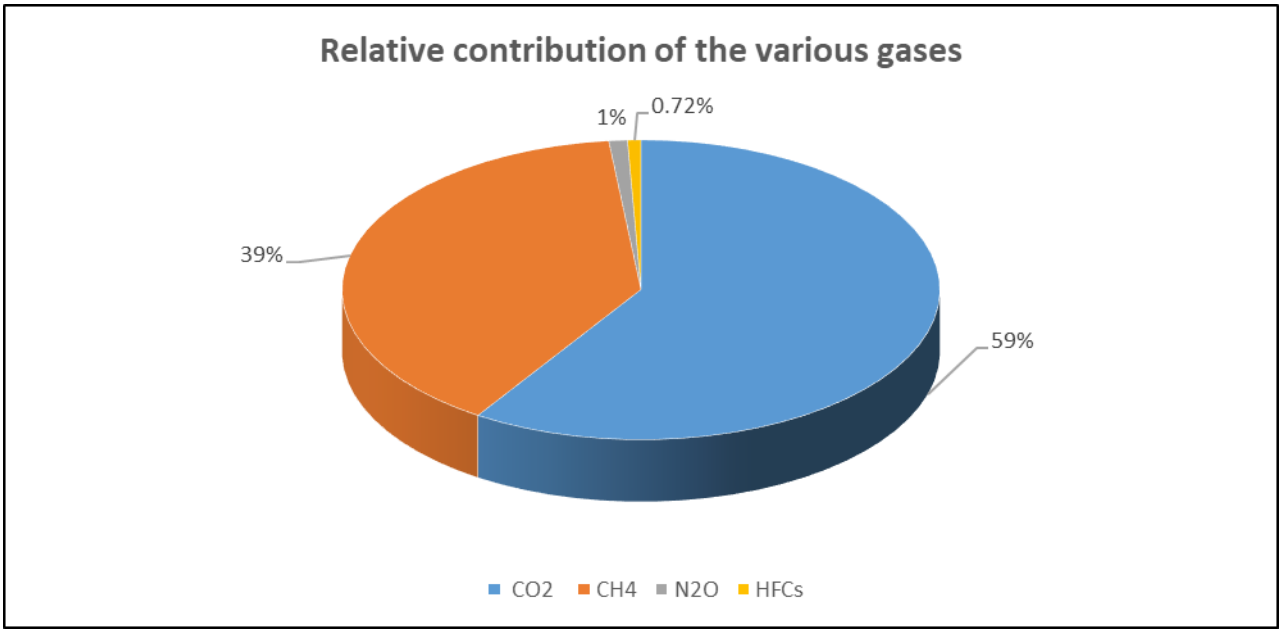


Figure 12-4: Relative Contribution of the Various Gases

Source: *Climate Change Directorate (CCD 2015)*

4.7: Climate scenario

A climate scenario is a plausible representation of future climate constructed to investigate the potential impacts of anthropogenic climate change consistent with assumptions about future emissions of greenhouse gases and other pollutants. Emission scenarios are used to know how anthropogenic emissions will change in the future by gradually increasing the atmospheric concentrations of greenhouse gases and observing the future climate model trends. These are based on a consistent set of assumptions about driving forces (e.g., demographic and socio-economic, and technological change).

The assumptions include future trends in energy demand, emissions of greenhouse gases, land-use change, and assumptions about the behavior of the climate system over long-time scales. Figures 13-4 demonstrate Kenya's total greenhouse gas emissions trend from 1995 to 2015.

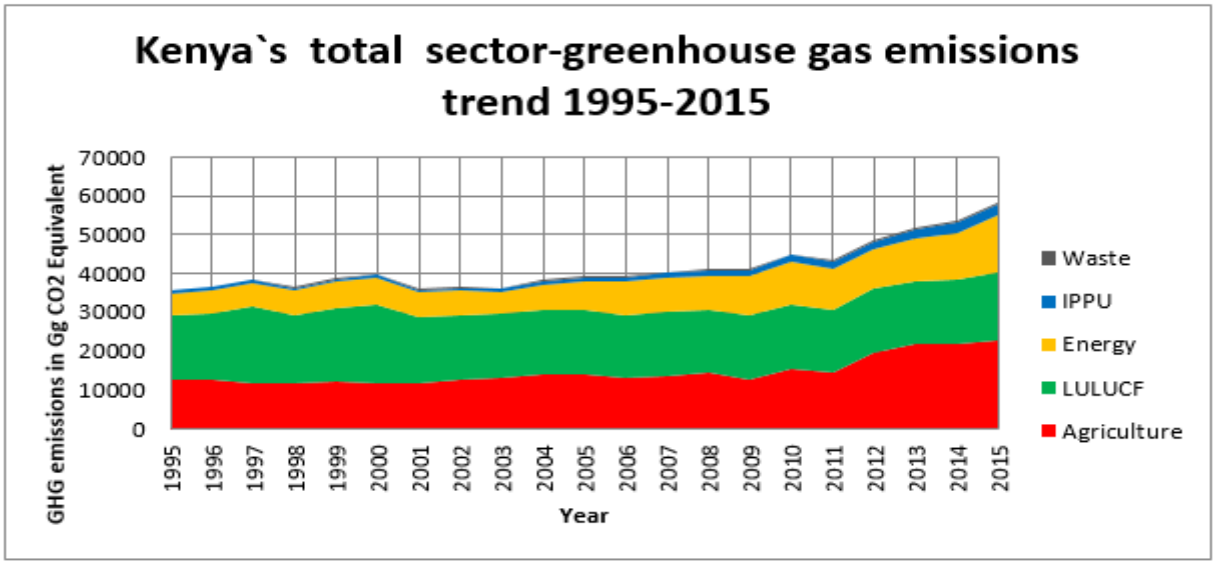


Figure 13-4: Total Sector Greenhouse Gas Emissions

Source: Climate Change Directorate (CCD 2015)

Climate change and variability have led to more frequent extreme weather events such as hurricanes, erratic rainfall, flooding, more intense and prolonged droughts and devastation of some coastal areas, species' extinction, reduction in ecosystems' diversity, and negative impacts on human health (IPCC AR4 WGII, 2007). Examples of the impacts attributable to the current observed climate change in Kenya include Sea level rise, the resurgence of some diseases, rivers becoming more seasonal or disappearing altogether, rise in Lake's water level, Shifts in rainfall seasons (Onset and cession dates), more frequent severe flooding and prolonged droughts and conflicts over limited resources.

4.8: Impacts of Climate Change on Environment and Natural Resource in Kenya

The impacts of climate change cut across diverse aspects of society, the economy, and the environment. The adverse effects have the potential to significantly inhibit the sustainable development of Kenya in key priority areas:

4.8.1: Environment, Water and Forestry

Natural ecosystems have been adversely affected by climate change, including variations of temperature and precipitation. The decline in environmental quality brings social and economic hardship to the people who depend on these ecosystems and increases contestation and the likelihood of conflict over diminishing natural resources. It also creates a window for invasive species, new pests, and diseases. The Arid and Semi-arid Lands (ASALs) are particularly vulnerable to climate change impacts, especially in insufficient investments in mechanisms to build resilience. Impacts include loss of biodiversity, threats to animal and plant species, change in vegetation composition and structure, decrease in forest coverage, rapid deterioration of land cover, and depletion of water quality and quantity through the destruction of catchments and underground aquifers.

Increased scarcity of water resources is a core concern making resource management more difficult and increasing the likelihood of conflict. Water scarcity will affect energy production and agricultural systems. Potential impacts include declining forest coverage, reduced water quality and quantity for domestic and industrial use, high water pricing, and increases in waterborne diseases.

Forests are susceptible to climate change. Forests provide environmental goods and services and are a significant source of biomass energy. Forest degradation and deforestation exacerbated by climate change have led to reduced canopy cover and altered biodiversity composition. It affects the ecosystem services that forests provide, such as reducing soil erosion, natural pest control, preserving water availability, cleaning the air, and maintaining water quality. Deforestation and forest degradation also affect GHG emissions.

4.8.2: Agriculture, Livestock, and Fisheries

The agriculture, livestock, and fisheries sector is one of the economic sectors in Kenya that is most vulnerable to climate change. Some crops in Kenya are expected to experience more favorable growing conditions due to climate change, whereas others will find future climatic conditions intolerable. Maize yields are likely to increase in mixed rain-fed temperate and tropical

highlands, while the ASALS are projected to experience a significant decline in crop yields.

Livestock management systems in Kenya, especially in the ASALs, rely extensively on natural methods such as rain-fed pasture. These livestock systems are very climate-sensitive, vulnerable to changing and irregular rainfall patterns and droughts. Greater drought frequency in the ASALs increases livestock morbidity and mortality because of reduced availability of forage, increased disease incidences, and a breakdown of marketing infrastructure.

In the fisheries sector, temperature changes in the aquatic environment affect the breeding and feeding behavior of fish and significantly affect the species composition. It is caused by the temperature increase on the nesting and feeding grounds. In some cases, catches of non-resident species have been reported, with a compounded risk of alien invasive species. The species of fish suitable for certain areas, such as cold-water aquaculture, is increasingly becoming unsustainable. The combined effects of these factors have a negative impact on the socio-economic status and livelihoods of the fisherfolk.

4.8.3: Trade

Diversified and climate-resilient trade sector is imperative for Kenya to attain low carbon climate-resilient development. The trade sector depends on products and services developed by other sectors of the economy, and any adverse climate change impacts of such sectors will likely impact trade. The agriculture, manufacturing, and transportation sectors, which are key for internal and international trade, are highly vulnerable to climate variability and extreme weather events. A successful trade sector will therefore require building resilience across the entire economic regime in Kenya.

4.8.4: Physical Infrastructure

An improved and expanded physical infrastructure is an essential and necessary enabler of socio-economic development. Climate proof infrastructure considers the integration of climate change risks and opportunities in the design, operation, and management of infrastructure. Another consideration is the promotion of investment in infrastructure that supports transformation to a low carbon economy while creating employment and reducing poverty.

4.8.5: Extractive Industries

The extractive industry in Kenya is rapidly developing into a potentially high contributor to economic growth. High-value resources such as petroleum, coal, and titanium have been discovered. Natural resource extraction contributes to and is vulnerable to climate change. Extraction of resources such as petroleum and minerals utilizes copious quantities of water and energy and releases GHG emissions. The exposure of sensitive infrastructure, such as pipelines, to extreme weather events, could result in disasters with significant adverse impacts on the Kenyan environment, economy, people, and property. Therefore, extractive industries require mainstream climate

proofing to protect the environment and natural resources, and economic development.

4.8.6: Energy

Biomass energy, such as charcoal and firewood, continues to be common in the country's urban and rural households. Hydroelectricity generation, which is still prevalent in the country, is affected by extreme droughts. Reductions in reservoir levels can decrease hydroelectricity generation, leading to shifts in fossil fuels, which increase GHG emissions. Coal and petroleum as sources of electricity generation contribute to GHG emissions. Kenya possesses significant renewable energy potential, including geothermal, wind, and solar.

4.8.7: Tourism

Tourism in the Kenyan context is highly climate-sensitive because of its close connection to the natural environment. A large proportion of tourism depends directly on natural resources, and much is focused on protected areas. Climate variability is causing negative impacts that could inhibit the positive contribution of tourism to Kenya due to wildlife changes in response to climate change. Increasingly warmer temperatures reduce plant and vegetation productivity in semi-arid environments, affecting wildlife diversity and distribution. It has resulted in wildlife competing with domestic livestock and human beings for both food and water. The main coastal areas are susceptible to sea-level rise due to low altitude, high temperatures, and high humidity levels driven by climate change.

4.8.8: Health

Human health has been affected adversely by climate change impacts in Kenya. The country has a high degree of risk from climate-sensitive infectious diseases such as food or waterborne diseases. Increases in vector-borne diseases such as malaria, dengue fever, and Rift Valley Fever have previously been witnessed during periods of extreme weather events primarily driven by high temperatures and intense rainfall, causing epidemics.

4.8.9: Coastal and Marine Ecosystems

Local communities have a high dependence on coastal and marine ecosystems, with a majority of people relying on fishing or fishery-related activities, and tourism is a major income earner. Coastal and marine ecosystems such as wetlands, mangroves, estuaries, and coral reefs are particularly vulnerable to climate change. Temperature rise affects the health, structure, and function of these ecosystems. For instance, changes in precipitation and sea-level rise will have significant consequences for the water balance of these ecosystems. Further, increases or decreases in rainfall and runoff may increase the risk of coastal flooding or drought with implications on ecosystems and biodiversity. Sea level rise resulting from climate change will gradually inundate coastal lands affecting environments and natural resources situation.

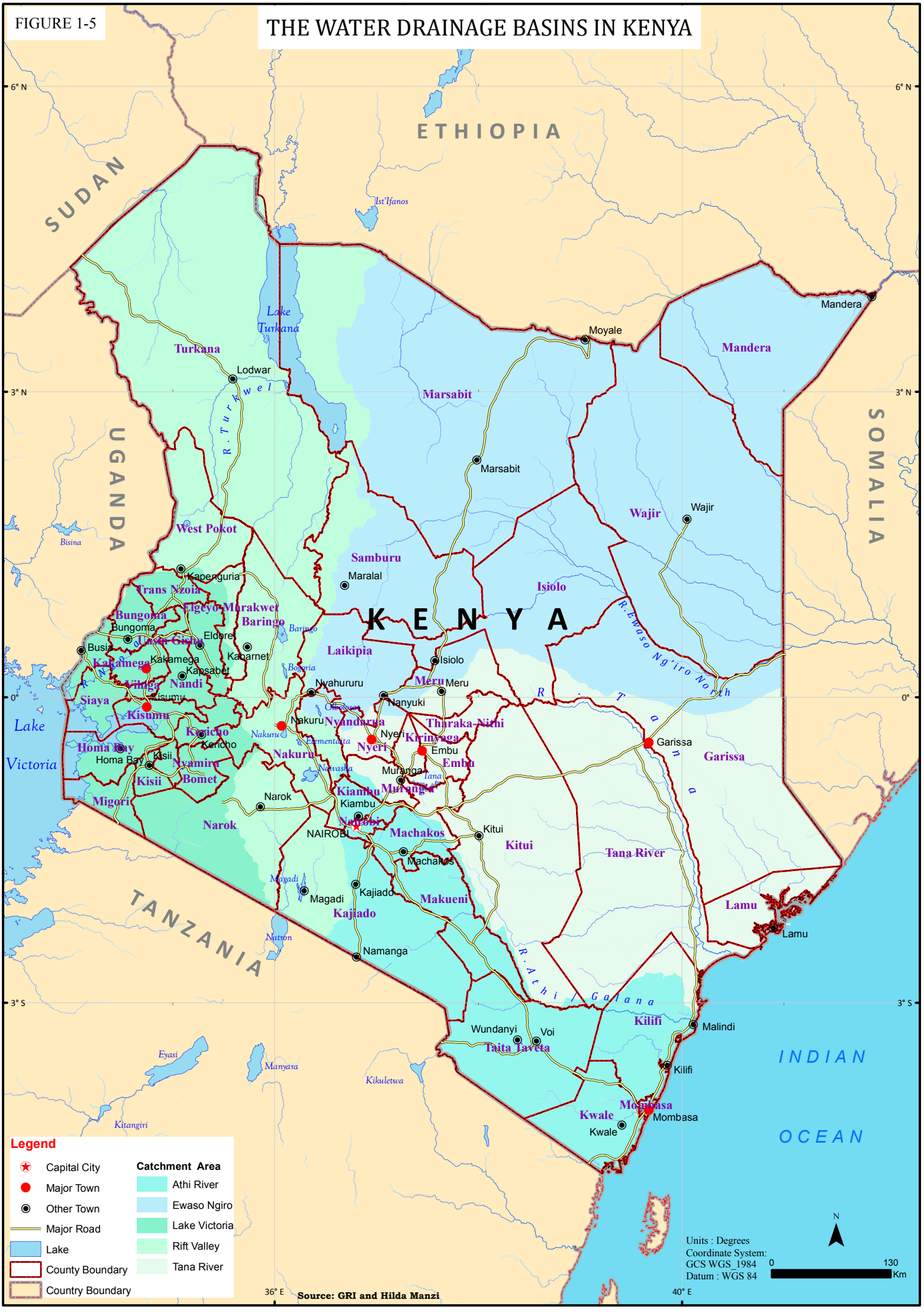
Chapter 5: Water Resources

At a global and regional level, the water sector is implementing the United Nations Sustainable Development Goals (SDG) and Africa Agenda 2063, emphasizing the role of water resources in socio-economic development. At the national level, the COK 2010 Article 62 classifies water bodies as public land held in trust for the people of Kenya by the national Government. Part II of the Water Act 2016 section 5 states that the water resources are vested in and held by the national Government. Water rights are through the issuance of a permit that ensures equity and good practice in water sharing.

The per capita water resources available in 2010 was 586 m3 per capita per year (GOK, 2013) against the global benchmark of 1000m3. The Water Resources Authority (WRA) has developed several regulatory tools. It has adopted the Integrated Water Resources Management (IWRM) approach, a global conceptual framework to achieve the institution's goals. WRA as a regulator maintains water resources quantity and quality by; assessments, monitoring, allocating water resources equitably through water permit issuance, water apportionment by assigning priorities to various water-use categories, giving priority to reserve and domestic water demand, and technical support in watershed conservation activities. The country has six catchment areas according to the drainage basin shown in Figure 1-5

FIGURE 1-5

THE WATER DRAINAGE BASINS IN KENYA



5.1: Situational Analysis

Kenya's water resources are classified into surface water and groundwater. The representation of these are lakes, rivers, swamps, springs, dams, water pans, and groundwater. The Kenya catchment area covers a total of 575, 451 km2. The distribution where, the Lake Victoria North Catchment Area (LVNCA) covers 18,374 km2; Lake Victoria South Catchment (LVSCA) Area cover 31,734 km2; Rift Valley Catchment (RVCA) Area cover 130,452 km2, Athi Catchment (ACA) Area cover 58,639 km2, Tana Catchment Area cover 126,026 km2 and Ewaso Nyiro (ENNCA), North cover 210,226 Km2 (GoK, 2013).

The pressure on water resources increases, and water supplies are under pressure from climate change and population growth. As water quality declines, water treatment costs increase and further affect the ecosystem's health and aesthetic values of water bodies.

5.1.1: Surface Water

Kenya has limited natural renewable water resources estimated at 42.1 BCM/year, which consists of 20.6 BCM/year of surface water and 21.5 BCM/year of groundwater recharge (GOK, 2013). The country has five major water towers, namely, Mt. Kenya (199,558 ha), Aberdares Range (103,315 ha), Cherangani Hills (128,000 ha), Mt. Elgon (73,089 ha), and Mau Forest Complex (400,000 ha). These water towers form the upper catchments of the main perennial rivers in Kenya (GOK, 2013).

The surface water resources include all permanent or intermittent inland waters, such as streams, rivers, lakes, reservoirs, and wetlands, which occur in different proportions. The surface water is distributed in the six catchment areas of Lake Victoria North, Lake Victoria South, Rift Valley, Tana, Athi, and Ewaso Nyiro. Table 1-5 shows the distribution of the available water resources of six catchment areas.

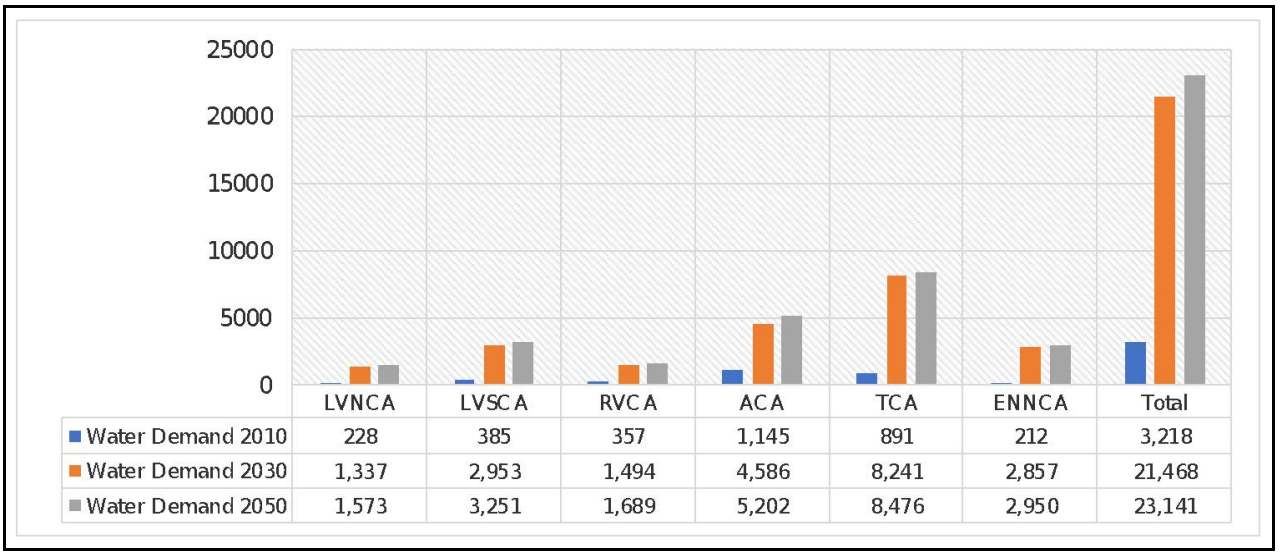
Table 1-5: Available Water Resources by Catchment

Catchment Area	Area (Km²)	Units: Million Cubic Meters (MCM)		
		2010	2030	2050
LVNCA	18,374	4,742	5,077	5,595
LVSCA	31,734	4,976	5,937	7,195
RVCA	130,452	2,559	3,147	3,903
ACA	58,639	1,503	1,634	2,043
TCA	126,026	6,533	7,828	7,891
ENNCA	210,226	2,251	3,011	1,810
Total	**575,451**	**22,564**	**26,634**	**28,437**

***Source**: National Water Master Plan (NWMP 2030)*

Water Demand

The total water demand in 2010 was 3,218 MCM/year against the available 22,564MCM/year. The demand will rise to 21,468MCM/year in 2030 against the available 26,634MCM/year (GOK, 2013). Although there seems to be sufficient water to meet the demand, available water resources in the Athi basin have barely met the demand since 2009. As is evident from Figure 2-5, the situation may worsen by the year 2030. The suggestion that new approaches to water conservation such as roof and rock catchment need to be promoted to supplement the traditional natural supplies and prepare for drought resilience is crucial. Because of human activities and climate variability, water availability in space and time has not been guaranteed in recent years. Hence, there is a need for water governance to strengthen the protection, management, and conservation of these resources.



	LVNCA	LVSCA	RVCA	ACA	TCA	ENNCA	Total
Water Demand 2010	228	385	357	1,145	891	212	3,218
Water Demand 2030	1,337	2,953	1,494	4,586	8,241	2,857	21,468
Water Demand 2050	1,573	3,251	1,689	5,202	8,476	2,950	23,141

Figure 2-5: Water Demand Trends in Catchment Areas (Units: MCM)
Source: *National Water Master Plan (NWMP 2030)*

Water Quality

Water quality refers to the chemical, biological and physical characteristics of a water resource. Both natural and human activities influence it. Sources of pollution can be broadly categorized into two; point and non-point source pollution. Point source pollutions are those with traceable points of origin into a water body; an example is effluent from a factory/course, while non-point source example result from agricultural activities are diffuse.

Within the catchment areas, the increase in the number of industries and urban development has negatively impacted water quality. Water pollution has caused some water bodies to have high nutrient levels that emanate from the farms causing eutrophication like that in Lake Victoria. Excessive growth of these types of organisms clogs the waterways and blocks light to deeper waters where organisms live; when the organisms die, oxygen is consumed during decomposition creating oxygen-poor waters that affect aquatic life.

Human activities like unsewered domestic sanitation, disposal of urban and industrial wastes (solid and liquid) affect groundwater quality. Natural

influences include geologic formations and aquifer conditions. Water pollution leads to the spread of water-borne and water-related diseases and reduces the availability of safe water. In addition, pollution causes the death of fish. These have ripple effects that affect people's livelihoods. Some of the water resources within the catchment areas are exposed to pollution from anthropogenic activities such as motorbike washing, bathing, car wash, and encroachment of the riparian areas. To control water resource pollution, the development of an effluent discharge control plan and obtain an effluent discharge permit from the National Environment Management Authority (NEMA) is provided for by the law.

The WRA currently has seven water quality testing laboratories, one in Nairobi National Water Testing Laboratories and one at each of the WRA's six regional offices. The six water quality test laboratories are Kakamega, Kisumu, Nakuru, Machakos, Embu, and Nyeri. It is recommended that the public visit these laboratories to be advised and sensitized on the quality of water they are using either for domestic, irrigation, recreation, and livestock purposes. Figures 6-5 and 7-5 show the trends of electrical conductivity and total dissolved solids for the Ewaso Ng'iro River. This Ewaso Ng'iro River at 5BC04 stations monitors Aberdare Ranges and part of Mt. Kenya river systems.

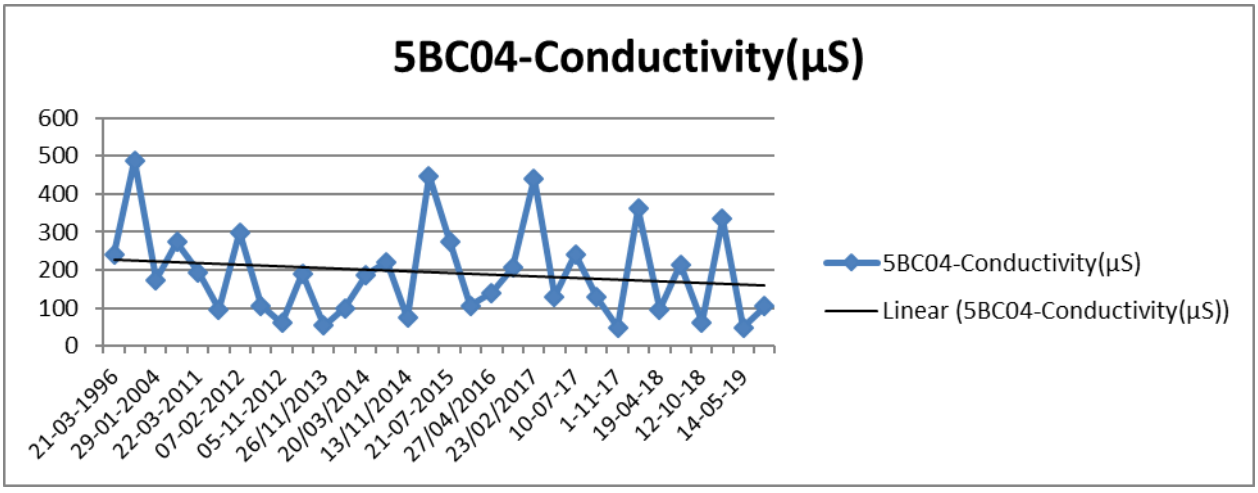


Figure 6-5: Electrical Conductivity of Ewaso Ng'iro River
Source: *WRA National Situation Report FY 2018-2019*

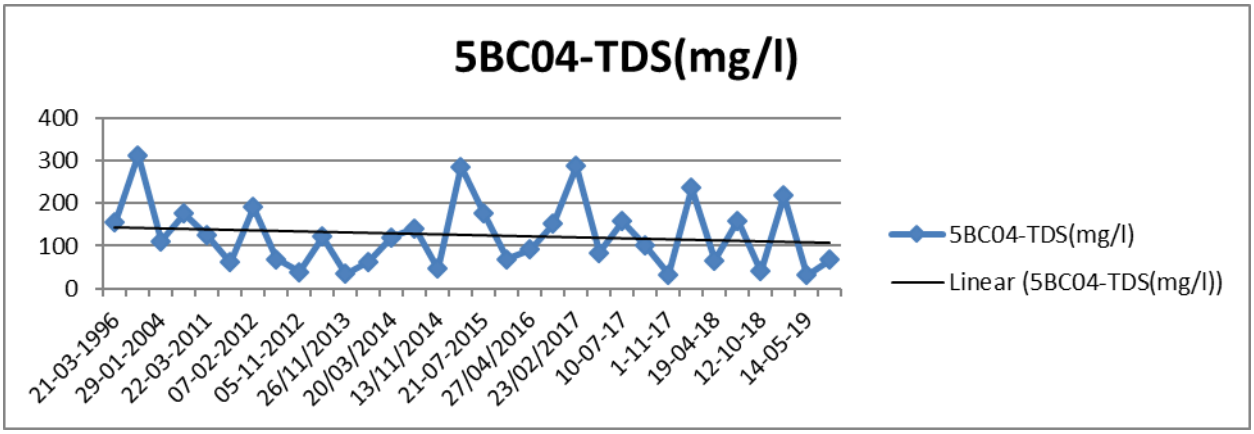


Figure 7-5: Total Dissolved Solids of Ewaso Ng'iro River
Source: WRA National Situation Report FY 2018-2019

Athi Catchment Area

Figure 8-5 shows a comparison of pH for selected stations at the Athi catchment area. The pH values in Athi River at Baricho (3HA13) remained relatively constant between 2012 (pH 8.18) and 2014 (pH 8.25), after which a gradual, gentle increase is noted until 2016 (pH 8.25 to 8.81) before a decrease in the average value of 8.82 in 2017. The highest value for the station has also been recorded in 2017 at 9.3. The indication being increased loading of the river with basic chemical materials from upstream locations from a combination of point and non-point sources. Further monitoring is recommended covering a broader spectrum of water parameters to present a clear picture of Athi Catchment water quality.

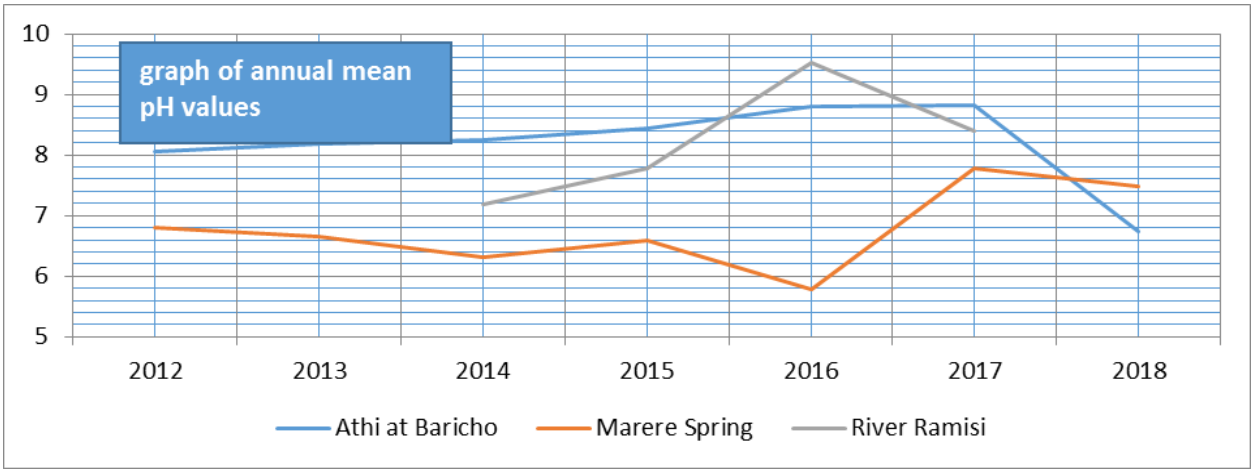


Figure 8-5: Trends in pH For Selected Water Bodies
Source: *WRA National Situation Report FY 2018-2019*

Lake Victoria North Catchment Area (LVNCA)

In this catchment area sources of Nitrates include mainly domestic sewage, agricultural run-off and agro-industrial effluents. Its excessive presence in surface waters usually indicates domestic or agricultural pollution.

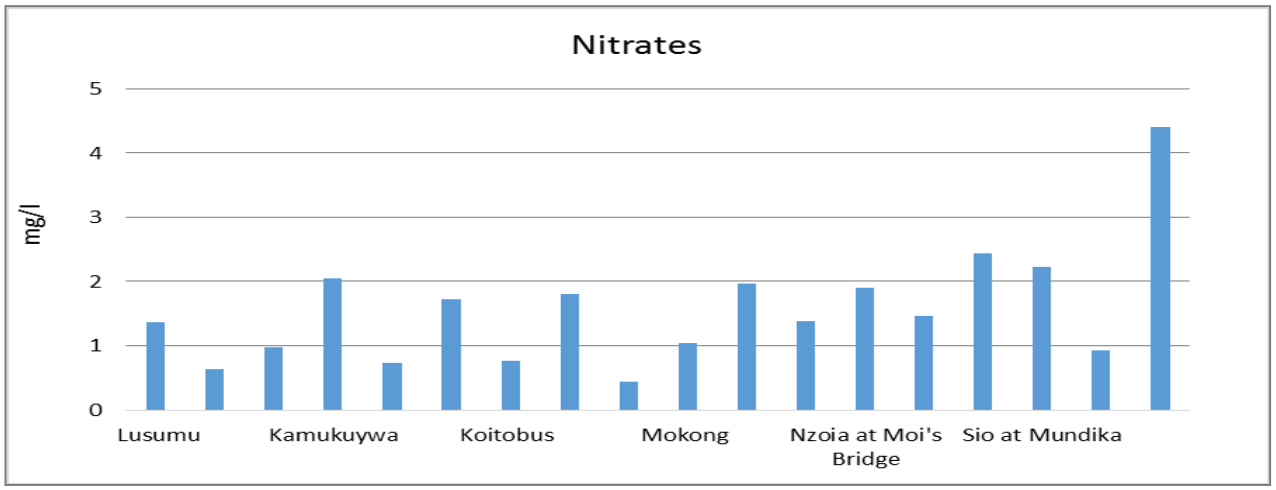


Figure 9-5: Concentrations of Nitrates at LVNCA
***Source**: WRA National Situation Report FY 2018/2019*

Figure 9-5 above shows the concentrations of Nitrates in some of the stations in the Lake Victoria North Catchment. The average concentrations of Nitrates (NO3) ranged from 0.44 to 4.4 mg/l compared to 1.03 mg/l to 7.24 mg/l during 2017/18.

5.1.2: Ground Water

Most of the current groundwater monitoring stations are mostly production boreholes used for water supply to institutions or individuals. However, WRA has established monitoring wells equipped to transmit real-time data on the groundwater levels and are not for production purposes. Water level trend is expected to give an overview of the general behavior of the aquifer and responses to various occurrences, either natural or anthropogenic. These monitoring wells are sited scientifically in different aquifers and are drilled in safe and secure areas like in institutions. All the facilities identified are required to support this initiative as it will inform the development of this country regarding the amount of water available and the quality.

In Ewaso Nyiro North Catchment Area (ENNCA), the groundwater level is consistently taken from four monitoring stations. The trends have been relatively stable during the year depicting a balance between abstraction and recharge, as illustrated in Figure 10-5.

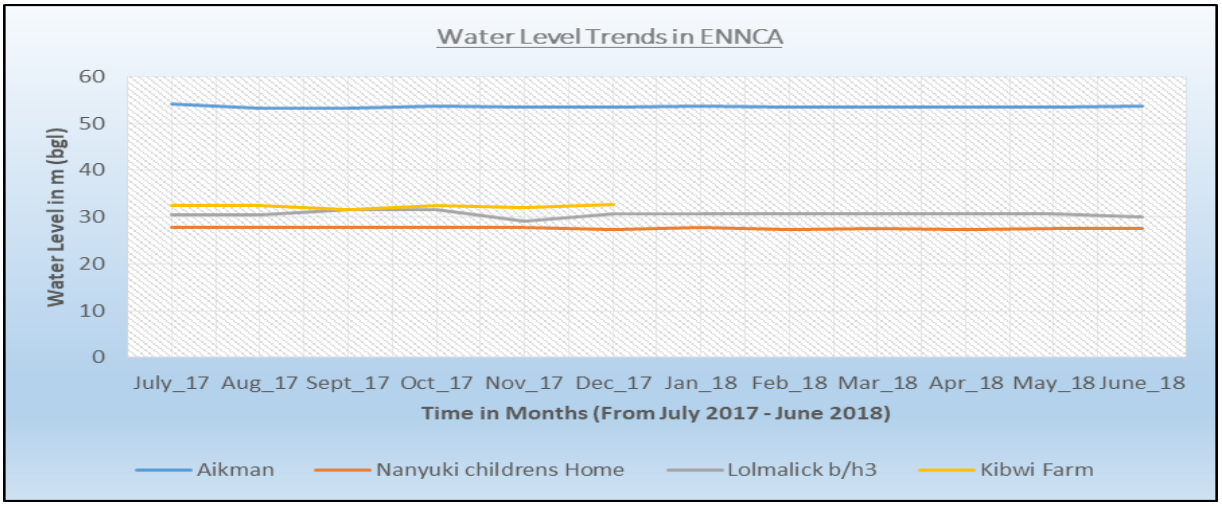


Figure 10-5: Abstraction and recharge levels at various stations in ENNCA
Source: *WRA National Water Situation Report of FY 2017/2018*

Projected Future Scenarios of Lake Turkana Water Levels

Lake Turkana is projected to present varied patterns of water levels over the coming years. Continued abstraction of upstream water and the possible construction of Gibe dams will leave little water for the lake. The projection is that it is too likely a split of Lake Turkana into two lakes will occur. Figure 11-5 shows lake height measurements taken between 1992-2018 as measured from Satellite Altimetry. Owing to the Gibe Dams and the Kuraz Sugar irrigation, the lake's bathymetry and the extent to which the shoreline is projected to recede is severe.

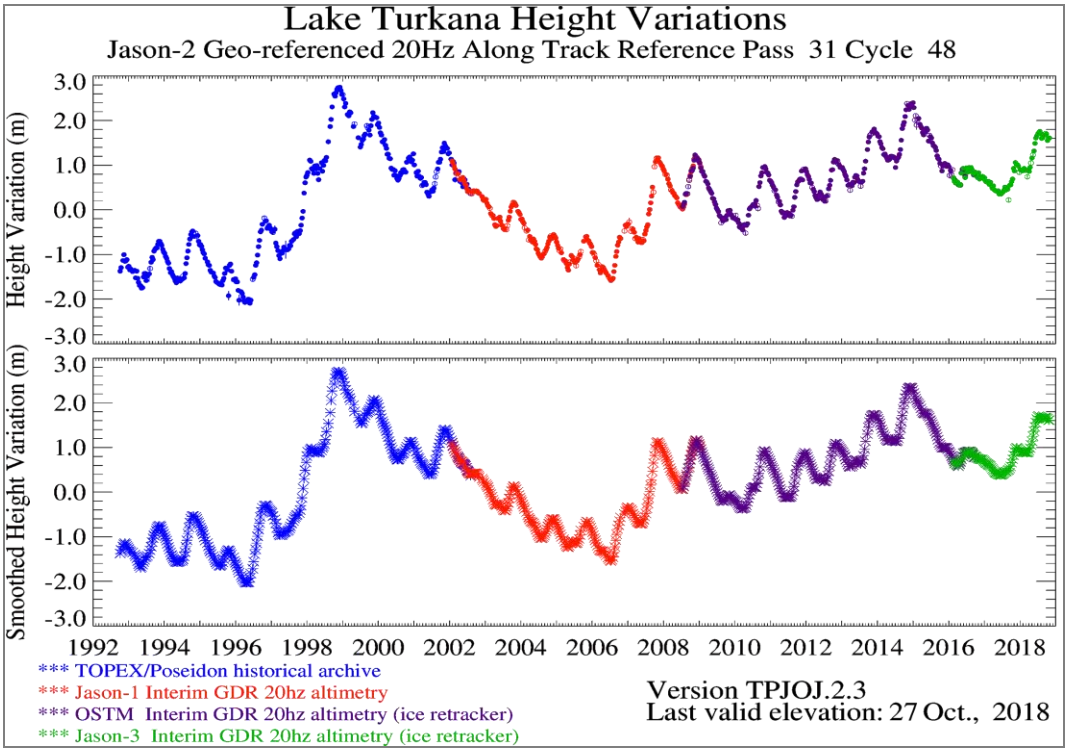


Figure 11-5: Heights Variations of Lake Turkana
Source: Malala et al 2018

5.2: Water and Sanitation

Water Coverage refers to the number of people served with drinking water expressed as a percentage of the total population within the service area. It is critical in tracking the progressive realization of the right to water concerning the accessibility component in the normative content of the right to water. The average water coverage currently stands at 59% in urban and urbanizing areas compared to 57% in the previous year. This change translates to an additional 894,827 people, representing 229,442 households. It is estimated that an average of 200,000 new households have to be served additionally to reach the target of universal access by 2030 (WASREB No. 12/2020).

The water service provision is a shared role between the two levels of Government with regulation and development of national public works retained at the national level and service provision at the County level. The population in the service area of the 87 utilities was 23.43 million, and out of these, the utilities serve 13.83 million, representing 3.55 million households. Non-Revenue Water (NRW) is water that has been produced and is "lost" before it reaches the customer. Losses can be actual losses (through leaks, sometimes also referred to as physical losses) or apparent losses (such as theft or metering inaccuracies). They can largely be attributed to various factors relating to governance. Table 3-5 presents Kenya's progress on water and sanitation regarding the country blueprint, Vision 2030 goals

Table 3-5: Progress made with Respect to Vision 2030 Goals

Indicator	Status 2017/2018	Goals (NWSS 2015)	Goals 2030 (Vision 2030)	Remarks
Water Coverage	57%	80%	100%	This is for areas covered by commercialized utilities
Skewered Sanitation	16%	40%	100%	Includes sewered and Non-Sewered sanitation
Non-Revenue water	41%	<30%	<25%	The indicator has not recorded significant improvement despite the commercialization of services
O+M Cost Coverage	99%	100%	150%	150% is a proxy measure for full cost coverage

Source: *WASREB Impact Report Issue No.11of 2019*

It can be seen that nearly 10 years to the timeframe, water coverage targets are just midway while those on sanitation are way below. Figure 5-12 shows the trend in water and sewerage coverage.

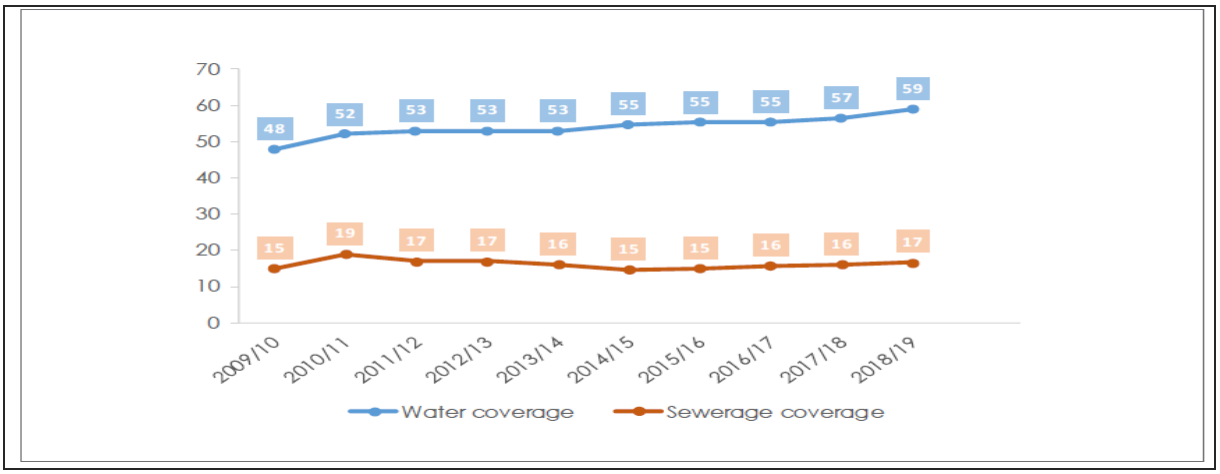


Figure 12-5: Trend in Water and Sewerage Coverage
Source: *WASREB IMPACT Report Issue No.12/ 2020*

5.2.1: Sewered Sanitation Coverage

Sewerage coverage currently stands at 17%, a marginal increase from the figure of 16% recorded in the previous year. To achieve the Vision 2030 target of safely managed sanitation services, the focus by the service providers and policymakers should be inclusive of urban sanitation that combines both sewered and non-sewered sanitation options. The regulator Water Services and Regulatory Board (WASREB) is developing a regulation strategy and framework for non-sewered sanitation. The framework considers that a huge proportion of the population depends on non-sewered sanitation (WASREB, 2019).

Sewered sanitation is currently available to only about 3.9 million people in 26 counties, with 61% of this being within Nairobi County. That, therefore, implies that 21 counties lack any systems for waste management. To achieve safely managed sanitation services as per the Sustainable Development Goal 6, sanitation practitioners and providers are adopting a Citywide Inclusive Sanitation (CWIS) approach. This approach seeks to ensure that everyone benefits from adequate sanitation service delivery outcomes embracing the principles of safety, equity, and sustainability (WASREB, 2020)

The national priority for the Kenya Government concerning sanitation are:

- To eradicate open defecation by the year 2030
- To improve access to sewerage in urban areas to 40% by the year 2022 and 80% by the year 2030

Non-Revenue Water Management

Water is a limited resource. Therefore, if the business-as-usual approach is maintained in water resources management, Kenyans will face a 30% gap between available freshwater supply and demand by the year 2030 (WASREB, 2019). Non-Revenue Water (NRW) has remained relatively stagnant, between 41% and 47% for the last 11 years (WASREB, 2020). Table 4-5 highlights the trend in key performance indicators in the water sector.

Table 4-5: Performance Trend

Key Performance Indicators	2017/18	2018/19	Trend
Water Coverage,%	57	59	↑
Drinking Water Quality,%	95	96	↑
Hours of Supply,hrs/day	13	14	↑
Non-Revenue Water,%	41	43	↓
Metering Ratio,%	95	94	↓
Staff Productivity,Staff per 1000 Connections	7	7	→
Personal expenditure as % of O+M Costs,%	50	50	→
Revenue Collection Efficiency,%	94	92	↓
O+M Cost Coverage,%	99	105	↑
Sewered Sanitation Coverage,%	16	17	↑
Sanitation Coverage,%	80	81	→
Sector Benchmarks good acceptable not acceptable benchmark varies			

Source: *WASREB Impact Report Issue No. 12/2020*

Water Resources Governance situation

Water Act, 2016

The Water Act, 2016 is the principal legal framework that steers water resources governance in Kenya. Other environment and natural resources-related statutes also offer governance aspects beneficial to water resources. The Water Act 2016 vests ownership and control of water resources, including their use, to the national Government in trust for the people of Kenya. Every water resource in the country is vested in the State, subject to any rights of user granted under the Act or any other written law. Further, the Act allows the Cabinet Secretary to exercise control over every water resource under the Act. The Water Resources Authority (WRA) is vested with the responsibility for overall sector oversight, including providing information and advising the Cabinet Secretary the Ministry in charge of water in policy formulation, coordination, and resource mobilization. The Water Resources Authority is to serve as an agent of the national Government and regulate the management and use of water resources. Concerning the water user rights, the Water Act 2016 provides that every person has the right to access water resources, whose administration is the function of the national Government as stipulated in the Fourth Schedule to the Constitution.

Water Act 2016 section 25 requires an establishment of a basin water resources committee. The composition and responsibilities of the committee are outlined in section 26 and 27 of the Act. Communities are allowed to participate in water resources governance by forming the WRUAs established

as associations of water resource users at the sub-basin level under regulations prescribed by the authority. The Act specifically provides for public consultation to develop national strategies such as the National Water Resources Strategy and the Water Services Strategy.

The water resources management functions that have been allocated to the national Government are spelt out in the Fourth Schedule, Part I, and include; use of international waters and water resources; national public works-water resources development, especially on permitting and ensuring compliance to permit conditions on water-retaining infrastructure and works on water bodies; protection of the environment and natural resources to establish a durable and sustainable system of development, including, in particular-water protection, securing sufficient residual water, hydraulic engineering and the safety of dams; disaster management- water-related disasters like flooding, drought, and landslides; and capacity building and technical assistance to the counties.

On the other hand, the water resources management functions that have been devolved to County Governments are spelt out in the Fourth Schedule Part 2. These include implementing specific national Government policies on natural resources and environmental conservation, including soil and water conservation; County public works and services, including stormwater management systems in built-up areas; firefighting services and disaster management, especially on water-related disasters. To actualize, the principles of natural resources management as envisaged in the current Constitution of Kenya, 2010, in a framework that engages the County Governments, WRA intends to:

- Provide information on water resources availability, use, allocation, and viable options for water resources investments planning to meet any water deficit for the County's developmental needs.
- Support the assessment of water resources to inform planning and decision-making.
- Work with the concerned County Governments to domesticate the development and management plans in the National Water Master Plan 2030 and jointly prepare an implementation matrix for each plan.
- Apportion the water resources equitably among various users and uses, including maintaining the reserve.
- Work with the concerned County Governments to protect water resources from harmful impacts.

The Water Act 2016 empowers County Governments to commission water services providers, a public limited liability company established under the Companies Act, 2015, or other bodies providing water services as approved by the Regulatory Board. In selecting a water services provider, a County Government must comply with the standards of commercial viability set out by the Regulatory Board. A water services provider shall be responsible for

providing water services within the area specified in the license; and the development of County assets for water service provision.

The Act also provides that a County water services provider may, with the approval of the relevant licensing authority, extend water services to rural or developing areas. The Act further provides that nothing in its provisions should deprive any person or community of water services if the grounds of such services are not commercially viable.

The Act also requires every County Government to put in place measures for providing water services to rural areas that are considered not to be commercially viable for the provision of water services. The measures referred to in subsection (2) shall include the development of point sources, small scale piped systems and standpipes that meet the standards set by the Regulatory Board and which may be managed by the Water community associations, NGOs, or a private person under a contract with the County Government. Further, to implement its obligations under this section, a County Government should formulate and submit annually to the Regulatory Board and the Cabinet Secretary a five-year development plan incorporating an investment and financing plan for the provision of water services in the rural areas referred to subsection (1) within its area of jurisdiction. The Cabinet Secretary also provides technical, financial, and other assistance to a County Government to enable the County Government to discharge its responsibility under this section.

Public institutions play a significant role in managing and protecting our environment and natural resources, including forests, river systems, coastal and marine. The Constitution 2010 guides the two-level of Governments in Kenya to properly manage, develop, protect, restore, enhance and conserve the natural environment.

The Fourth Schedule to the Constitution of Kenya outlines the obligations of the central (national) Government and those of the County Governments. The obligations of the central Government towards natural resource management include:

- The protection of the environment and natural resources to establish a durable and sustainable system of development, including, in particular, fishing, hunting, and gathering.
- Protection of animals and wildlife.
- Water protection, securing sufficient residual water, hydraulic engineering, and the safety of dams.

The County Government is obligated to implement specific national Government policies on natural resources and environmental conservation including, soil and water conservation and forestry. Further, the County Governments are also supposed to ensure and coordinate the participation of communities and locations in governance at the local level and assist communities and locations to develop the administrative capacity for the

effective exercise of the functions and powers and participation in governance at the local level (Muigai, 2018).

5.6.1: Water Resource Authority

The Water Resources Management Authority (WRMA) was established in 2005. It was later renamed as Water Resources Authority (WRA) under the Water Act 2016 that was operationalized on the 21st of April 2017. Water Resource Authority is the national Government's lead agency mandated to regulate the management and use of water resources. Further, to formulate and enforce standards, procedures, and regulations for the management and use of water resources and flood mitigation; coordinate with other regional, national, and international bodies for better regulation; Allocation of water resources through issuance of licenses and water permits and enforce conditions to those permits for water abstraction. In this strategy, WRA is expected to participate in planning, mapping water resources, and creating awareness to the community on the importance of protecting the water reserves. Further, facilitate the establishment of Water Resource Users Associations (WRUAs) and work with them to manage water resources and conflict resolution over water use.

Wetlands and Marine Resources

Wetlands

Wetlands are natural or man-made areas that are seasonally or permanently flooded with water. They include swamps, marshes, bogs, shallow lakes, ox-bow lakes, dams, riverbanks, floodplains, water catchment areas, fishponds, rice paddies, lakeshores, mangroves, seagrass beds, deltas, estuaries, coral reefs, and seashores. Globally, wetlands occupy about 6% of the earth's surface. In Kenya, wetlands occupy about 3% to 4% of the land surface, approximately 14,000 km2, and fluctuate up to 6% during the rainy seasons. Kenya' wetlands depend mainly on the amount of rainfall and, to some extent, on the landform.

Wetlands are critical water resources that serve as water purification systems. During the dry seasons, wetlands are the only places where the local communities can fetch water for domestic use. They also control floods and filter the water of pollutants. Wetlands are therefore an essential resource for the achievement of Vision 2030 and the Big 4 Agenda. At the global scene, the RAMSAR Convention obligates parties to formulate and implement their planning and policies to promote wetlands conservation.

The role of wetlands in sustaining ecological and human life has continued to receive prominence at the global, regional and national discourses. The United Nation's Convention on Sustainable Development in paragraph 122 (UNCSD, 2012) underscored the role of various ecosystems such as wetlands in maintaining water quantity and quality. There is a need to support actions to national boundaries to protect and sustainably manage these important ecosystems. Wetlands are a fundamental part of the local and global water

cycles that facilitate global and national developmental goals, including the Sustainable Development Goals (SDGs).

In recent times, wetlands have been subjected to severe degradation through the encroachment of illegal settlements and farming. For example, flash floods are being experienced in many parts of the country. Hence the need for wetland management.

Wetlands contribute directly and indirectly to the national economy through provisioning, supporting, regulatory and cultural services. These ecosystems are key to socio-economic development and are the resource base for the Sustainable Blue economy in the country. For instance, Lake Nakuru, injects enormous foreign exchange from tourism activities.

Despite the value of wetlands, they continue to face a myriad of challenges, including reclamation and encroachment for agriculture, settlement, and industrial development; invasive and alien species; pollution and eutrophication. Other key challenges include ownership of wetlands, overlapping institutional mandates, inadequate resources for governance, the inadequate linkage between research, planning, and policy development.

The Government of Kenya has made significant strides in wetlands management, including the development of the Kenya Wetlands Atlas (2012), which maps the country's wetland resources. A master plan for the conservation and sustainable management of water catchment areas in Kenya has also been developed to guide practical and transformative actions for the sustainable management of these complex ecosystems. Furthermore, a nationwide inventory of wetlands to take stock of the resources, challenges, and opportunities for sustainable development and surveillance continues.

Kenya also has a National Wetlands Conservation and Management Policy 2016 developed in conformity with the Constitution of Kenya 2010, Kenya's Vision 2030, the National Land Policy, and other national frameworks.

This policy aims to ensure the wise use and sustainable management of wetlands to enhance the sustenance of Kenya's wetland's ecological and socio-economic functions for the benefit of present and future generations. The policy, therefore, sets out policy statements on how the Government should address wetland conservation and management challenges with the following objectives:

- To establish an effective and efficient institutional and legal framework for the integrated management and wise use of wetlands.
- To enhance and maintain functions and values derived from wetlands to maintain ecosystem goods and services, protect biological diversity and improve the livelihood of Kenyans.
- To promote communication, education, and public awareness among stakeholders.
- To enhance scientific information and knowledge base on Kenyan wetland ecosystems.

- To strengthen institutional capacity on conservation and management of wetlands.
- To promote innovative planning and integrated ecosystem management approaches towards wetlands conservation and management in Kenya
- To promote partnership and cooperation at the County, national, regional, and international levels to manage transboundary wetlands and migratory species.

Rivers, Lakes, springs and Ground Water

Table 2-5 shows the major rivers in Kenya and their catchment area in Square Kilometers.

Table 2-5: Major Rivers of Six Catchment Areas

Catchment Area	Area (Km²)	Major Rivers
Lake Victoria North	18,374	Nzoia, Yala
Lake Victoria South	31,734	Nyando, Sondu, Kuja (Gucha), Mara
Rift Valley	130,452	Turkwel, Kerio, Ewaso Ng'iro South
Athi	58,639	Athi, Lumi
Tana	126,026	Tana
Ewaso Ng'iro North	210,226	Ewaso Ng'iro North, Daua
Total	**575,451**	

Source: *WRA Catchment Management Strategies 2014-2022*

Figure 3-5: Lake Naivasha
Photo*: UNDP*

Lake Victoria

Lake Victoria, the largest of all African Lakes, is also the second most expansive freshwater body globally. Its extensive surface belongs to three East African countries, with the northern half to Uganda, the southern half to Tanzania, and part of the northeastern sector to Kenya (wldb.ilec.or.jp/ - World Lake Database).

The lakeshore is highly indented, and there are many isles in the lake, some of which, especially the Sesse Group, are known for their beautiful landscape, health resorts, and sightseeing places. Abundant prehistoric remains found around the lake indicate the early development of agriculture. Lake Victoria's water quality is mainly affected by improper farming methods and human activities upstream, causing pollution and soil erosion. The water hyacinth infestation is threatening the lake ecosystem. The five fish landing beaches, namely; Usenge, Wich Lum, Luanda Kotieno, Asembo Bay, and Misori, have previously been assessed and recommended for general hygiene improvement (wldb.ilec.or.jp/Lake/AFR-05). Monitoring of the lake level started way back in the 19th century, and trends in water levels have been established. WRA rehabilitated and upgraded the monitoring station in September 2019, and the trend is shown in Figure 4-5.

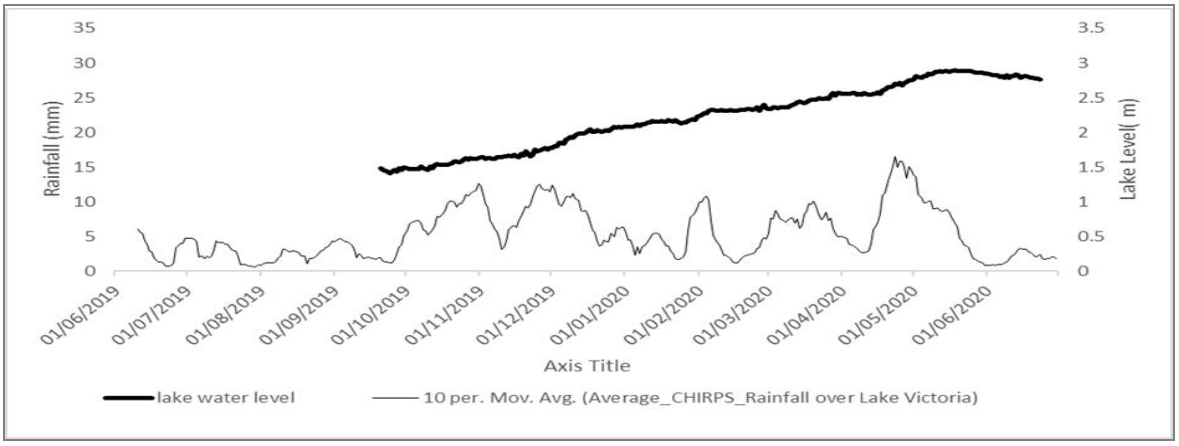


Figure 4-5: Rainfall and lake water levels in selected months of 2019/2020
Source: *WRA LVSCA Report 2020.*

Figure 5-5 shows Fishing boats on the lake shore of Lake Victoria and the fishermen preparing their nets.

Figure 5-5: Fishing Boats on the Lake Shore
Photo: *Kevin Ouma UNDP*

Lake Nakuru

Lake Nakuru is a small, shallow, alkaline-saline lake located in a closed basin without outlets in the Eastern Rift Valley of equatorial East Africa. It is the center of Kenya's most familiar national park known for its spectacular bird fauna (495 species), notably the vast flock of lesser flamingo (*Phoeniconaias minor*). The lake is a soda-lake with a water pH value of 10.5 (World Lake Database -Lake Nakuru - wldb.ilec.or.jp/Lake/AFR-07). Studies show that the lake level dropped drastically in the early 1990s but has since largely recovered. In 2013, the lake received an alarming increase in the water levels that led to the migration of flamingos. The lake has risen to levels that have never been seen in the last 50 years. The rise in levels also includes most of the lakes in the region. WRA team has embarked on an exercise to investigate the current high level of lakes, especially in Rift Valley.

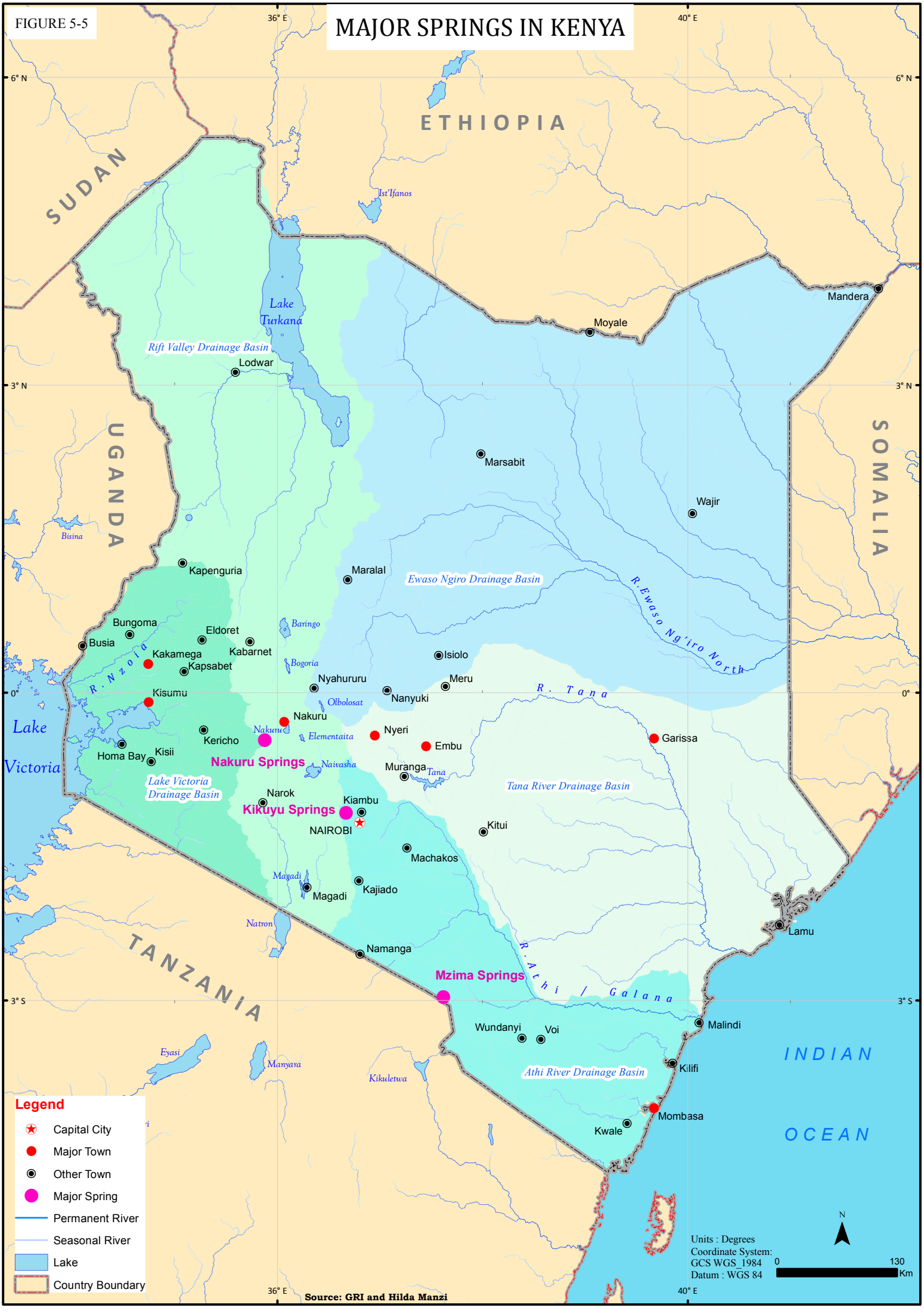
Springs

There are several springs in the country whose sources of water supply for various sectors and the community in the rural areas. The significant springs include the Mzima, Njoro Kubwa, Noltresh, and Kikuyu springs.

Figure 5-5 shows the major springs in the country. Various statutes such as Water Act, 2016, and EMCA and its subsidiary legislations provide for the governance of springs among other wetlands. Given challenges that face conservation of springs like other wetlands, it is recommended that in addition to current legal and institutional arrangements, a framework of cooperation between regulatory agencies on wetlands needs to be developed and adopted to strengthen governance and conservation wetlands.

FIGURE 5-5

MAJOR SPRINGS IN KENYA



Source: GRI and Hilda Manzi

Deltas and Estuaries

Along the coast, wetlands are represented by deltas, estuaries, tidal marshes, mangrove swamps, seagrass beds, and coral reef ecosystems. Tana delta is the most extensive wetland in Kenya, with an estimated area of 130,000 ha. It is a wetland of local and international importance, having been designated as a Ramsar Site in 2012. The Delta is also an Important Bird Area (IBA) and the second most important estuarine and deltaic ecosystem in Eastern Africa, with extensive floodplains and diverse mangrove systems (Hamerlynck, et al., 2008)

Another major wetland along the coast is the Sabaki estuary, which covers an area of 600 ha. The estuary consists of sandbanks, mud banks, dunes, mangroves, seasonal and permanent freshwater pools. The Sabaki estuary is an IBA that provides habitats for migratory and resident birds with other important animal species, including baboons, monkeys, antelopes, crocodiles, and hippopotamuses that attract visitors to the site.

Coastal lakes

Oceans are central to the delivery of SDG 14 and are very important sources for the livelihoods of most vulnerable communities. However, human activities continue to threaten these water bodies with detrimental long-term impacts on the planet. There are three major lakes in the coastal region of Kenya, namely, Lake Kenyatta (Mkunguya), Lake Jipe, and Lake Chala. Lake Kenyatta in Lamu County is the largest of the three with a surface area of 496 km2 and is part of the lower Tana River basin. Lakes Jipe and Chala, on the other hand, are transboundary, occurring between Kenya and Tanzania border in Taita-Taveta County. Coastal lakes and their riparian areas support rich biodiversity (Table 5-5) and vital economic activities of the surrounding settlements. They are also a source of water to the adjacent communities and wildlife.

Table 5-5: Biodiversity of the Coastal Lakes (KCDP, 2014)

Lake	Biodiversity
Kenyatta	**Over 306 plant species including those of special concern are found within the mixed vegetation types, including wooded grasslands, shrublands, overstorey forests and onshore vegetation on bogs.**
	105 species of invertebrates including **26** species of butterflies, **13** of bees, **3** of ants, **2** of
	wasps, **49** of beetles, **2** of cockroaches, **3** of snails, **4** of dipterans, **3** of true bugs & several unidentified species of spiders, scorpions and millipedes; some of which falls under species of special concern.
	Over **23** species of waterbirds at Lake Kenyatta. The most abundant species are African
	Open-billed Stork, Cattle Egret and White-faced Whistling Ducks. Small mammal
	Assemblages of the immediate surroundings, including rodents, bats, shrews, lagomorphs, mesocarnivores, hyraxes, and lorrisids

	An endemic Lorissid primate, *Galagoides cocos* is found in the forests around the lake
	The lake is known for its endemic fish species, water birds, mammals, wetland plants and lake-edge swamps, which extend about 2 km from the shoreline (Maltby, 2009)
	Vegetation dominated by bulrush (*Typha domingensis*) locally known as "Gugu maji" that grows out from the lakeshore forming floating 'islands' and fringing the lake edges.
	Swards of *Cyperus laevigatus*, *Sporobolus spicatus* and *S. macranthus*, and also papyrus, being the major plants as well as 50 others found on the landward side.
Jipe	One of the few places in this part of Eastern Africa where the Lesser Jacana and the Purple Gallinule are common and where the Madagascar Squacco Heron, Black Heron, African Darter and African Skimmers are often seen.
	Herbivores, carnivores, ungulates, reptiles are among the different wildlife species that have adapted to the environment around the Lake Jipe catchment area. These include; zebras, impalas, gazelles, hippopotamus, crocodiles, water monitors, otters and elephants.
Chala	Home to endemic Lake Chala tilapia *Oreochromis unter* which is critically endangered as per IUCN red list of threatened species

Among the coastal lakes, Lake Kenyatta has no restriction to resource exploitation; hence, the lake faces a number of challenges ranging from encroachment, selective felling of riparian vegetation, overgrazing, soil harvesting, and impact of invasive species such as *Prosopis juliflora* and aquatic plants (NEMA, 2017)). Indirect threats include excessive abstraction of underground water in numerous shallow wells and boreholes sunk by surrounding local communities to draw underground water for domestic use and irrigation agriculture. As a result, overgrazing of large herds of cattle owned by the local communities is among the major forms of pressure in this lake. Figures 13-5 shows elephants grazing on the shores of the lake.

Figure 5-13: Elephants grazing along the riparian zone of Lake Jipe
***Photo courtesy**: Stephen Mwangi*

Lake Jipe is facing numerous environmental and management challenges including: lake recession, sedimentation, deteriorating water quality, increased salinity and accelerated weed invasion (Figure 14-5). These changes potentially affect the biodiversity and provision of ecosystem services.

Figure 14-5: Invasive species water cabbage *Pistia stratiotes* in the shores of Lake Jipe
***Photo credit:** Stephen Mwangi*

The catchment is facing human-induced changes due to land use activities and diversions of River Lumi for agriculture and domestic use. The lake ecosystem is now at risk from environmental degradation due to heavy sedimentation. The presence of which has caused rapid growth and spread of the macrophytes, especially emergent *Typha domingensis*, which have colonized a large proportion of the lake. Sedimentation results from soil erosion in the riparian areas arising from anthropogenic activities, including settlement and agriculture. Consequently, the fishery once relied upon heavily in the Taita-Taveta region has since declined due to the changes in water quality, among other factors. Figures 16-5 shows fishermen in a traditional boat in Lake Jipe fishing.

Figure 16-5: Fishermen in A Traditional Vessel in Lake Jipe
Photo source: *KCDP 2014*

Governance strategies to conserve wetlands include ratification of the Ramsar Convention (Ramsar, 1971) in 1990 to address sustainable utilization of wetland resources and formulation of the National Wetlands Conservation and Management Policy (2016) to guide the management and use of wetlands in the country. A site-specific management plan has been developed e.g., for the Tana Delta. The focus of the management plan is renewing efforts by the local community and other stakeholders to utilize the resources within the delta sustainably. A management plan for Lake Jipe has also been developed.
Building on the Blue Economic Conference's recommendations in November 2018, our country Kenya needs to accelerate the implementation of the recommendations arising from the conference. The recommendations mainly call for the Blue Economic concept to ensure the sustainability of these water bodies and their surroundings.

5.4: Drivers, Pressures, Impacts and Response Strategies

In Kenya, pressures in coastal wetlands and lakes are driven by unsustainable human activities within and adjacent to the catchment areas and in the wetlands. Lack of coordinated and holistic policy guidelines and climate change have also contributed. Communities within and adjacent to coastal wetlands and lakes practice mixed farming, fishing, sand collection, among other economic activities, which are the major drivers of change (Table 6-5). Frequent drought and abstractions of water upstream, either for irrigation or energy, resulting in alteration of sediment dynamics downstream, thereby affecting loss of critical habitats and species and resource use conflicts and loss of livelihoods. For example, Tana Delta and the Athi-Sabaki estuary show evidence of shoreline change resulting from reduced freshwater flow and increased sedimentation. These changes have eroded the ecological and socio-economic values and services derived from these wetlands. The Blue economy protects aquatic ecosystems and coastal regions through sustainable initiatives.

Table 6-5. Major Drivers, Pressures, and Impacts of the Changes in Coastal Wetlands

Underlying Sectors	Pressures	Impacts
Agriculture	Excessive abstraction of fresh water	Water scarcity due to high
	Unregulated diversion of water	water demand
	irrigation	Changing river course
	Conversion of wetlands	water pollution and solid
	agriculture and settlement	waste management
	Overgrazing	Resource use conflicts
Sand mining	Sand over harvesting	Soil erosion/sedimentation
Fisheries	Use of illegal/ destructive fishing methods	Reduced hydrological Capacity
	Over exploitation of fisheries resources	Loss of critical habitat and Species
Forestry	Overexploitation of forest products	
Tourism	Conversion of wetlands for tourism development and Wastewater discharge and pollution	
Energy	Excessive abstraction water Alteration in freshwater flows and sediment loadings	

Source: *State of the Coast Report for Kenya, 2017*

5.5: Options for strengthening wetlands governance

The action undertaken to conserve and safeguard wetlands in Kenya, include;

- Continual updating of the national wetlands inventory
- Develop and implement targeted, integrated wetlands management plans to promote conservation and sustainable use of these resources

- Strengthen enforcement of relevant laws and regulations, including the EMCA wetland and EIA regulations, to protect wetlands from unsustainable developments and use
- Implement long-term wetlands monitoring programs to inform decision-making and planning of wetlands conservation interventions
- Develop eco-tourism ventures to encourage the participation of communities in the conservation of wetlands;
- Creating awareness among the local communities to enable them to embrace conservation and management of wetlands
- Promoting the Blue economy initiatives can help mitigate pressures and increase the resilience of marine resources and aquatic ecosystems.
- Reflection of wetlands governance systems to strengthen the procedures for ensuring effective and efficient management of wetlands

Chapter 6: Agriculture, Livestock and Fisheries

6.1: Introduction

Agriculture is the mainstay of Kenya's economy, and the growth of the sector is crucial to the country's overall economic and social development. The Government has two agricultural production systems, i.e., rain-fed and irrigation. There are two cropping seasons which occur during the long rain between March and May, and short rains extending from October to December. The very high-altitude areas, however, do not receive rain according to the seasons mentioned. Agriculture is the major contributor to Kenya's economy, with crop production contributing 24.9 percent of the Gross Domestic Product (GDP) in 2017 (KNBS, 2018). Figure 1-6 shows the relationship between the National GDP and vis-à-vis Agriculture GDP, and they present similar profiles indicating agriculture contributes to moving the country's GDP. Small scale farms averaging 0.2 - 3 ha dominate the rain-fed agriculture with about 75 percent of the total agricultural output and about 70 percent of the overall marketed agricultural produce.

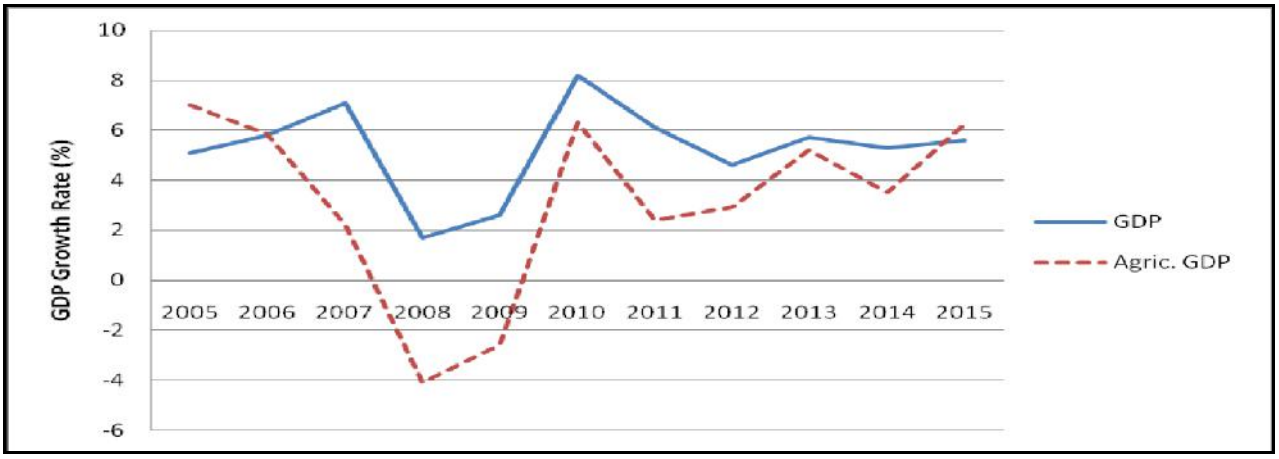


Figure 1-6: The Relationship between Agricultural Performance and the National Economy

Source: *Economic Surveys (2005 -2016) Kenya National Bureau of Statistics (KNBS)*

6.1.1 Important Crops

The main food crops in Kenya are maize (*Zea mays*), wheat (*Triticum aestivum*), beans (*Phaseolus vulgaris*), peas (*Pisum sativum*), bananas (*Musa sp.*), and potatoes (*Solanum tuberosum*). Maize (*Zea mays*) is the principal staple food of Kenya, and it is grown in 90% of farms. Maize is a strategic food security crop, and poor yields almost inevitably result in food shortage and famine. It is also a major income-generating crop and accounts for about 25 percent of agricultural employment. Another important food security and cash crop in Kenya is the banana which is popular among small-scale farmers. Common bean is the most important legume and second to maize as a food crop. The main agricultural export products from Kenya are tea (*Camellia sinensis*), coffee (*Coffea arabica*), pyrethrum (*Chrysanthemum cinerariifolium*), sisal (*Agave sisalana*), and horticultural products such as

fruits, vegetables, and floricultural crops). Other crops that are gaining popularity due to their nutritional value and adaptability to marginal environments include sorghum (*Sorghum bicolor*), millets (*Eleusine coracana*), and cassava (*Manihot esculenta*). Different crops are of varying importance in other regions of the country, as shown in Table 1-6.

Table 1-6: Important Crops and their relative Importance in Different Regions

Crop	Region
Maize (*Zea mays*)	Whole country
Rice (Oryza sativa)	Whole country
Wheat (*Triticum aestivum*)	Whole country
Sorghum (*Sorghum bicolor*)	Eastern, Nyanza, North Rift, and Coast
Cassava (*Manihot esculenta*)	Nyanza, Western and Coast
Beans (*Phaseolus vulgaris*)	Eastern, Western, Nyanza and Central
Millet (*Eleusine coracana*)	Eastern (Tharaka and Meru)
Cowpeas (*Vigna unguiculata*)	Eastern and Nyanza
Green grams (*Pisum sativum*)	Eastern and Coast
Mangoes (*Mangifera indica*)	Coast, Eastern and Central
Cashew nuts (*Semecarpus anacardium*)	Coast
Pineapples (*Ananas comosus*)	Central (Thika), Coast and Western
Oranges (*Citrus sinensis*)	Coast and Eastern
Avocado (*Persea americana*)	Central, Eastern and Coast
Bananas (*Musa* spp.)	Nyanza (Kisii), Central, Eastern and Western
Sugarcane (*Saccharum officinarum*)	Western and Nyanza

Source: *Modified from* (Wambugu & Muthamia, 2009)

The agriculture sector performance decelerated from 6.1 percent recorded in 2018 to 3.6 percent in 2019 (Figure 2-6). Extreme weather phenomenon characterized by drought during the first half of the year, followed by high rainfall in the second half of the year, culminated in reduced production of selected crops. Maize production declined from 44.6 million bags in 2018 to 39.8 million bags in 2019, largely attributed to drought in several areas coupled with the army worms' infestation (KNBS, Economic Survey, 2020).

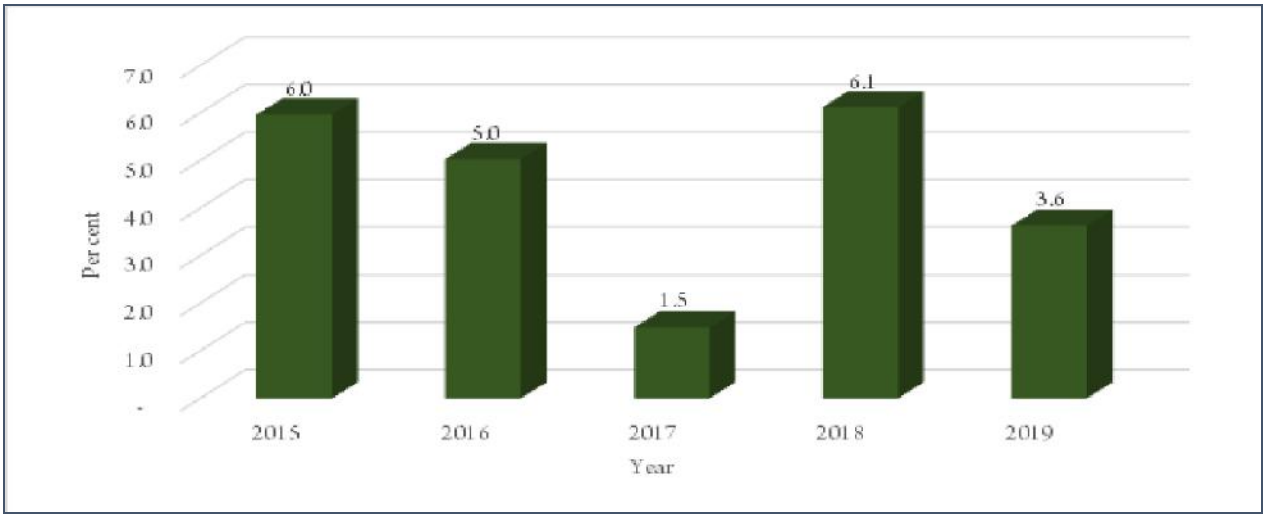


Figure 2-6: Real Agriculture Growth Rate, 2015 -2019
Source: *KNBS, 2020*

6.3: Livestock

6.3.1: Introduction

An analysis carried out showed that the demand for livestock products was increasingly widening. According to (Delgado, 2005) supply and demand for livestock products and by-products are affected by increasing population, urbanization, improved literacy levels, and corresponding living standards and prevailing import/export markets, among other factors. Livestock production is the major activity in ASALs and contributes a considerable proportion of the Gross Domestic Product (GDP) and agricultural labor force. From an environment and natural resources perspective, overstocking in ASALs leads to land degradation. In high potential areas, especially where zero-grazing is practiced, the main issue in livestock production is waste management resulting in water pollution. In urban areas, disposal of effluents from abattoirs, butcheries, and tanneries is a major concern (Kenya National Environment Policy, 2014).

According to the census of 2009, the KNBS estimated that there were 17.5 million cattle, 27.7 million goats, 17 million sheep, 3.7 million camels, 31.8 million domestic birds, 1.8 million donkeys, and an undetermined number of companions, game, and aquatic animals (KNS, 2009). The population of these livestock has been on an upward trend, whose estimated capital worth was estimated at KES 812.9 billion provided. Table 2-6 provides the details. In 2018, the total livestock products were valued at KES 1,891 billion.

Table 2-6: Livestock Population

Species	Category	Population			Average farm-gate unit value (KES)	Capital value of stocks 2018 (Billion KES)
		2016	2017	2018		
Cattle	Beef Cattle	16,023,458	13,764,938	14,501,440	20,000	290.0
	Dairy Cattle	4,505,733	4,573,871	5,133,703	50,000	256.6
Sheep	Hair Sheep	17,129,606	17,785,129	18,572,651	2,000	37.1
	Wool Sheep	831,233	973,944	913,048	4,000	3.6
Goats	Meat Goats	26,170,371	25,182,445	26,279,750	3,000	78.8
	Dairy Goats	575,545	502,044	431,025	5,000	2.2
Camels		3,222,593	3,338,757	3,273,445	38,000	124.4
Poultry	Indigenous Chicken	36,578,441	40,067,874	41,450,829	300	12.4
	Layers	4,161,289	4,237,188	4,397,027	300	1.3
	Broilers	3,056,747	3,819,515	4,041,510	300	1.2
	Other poultry*	827,976	1,663,026	1,301,101	300	0.4
Pigs		504,395	554,301	567,843	8,000	4.5
Rabbits		824,555	828,091	762,531	500	0.4
	Total					**812.9**

Source: *MoAL&F, 2018*

The country produced over 7.634 billion liters of milk in 2017, valued at KES 414 billion. Dairy cows had 5.788 billion liters (76%), camels produced 0.553 billion liters (7%), and goats produced 1.293 billion liters (17%) of the total milk produced (FAO,2017). The per capita consumption of milk in the country is estimated at 198 liters per year (Behnke & Muthami, 2011) which is the highest in Africa. Milk production is closely related to cattle population but higher where intensification is higher characterized by small landholdings rearing high producing dairy cows in semi- or zero-grazing units.

In the last 55 years, the population trends of different major livestock species have increased across species. Population changes are noted over some years, and this may be due to severe climatic or other environmental changes that mainly affect the livestock, particularly in the ASAL areas. Population trends of different major livestock species from the year 1963 to 2017 are highlighted in Figure 4-6.

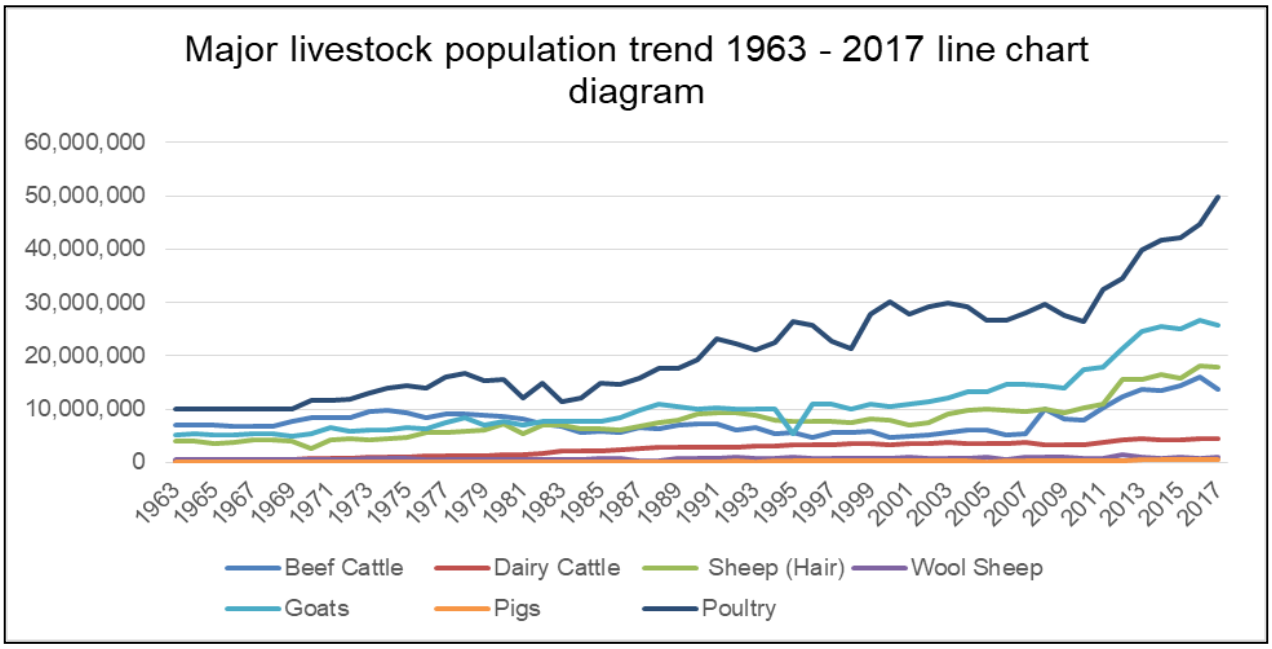


Figure 4-6: Population Trends of Major Livestock Species
Source: MOAL&F

The Livestock sub-sector emissions total to 22,257.8 Gg CO2 equivalent, with most GHG emissions arising from dairy cattle (primarily in zero-grazing) both from enteric fermentation and manure management. Emissions in this sub-sector have risen between 1995 and 2015, representing a 78.6% rise in emissions in the sub-sector, as provided in the draft third national communication on Greenhouse gas chapter. Emissions of CH4 from enteric fermentation dominated the livestock subsector standing at 94% of C02 equivalent. Manure Management only contributed 6% of emissions to the sub-sector. Livestock manure is composed principally of organic material. When the manure decomposes in the absence of oxygen, methanogenic bacteria produce CH4. The emissions of CH4 are related to the amount of waste produced and the amount that decomposes anaerobically.

Methane (CH4) is the main greenhouse gas produced as a by-product of digestion in ruminants, e.g., cattle and some non-ruminant animals such as pigs and camels. Ruminants are the largest source of CH4 as they can digest cellulose. The amount of CH4 released depends on the type, age, and weight of the animal, the quality and quantity of feed, and the animal's energy expenditure (see Table 3-6 below).

Table 3-6: Total Greenhouses Gas Emissions (CO2e) from Livestock, 1995 – 2015

Year	1995	2000	2005	2010	2015	Change 1995 - 2015
Enteric Fermentation (CH_4 Gg CO_2 eq)	11,703.4	10,722.1	12,843.5	14,383.0	20,919.9	**78.75%**
Manure Management (CH_4 Gg CO_2 eq)	533.6	512.6	611.9	670.5	965.3	**80.90%**
Manure Management (N_2O Gg CO_2 eq)	223.8	224.2	261.9	272.8	372.7	**66.50%**
Total Livestock Emissions	**14,455.8**	**13,458.9**	**15,722.3**	**15,326.3**	**24,272.9**	**78.62%**

Source: *Draft Third National Communication Report 2020*

The livestock farming sector contributes 12% to the Gross Domestic Product (GDP) and about 44.5% of the agricultural GDP (FAO, 2016).

6.4: Fisheries

6.4.1: Introduction

Kenya's fisheries resources are both inland freshwater bodies and the territorial waters, including the Exclusive Economic Zone (EEZ) and Territorial Sea within the Indian Ocean.

Figure 5-6 shows Kenya's territorial oceanic waters delineation (Source – Survey of Kenya). During the year 2018, the total fish production was 154,671 metric tonnes worth 25,857 million Kenya shillings (Figure 6-4). The production was a 12.98% increase compared to 135,776 metric tonnes worth 23,177 million Kenya shillings landed in 2017. Most of the production, as in the past, was from inland capture fisheries. The production from marine and aquaculture was 24,220 and 15,320 metric tons, respectively (GOK, SDF&BE, Fisheries Bulletin, 2017).

Inland capture fisheries contributed 74.8% of Kenya's total fish production, with the principal fishery being Lake Victoria. The lake accounted for 104,765 metric tonnes, or 67.7% of the country's total annual inland fish production in 2018.

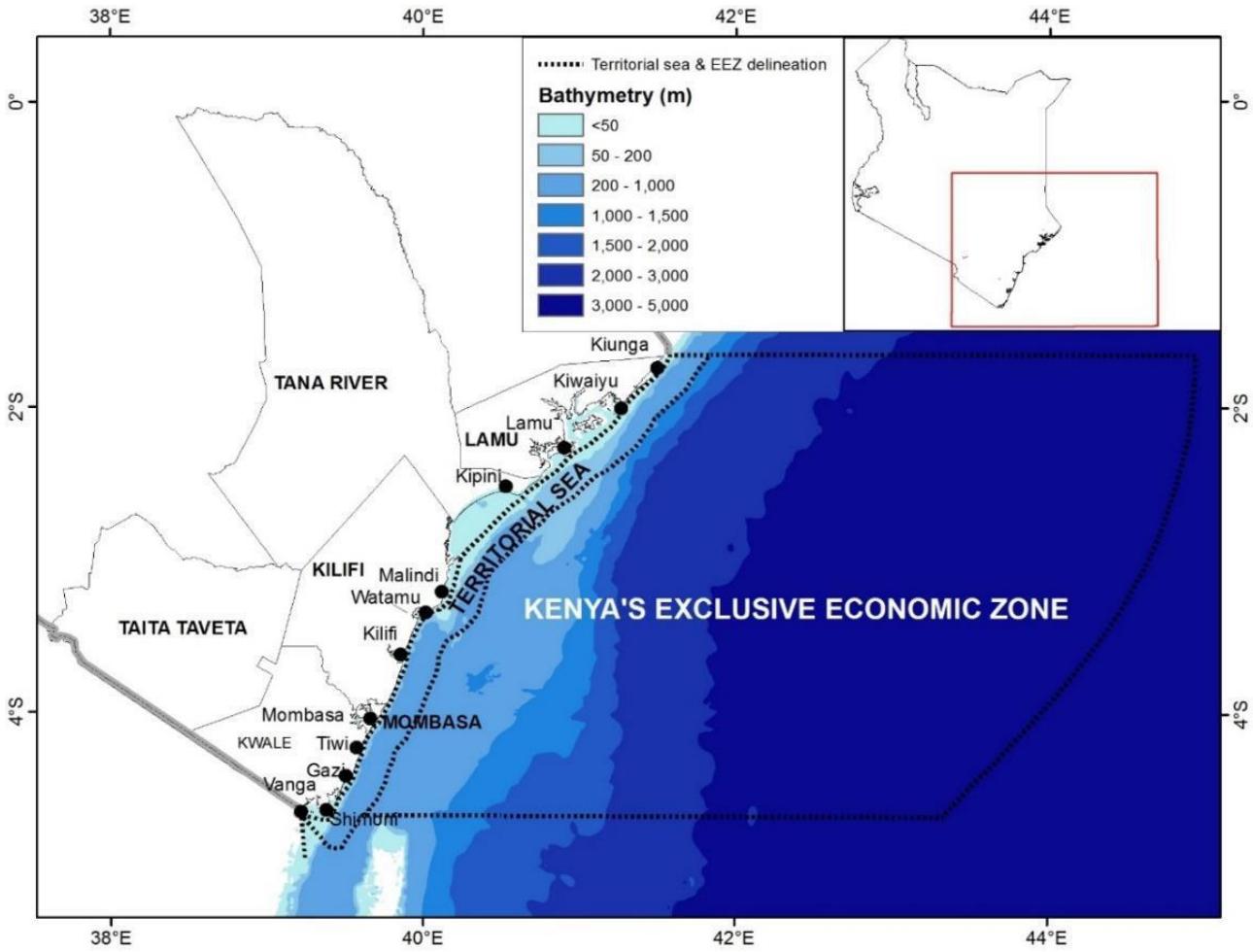


Figure 5-6: Kenya's Territorial Oceanic Waters Delineation
Source: *Survey of Kenya*

In the year 2019, the sector realized a decline in total fish production. Fish output declined from 154,671 thousand tonnes in 2018 to 146.5 thousand tonnes in 2019. The tonnage of freshwater fish landed decreased from 122.5 thousand tonnes in 2018 to 120.9 thousand tonnes in 2019. However, fish output from marine sources increased slightly from 24.2 thousand tonnes in 2018 to 25.7 thousand tonnes in 2019. Fish farming accounted for 12.8 percent of the country's fish output in 2019. The tonnage of fish catches from this source increased by 20.9 percent from 15.3 thousand tonnes in 2018 to 18.5 thousand tonnes in 2019 (KNBS, 2020), as shown in Figure 6-6. Lake Victoria, which remains the highest single source of fish in the country, accounted for 62.5 percent of the total fish landed in 2019. However, this was the lowest output over five years period. It is attributed to climate change, deteriorating environment, inadequate fisheries infrastructure, inappropriate fishing methods, water pollution, and restrictions on fishing in neighboring countries such as Uganda and Tanzania. The national fish production from inland waters increased from 15,000 Mt in 1950 to approximately 180,000 Mt in the 1990s. Species contribution to catch has changed over the years and is

currently dominated by Nile perch (*Lates niloticus*), Dagaa (*Rastrineobola argentea*), and Nile tilapia (*Oreochromis niloticus*).

The marine capture fishery is composed of coastal and nearshore artisanal, semi-industrial, and offshore industrial fisheries. Artisanal and semi-industrial fisheries are exploited by the local coastal communities, while foreign fishing companies exploit the industrial fisheries. Table 4-6 shows Kenya's Marine fish production by Coastal County. Coastal and Marine Fisheries of Kenya can be subdivided as:

- Small-scale nearshore finfish fisheries
- Crustacean fisheries - prawns, lobsters, and red Crabs

Pelagic fisheries - large pelagics include tuna, billfish, and shark species, medium ones are Amberjacks, snake mackerels, Kingfish, and Barracuda. The small pelagics include Indian mackerels, sardines, herrings, etc.

Non-conventional marine fisheries - These fisheries include sea cucumbers, cephalopods, ornamental fishery, ornamental curio, and recreational fishery

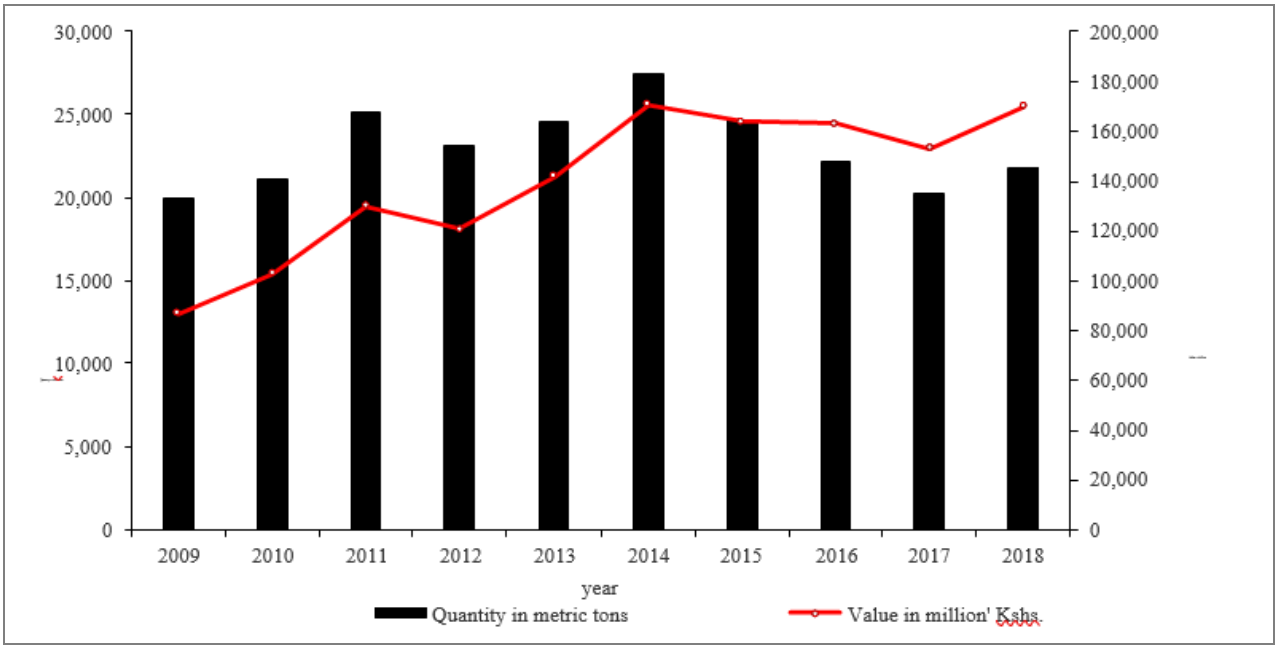


Figure 6-6: Fish production by quantity and value 2009-2018
Source: *SDF&BE, Fisheries Bulletin, 2017*

Table 4-6: Kenya's Marine Fish Production per County in tonnes

COUNTY	2012	2013	2014	2015	2016	2017	2018
KWALE	2373	2358	4448	5079	5011	4846	4950
MOMBASA	1066	1178	1688	1743	1726	1719	1810
KILIFI	2403	2342	11292	11444	12211	11649	11700
TANA RIVER	743	803	763	575	552	630	650
LAMU	2279	2450	5096	3566	4775	6380	6450

Source: *KeFS*

Figure 6-6 shows temporal variation in the total annual fish landings and water level fluctuations in Lake Turkana.

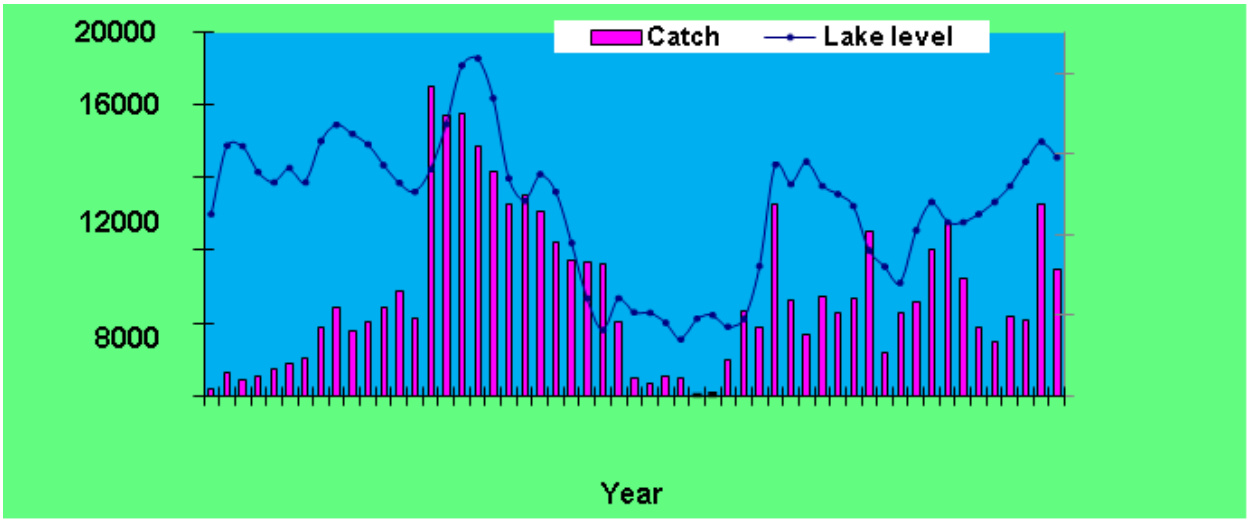


Figure 6-6: Temporal variation in the total annual fish landings and water level fluctuations in Lake Turkana
Source: *Fisheries Department Annual Statistical Bulleting*

The Table 5-6 shows common fish species and their families found in Lake Turkana in Kenya.

Table 5-6: Common Fish Species and their Families Found in Lake Turkana

Family	Species	Author and date
Protopteridae	***Protopterus aethiopicus***	Heckel, 1851
Cyprinidae	***Barbus neumayeri***	Fischer, 1884
	Barbus stigmatopygus	Boulenger, 1903
	Labeo cylindricus	Peters, 1852
	Labeo niloticus	Linnaeus, 1758
	Leptocypris niloticus	(Joannis, 1835)
	Neobola bottegoi	Vinciguerra, 1895
	Neobola stellae	(Worthington 1932)
	Raiamas senegalensis	(Steindachner, 1870)
	Brycinus ferox	(Hopson and Hopson, 1982)
	Brycinus macrolepidotus	Valenciennes, 1850
	Brycinus minutus	(Hopson and Hopson, 1982)
	Brycinus nurse	(Rüppell, 1832)
	Hydrocynus forskahlii	(Cuvier, 1819)
	Hydrocynus vittatus	Castelnau, 1861
	Microalestes elongatus	Daget, 1957
	Distichodus nefasch	Bonnaterre, 1788
Clariidae	*Clarias gariepinus*	(Burchell, 1822)
Claroteidae	***Chrysichthys turkana***	Hardman, 2008
Malapteruridae	***Malapterurus minjiriya***	Sagua, 1987
Cichlidae	*Hemichromis exsul*	(Trewavas, 1933)
	Hemichromis letourneuxi	Sauvage, 1880
	Oreochromis niloticus	Linnaeus, 1758

Source: *Malala et al, 2018*

Figure 7-6 shows trends of the fish biomass in the Kenyan part of Lake Victoria.

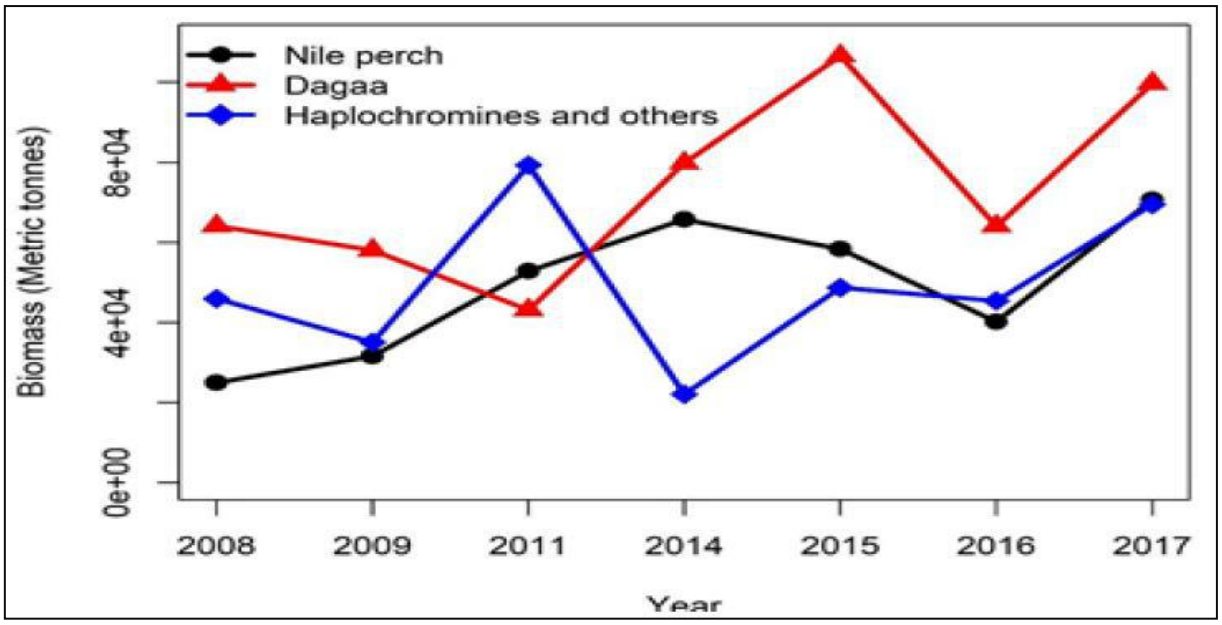


Figure 7-6: Table 6 13: Trends of the fish biomass in the Kenyan part of Lake Victoria
Source: KeFS

The other inland lakes with commercially viable fish landings are Lake Baringo, Lake Turkana and Lake Naivasha. Figure 8-6 shows the temporal variation in the total annual fish landings and water level fluctuations in Lake Turkana from 1962-2016.

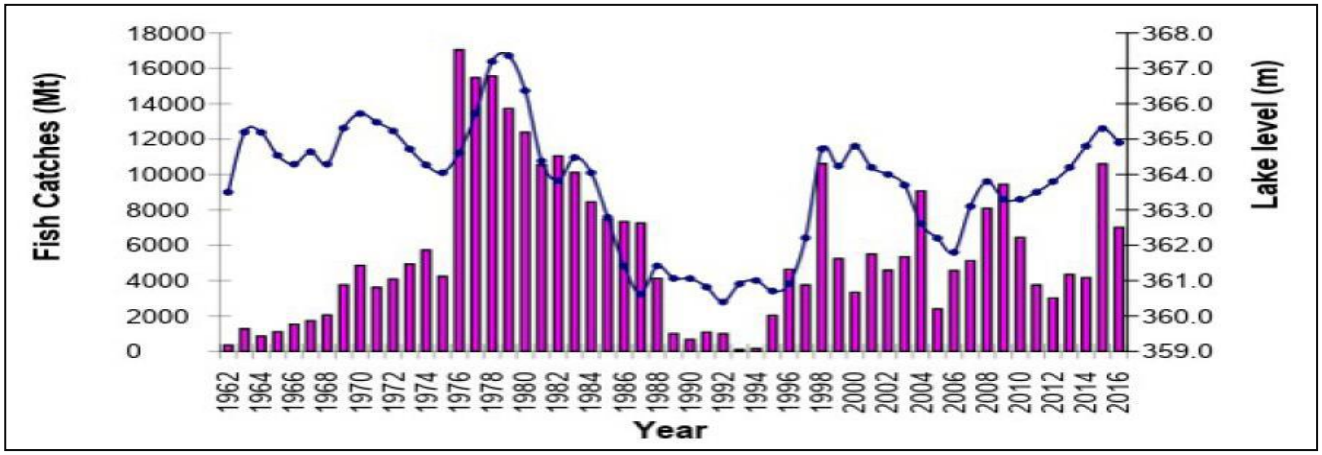


Figure 8-6: Temporal variation in the total annual fish landings and water level fluctuations in Lake Turkana
Source: *Fisheries Department Annual Statistical Bulletin*

6.4.2: Aquaculture and Mariculture

Freshwater aquaculture development in Kenya in recent years has been fast-growing. Compared to an annual production of about 1,000 MT in 2006, production had increased to an estimated 18,656 MT in 2015. It has been mainly the result of a nationwide fish farming mass campaign as part of the Economic Stimulus Programme launched by the Government of Kenya (GoK) during 2009-2013. The results were increased fishponds area from 220 ha in

2009 to 1,873 ha in 2015 (7,700 new ponds) and support along different aquaculture value chains. The main produced species were Nile tilapia (79%), African catfish (15%), Rainbow trout (4%), and Common carp and Ornamental fish (2%). Mariculture production of seaweeds is being practiced commercially, mainly at Kibuyuni on the south coast. It is planned for uptake in other areas, as it has demonstrated that seaweed production can succeed in Kenya (Fisheries Bulletin, 2016).

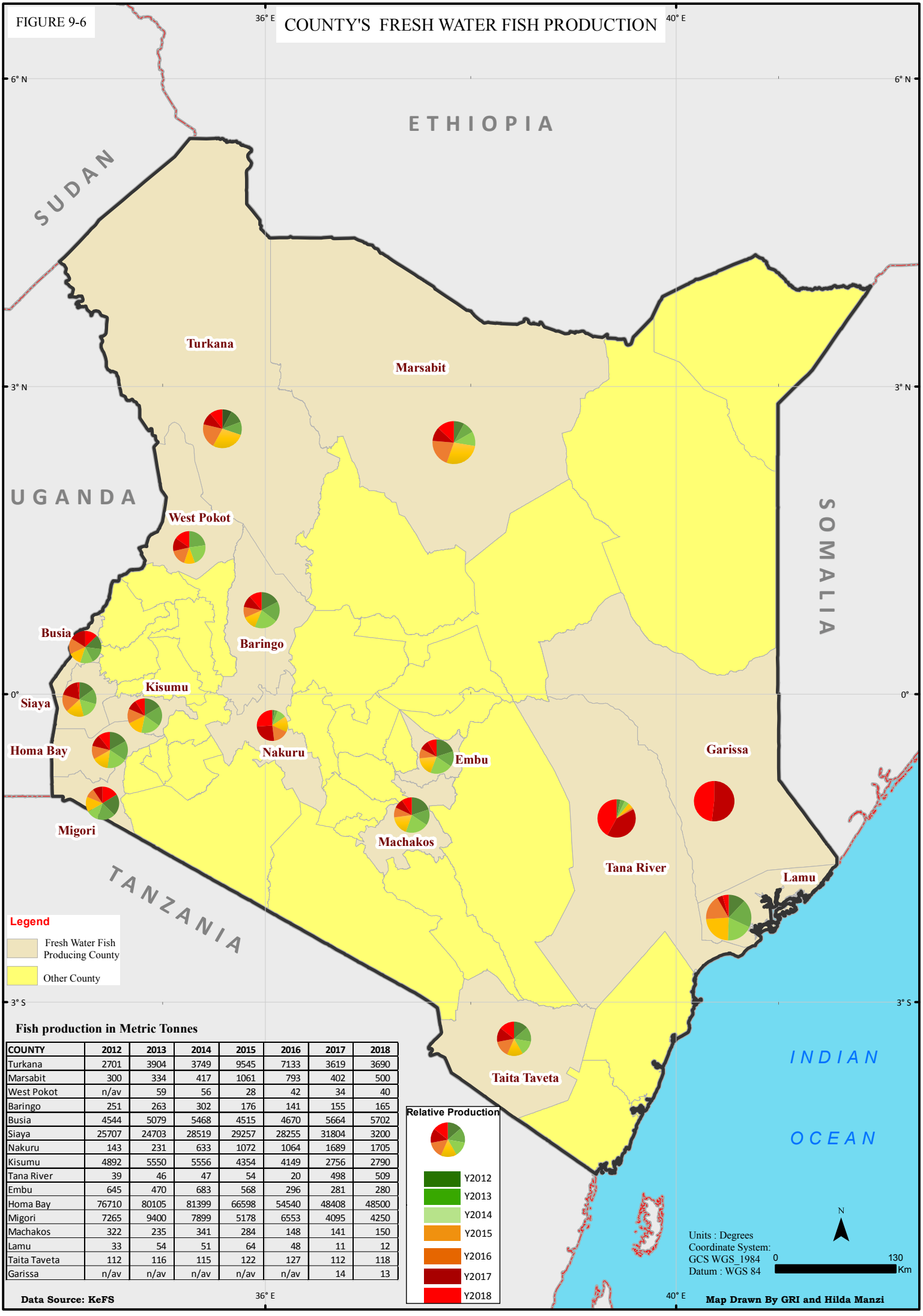
Kenya currently has about 3696 cages across the five riparian counties with an estimated production capacity of 3,000 tones/year. Suitability mapping indicates that out of 4,100 km2 lake scape available, the maximum suitable area for cages is 362 km2, or approximately 9 percent of the Kenyan portion of Lake Victoria. The majority of the lake scape, 3,737 km2 or 91 percent of the lake, is either unsuitable or highly unsuitable for tilapia cage culture. (KEMFRI, 2018)

The majority of riverine, dams and small lakes fisheries are small-scale. A significant part of the production is not commercialized or is marketed through informal channels and is therefore not reflected in national economic statistics. Lake Jipe, Lake Kenyatta, the Turkwel Dam, and the Tana River Dams support fisheries of significant amounts. On the other hand, the map in Figure 9-6 shows an attempt by the Government to introduce an economic stimulus in 2009 which extended to the fish industry to enhance fish production in the counties. It had a positive impact in the first few years but started dwindling when the industry was devolved to the counties. The counties did not embrace the initiative resulting in a large reduction in fish production.

Overall, the fishing industry contributes about 0.5% of the national GDP and about 2% of the national export earnings (KNBS, 2018).

FIGURE 9-6

COUNTY'S FRESH WATER FISH PRODUCTION



Fish production in Metric Tonnes

COUNTY	2012	2013	2014	2015	2016	2017	2018
Turkana	2701	3904	3749	9545	7133	3619	3690
Marsabit	300	334	417	1061	793	402	500
West Pokot	n/av	59	56	28	42	34	40
Baringo	251	263	302	176	141	155	165
Busia	4544	5079	5468	4515	4670	5664	5702
Siaya	25707	24703	28519	29257	28255	31804	3200
Nakuru	143	231	633	1072	1064	1689	1705
Kisumu	4892	5550	5556	4354	4149	2756	2790
Tana River	39	46	47	54	20	498	509
Embu	645	470	683	568	296	281	280
Homa Bay	76710	80105	81399	66598	54540	48408	48500
Migori	7265	9400	7899	5178	6553	4095	4250
Machakos	322	235	341	284	148	141	150
Lamu	33	54	51	64	48	11	12
Taita Taveta	112	116	115	122	127	112	118
Garissa	n/av	n/av	n/av	n/av	n/av	14	13

Data Source: KeFS

Map Drawn By GRI and Hilda Manzi

6.4.3: Challenges affecting Agriculture, Livestock and fisheries in Kenya

Fisheries

The pressures for fishing in Kenya include:

- Overfishing/unsustainable fishing/chemical fishing,
- Pollution and habitat loss
- Impact of global climate change on the marine ecosystem,
- Oil and human activity, mineral and energy mining, e.g., recently discovered titanium ores,
- Clearing of mangroves areas to reclaim land for other use, e.g., aquaculture, salt manufacture, agriculture.
- Overstocking of livestock
- Pest and diseases
- Land and population pressures: As the population increases, average farm size is reducing, and land distribution is becoming more concentrated, leading to constraints on production, particularly for smallholders.
- Agricultural research and development and agricultural extension: The proportion of farmers' especially small scale, accessing extension advice is low.
- Markets: There are generally inadequate markets for cereals, tea, and coffee, which were initially doing well.
- Climate change: Changes in temperature and rainfall variability have significant effects on agricultural production.
- Soil fertility and land degradation: The country has low adoption of sustainable land management practices, and land degradation is on the increase
- Public expenditure: Kenya is not spending much on agriculture. Its subsidy schemes are low for important crops like tea, coffee, and maize.

6.5: Soils

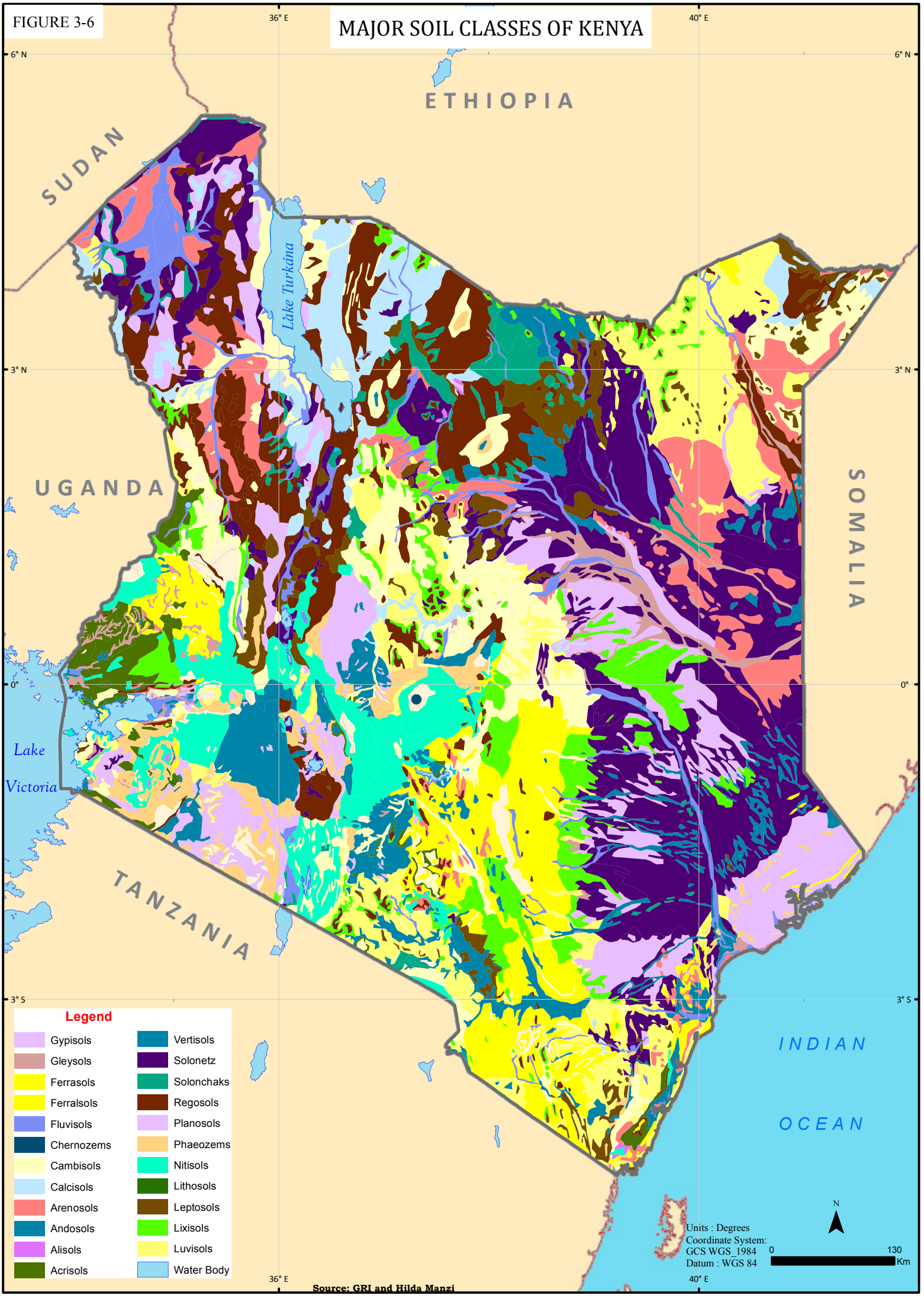
Soils are also essential in the hydrological cycle. Soil degradation processes of particular concern throughout the country include erosion, compaction, and soil fertility depletion. Loss of natural habitats through conversion of natural landscapes to agricultural lands has reduced vegetation cover and exposed soils to extensive wind and soil erosion in many parts of the country (Kenya National Environment Policy, 2014). Soil erosion reduces land productivity, requiring farmers to apply more and more fertilizers and other chemicals that help check declining productivity. The resultant excessive use of fertilizers and other chemicals contributes to soil degradation and water pollution.

Presently several efforts have been made to constitute the national soil information base for decision-making. The Exploratory Soil Map of Kenya at 1:1 million scales (Sombroek, Braun, & Pouw, 1982). ISRIC - World Soil Information soil grids at 250m spatial resolution (Hengl *et al.,* 2015), and National Accelerated Agricultural Inputs Access Programme (NAAIAP) soil fertility report (NAAIAP, 2014) are some of these efforts. Besides these, there is also a limited reconnaissance (scale between 1: 100,000 and 1: 250,000), semi-detailed (scale between 1: 20,000 and 1: 50,000), and detailed (scale larger than 1: 20,000) soil maps and reports, which can provide information for multi-purpose land use planning at the County level, farm planning and feasibility studies for proposed projects. Figure 3-6 presents the major soil classes of Kenya.

Agricultural activities contribute to greenhouse gas (GHG) emissions. Methane (CH4) and Nitrous Oxide (N2O) are key greenhouse gases emitted by the Agriculture Sector through various processes. Methane emissions arise from enteric fermentation and manure management associated with livestock and rice cultivation.

FIGURE 3-6

MAJOR SOIL CLASSES OF KENYA



Source: GRI and Hilda Manzi

Chapter 7: Mineral Resources

7.1: Introduction

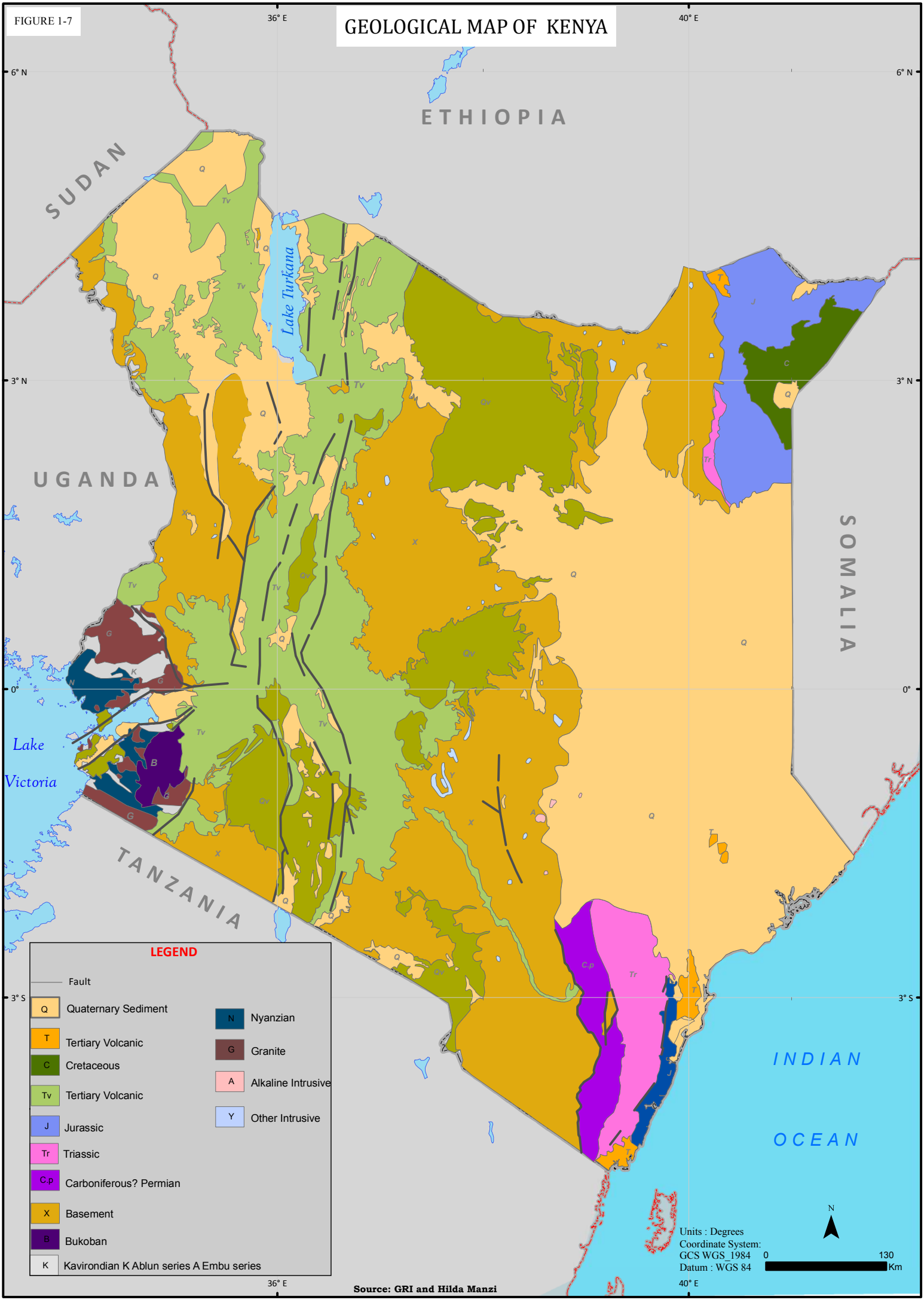
Kenya is endowed with some key and valuable mineral treasures. The Ministry of Petroleum and Mining, created in 2018, during the re-organization of the Kenya Government, administer mineral resources in the country.

7.2: Mineral Exploration

The mineral exploration entails the sequential process of information gathering that assesses the mineral potential of a given area. Suitable targets are then staked as mineral claims to secure mineral rights. Figure 1-7 shows the geological map of Kenya, while Figure 2-7 shows some minerals localities.

FIGURE 1-7

GEOLOGICAL MAP OF KENYA



Source: GRI and Hilda Manzi

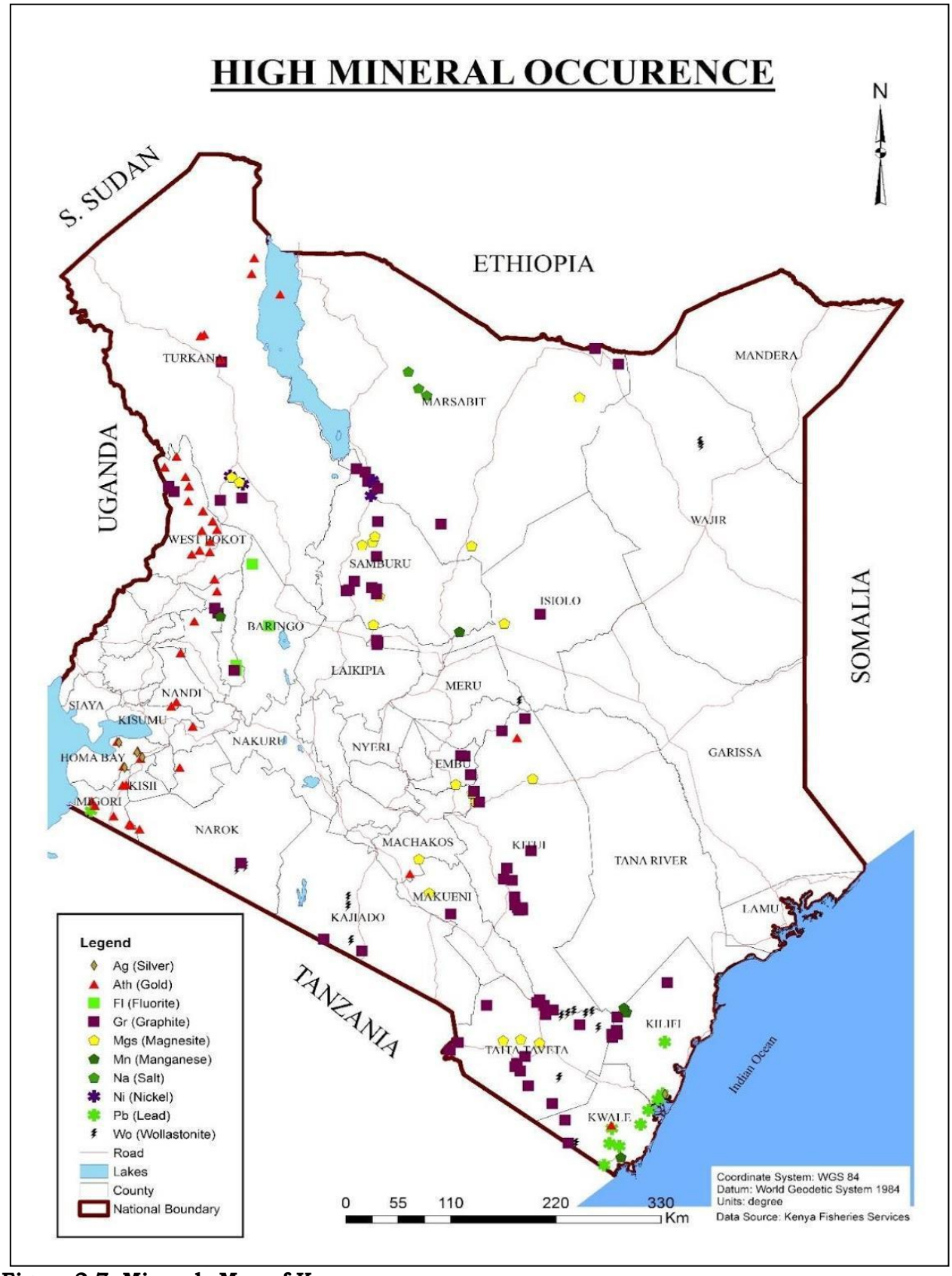


Figure 2-7: Minerals Map of Kenya
Source: *Ministry of Petroleum and Mining*

7.3: Petroleum Exploration

Petroleum exploration in Kenya begun in the 1950s in the Lamu Basin, but it was not until 2012 when the first commercially viable oil discovery was made

in the Tertiary rift, followed by significant gas discoveries in the offshore Lamu Basin.

7.4: Situational Analysis - Mineral Resources

Mining supports many sectors, including agriculture, medical, and above all, providing raw material for industrial development. Kenya is still developing its mining environment to attain international status. Despite the high potential for mineral deposits, the country lags in the research, technology, and financial support to realize the dream. Table 1-7 shows the approximate insitu mineral quantities in Kenya and the estimated value.

Table 1-7: Approximate Insitu Mineral Quantities in Kenya and Estimated Value.

No.	Mineral Name	Occurrence (Where Found)	Estimated Quantity and or Grade	Estimated Value (Ksh)
1.	Precious and Base Metals (Gold, Copper, Zinc)	Migori, Homa-bay, Kisumu, Siaya, Vihiga, Kitui, Kakamega, Busia, Nandi, Narok, Turkana, West Pokot, and Kwale	10 Metric Tonnes	40 Billion/Year
2.	Niobium and Rare Earth Elements	Mrima Hills in Kwale County and	100 Million Metric Tonnes of Niobium Oxide (Grade 0.7% - 0.8%) 110 Million Tonnes of Rare Earth Oxide Grade 3.1%	Over 1 Trillion
3.	Industrial Minerals (Gypsum, Limestone, Silica sand and Clay)	Homa Bay, Kisumu, Kericho, Kitui, Machakos, West Pokot, Mandera, Marsabit, Isiolo, Wajir, Taita Taveta, Kilifi, Kwale and Elgeyo Marakwet, Garissa, Tana River, Kajiado		50 Billion/Year
4.	Coal	Kitui, Kilifi and Kwale Counties	1.5 Billion Tonnes MT Mui Basin alone: a) The calorific value of 18 MJ/Kg	50 Billion/ Year
5.	Dimension stones (Granite and Marble)	Meru, Isiolo, Muranga, Nyeri, Kiambu, Nairobi, Homabay, Kericho, Mandera, Vihiga, Kajiado, Kisumu counties	Good quality	10 Billion/Year
6.	Agro- Minerals (Apatite, Guano, Limestone, Magnetite, zeolites, Rock phosphate and Vermiculite)	Kwale, Mombasa, Kilifi, Tana River, Kitui, Nakuru, Narok, Nyandarua, Kisumu, Homabay, Bungoma counties	Good quality	10 Billion/Year
7.	Titanium Minerals (Rutile, Zircon and Ilmenite)	Kwale, Kilifi and Tana River Counties	Total Heavy Mineral content: Kwale ~2.1-5.7% Vipingo ~2% Mambrui ~3.7% Kilifi ~3%	400 Billion Overall
8.	Radio-active Minerals (Uranium and Thorium)	Homabay, Kisumu and Kwale counties	Mineral grades: Uranium ~ 463-507 ppm Thorium ~ 23-26 ppm	50 Billion/Year

Source: Directorates of Mines and Geological Surveys, MoM

Kenya witnessed remarkable growth in the mining sector last year. A total of KSh 30.4 Billion was collected as revenue in 2018 for the mining sector, which represents a year-on-year growth of 5.9 percent over the previous year. There are proven deposits of titanium, gold, and coal found in Kenya, though mining is a small contributor to the nation's output (MINEXPOAfrica, 2019). GDP from Mining in Kenya decreased to 12085 Ksh Million in the second quarter of 2019 from 13186 Ksh Million in the first quarter of 2019. GDP contribution from Mining in Kenya averaged 9137.93 Ksh Million from 2009 until 2019, reaching an all-time high of 13186 Ksh Million in the first quarter of 2019 and a record low of 4195 Ksh Million in the first quarter of 2009 (KNBS,2009). Figure 4-7shows the mining sector contribution to the Kenyan GDP.

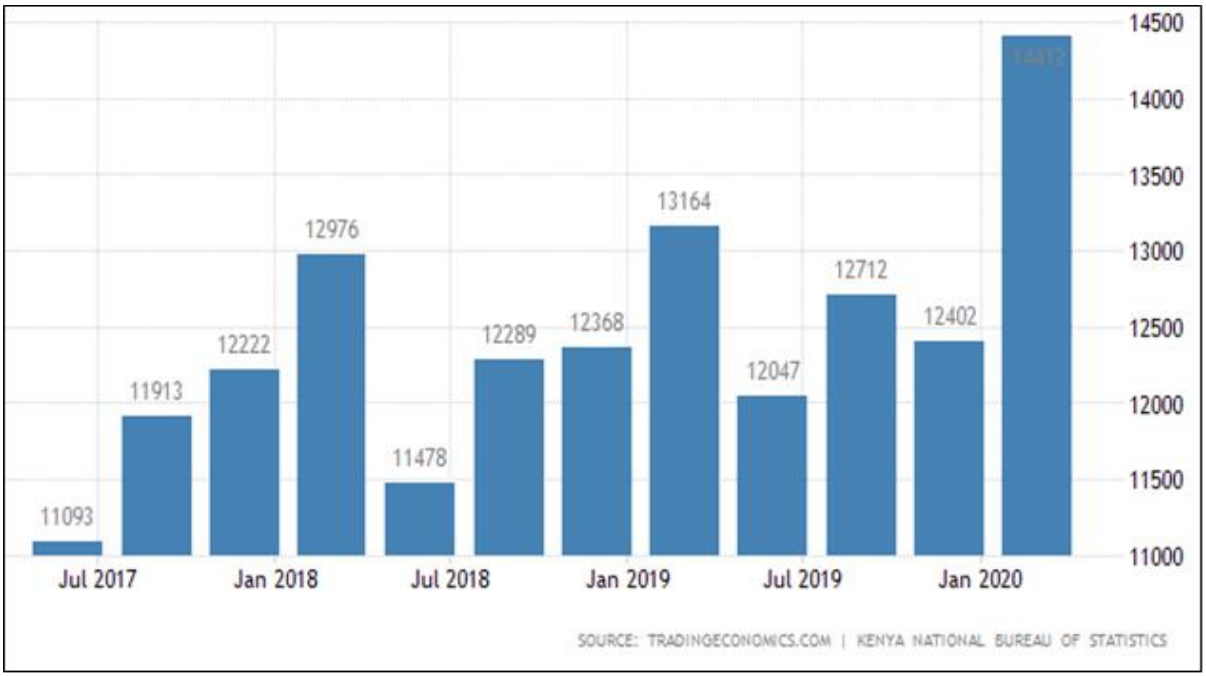


Figure 4-7: GDP contribution (in KSHs) from Mining since 2017

Source: MoM

Data from annual national exports of minerals and field visits point to heavy mineral losses through smuggling or undocumented exports.

The State Department for Mining is carrying out mineral exploration programs in various parts of the country.

Base Titanium mining in Kwale contributes to over 65% of Kenya's mineral earnings. Table 2-7 shows some gemstone types, their monthly production, and prices in Taita Taveta County.

Table 2-7: Types of gemstone types and their prices in Taita Taveta County

Ranking	Type of Gemstone	Quantity g/month	Selling Price (ksh/g)	Average cost of Production ksh/month	Gross Monthly Income (Ksh)	Net Income (Monthly)

1	Tourmaline	76,000	14.00	80,000.00	1,064,000.00	984,000
2	Ruby	120,000	500.00	Not given	60,000,000.00	60,000,000
3	Rhodolite	24,000	3,000.00	120,000.00	72,000,000.00	71,880,000
4	Red Garnet	7,500	10.00	24,000.00	75,000.00	51,000
5	White Sapphire	1,000,000	10.00	24,000.00	10,000,000.00	976,000
6	Tsavorite	6,000	30,000.00	Not given	180,000,000.00	180,000,000
7	Green Garnet	1,000,000	13.50	24,000.00	13,500,000.00	13,476,000
TOTAL		**2,233,500**	**-**	**272,000.00**	**336,639,000.00**	**327,367,000**

Source: *Ministry of Mining, 2015*

Quarrying

Demand for construction materials has accelerated the opening up of quarries across the Country. For example, in Machakos County, there is much activity associated with excavating stones for construction around Lukenya in Athiriver (Figure 6-7). Mount Margaret Quarry in Mai Mahiu is another site that has been worked for many years to produce dimension stones. The blocks are sold either as rough stones or well-trimmed blocks at an approximate price of forty Kenya shillings (40/-) per foot. Other major quarries occur elsewhere in Uasin Gishu County, Kisumu and Siaya Counties, Mombasa County, and so forth. State Department is carrying out documentation of disused quarries for Mining.

Figure 6-7: Stone quarrying in Athiriver, Lukenya area (Machakos County)
Photo: Hilda Manzi

If not well managed, Quarrying can lead to land degradation and destruction of residential and commercial buildings, primarily through a change of aesthetic view and ground shaking occasioned with blasting.

7.9.3: Sand Harvesting

Sand harvesting is a nationwide activity that has defied orderliness. Haphazard excavation of sand has led to much environmental damage by affecting flora and fauna in some cases. Siltation and water pollution are key effects of this activity. Harvesting of layered pumice ('Sand') is more rampant in Rhonda estate in Nakuru town and Soysambu Ranch along Nakuru-Elmenteita road, among other areas. Scooping of the loose volcanic material has rendered some buildings unstable as the ground keeps shifting. Figure 7-7 shows a sand harvesting site that has started to present land degradation.

Figure 7-7: Effects of 'Sand' harvesting in Rhonda Estate, Nakuru town

Sand harvesting activities have been the most difficult to control because of the weak enforcement of relevant laws by County and National Governments.

7.9.4: Artisanal Gold Mining

There is potential pollution in artisanal gold mining areas where mercury is used to win gold. The metal is a health hazard that can pose a danger to the environment and human health.

7.5: Governance in Mining Sector

Kenya'sKenya's Vision 2030 and Medium-Term Plan (MTP) III has recognized the mining industry as one of the key drivers of economic growth to realize the targeted ten percent economic growth per annum, transforming Kenya into a middle-income economy.

7.5.1: The Constitution of Kenya 2010

The Constitution has made provisions for Minerals and Natural Resources in Article 69 (1) of the Constitution of Kenya 2010. It spells out the State's obligation in respect of the environment by Articles 62, 66, 69, 71, and Article 23.

7.5.2: Mining Act No.2016

The Mining Act 2016 was adopted after extensive public participation to guide on matters relating to mining administration. The law provides royalty and revenue sharing as follows; National Government 70%, County Government 20%, and Community 10%. The Cabinet Secretary for Petroleum and Mining is responsible for the actualization of this Act, in tandem with principles and values in Article 201 (c) and (d), and Article 69 (1) of the Constitution. The

Mining Act 2016 gives the Cabinet Secretary the powers to declare certain minerals as "Strategic Minerals", after getting approval of the Cabinet. The Cabinet Secretary may establish Directorates to take charge of various interests in the Mining Sector. The Mining Act 2016 does not address matters related to Petroleum and its exploitation. This is handled by a separate Law, The Petroleum Exploration and Production Act CAP. 308 (Revised 2019).

7.5.3: Kenya Minerals and Mining Policy 2016

Goal: Sets out frameworks, principles, and strategies to explore and exploit mineral resources for the Country's socio-economic development.

Linkages and Partnerships

Developing the Mining and Mineral Resources policy involved consultations with a wide range of stakeholders. These include the Government ministries, academic and research institutions, mining industry players, County Governments, Kenya Chamber of Mines, bilateral and multilateral development partners, community leaders, Cabinet, and Parliamentary Committees on Environment and Natural Resources. Kenya is a Member State of the East Africa Community and is obliged to abide by all Mining sector agreements.

Awakening Women in Extractive Industries in Kenya (AWEIK), is a civil society organization that champions issues of women involved or affected by mining undertakings.

7.6: Mining Institutions and Bodies

The Mining Act 2016 established the following Institutions to support the development of the mining sector.

7.6.1: The National Mining Corporation

The National Mining Corporate is an investment arm of the Government that seeks to identify potential mineral reserves to be developed and mined on behalf of the national Government.

7.6.2: Mineral and Metals Commodity Exchange

It is a Government entity in charge of facilitating efficiency and security in mineral trade transactions. The Cabinet Secretary shall make Regulations to guide in the execution of its functions.

7.6.3: Mineral Rights Board

The mineral Rights Board shall be responsible for, among others;

- Advise the Cabinet Secretary on matters pertaining to Mineral Rights agreements
- Designate areas suitable for small scale and artisanal mining
- Areas restricted from mining
- Declaration of certain minerals as strategic
- Administration of mining licenses

- Determination of fees, charges, and royalties payable for a Mineral Right or Metal
- Handling any other matter in line with its mandate
-

7.6.4: Internationally Accredited Mineral Certification Laboratory

The geological Laboratory is being modernized to enhance analytical capacity and credibility to be internationally accredited to analyze locally. It will save funds used in external geochemical analyses.

7.7: Challenges Facing Mining Industry

The Mining sector is faced by some challenges, which include:

1. Under the new Mining Act 2016, the applicant of a mining license is obliged to undertake Environmental Impact Assessment and Environmental Management Plan before being granted a license. It has not been effectively implemented.
2. There is still a lack of a credible Minerals Certification Laboratory of international recognition. Analysis of field data and samples, therefore, cannot be done with certainty.
3. There is a Countrywide Airborne Geo-Physical Survey at the advanced stage of implementation. Under this program, the whole country has been divided into twenty-two offshore Blocks and one Marine Block. So far, nine out of twenty-two offshore blocks have been done covering certain Counties as follows: -
4. Overlaps of organizational laws and regulations causing duplication of roles and sometimes, conflicting interests
5. Poor management of mineral exploration programs leading to wastage of resources
6. Obsolete mineral processing technologies leading to loss of value during beneficiation
7. Poor management and dissemination of geo-information data
8. Aspirations generated by some political leaders that lead to activism, partisan interests, and diversion of budgeted allocations
9. There are Competing land-use interests, i.e., agriculture, forests, settlements, and transport and wildlife corridors.
10. The Constitution of Kenya 2010 and the Mining Act 2016 envisions community participation in environmental governance. However, the definition and scope of what "community" entails are unclear.
11. The Petroleum Exploitation and production Act 308 is being implemented side by side with the Mining Act 2016.

Chapter 8: Energy Resources

8.1: Introduction

The energy sector plays a critical role in socio-economic development and plays a major role in environmental and natural resources conservation. The Kenya Vision 2030 identified energy as one of the infrastructure enablers of its social and economic pillar. Sustainable, affordable, and reliable energy for all citizens is a key factor in realizing the Vision. In Kenya, petroleum and electricity as energy sources are the main drivers of the economy, while biomass is mainly used in rural communities and a section of the urban population. Currently, the energy sector relies wholly on the importation of all petroleum requirements. However, with the discovery of oil in Northern Kenya, this trend is likely to change in the near future.

8.2: Situation Analysis

Electricity generation is predominately hydro, supplemented by geothermal and thermal sources. Apart from wood fuel which is highly exploited, the other renewable energy resources include solar and wind energy while other opportunities are being sought. Figure 1-8 shows the proportion of Electricity Generation by Source. The energy sector's major challenges include; improving the quantity, quality, and reliability of energy supply. Further, there is a high initial capital outlay with long lead times from feasibility studies to energy infrastructure development. In addition, mobilizing adequate financial resources to undertake massive investment in the power sector, high cost of energy, low per capita incomes, and low levels of industrialization are other challenges.

Commercial energy is dominated by petroleum and electricity, while wood fuel provides energy for domestic use, especially in rural communities. At the national level, wood fuel and other biomass account for about 68% of the total primary energy consumption, followed by petroleum at 22%, electricity at 9%, and other fuel sources (including coal), standing at less than 1%. Solar energy is also mostly used for drying and, to some extent, heating and lighting.

.

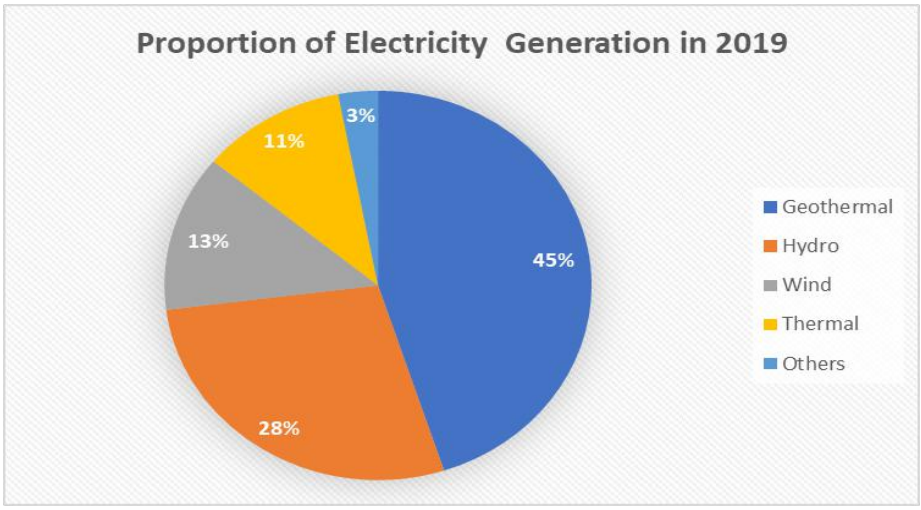


Figure 1-8: Proportion of Electricity Generation by Source in 2019
Source: KNBS, 2020

Energy sources and use in Kenya

Kenya has varied sources and uses for energy as shown in the Figure 3-8. Biomass is the main source with about 75% followed by petroleum while the least is coal.

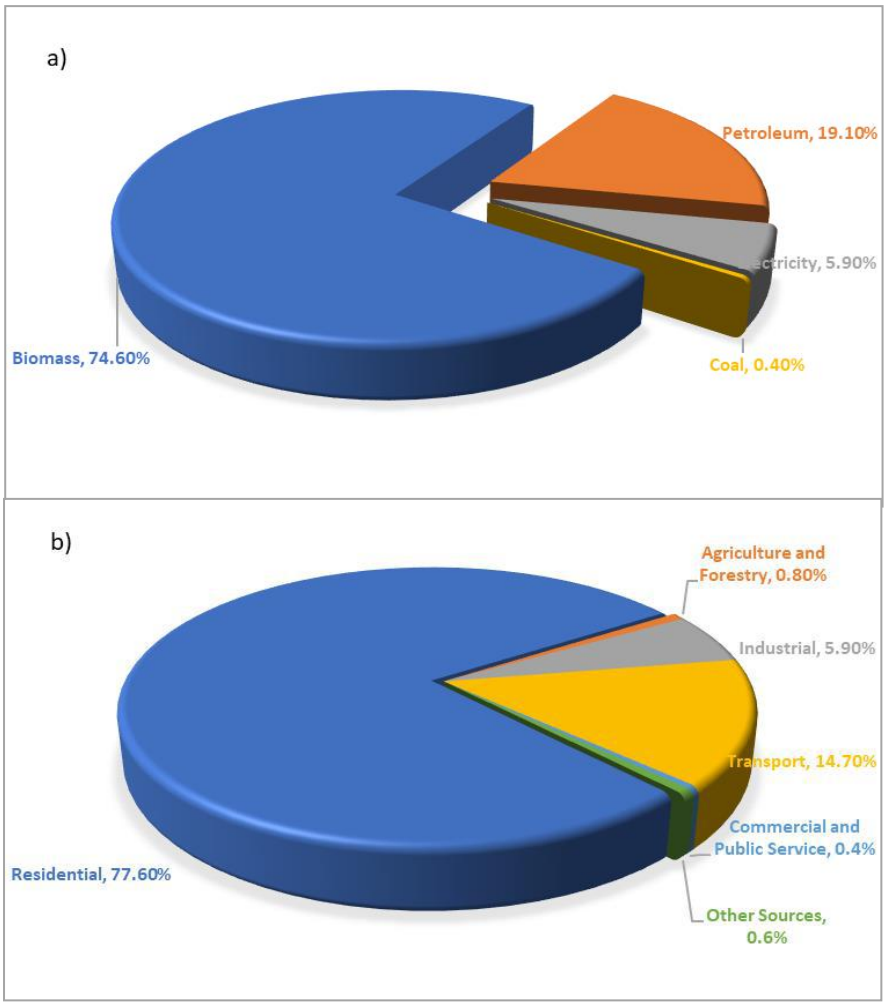


Figure 3-8: Energy sources and use in Kenya
Source: *Adopted and Modified from (Kiplagat, et al.,2011)*

Kenya has made notable progress in deploying renewables largely because it has successfully attracted the necessary private investment for renewables projects. Further development of these resources would help meeting demand growth. Figure 4-8 shows the growth of Kenya's electrical generation by technology.

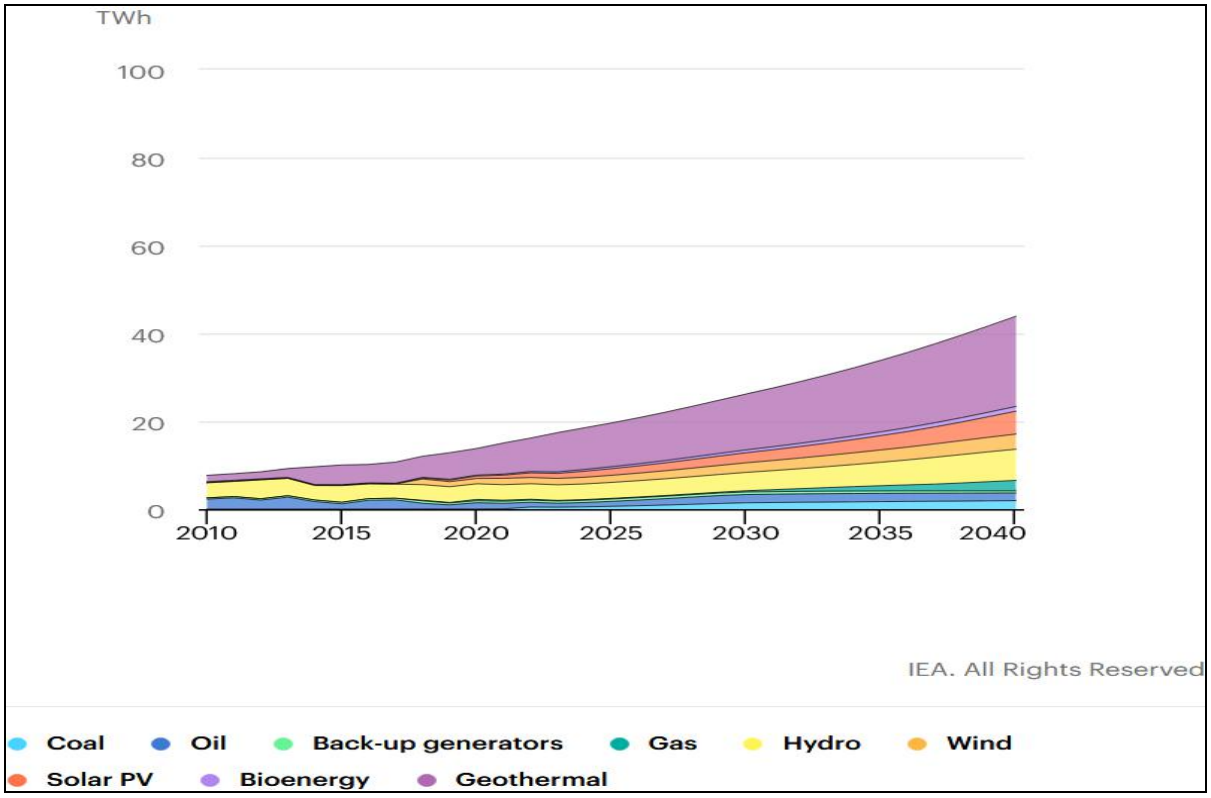


Figure 4-8: Growth of Kenya's electricity generation by technology
Source: MOE

8.2.1: Fossil Fuels

Fossil fuels encompass petroleum (oil, oil shale, and gas) and coal resources. Coal provided about 1% of the primary energy consumed in the country, mainly by cement manufacturers. The petroleum industry is broadly divided into three categories, namely: upstream (exploration and production), midstream (storage, refining, and transportation), and downstream (supply and distribution).

1. Petroleum (Oil)

Kenya has had no known commercial reserves of petroleum until January 2012 when Tullow Oil Limited discovered it at Ngamia I well, located at Lokichar in Turkana County. By November 2013, Tullow had drilled four more exploration wells (Etuko, Twiga, Ekales, and Paipai), three of which had oil. The API gravity of the oil was estimated at between 300 and 350, indicating high-quality oil. Further petroleum exploration is being undertaken both on-shore and offshore in the country's four major Sedimentary Basins. Drilling of three exploration wells was done in Mbawa, Kiboko, and Kubwa between 2012 and November 2013.

A total of sixty-three (63) oil exploration blocks have been gazetted, out of which thirty-seven (37) are licensed to International Oil Companies (IOCs) and one to the National Oil Corporation of Kenya (NOCK). Twenty-five (25) blocks are open for licensing. A total of seventy-eight (78) wells have been drilled, of which twelve (12) were discoveries out of which 9 with crude oil in Block 10BB and Block 13T; two with natural gas discoveries in Block L8 and Block 9; one with both crude oil and natural gas in Block L10A. Crude oil recoverable reserves stand at approximately 750 million barrels.

During the review period (2019), 23,930.78 TJ of petroleum fuels were supplied to the country mainly from imports. Over the same period, 21,999.79 TJ of petroleum fuels were demanded, with 63.0 percent being used by road transport. Air transport and households accounted for 13.5 percent and 7.4 percent, respectively (KNBS, 2019). The key environmental concern from petroleum is pollution from refining, transporting, and using petroleum products.

2. Natural Gas

Natural gas accumulations can be found as pure methane or in conjunction with higher hydrocarbons. Natural gas is categorized as being one of three types: (a) Oil and associated gas, (b) Rich condensate and gas, and (c) Dry gas.

Natural gas has the potential of meeting future energy needs of the country and offers several significant environmental benefits over other fossil fuels mainly due to its chemical simplicity and burns cleaner than all other fossil fuels. Kenya had no known natural gas reserves until September 2012 when offshore gas discoveries at Mbawa 1 near Malindi came up. The commercial viability is yet to be established.

3. Coal Resources

It is the most affordable fuel worldwide and can become the most reliable and easily accessible energy source. The introduction of clean coal technology (CCTs) in coal-fired power plants reduces emissions. It extracts sulfur for other applications such as chemical and fertilizer production while capturing carbon for storage (CCS). Current world coal energy consumption by sector is about 42% electricity, 25% industrial, and 33% other uses. As at 2013, a large part of coal utilized in Kenya was imported. Between 2006 and 2013, consumption of coal averaged 140,000 metric tonnes per annum. It constitutes less than 1% of the total primary energy consumed in the country. Coal consumption is expected to increase with the discovery and mining of coal deposits in Mui Basin in Kitui County and other parts of the country

There are commercially viable coal reserves in the Mui Basin situated in Kitui County. The basin is sub-divided into four blocks: A, B, C, and D. In 2010, four hundred million tonnes of coal reserves were confirmed in Block C. The coal has been analyzed and ranged from lignite to sub-bituminous with calorific values ranging from 16 to 27 MJ/kg. Further exploration work was scheduled for Blocks A and B. Exploration for coal was also planned for the coastal region in Taru Basin in Kwale and Kilifi Counties. It was also lined for other parts of the country and in these 31 more coal blocks to establish coal potential and delineate the blocks for concessions.

8.2.2: Renewable Energy

Despite the high consumption of non-renewable energy in the country, Kenya has promising potential for power generation from renewable energy sources. Abundant solar, hydro, wind, biomass, and geothermal resources led the Government to expand renewable energy generation to central and rural areas.

Following a least-cost approach, the Government has prioritized the development of geothermal and wind energy plants and solar-fed mini-grids for rural electrification. A major part of Kenya's energy still comes from bioenergy. This share may shrink to 15% by 2040 due to the increased use of geothermal resources. Electricity generated from renewable sources has risen gradually and currently makes up a share of 69.6% of the total energy generation mix (Figure 2-8).

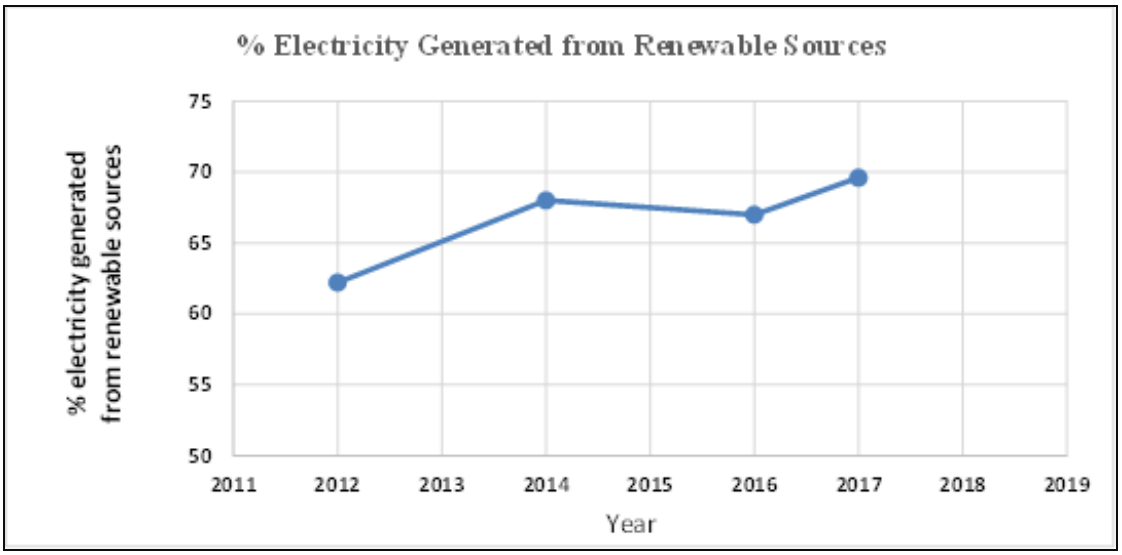


Figure 2-8: Trends in Renewable Electric Energy
Source: *KEPI, NEMA 2019*

1. Bio-Energy Power

The country's agricultural activity produces large amounts of agricultural waste. These can be used to produce electricity by implementing biogas and biomass technologies. The National Energy Policy of 2014 sets out biogas expansion targets of 10,000 small and medium-sized digesters by 2030. Biogas is considered a viable energy solution by several agricultural producers.

2. Wind Energy

Kenya has promising wind power potential. Due to its topography, Kenya has some excellent wind regime areas. The northwest of the country (Marsabit and Turkana counties) and the edges of the Rift Valley are the two windiest areas (with average wind speeds of over 9m/s at 50 meters). The coast has lower but promising wind speeds (about 5-7m/s at 50m). It is expected that about 25% of the country will be suited to current wind technology. There is significant potential to use wind energy for wind farms connected to the grid, while isolated grids will be for off-grid community electricity and water pumping. The largest wind farm in Africa (310 MW) is in the Turkana area of north-western Kenya. The Ngong hills area close to Nairobi also has 5.1 MW, as shown in Figure 5-8. An average of 80100 small wind turbines (400 W) have been installed, often as part of a hybrid PV-wind system with battery storage.

Land access has been a challenge for both site selection and transmission connection. The 310 MW Lake Turkana wind farm is the largest clean energy project connected to the grid in 2018 after facing severe delays in the construction and transmission phases. Several other wind projects are in the early planning stages.

Figure 5-8: Ngong Wind Power Station in Kajiado County
Source: Hilda

3. Solar Energy

Kenya has high insolation rates of 5-7 sunshine peak hours and average daily insolation of 4-6 kWh/m2. The total potential for photovoltaic installations is estimated at 23,046 TWh/year. Solar power is primarily seen as an option for rural electrification and decentralized applications. Photovoltaic stand-alone systems for households and public institutions have been subsidized for some time. Commercial and industrial applications are also becoming increasingly important: flower and vegetable farms have already pioneered and installed captive renewable energy systems to contribute to the power supply on their premises. In addition, hybrid PV-diesel island grids multiply: 18 MW of existing diesel-run stations will be retrofitted for the use of solar power in the next few years. The Rural Electrification Authority (REA) also plans to install green-field hybrid island grids.

There are also a handful of large solar projects, each around 40MW, which received PPAs (Power Purchase Agreements) in late 2015. While the ongoing feed-in-tariff for utility-scale solar is $0.12/kWh, several projects have bid for PPAs at just two-thirds of this price level. Once built, these solar projects will be among the largest PV plants in sub-Saharan Africa. However, the stamina and risk appetite required to overcome challenges in PPA negotiation and land access, combined with slowing power demand growth, cast a shadow on other PV projects.

4. Hydro Power

The potential for large-scale hydroelectric power development is estimated to be 1,500 MW, of which 1,310 MW is feasible for projects with a capacity of at least 30 MW. Of these, 434 MW has been identified in the Lake Victoria basin, 264 MW in the Rift Valley basin, 109 MW in the Athi River basin, 604 MW on Tana River basin, and 146 MW on Ewaso Ngiro North River basin (Mokveld & Eije, 2018). However, the projected generation costs for these sites mean they are excluded from the Least Cost Power Development Plan. Around 55 river sites suitable for rural electrification have been identified as attractive commercial opportunities. Their maximum mean capacities would range from 50 kW to 700 kW (Mokveld & Eije, 2018).

Small hydros power plants (SHP) are hydropower schemes whose potential does not exceed 10MW of installed capacity. The total estimated potential of small, mini, and micro-hydro systems is 3, 000MW. Most of this potential is situated within the country's five main drainage basins. The implementation of some of these schemes is undertaken by both the Government and private investors. In summary, the SHP supply about 15 MW into the grid network, and the off-grid capacity is 31 MW. Table 1-8 shows the capacity in Megawatts (MW) of SHP installed in different rivers between 1925 and 2009 in Kenya.

Table 1-8: The capacity (MW) of SHP installed in different rivers.

SHP	Ownership	River	Year	Capacity in MW
Ndula	KenGen	Thika	1925	2.0
MESCO	KenGen	Maragua	1933	0.38
Selby falls	KenGen	n.a	1952	0.4
Sagana falls	KenGen	Tana	1955	1.5
Gogo falls	Mining company	Migori	1958	2.0
Tana 1 & 2	KenGen	Tana	1932	4.0
Tana 3	KenGen	Tana 3	1952	2.4
Tana 4	KenGen	Tana	1954	4.0
Tana	5 KenGen	Tana	1955	4.0
Wanjii 1 & 2	KenGen	Maragua	1952	5.4
Wanjii 3 & 4	KenGen	Maragua	1952	2.0
Sosiani	KenGen	Sosiani	1955	0.4
James Finlay 1	Tea company	Kericho	1934	0.3
James Finlay 3	Tea company	Kericho	1980	0.1
James Finlay 4	Tea company	Kericho	1984	0.3
James Finlay 5	Tea company	Kericho	1999	1.1
Brooke Bond 1	Tea company	n.a	n.a	0.09
Brooke Bond 2	Tea company	n.a	n.a	0.1
Brooke Bond 3	Tea company	n.a	n.a	0.18
Brooke Bond 4	Tea company	n.a	n.a	0.24
Savani	Eastern produce	n.a	1927	0.09
Diguna	Missionary	n.a	1997	0.4
Ten wek	Missionary	n.a	n.a	0.32
Tungu-Kabiru	Community	Tungu	2000	0.01
Thima	Community	Mukengeria	2001	0. 01
Kathamba	Community	Kathamba	2001	0.001
Imenti	KTDA	Imenti	2009	0.9

Source: Mbaka and Mwaniki, 2017

5. Geothermal Power

Kenya is endowed with geothermal resources, mainly in the Rift Valley. Conservative estimates suggest geothermal potential in the Kenyan Rift at 2,000 MW, whereas the total national potential is between 7,000 and 10,000 MW. Production started in 1981 when a 15 MW plant was commissioned in Olkaria. KenGen and an independent power producer currently produce a total of 129 MW. Geothermal power has been identified as a cost-effective power option in Kenya's Least Cost Power Development Plan. Exploration for geothermal energy in the high-potential areas of the Kenyan Rift is ongoing. The target for 2030 is 5,000 MW of geothermal power (Mokveld & Eije, 2018).
Geothermal accounted for 27% of installed capacity in 2016, following a unit at Orpower's Olkaria geothermal project. Geothermal development is, however, a lengthy process in the best of scenarios, requiring several years from conception to commissioning.

6. Municipal Waste Sources

The municipal waste consists of solid waste including durable and non-durable goods, containers, food scraps, yard waste, and inorganic waste from homes, institutions, and businesses, wastes generated by manufacturing, agriculture, mining and construction, and demolition debris, as well as sludge and liquid waste from water and wastewater treatment facilities, septic tanks, sewerage systems, slaughterhouses. In order of preference, municipal waste can be managed by reduction of its production at the source. Processes of reuse and recycling, treatment to destroy or reprocess waste to recover energy or other beneficial resources if the treatment does not threaten public health, safety, or the environment, or dumping and disposal are some ways of managing municipal waste.
The disposal of municipal waste in Kenya as of 2013 was poorly managed in dumpsites such as the Dandora, located 8 km from Nairobi's Central Business. The dumpsite is ranked as the largest waste disposal site in the East African region. With appropriate waste-to-energy technologies, municipal waste can provide energy while helping to clean the environment.

7. Biomass Co-Generation

Co-generation refers to the simultaneous production of heat and power from one single fuel source. It is common where plant processes require both heat and power, such as sugar processing, and offers an opportunity for improved plant energy efficiency besides reducing energy costs and providing additional revenue streams through surplus power export to the national grid. A pre-feasibility study on cogeneration by the Ministry of Energy completed in 2007 established that there is potential for generating up to 120MW of electricity for export to the national grid without major investments and about 200MW with modest investments in terms of expanding cane fields and cane crushing capacity. Mumias Sugar Company previously took advantage of its cogeneration potential from sugarcane bagasse by generating 38MW, out of

which 26MW is exported to the national grid. Other sugar companies are expected to diversify into sugar processing by-products through the value addition of cogeneration and bioethanol production. The planned generation capacity from all sugar companies was estimated at 90MW in 2013.

Nuclear Energy in Kenya

The Nuclear Power and Energy Agency, formerly Kenya Nuclear Electricity Board (KNEB), is a State Corporation established under the Energy Act 2019. It is charged with promoting and implementing Kenya's Nuclear Power Programme, carrying out research and development for the energy sector.

The Nuclear Power and Energy Agency is mandated to develop policies and legislation, undertake public education and awareness, identify suitable sites for the construction of Nuclear Power Plants, carry out research, development, and innovation on energy technologies and capacity building for the energy sector.

Kenya has embarked on a program to see the country generate 1 GW (1,000 MW) from Nuclear sources between 2020 and 2022. By 2030 Kenya is slated to have installed a capacity of 4 GW of nuclear energy, generating about 19% of Kenya's energy needs. It has been proposed that a nuclear plant be established in Tana River County at an estimated cost of 5.0 Billion Dollars in the next seven years. Tana River was the most preferred place for the plant since it is not prone to earthquakes. Other possible areas were around Lake Victoria and Lake Turkana, which have large masses crucial in cooling the reactors.

The global, traditional challenge of nuclear energy remains the management of radioactive waste. However, due to continued research in the area, radioactive waste management is now within manageable levels. Spent fuel rods can either be safely stored until the radioactive levels reduce to non-toxic levels or are reprocessed and reused in nuclear energy generation. The waste also requires special handling and storage facilities to reduce the risk of exposure to employees, the public, and the environment. A nuclear meltdown may cause the release of radioactive materials, which can negatively impact the environment, health, and safety of persons. However, further research has led to the development of advanced reactors with enhanced security and safety mechanisms that significantly diminish the possibility of a nuclear accident.

Nuclear power is viewed as both a long-term solution to high costs incurred during times of drought when diesel generators are used and an effective way to cut carbon emissions from the power generating sector.

8.3: Energy Efficiency

A substantial amount of primary energy input is wasted, but opportunities exist to improve energy savings in all sectors, particularly the industrial sector. Food, beverage and tobacco, paper and paper products, chemicals, petroleum, rubber, and plastic products are among the major consumers of

energy for environmental benefits. Energy savings of up to 25 percent are possible in steam systems, largely by improving the efficiency of steam boilers, better steam distribution, and the use and recovery of waste heat and condensate.

The Kenya Association of Manufacturers provides training and energy audits on energy efficiency through the Centre for Energy Efficiency & Conservation (CEEC). The production of energy-efficient charcoal and fuel-wood stoves has provided significant employment opportunities in urban and rural areas. For example, the Ceramic jiko, an energy-efficient charcoal stove produced by over 200 businesses, the bulk of which are informal sector manufacturers.

8.4: Energy Accounts

Environmental Economic Accounts are systems of accounts that seek to account for natural resource use. The accounts track natural resources from the point of extraction to intermediate use by industries, to final use, to residuals/waste, which are eventually disposed of back to the environment. Further, the accounts seek to promote efficient natural resource accounting and ensure a country can trace how much it has utilized, estimate reserves in the environment, and promote proper disposal of residuals for environmental sustainability.

The System of Environmental Economic Accounts (SEEA) framework follows a similar accounting structure as the System of National Accounts (SNA). It uses concepts, definitions, and classifications consistent with the SNA to facilitate environmental and economic statistics. Kenya first published the pilot SEEA Energy Accounts as a unique chapter in the Economic Survey of 2018 publication (KNBS, 2018).

8.5: Energy Balance

The total supply of non-renewable feedstocks was 75,559 Tera Joules (TJ) in 2019. Total supply continued to reduce due to a ban on illegal logging of Government forests in the review period. Households demanded about 95 percent of non-renewable feedstocks in 2019. In the review period, 98.3 percent of all electricity supplied was produced domestically. Further, 88.5 percent of domestically produced electricity in 2019 was renewable. In 2019, total electricity demand was 31 3874.13 TJ while 9,901.80 TJ were transmission and distribution losses.

Chapter 9: Biodiversity Resources

9.1: Introduction

Biological diversity generally refers to the variety and variability within species, between species, and between ecosystems. There are three types of Genetic diversity, Species diversity, and Ecosystem diversity. Genetic diversity is described by the fact that each species possesses genes that are the source of its unique features. Loss of genetic diversity is often associated with inbreeding and reduction in reproductive fitness. On the other hand, species diversity refers to the total number of different species in space, locally, in the region, country, world, and ecosystems. Each species has a role in the ecosystem. An absence of one species will affect other species. Ecosystem diversity is the combination of living things of communities with the physical environment around them. There are various types of ecosystems such as deserts, mountains, oceans, among others.

There is no doubt that human civilization has had a negative impact on biodiversity. Pollution from all sources, deforestation, among other challenges, has led to severe effects on biodiversity. International Union of Conservation of Nature (IUCN) estimates that extinction rates are now over 50 times higher than previously thought and could probably be higher. This challenge continues even though the earth's biological resources are vital to humanity's economic and social development. The threat to species and the ecosystems is, therefore, a threat to human wellbeing. Kenya has 4,623 plant species, 766 species of bryophytes, 511 ferns, and 2,071 species of fungi and lichens (GOK, 2015).

The animal species diversity consists of 2 golden moles; 43 even-toed ungulates; 4 odd-toed ungulates; 36 carnivores; 26 Whales, five dolphins, and porpoises; 105 bats; 39 hedgehogs; 4 hyraxes; and 4 Lagomorphs; 5 elephant shrews; 3 pangolins; 20 primates; 1 proboscis; 94 rodents; 1 Dugong and one aardvark. Kenya has over 260 reptiles (Snakes, lizards, geckos, skinks, chameleons, tortoise, turtles, terrapins, crocodile) and amphibians (toads, frogs, salamanders) species; 1,105 bird species; 769 Fish species (362 freshwaters), of which five are likely to be extinct, 168 arthropods and arachnids. Kenya's biodiversity has also been documented in terms of occurrences, as shown in Table 1-9.

Table 1-9: Kenya's Biodiversity in Terms of Occurrences.

Taxonomic category	No. of occurrences
Mammals	95,598
Birds	1,621,535
Reptiles	16,063
Insects	121,686
Molluscs	7,467
Amphibians	15,648
Plants	163,644
Fungi	8,895
Bacteria	376
Protozoa	4,836
Viruses	546
Chromista	827

Source: *(GoK, Natural Capital:Biodiversity Atlas, 2015)*

9.2: The Large Mammals

Large mammals are the ecologically dominant species in Kenya's terrestrial ecosystems. The sheer abundance, impact, and mobility of large herbivores, including elephants, wildebeest, and zebra, and carnivores including lion, leopard, and hyenas, govern the structure and dynamics of all major habitats from forests to deserts. The savannahs are among the most productive grasslands on Earth due to the diversity of herbivores, their range of feeding habits, and their resilience to harsh droughts. The patchiness and diversity of habitats in Kenya are primarily due to the interactions between herbivores and carnivores shifting across the landscape in response to seasons. The country savannahs are among the last places on Earth where the large mammals that dominated the Pleistocene era until 10000 years ago still survive in abundance. Kenya's parks and reserves, including Mara, Tsavo, Amboseli, Samburu, and Nakuru, are world-famous wildlife attractions.

9.3: Smaller Mammals, Reptiles, and Amphibians

Kenya has 250 small mammal species distributed in eight orders: Afrosoricida (2 spp.), Macroscelidea (5 spp.), Hyracoidea (4 spp.), Rodentia (95 spp.), Lagomorpha (3 spp.), Erinaceomorpha (1 spp.), Soricomorpha (37 spp.) and Chiroptera (103 spp.). The country has over 215 reptile species. These include 100 species of snakes, 100 species of lizards, 5 species of marine turtles, 5 species of tortoises, 5 species of terrapins and 1 species of crocodile. The centre of reptile richness in Kenya runs in an arc of habitats ranging from the coastal forests, through the bushes and grassland savannahs of the Kenya–Tanzania borderlands, and into the Rift Valley.

The distribution patterns of snakes and lizards are broadly similar. The cold-blooded vertebrates prefer warmer lower altitudes, but all latitudes on a global scale are suitable. Amphibians are associated with wetter habitats and tree frogs, mostly with forest and mountain areas. Reptiles and amphibians in Kenya have not received as much taxonomic attention as other vertebrates, so large gaps still occur in specimen collection, mapping, and behavioral and

ecological studies. Some of these species are listed as endangered (IUCN, 2021). Some of these threats include habitat loss and change, encroachment, destruction of their ground nests, logging, pollution, farming, and persecution.

9.4: The Birds

Kenya has one of the richest avifauna diversities in Africa, with around 1,100 bird species recorded. Of these, about 800 species are year-round residents, 60 species are afro-tropical migrants moving within the continent, and 170 are Palearctic migrants that journey from Eurasia each winter. The major migratory flyways in Kenya include the 550km long coastline with its associated creeks, reefs, beaches, and lakes stretching along the Rift Valley from Turkana in the north to Magadi in the south. Some 170 Palearctic migrant bird species migrate south to Kenya from Eurasia for the northern hemisphere's winter. Eleven of these species have local breeding populations that are year-round residents. Around 60 species in Kenya migrate only within Africa, including Madagascar. Four globally recognized Endemic Bird Areas (EBAs) are represented in Kenya (Stattersfield et al.,1998). One other EBA, the Jubba and Shabeelle valleys, is only marginally represented in Northern-eastern Kenya. EBAs are defined as places where two or more bird species with a world distribution of fewer than 50,000 km2 occur together. Kenya has three globally recognized secondary areas of importance; Kakamega, Nandi forests, and the northern Kenya short-grass plains.

9.5: Fish

The distribution of fish in Kenya's drainage systems is determined by the size of the aquatic basin, diversity of aquatic habitats, the ability of fish to disperse, temperature, food availability, depth, and water movement. Swamps and river habitats are also important dryland biodiversity conservation centers. Kenya is known for its high endemism of freshwater fishes, totaling thirty-six (36) endemic fish species. There are over 355 species of freshwater fishes in Kenyan lakes and rivers, of which 332 are confirmed present, 18 species have been introduced, 15 recorded as possibly present, while 8 have expatiated. Presently several fish species are listed threatened by the IUCN Red-list of threatened species (IUCN, 2021).

9.5.1: Invertebrates Diversity

Kenya has over 25 000 species of invertebrates, with some yet to be described. Insects are the most diverse group of animals. Some of the major species listed for Kenya include about 9000 beetles, 900 butterflies, 500 bees, 650 ants, and 60 thrips species. Insects include flies, wasps, bees, beetles, bugs, mantids, crickets, grasshoppers, ants, termites, lice, fleas, moths, and butterflies. Some 900 species of bees are estimated in Kenya. Farmers poorly understand most species except the honey-bee(*Apis mellifera).* The richest bee habitats in Kenya include the Kakamega forest, where over 240 bee species

have been documented, and the coastal forest and savannah ecosystems. Over 90 species of bees have been documented in Nairobi City Park. The Montane/Kenyan Dancing Jewel *(Platycypha amboniensis)* is the only listed insect species and is listed as critically endangered (IUCN, 2021). The species belongs to the African Damselfly and in the family chlorocyphidae, which has about 10 species. The species is endemic to the montane forest streams of the Aberdares and Mt. Kenya and only found between 1600 and 2000M above sea level. The species is critically in danger of extinction due to severe habitat loss and degradation. Table 2-9 gives a summary of the invertebrate in Kenya.

Table 2-9: summary of some of invertebrates' species in Kenya

Invertebrate	No. of species present
Dragonflies	194
Bees	800
Butterflies	900
Molluscs	294
Crustaceans	343
Corals	183
Total	2717

Source: *Kenya's Biodiversity Atlas 2015*

9.6: Plant species diversity

Kenya's plant biodiversity richness and abundance are enormous. There are over 7,004 species of plants and 766 species of bryophytes, 511 ferns, and 2,071 species of fungi and lichens in Kenya (GoK, 2015).

Of the 7,004 plant species found in Kenya, 577 (some 8 percent) are endemic.

IUCN has classified 356 vascular plant taxa (species, subspecies, and varieties) in Kenya for Conservation of Nature (IUCN) as Threatened or Near Threatened. The threatened species are prevalent in the Fabaceae, Euphorbiaceae, and Rubiaceae families; of these, 24 taxa (21 species) are Critically Endangered, 111 are Endangered (83 species), 167 are Vulnerable (128species), and 67 are Near Threatened (56 species). The main hotpot loss areas are the coastal forests such as the Arabuko Sokoke National Park and the *Kaya* forests.

Occurrences of serious threats to plant biodiversity have been observed from both natural and anthropogenic sources both in the protected and non-protected areas. Some of these include destruction of habitats, unsustainable over-harvesting of the plant products by the local communities, land fragmentation and clearing for agriculture and settlement, pollution, invasion of habitats, especially freshwater ecosystems by invasive species, among other environmental challenges. For example, the tick-berry *(Lantana camara*) has invaded Nairobi and Oldonyo Sabuk National Parks, forming dense, bushy undergrowth that inhibits natural vegetation from flourishing (GOK, Natural Capital: Biodiversity Atlas, 2015).

9.7: Below-Ground Micro-Organisms

Biodiversity conservation actions have primarily focused on above-ground species. Though the soil comprises a large proportion of the world's biodiversity, the below-ground ecosystems that play a central role in nutrient and water capture and recycling—on which plant production depends—have been poorly studied. The rich biota includes microbial fauna made up of fungi, bacteria, and protozoans; mesofauna made up of taxa such as nematodes, mites, ants, and collembolans; macrofauna made up of taxa such as arthropods and earthworms; and megafauna made up of vertebrates such as rodents, moles, and lagomorphs—rabbits and hares. Only in the past two decades has research focused on the richness and ecosystem services of below-ground biota. The conservation status of most invertebrates and micro-organisms is poorly known due to a large number of species and paucity of surveys. However, great interest in accessing microbial resources for research and development leading to commercialization of resulting products has been recorded recently.

9.8: Wildlife Conservation Areas

Wildlife Conservation Areas are important ecosystems because they inhabit large assemblages of biodiversity and, therefore, a major tourist attraction. Its management, protection, and conservation is key to the country's economic performance and national heritage. Wildlife Conservation Areas in Kenya include a) National Parks, b) National Reserves, c) National Sanctuaries, and d) Wildlife Conservancies and Forest Reserves. Figure 1-9 shows the wildlife conservation areas in Kenya.

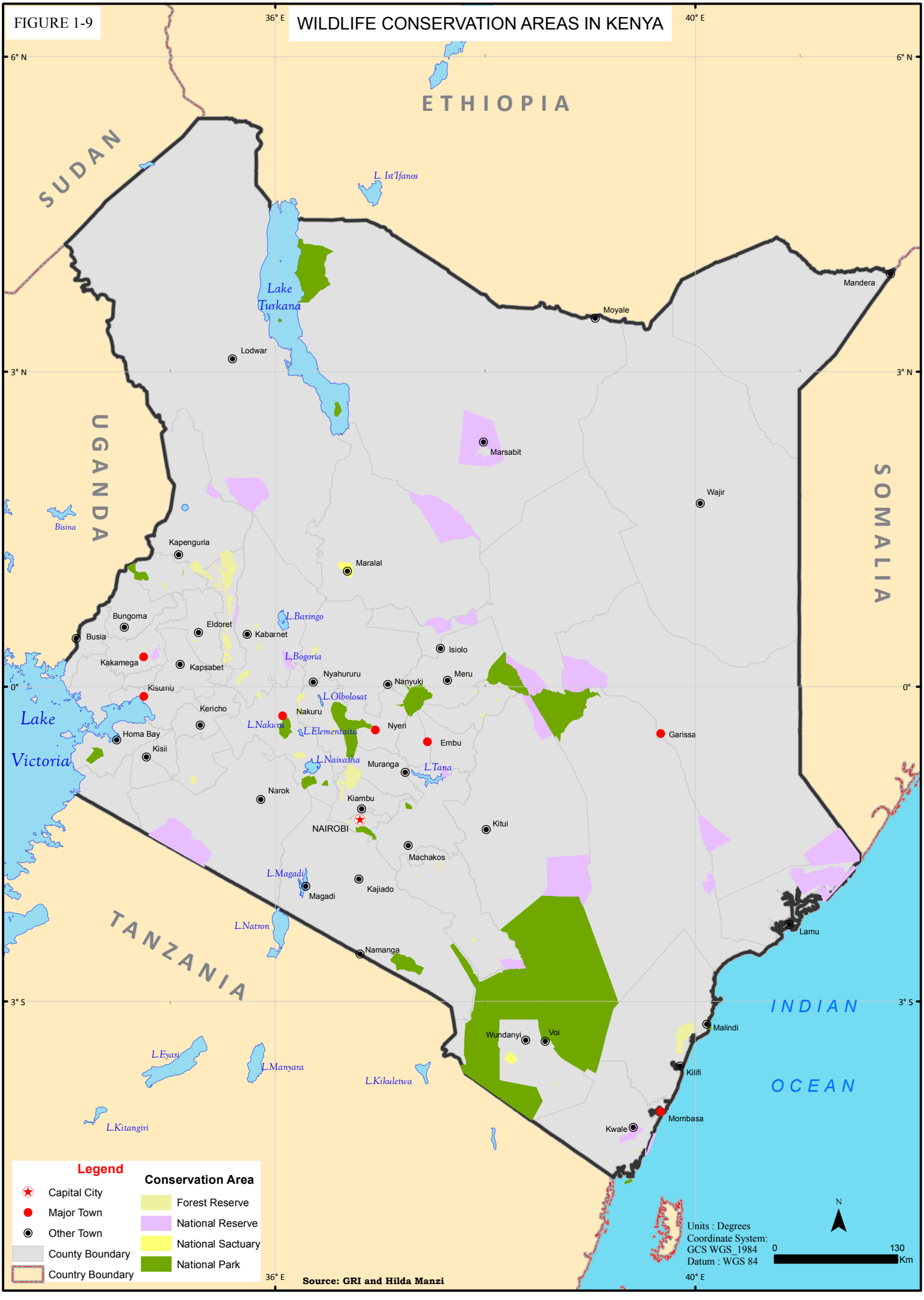
Kenya Wildlife Service conserves biodiversity through protected area systems which cover 8% of the Kenyan landmass, and they include the National Parks (23), National Reserves (28) National Sanctuaries (5), Marine Parks (4), and Marine Reserves (6) as shown in Figure 55 for the duration 2015 -2017.

The numbers and acreage of the wildlife areas protected as National parks, National reserves, and national sanctuaries remained generally unchanged in the last two years. However, the numbers and acreage of the wildlife areas managed as community and private wildlife conservancies increased with more communities and private landowners committing their land for recognition and registration as wildlife conservancies. Among the landowners with land registered as wildlife conservancy include 20 000 acres under the ILRI facility in the Athi -Kaputiei plains in Machakos.

The 2,000-acre Government land under the Sheep and Goat Research Facility adjacent to the Nairobi National Park on the southern boundary was designated a wildlife area to be part of the National park to create connectivity for wildlife dispersal between the park and the Athi –Kaputiei plains. Title Deed for the land was awarded to the Nairobi National Park, thus securing the much-needed space for wildlife to support wildlife conservation within Nairobi National park and the Nairobi- Athi Kaputiei landscape.

FIGURE 1-9

WILDLIFE CONSERVATION AREAS IN KENYA



Source: GRI and Hilda Manzi

9.9: Terrestrial Parks and Reserves

9.9.1: Status of National Parks

To achieve 'in-situ' conservation of biodiversity, Kenya has a well-established National Park system where the diverse ecosystems, habitats, and wildlife are represented and managed directly by Kenya Wildlife Service. Presently, Kenya has 24 terrestrial National Parks, which are distributed in 17 Counties. These parks occupy an area of 29,504Km2 that is approximately 5.08% of the total area of Kenya. Tsavo East and Tsavo West National Parks, including the Tsavo National Road and Railway Reserve- cover 71.2% of the area occupied by all National Parks. It is followed by Kora (6%), Sibiloi (5.3%), and Malkamari (3%).

During this reporting period, the parks received 2,055,667 visitors. Lake Nakuru National Park recorded 422,883 visitors (20.57%) followed by Nairobi National Park 306,615 visitors (14.92%), Hells Gate National Park with 304,212 visitors (14.80 %) and Amboseli National Park with 218,987 visitors (10.65 %). Tsavo East and Tsavo West combined had 273,592 visitors (13.31 %).

UNESCO designates Amboseli and Mt. Kenya as Man and Biosphere Reserves (MAB). UNESCO equally designates Tsavo East and West and Central Island as World Heritage Sites while Aberdares, Mt. Kenya, Chyulu, and Mt. Elgon are National Water towers. Sibiloi hosts Koobi Fora, which is regarded as the cradle of Mankind. All the parks are required by law to have a management plan that is gazetted. Presently only Amboseli, Mpunguti (Kisite-Mpunguti), and Marsabit have gazette management plans. The rest are at various stages of development. In addition, all of them have legal notices of their gazettement, while a number of them have title deeds. The management plans will form the basis of evaluating the state of conservation areas. The WCMA, 2013 requires that the managers will give a compliance report of the management plans every year. The use of fences was considered a strategy to reduce human-wildlife conflict during this period and was undertaken in several parks. However, in certain areas, notably Tsavo East and Meru; Electric fences were constructed inside the Park to create Rhino sanctuaries, while the Meru one was an extension of the existing sanctuary.

9.9.2: Status of National Reserves

There are 31 terrestrial National Reserves in Kenya, occupying 17,358.8km2, 3% of the country's total area. These Reserves are distributed in 21 out of the 47 Counties. Most of the National reserves are managed by County Governments with technical advice from KWS. However, Marsabit, Mt. Kenya, Mwea, Kakamega, and Shimba Hills are managed by KWS. There are seven Reserves, each covering an area larger than 1000km2. Mt. Kenya National Reserve is designated a UNESCO Man and Biosphere Reserve.

In contrast, Lake Bogoria National Reserve is designated a World Heritage Site as part of the serial listing of the Rift valley Lake System UNESCO World Heritage site. Lake Bogoria National Reserve is further designated as a Ramsar site. Apart from Marsabit National Reserve, none of the other Reserves presently has a gazetted Management Plan. However, the Management Plan for Lake Bogoria National Reserve was completed in the reporting period and is pending gazettement.

The lack of gazetted management plans, a legal requirement for all wildlife conservation areas, is a major impediment to development in the reserves and poses threats to wildlife conservation and management.

9.9.3: Status of Natural Forest Reserves

Kenya at present has 257 sites categorized as natural forests. They harbor a variety of wildlife species and are also water towers or water catchment areas. Some wildlife species are endemic to these forests. These natural forests fall under four key management regimes, namely; community forests (52 sites covering 180, 245 ha), forest reserves (201 sites covering 2,045, 406 ha), national monuments (3 sites covering 401 ha), and trust land (1 site covering 188,2017ha) with a total area of 24,142.59km2 which is 4.2% of Kenya's total area. These forests are important wildlife habitats. However, it's only in Mau, Aberdares, Mt. Kenya, and Shimba hills where comprehensive biological resource inventories have been initiated. Marsabit forest ecosystem management plan 2015-2025 is under legal notice No. 1894 of March 2016.

9.9.4: Status of National Sanctuaries

There are 5 National Sanctuaries in Kenya in Nakuru, Samburu, Kisumu, and Homa bay Counties. They cover12.47km2 of the country. These sites were designated as Sanctuaries for various reasons, amongst them: spectacular views and abundant birdlife; conservation education and rescue centers; or due to historical reasons. Lake Simbi, Ondago swamp, and Maralal National sanctuaries fall under the County Government land. Maralal town has encroached fully into the Maralal Sanctuary.

9.9.5: Status of Wildlife Conservancies

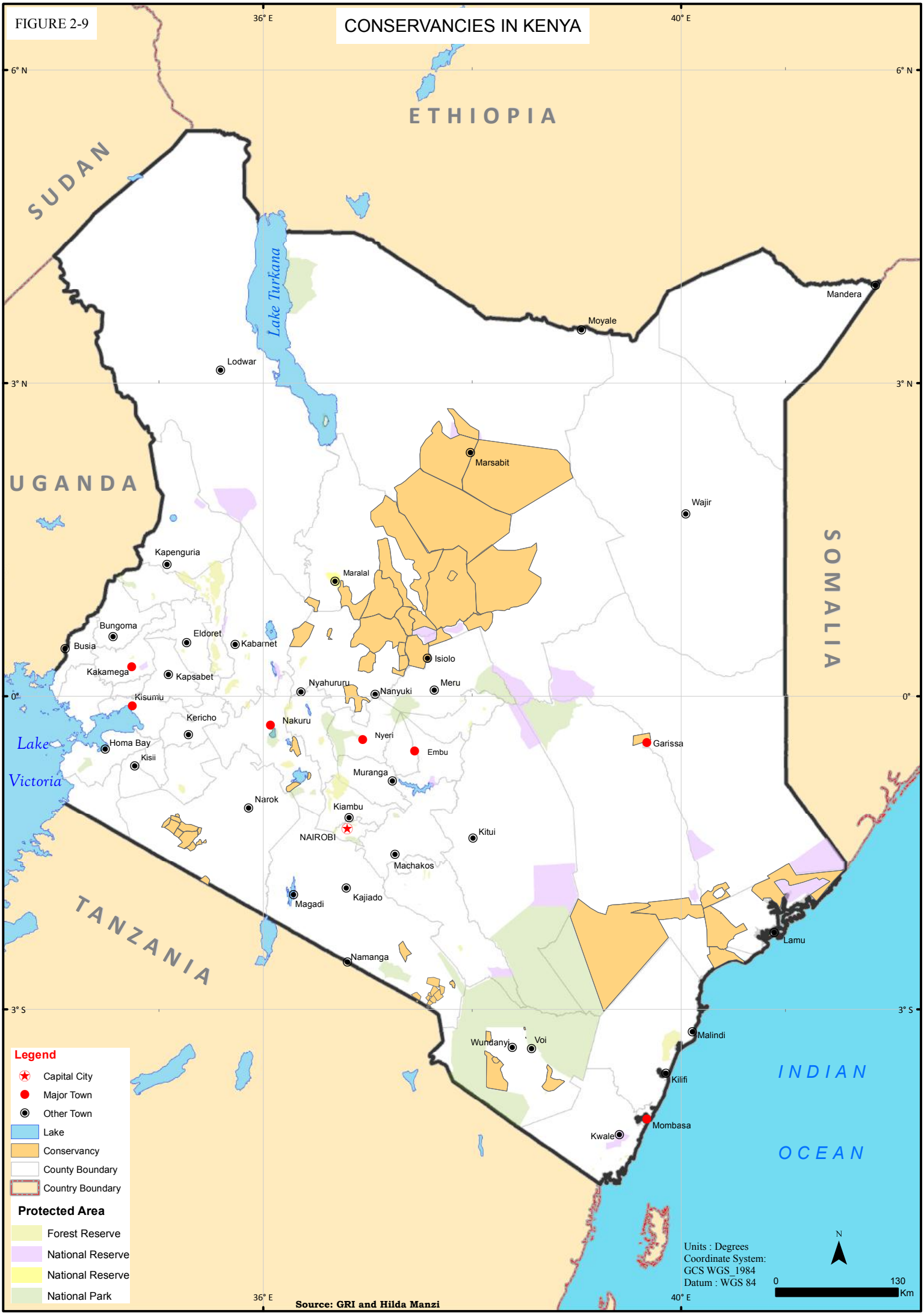
The WCMA, 2013 recognizes conservancies as a form of wildlife land use. Any person or community who owns the land on which wildlife inhabits may individually or collectively establish a wildlife conservancy or sanctuary in accordance with the provisions of the WCMA, 2013. According to the Kenya Wildlife Conservancies Association (KWCA), the first conservancies were established in the 1970s and have continued to grow in number and complexity. Currently, they have 160 conservancies registered with them in 28 counties, as shown in Figures 2-9 below. Of these, 110 are operational, 42 emerging, and eight proposed. Of these, 76 are on community land, 26 are formed by grouping together private lands, and 58 are on private individual

land ownership. The largest community conservancy in the country is the Melaka 5467Km2, followed by Malkahalaku conservancy, which covers 4800Km2and then Lokichar 4540Km2. (KWS report 2015-2017).

These conservancies are host to 90% of the global population of Grevy's Zebra and Hirola. They also support community livelihoods with over 707,460 households -1,809 non-uniformed staff, 2,991 rangers, and 206 staff employed by the regional association. The conservancies have administrative and management structures defined by their various umbrella associations. Thus, they are grouped based on areas of the region: Amboseli ecosystem, Athi Kapiti, Laikipia, Lamu, Masai Mara, Rift Lakes, Southern rangeland, Northern rangelands, Taita Taveta, Tsavo, Western and North Eastern. The associations deal with the governance, laws, policies, and regulations affecting the member conservancies. The Northern Rangeland Trust, the KWCA, and the Maasai Mara Wildlife Conservancies Association are the three largest umbrella Conservancy associations in Kenya (KWS, 2017).

FIGURE 2-9

CONSERVANCIES IN KENYA



Source: GRI and Hilda Manzi

9.9.6: Marine National Parks

There are 4 Marine National Parks distributed in Kilifi, Kwale, and Mombasa Counties. These are Kisite, Mombasa, Watamu, and Malindi Marine National Parks. They cover a total gazetted area of 54km2, with Mpunguti Marine Park being the largest while Malindi is the smallest. Kisite-Mpunguti Marine Protected Area Management Plan, 2015-2025, was finalized and gazetted through a gazette notice. no. 1896 of March 2016 (KWS, 2017).

9.9.7: Marine National Reserves

There are 6 Marine National Reserves in the counties of Lamu, Kilifi, Mombasa, and Kwale with a total acreage of 871km2 that are appendages of the National Marine Parks except for Diani Chale and Kiunga. Kiunga is the largest, followed by Mombasa, while Mpunguti is the smallest. Kiunga, Malindi, and Watamu Marine Reserves are internationally recognized as UNESCO Man & Biosphere Reserves (1978). Diani Chale Marine National Reserve is yet to develop a management plan while the rest have their management plans developed at various stages. Kisite-Mpunguti Management Plan was gazetted in 2016. Presently, the Reserves face various pressures, including illegal fishing by trawlers, pollution, especially by solid and plastic waste, dynamite fishing, climate change, and invasive species that undermine the health status of the Reserves (KWS, 2017).

9.9.8: Wildlife Trends and Distribution in the Rangelands

Kenya's semi-arid and arid areas make up the rangelands covering 80 percent of Kenya, supporting large free-ranging populations of wildlife and pastoralists. Ecological surveys of wildlife and livestock populations conducted in the Kenyan rangelands since the mid-1970s by the Directorate of Resource Surveys and Remote Sensing (DRSRS) show populations have fallen steadily (Ottichilo et al., 2000). The overall losses stood at 48 percent between the 1970s and 1980s, halved to 23 percent in the 1990s, and halved again to 11 percent in the 1990s and averaged 68.1% or 1.7% year in the 2000s (Ogutu *et al.,* 2016). The declines were most pronounced (64–88%) for, and therefore severely threaten the continued population viability and persistence of wildebeest, Giraffe, gerenuk, Grant's gazelle, warthog, lesser kudu, Thomson's gazelle, eland, Oryx, topi, hartebeest, impala, waterbuck and Grevy's zebra. The gravity of the declines is underscored by the facts that already by 2013, 7 species of large mammals, including Ader's duiker (*Cephalophus adersi*), the hirola or Hunter's hartebeest (*Beatragus hunteri*), Roan (*Hippotragus equinus*), and Sable (*Hippotragus niger*) antelopes, had been classified as critically endangered. Nineteen (19) species of mammals were rated as endangered, whereas 37 species of mammals were classified as vulnerable.

Most wildlife species in the Kenyan rangelands declined in 2019 compared with the population recorded in 2018. The decline is attributable to unfavorable weather conditions in the rangelands during the year and habitat conversion and loss resulting from human population expansion. The species whose populations remained stable during the period include Eland, Elephants, Gerenuk, Hunters Heartbeats, Waterbuck, and Grevy's Zebra. Grevy's zebra is listed on the Convention on International Trade as Endangered Species of Wild Fauna and Flora (CITES Appendices valid from 28 August 2020)

According to Kenya's Natural Capital Biodiversity Atlas, 2015; wildlife trends in Kenya rangelands indicate large losses in the last 30 years. The period the 1990s –2000s registered heavy declines in Grevy's zebra (74%), Kongoni (68%), Topi (65%), Eland (62%), and Oryx (49%), Burchell's zebra (43%), Hunter's hartebeest (41%), Giraffe (39%) 47and Impala (38%) populations. There were moderate declines in Grant's gazelle (29%), Warthog (28%), Waterbuck (16%), Lesser kudu (16%), and Buffalo (1%). There were positive increases in Elephant (2%), Gerenuk (3%), Wildebeest (16%), and Thompson's gazelle (38%) populations during the period (Ogutu et al., 2016).

Table 3-9 depicts the trends of species that have experienced particularly extreme declines in their population.

Table 3-9: Trends of Species

Species	1977 – 1980	2011 – 2013
Warthog	30,726	8,676
Lesser kudu	17,023	4,699
Thomsons gazelle	158,452	38,989
Eland	447,145	9,826
Oxryx	64,313	13,726
Topi	126,330	221,239
Hartebeest	42,977	6,837
Impala	171,016	27,124
Grevy zebra	14,447	1,874
Waterbuck	15,619	1,906

Source: *Ogutu, et al, 2016*

9.10: Threats and Challenges to Wildlife Conservation and Management

In Kenya, the human population has grown from 37.7 million in 2009 to 47.6 million people in 2019 (KNBS 2020). This increase in population has been a decline in land availability, especially in high and medium potential areas, and increased settlement in arid and semi-arid regions, which in most cases are wildlife inhabited areas. The emergence of irrigation agriculture and the opening up of infrastructure in the ASAL areas has acted as a population pulls effect. Such areas are now facing land subdivisions, and evidence of man's impact on wildlife is evident, including enlargement of agricultural land and the spread of invasive species with a record 212 alien species in the Mara ecosystem. There are human to wildlife conflict, and soil loss, especially in fragile lands, and changes in land use. The rapid population increase also comes with increased demands on natural resources, which negatively impact wildlife conservation. These include more demand on fuel resources (charcoal

and firewood) and building materials (poles, posts, and timber), extraction of water resources. It is manifested in areas such as habitat destruction and fragmentation, introduction and spread of alien and invasive plant and animal species, encroachment into wildlife areas, pollution, water abstraction, loss of wildlife corridors and dispersal areas, loss of native vegetation for exotic species, the proliferation of illegal harvesting and trade in wildlife and wildlife products.

9.11: Wildlife Migratory Routes and Corridors

Wildlife Habitat fragmentation and loss. As a result of the human population increase leading to encroachment into key wildlife habitats, the wildlife dispersal areas have shrunk, and others lost, resulting in fragmented areas. Connecting these habitat fragments is critical to allow the movement of wildlife and the flow of genes between populations for the survival of the species therein.

Wildlife migratory corridors are important because they connect core habitats and are critical for maintaining the ecological integrity of the protected area systems for species' survival and long-term viability of ecosystems. Kenya has major challenges in securing connectivity and dispersal areas to allow wildlife to move freely across landscapes while at the same time protecting other key land use activities such as agriculture, settlements, and infrastructure development.

Mapping of wildlife dispersal areas and migratory routes/corridors was done for eight keystone species – namely elephants, wildebeest, Burchell's (Common or Plains) zebra, Grevy's zebra, giraffe, buffalo, topi, and oryx selected mainly due to their migratory nature, foraging habits and (i.e., grazer, browser, and mixed feeder), their conservation status. It was one of the flagship projects in line with Vision 2030.

In the Southern Kenya rangeland ecosystems that comprise six contiguous sub-ecosystems, a total of fifty-eight (58) migratory routes and corridors were identified: Maasai-Mara ecosystem (17); Eburu Forest and Lakes Naivasha-Elmentaita-Nakuru conservation and ecological area (8), Athi-Kaputiei and Nairobi National Park (7), South Rift (8), Amboseli and west Kilimanjaro (8), and the Tsavo Conservation Area (10).

There are 52 migratory routes and corridors identified in the Northern Kenya rangelands and coastal terrestrial ecosystem that comprise the greater Ewaso ecosystem, South Turkana-Mt. Elgon ecosystem, northeast Kenya landscapes, and coastal terrestrial ecosystems. The majority of the migratory routes and corridors are found in the greater Ewaso ecosystem that occupies a vast area largely arid and semi-arid. It extends from Mt. Kenya and the Aberdare slopes Range in the southwest to the arid lowlands east of the Lake Turkana shoreline and Mt. Marsabit in the north. More salient routes and corridors used by other wildlife species also exist in the Kenya rangelands but were not considered and needed further investigation (Ojwang et al., 2017). Some of the major migratory corridors and routes mapped are illustrated in

Figures 3-9, 4-9, 5-9, and 6-9. Further details on the wildlife migratory routes and corridors as provided in the figures below.

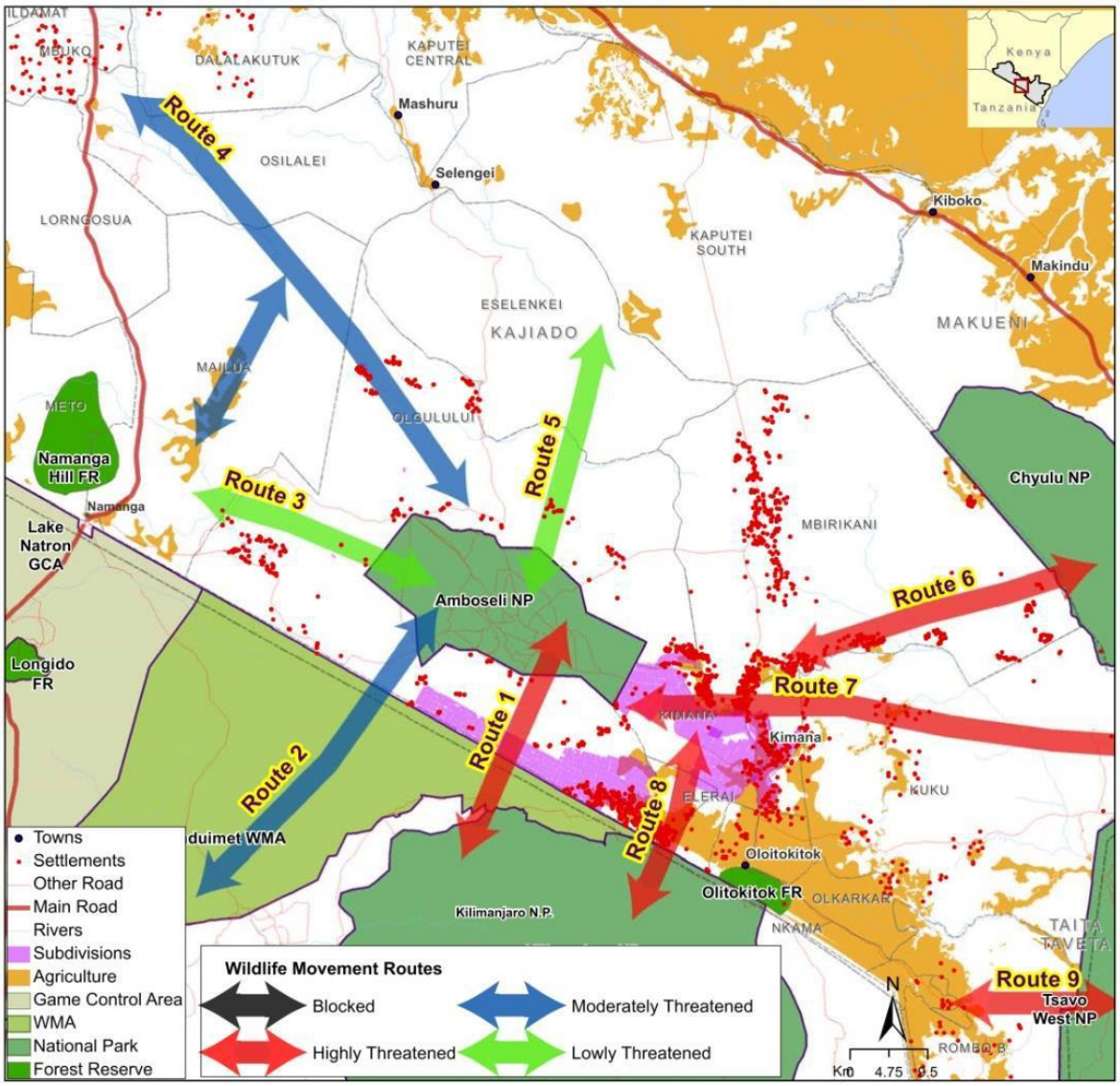


Figure 3-9: The Amboseli –West Kilimanjaro (Elephant corridor)
Source: *DRSRS/KWS 2017*

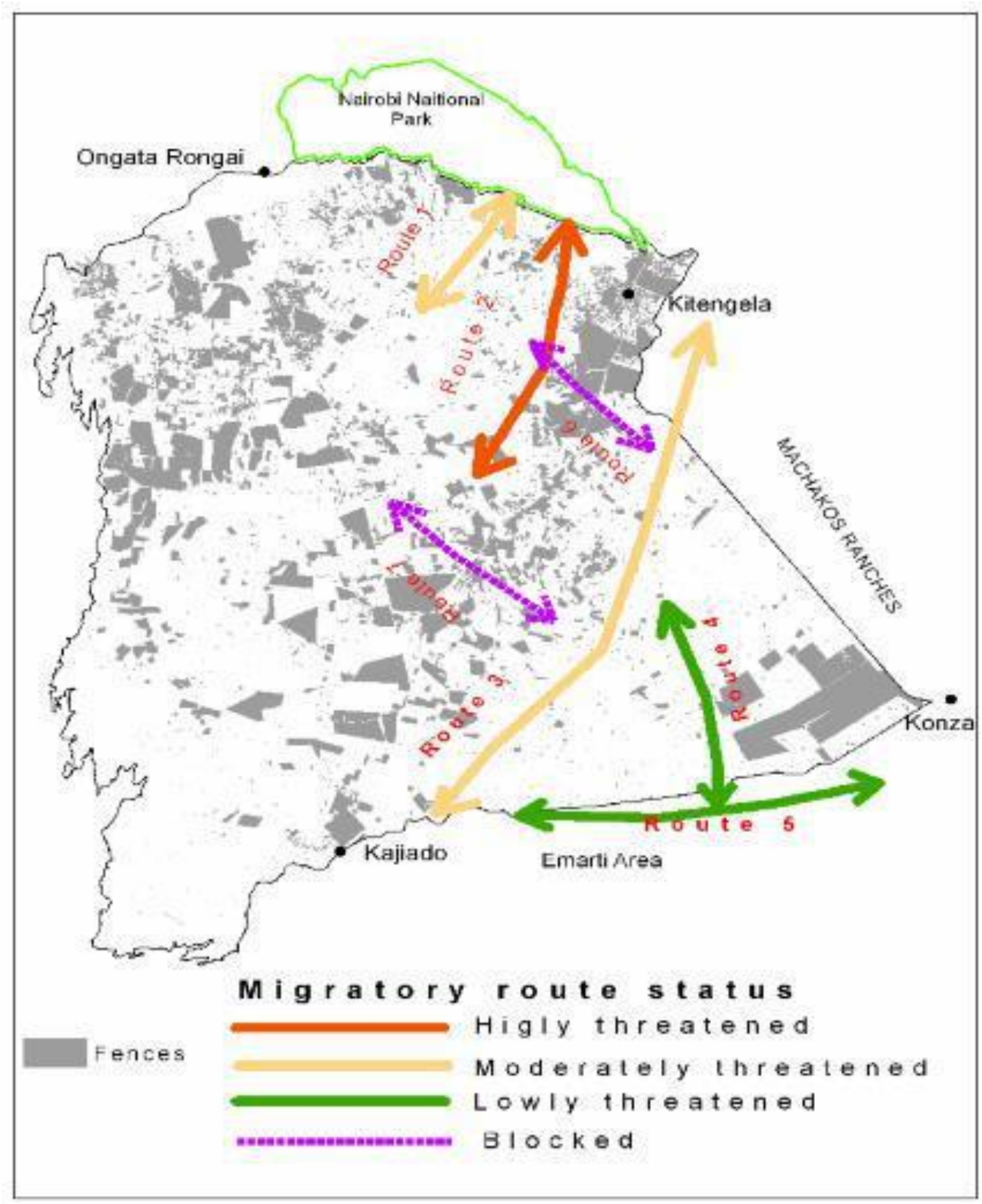


Figure 4-9: Athi –Kaputei (Nairobi-Kitengela) - Wildebeest Corridor
Source: *(DRSRS/KWS 2017)*

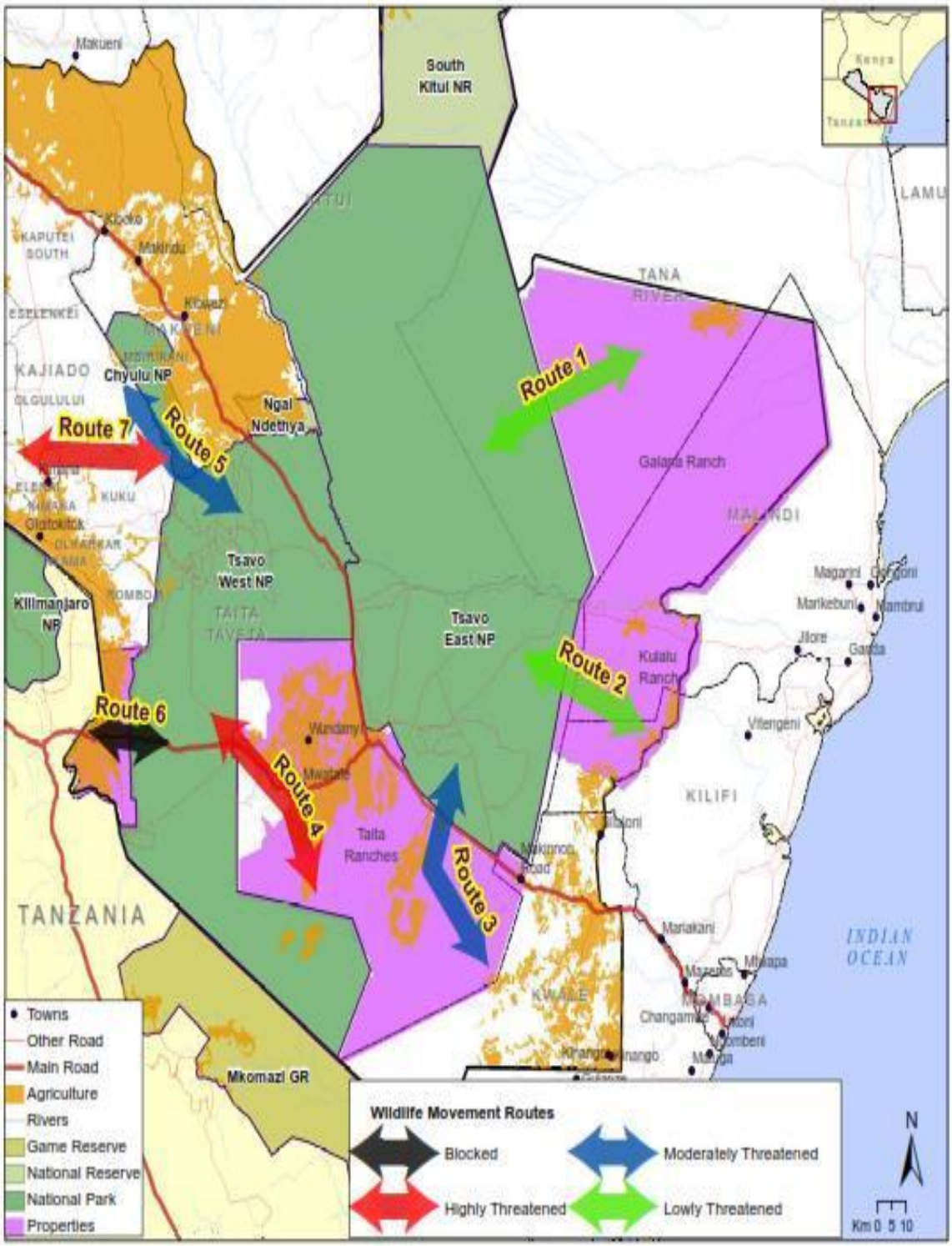


Figure 5-9: Tsavo-Mkomazi (Elephant corridor)
Source: (DRSRS/ KWS 2017)

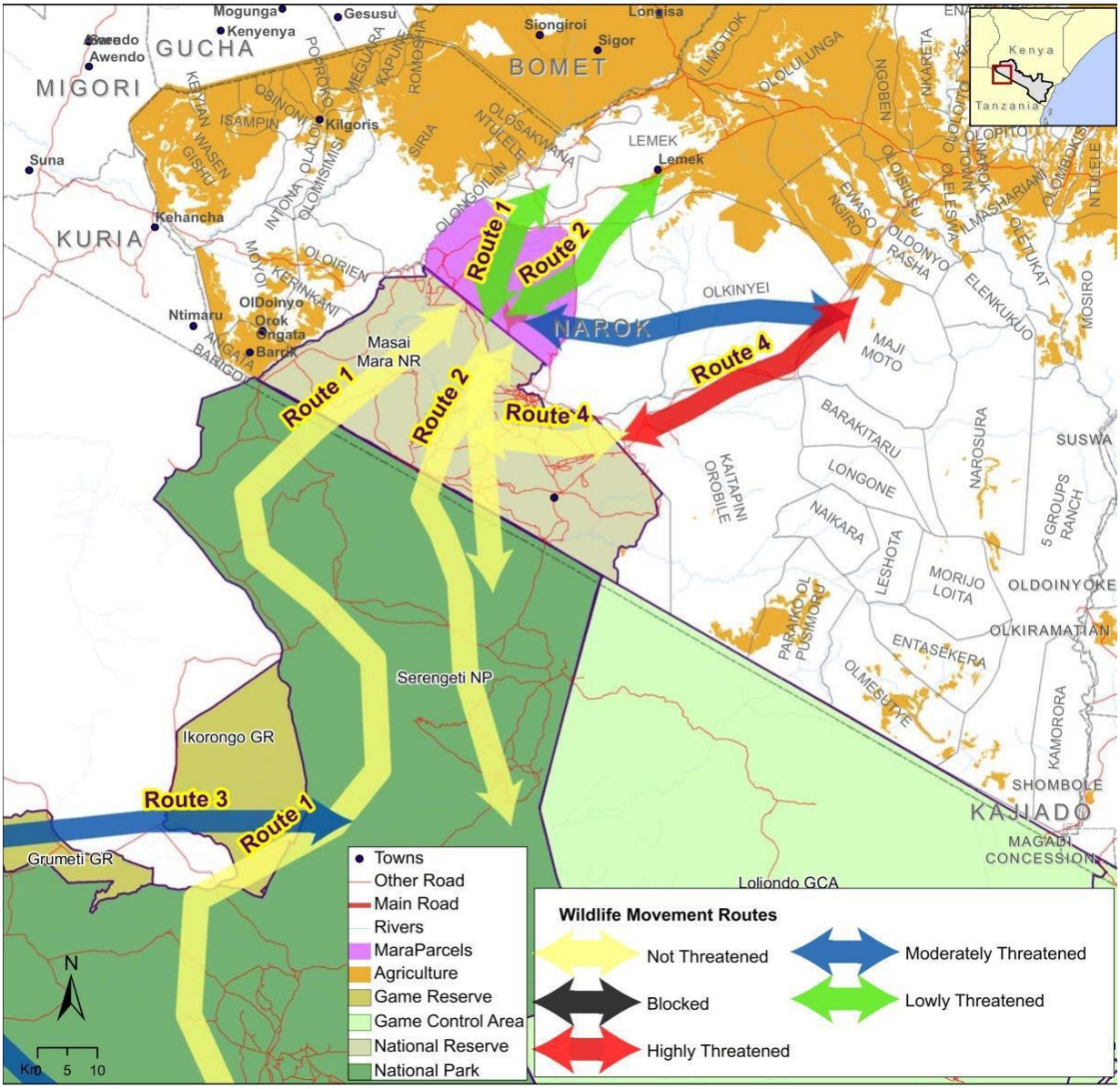


Figure 6-9: Serengeti-Mara- Wildebeest Migratory Corridor
Source: (DRSRS/KWS 2017)

The National Wildlife Conservation Status Report, 2015-2017 indicates that nearly all the wildlife dispersal areas and migratory corridors in the Kenya rangelands have been interfered with by human activities. Some are highly threatened or have been completely blocked. For example, the collapse of wildlife populations in the Athi-Kaputiei area and subsequent curtailment of their movement from the Kajiado plains into Nairobi National Park has been attributed to high-density settlements, fences, and subdivision along the Kitengela-Namanga highway.

The main threats identified in this report affecting habitat connectivity include incompatible land use in wildlife areas, including expansion of crop cultivation along the rainfall gradient, high-density settlements, fences, mining and quarrying, woodland clearing, wetland drainage, high-density livestock presence, and poaching. The rapidly escalating human population and high levels of rural poverty are mainly to blame; these are often

associated with land tenure and land-use change, sedentarization, sub-divisions, and habitat fragmentation.

9.11.1: Strategies for securing Wildlife Migratory Routes and Corridors

A multi-agency task force established in 2017 and coordinated by DRSRS, among other tasks, mapped the wildlife migratory routes and corridors in 2017. In this regard, the following broad recommendation strategies were advocated to address the threats and impacts on wildlife dispersal areas and migratory corridors;

- Developing, expanding, and implementing the proposed Conservation Connectivity Framework;
- Identifying, prioritizing, and securing wildlife dispersal areas and migratory corridors; Promoting an integrated land use for spatial planning taking into consideration biodiversity conservation;
- Reviewing policies and legislation; Rationalize and implement the policies, laws, and regulations related to land use, wildlife conservation, forestry, water, and agriculture;
- Promoting community participation in biodiversity conservation in decision-making;
- Programmes and initiatives that involve local communities; Sourcing and providing resources for conservation connectivity management;
- Carrying out regular monitoring and evaluation for effective management of wildlife dispersal areas and migratory corridors.

9.12: Human-Wildlife Conflict

Human-wildlife conflict is the interaction between humans and wildlife that negatively impacts the environment, social, economic, and culture. Human-wildlife conflict has emerged as a great challenge to wildlife management and a major threat to wildlife conservation, as shown in Figure 9-7. It is because wildlife habitats are confined to protected areas and extend into the community and private lands. The main reasons for the increased cases of conflicts are the increased human population leading to human encroachment into wildlife areas for agriculture, settlement, urbanization, and climatic changes.

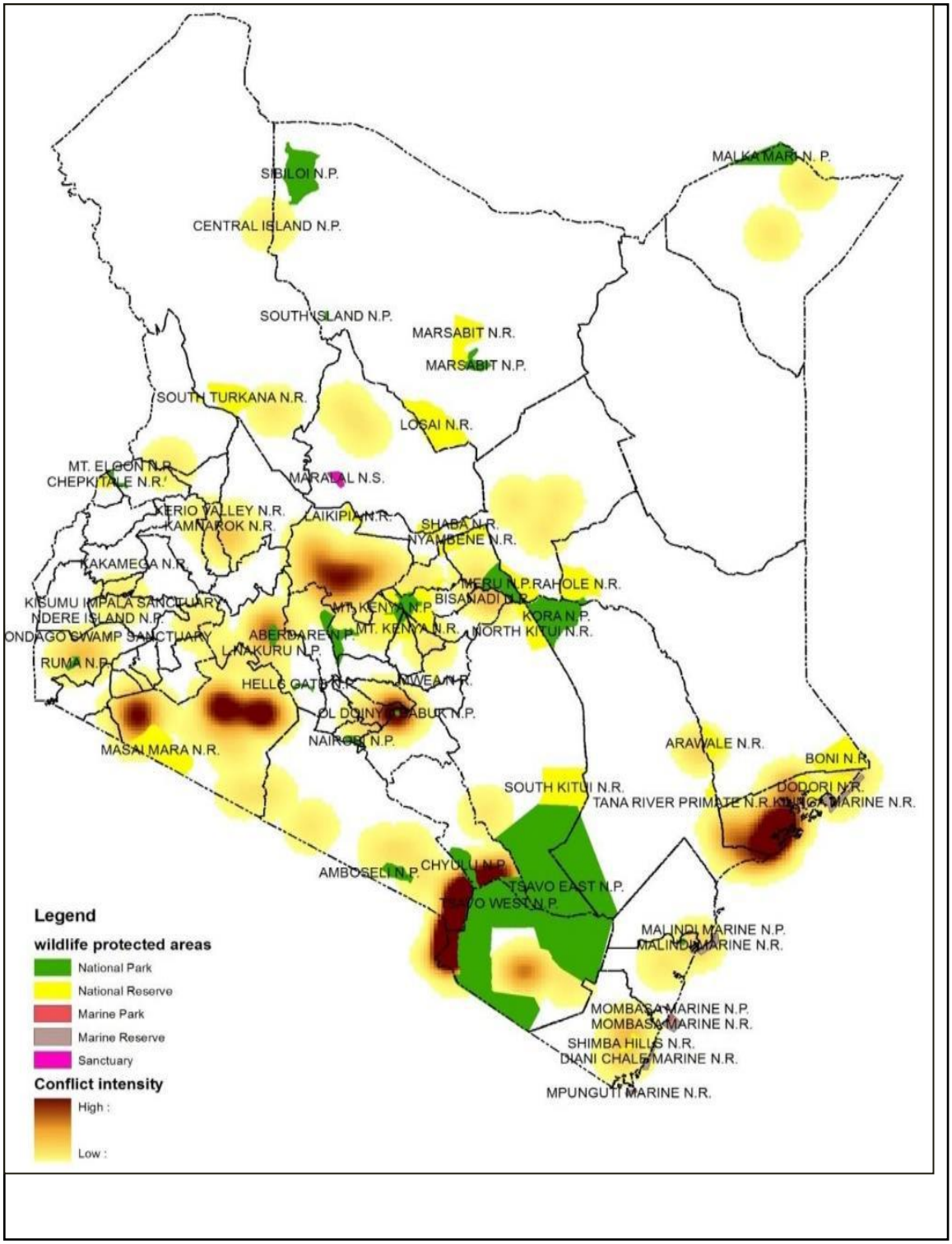


Figure 7-9: Map Showing Human Wildlife Conflict Hot Spots
Source: *KWS, National Wildlife Conservation Status report 2015-17*

As the Government agency mandated to conserve and manage Kenya's wildlife has collaborated with stakeholders, Kenya Wildlife Service employed several strategies to address the Human-Wildlife Conflict challenges. These strategies, among others, include the use of wildlife barriers such as electric and non-electric fences. Telemetry technology to monitor wildlife movements, establishment and modernization of a Problematic Animal Management Unit (PAMU) for deployment in human-wildlife conflict hotspots to manage the conflicts is another strategy. A Community support program on compensation for loss of property, human injury/death resulting from human-wildlife conflict. Concerning addressing human-wildlife conflict, the Government undertakes to promote human-wildlife coexistence.

9.13: Wildfires and impacts on Wildlife Protected Area system ecology

Wildfires are common in the Wildlife Protected Areas globally, leading to environmental degradation, including landscape destruction, soil erosion, nutrients depletion, biodiversity loss, ecosystems change (vegetation and habitats, with implications for fauna sustainability), and air pollution. These changes can remain for some months to several years. The ecosystem recuperation is vulnerability extends, resilience to disturbance, vegetation, topography, meteorological conditions, and human intervention depended (McKenzie, 2010). At a global scale, fires are a significant source of emitted carbon, contributing to global warming, leading to biodiversity changes.

Wildfires lead to changes in biomass stocks, alter the hydrological cycle with subsequent effects for marine systems such as coral reefs, and impact plant and animal species functioning. Smoke from fires can significantly reduce photosynthetic activity and be detrimental to humans and animals' health. The destruction of standing trees and dead logs on the ground has negative effects on most small mammal species, e.g., bats and cavity-nesting birds. Fires can cause the displacement of territorial birds and mammals, which may upset the local balance and ultimately result in the loss of wildlife since displaced individuals have nowhere to go. Loss of fruit trees results in an overall decline in bird and animal species that rely on fruits for food; this effect is particularly pronounced in tropical forests. Burned forests become impoverished of small mammals, birds, reptiles, and carnivores to avoid burned over areas. The reduction in densities of small mammals such as rodents can adversely affect the food supply for small carnivores. Fires also destroy leaf litter and its associated arthropod community, further reducing food availability for omnivores and carnivores.

Wildfire is a common phenomenon in Kenya's wildlife-protected area system of National Parks and reserves. Key areas that experience wildfires include the Tsavo National parks (Tsavo East and Tsavo West and Chyulu National Park in the Tsavo Conservation Area (TCA). Other significant areas include Shimba Hills National Reserve in the Coast Conservation Area, Mt. Kenya National Park and Forest Reserve, and Aberdare National Park in the Mountain Conservation Area. In addition, Ruma National Park in the Western

Conservation Area also experiences fires. Table 9-4 showcases the acreage burnt in Tsavo conservation in the period July-August 2020. Mt. Kenya National Park is a UNESCO-scribed World Heritage site. It is also a UNESCO inscribed Man and Biosphere Reserve due to its outstanding Universal values attributed to its unique biodiversity and other ecological characteristics. Tsavo National Parks is listed in the UNESCO Tentative List for inscription as a World Heritage site. Figures 9-8 and 9-9 shows areas affected by fire in Tsavo West and Tsavo East in July-August 2020, while Table 4-9 acreage burnt in Tsavo conservation for the same period.

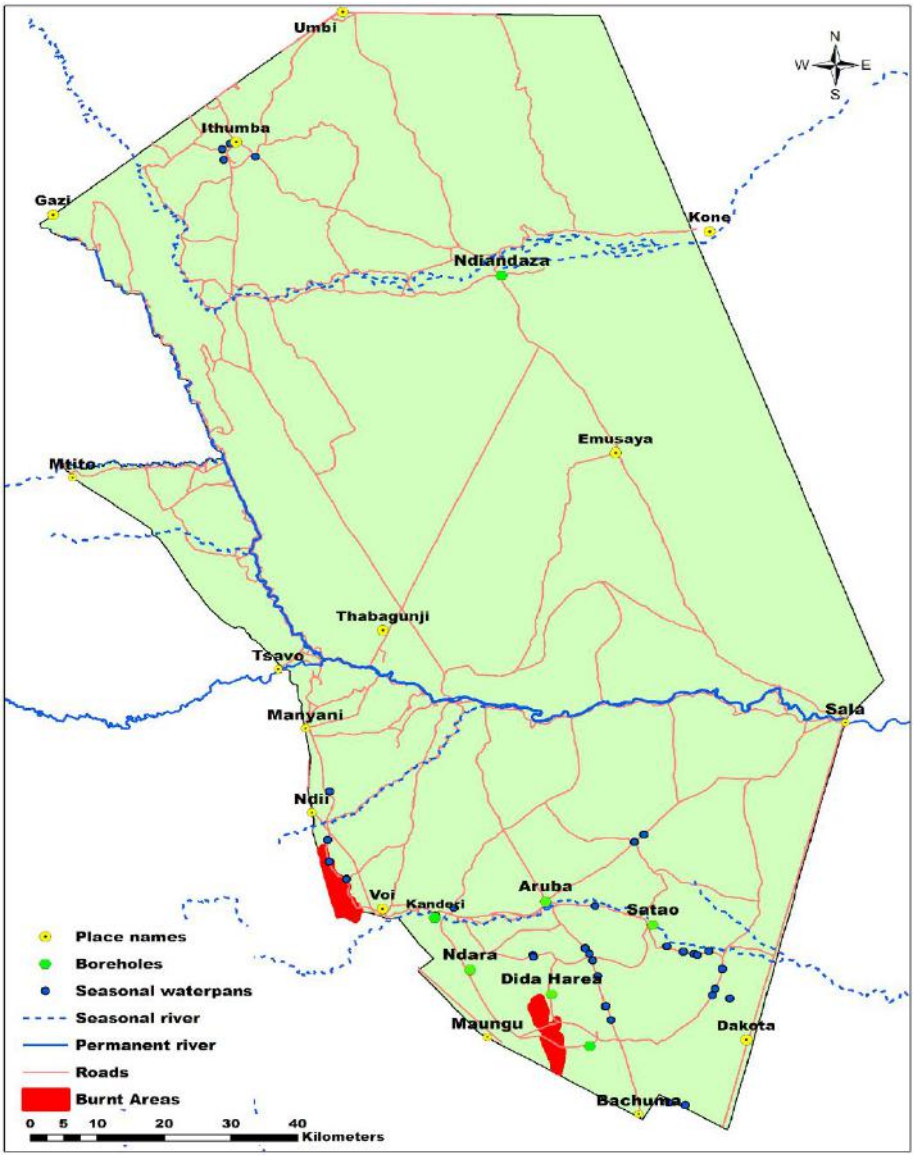


Figure 8-9: Areas Affected by Fire in Tsavo West
Source: KWS 2015 -2017 Report

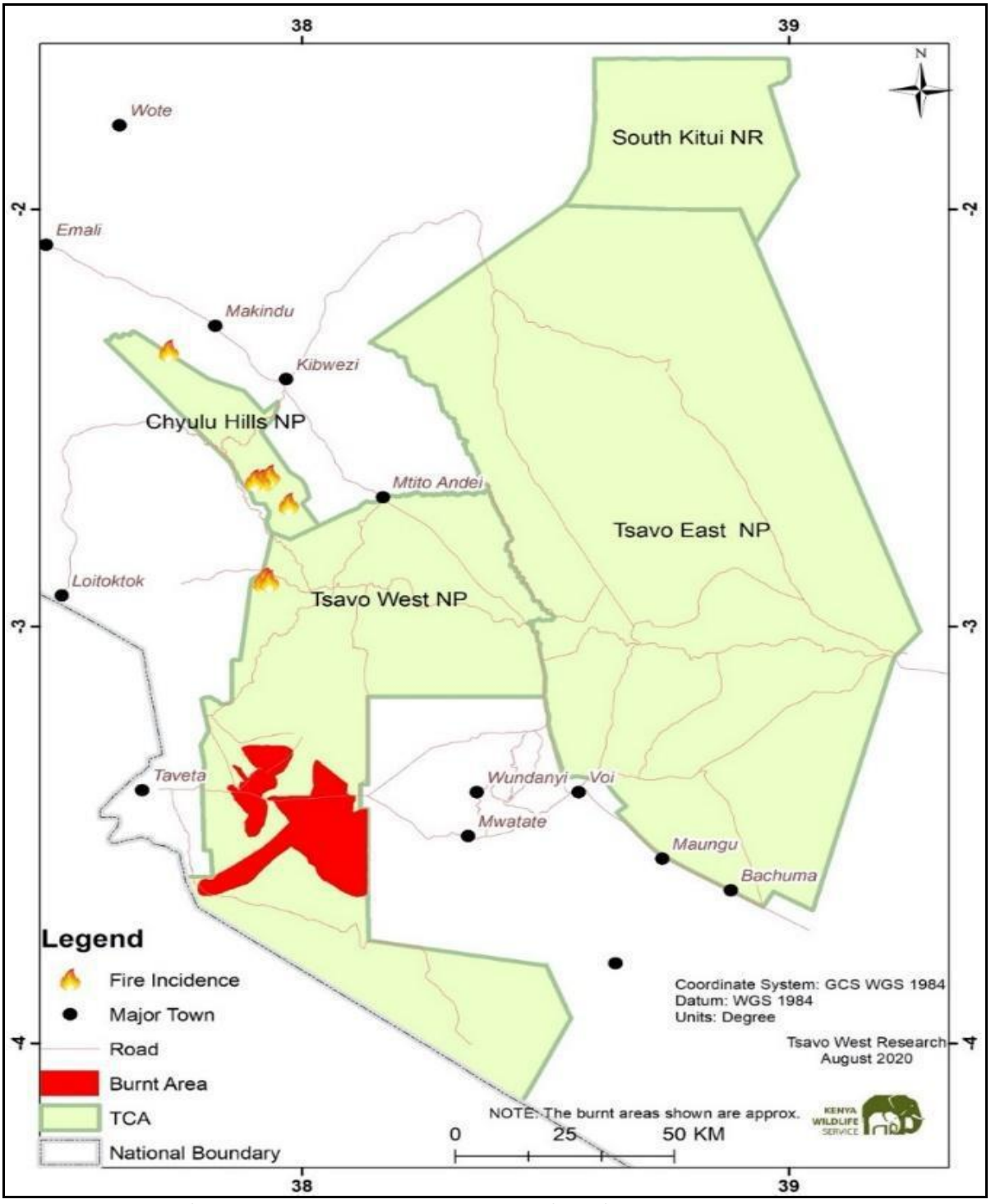


Figure 9-9: Fire locations in Tsavo East National Park
Source: KWS

Table 4-9: Acreage burnt in Tsavo Conservation Area, July-August 2020

Area	Acres	Hectares	KM²
Tsavo East National Park	13,272.50	5,372.19	53.72
Tsavo West National Park	145,390.24	58,837.34	588.37
Chyulu National Park	132	53.42	0.53
Taita Ranches	3596	1,455.25	14.55
Grand total	162,390.74	65,718.20	657.17

Fires and their impact have to be managed and should include social, economic, cultural, and ecological variables to minimize the damage and maximize the benefits (Rego et al., 2010). There is no consensus on how to manage fires in protected areas or outside them. The strategies to combat wildfires are divided into suppression strategies and prevention strategies. For the first half of the 20th century, complete fire suppression was a standard policy, and it still is in many National Parks of the world. Suppression policies have slowly changed, partly because of their cost, partly because they are inefficient, and partly because of changes in ecological thinking.

Fire suppression leads to the buildup of dead biomass in fire-prone ecosystems, which may produce more severe fires when they do burn. Fire suppression strategies are based on the idea of the application of fire to combat wildfires. It is an intentional application of fire to speed up or strengthen the fire suppression used by the local population. In uncontrolled wildfires, this technique is beneficial to extinguish them (Montiel & Kraus, 2010) but not to protect the land from wildfires. It is clear that fire suppression is not an adequate strategy for fire management from the ecological point of view - it is creating flammable landscapes (Bowman et al., 2011) with unknown and tremendous impacts on protected areas.

To some extent, in determining ecosystems, fire is an important ecological element in managing the protected areas. It is important to let natural fires burn and manage the other areas with prescribed fire (Barber, Miller, & Bones, 2004). The recent fires in the Tsavo conservation area, in Mt Kenya National Park and Ruma National park, have impacted wildlife in those areas. It is clear that elephant, and possibly other wildlife species, the movement was affected by the fire. Elephants avoided the burnt area, possibly due to lack of forage or the fear of fire. Most of the forage plants for wildlife were destroyed by fire.

Fire Prevention strategies are much more advantageous in fire management, including fire with prescription and traditional burning. Fire with prescription considers the application of fire by firefighters to landscape management proposals. The prescribed fire is the application of fire under certain environmental conditions where it is usually confined to a plot and has management objectives.

The management of protected areas with prescribed fire is a great advantage in maintaining the natural fire regimens and protecting them from wildfire building firebreaks. Application of prescribed fire as a firebreak strategy may achieve over 70% of the effect of wildfires. The use of fire in protected area management has been progressively introduced, and the role of fire in protected areas has a positive relationship with management, forest health, and biodiversity. However, many efforts and research have to be done to understand the fire effects on sensitive and protected habitats. Figure 10-9 outlines the movement of elephants within Tsavo Landscape and fire-prone areas.

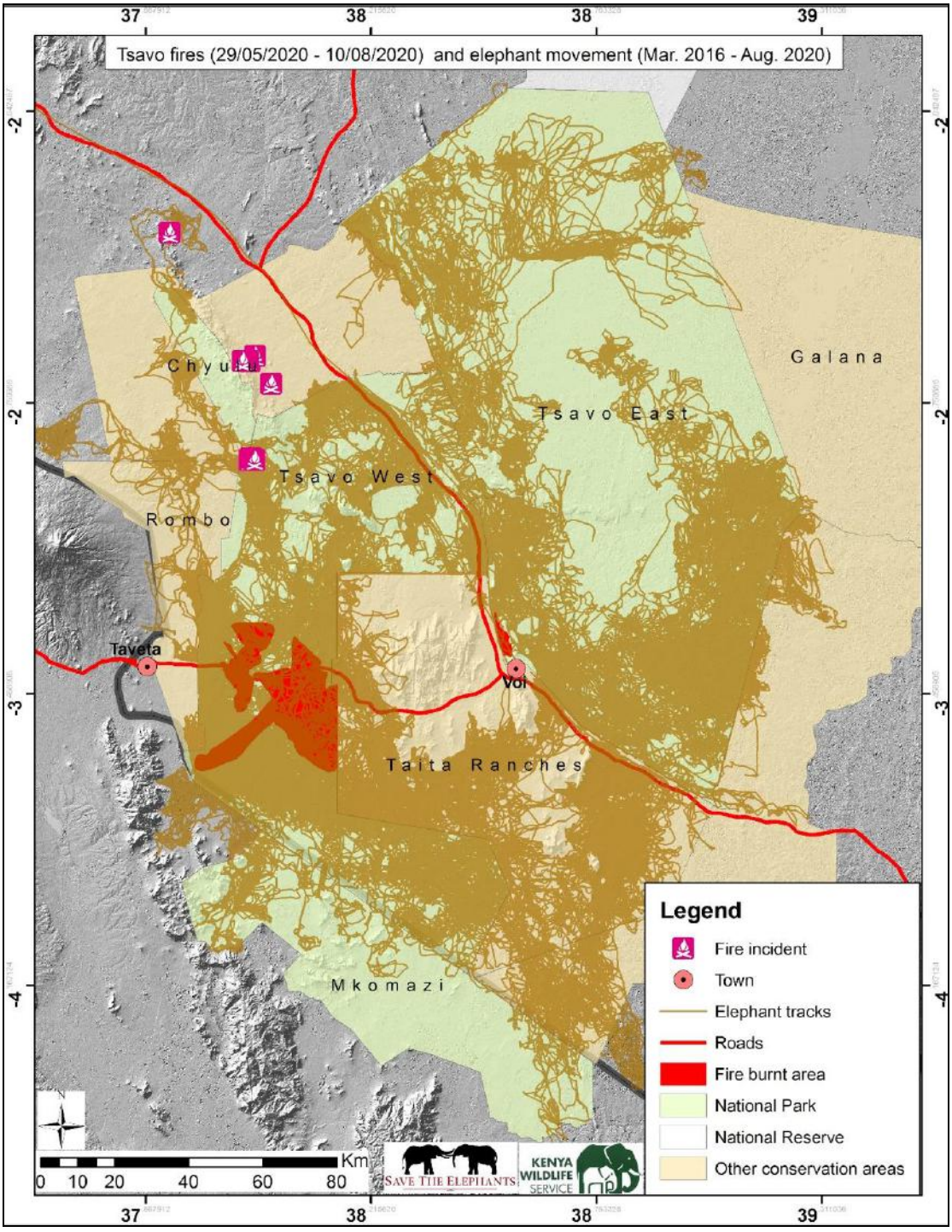


Figure 10-9: Collared elephant movement in Tsavo Landscape

9.13.1: Mitigation Measures

Putting up fire breaks along the wildlife protected area boundaries important. The fire breaks should be wide enough to stop the fire from getting into the wildlife areas and communities neighboring the parks.

There is a need to develop capacities to mitigate and control fire instances by leveraging partnerships with communities and stake holders adjacent to the Wildlife Protected Areas prone to fire for efficiency and functionality. Further, there is a need to develop a logistical fire management strategy in each wildlife conservation area, especially the Tsavo, Mountain, and the western regions prone to wildfires anchored around community partnerships for effective fire incidence reduction mitigation.

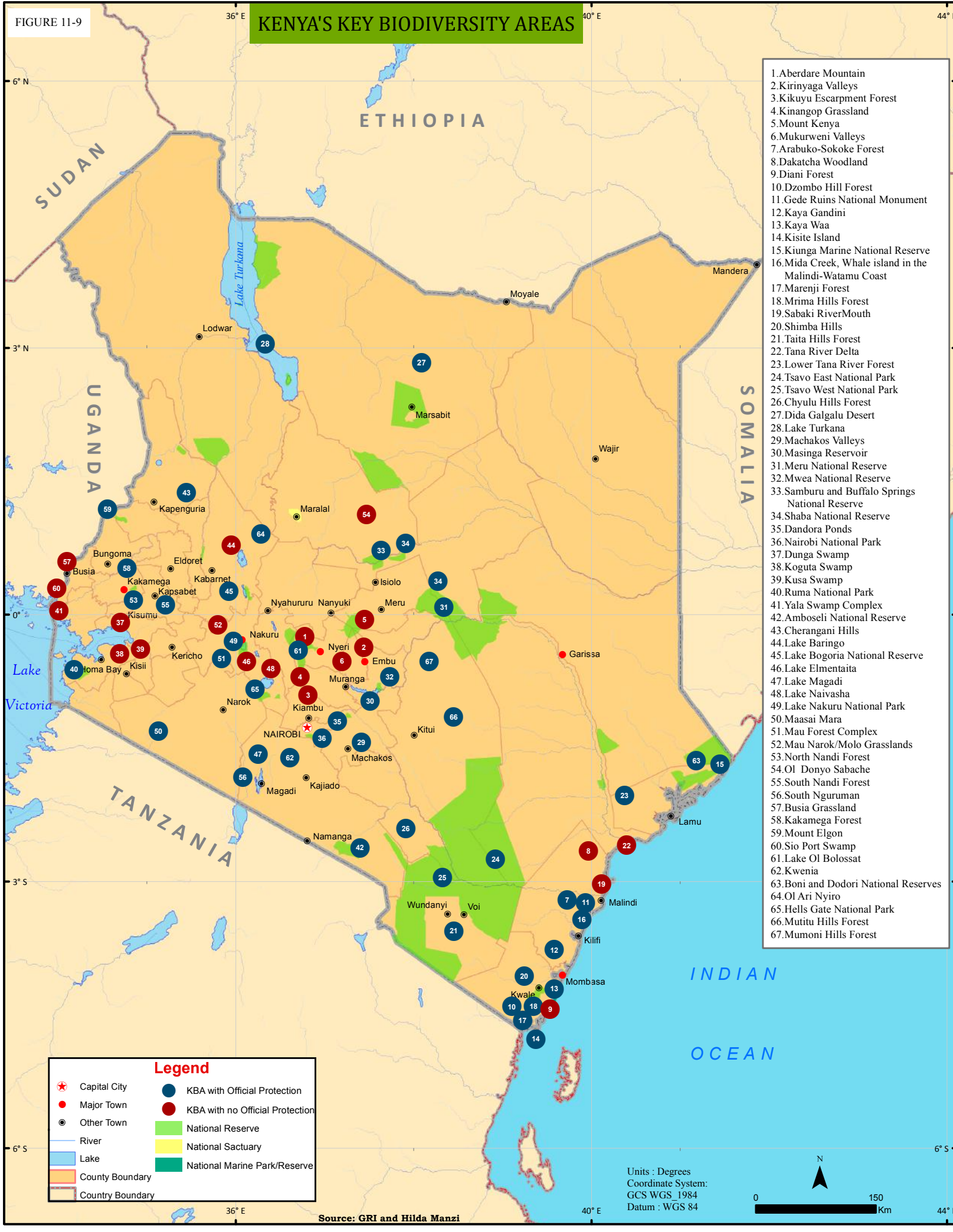
Recent technological advances in satellite imagery have led to a fire monitoring system (MODIS). The management should use the data generated over time in decision-making before and after fire outbreaks. There is a need to establish and support adequate budgets, Fire Fighting Zones, and response Units for each wildlife conservation area prone to wildfires to mitigate against fire outbreaks and restore the affected areas.

9.14: Key Biodiversity Areas (KBAs) Performance Assessment

Key Biodiversity Areas (KBA) are 'sites contributing significantly to the global persistence of biodiversity, in terrestrial, freshwater, and marine ecosystems, as shown in Figure 11-9 below.

FIGURE 11-9

KENYA'S KEY BIODIVERSITY AREAS



1.Aberdare Mountain
2.Kirinyaga Valleys
3.Kikuyu Escarpment Forest
4.Kinangop Grassland
5.Mount Kenya
6.Mukurweni Valleys
7.Arabuko-Sokoke Forest
8.Dakatcha Woodland
9.Diani Forest
10.Dzombo Hill Forest
11.Gede Ruins National Monument
12.Kaya Gandini
13.Kaya Waa
14.Kisite Island
15.Kiunga Marine National Reserve
16.Mida Creek, Whale island in the Malindi-Watamu Coast
17.Marenji Forest
18.Mrima Hills Forest
19.Sabaki RiverMouth
20.Shimba Hills
21.Taita Hills Forest
22.Tana River Delta
23.Lower Tana River Forest
24.Tsavo East National Park
25.Tsavo West National Park
26.Chyulu Hills Forest
27.Dida Galgalu Desert
28.Lake Turkana
29.Machakos Valleys
30.Masinga Reservoir
31.Meru National Reserve
32.Mwea National Reserve
33.Samburu and Buffalo Springs National Reserve
34.Shaba National Reserve
35.Dandora Ponds
36.Nairobi National Park
37.Dunga Swamp
38.Koguta Swamp
39.Kusa Swamp
40.Ruma National Park
41.Yala Swamp Complex
42.Amboseli National Reserve
43.Cherangani Hills
44.Lake Baringo
45.Lake Bogoria National Reserve
46.Lake Elmentaita
47.Lake Magadi
48.Lake Naivasha
49.Lake Nakuru National Park
50.Maasai Mara
51.Mau Forest Complex
52.Mau Narok/Molo Grasslands
53.North Nandi Forest
54.Ol Donyo Sabache
55.South Nandi Forest
56.South Nguruman
57.Busia Grassland
58.Kakamega Forest
59.Mount Elgon
60.Sio Port Swamp
61.Lake Ol Bolossat
62.Kwenia
63.Boni and Dodori National Reserves
64.Ol Ari Nyiro
65.Hells Gate National Park
66.Mutitu Hills Forest
67.Mumoni Hills Forest

Legend

- Capital City
- Major Town
- Other Town
- River
- Lake
- County Boundary
- Country Boundary
- KBA with Official Protection
- KBA with no Official Protection
- National Reserve
- National Sactuary
- National Marine Park/Reserve

Units : Degrees
Coordinate System:
GCS WGS_1984
Datum : WGS 84

N

0 150 Km

Source: GRI and Hilda Manzi

9.14.1: State, Pressure and Response of KBAs

Sixty-seven (67) KBAs have been monitored repeatedly to establish the pressure exerted on the habitats and species. The state of KBAs improved slightly in 2018 (Figure 12-9) from an average score of 0.94 in 2017 to an average of 1.40 in 2018. However, Kenyan KBAs are increasingly experiencing high pressure. Pressure scores increased from an average score of 1.90 in 2017 to a high of 2.57 in 2018. This increase is primarily attributed to proposed and ongoing infrastructure development projects (road, rail, power transmission lines, and pipelines). Unregulated resource extractions – for example, water abstraction from catchment areas –are key threats to these critical sites.

Furthermore, land-use changes – mainly forest land to agricultural expansion- have been highlighted to increase pressure on habitats, such as in Mau forest and Cherangani forest in the Central rift valley and Dakatcha Woodland coastal region, among others. The Response score increased marginally, from 1.42 in 2017 to 1.47 in 2018. The scores can be attributed to the deliberate action by the Government to ban the extraction of timber and other forest products and the focus on catchment forest restoration initiatives.

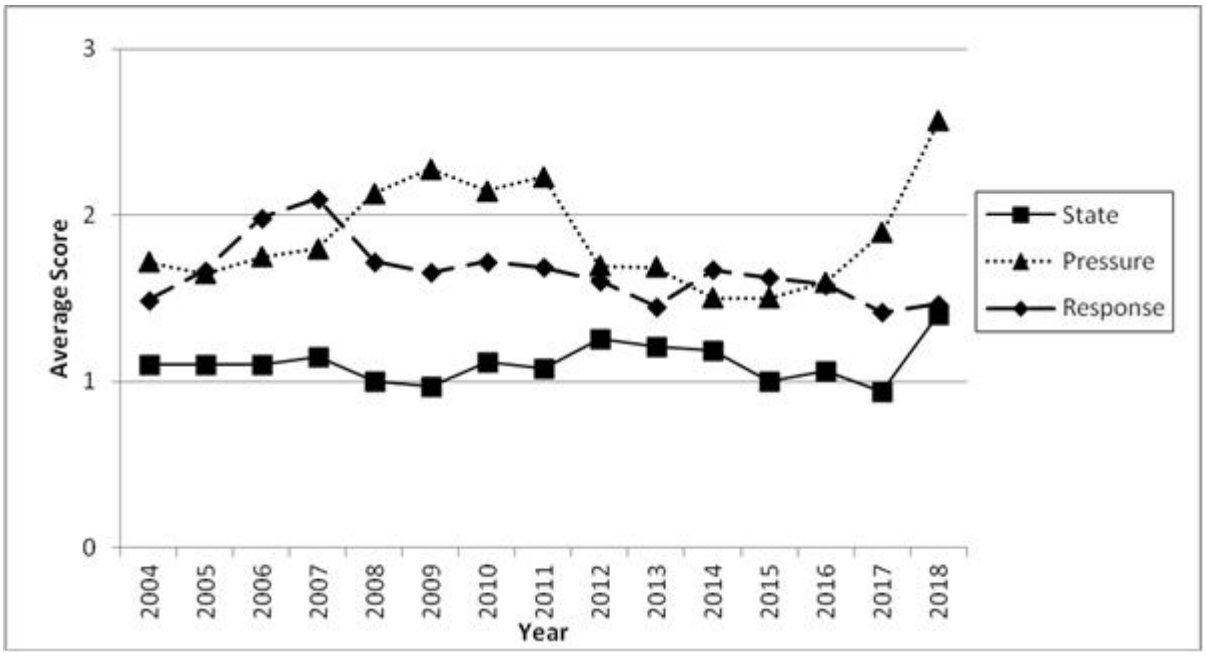


Figure 12-9: Performance trend on State, Pressure, and Response of 67 Key Biodiversity Areas

Source: *Nature Kenya Report 2019*

Out of the 67 KBAs, only five scored favorable status: Aberdare Mountains, Mwea National Reserve, North Nandi Forest, Sabaki River Mouth, and South Nguruman. Three KBAs, namely, Lake Ol 'Bolossat, Masinga Reservoir, and Mt. Elgon, reported a near favorable status. At the same time, the Taita Hills, Dakatcha Woodland, Kinangop Grassland, Kakamega Forest, Yala Swamp Complex, and Mount Kenya totaling 34 KBAs, recorded an unfavorable state. In addition, another 25 KBAs, including Shimba Hills, Kianyaga Valleys, Kaya Gandini, and Busia grassland, were very unfavorable.

Some of the critical threats profiled from the sites include:

- Land-use change, especially within KBAs that are not formally protected and located within private land
- Overexploitation, especially illegal logging, collection of eggs and poaching, charcoal burning, and wood carving
- Lack of legal protection leaving open access and target for conversion and encroachment
- Energy production (Geothermal expansion) and mining (for Rutile, Zicon, and Titanium), particularly prospecting of minerals and quarrying (for cement manufacturing) and industrial expansion near KBAs (Expansion of transport and energy (power line) Infrastructure and service corridors through or near KBAs (e.g., SGR)
- Climate change and severe adverse weather causing prolonged droughts, increasing risks to accidental wildfires, and limited mid-level vegetation and seedling regeneration
- Colonization by alien /or Invasive plant and animal species
- Pollution from untreated open wastewater and solid domestic and industrial garbage
- Agricultural expansion and intensification around KBAs and dispersal corridors
- Human-wildlife conflicts and wildlife poisoning

The response in conservation actions in KBAs increased slightly from 1.42 in 2017 to 1.47 in 2018. This positive rating is attributed to the improvement and continued commitment by the Government through the relevant lead agencies and collaboration with partners and stakeholders towards the conservation of wildlife habitats.

9.16: Invasive species

Kenya has had several invasions of alien species that negatively impacted biodiversity, agriculture, and human development. Studies show that 34 species have invaded Kenya: 11 arthropods, ten microorganisms, nine plant species, and four vertebrates (Kedera & Kuria, 2005), as shown in Table 5-9 below. Strategies for managing alien and invasive species have included quarantine measures for unintentional and intentional introductions, eradication, containment and control, monitoring and research, regional

cooperation, and public awareness. Cooperation, assistance, and capacity building are required to manage the problem of invasive species effectively.

Table 5-9: List of Invasive Species in Kenya

1. Arthropods			
Larger grain borer *Prostephanus truncatus*	1983	Pest of stored maize and cassava	Heavy post-harvest losses in maize; trade restrictions
Serpentine leafminer *Liriomyza trifolii* (Burgess)	1976	Pest of many horticultural crops	Crop losses and loss of overseas markets due to quarantine requirements
Western flower thrips *Frankliniella occidentalis* (Pergande)	1989	Pest of many flower crops, pulses and horticultural crops	Intensified use of pesticides; loss of crop and capital due to quarantine requirements
Cypress aphid *Cinara cupressivora*	1991	Cypress trees decimated	Degraded environment
Russian aphid *Diuraphis noxia*	1995	Barley and wheat production reduced	Less food, income available
Cassava mealybug *Phenacoccus manihoti*	1989	Reduced cassava production	Less food, income available
Leucaena psyllid *Heteropsylla cubana*	1992	Reduced fodder	Loss of capital
Citrus woolly whitefly *Aleurothrixus floccosus*	1970s	Reduced fruit production	Loss of capital
Purple tea mite *Calacarus carinatus*	1976	Reduction in tea leaf production	Loss of capital
Tomato russet mite *Aculops lycopersici*	1976	Reduced tomato production	Loss of capital
Louisiana crayfish *Procambarus clarkii*	1970	Reduction of flora and fauna, increased turbidity	Harvested by man
2. Micro-organisms			
Crown gall *Agrobacterium tumefaciens*	1995	Reduced production in roses	Loss of capital
Black Sigatoka *Mycosphaerella fijiensis*	1988	Reduced banana production	Less food, income available
Panama disease *Fusarium oxysporum f.* sp. *cubense*	1952	Reduced banana production	Less food, income available
Cassava mosaic disease ACMV (UgV) (*Begomovirus*)	1994	Reduced cassava production	Less food, income available

Maize streak disease (MSV) (*Geminivirus*)	1936	Reduced maize production	Less food, income
Fruit and leaf spot *Phaeoramularia angolensis*	1972	Reduced citrus production	Less food, income
Citrus greening disease (bacterial)	1972	Reduced citrus production	Less food, income
Barley yellow dwarf virus (BYDV)	1983	Reduced barley and wheat production	Less food, income available
Napier grass smut *Ustilago kamerunensis*	1992	Reduced fodder production	Loss of capital
Coffee berry disease *Colletotrichum coffeanum*	1940	Reduced coffee production	Loss of capital
3. Plants			
Water hyacinth *Eichhornia crassipes*	1989	Serious	Very serious
Water fern *Salvinia molesta*	1984	Serious	Serious
Prosopis julliflora.	1983	Serious	Serious
Wild garlic *Allium vineale*	1993	NA	Serious to horticultural farmers
Prickly pear *Opuntia* spp.	1940s - 50s	Out-competes native plants, precludes grazing and browsing near it	Poisonous, spines dangerous
Mexican marigold *Tagetes minuta*	Unknown	Minimal	Increased weed eradication costs
Lantana *Lantana camara*	1950s	Out-competes other vegetation	Poisonous to livestock, habitat for tsetse flies
Morning glory *Ipomoea* spp.	1960s	Grows over and out-competes other plants	Reduced pasture
Eucalypt *Eucalyptus* spp.	1939 - 45	Minimal, though some evidence it retards recruitment of native species	None
4. Vertebrates			
Nile perch *Lates niloticus*	1960s	Greatly reduced abundance of native cichlids	Economic boost to fishers, reduced catch of smaller species
House sparrow *Passer domesticus*	Early 1900s	Displacing local sparrows	Noisy, messes buildings with nests
Lovebird *Agapornis* sp.	19th century	Competing with local species for nest holes	Pests especially for cereals
Indian house crow *Corvus splendens*	1947	Displacing native species, kills fruit bats	Urban pest, damages crops, hazard at airport

Source: Kedera & Kuria, 2005

9.17: Governance of biodiversity

Several national policies, legislation, regulations, and guidelines as legal instruments for governance in the conservation and management of the country's biodiversity were developed or reviewed during the reporting period. Some of the existing key policy and legal documents considered for review included

- The Wildlife Policy of 1975 - Sessional Paper no. 3 on Statement
- The Wetlands Management Policy
- The Wildlife Conservation and Management Act, 2013
- The Environment and Management Coordination Act, 1999
- The Science, Technology and Innovations Act

The review and development of such instruments have been informed by the need for enhanced conservation and management of the country's biological resources. It is also driven by the need to domesticate as part of the national laws, provisions of the various biodiversity–related multi-lateral environmental agreements that the country has signed and ratified. Recently, the following policies were reviewed/formulated

1. The National Wildlife Conservation Strategy, 2030
2. National Wildlife Policy 2020, the Sessional Paper No. 1 of 2020.

Sessional Paper No. 1 of 2020 outlining National Wildlife Policy aims to create an enabling environment for conservation and sustainable management of wildlife for the present and future generations. It will be achieved by promoting access to incentives and sustainable use of wildlife resources while ensuring equitable sharing of benefits. Further, promoting partnerships and incentives for wildlife-based enterprises and facilitating collaboration for effective governance and financing of the wildlife sector between communities, private conservancies, counties, and national Government. It takes cognizance of the myriad of challenges wildlife conservation outside protected areas is facing. The cooperation of landowners is important for wildlife conservation in non-protected areas. Proper incentives are needed for land-use practices that tend to phase out wildlife, such as agriculture, to be minimized or confined to appropriate areas. To achieve this, the Government undertakes to promote wildlife conservation as a land-use option while providing incentives to support individuals, communities, and other stakeholders to invest in wildlife conservation and management. There is also the empowerment of landowners and communities in wildlife areas to participate effectively in decision-making on wildlife resources and benefit from using the resources.

Implementation of Biodiversity related Multilateral Environmental Agreements (MEAs)

Among the key biodiversity-related multilateral environmental agreements the country continued to implement with biodiversity governance implications are:

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

The main objective of CITES is the regulation of international trade in endangered species of wild fauna and flora through a system of Permits and Certificates.

Parties to the Convention are obligated for purposes of effective implementation of the Convention to formulate national laws that provide for:

- Designation of a CITES Management and 1or more CITES Scientific Authorities;
- Prohibition of trade conducted in violation of the Convention;
- Penalization of illegal trade
- Confiscation of specimens illegally traded or possessed

Kenya Wildlife Service is the designated CITES Management Authority for purposes of implementing the Convention. Kenya Wildlife Service and National Museums of Kenya are designated CITES Scientific Authorities to advise the Management authority on the status of CITES-listed species and issuance of trade permits for such species. The Conference of the Parties to CITES, a meeting of all signatory States to and the highest decision-making organ of the Convention, is held every three years for Parties to review progress in implementing the Convention and make decisions including amending species listing in the CITES Appendices. Parties make proposals for considering the Conference of the Parties for the amendment of the CITES listing and interpretation of the Convention. The decisions adopted by the Parties are binding. New measures for the implementation of the Convention are adopted through approval of proposals submitted by Parties to amend the listing of species in the Appendices of the Convention (Appendix I and II) and draft decisions and resolutions for better interpretation of the text of the Convention to enhance its implementation.

Kenya's submission of proposals to the 18th Meeting of the CITES Conference of the Parties held in August 2020 in Geneva, Switzerland, for inclusion of white-spotted Wedgefish; *Rhynchobatus Australia* and *R. djiddensis*, of Sea Cucumber, *Holothuria spp*, and Giraffe, *Giraffa spp*. to regulate international trade in specimens of the species and transfer Pancake tortoise, *Malacochersus tornieri* from Appendix II to Appendix I to control trade in wild-caught specimens were approved thus amending the CITES Appendices.

The Ramsar Convention on Wetlands

The Convention on Wetlands (popularly known as the Ramsar Convention), signed at Ramsar, Iran in 1971, provides the framework for national action and international cooperation to conservation and wise use of wetlands and their resources. The Convention covers all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and the wellbeing of human communities.

Contracting Parties commit themselves to promote the wise use of all wetlands in their territory through:

- National land-use planning, including wetland conservation and management,
- Promote training in wetland research, management, and wise use and
- Consult with other Parties on the implementation of the Convention, especially concerning trans-frontier wetlands, shared water systems, shared species, and development projects that may affect wetlands

Kenya ratified this Convention in 1990 to stem the loss and promotion of wise use of wetlands in the country. In recognition of the international importance of Kenya's wetlands to biodiversity conservation and management, six (6) sites; Lake Nakuru, Lake Bogoria, Lake Elmentaita, Lake Baringo, Lake Naivasha, and the Tana River Delta, have been designated Ramsar Sites. The conservation and management of the Ramsar sites are expected to be in accordance with the norms, standards, and guidelines prescribed under the Ramsar Convention, including providing to the Ramsar Secretariat, regular update Ramsar site Information Sheet) on the status of conservation of each of the sites designated as a Ramsar site.

During the reporting period, international concerns were raised by the Secretariats of Ramsar, Africa Eurasian Waterbirds Agreement (AEWA), and the World Heritage (WHC)

Conventions on the state of the ecological integrity of Lake Elmentaita as an Important Birds Area and habitat for migratory waterbirds following potential impacts of infrastructural development related to the construction of the high voltage 400kv Olkaria-Lessons – Kisumu overhead power transmission line to the birds and other biodiversity of Lake Elmentaita wildlife sanctuary Figure 13-9, below;

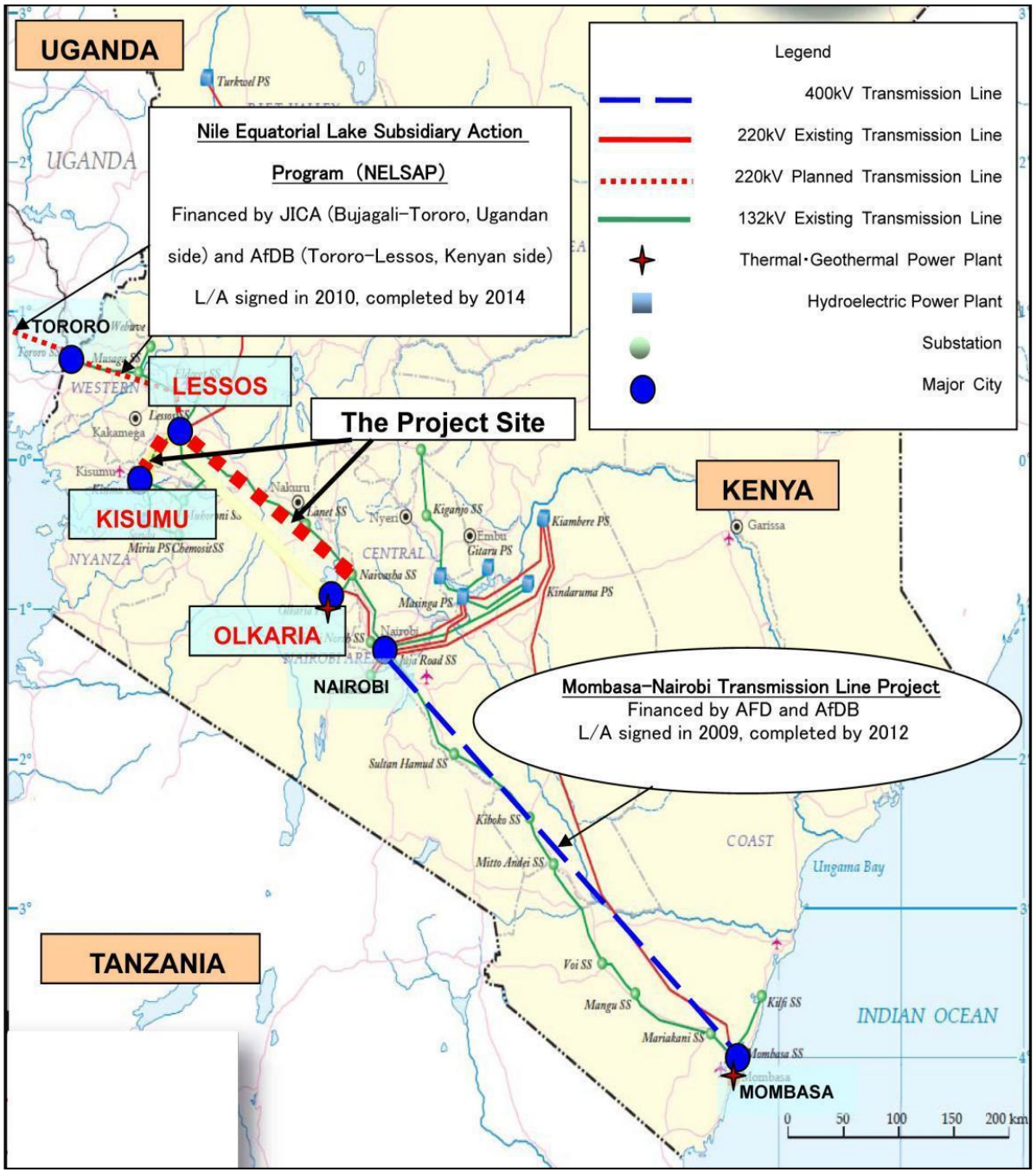


Figure 13-9: Map of the Olkaria-Lessos-Kisumu Line (in dotted red).
Source: MOE

This map also shows the existing 132 kV line that was commissioned in 1957. The Government was requested to invite a joint Mission of the technical team from the IUCN, AEWA, RAMSAR, and WHC to check the threats to Lake Elmentaita as a Ramsar and World Heritage site. The team also studied the sites as an important area for migratory waterbirds listed under the AEWA agreement while noting the Government's efforts to mitigate against the threats.

The rising of water levels, a phenomenon reported during the reporting period and in all the rift valley lake system, changed the ecological characteristics of the lakes. For example, the population of flamingoes in the Lake Nakuru National Park, one of the characteristics /outstanding universal value used in the designation of the Lake as a World heritage site, declined.

The increased water levels in the lake system have expanded the lakes and shrinking of the terrestrial habitats for wildlife within the sites.

Convention on the Conservation of Migratory Species of Wild Animals (CMS or the Bonn Convention)

The Convention on Conservation of Migratory Species (CMS) is a Framework Convention that aims to conserve terrestrial, marine, and avian migratory species throughout their range. Kenya ratified CMS in 1997, with KWS as the focal organization coordinating the implementation process for CMS in the country. The Convention lists species of conservation concern in its schedules; the Appendices and encourages the Range States of those listed species to conclude Global or Regional Agreements and MoUs for cooperative engagements towards conservation and management of the species and their habitats. Such agreements for which Kenya has signed include:

- Agreement on the Conservation of African-Eurasian Migratory Waterbirds, **AEWA**Memorandum of Understanding on the Conservation and Management of **Marine Turtles** and their Habitats of the Indian Ocean and South-East Asia (IOSEA);
- Memorandum of Understanding on the Conservation and Management of **Dugongs** (*Dugong dugong*) and their Habitats throughout their Range';
- Memorandum of Understanding concerning the Conservation of Migratory **Birds of Prey** in Africa and Eurasia; (Raptors MoU); and
- Memorandum of Understanding on the Conservation of Migratory **Sharks (Sharks MoU)**

In the implementation of provisions of the CMS Convention and its family of agreements, the Government's efforts are described as ensuring that animals' migratory species are secure and monitored when in the country. It also involves ensuring that the integrity of their unique habitats is maintained to sustain both the migratory and resident species.

Strategies and Species-Specific Action Plans for the conservation of the migratory species were developed or processed for development initiated in

the reporting period. These include the development of the National Action plan for the conservation of the Grey Crowned Cranes (*Balearica regulorum*) under the framework of the AEWA agreement, development of the Protocol to the preservation of Marine Turtles under the framework of the IOSEA Marine Turtles MoU, under the framework of the Raptors MoU, monitoring through tagging of Raptors, the impacts of
windfarms infrastructure on the movements of the birds and utilization of their habitats, especially around Kipeto in Kajiado and around the Lake Turkana parks.

The Convention on Conservation of Biological Diversity (CBD) and Nagoya Protocol (NP)

Adopted in 1992 at Rio, the Convention on Conservation of Biological Diversity aims at achieving three (3) goals:

- Conservation of biological diversity,
- Sustainable use of the components of biodiversity and
- Fair and equitable sharing of the benefits from the use of genetic resources.

Under the Convention, Governments undertake to conserve and sustainably use biodiversity. Therefore, parties are required to develop National Biodiversity Strategies and Action Plans (NBSAPS) and integrate these into broader national plans for environment and development. Under the Convention are two (2) Protocols, the Nagoya Protocol on Access to Genetic Resources and Fair and equitable sharing of benefits arising from their utilization and The Cartagena Protocol on Biosafety for governing movement from one country to another of living modified organisms resulting from modern biotechnology.

Kenya is a signatory to the Convention and both its supplementary protocols.

In the effort to implement the third goal of the Convention as amplified by the Nagoya Protocol, the country has developed a national model; an Access and Benefit Sharing (ABS) model for permitting access to genetic resources for research and development and sharing of benefits accruing from the access and utilization of the resources. This model aims to mainstream access genetic resources and unlock the national economic development potential in research and development but control bio-piracy in the country's biodiversity. Key elements of the model are Prior Informed Consent (PIC), Mutually Agreed Terms (MAT) and, Material Transfer Agreement (MTA) that are contractual agreements between the providers and the resources users of the genetic and biological resources being accessed for research and development. The developed National ABS Model flow process for permitting access to and utilizing biological resources for research and development is presented in Figure 14-9.

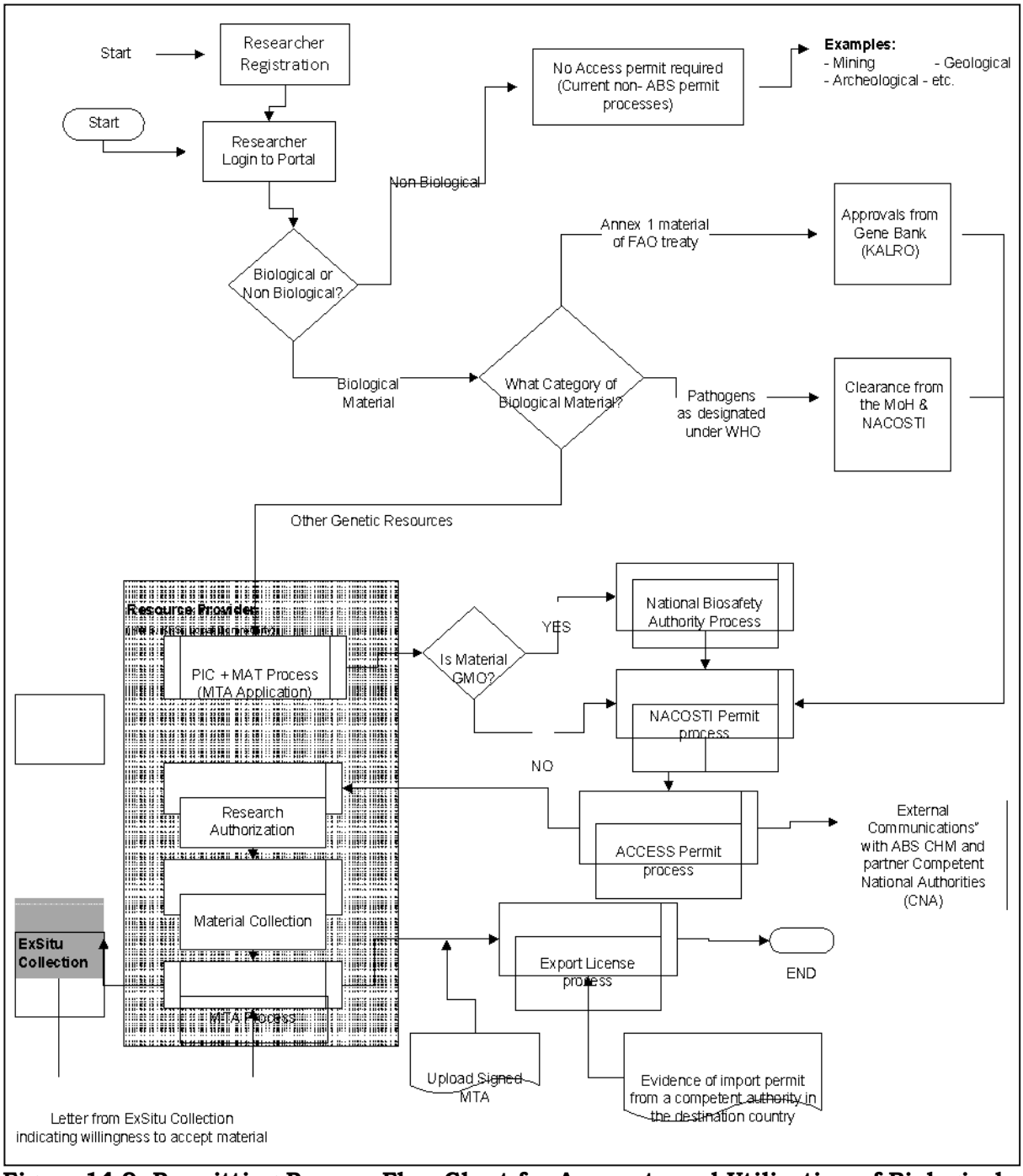


Figure 14-9: Permitting Process Flow Chart for Access to and Utilization of Biological
Source: Resources for Research & Development

Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (Lusaka Agreement Task Force-LATF)

The 10th December 1996 agreement concluded an inter-Governmental agreement to facilitate cooperative activities in/among the Party States. It included carrying out investigations on violations of national laws pertaining to illegal trade in wild fauna and flora. Kenya Wildlife Service, on behalf of the country, hosts the Secretariat of the Agreement. Law enforcement officers run the Secretariat seconded from the signatory States' Wildlife authorities and coordinate with the National wildlife authorities of signatory States and other law enforcement agencies to control Cross –border illegal wildlife trade in member States.

In the reporting period, the Government continued with its commitment to implementing the international obligations, including domestication, into national laws by developing policies, reviewing and developing national laws and regulations, and provisions of the biodiversity multilateral environmental agreements.

The Convention Concerning the Protection of the World Cultural and Natural Heritage-The World Heritage Convention (WHC)

The primary focus of the UNESCO World Heritage Convention (WHC) concluded in 1972 is to identify and conserve the world's cultural and natural heritage. It does this by drawing up a list of sites whose outstanding values (OUV) should be preserved for all humanity and ensure their protection through closer cooperation among nations.

The WHC further aims to promote cooperation among nations to protect the all-natural and cultural heritage of such outstanding value. Kenya ratified this Agreement in 1992, with the National Museums of Kenya being the national focal point for coordinating its implementation and custodian of the cultural heritage component and Kenya Wildlife Service as the custodian of the natural heritage sites.

The country has three sites listed under the UNESCO list of Natural World Heritage Sites and six (6) as Cultural World Heritage sites. The Natural World Heritage sites in Kenya are Mt. Kenya-National Park- Lewa Conservancy World heritage site, The Rift Valley Lakes System World heritage site composed of the Lake Elmentaita-Lake Nakuru National Park and Lake Bogoria National Reserve, and the Lake Turkana National Parks World Heritage Sites composed of the Sibiloi National Park, Central Island National Park, and the South Island National Park.

Under the UNESCO Convention's Man and Biosphere (MAB) Program, the country has six sites inscribed as Man and Biosphere Reserves. These sites cover the Amboseli National Park Biosphere Reserve, Mt. Elgon Biosphere Reserve, Mt. Kulal Biosphere Reserve, Mt. Kenya National Park Malindi-Watamu-Arabuko Forest Biosphere Reserve, and the Kiunga Marine Biosphere Reserve.

Maintaining the Outstanding Universal Values, especially the ecological characteristics of the sites designated as World Heritage sites, continued to be an issue of attention for the Government after concerns were raised at the UNESCO World Heritage Committee on the adverse effects of infrastructural developments by the Government of Ethiopia. This development along the Omo river to the Lake Turkana Parks has been found to cause a decline in wildlife populations of the unique species compounded by management challenges in the parks which are World Heritage sites.

Consequently, the status of Lake Turkana Parks as a World Heritage site was degraded to a World Heritage Site on UNESCO Danger List. A 10-year Management Plan (2018-2028) for Lake Turkana National Parks was developed, and the process for its implementation was initiated in 2020.

Chapter 10: Forest Resources

10.1: Introduction

According to the Green Economy Strategy Implementation Plan, natural resources-related sectors contribute 42% of Kenya's GDP and 70% overall employment. These sectors include agriculture, mining, forestry, fishing, tourism, water supply, and energy. The Constitution of Kenya, 2010 provides a robust governance framework in managing natural resources by the two-tier Government systems while stipulating devolution, equity in benefits. It sets a minimum of 10% tree cover (NFP 2016-2030).

The lead agency in Forest management in Kenya is Kenya Forest Service (KFS), a state corporation under the Ministry of Environment and Forestry. KFS derives her mandate from the Forest Conservation and Management Act, 2016, which is "to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the country's socio-economic development and connected purposes."

The Vision of KFS is an internationally recognized organization of excellence in knowledge-based sustainable forest resources development, conservation, and management. Its mission is conservation, management, development, and sustainable utilization of forests and allied resources. The Country is divided into 10 Conservancies, 47 Ecosystem Areas, and 250 Forest Stations. Each of the offices in the field is fully functional. The Forest Station is the smallest administrative unit in the governance structure of the management of gazetted forests. The constitution has devolved the management of forests in farmlands and County Government forests under various County Governments as provided under the Constitution of Kenya, 2010, Schedule Four (10(b)) on Forestry.

10.2: Status of Forests

The last comprehensive forest cover assessment, "wall-to-wall," conducted in 2013, indicated that the national forest cover stood at 4.18 million Ha, representing 6.99% of the total land area. This survey was undertaken using 2010 satellite imagery, ground-truthing, and sampling for inventory data collection. This survey used FAO classification of the forest, which consider a forest to be a group of trees whose crowns are largely contiguous and include the ecosystem that makes it up to a tree canopy cover of over 15%, the minimum area of 0.5Ha and a minimum height of 2m with potential to reach 5m.

The vegetation is predominantly of indigenous tree species growing under natural conditions and excludes planted indigenous plantation forests. The area includes Mangroves and bamboo ecosystems. The area is legally delineated through gazettement and includes central Government, County Government forests, national parks/reserves, or the National Museums and Heritage Act, 2006. In 2015, the forest cover was estimated at 7.2% based on

the national projection from the 2010 forest cover data (Table 1-10) according to (FAO 2015).

Table 1-10: Land Use/ Cover Hectarages

Name of variables	Area (,000 Ha)				
	1990	2000	2005	2010	2015
Forest	4724	3557	4047	4230	4413
Crop land	9258	9661	9868	10072	10276
Grass land	41522	41654	41496	41080	40664
settlements	57	87	109	126	143
Other lands	1004	1574	1035	1044	1053
wetlands	1472	1504	1482	1485	1488
Total area	**58037**	**58037**	**58037**	**58037**	**58037**

Source: *FAO 2015*

Analysis of change in forest cover over the last 25 years revealed improved afforestation activities, especially from 2000 through 2015 through forest cover decreased between 1990 and 2000 (Table 1-10). Cropland increased by 1,018,000 Ha between 1990 and 2015. Between 1990 and 2000, Kenya lost approximately 1.2 million ha of forest land, equivalent to 25% of forest cover. However, there has been a remarkable increase in forest cover from 6.01% in 2000 to the predicted 7.2% in 2015. It is equivalent to an annual increase of 0.1%. The difference in total forest area for 2010 was attributed to different data sources.

10.3: Forest Types

According to the last inventory undertaken in 2010 by Kenya Forest Service, the total forest cover stood at 6.99% of the land area. Protected forest cover was 3.2% of the total land area. However, this does not include the recent gazetting of several forests, including Boni Forest and others, totaling to extra 631,173.34 Hectares. Currently, the National forest cover is projected to be 7.4%. These forests are categorized as Montane, Western rainforest, Bamboo, Afro-montane undifferentiated forest, Coastal, and Dryland forests. The montane forest and the coastal forest regions are the most forested areas with 18% and 10% forest cover. Natural forests in Kenya are made up of montane forests, which occupy about 2% of the total land area (1.14 million hectares). A considerable area of 2.13 million hectares consists of bushland and mangroves. Public and private plantations constitute 220,000 hectares (FAO, 2015). The distribution of forests in 2010 is presented in Table 2-10.

Table 2-10: Forest Types

Forest type	Forest sub-types	Approximate area (Ha)	% of total forest area	Examples
1.Western rainforest	Natural forest (mixed indigenous) [Kakamega, Nandi forests]	144,615	3.5	Kakamega and Nandi Forests
2.Montane forests	Natural forest (mixed indigenous) which include Mt. Kenya, Aberdares, Mau, Cherangany, Mt. Elgon, Matthews Ranges and Chyulu Hills	1,359,860	32.8	Mt. Kenya, Mt Elgon, Cherangani, Aberdares, Mathews Range etc.
	Bamboo	85,693	2.1	Found within Montane Forest Just before the Moorland
Coastal Forests	Naturla Forest (mixed Indigenous trees) [Arabuko sokoke, Dakatcha, Boni, Shimba Hills, Kayas]	295,871	7.1	Arabuko Sokoke, Shimba hills Boni Forest
	Mangroves	61,271	1.5	Vanga to Kiunga along the sea shore
4.Dryland forests	Natural forest (mixed indigenous trees) [Hilltops in Eastern and Northern Kenya and Lake Victoria regions]	1,875,316	45.2	Mbooni, Nzaui, Kibwezi
	Riverine forest	135,231	3.3	Tana River, Athi River, Ewaso Nyiro North
5.Forest plantations	Public and private forests	220,000	4.5	State plantation forests and Planted forest within farmlands
Total		4,144,573	100.0	
Source: KFS, 2013; based on the forest cover mapping of 2013 using 2010 satellite imageries				

Guinea-Congolian (Western) Rainforest

The Guinea-Congolian rainforest is distributed from the coastal areas of West Africa to the Congo Basin. The Kakamega and Nandi forest reserves represent this type of forest. The dominant species are *Croton megalocarpus, Bosqueia phoberos, Celtis durandii, Aningeria altissima, Funtumia elastica, Antiaris toxicaria, Craibia brownii* and *Olea capensis*.

Afro-Montane Forest

Afro-montane forest covers Mt. Kenya, the Aberdares, Karura, Mau Forest Complex, the Cherangani Hills, Mt Elgon, Mt Nyiro, Mt Kulal, Mathews Range, and Mt Marsabit forest ecosystems. It varies with rainfall and altitude. These forests form the catchments of the main rivers in Kenya. These forest types are considered within two major sub-types: the mixed indigenous natural forest and bamboo dominated forest. Afro-montane natural forest vegetation varies with altitude and rainfall. The dominant tree species in this forest sub-type include; *Syzygium guineense*, *Macaranga capensis*, *Neoboutonia macrocalyx, Xymalos monospora, Tabernaemontana stapfiana, Juniperus Procera, Podocarpus spp., Ocotea usambarensis, Olea capensis and Vitex keniensis*. On the lower parts, the dominant species are *Olea Europea, Juniperus Procera, Mytenus spp*, *Tecla simplicifolia* and *Podocarpus falcatus*. They are found in high-potential areas and are under constant pressure of being converted to agricultural land use due to population pressure and high demand for wood and non-wood forest products. They are characterized by a wealth of biodiversity and are suitable habitats for wildlife.

Bamboo Forest

Bamboo has been an integral part of indigenous forests in Kenya. The *Oldeania Alpina (*Syn. *Yushania Alpina)*, commonly known as highland bamboo is the only indigenous bamboo species that grows naturally between 2,200m and 3,400m AMSL. Based on previous inventory and anecdotal reports, bamboo forests once covered over 300,000 hectares.

Currently, only about a third of the bamboo forests remain. The INBAR-Tsinghua University regional remote sensing studies conducted in 2016/17 in Kenya indicate bamboo growing areas of 133 273 hectares. Most of the bamboo resources in Kenya are found in central, western, and rift valley regions, especially on the mountain ranges and the protected areas in Mt Kenya, Aberdares, Mt Elgon, Mau Forest, the Cherangani hills, and other water catchment areas.

Coastal Forest

Terrestrial, coastal forests are found in a narrow coastal strip running inland approximately 30 km from the coastline and stretch from southern Somalia to northern Mozambique. Many plant species in these forests are endemic and are confined to the remaining patches of natural forests. The coastal terrestrial forests are home to over 90 threatened plants and animal species (Matiru, 1999). 80.3% of the coastal forests (80.3%) face some challenges such as gazettement into national parks, national reserves, national monuments, forest reserves, sacred sites, and private forests. Some of the main tree species found in these forests are *Comboretum schumanii, Drypetes reticulate, Afzelia quensensis, Dialium Orientale , Hymenaea verucosa,*

Manilkara sansimbarensis, Brachystegia speciformis, Cynometra webberri, and *Brachyleana huillensis*, in Arabuko Sokoke, *Diospyros shimbaensis, Cephalosphaera usambarensis,Pavetta tarennoides, Synsepallum Kassneri, Bauhinia mombasae* and *Phyllantus sacleuxii* in Shimba Hills, *Newtonia buchananii, Anthocleista Grandiflora, Albizia gummifera, Tabanaemontana stafiana* and *Strobosia schefferi* in Taita Taveta (BirdLife International 2020) and Ficus SPP, *Phoenix reclinata, Acacia robusta, Populus ilicifolia, Blighia unijugata, Sorindeia Madagascarensis, Dryospyos mesopiliformis* and *Mimusop abtusifolia* in Tana River.

Mangroves forests

Mangroves forests form an interface ecosystem between the oceans and terrestrial ecosystems. Halophytes are occupying intertidal zones in estuaries, lagoons, and mudflats in tropical and subtropical zones. They can function in poorly oxygenated, waterlogged, saline habitats that have seasonal flushing with fresh water. In Kenya, the area under mangroves forests is 61,271 ha, representing 3.0% of the national forest area and is composed of all the nine species found in the western Indian Ocean (WIO) dominated by *Rhizophora mucranata* and *Ceriops tagal* that occupy 70% of the formation. They are managed by Kenya Forest Service alone or with Kenya Wildlife Service when they fall in marine protected areas.

Mangroves are important resources in our economy in that they provide socioeconomic, ecological, environmental, cultural, scientific, and educational values in varying degrees. Their key roles include; provision of wood, building poles, and non-wood (fishery and local medicine) products, regulating the environment through the protection of the shoreline, sequestration of carbon dioxide, and filtering of nutrients and pollutants and sediments. They also support nutrient cycling, primary production, habitat, and breeding ground for marine life. They also provide cultural services in that they act as sacred sites, educational grounds, research sites, eco-tourism attractions, and recreation areas.

Dryland Forests

The dry zone forests are found in Kitui, Machakos, Taita Hills, and Northern Kenya hills, among other hilltops. They also include dense savanna acacia forests mainly found in Laikipia, Baringo, and Samburu counties. Patches of dry forests are also found in the Lake Victoria region. Dryland forests are composed of trees measuring 5–15 m high with dwarf under-story. These forests occur in low-lying sandy alluvial soils. The dry forests on the hilltops of Samburu and Marsabit are dominated by *Podocarpus, Croton, and Juniperus species*. The dry savanna forests in Samburu, Laikipia, and Baringo are mainly dominated by *Acacia spp*. The upland woodlands provide habitats for species such as *Combretum molle, Acacia nilotica, A. seyal, A. tortilis, and A. Kubica.*

Riverine Forest

The riverine forests are found in floodplains covered by alluvial and fertile deposits. They take the form of narrow strips of gallery forest, creating ecologically diverse eco-zones. In addition, they have characteristic upper canopy trees, including *Acacia elatior, Populus ilicifolia, Garcinia livingstonei, Mimusops fruticose and Acacia nilotica.*

Planted Forest

Large-scale tree planting was started at the beginning of the 20th century by the colonial Government to provide a sustainable supply of fuel-wood for steam locomotives. Exotic tree species were preferred as they are fast-growing compared with indigenous species. Commercial plantations are systematically planted areas with both exotic and indigenous tree species. Plantations are either under state, private, or community tenure. The total area under plantation is approximately 220,000 ha. The main tree species are *Cupressus lusitanica, Pinus radiata, Pinus patula, Eucalyptus spp., Vitex keniensis, Polyscias kikuyuensis,* and *Juniperus procera*. Most plantations are found in the highland areas between altitude 1,500 to 2,500 m and an annual rainfall of between 1,000 and 1,750 mm.

On-farm Forestry

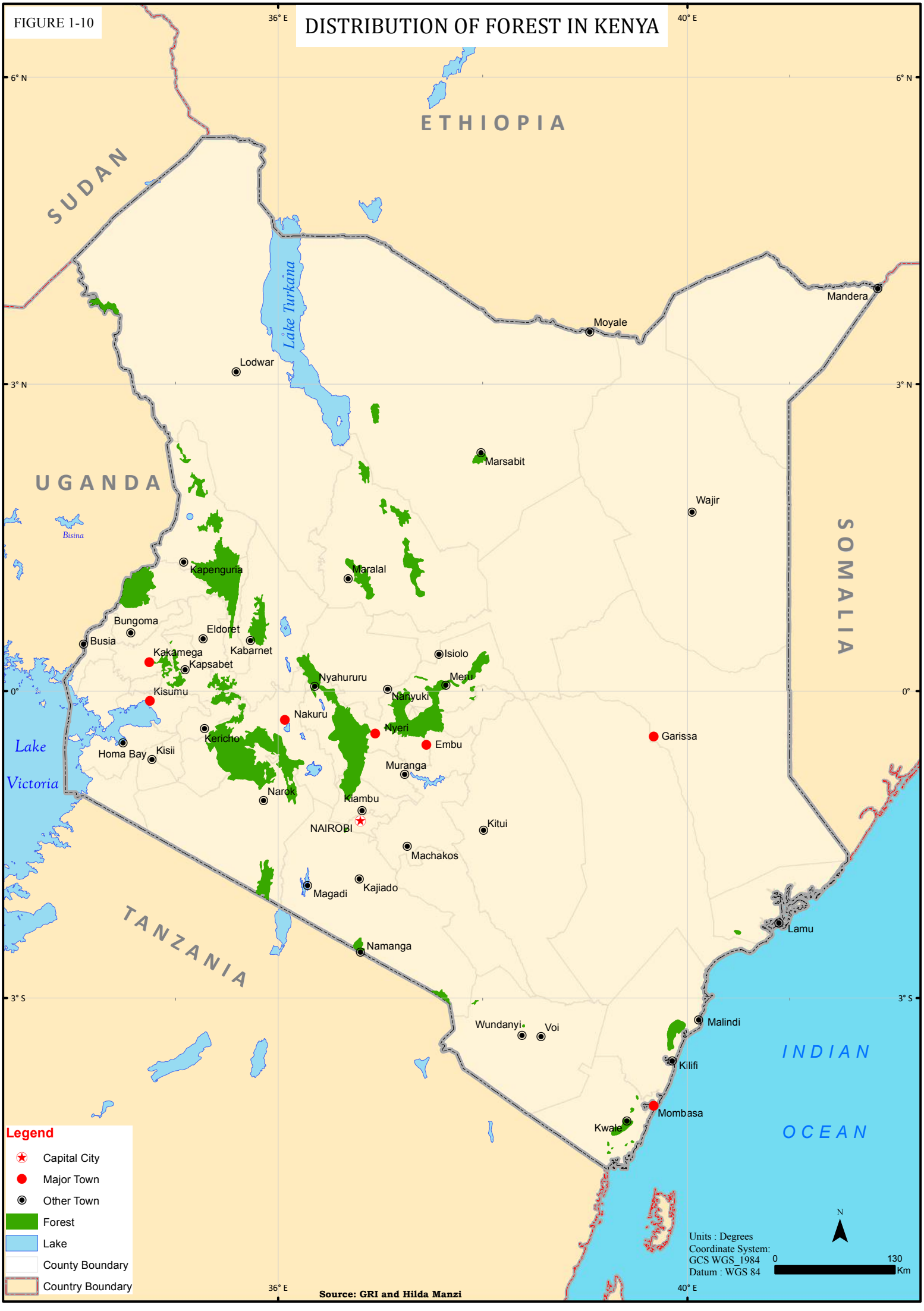
The 1970s and 1980s were periods of intensive on-farm tree planting promoted by various organizations. In the early 1990s, agroforestry was promoted, targeting multipurpose trees and shrubs. *Grevillea robusta* was widely adopted in Central and the eastern parts of the country and eucalyptus in western Kenya. Cypress was also commonly planted in the sub-humid areas.

Gazetted Forests

Kenya had a total of 370 forest reserves distributed across the country as of 31st December 2017. The distribution of forests is highlighted in Figures 1-10, and a list of protected forests in Kenya are in Annex 2 of the report.

FIGURE 1-10

DISTRIBUTION OF FOREST IN KENYA



Source: GRI and Hilda Manzi

10.4: Forest Cover Percentage in the Counties

Forest distribution and type in Kenya are influenced by altitude, weather conditions and topography. As a result of this the forest cover in each of the 47 counties are varied depending on the three factors above. The specific percentages per County are tabulated below in Table 3-10.

Table 3-10: Percentage Forest Cover per County - According to 2018 Release

NAME OF COUNTY	FOREST AREA (Ha)	TOTAL AREA (Ha)	PERCENTAGE FOREST COVER
BARINGO	274,157	1,091,197	25.12
BOMET	33,927	267,196	12.7
BUNGOMA	45,049	303,123	14.86
BUSIA	1,848	182,336	1.01
ELGEYO-MARAKWET	113,145	301,805	37.49
EMBU	26,242	282,315	9.3
GARISSA	309,264	4,359,107	7.09
HOMABAY	12,334	475,925	2.59
ISIOLO	135,626	2,538,173	5.34
KAJIADO	156,260	2,189,203	7.14
KAKAMEGA	29,656	302,246	9.81
KERICHO	54,150	229,962	23.55
KIAMBU	42,118	254,473	16.55
KILIFI	96,115	1,252,382	7.67
KIRINYAGA	30,515	147,530	20.68
KISII	3,456	132,112	2.62
KISUMU	1,184	267,964	0.44
KITUI	215,340	3,043,650	7.08
KWALE	44,984	826,391	5.44
LAIKIPIA	64,794	954,386	6.79
LAMU	209,674	618,507	33.9
MACHAKOS	20,218	604,411	3.35
MAKUENI	106,746	817,225	13.06
MANDERA	78,914	2,598,251	3.04
MARSABIT	129,396	7,602,995	1.7
MERU	128,028	699,038	18.31
MIGORI	2,029	316,458	0.64
MOMBASA	1,462	28,566	5.12
MURANG'A	36,729	252,651	14.54
NAIROBI	5,506	70,806	7.78
NAKURU	69,563	748,920	9.29
NANDI	47,810	284,655	16.8
NAROK	298,828	1,794,207	16.66
NYAMIRA	6,568	90,095	7.29
NYANDARUA	60,310	327,034	18.44
NYERI	126,883	333,623	38.03
SAMBURU	269,325	2,102,371	12.81
SIAYA	1,480	354,212	0.42
TAITA TAVETA	62,113	1,711,824	3.63
TANA RIVER	243,320	3,915,365	6.21

NAME OF COUNTY	FOREST AREA (Ha)	TOTAL AREA (Ha)	PERCENTAGE FOREST COVER
THARAKA-NITHI	50,066	258,007	19.4
TRANS-NZOIA	40,241	249,526	16.13
TURKANA	285,982	7,035,330	4.06
UASIN GISHU	25,714	340,711	7.55
VIHIGA	5,501	56,300	9.77
WAJIR	110,144	5,664,861	1.94
WEST POKOT	78,357	933,689	8.39
GRANDTOTAL	**4,230,094**	**59,211,442**	**7.14**

Source: *KFS*

The counties with signed Transition Implementation Plans (TIPS) are 35 in number, still pending are 12. The counties that have developed other environmental management initiatives for enhancing forest conservation as tabulated in Table 4-10.

Table 4-10: Other Developed Environmental Management Initiatives by Counties

No.	Climate Change Management Institution	No. in Place/In Dev.	No. Not in Place
1	Climate Change Act	19	28
2	Climate Change Policy	21	26
3	Climate Change Action Plan	12	35
4	Climate Change Unit Establishment	29	18
5	CIS Plan	14	33
6	DRM Action Plan	12	35
7	Any other Legislation	5	42
8	M&E units	25	22
9	Municipality Action Plans	5	42
10	Gazetted County Environment Committee	45	2
11	Signed TIPs	32	12
12	CCCF Legislation	16	31
13	County Climate Change Planning	8	39
14	Ward Committee	6	41
15	Rural Ward Committee	5	42
16	Urban Ward Committee	0	47
17	Membership of Regional Economic Blocks	44	3

Source: *COG data*

10.5: Importance of Forests

Forests in the national context are considered very important. They provide a wide range of goods, in wood (of timber, poles, fuelwood) and non-wood forest products (Honey, Herbal medicine, Gum and resins, and fodder). Medicinal trees and forest plants play an important role in rural health. They provide services including conservation of biodiversity, regulation of ecosystem processes and habitat for wildlife (Figure 2-10), air quality control, soil erosion control, flood mitigation, and carbon sequestration. They also provide cultural, spiritual, educational, and recreational services to the Kenyan communities. They support Kenya's economy, such as energy generation, tourism, agriculture, and the fishing industry.

Figure 2-10: Forest as Habitat for Wildlife
Photo by sheldrick wildlife Trust

They contribute to economic, environmental, social, and cultural values. Forests contribute 3-3.6% to the GDP, excluding environmental services and contributions to other sectors. FAO's State of the World's Forest (2014) estimates that Kenya's forestry sector contributes USD 365 million to Kenya's GDP annually. However, these statistics do not include forestry's contribution to household wood energy (charcoal production), non-timber forest products, and ecosystem services, directly employing over 750,000 formally and informally, and indirectly 4 million people. Forests support more than 530,000 households who live within 5 km from them. Forests also contribute to the 23% climate mitigation potential provided by tropical trees as provided by the Paris agreement of 2015. They act as a source of livelihood for adjacent forest communities and regulate the Environment.

Forests contribute to the achievement of 7 of the 17 sustainable development goals. These goals include SDG 1 on no poverty, SDG 6 on clean water and

sanitation, SDG 7 on affordable and clean energy, SDG 8 on decent work and economic growth, SDG 13 on climate action, SDG 15 on life on land, and SDG 17 on Partnerships.

10.5.1: Wood-Energy

An estimated 80% of the national energy supply is met from fuelwood.

The current wood deficit is projected to increase from 10 million m3 to at least 15 million m3 per year by 2030. The private sector, including tree farmers, communities, and medium- and large-scale investors, provide 90% of the wood supply (NFP, 2016-2030) in Kenya.

A nationwide study on charcoal estimated that annual production was 1.6 million tons in 2005. In eight years, production rose to 2.5 million tons, increasing 156% or almost 20% growth per annum. The economic value of charcoal production over the same period grew from KSh 32 billion to KShs 135 billion, representing a 422% growth. Forests (Charcoal) Rules were developed and have been operational since 2009 for efficient and effective management of charcoal production.

In the Jua Kali sector, support to furniture production earns Ksh 23 billion, and in informal furniture production, the earning is Ksh. 15 Billion annually (Creapo Oy, 2014). Non-Wood Forest Products (NWFPs) annual earnings in Kenya is 3.2 billion shillings, a figure that excludes national statistics on grazing and hunting of game meat that account for nearly 60% of NWFPs approximated at KSh 510 million. Other NWFPs include fiber (KSh 149 million), honey at KSh 139 million, and others at KSh 70 million (FAO, 2015).

Kenya has the potential to expand its commercial forestry sector, not only to address its wood supply deficit but also to contribute significantly to the realization of Kenya's Green Growth Objectives by 2030. It can be achieved by:

1. Doubling the contribution of the sector to the GDP.
2. Doubling the number of jobs in the sector to over 2 million people.
3. Tripling the rural income from the sector.
4. Increasing by 50% the direct tax revenue from the sector.
5. Reducing by 50% Kenya's national carbon emissions.

The private sector should deliver this expansion on private land due to the limited geographical area of the existing gazetted plantation forests.

10.6: Forest Degradation

Natural gazetted forests constitute the bulk of our forests, with a total area of 2.29 million hectares which is 95.5% of the total gazetted forest. The integrity of natural forests has been compromised, and as a result, some of them are degraded. Forest degradation the world over is influenced by accessibility, road density, topography, and the biophysical characteristics of the forest. Forest degradation emanates from major demand centers and expands into

forested areas targeting resources in sequence, starting with the highest value products.

Human activities are the main drivers of degradation, including agriculture, mining, infrastructure, urban expansion, timber extraction, fuelwood collection, charcoal production, and overgrazing. In addition, there are indirect drivers of forest degradation, including social, economic, political, cultural, and technological processes, international markets and prices, national drivers like population growth, domestic markets, national policies, and governance issues. In addition, local circumstances, which include subsistence and poverty levels, influence forest degradation.

10.6.1: Drivers of Forest Degradation and Governance

Forest governance issues of forest degradation revolve around the inadequate application of basic silvicultural and ecological principles for forest management and inadequate integration of the forest sector with other stakeholders. These result in unclear forest responsibilities and weak conflict management capacity, resulting in the tragedy of commons resulting in conflicts over natural resources.

This scenario is manifested into weak forest governance and institutions, corruption, illegal logging, weak enforcement, inadequate benefit sharing from forest resources, diverse perceptions of the importance of forests, communal land tenure systems, and their application and lack of private ownership, unclear tenure and access to forest resources.

Policy Drivers

There is overgrazing and inadequate regulation of grazing in forest reserves and community lands. More focus has been put on the water tower and less attention put on dry-land woodlands, including the coastal and riparian forests resulting in continued degradation in less attention forest ecosystems.

Economic Drivers

The clearing of forest for agriculture and forest degradation due to charcoal and fuelwood from unsustainable production, infrastructure and urbanization, conversion of communal forest to agriculture, mining within forest areas, and illegal logging. The following issues indirectly influence forest deforestation economically:

- Poverty, high prices for agricultural products, subsidized fertilizer, tax exemption for certain agricultural machinery resulting in unhealthy competition for land.
- Fixed timber prices at low levels.
- A rapidly increasing population has heightened the demand for land.
- Few or no livelihood options have created overdependence on agriculture and mounting pressure on forest lands.

Technology drivers

Technological issues that directly drive forest deforestation and forest degradation include poor uptake of new technologies and poor awareness of deforestation impacts. Further, poor knowledge of tree planting methods and indirect issues such as uncertainty of availability of timber and wood for processing enterprises and low investment in wood processing poses a challenge.

Cultural and environmental drivers

Direct cultural and environmental drivers include unsustainable utilization, including overgrazing, conflict at multiple levels, deliberate and accidental fires, and poorly managed, which destroy forests. The indirect issues include wildlife damage impacting regeneration. Traditional farming methods in the context of increased population and overstocking of animals in community lands have threatened the forest ecosystem. At the same time, the purported indigenous people concept that supports some communities to have a stake in the ownership of gazetted forests in Kenya has increased the threats to the forest. These communities have changed their way of life from hunters and gatherers to farming, grazing, and timber logging, which is not compatible with forest conservation.

Illegal logging of indigenous forests has led to over-exploitation due to the selective logging of important timber trees. It has greatly reduced the canopy cover, modified the forest composition, and undermined the regenerative capacity of the forests. Cedar (*Juniperus procera*) appears to be the single most targeted tree species, mostly for making fencing posts but also for construction.

Land Use Change

Figure 3-10 shows the land cover classifications. For the period 1990-2015, Kenya lost 311,000 Ha of forestland, primarily due to conversion to settlements, crop farming, and infrastructure developments. The increasing and largely rural population and high dependency on rain-fed agriculture also explain the expansion of the croplands at the expense of the forestland.

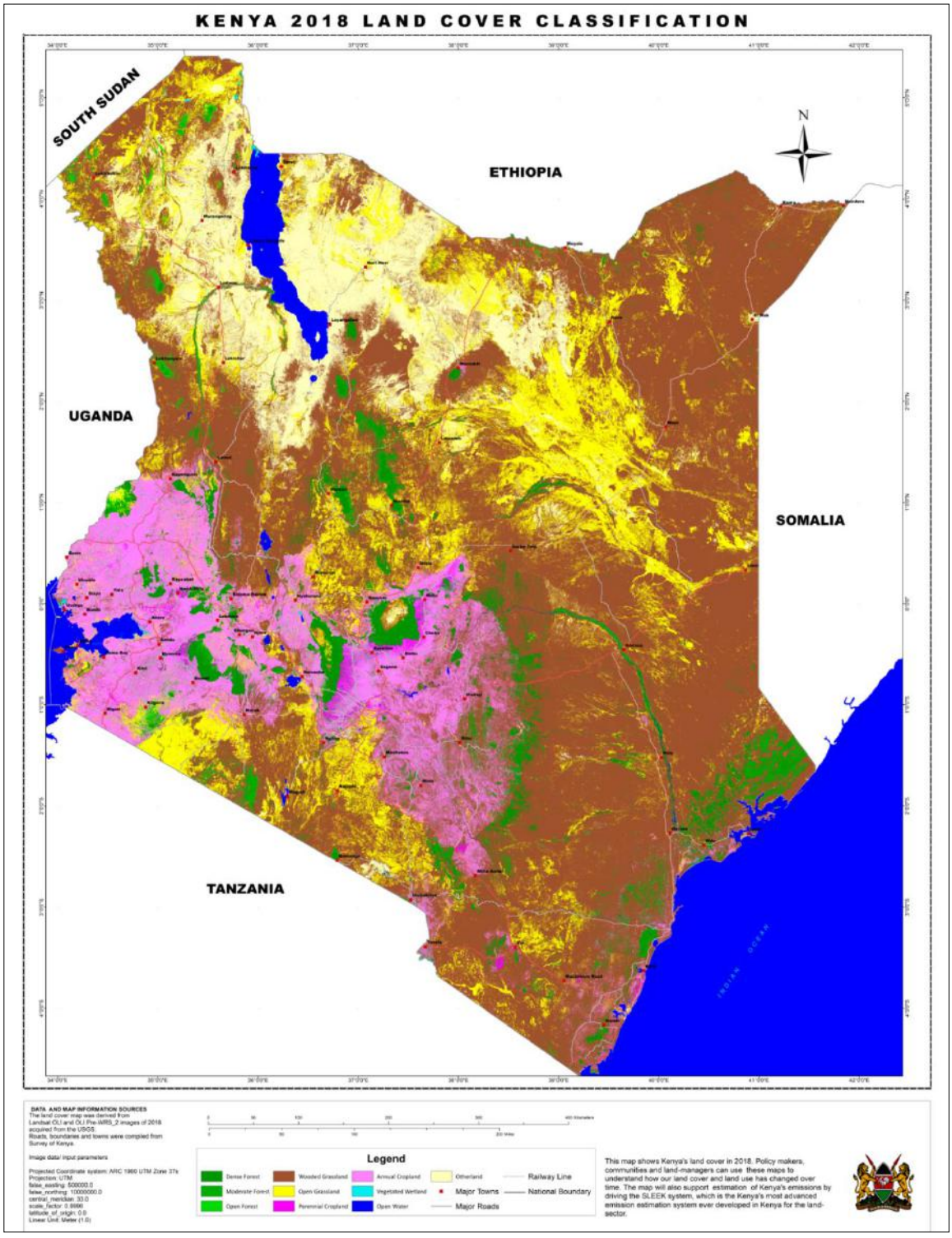


Figure 3-10: Land Cover Classifications
Source: Kenya Forest Service

10.8: Interventions for Increasing Forest Cover

The current forest cover is 7.4 %, and the country is striving to increase it to 10% as per the Constitutional requirement and the targets of Kenya's economic blueprint Vision 2030. Several interventions are employed to ensure the achievement of the above target. These include intensified tree seedling production and tree planting, gazettement of new public forests, forest fire management, tree planting in private land, and community involvement in forest management. Recovering of illegally settled forest land, especially in the Mau Forest Complex, and erecting permanent beacons along the forest boundary.

Other measures include the institution of a total ban on tree logging in 2018 by the Ministry of Environment and Forestry to allow studies to be carried out and recommendations to enhance sustainable forest resource management in the country. A multi-stakeholder task force was appointed to carry out the studies and isolate forest management issues. The task force report recommended the appointment of a Multiagency team to carry out surveys on existing plantations to determine standing overgrown plantation stock and critical issues that affect forest management. It further recommended the way forward on forest logging and developing a strategy to address the critical issues that entail financial requirement and funding mechanism.

The interventions resulted in the gazettement of 65,565.94 Hectares of new natural forests. Under Participatory Forest Management development/review of 152, Participatory Forest Management (PFMPs) and 11 Ecosystem Plans were accomplished. 102 forest management agreements (FMA) were done since the enactment of the forest Act, 2005 and the Forest Conservation and Management Act, 2016. The process has enhanced stakeholder participation in forest management. These PFMPs and FMAs are valid for five years and are reviewed regularly to capture emerging forest management issues. Seventy-six of the PFMPs and 65 FMAs have expired and therefore need review. Annual management of 500 Hectares of invasive species, rehabilitation of 9,595.45 hectares of degraded natural forest through enrichment planting, forest fire suppression strategy, promotion of ecotourism, and other non-extractive uses of forest are ongoing. Therefore, an overall improved forest cover by 0.2% from 7.2% to 7.4 % in the 2018- 2019 period. Table 5-10 shows the trend of forest destruction by fire 2013-2018.

Table 5-10: Trend of Forest Destruction by Fire (2013-2018 in HA)

Year	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Plantation	58.4	87	0	597	20	227.72
Indigenous Forest	7.25	27.38	0	136.2	2	125.82
Bush Land/Grass	63.5	39.52	0	7330.85	1	90,663
Total	**129.15**	**153.9**	**0**	**8064.05**	**23**	**91,016.54**

***Source**: Kenya Forest Service*

10.9: Forest Management Issues of Environmental Concerns

The following issues in forest management raise environmental concerns; deforestation due to unsustainable harvesting of forest products that come from the unclear annual cuts. It is aggravated by the lack of information on annual yields that can inform timber imports versus local timber supply decisions. The ever-increasing wood fuel deficit, overgrazing, charcoal burning, and lack of alternative livelihood for communities surrounding forest resources is also another concern. The forest encroachment due to illegal settlement and occupation of some forests by indigenous people and the enhanced forest fires due to annual variation of weather conditions is also another issue. In addition, soil erosion, landslides, Siltation of water bodies, floods, the extension of cultivation into river reserves, and invasion by invasive species have increased the problems further. The double gazettement of Mt Kenya and Mwalunganje Forest Reserves resulted in inter-institutional conflict. Expired Participatory Forest Management Plans and Forest Management Agreements. Although KFS has had good mileage in community involvement in forest management, there is no clear benefit-sharing Mechanism in place.

Chapter 11: Heritage Sites

11.1: Introduction

Over the years, Kenya has successively nominated seven (7) sites for inscription to the UNESCO World Heritage List. In the list nominated, three are natural sites, including, i.e., Kenya Lake System in the Great Rift Valley (2011), Lake Turkana National Parks (1997,2001), and Mount Kenya National Park/Natural Forest (1997,2013). The other four are cultural sites comprising of Fort Jesus, Mombasa (2011), Lamu Old Town (2001), Sacred Mijikenda Kaya Forests (2008), Thimlich Ohinga Archaeological Site (2018). Several heritage sites are recognized spread across the country and managed by the National Museums of Kenya under the National Museums and Heritage Act, 2006.

In Annex 1, a comprehensive list of Heritage sites in Kenya has been provided in the report. In addition, there are six-man and biosphere reserves in Kenya, as sown in Table 2-11.

Table 2-11: Man, and Biosphere Reserves in Kenya

Name	Report Area (Km²)	Status year
Mount Kulal	7000	1978
Mount Kenya	717.59	1978
Malindi Watamu	196.	1979
Kiunga	600	1979
Amboseli National Park	4832.06	1991
Mount Elgon	Not reported	2005

The Figures 1-11, 2-11 and 3-11 illustrates areas of man and biosphere reserves in Kenya.

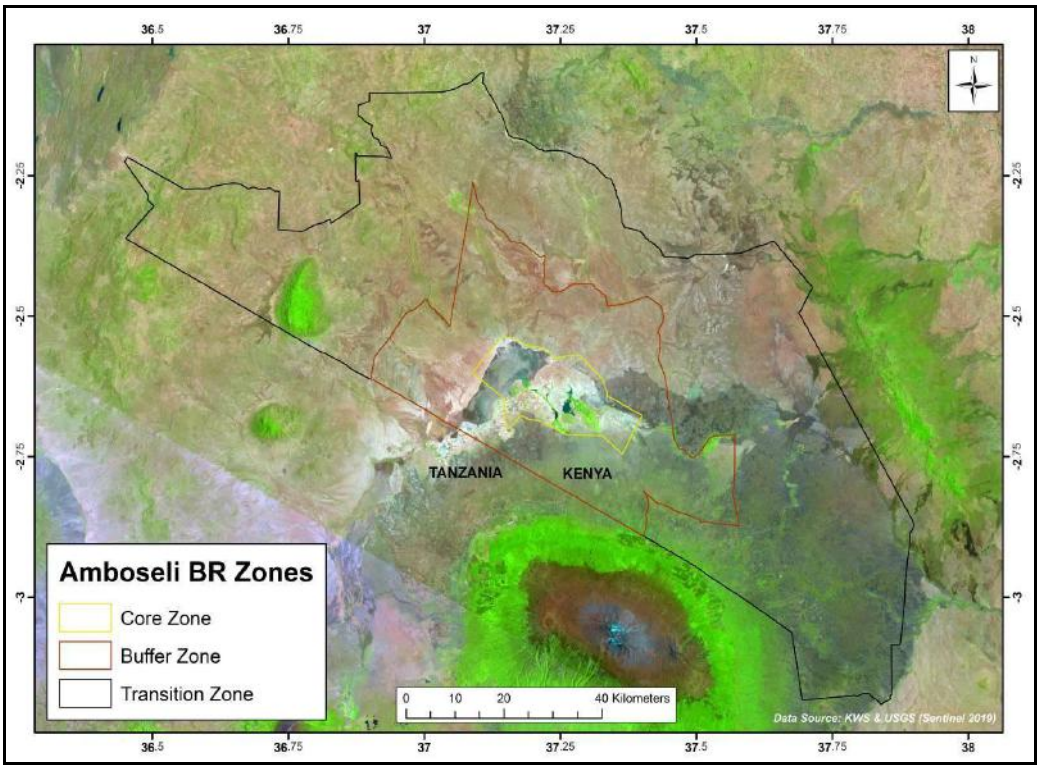


Figure 1-11: Amboseli Man and Biosphere Reserve
Source:KWS

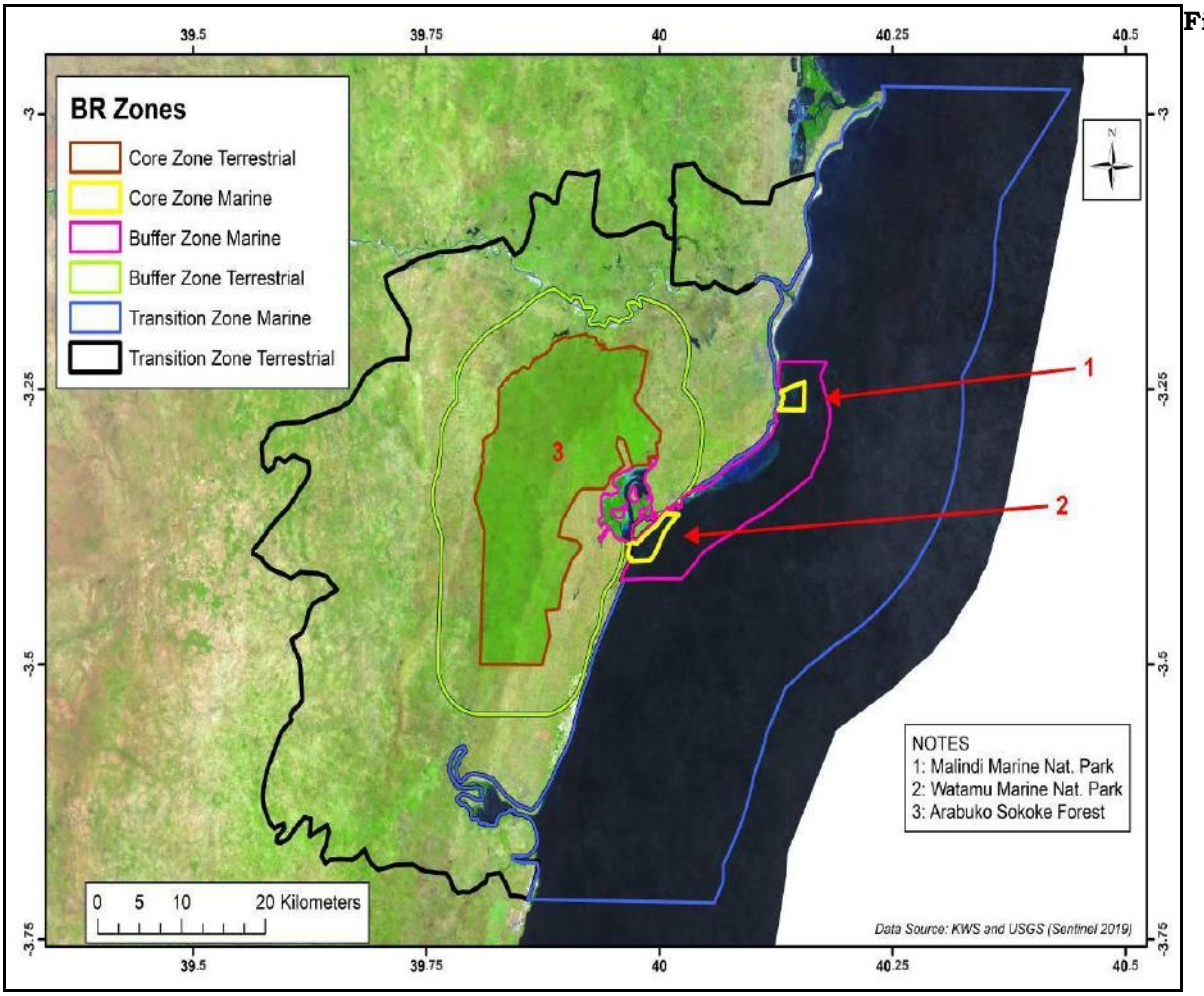


Figure 2-11: Malindi-Watamu – Arabuko Sokoke Forest Man and Biosphere Reserve
Source:KWS

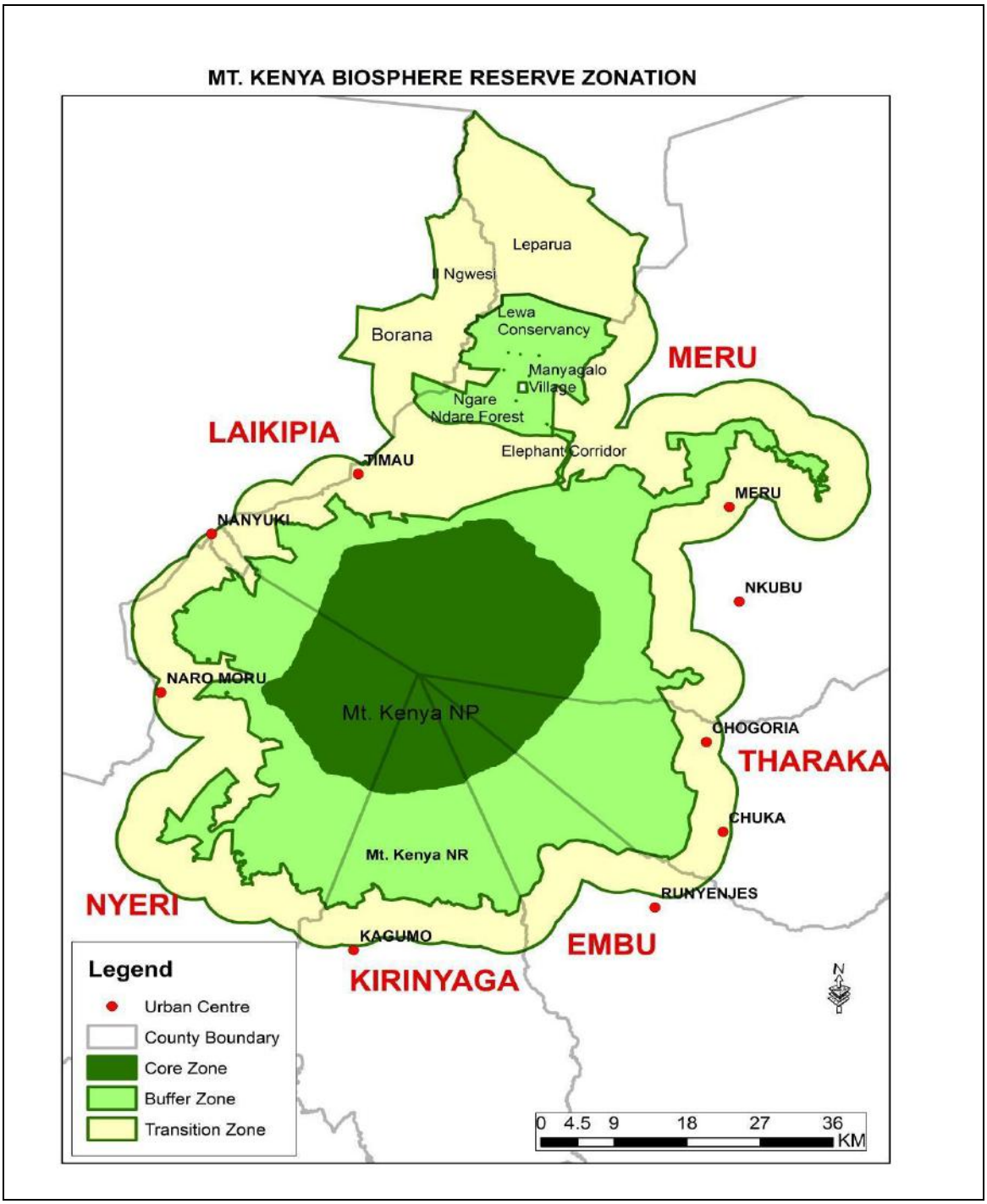


Figure 3-11: Mt. Kenya National Park –Lewa Conservancy Man and Biosphere Reserve
Source: KWS

11.5: The Kenya Lake System in the Great Rift Valley

11.5.1: Kenya Lake System Biodiversity Value

Lakes Bogoria, Nakuru, and Elementaita world heritage site has a combined size of 32,043 hectares (Table 4-11). The lakes support 75% of the global population of the lesser flamingo. They also support one of the major breeding colonies of the great white pelicans and are vital wintering grounds for over 100 species of migratory birds. The lakes are part of the Palearctic African migratory flyway system and have been recognized as wetlands of regional and international importance**.**

Table 4-11: Area of the Kenya Lakes System as inscribed on the World Heritage List

Name	Area of inscribed property (ha)
Lake Elementaita	2,534
Lake Nakuru	18,800
Lake Bogoria	10,700
Total area	**32,034**

Chapter 12: Tourism and Environment

12.1: Introduction

Tourism is a key sector for supporting Kenya's Gross Domestic Product. The sector reported major performance in the previous years up to 2019. The sector registered improved performance mainly attributed to growth in aviation, investor confidence, and withdrawal of travel advisories. The performance was also boosted foreign dignitaries' visits and revitalized marketing efforts. Tourism earnings increased by 31.3 percent to Kshs.157.4 billion in 2018. The number of international arrivals increased by 14.0 percent to 2,027.7 thousand in 2018. Hotel Bed-night occupancy increased by 20.1 percent to 8,617.9 thousand in 2018, of which 52.1 percent were occupied by residents, indicating the growing importance of domestic tourism. In 2018, Kenya travel and tourism exceeded global and regional levels (WTTC, 2018).

The international conferences expanded by 6.8 percent in 2018, while the local conferences increased by 7.9 percent in the same year. It is partly attributed to high-profile international conferences and meetings held. The number of visitors to national parks and game reserves rose by 20.3 percent to 2,868.9 thousand, while that of visitors to museums, snake parks, and historical sites grew by 32.3 percent to 1,034.3 thousand in 2018.

The robust performance of tourism in 2018 indicated that the sector is poised to achieve the set targets by 2020 as contained in the Third Medium Term Plan (MTP III) 2018-2022. The targets included the number of international arrivals rising to 2.1 million; tourism earnings at Kshs.145.0 billion and; hotel bed-nights occupancy by Kenyans at 5.5 million. The number of international visitor arrivals increased by 14.0 percent to 2,027.7 thousand in 2018, against a target of 2,100 thousand by 2020. Consequently, tourism earnings increased by 31.3 percent from Kshs.119.9 billion in 2017 to Ksh 157.4 billion in 2018. Figure 1-12 presents details on trends in international arrivals and tourism earnings. Table 3-12 shows the number of visitors to national parks and game reserves -from 2014 to 2019, while Table 3-12 present bed night occupied in game lodges 2016-2018 in '000

Despite the impressive tourism performance previously, starting 2020, the Covid 19 entry in Kenya saw the sector performance decline drastically with very limited international arrival. Hotels witnessed low bed occupancy, almost bringing the sector to a halt. Nevertheless, following the discovery of vaccines, the situation is likely to change bring back the sector vibrancy.

.

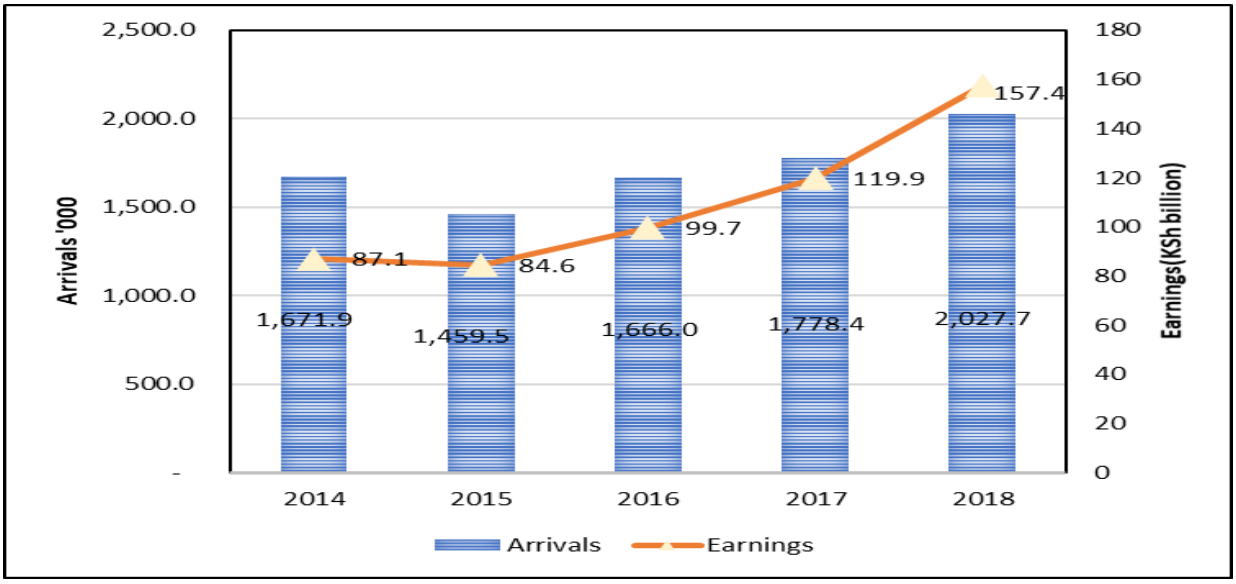


Figure 1-12: Trends in International Visitor Arrivals and Tourism Earnings
source: KTB

Table 1-12: Bed Night Occupied in Game Lodges 2016-2018 in '000

	Bed-Nights Occupancy								
	None EAC			EAC Residents			Total		
	2016	2017	2018*	2016	2017	2018 *	2016	2017	2018*
Game Reserves National Parks	176.5 274.6	170.4 381.0	186.0 508.1	187.7 116.6	164.2 119.8	141.1 122.4	364.2 391.2	334.6 500.8	327.1 630.5
TOTAL	**451.1**	**551.4**	**694.1**	**304.4**	**284.0**	**263. 5**	**755.4**	**835.4**	**957.6**
Of which full Catering	382.3	493.2	635.6	217.2	176.4	157.1	599.5	669.7	792.7
Self Service	68.7	58.2	58.4	87.2	107.6	106.4	155.9	165.8	164.9

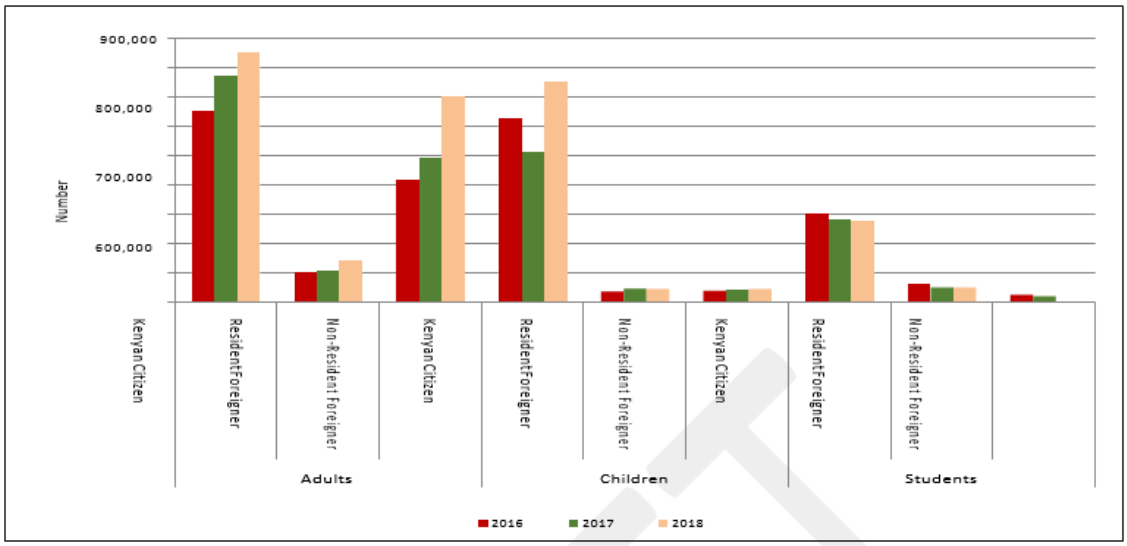


Figure 4-12: Visitors to National Parks and Game Reserves, 2016-2018[1]

1 *Note: Resident foreigner refers to foreigner expecting and/or have stayed in Kenya for more than 12 months*

12.2: Environmental challenges associated with tourism

Negative impacts from tourism occur when the level of visitor use is greater than the environment's ability to cope with this use within the acceptable limits of change. Uncontrolled conventional tourism poses potential threats to many natural areas around the world. It can put enormous pressure on an area and lead to impacts such as soil erosion, increased pollution from increased waste, discharges into the sea, natural habitat loss, increased pressure on endangered species, and heightened vulnerability to forest fires. It often puts a strain on water resources, forcing local populations to compete for the use of critical resources.

For instance, if not well planned and governed, tourism growth may result in overexploitation of water resources by hotels and other tourism facilities. It can result in water shortages and degradation of water supplies and generate a greater volume of wastewater.

If the water comes from wells, over-pumping can cause saline intrusion into groundwater. Tourism can also create significant pressure on local resources like energy, food, and other raw materials that may already be in short supply. Greater extraction and transport of these resources exacerbate the physical impacts associated with their exploitation.

Important land resources include minerals, fossil fuels, fertile soil, forests, wetland, and wildlife. Increased construction of tourism and recreational facilities has increased the pressure on these resources and scenic landscapes. Direct impact on natural resources, both renewable and non-renewable, in the provision of tourist facilities can be caused by land for accommodation and other infrastructure provision and the use of building materials. Forests, for instance, often suffer negative impacts of tourism in the form of deforestation caused by fuelwood collection and land clearing. If not well governed, tourism may also be a source of air emissions, noise, solid waste and littering, releases of sewage, oil and chemicals, even architectural/visual pollution. For instance, during periods of good performance, transport in tourism increased transport by air, road, and rail due to the rising numbers of visitors. The consequence of the increase in transportation by air comes with increase Greenhouse gas emissions. It is estimated that a single transatlantic return flight emits almost half the CO2 emissions produced by all other sources (lighting, heating, car use, etc.) consumed by an average person yearly. Transport emissions and emissions from energy production and use are linked to acid rain, global warming, and photochemical pollution.

Noise pollution from airplanes, cars, buses, and recreational vehicles such as snowmobiles causes distress to wildlife, especially in sensitive areas.

Often tourism fails to integrate its structures with the natural features and indigenous architecture of the destination. Large, dominating resorts of

disparate design can look out of place in any natural environment and may clash with the indigenous structural design.

A lack of land-use planning and building regulations in many destinations has facilitated sprawling developments along coastlines, valleys, and scenic routes. The sprawl includes tourism facilities themselves and supporting infrastructures such as roads, employee housing, parking, service areas, and waste disposal. Attractive landscape sites, such as sandy beaches, lakes, riversides, and mountain tops and slopes, are often transitional zones characterized by species-rich ecosystems. Typical physical impacts include the degradation of such ecosystems.

Anchoring and other marine activities in marine areas (around coastal waters, reefs, beach and shoreline, offshore waters, uplands, and lagoons), many tourist activities occur in or around fragile ecosystems. Anchoring, snorkeling, sport fishing, and scuba diving, yachting, and cruising are activities that can cause direct degradation of marine ecosystems such as coral reefs and subsequent impacts on coastal protection fisheries.

Table 2-12: Impacts of Tourist on Vegetation and Soil

Trampling impacts on vegetation	Trampling impacts on soil
Breakage and bruising of stems	Loss of organic matter
Reduced plant vigor	Reduction in soil macro porosity
Reduced regeneration	Decrease in air and water permeability
Loss of ground cover	Increase in run off
Change in species composition	Accelerated erosion
Source: University of Idaho	

Solid Waste situation: Table 2-13 shows trends in the solid waste situation in Nairobi, Mombasa, and Kisumu. The tonnage of solid waste generated within Nairobi City County increased to 2.9 million tonnes in 2019 up from 2.7 million tonnes in 2018 with only 55.3 percent being collected by the county government. In Mombasa County, 320.8 thousand tonnes were generated and only 147.8 thousand tonnes were collected by the county government. The tonnage of waste generated within Kisumu County in 2019 was 210.9 thousand tonnes out of which only 63.3 thousand tonnes were collected by the county government. The proportion of solid waste not collected demonstrate governance challenges in solid waste management that require to be strengthened.

Table 3-12: Trend in solid waste situation in tree Kenyan cities in '000 tonnes

Urban Centre		Year		
		2017	2018	2019
Nairobi	Generated	2,601.0	2,725.0	2,977.0
	Collected	1,259.9	1,233.7	1,646.1
Mombasa	Generated	311.3	293.8	320.8
	Collected	143.1	135.1	147.8
Kisumu	Generated	201.7	206.3	210.9

Urban Centre		**Year**		
		2017	**2018**	**2019**
	Collected	60.5	61.9	63.3

Source: KNBS 2020

Chapter 13: Environment and Natural Resources Governance Systems

13.1: Introduction

Natural Resource Governance refers to "the norms, institutions, and processes that determine how power and responsibilities over natural resources are exercised. Further, it is how decisions are taken and how citizens – men, women, indigenous people, and local communities – participate in and benefit from the management of natural resources" (IUCN website). While environmental governance refers to the institutions, policies, rules, legal frameworks, and practices that mediate how Governments, the private sector, and civil society interact with the environment at local, national, and international levels. The conservation and management of the environment is mainly dependent on governance.

13.2: History of Natural Resources Management in Kenya

The Kenyan economy relies heavily on natural resources to support people's livelihoods and contribute to national income. However, Kenya's huge potential for economic growth is threatened by environmental degradation and unsustainable use. This largely due to governance deficiencies.

Previously particularly in colonial and some periods of the post-colonial era, natural resource management (NRM) in the country was mainly a state affair and only limited involvement of the local communities and the public in general. Any efforts towards facilitating community participation or inclusion in such management had been peripheral. The state acted as the custodian of natural resources, with the public being expected to receive only accruing benefits, if any, without participation in crucial decision-making. Inequitable benefit-sharing, exclusion of the poor and the marginalized in the decision-making system, and indiscriminate environmental degradation are features that characterize the natural resources management system. In the colonial period, the colonial masters had mastered the art of grabbing the natives' lands and appropriating all the land-related resources such as water, wildlife, forests, and mineral resources for their benefit. In the 1980s, Kenya Government allocated its resources for rural development on a decentralized basis to be more responsive to the 'needs and aspirations of Citizens.

Therefore, over the years, there has been a paradigm shift in conservation and natural resource management from the central Government to Community-Based Natural Resource Management (CBNRM) approaches. CBNRM is an approach to resource management practice involving local communities in decision-making. Participation by local communities, one fundamental principle of CBNRM, is well-aligned with the anthropocentric participatory discourse that emerged in the 1970s and 1980s. CBNRM rests on the assumption that local communities living close to natural resources are their best managers (Child 2004; Leach et al. 1999) and share a collective

interest in conserving resources upon which their livelihood depends (Thakadu, 2005; Tsing et al. 1999). CBNRM led to a 'win-win' situation of greater sustainability of the natural resource and reduction of poverty or improvement of livelihoods.

13.3: International Legal Frameworks

13.3.1: Multilateral Environment Agreements (MEAs)/Treaties

Kenya is a signatory to many international and regional treaties and conventions relevant to the conservation and governance of globally threatened and endemic species and fragile ecosystems. These include the Convention on Biological Diversity (CBD), the Global Forest Principles (GFP), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), Ramsar Convention, Bonne Convention, the United Nations Framework Convention for Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD). CITES controls trade in listed species. One of the CITES-listed species found in Mount Kenya is the African elephant. The Convention on Biological Diversity (CBD) stipulates that states' responsibility is to conserve their biological diversity and sustainably use their biological resources. CBD emphasizes in-situ conservation of biological diversity. Kenya is also a signatory to the United Nations Framework Convention for Climate Change (UNFCCC), aiming to reduce greenhouse gas emissions. Restoration of degraded natural resources will be held to address climate change issues, therefore, furthering the ideals of UNFCCC and UNCCD.

Ramsar Convention is an interGovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. The contracting parties commit to work towards the wise use of the wetlands, designate suitable wetlands of international importance and ensure their effective management. In addition, they are also mandated to co-operate internationally on transboundary wetlands, shared wetland systems, and shared species. Although there are no large wetlands within Mount Kenya Ecosystem, there are several small sites, including swamps and lakes, where Ramsar convention ideas can apply. In addition, Mount Kenya serves as one of the Key water sources of the Tana River that sustain the Tana Delta, one of Kenya's Ramsar sites.

At the regional level, legal instruments and initiatives include the African Convention on the Conservation of Nature and Natural Resources, the New Partnership for Africa's Development (NEPAD), the African Ministerial Conference on the Environment (AMCEN), and the Protocol on Protected Areas and Wild Fauna and Flora in Eastern Africa and the Convention for the Establishment of the Lake Victoria Fisheries Organization 1996. Another important regional development was Kenya becoming a signatory, together with Uganda, Tanzania, Ethiopia, and Rwanda, to the Nile River Basin Cooperative Framework. Besides providing for more equitable use of the waters of the Nile, the parties committed to collectively work towards

conserving the Nile riparian lands and, implicitly, the vast biodiversity wealth of the Nile basin. Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora.

13.3.2: Convention on Migratory Species (CMS) Family Agreements

The Convention on Migratory Species Agreements which Kenya is party to includes; African Eurasian Migratory Waterbirds Agreement (AEWA), Indian Ocean and South-East Asia MoU on Marine Turtle Conservation and their Habitats (IOSEA) - [MoS8 Vietnam, Oct 2019] Memorandum of Understanding (MoU) on conservation of Migratory Sharks, Memorandum of Understanding (MoU) on Conservation of Dugongs.

13.4: National Legal and Policy Frameworks

In Kenya, natural resources are managed under different statutes. The forests are gazetted and management by Kenya Forest Service guided by the Forest Conservation and Management Act, 2016 unless found on private land. Land on the other hand, is owned as either private or trust land or state land. The Government empowered through the Water Act, 2016 to act as the custodian of the water resources in the country. As a result, all ownership and control of water is vested in Government involving both County and national Governments, subject to any user rights that may be granted or vested under common law.

13.4.1: Constitution of Kenya 2010

The Kenyan Constitution 2010 acknowledges and highlights the importance of the environment and natural resources. Chapter five of the Constitution deals with land, the environment, and natural resources. The land is categorized into public, community, and private land. Article 69(1) emphasizes the development and management of the forest sector through a) sustainable exploitation, utilization, management, and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; b) achieving and maintaining at least 10% tree cover of the land area; c) protecting and enhancing intellectual property and indigenous knowledge of biodiversity and genetic resources; d) public participation in the management, protection, and conservation of the environment; e) protecting genetic resources and biological diversity; f) establishing systems of environmental impact assessment, audit, and monitoring; g) eliminating processes and activities that are likely to endanger the environment; and, h) using the environment and natural resources for the benefit of the people of Kenya.

The Constitution also includes environmental rights in the bill of rights. It states that "every person has the right to a clean and healthy environment, including having the environment protected for the benefit of present and future generations (Article 42)" and Article 43 ensures every person has clean and safe water in adequate quantities. These provisions have a bearing on water allocation and governance. The Constitution further provides

concessions to natural resources, including forest concessions in Article 71(1), subject to ratification by parliament. Article 174 provides for the objects of devolving national Government functions, while schedule 4 provides for the devolution of forestry functions. The functions for the County Governments on forestry are:

- Shall implement national policies on forest management and conservation.
- Shall manage all forests on public land defined under Article 62(2) of the
- Constitution.
- Shall prepare an annual report, with the approval of the County Assembly, for the service on the activities of the County Government in relation to this Forest Conservation and Management, Act 2016 and any national policies on forest management and conservation.
- Shall promote afforestation activities in the County.
- Shall advise and assist communities and individuals in the management of community forests or private forests.
- May enter into joint management agreements with communities or individuals for the management of community forests or private forests.

Participation by local communities in the governance affairs of a country has been hailed as an indication of good and democratic governance. It has also been seen as the promotion of the rights of citizens. One of the most outstanding features of the current Constitution of Kenya, 2010, is the principle of public participation in the governance affairs of the country. The Constitution calls for respect of the environment, being the people's heritage. It also lays out the obligations of the state in respect of the environment. Amongst these is the obligation to encourage public participation in the management, protection, and conservation of the environment. Further, it places a duty on every person to corporate with state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources. It brings about a paradigm shift in that participation in natural resources is a right and a duty of every citizen (Kariuki, 2018).

13.4.2: Vision 2030

It is the long-term development blueprint for the country. Vision 2030 aims to transform Kenya into "a newly industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment." Vision 2030 recognized the need to promote eco-tourism in forest areas and recognized the challenge of sustainable management of natural resources. For example, in Mt. Kenya and other key water towers, including the Aberdares Range, Mau Escarpment, Cherangani Hills, and Mt.

Elgon, severe destruction affects the hydrological cycles in water shortages across the country.

13.4.3: Big Four Agenda (2018-2022)

The Kenyan Big 4 Agenda (2018) establishes Kenya Government's priorities from 2018 to 2022. These include ensuring food security, affordable housing, increased manufacturing, and affordable Universal healthcare. Restoration initiatives of degraded natural resources will contribute to the achievement of this agenda. For example, forest restoration will secure water necessary for industrial, domestic, and irrigation needs. In addition, a reliable water supply will help stabilize the power supply from hydroelectric power stations along the Tana River, thus providing a stable power supply for industries. The provision of clean water will contribute to the Government's agenda on health and food security too.

13.4.4: County Government Act, 2012 (revised 2013)

The County Government Act, 2012 gives Counties powers, functions, and responsibilities to deliver services. Section 5 of the Act states that "*A County Government shall be responsible for any function assigned to it under the constitution or by an act of parliament*".

The County Governments Act, 2012, contains elaborate provisions on public participation, public communication and access to information, and civic education, all of which have an implication on natural resources management at the County level. The Act provides the principles upon which citizen participation in counties should be based. These include timely access to information, data, documents, and other information relevant or related to policy formulation and implementation. It is in appreciation that the meaningful public participation of the citizens requires access to the relevant information that is also useful in decision making by the citizenry concerning the management of natural resources in their counties.

Further, the Act calls for reasonable access to the process of formulating and implementing policies, laws, and regulations, including the approval of development proposals, projects, and budgets, the granting of permits, and the establishment of specific performance standards. It is an important procedural aspect of natural resources management that enables the public to appreciate the whole process and to be able to voice their concerns and proposals regarding the whole process.

In the face of devolution, the effect of this is that the policies, laws, and regulations that are put in place and any development projects that are undertaken concerning exploitation of natural resources are more likely to be responsive to the real needs of the people. It is likely to be more effective at the County level facilitating effective natural resources management to improve people's livelihoods. It is also important to note that the affected communities may miss out on actual benefits accruing from localized natural

resources management without the relevant information. Meaning the whole process may be hijacked by other interested parties, thus defeating the essence of devolution.

The Act requires that to enhance the participation of marginalized groups and communities, they should also have access to relevant information. It is important in actualizing Article 56 of the Constitution, which obligates the state to put in place affirmative action programs designed to ensure that minorities and marginalized groups inter alia, participate and are represented in governance and other spheres of life. Although the national Government has the role of protecting the environment and natural resources, County Governments have a role in pollution control and implementation of specific national Government policies on natural resources and environmental conservation, including soil and water conservation and forestry.

Climate change is not listed in the Fourth Schedule of the Constitution as a function of either level of Government. The implication is that by default, Article 186(3) of the Constitution applies so that climate change can be interpreted as a function of the national Government. Cooperation between the national Government and County Governments in the design and overall implementation of climate change response strategies is imperative, as the counties are the likely implementers.

13.4.5: The Environmental Management and Co-ordination Act, 1999

The Environmental Management Co-ordination Act aims to provide a framework for integrating environmental considerations into the country's overall economic and social development. The Act aims at harmonizing the various sector-specific legislation touching on the environment in a manner designed to ensure greater protection of the environment, both physical and social, in line with the goals enunciated in Agenda 21 of the Earth Summit held at Rio de Janeiro in 1992.

The Act entitles people in Kenya to a clean and healthy environment and confers on them the duty to safeguard and enhance the environment. Provisions of the Act grant *loci standi* to the public in environmental matters. *Locus standi* is the capacity to bring legal action against a person or other entity if their activities are causing or are likely to cause the environment's degradation. According to the Act, an individual is granted loci standi whether they have directly suffered personal loss or injury from the actions or omissions of an entity alleged to be promoting environmental degradation.

The implementation of the Act is guided by the principle of public participation in the development of policies, plans, and processes for the management of the environment. The Act also recognizes the cultural and

social principles traditionally applied by communities in Kenya for the management of natural resources.

The EMCA, 1999 acknowledges the need to involve local communities in the management of natural resources by recognizing their traditional and cultural interests and through their representation in the County Environmental Committees. The committees have an obligation under the Act on managing the environmental affairs at the County level by developing County environment strategic action plan every five years and any additional functions prescribed under the Act or as assigned by the governor by notice in thgazettete. These committees will have representatives of farmers, pastoralists, businesspeople, NGOs, women, and youth drawn from the local communities and will be responsible for the proper management of the environment within their respective counties.

EMCA, 1999 prominently promotes the maximum participation of people in the development of policies, plans, and processes for the management of the environment. Two other principles further complement this principle: the principle of environmental awareness and education and the principle of access to information.

13.4.6: National Environment Policy, 2014

The National Environment Policy was also developed following Vision 2030 and the Constitution of Kenya 2010. The policy supports the management of ecosystems and sustainable use of natural resources, encompassing; forest ecosystems, freshwater and wetland ecosystems, coastal and marine ecosystems, mountain ecosystems, arid and semi-arid lands ecosystems, land, soils, minerals, biodiversity, wildlife resources, livestock, and fisheries.

13.4.7: Forest Conservation and Management Act, 2016

The Forest Conservation and Management Act, 2016 makes provision for the conservation and management of the public, community, and private forests and areas of forest land that require special protection, define the rights in forests, and prescribes rules for forest land use.

The then Forests Act of 2005, which is now the Forest Conservation and Management Act, 2016, led to the implementation of participatory forest management (PFM) in Kenya. Mogoi et al. (2012) indicate that local community forest "associations are responsible for diverse management activities in forest protection, monitoring, and management, yet access to decision-making, revenue streams, and overall resource control rights are vested in the Kenya Forest Service" (KFS). To undertake their responsibilities, communities have formed Government-required and approved community forestry associations that have imposed membership requirements and procedures.

KFS also requires that forest management plans be developed to their specifications beyond the communities' capacity. Community Forestry

Associations (CFAs) are essentially constrained to hire outsiders (often retired Government foresters) to create the plans and often cannot do so without support from NGOs and donor programs. Increased rights, access, or benefits do not compensate community costs. In terms of rights, only the pre-existing use rights have been more formally recognized. This situation appears to be an example of extractive state institutions Mogoi et al. (2012) recommends that costly burdens and responsibilities must be matched with shared revenue streams if communities are to remain interested in PFM

Forest Conservation and Management Act, 2016 recognized local communities through Community Forest Associations (CFAs) in participation in management and conservation of forests have specific statutory functions that;

- Provides an opportunity for communities to participate as CFA, which integrate local communities living adjacent to forests in the management of forests
- Provides user rights for local communities through management agreements entered between the KFS and CFAs. It includes provisions for the enjoyment of customary rights.
- Provides for Local communities engaging governance through their respective forest conservation associations by nominating 4 individuals to the forest conservation committee.
- Develops Forest Conservation and Management Trust Fund whose role includes nurture, promote and support innovations and best practices in forest conservation and development, including the support of Community forestry programs.

13.4.8: Draft Forest Policy 2015

Introduces several initiatives to improve and develop the forest resource base through the integration of good governance, transparency, accountability, equity, and poverty reduction in the forestry sector. Kenya's draft Forest Policy 2015 aims to improve livelihoods through sustainable use, conservation, and management of forests and promotes communities and other stakeholders in forest management. It also aims to conserve water catchment areas, create employment, reduce poverty and ensure the sustainability of the forest sector. Through specific policy statements, the policy provides for the empowerment of local communities to manage forests through Community Forest Associations. The promotion of participatory forest management approaches in the management of indigenous forests supports community forest associations to rehabilitate degraded and over-exploited forests - support to communities to develop and implement forest management plans and manage community forests.

The Draft Forest Policy 2015, provides a revised policy framework for forest conservation and sustainable management and one of its main features is the enactment of a revised forests law to implement the policy; the

mainstreaming of forest conservation and management into national land use systems; clear division of responsibilities between public sector institutions and regulatory functions of the sector, thereby allowing Kenya Forest Service to focus on the management of forests on public land, and the role of the County Governments in implementing national policies, County forest programmes including the delivery of forest extension services to communities, farmers and private land owners, and management of forests other than those under Kenya Forest Service; the devolution of community forest conservation and management, implementation of national forest policies and strategies, deepening of community participation in forest management by the strengthening of community forestry associations, and the introduction of benefit-sharing arrangements; the adoption of an ecosystem approach for the management of forests, and recognition of customary rights and user rights to support sustainable forest management and conservation; and the establishment of national programmes to support community forest management and afforestation/reforestation on community and private land.

The draft Forest Policy recognizes ineffective regulatory mechanisms and inadequate law enforcement as some of the country's challenges facing the forestry sector. Further, it observes that these challenges are compounded by dwindling public land, meaning that forestry development has to expand into private and community land, which needs incentives and clear engagement methods to encourage investments in commercial forestry. Regarding forestry governance, the policy proposes that there is a need to enact supporting legislation following the promulgation of the Constitution to minimize conflicts between industry, communities, and Governments at both national and County levels over resource management benefit-sharing. In addition, forest governance needs to consider emerging issues and best practices at the global, regional, and national levels.

The policy also observes that the forest sector has had to contend with low productivity of tree crops, low conversion efficiency, and weak value addition schemes. These arise from climate change, the small genetic base of crops, emerging pests and diseases, low investments in technology development, and poor investment in the forest-based industry. Thus, the policy recommends that there is a need for research and development to refocus on basic forestry disciplines such as productivity, health, crop diversification, processing, value addition, intellectual property rights, and indigenous knowledge.

Further, the sector also faces challenges in building capacity for sustainable utilization and management. Concerning the County Governments, the policy recommends that there is a great need to develop the capacity of County

Governments to undertake forestry development on community and private lands. The mechanisms for engaging County Governments in forestry research and development should also be developed. Further, livelihood enhancement will be one of the guiding principles with a focus on fighting poverty as a major consideration for all strategies and programs in forest sector development. The policy recommends enhancing participatory approaches as one of the guiding principles in forest conservation and management to ensure that the relevant Government agencies, County Governments, private sector, civil society, and communities are involved in planning, implementation, and decision-making processes.

The policy also advocates for the commercialization of forestry activities where forestry operations are to be undertaken in a business manner focusing on result-based management. In this regard, the Government will invite the private sector to invest in tree growing, wood processing, and value addition. The draft Forest Policy is intended to provide a framework for improved forest governance, resource allocation, partnerships, and collaboration with the state and non-state actors to enable the sector to contribute to meeting the country's growth and poverty alleviation goals within a sustainable environment.

In response to the draft Policy, the Forest Conservation, and Management Act, 2016 was enacted to give effect to Article 69 of the Constitution concerning forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country. It is noteworthy that this Act mainly concentrates on affording community's user rights as against actual control of forests resources. It is also notable that although the Act was to be aligned with the current Constitution of Kenya and the devolved system of governance, the provisions addressing the issue of devolution is still a rather bureaucratic law. The requirements are such that communities require an application for any intended participation in forest resources management.
Implementation of the law is to be guided by such principles as good governance and access to public information, and a participatory approach to forest conservation and management; devolution of forest resources management and conservation wherever possible and appropriate to those owners and managers of forest resources; adoption of an 'ecosystem approach' in the conservation and management of forests wherever possible; recognition of the rights and responsibilities of communities and private landowners to manage and utilize forest and forest resources; equitable sharing and enjoyment of the benefits accruing from forest conservation and management by the people of Kenya; and protection of indigenous knowledge and intellectual property rights embodied in forest biodiversity and genetic

resources. Despite the bureaucratic tendencies still retained in the Act, these guiding principles, if well implemented, will go a long way in facilitating equitable and effective management of forest resources under the devolution system.

13.4.9: The Forest (Harvesting) Rules, 2009

Section 4 (1) provides that no person shall harvest timber in a state forest, provisional forest, a local authority forest, or a registered private forest without a valid license. However, a person may harvest timber for final felling, selection thinning, sanitary; harvesting, reconstruction harvesting, or any other type of harvesting intended to establish and maintain the forest infrastructure, shape forest landscape or transform the forestland for other uses.

13.4.10: The Forest (Charcoal) Regulations, 2009

Section 4(1) provides that Kenya Forest Service shall be the competent authority responsible for issuing licenses for the production and transportation of charcoal.

(1) Secondly, no person shall undertake or engage in any activity relating to commercial charcoal production and transportation without a valid license issued by the service under these Regulations. These regulations are important considering the importance of energy provision as wood fuel meets 64.5 % of household energy needs while charcoal meets 7% as of 2014 (Weinsmann et al. 2014). Charcoal provides 82 % of urban household energy

needs and while it provides 34 % to rural household energy needs.

13.4.11: The Forests (Participation in Sustainable Forest Management) Rules, 2009

Section 2 stipulates that these Rules shall apply to the participation of the private sector and forest communities. The necessary modifications may be applied by a local authority, with the ministers for local authorities' consent. It shall apply to the authorizations issued by the service in the management of provisional forests declared as such under section 26 of the Forest Conservation and Management Act, 2016.

Kenya Forest Service embraces engagement in partnership with stakeholders in forest development and management. Through support by stakeholders on the production of seedlings, adopting forests for rehabilitation and maintenance for at least five years. These engagements are usually backed by a Framework of collaboration signed between KFS and the stakeholder.

13.4.12: The Wildlife Management and Conservation Act, 2013 (WMC, Act, 2013)

This Act is another critical environment and natural resources governance instrument that provides protection, conservation, and management of

wildlife resources in Kenya and related matters on public, community, and private land and Kenya territorial waters. Protection of endangered /threatened ecosystems/ habitats and species L.N. No. 242 0f 2017: Key provisions for enhancing environment and natural resources governance under this instrument include;

The WMC Act 2013 recognizes user rights for the local communities and issuance of the permits

Section 79. Except as, or to such extent as may be specifically provided in this Act, no person or entity shall undertake any wildlife-use activity otherwise than under and in accordance with the terms and conditions of a license issued or permit granted under this Act.

Section 85. (1) No person shall import, export, re-export, or otherwise trade in any wildlife species without a permit issued by the service.

- Promote participation of local communities to manage their natural resources and become more effective stewards of their environment
- Promote the conservation of wildlife and its habitats in community areas
- Involve local communities in the management of wildlife through the creation of wildlife farms, sanctuaries, and conservancies
- Promotes consumptive and non-consumptive of wildlife resources.
- Involve local people in the decision-making process, such as County Wildlife Conservation Committee, management, and land use plans.
- Introduces Community Wildlife Association where communities, landowners, groups of landowners, and existing representative organizations may establish.

13.4.13: Water Act, 2016

This governance instrument focusing on water resources, vests ownership, and control of water resources, including their use, in the state to be held by the national Government in trust for the people of Kenya. Water resources are vested in the state, subject to any rights of user granted by or under the Act or any other written law. Further, the Act allows the Cabinet Secretary to exercise control over every water resource in accordance with the Act. The Water Resources Authority (WRA) is vested with the responsibility for overall sector oversight, including policy formulation, coordination, and resource mobilization. The Water Resources Authority is to serve as an agent of the national Government and regulate the management and use of water resources. Concerning the user water rights, the Water Act 2016 provides that every person has the right to access water resources, whose administration is the function of the national Government as stipulated in the Fourth Schedule to the Constitution.

Water Act 2016 section 25 requires an establishment of a basin water resources committee. The composition and responsibilities of the committee out outlined in section 26 and 27 of the Act. Communities are allowed to

participate in water resources management through the formation of the Water Resource Users Associations (WRUAs) may be established as associations of water resource users at the sub-basin level in accordance with Regulations prescribed by the authority. The Act specifically provides for public consultation in the development of national strategies such as the Water Services Strategy.

The water resources management functions that have been allocated to the national Government are spelt out in the Fourth Schedule, Part I, and include use of international waters and water resources; national public works-water resources development, especially on permitting and ensuring compliance to permit conditions on water-retaining infrastructure and works on water bodies; protection of the environment and natural resources to establish a durable and sustainable system of development, including, in particular- water protection, securing sufficient residual water, hydraulic engineering and the safety of dams; disaster management- water-related disasters like flooding, drought, and landslides; and capacity building and technical assistance to the counties.

On the other hand, the water resources management functions that have been devolved to County Governments are spelt out in the Fourth Schedule Part 2. These include implementing specific national Government policies on natural resources and environmental conservation, including soil and water conservation; County public works and services, including stormwater management systems in built-up areas; firefighting services and disaster management, especially on water-related disasters. To actualize the principles of natural resources management as envisaged in the current Constitution, in a framework that engages the County Governments, WRA intends to strengthen water resources governance. It will achieve this by providing information on water resources availability, use, allocation, and viable options for water resources investments planning to meet any water deficit for the County's developmental needs. It will further support water resources assessment to inform planning and decision-making while working with the concerned County Governments to domesticate the development and management plans as contained in the National Water Master Plan 2030. and jointly prepare an implementation matrix for each plan; apportioning the water resources equitably among various users and uses, including maintaining the reserve; and working with the concerned County Governments to protect water resources from harmful impacts.

The Water Act 2016 empowers County Governments to establish water services providers, a public limited liability company established under the Companies Act, 2015, or other bodies providing water services as approved by the Regulatory Board. In establishing a water services provider, a County

Government must comply with the standards of commercial viability set out by the Regulatory Board. A water services provider shall be responsible for providing water services within the area specified in the license; and the development of County assets for water service provision.

The Act also provides that a County water services provider may, with the approval of the relevant licensing authority, extend water services to rural or developing areas. The Act further provides that nothing in its provisions should deprive any person or community of water services because the provision of such services is not commercially viable.

The Act also requires every County Government to put in place measures for providing water services to rural areas that are considered not to be commercially viable for the provision of water services. The measures referred to in subsection (2) shall include the development of point sources, small scale piped systems and standpipes that meet the standards set by the Regulatory Board and which may be managed by the Water community associations, NGOs, or a private person under a contract with the County Government. Further, to implement its obligations under this section, a County Government should formulate and submit annually to the Regulatory Board and the Cabinet Secretary a five-year development plan incorporating an investment and financing plan for the provision of water services in the rural areas referred to subsection (1) within its area of jurisdiction. The cabinet secretary also provides technical, financial, and other assistance to a County Government to enable the County Government to discharge its responsibility under this section.

13.4.14: The Land Act, 2012

This Act received presidential assent on 27th April 2012 with a commencement date of 2nd May 2012. Consolidates and rationalizes land laws in Kenya and provides sustainable administration and management of land and land-based resources. It also provides for the Land and Environment Court jurisdiction and on public land, identifies forest land as one of the public lands that cannot be allocated to anyone.

13.4.15: Land Control Act (Cap. 302)

The main objective of the Act is to provide for the control of transactions in agricultural land. Therefore, dealings in agricultural land are controlled in the sense that the transacting parties must obtain consent from the relevant land control board that has jurisdiction within the area in which the land is located. Controlled dealings include sale, transfer, lease, mortgage, exchange, partition, subdivision, or other disposals of agricultural land. The purpose of controlling transactions in agricultural land is to ensure that the productivity of the land in question is assured and dealings in agricultural land are fair

and beneficial to both parties. Further, it provides for parties to farm well and develop agricultural land adequately.

13.4.16: The Physical Planning and Land Use Act Planning Act, 2019

The Act provides for the preparation and implementation of physical development plans. The Act further provides that proper planning of land use in the coastal zone is important and critical in ensuring various economic and environmental interests are accommodated in land use. The Director of Physical Planning is empowered to prepare physical development plans. Development of land within a certain area must be done in compliance with the physical development plan for that area and the development permission of the local authority in charge of that area. Such powers are currently exercised by the respective County Governments and are governance provisions that promote environmental and natural resources conservation.

13.4.17: National Land Use Policy (Sessional Paper No. 1 of 2017)

This Act guides Kenya towards an environmentally and socially responsible use of land and land-based resources for the socio-economic transformation of the people of Kenya. It promotes the best land-use practices for optimal utilization of the land resource in a productive, efficient, equitable, and sustainable manner. Mapping land cover, land use data, and land use planning and documentation of all land use in the country. It involves the development of a framework for incentives to encourage the maintenance of forest cover. This statute also provides for enhancing the environment and natural resources governance in Kenya.

13.4.18: Community Land Act, 2016

The Act provides for the recognition and registration of community land rights, management and administration of community land, and the role of County Government in relation to unregistered community land. It provides that all current land held in trust by the County Government will be registered and the communities issued with title deeds to secure and preserve their land from arbitrary excisions and allocation without community consent.

The Act establishes a Community Land Management Committee, which shall be elected by a community assembly consisting of all adult members of the community.

13.4.19: Fisheries Management and Development Act 2016.

This Act provides for the conservation, management, and development of fisheries and other aquatic resources to enhance the livelihood of communities dependent on fishing and to establish the Kenya Fisheries Services. This Act aims to protect, manage, use, and develop the aquatic resources in a manner consistent with ecologically sustainable development, uplift the living standards of the fishing communities, and introduce fishing

to traditionally non-fishing communities to enhance food security. The law provides beneficial governance provisions for promoting the conservation of our fishery resources while supporting socio-economic development.

13.4.21: Kenya Maritime Act 2006

The Act establishes the Kenya Maritime Authority as a body responsible for monitoring, regulating, and coordinating activities in the maritime industry and all other matters connected therewith and incidentally. Key functions, among others, with implications on the environment and natural resources, include; advice the Government on legislative and other measures necessary for the implementation of relevant international conventions, treaties, and agreements to which Kenya is a party.

13.4.22: Climate Change Act, 2016

Climate change is an international agenda, and every stakeholder must take an active role in mitigating the effects of climate change. The Climate Change Act encourages and puts in place measures for managing climate change, including reducing greenhouse emissions. The Act introduces the need for a National Climate Change Action Plan with measures and mechanisms for adopting energy conservation, efficiency, and use of renewable energy in industrial, commercial, transport, domestic, and other uses.

The Act recognizes that the County Governments play a central role alongside the national Government to mitigate the effects of climate change. The law establishes the Climate Change Council. The Council is to provide an overarching national climate change coordination mechanism and should—ensure the mainstreaming of the climate change function by the national and County Governments; approve and oversee implementation of the National Climate Change Action Plan; advise the national and County Governments on legislative, policy and other measures necessary for climate change response and attaining low carbon climate change resilient development; approve a national gender and intergenerational responsive public education awareness strategy and implementation programme; provide policy direction on research and training on climate change including on the collation and dissemination of information relating to climate change to the national and County Governments, the public and other stakeholders; provide guidance on review, amendment and harmonization of sectoral laws and policies in order to achieve the objectives of this Act; administer the Climate Change Fund established under this Act; and set the targets for the regulation of greenhouse gas emissions. In providing for climate change management, the Climate Change Act, 2016 promote also matters environmental and natural resources governance as climate change is critical in the environment and natural resources conservation,

13.4.23: Agriculture, Fisheries, and Food Authority Act (AFFA) No. 13 of 2013

The Agriculture, Fisheries, and Food Authority Act (AFFA) No. 13 of 2013 came into effect on the 17th January 2014 and is the current legal instrument regulating the agricultural sector in Kenya. Prior to this, the agriculture sector had in excess of 130 laws that made the sector uncompetitive, inefficient, and too bureaucratic for a conducive business environment. The merger process commenced with the consolidation of the Agricultural sector legislation, which culminated in enacting three key laws: The Agriculture, Fisheries and Food Authority Act, 2013, the Crops Act, 2013, and the Kenya Agricultural and Livestock Research Act, 2013.

This AFFA Act, 2013 requires that any person who owns or occupies agricultural land shall establish and maintain a minimum of 10% of the land under farm forestry. Under this arrangement, one may include trees on soil conservation structures, rangeland, and cropland in any suitable configuration provided the species of trees or varieties planted shall not have an adverse effect on water sources. The Act also promotes soil and water conservation and prevents the destruction of vegetation. It requires regulating or controlling the afforestation or reforestation of land, among other things.

13.4.24: The Energy Act of 2019

The laws relating to energy, to provide for National and County Government functions in relation to energy, to provide for the establishment, powers and functions of the energy sector entities; promotion of renewable energy; exploration, recovery, and commercial utilization of geothermal energy; regulation of midstream and downstream petroleum and coal activities; regulation, production, supply and use of electricity and other energy forms; and for connected purposes. In providing for renewable energy, the law provides for promoting environmental conservation.

13.4.25: Mining Act No. 12 of 2016

The Mining Act 2016 was adopted after extensive public participation to guide how matters related to mining should be administered. The law provides royalty and revenue sharing as follows; National Government 70%, County Government 20%, and Community 10%.

Artisanal and Small-Scale Miners (ASMs) are formally recognized and allowed to apply for a Reconnaissance or Mining Permit. The previous Mining Act did not make for this provision. ASMs are obliged to ensure compliance to the existing environmental laws as applicable - Article 133 (b). Under Mining Act 2016, the applicant of a mining license is obliged to undertake Environmental Impact Assessment and Environmental Management Plan before being granted. The Mining Act 2016 gives the Cabinet Secretary the powers to declare certain minerals as 'Strategic Minerals', after getting approval of the Cabinet. The Cabinet may establish Directorates to take charge of various

interests in the Mining Sector. The Mining Act 2016 does not address matters related to Petroleum and its exploitation. This is handled by a separate Law, The Petroleum Exploration and Production Act CAP. 308 (Revised 2019).

13.4.26: Kenya Minerals and Mining Policy 2016

Sets out frameworks, principles, and strategies to explore and exploit mineral resources for the country's socio-economic development.
Guiding Principles:

- Intergenerational equity and sustainability in mineral utilization for current and future generations
- Sound environmental management ensures equitable access to mineral resources and benefit-sharing at National, County, and Community levels in line with the Constitution.
- Promote International and Regional cooperation in the management of mineral resources.
- To promote value addition of the mineral resources.
- Ensure transparency, accountability, and public participation

13.4.27: National Museums and Heritage Act, 2006

Provides for legal protection of heritage sites and establishes protected area designations, including national monuments. As a consequence of this Act, to date, several Kaya forest sites are exclusively gazetted as national monuments (sacred groves). Kaya forests are explicitly mentioned in the Act as important heritage areas.

13.4.28: Tourism Act 2011

The tourism sector is governed by the Tourism Act 2011. This Act repealed Kenya Tourism Development Corporation Act (Cap 382). The Act provides for 'the development, management, marketing and regulation of sustainable tourism and tourism-related activities and services.' Section 3 of the Act requires the Cabinet Secretary responsible for tourism to formulate and publish in the gazettete a national tourism strategy once every five years. Participation of the public in the formulation of the strategy is a key requirement. To safeguard the environment from tourism activities, the Act prohibits effluent discharge into the environment, including wildlife habitats and ecosystems.

13.4.29: The Tourism Regulatory Authority Regulations 2014

Under Section 122 of the Tourism Act 2011, Tourism Regulatory Authority Regulations 2014 were formulated and gazetted to prescribe matters related to regulating the tourism sector and operations of the authority.

- The Tourism Act No. 28 of 2011
- The Tourism Regulatory Authority Regulations (download)
- Guidelines on Tourism Area Plans-Draft
- East African Classification Criteria

13.4.30: Public-Private Partnerships (PPP) Act, 2013

Provides for the participation of the private sector in the financing, construction, development, operation, or maintenance of infrastructure or development projects of the Government through concession or other contractual arrangements. Defines the structure, parties' mandates, forms of intervention, and processes for establishing PPPs in Kenya that matter environment and natural resources are mainstreamed.

13.4.31: The Timber Act, Cap. 386, 1972

Provides for the control of the sale and export of timber by means of grading, inspection, and marking. It also provides for control of timber in transit, which forms part of natural resources governance.

13.4.32: The Seeds and Plant Varieties Act Cap 326

The Act prevents the spread of plant diseases through the control of import and export of plant species. The Act also prevents introductions of invasive species, a key governance aspect in safeguarding biodiversity conservation.

13.4.33: The Animal Diseases Act Cap 364

The Act controls animal diseases and pathogens. It also controls the introductions of invasive species, also a key governance aspect in safeguarding biodiversity conservation.

13.4.35: East African Community Protocol on Environment and Natural Resources Management

The Protocol governs the partner states (the Republic of Burundi, the Republic of Kenya, the Republic of Rwanda, the United Republic of Tanzania, the Republic of Uganda, and the Republic of South Sudan) in their cooperation in the management of the environment and natural resources over areas within their jurisdiction including trans-boundary environment and natural resources. This Protocol is a protocol of general application and shall apply to all activities, matters, and areas of management of the environment and natural resources of the Partner States.

13.5: County Based Legislation and Development Agenda

Most of the IDPs recognize that forest conservation is one of the climate change mitigation strategies that the counties can adopt. There is also concurrence that forest restoration is necessary. Some counties have even gone further to make legal provisions for forest protection. For example, the Embu County Environment Management and Protection Act, 2015 no. 16 of 2015 Article 18 (d) states that "the County Government shall promote tree planting and expansion of forest cover." In Nyeri County, the Nyeri County Water and Sewerage Services Act, 2016 No.6 of 201 Article 16 allows Water

Service Providers to agree with other entities in carrying out soil conservation measures. Article 48 of the same Act creates a Directorate of Environment and Natural Resources. One of its core responsibilities is the conservation and management of water resources.

13.5.1: Agricultural Sector Development Strategy (ASDS)

The Agricultural Sector Development Strategy (ASDS) 2010-2020 was developed in line with the Kenya Vision 2030 to upscale the agricultural sector. Drawing from the Vision 2030, under the economic and social pillars, it emphasizes the enhancement of crops and livestock, incomes, and food security and nutrition. ASDS outlines ways to transform the agricultural sector to encompass innovative, commercially oriented, and modern agricultural undertakings. The modern agricultural undertakings cover aspects of the environment and natural resources conservation.

13.5.2: Kenya Green Economy Strategy and Implementation Plan, 2015

The Green Economy Strategy and Implementation Plan (GESIP) is based on four principles drawn from national policy planning as enshrined in Article 10 of the Constitution of Kenya. The strategy recognizes that 42% of Kenya's GDP and 70% of overall employment is derived from natural resource-related sectors. The sectors are agriculture, mining, forestry, fishing, tourism, water supply, and energy. It acknowledges that climate change leads to adverse impacts across all the production sectors of the economy if proper management measures are not taken, a milestone towards promoting environment and natural resources governance.

Chapter 14: Institutions Perspective/Role in Environment and Natural Resource Governance

14.2: Public Institutions

Public institutions play a significant role in managing and protecting our environment and natural resources, including forests, river systems, coastal and marine.

The Constitution 2010 guides the two-level Governments in Kenya to properly manage, develop, protect, restore, enhance and conserve the natural environment.

The Fourth Schedule to the Constitution of Kenya outlines the obligations of the central (national) Government and those of the County Governments. The obligations of the central Government towards natural resource management include the protection of the environment and natural resources to establish a durable and sustainable system of development, including, in particular, fishing, hunting and gathering; protection of animals and wildlife; water protection, securing sufficient residual water, hydraulic engineering and the safety of dams; and energy policy.

The County Government is obligated to implement specific national Government policies on natural resources and environmental conservation including, soil and water conservation and forestry. Further, the County Governments are also supposed to ensure and coordinate the participation of communities and locations in governance at the local level and assist communities and locations to develop the administrative capacity for the effective exercise of the functions and powers and participation in governance at the local level (Kariuki, 2018).

14.2.1: Ministry of Environment and Forestry

The Ministry of Environment and Forestry was created via Executive Order No. 1 of 2018 on the Government of Kenya. It is mandated to undertake National Environment Policy and Management, Forestry development policy and management. Further, it is involved in re-afforestation and agro-forestry, restoration of strategic water towers, protection and conservation of the natural environment, and pollution control. For example, it is involved in the Lake Victoria management programme, restoration of lake Naivasha basin, Kenya Meteorological Department, Kenya meteorological training, conservation and protection of wetlands, and Climate change affairs.

The Ministry is committed to facilitating the enabling policies, legal and regulatory reforms for promoting sustainability of the environment and forest resources while at the same time mitigating the effects of climate change.

Strategic Objectives of the Ministry are as follows: Protect and manage the environment for sustainable development and posterity; Promote innovation and appropriate technologies for sustainable utilization of natural resources; Protect and restore forest ecosystem for the benefit of the present and future generation; Increase forest and tree cover to enhance social-economic benefits of the Kenyan people and healthy environment; To create enabling environment for good governance in environment and natural resources management; To strengthen institutional framework for efficient utilization of resources and effective service delivery; Promote research and innovations for enhanced environmental sustainability; Enhance climate change resilience and low emission development pathway in all economic sectors for sustainable development and posterity; Enhance the generation and dissemination of weather and climate information for early warning, planning and decision support.

14.2.2: The Kenya Wildlife Service

The Kenya Wildlife Service (KWS) was established in 1990 to succeed the Department of Wildlife Conservation and Management. KWS is charged with the management of all wildlife, both within and outside protected areas. Through its Community Wildlife Service and Partnerships Programme, KWS has initiated the formation of a wide range of CBOs (Wildlife Conservancies Association) to engage in CBNRM activities. KWS established the Community Wildlife Programme to guide the management of wildlife outside parks and reserves and involve local communities. Efforts to enhance the economic and social benefits to local communities are affected by several policy positions of KWS, especially with regard to consumptive and non-consumptive utilization of wildlife resources inside and outside parks. For example, in 1991, KWS introduced the wildlife cropping scheme for specific, organized community groups.

Several factors adversely affect the extent to which KWS can promote community participation in wildlife management. One of the key factors is human-wildlife conflict. The compensation for the damages caused by wildlife takes a long process, demoralizing the affected persons. Other factors include the lack of access by community members to resources within protected areas, especially for water and grazing, while wildlife continues to use the resources on land adjacent to protected areas. Communities living adjacent to protected areas receive minimal direct benefits from gate fees and other revenue generated by the parks and reserves.

14.2.3: The National Environment Management Authority (NEMA)

The National Environment Management Authority (NEMA) is a corporate body that shall exercise general supervision and coordination over all matters relating to the environment and be the principal instrument of Government in implementing all policies relating to the environment. The authority works with lead agencies on various partnerships to provide effective and efficient coordination of environmental matters. Among the key governance areas the authority is undertaking to promote environment and natural resources management is administration of Environmental and Social Impact Assessments, Strategic Environmental Assessments, Audits and other environmental licensing regimes. The authority also governs matters of environmental compliance and administers compliance enforcement actions to environmental crimes. The authority is science-driven in advancing compliance enforcement actions. EMCA, 1999 section 9 (2) provide the core functions of NEMA, among others.

14.2.4: National Environment Complaints Committee (NECC)

The NECC is concerned with the investigation of complaints relating to environmental damage and degradation generally. The NECC has powers to investigate complaints against any person on its own motion investigate any suspected case of environmental degradation.

14.2.5: National Environmental Tribunal (NET)

The NET is established under Section 125 of EMCA for the purpose of hearing appeals from administrative decisions by organs responsible for enforcement of environmental standards. An appeal may be lodged by a project proponent upon denial of an EIA license or by a local community upon the grant of an EIA license to a project proponent. NEMA may also refer any matter that involves a point of law or is of unusual importance or complexity to NET for direction.

14.2.6: County Environment Committees

County Governments are to gazette County Environment Committees (CEC) as the instrument to integrate CEAPs into the CIDP. So far, many Counties have gazetted their CECs and made them functional. The main challenge is the operations of these committees being hampered by lack of funds because the CIDP process does not apportion the funding. These committees assist NEMA in effectively carrying out its function of management of the environment at these levels. It is instructive to note that the membership of these committees includes inter alia representatives of farmers or pastoralists, the business community, women, and youth.

14.2.7: Kenya Forest Service

Kenya Forest Service (KFS) is a State Corporation under the Ministry of Environment and Forestry. The Service derives its mandate from the Forest Conservation and Management Act, 2016, which is "to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the country's socio-economic development and connected purposes."

The Vision of KFS is an internationally recognized organization of excellence in knowledge-based sustainable forest resources development, conservation, and management. Its Mission is Conservation, management, development, and sustainable utilization of forests and allied resources. The country is divided into 10 Conservancies, 47 Ecosystem Areas, and 250 Forest Stations.

Each of the offices in the field is fully functional. The Forest Station is the smallest administrative unit in the field.

Kenya Forest Service (KFS) functions are stipulated and outlined in section 6 of the Forest Act 2016 (a-q). While Part V section 48-52 provides for community participation in forest management through Community Forest Associations. This part provides for the formation and registration of a Community Forest Associations with the registrar of societies Act Cap 108, Development of Participatory Forest Management Plan, and signing of Forest Management Agreement (FMA). The Implementation of Rule 46 provides that the Service shall initiate the formation of a Forest Level Management Committee consisting of; Representatives of the Service; Representatives from the forest association and other stakeholders in the area "To assist the forest association in the implementation of the community forest management agreement."

Part VII Provides for trade-in Forestry-section 56(2) Permits; a Timber license; Special forest use license; A contract; Joint Management; or Concession.

14.2.8: Water Resource Authority

The Water Resources Management Authority (WRMA) was established in 2005. It was later renamed as Water Resources Authority under the Water Act 2016 that was operationalized on the 21st of April 2017. The authority is an Agent of the National Government responsible for regulating the management and use of water resources. Water Resource Authority (WRA) is the national Government's lead agency mandated to regulate the management and use of water resources. Further, to formulate and enforce standards, procedures, and regulations for the management and use of water resources and flood mitigation; It is expected to allocate water resources through issuance of licenses and water permits and enforce conditions to those permits for water abstraction. In the context of this strategy, it is expected to participate in; Planning, surveying of water resources, creating awareness to the community on the importance of protecting the water

reserves, facilitating the establishment of Water Resource Users Associations (WRUAs), and working with them in the management of water resources and conflict resolution over water use among others.

14.2.9: National Land Commission

The National land policy of 2009 recommended the establishment of the National Land Commission (NLC), an idea adopted by the Committee of Experts (CoEs) that drafted the Constitution of Kenya, 2010. Article 67(1) (a) of the Constitution establishes the National Land Commission as an independent constitutional commission mandated principally to manage and administer public land on behalf of the County and national Governments. Further, Section 5(2) (c) of the Land Act 2012 tasks the commission to ensure that public land under the management of the designated state agencies is sustainably managed for the intended purposes. Other functions of the commission are laid down in the constitution and relevant land laws, including the National Land Commission Act, 2012, the Land Act 2012, and the Land Registration Act 2012. Apart from the direct land laws, natural resource laws such as the mining Act 2016 and the Petroleum Act 2019 also provides important oversight responsibilities to the commission.

14.2.10: Kenya Meteorological Department

The Kenya Meteorological Department is the Kenyan authority responsible for providing weather and climate information and services to ensure food security, poverty reduction, sustainable development, disaster prevention, environmental conservation, adaptation to climate change, and stop the environment's degradation. The services are decentralized in all the counties that provide surface, upper air, and marine meteorological services.

14.2.11: Ministry of Petroleum and Mining

The Ministry of Petroleum and Mining was created in 2018, during the re-organization of the Kenya Government to administer mineral resources. The mineral exploration entails the sequential process of information gathering that assesses the mineral potential of a given area. Suitable targets are then staked as mineral claims to secure mineral rights. The Constitution of Kenya 2010 and the Mining Act 2016 envisions community participation in environmental governance. However, the definition and scope of what community entails is vague. It leaves room for unwarranted mining consent disputes with people and groupings that may not merit.

The Mining Act 2016 established the following institutions to support the development of the mining sector, the National Mining Corporation, Mineral and Metals Commodity Exchange, Mineral Rights Board, Internationally Accredited Mineral Certification Laboratory, and Community Liaison. The community liaison is established under the directorate of mines to manage complaints and disputes from mining and mineral exploration. This division

is charged with creating awareness to the public in mining matters that concern them and ensure harmony between investors and landowners. The Cabinet Secretary may, by notice in the Gazette, designate duly qualified public officers to be inspectors of mines for such jurisdiction as specified in the Mining Act. 2016. The designated inspector of mines may enter any building, premises, or land for inspection purposes to ensure compliance documents and standards are met by official identification. These include compliance regarding blasting permits and prospecting rights and importing storage and use of correct explosives.

14.2.12: Energy and Petroleum Regulatory Authority

The Energy and Petroleum Regulatory Authority (EPRA) is established as the successor to the Energy Regulatory Commission (ERC) under the Energy Act, 2019, with an expanded mandate of regulation of the Energy and Petroleum. The core functions that offer governance over petroleum also provide for the promotion of environmental conservation by observing compliance matters that border on protecting pollution of the environment by petroleum products.

14.2.13: National Museum of Kenya

The National Museums of Kenya (NMK) is a state corporation established under the Museums and Heritage Act No. 6 of 2006 charged with collecting, preserving, studying, documenting past and present cultural and natural heritage in Kenya. NMK's mandate is to enhance knowledge, appreciation, respect, and sustainable utilization of the resources to benefit Kenya and the world. NMK is a key agency in the governance of heritage resources in the country.

14.2.15: Civil Society Organizations

Civil Society Organizations (CSOs) involved in environmental governance are highly diverse, including local, national, regional, and international groups with various missions dedicated to environmental protection, sustainable development, poverty alleviation, animal welfare, and other issues. Civil society covers a wide range of actors, including individuals, religious and academic institutions, and issue-focused groups such as not-for-profit or non-Governmental organizations. The diversity of civil society and its value to official inter-Governmental processes on the environment are acknowledged in Agenda 21, the comprehensive sustainable development blueprint adopted at the 1992 Rio Earth Summit

Civil society plays a key role in bridging the information and exchange gap between the population and policy. It can support information collection and dissemination, policy development, policy implementation, advocacy, and assessment and monitoring, making sure that concerns of those affected by environmental challenges and policies are considered in environmental

governance. NGOs also promote networking of different stakeholders to address issues collaboratively and help to develop the skills and mindset necessary for sustainable management of (natural) resources. Besides advisory and support roles, civil society organizations can also take on a more direct environmental management and governance role. They can enhance representation on multistakeholder governance platforms such as river basin authorities or fisheries management councils, thereby functioning as principal actors and agents for good governance.

In terms of governance, civil society organizations (CSOs) are vital in holding Governments accountable and ensuring that the needs of local communities are effectively reflected in national policies. They also ensure plans that the necessary resources are mobilized to enable local communities to take adaptive action.

Some of these CSOs include:

14.2.16: Nature Kenya

Founded in 1909 initially known as The East African Natural History Society, it is among Africa's oldest nature-related NGOs. Nature Kenya's work is firmly based on partnership, science, and action. The society's programmes now have a strong focus on biodiversity conservation action, specializing in educating and involving local communities in what is referred to as Site Support Groups (SSGs) living around key conservation areas. Currently, Nature Kenya works closely with 26 SSGs covering 25 Key Biodiversity Areas (KBAs). Nature Kenya developed a monitoring framework owned by an established National Liaison Committee composed of some 33 Government and non-Government agencies that ensure sustainable partnerships for KBAs conservation, monitoring, and reporting. The KBA monitoring aims to: track state, pressure, and response; assess the impact of conservation interventions; determine how KBAs continue to meet their conservation objectives; enable timely detection of threats and their effects on biodiversity; and influence policy and management decisions.

The GEF-UNDP project entitled *"Strengthening the Protected Area Network of the Eastern Montane Forests Hotspot of Kenya"* Nature Kenya supported the development of the first State of Environment (SoE) Report under devolved governance structure, i.e., Kakamega County SoE Report of 2012. Through support from World Land Trust, UK, 409 hectares (1,010 acres) of land was purchased in Dakatcha Woodland to conservation Clarke's Weaver, a globally threatened bird species. The local communities are managing the land under the Dakatcha Woodland Conservation Group and Community Conservation Areas Committees. With support from Rainforest Alliance, Nature Kenya purchased 3.6 hectares (8 acres) of land in Taita Hills for the conservation of Taita Apalis, a globally threatened bird species listed under the IUCN Red Data List. Nature Kenya facilitated the development of Tana River Delta Land Use Plan (LUP) and Strategic Environmental Assessment (SEA). These plans

won The Royal Town Planning Institute (RTPI) international Award for Planning Excellence and commended by DFID as a model for delivering Sustainable Development Goals. Yala Swamp LUP and SEA have been signed by the two governors of Siaya and Busia counties, including the Right Hon. Raila Amolo Odinga.

To ensure that the Government is kept in check, Nature Kenya and SSGs are engaged in routine strategic advocacy work to mainstream KBAs into Government planning and decision making. The advocacy work includes but is not limited to: the passage of appropriate policies and implementation; Important joint Bird (Biodiversity) Areas (IBA) /KBA management and national recognition; expansion of Protected Area network; sustainable development initiatives such as Tana Delta, Yala Swamp; sound climate change mitigation measures; NGO-Government-Local community partnerships; adherence to international obligations and sustainable KBA monitoring.

14.2.17: IUCN-The World Conservation Union

IUCN, particularly the East and Southern Africa Regional Office, has taken on a more ecosystem approach to conservation around Mt. Elgon, among other areas. It includes working with conservation authorities to improve and secure the integrity of the conserved areas and with community groups and local authorities to integrate conservation and its benefits with the livelihoods of people who live close to the reserved areas.

14.2.18: Act Change Transform (ACT Kenya), former PACT-Kenya

ACT Provides institutional capacity building for community institutions in governance and accountability. It is developing the capacity of the National Landowners Wildlife Forum and its constituent members in lobbying for more supportive policy and legislative frameworks for biodiversity. Through its Organizational Capacity Assessment Process Programme, ACT develops the capacity of regional NGOs to plan effectively and transparently. The aspects monitored in this programme include the effectiveness of CBOs to operate and communicate with their members while networking among themselves. The perceived responsiveness towards supporting their constituents and their ability to communicate and collect information.

Many more NGOs not covered in this report also occur in the country working on environment and natural resources conservation. They contribute to advancing the environment and natural resources governance in Kenya in partnership with relevant public agencies.

14.2.20: Community Forest Associations (CFAs)

These are civil society institutions that were established by the Forest Conservation and Management Act, 2016. CFAs provide interesting avenues for the local community to partner with KFS in the management of forests.

The roles of CFAs include; Participating in forest management by signing management agreements with KFS, improving the livelihoods of its members through income-generating activities like beekeeping, protection of forest reserves through collaborative patrols by community scouts, tree planting in degraded sites within indigenous forests, and harvested sites in forest plantations, dissemination of indigenous conservation initiatives to present generation and liaising with KWS to manage human-wildlife conflicts.

In Kenya, as per the year 2019, there were 179 CFAs registered in Kenya where communities participate in forest management. In the same year, Kenya Forest Service (KFS) had approved 160 Participatory Forest Management Plans (PMPs), which guide the co-management of the forests between CFAs and KFS within a certain forest block. In 2019, CFAs had signed 2 Concessions signed between them and KFS, and 106 signed Forest Management Agreements (FMAs). Out of 160 signed PFMPs 48 were under review.

14.2.21: Water Resource User Associations (WRUAs)

Section 29 (1) of the Water Act 2016 provides for the possibility of establishing a Water resource users association (WRUA) which shall be a community-based association for collaborative management of water resources and resolution of conflicts concerning the use of water resources.

A WRUA is an association of water users, riparian landowners, or other stakeholders who have formally and voluntarily associated cooperatively with sharing, managing, and conserving a common water resource (definition in WRM Rules). In broad terms, the membership of a WRUA comprises the following 5 categories: Riparian members, Abstractor members, Non-consumptive members, Observer members, CBOs, and SHGs. Membership is based on a certain amount of annual subscription fee dictated by individual WRUA.

The WRUA Development Cycle (WDC) defines the roles and responsibilities of a WRUA as:

- Represent interests of water users at the community level, ensuring that all stakeholders' opinions are taken into account
- Participate in decision-making such as in the application of water permits for water abstraction
- Mobilize water users for collective water resources management and catchment conservation
- Provide local information on water use
- Mobilize resources in water resource management
- Promote compliance with water laws
- Support WRA in the monitoring of water use
- Provide a forum to discuss and resolve conflicts on water use

14.2.22: Beach Management Units (BMUs)

Fishing communities around lakes and along rivers usually organized themselves along clan lines and used traditional institutions to regulate their member's fishing activities, thereby conserving fishery resources. These communities formed co-operatives to facilitate their fishing and marketing activities, referred to as Beach Management Units. The Malindi Fishermen Committee is a CBO with over 1,000 members from the community living around the Malindi National Park (Maina, 2000). The Watamu Turtle Watch was formed in 1997 by a group of residents concerned about the poaching of turtles and their eggs within the Watamu Marine Park. The group's activities include education and awareness-raising, nest protection, tagging and releasing turtles caught in fishing nets, and compensating fishermen who agree to release captured turtles (Maina, 2000). Many other water bodies, such as Lake Victoria, also have Beach Management Units to regulate fishing activities in these fishing areas. In so doing, they contribute in the governance of the environment and fish resources.

15.2.23: Kenya Wildlife Conservancies Association

Wildlife Conservancy is land set aside by an individual landowner, body corporate, group of owners, or a community for wildlife conservation purposes (Wildlife Management and Conservation Act, 2013). Any person or community who owns the land on which wildlife inhabits may individually or collectively establish a wildlife conservancy or sanctuary in accordance with the provisions of this Act. We have over 155 conservancies in Kenya distributed across 28 counties in Kenya, with 2,364 scouts trained on wildlife security. Conservancies are represented in Kenya Wildlife Service (KWS) board. On the board are 2 members representing community conservancies and 1 member from private conservancies.

Most of the Wildlife Conservancies are in the rangelands of Kenya undertaking wildlife-based tourism-related activities.

Such activities are generating income for the local communities and enhancing their direct benefits from natural resources. For instance, Kerio Environmental Conservation Association in Baringo County was initiated by the Kenya Resources Centre for Indigenous Knowledge of the National Museums of Kenya. The association is organized into committees and engages in income-generating activities, establishing tree nurseries, and rehabilitating eroded areas. The association's members have also initiated water projects for household consumption and irrigation. Another activity is collecting and selling medicinal plants, especially by communities around the Kamnarok National Reserve (Maina, 2000).

14.2.24: Community-Based Organizations (CBOs) and Associations

Diverse community-based organizations have been formed to address specific natural resources management issues. The formation of these CBOs has largely been initiated and facilitated by relevant Government agencies.

Private Sector

The private sector plays a key role in environmental governance. Private operators provide capital, expertise, and market access, support re-use, and recycle solid waste and information dissemination. Many private sector players benefit directly or indirectly from the ecosystem services provided by forests, rangelands, and wetlands. Such private sector players, including water service providers, water bottling enterprises, tour operators, tourism sector players, saw millers, and others, can participate in natural resource restoration. They can do this through payment for ecosystem services (PES) schemes or their Corporate Social Responsibility (CSR) agendas. Their staff can also provide labor for restoration initiatives during corporate engagement events in the field.

In Kenya, several private sectors contribute to environmental protection and conservation by restoring degraded areas. Some of these institutions include Kenya Breweries Limited, Privatization Commission of Kenya, Vivo Energy, Total Kenya, Coca Cola Company, Tea companies, and Financial Institutions such as Banks.

14.4: The International Agencies

Several intentional agencies, such as World Bank Group's, offer good corporate governance and social and environmental sustainability in all its investments. The World Bank Group, for instance, encourages its clients to operate in an environmentally and socially responsible fashion. Proactive approaches to the governance of natural resources, such as collaboration with Governments and other stakeholders, fair compensation to stakeholders for loss of traditional access to resources, and conflict resolution relating to the distribution and shared use of resources that can impact business reputations and business risks.

.

Chapter 15: Strategies for Enhancing Environment and Natural Resources Governance

Table 1-15: Strategies for enhancing environment and Natural resources governance in Kenya

Theme	Action	Indicator	Key Actor	Other Actors	Time frame			Budget Estimate
Energy Sector					ST	MT	LT	
	Review of Subsector Laws	No reviewed	Min of Energy	AG, NEMA, KFS				250.0M
	Review of Institutional Mandates	No reviewed	Min of Energy	AG				100.0M
	Private Sector Participation in Retail Business	No allowed to participate	Min of Energy	EPRA, KEPSA				200.0M
	Establishing a strong National Competition Policy	Policy established	Min of Energy	EPRA, KETRACO, GDC, KENGEN				300.00M
	Providing Alternate Subsidies	No of subsidies instituted	ERC	KP, KETRACO, GDC, KENGEN				100.00M
	Implementation of Open Access	No. Accessing electricity	ERC	KETRACO, PPP				200.0M
	Unbundling the Supply of Electricity	No of PPP	ERC	Private players, KETRACO, KP				300.00
	Strengthen Energy Tribunal	Capacity built	Tribunal	Exchequer, AG, PPP				200.0M
	Encourage Public Participation	No of forums engagements	Min of Energy	KETRACO, KP, KENGEN, EPRA, Private players				200.0M
	Strengthen Regional Integration	No of regional engagements	Min of Energy	EPRA, KENGEN, ERC, KP				200.0M
	Expand Renewable energy sources	No of RE firms established	Min of Energy	Private players, KENGEN, EPRA				300.0M
	Establish adequate investment frameworks for PPPs	No of frameworks established	Min of Energy	Private players, KENGEN, EPRA				100.0M
	Align the Energy legislation to the Constitution of Kenya 2010	Policy established	Min of Energy					100.0M
	Enhance implementation of the Solar heating regulations of 2012.	No of solar installations	Min of Energy	NPS				200.0M
	Improve energy infrastructures particularly to the rural population	No of infrastructures installed and power connections	KETRACO, KPLC	Private players				500.0M
Mining sector	*Incorporate petroleum and related products into Mining Act*	Reviewed legislation	Min. Mining & petroleum, CG	Private players,				100.0M

Theme	Action	Indicator	Key Actor	Other Actors	Time frame			Budget Estimate
	2016							
	Introduce advanced mineral processing technologies to add value	No of mineral processing firms established	Min. Mining & petroleum, CG	Private players				500.0M
	Formulate land use related regulations to guide mining	Policy established	Min. Mining & petroleum	Private players				50.0M
	Ensure completion and implementation of all mineral exploration programs	All programs implemented						574.0M
	Ensure proper management and dissemination of geo-information data	An updated geo-information centre	Min. Mining & petroleum, CG	Private players				100.0M
	Awareness creation especially among the Political leaders	No of forums of engagement	Min. Mining & petroleum, CG	Private players				20.0M
Climate change sector	*Allocate more funds to address climate change*	Funds allocated	GoK, Min of Environment and Natural Resources, CG	Private players				50.0M
	Provide adequate infrastructures and technology to address climate change	Infrastructure in place	GoK, Min of Environment and Natural Resources, CG	Private players				700.0M
	Implement climate change policy	Policy implemented	Min of Environment and Natural Resources, ELC	Private players				100.0M
	Enact Meteorology policy	Policy enacted	KMD	Private players				50.0M
	Promote partnerships with international organizations such as WMO, ICAO, Global and regional centres, NMHSs, national institutions such as KCAA, KAA, KenGen	Partnerships in place	Min of Environment and Natural Resource, KMD	Private players				10.0M
Water Resources sector	*Enforcement of water sector Regulations*	Regulations enforced	WRA, CG	NPS				10.0M
	Adequate funding for the Sub Catchment management plans (SCMP) implementation	SCMP implemented	WRA, WRUAs, CG	CECs				300.0M
	Provide adequate infrastructures and technology to address	Infrastructure in place	WRA					400.0M

Theme	Action	Indicator	Key Actor	Other Actors	Time frame			Budget Estimate
	water resources monitoring systems							
	Create awareness among lead agencies on water resource regulations	No of forums	WRA, CG					20.0M
	Construct adequate wastewater treatment plants	Infrastructure in place	Water Service Boards, CG					100.0M
	Upgrade existing waste water treatment plants		Water Service Boards					100.0M
	Establish framework on operationalization of interGovernmental linkages in the water sector	Framework in place	WRA, CG					50.0M
Forest sector	*Develop benefit sharing framework with community forest association (CFAs)*	Framework developed	KFS, CFAs					50.0M
	Review the regulations under Forest Act 2016	Reviewed Act in place	KFS, CG	Private players				50.0M
	Review regulations to control cultivation in river riparian reserves.	Reviewed Regulations in place	KFS, CG	Private players				50.0M
	Finalize the Draft Forest Policy upon which the Forest Conservation and Management Act 2016 is anchored	Forest Policy in place	KFS, CG	Private players				50.0M
	Develop and implement Participatory Forest management Plans (PFMP)	No of PFMP developed	KFS, CFAs, CG					20.0M
	Build capacity of CGs to take up devolved forest functions (TIPS)	No of CG staff trained	KFS, CG					30.0M
	Establish linkages between research institutions, universities and the public	No of MoUs signed	CG, KFS					20.0M
Heritage sector	*Harmonize heritage laws with other sector regulations*	Harmonized laws in place	NMK					20.0M
	Awareness creation on the importance of our heritage	Informed public	NMK					10.0M
	Enforcement of regulations governing heritage sites	Regulations enforced	NMK	NPS, Heritage wardens				10.0M
	Promote heritage research for data	No. of Surveys	NMK	NEMA, KWS, KFS				100.0M

Theme	Action	Indicator	Key Actor	Other Actors	Time frame			Budget Estimate
Biodiversity Sector	*Enhance enforcement of Regulations on Conservancies*	Regulations adequately enforced	KWS, NMK					10.0M
	Gazette management Plans for conservancies	Gazzetted Management Plans	KWS, Community Wildlife Conservancies, CG					10.0M
	Enhancement of the benefit sharing mechanisms	Benefit sharing mechanisms enhanced	KWS, local community	Nature Kenya				5.0M
	Finalize & implement the National Biodiversity Strategy and Action Plan	Strategy Implemented	KWS, Nature Kenya	WWF				10.0M
	Conduct inventory and research on biodiversity	Biodiversity inventory in place	KWS, WWF	Nature Kenya				100.0M
	Conduct valuation of biodiversity	No of reports	WWF, KWS	NEMA				100.0M
	Enhanced information and knowledge on natural resources mapping	Maps of all resources developed	DRSRS, KWS,	Nature Kenya, NMK, KWCA				200.0M
	Enact regulations to prevent encroachment into the wildlife migratory corridors	Regulations in place	KWS, DRSRS, AG					100.0M
Fisheries sector	*Enhance utilization of the invasive species to generate energy*	Regulations in place	NEMA, Fisheries Department, WRA					100.0M
	Enhance implementation of legislations on fisheries including use of illegal gear and gazettement of BMUs	Legislations implemented to the later	State Department of Fisheries, CG	NPS				50.0M
	Enhance implementation of regional framework for cross border utilization of fisheries resources	Frameworks implemented	State Department of Fisheries, CG					10.0M
	Capacity building on fisheries and fishing personnel	No of personnel trained	State Department of Fisheries, CG					20.0M
Livestock Sector	*Enhanced implementation of frameworks governing livestock diseases and parasites*	Framework in place	State Department of Livestock, CG					20.0M
	Establish marketing infrastructures for livestock	Infrastructures in place	State Department of Livestock, CG					50.0M

Theme	Action	Indicator	Key Actor	Other Actors	Time frame			Budget Estimate
	products including value addition							
	Review legislation on the land tenure system	Reviewed laws	State Department of Livestock, CG, NLC					50.0M
	Create awareness on the livestock carrying capacity	No trained	State Department of Livestock, CG					10.0M
	Build capacity on the inventory of GHG emission emanating from the sector	No trained						15.0M
Agriculture sector	*Enhance implementation of legislations on economically viable land parcels*	Determined acreage	State Department of Agriculture, CG					20.0M
	Capacity building to the agricultural extension officers	No trained	State Department of Agriculture, CG					10.0M
	Enhance capacity building to farmers on emerging new farming technologies	No trained	State Department of Agriculture, CG					10.0M
	Develop framework for agrochemical management	Framework developed	State Department of Agriculture, CG					20.0M
Land sector	*Review legislations on land such as Survey Act and Land consolidation Act*	Reviewed legislations	NLC, CG					10.0M
	Creation of awareness on Land laws	No of forums held	NLC					5.0M
	Enhance land adjudication programs	No of acreage adjudicated	NLC, Min. of Lands					10.0M
	Harmonize legislation on riparian land	Legislation harmonized	NLC, Min. of Lands					10.0M
	Develop and implement spatial plans both at County and National level	Plans in place for each CG.	NLC, Min. of Lands					10.0M
Wetlands, Coastal and Marine sector	*Enhance inventory and mapping of all wetlands and biodiversity*	Inventory in place. Wetland map	NEMA, WRA, CG					20.0M
	Enhance enforcement of Wetland Regulations	No of enforcement actions	NEMA, WRA	CG				10.0M
	Review all wetland legislation	Reviewed legislation	NEMA, WRA	CG				20.0M
	Implement spatial plans both at County and National level	Spatial plans implemented	NEMA, WRA	CG				10.0M

Theme	Action	Indicator	Key Actor	Other Actors	Time frame			Budget Estimate
	Establish a framework for utilization of transboundary wetlands	Framework established	NEMA, WRA					5.0M
Infrastructure Sector	*Create awareness on the significance of EIA processes in infrastructure development*	No of reports on workshops	NEMA, NCA	CG				20.0M
	Review institutional mandates on infrastructures	Reviewed mandates	NEMA	CG, AG				20.0M
Public Health Sector	*Review institutional mandates on public health*	Reviewed mandates	DPH, CG					10
	Create awareness on attitude change in relation to public health for environment management	No of Reports	NEMA, DPH, CG					20.0M
	Build capacity in Public health	No of personnel trained	DPH, NEMA	CG				100.0M
	Construct adequate sanitary landfills to handle solid waste	Infrastructures in place	CG					200.0M
	Enhance enforcement of laws on Public health mainstreaming environment	No of cases of compliance	DPH, CG					100.0M
Tourism sector	*Review spatial plans in key tourism areas*	Reviewed spatial plans	State department of Tourism, CG					100.0M
	Enforce spatial plans governing tourism sector	No of enforcement actions taken	State department of Tourism	NPS				50.0M
	Develop framework for benefit sharing	Framework developed	State department of Tourism, CG					50.0M

Chapter 16: Conclusion and Recommendation

In 2018 Government of Kenya announced an ambitious development agenda dubbed 'the Big 4' that aims to address affordable housing, universal healthcare, food security, and growing manufacturing. The realization of this vision requires an equal commitment to balancing development and the environment.

Environmental governance institutions in Kenya are faced with inadequately harmonized functionalities leading to either duplication of roles or implementation conflicts. Therefore, it is prudent to suggest functions to uniquely identified and relevant units to take leadership in a given area of specialty. It will effectively promote proper management of the fiscal regime. Whereas there are governance mandates unique to some sectors, most are found to have cross-cutting similarities.

Our biodiversity depends on the natural environment for survival, and hence the need to sustainably manage it for posterity. Threats to biodiversity emanate mainly from human activities, including land-use change, encroachment, habitat degradation, destruction of wildlife dispersal areas and migratory corridors and routes, poaching, human-wildlife conflict, among others. There is a need to scale up the implementation of various existing strategies and policies governing biodiversity conservation and management by national and County Governments and other stakeholders with a stake in biodiversity to tackle these issues. Additionally, other innovative strategies such as Payment for Ecosystem Services (PES) can be introduced.

In the Mining sector, the recent growth of 5.9 percent in the industry is a measure of improved governance and infrastructural development to spur investment. The embodiment of institutions in the Mining Act No. 12 of 2016 and regulations has given credibility to the licensing process and provided infrastructure for capacity building to impact this sector positively. There is a need to fast-track the establishment and operationalization of mineral value addition facilities to further enhance this nascent and yet promising sector.

On the other hand, agriculture resources collectively constitute a considerable natural resource base that propels Kenya's economic development agenda. Whereas the existing agro-based resources should be exploited for crop production to meet the present needs of Kenyans, we should simultaneously ensure their long-term productive capacity to perform various ecosystem

functions. The use of resources should occur without degrading their quality and viability while also cushioning them against the adverse effects of climate change. Adoption of sustainable and climate-smart agricultural technologies, innovations, and management practices (SCSA-TIMPs) is recommended.

Kenya, like the rest of the world, is experiencing adverse impacts of climate change and variability. These have exacerbated environmental degradation, reduced agricultural production and food security, increased incidences of flooding, landslides, droughts, and disease epidemics. These have also led to the destruction of physical infrastructure and heightened the risk of natural resource conflicts. While vulnerability to these impacts is differentiated and context-specific, it can result in significant economic costs that can derail the vision's 2030 goals. The development of the National Climate Change Response Strategy (NCCRS) provides a broad, coordinated framework for Government, private sector, civil society, and other stakeholders to integrate climate change and variability considerations into national and County development planning and implementation at various levels.

The energy sector meanwhile plays a critical role in the socio-economic development of a country. The Kenya Vision 2030 identified energy as one of the infrastructure enablers of its social and economic pillar. Currently, the energy sector relies wholly on the importation of all petroleum requirements. However, with the discovery of oil in Northern Kenya, this trend is likely to change. Following a least-cost approach, the Government has prioritized geothermal and wind energy plants and solar-fed mini-grids for rural electrification. Energy Policy sets out biogas expansion targets of 10,000 small and medium-sized digesters by 2030.

Policies on funding for energy research should concentrate more on renewable energy sources, which has a double benefit of sustainability and a cleaner environment. Dependence on hydro-power generating Plants to supply the country's energy needs poses uncertainty in the heavy manufacturing industries. It is estimated that between 10-30% of the primary energy input is wasted in Kenya. The production of energy-efficient charcoal and fuel-wood stoves has provided significant employment opportunities in urban and rural areas.

In the biodiversity sector, a detailed census of key wildlife species is needed to establish their status and develop a baseline to monitor their recovery. There is a

need to assess the feasibility of reintroducing flagship species that have disappeared, such as the reticulated giraffe and Grevy's zebra.

There is a need to put together a transboundary water agreement to govern the use of River Omo and provide provision to regulate the permanent use of Omo River flows. On the other hand, efforts should encourage Tanzania to nominate the lake as an extension to the Kenya Lake System.

The Infrastructural elements associated with the "big 4 agenda" need effective coordination in the environmental (Ministries, Departments, and Agencies) MDAs Units to ensure that the relevant regulations and guidelines are implemented. ASEA should be undertaken for upcoming projects to realize the agenda among other infrastructural developments in the country. Payment of Ecosystem Services approach is recommended where it applies. The land-use regulations development needs to be completed and implemented.

Regulation across MDAs and lead agencies on environmental management should focus on quality assurance and control of the environment.

The approach of the ''Nyumba Kumi '' initiative needs to be applied to all environmental regulations on water, air, biodiversity, chemical substances, noise, waste, EIAs, EAs, SEAs, E-Waste enforcements. The smaller unit community organization involvement will improve the awareness creation on the role of sound environmental parameters in human health. The entire enforcement process should be facelifted from the trend as usual to realize this.

Environmentally sustainable tourism depends on the management of the value-added to the resource endowment. Therefore, the development of the sector depends on human, land, water, and air resources. Tourist safaris in the national parks exact a heavy toll on the balance of the ecosystem. Adverse impacts from tourism occur when the level of visitor use is greater than the environment's ability to cope with this use within acceptable limits of change. Uncontrolled conventional tourism poses potential threats to the natural areas in Kenya.

References

Africa, M. (2019). East Africas Largest International Mining,Processing of minerals and safety Equipment Trade Exhibition. *MINEXPO AFRICA.* Nairobi: Expo Group Exhibition Worldwide.

Akech, J. M. 2006. "Land, the Environment and the Courts in Kenya. Background Paper for the Environment and the Law Reports." (February):1–26.

Anon. n.d. "TOWARDS A FRAMEWORK FOR NATIONAL CLIMATE FINANCE GOVERNANCE."

Avery, S. (2010). Hydrological impacts of Ethiopia's Omo Basin on Kenya's Lake Turkana water levels & fisheries, Final Report, African Development Bank, Tunis.

Avery, S. (2014). what future for Lake Turkana and its Wildlife? Swara January –March 2014. www.watres.com Retrieved on 18th November 2019

Allibhai, N. (2015). Sacrificing human rights for development on Lake Turkana.

https://www.international rivers.org/blogs/433-9. Retrieved 18th November 2019

Barber, V., Miller, K.R., Boness, M., Securing protected areas in the face of the global change: Issues and strategies, IUCN, Gland, Switzerland and Cambridge, 2004, p. 234

Behnke, R., & Muthami, D. (2011). *The contribution of Livetsock to the Kenyan Economy.* IGAD Livestock Policy Initiative Working Paper.

Bennun, L. A. & Njoroge, P. (1999): Important Bird Areas of Kenya. East Africa Natural History Society. Nairobi

Bennun, L. A., Dranzoa, C., & Pomeroy, D. (1996). The forest birds of Kenya and

Uganda. Journal of East African Natural History, 85: 23–48

Birdlife International (2021) Important Bird Areas factsheet: Shimba Hills. Downloaded from http://www.birdlife.org on 10/04/2021.

Bond, Patrick, Khadija Sharife, Ruth Castel-branco Coord, Terri Hathaway, Adrian Nel, and Will Nham. 2012. "The CDM Cannot Deliver Deliver the Africa." (2).

Bowman, D., Balch, J., Artaxo, P., Bond, W., Cochrane, M., D'Antonio, C., . . . Swetnman. (2011). The human dimension of fire regimes on Earth. *ournal of Biogeography Vol 38*, 2223-2236.

Bruce, D. J. (2009). *Kenya Land Policy: Analysis and Recommendation.* United States Agency for International Development,ARD Inc.

Bugembe, B. N. (2016). Natural Resources Governance Framework Challenges and Opportunities in Eastern Africa. *A regional Scoping synthesis of the critical Natural Resource Governance Issues*, 26.

COK. (2010). *THE CONSTITUTION OF KENYA.* Published by the National Council for Law Reporting with the Authority of the Attorney-General.

Deininger, K. &. (2012). The Rise of Large Farms in Land Abundant Countries: Do They Have a Future?," World Development. *World Development, Elsevier, volume 40(4)*, 701-714.

Delgado. (2005). Rising Demand for Meat and Milk in Developing Countries: Implacation for Grasslands based Livestock Production. *In Grasslands: A global Resource*, 29-39.

FAO. (2011). *Climate Smart Agriculture; A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits from Improved Cropland Management.* Viale delle Terme di Caracalla, 00153 Rome, Italy.

FAO (2014). Soil, World, and Resources Reports: *World Reference Base for Soil Resources 2014 International Soil Classification System*

FAO. (2015). *Global Forest Resources Assessment Report.* Food and Agriculture Organization of the United Nation.

FAO. (2016). *The State of Food and Agriculture;Climate Change, Agricultuture and Food Security.* Food and Agriculture Organization of the United Nations.

FAO. (2017). *Gender Assessment of dairy Value Chains: Evidence from Kenya.* Food Agriculture Organization of the United Nations.

GoK (2009). Kenya Water for Health Organization (KWAHO), (2009). Enhancing Water and Sanitation Governance in Kenya. Human Rights Based Approach to Reforms in the Kenya Water Sector".

GoK. (2013). *National Water Master Plan 2030.* Ministry of Water, Environment and Natural Resources;JAPAN INTERNATIONAL COOPERATION AGENCY NIPPON KOEI CO., LTD.

GoK (2014). Sessional Paper No. 12 of 2014 on National Wetlands Conservation and Management Policy.

GoK (2015). EMCA Cap 387 (Amendment) Act 2015

GoK. (2015). *Natural Capital:Biodiversity Atlas.* Ministry of Environment Natural Resources and Regional Developement Authorities,Kenya.

GoK (2016). Fisheries Department Annual Statistical Bulletin, 2016

GoK (2016). Kenya, Ministry of Environment and Natural Resources (2016). National Forest Programme of Kenya 2016-2030, MENR, Nairobi, Kenya

GoK (2016). The Mining Act 2016

GoK (2016). Forest Conservation and Management Act, 2016.

GoK. (2017). *Aquaculture Business Development Programme.* IFAD Investing in Rural People.

GoK (2017). State of the Coast Report for Kenya

GoK (2017). Report on Sub Committee on Country Mining Vision Gap Analysis (March 2017)

GoK (2017). Third Vision 2030 Medium Term Plan.

GoK (2017). Kenya, Ministry of Environment and Natural Resources and Regional

Authorities 2017, National Mangroves Ecosystem Management Plan.

GoK. (2018). *National Climate Change Action Plan (Kenya) 2018-2022.* Nairobi: Ministry of Environment and Forestry.

GoK (2019). Mayoni Sub Catchment Management Plans 2019.

GoK (2019).Kenya, Ministry of Environment and Forestry (2019), National Strategy for Achieving 10% Tree Cover by 2022.

Gonzalez-Roglich, M., Zvoleff, A., Noon, M., Liniger, H., Fleiner, R., Harari, N., & Garcia, C. (2019). Synergizing global tools to monitor progress towards land degradation neutrality: Trends. Earth and the World Overview of Conservation Approaches and Technologies sustainable land management database. Science & policy, 93, 34-42

Hamerlynck, O., Richmond, M., Mohammed, A., & Mwaitega, S. R. (2008). *Fish and invertebrate life histories and important fisheries of the Pangani River Basin, Tanzania.* International Union for Conservation of Nature.

ICOMOS (2002). ICOMOS, International Cultural Tourism Charter. Principles and guidelines for managing tourism at places of cultural and heritage significance. ICOMOS International Cultural Tourism Committee.

IFAD (2010).Livestock and climate change.
http://www.ifad.org/lrkm/events/cops/papers/climate.pdf.

IPCC. (2007). *Climate Change 2007 - Impacts, Adaptation and Vulnerability; Contribution of Working Group II to the Fourth Assessment Report of the InterGovernmental Panel on Climate Change.* http://www.ipcc.ch/pdf/glossary/ar4-wg2.
Kedera, C., & Kuria, B. (2005). Invasive alien species in Kenya: status and management. *Kenya Plant Health Inspectorate Service.*

IUCN 2021. The IUCN Red List of Threatened Species. Version 2021-1. <https://www.iucnredlist.org.

KEMFRI. (2018). *Status of Kenya Fisheries.* Kenya Marine Fisheries Research Institute.

KFS. (2013). *National Forest Resource Mapping and Capacity Development* . PASCO CORPORATION.

Kilavi, M.K. 2008. Analyzing the temporal characteristics of extreme temperature

Events over ASALs and the coastal regions of Kenya as an indicator of climate change.

King'uyu, S. M. 1994. Space-time characteristics of the extreme temperature values over the Tropical Eastern Africa region. MSc. Thesis, University of

Nairobi, 1994.

King'uyu, S. M., L. A. Ogallo and E. K. Anyamba 2000: Recent trends of surface minimum and maximum temperatures over Eastern Africa. Climate. Vol. 13 No. 16, 2876- 2885, 15 August 2001.

King'uyu, S. M., M. Kilavi, P. Omeny, E. Muigai and A. K. Njogu.2010/2011. Climate Change Indices for Kenya. Meteorological& Related Sciences. Vol. 5, No. 1; Nov 2011; Kenya Meteorological Society.

Kiplagat, Wang, & T.X. Li. (2011). Renewable energy in Kenya: Resource potential and status of exploitation,Renewable and Sustainable Energy Reviews,. *Science direct Volume 15 Issue 6*, 2960-2973.

KIPPRA. (2019). *Kenya Economic Report; Resource mobilization for Sustainable development in Kenya.* The Kenya Institute for Public Policy Research and Analysis.

KNBS. (2009). *Economic Survey.* Kenya National Bureau of Statistics, GOK.

KNBS. (2015). *Economic Survey Kenya 2015.* Nairobi: Kenya National Bureau of Statistics.

KNBS. (2018). *Economic Survey .* Kenya National Bureau of Statistics.

KNBS. (2019). *Economic Survey Kenya.* Nairobi: Kenya National Bureau of Statistics.

KNBS (2019): Kenya Population and Housing Census 2019

KNBS. (2020). *Economic Survey.* Kenya National Bureau of Statistics.

KWS. (2015-2017). *Conservation Status Report.* Ministry of Tourism and Wildlife.

Lazarus, David. 2006. "United Nations Environment Programme (Unep)." *Environmental Geology* (November):638–40. doi: 10.1007/1-4020-4494-1_337.

Lee, C., de Vries, W. T., & Chigbu, U. E. (2019). Land Governance Re-Arrangements: The One-Country One-System (OCOS) versus One-Country Two-System (OCTS) Approach. Administrative Sciences, 9(1), 21.

Madzwamuse Masego (2010). Climate Governance in Africa - Adaptation Strategies and Institutions Cape Town: Heinrich Böll Foundation, 2010 http://za.boell.org/web/publications-631.htm]

Malala J., Keyombe, J. Olilo, C., Obiero M., Aura, C., and Njiru, J. (2018). Biodiversity and its trends in and around Lake Turkana. Kenya Marine and Fisheries Research Institute

Matlon, P. (1994). "Indigenous land use systems and investments in soil fertility in Burkina Faso." In J. Bruce and S. Migot-Adholla (eds.), *Searching for Land Tenure Security in Africa* (pp. 41–69). Dubuque, Iowa: Kendall/Hunt Publishing.

Matiru, V. (1999). *FOREST COVER AND FOREST RESERVES IN KENYA:POLICY AND PRACTICE.* IUCN.

McKenzie. (2010). The effects of climatic change and wildland fires on air quality in national parks and wilderness areas. *Fire Management Today 70*, 26-28.

Migai, A. (2006). *Land, The Environment and the Courts in Kenya. The environment and law reports.* DFID/KLR Patnership.

Mogoi, Obonyo, Ongugo, Oeba, & Mwangi. (2012). Communities, property rights and forest decentralization in Kenya: Early lessons from participatory forestry management. *Cons. Soc.10*, 182-194.

Mokveld, K., & Eije, S. v. (2018). *Final Energy Report Kenya.* Netherlands Enterprise Agency .

Montiel, C., & Kraus, D. (2010). *Best Practise of Fire use: Prescribing Burning and Fire Suppression Programmes in Selected case study regions in Europe.* European Forest Research Institute.

Muigai, K. (2018). *Devolution and Natural Resource Management in Kenya.*

Munawer, W., Vinayagam, S., & Reddy, D. R. (2019). Participatory Management Process in Natural Resource Management (NRM) by Women Groups. Journal of Extension Education, 31(1).

Mulwa, R., Mutunga, J., Kioko, O. (2018). Baseline Avifauna Survey at Mt. Kenya Forest KBA. Report.

MOM (2015). Ministry of Mining. Feasibility Report for Proposed Gemstone Centre Gemology Laboratory.

Mwakubo. (2002). LAND TENURE AND FARM LEVEL SOIL CONSERVATION IN SEMIARID AREAS, KENYA. *International Association of Common Property Resources, Common Property Resources and Globalization, Victoria Falls, Zimbabwe, June 2002* (pp. Sub-theme 4: Land /Water and Resource Tenure and the Commons in an Era of Globalisation). iascp@cass.org.zw.

NCPD. (2012). *Sessional Paper No. 3 of 2012 on Population Policy for National Development.* Nairobi: National Council on Population and Development.

NCPD. (2013). *Insights into Family Health in Kenya.* Nairobi: National Council for Population and Development.

NCPD. (2017). *The State of Kenyan population.* National Council on Population and Development.

NEMA. (2010). *State of Environment Report .* Progress Press Co. Malta.

NEMA. (2017). *State of Coast Report.* National Enviroment and Management Authority.

NEMA. (2019-2020). *State of Environment Report.* National Environment and Management Authority.

NFP. (2016-2030). *National Forest Programme.* Ministry of Environment and Natural Resources.

NWSS) (2007). The National Water Services Strategy (NWSS) (2007 – 2015).Ministry of Water and Irrigation

NK (2019). Nature Kenya Report. Kenya's Key Biodiversity Areas (KBAs) Status and Trends 2019.

NMK (2010). National Museums of Kenya, 2010. Kenya Lakes System in the Great Rift Valley Nomination Dossier

Obayelu, A. E. (2015). Transformation from subsistence to commercial agriculture in Nigeria: The effects of large land aquisition on smallholder farmers. In E. Osabuohien, *Handbook of Research on In-Country Determinants and Implications of Foreign Land Acquisitions* (p. 23). Nigeria: IGI global Publisher of Timely Knowledge.

Ogutu, J. O., Piepho, H.-P., Said, M. Y., Ojwang, G. O., Njino, L. W., Kifugo, S. C., & Wargute, P. W. (2016). Extreme Wildlife Declines and Concurrent Increase in Livestock Numbers in Kenya:

What Are the Causes? *PLoS ONE 11(9): e0163249*, https://doi.org/10.1371/journal.pone.0163249

Ojwang W., Asila A., Malala J., Ojuok J., Othina A., 2007 The Status of Fishery in Lake Turkana. In Ojwang, W.O., Gichuki, J., Getabu, A., Wakwabi, E. and Abila, R. (eds.) Lake Turkana Fisheries, People and the Future. KMFRI Technical Report No.1. 122p.

Ojwang, G., Wargute, Said, M. Y., Worden, J. S., Davidson, Z., Muruthi, P., . . . Ihwagi, F. (2017). *Wildlife Migratory Corridors and Dispersal Areas;Kenya Rangelands and Coastal Ecosystem.* Government of the Republic of Kenya.

Omuto, C.T. (2013). Major Soil and Data Types in Kenya. In: Development in Earth Surface Processes, Vol. 16. Kenya: A natural outlook. Geo-environmental Resources and Hazards, Paron, P., Olago, D.O., Omuto, C.T. Ed. Elsevier, Amsterdan/ Oxford

Ottichilo, Grunblatt, Said, & Wargute. (2000). Wildlife and Livestock Population Trends in the Kenya Rangeland. *Conservation Biology Series, vol 12*, 203-218.

Policy, N. L. (2009). *Session Paper no.3 of 2009 on National Land Policy.* Ministry of Lands.

Rego, Rigolot, Fernandes, Montiel, & Sande. (2010). Towards Intergrated Fire Management. *European Forest Institute, Joensuu Finland*, 16.

Rishon Chimboza (2018): Growth and Momentum in Kenya Mining Sector; Mining Review Africa Issue, 2018

Röhr Ulrike (2009). Gender in Climate Change Mitigation and Adaptation, Factsheet in the Dialogue on Globalization journal, Berlin: Friedrich-Ebert-Stiftung, 2009.

Sombroek, Braun, & Pouw. (1982). *Exploratory soil Map and Agro-Climatic Zone Map for Kenya.* Kenya Soil Survey.

Stattersfield, Crosby, Long, & Wege. (1998). Endemic Bird Areas of the World: Priorities for biodiversity conservation. *BirdLife Conservation Series 7*.

Steudler, D., & Williamson, I. P. (2002). A framework for benchmarking land administration systems.

Thakadu. (2005). Success Factors from Community based Natural Resource management in Northern Botswana: Lessons from practice. *Natural Resource Forum*, 199-212.

UNCSD. (2012). The Future we Want. *RIO+20.* Rio de Janeiro, Brazil.

UNDP-UNEP. (2006). *Poverty and Environment Issues:Governance Institutions, Institutional Frameworks and Opportunities for Communities.* WWF EARPO & BSI Ltd .

UN HABITAT (2010). Alber, Gotelind Gender, Cities and Climate Change, Nairobi, Kenya. http://www.unhabitat.org/downloads/docs/GRHS2011/GRHS2011.

UNESCO (1972). Convention Concerning The Protection of The World Cultural

And Natural Heritage. http://whc.unesco.org/ Retrieved 18th November 2019

UNEP. (2006). *Annual report* . United Nations Environment Programme.

UNEP (2012). United Nations Environment Programme (UNEP). Contribution of Montane Forests and Related Ecosystem Services to Kenya Economy.

Wambugu, & Muthamia. (2009). *The State of Plant genetics for Food resources in Kenya.* Kenya Agriculture Research Institute,National Gene Bank of Kenya.

Wario R. Adano&Fatuma Daudi (2012). Links between Climate Change and Governance in Africa. Between climate change, conflict and governance in Africa". Institute for Security Studies Paper No. 234 (May 2012) www.issafrica.org/uploads/ Paper_234.pdf

Wargute PW, Said MY (1998). The population and distribution of Grevy's zebra (Equus grevyi Oustalet) in Kenya, 1977±1994. Department of Resource Surveys and Remote Sensing, Ministry of Environment and Natural Resources, Nairobi, Kenya. Technical Report No. 149.

Wambugu, Peterson. 2014. "Country Report on the State of Plant Genetic Resources for Food and Agriculture." (January 2009). doi: 10.13140/2.1.2113.4727.

WASREB. (2019). *IMPACT REPORT ISSUE NO.11.* Water Services and Regulatory Board.

WASREB. (2020). *Impact Report Issue No. 12.* Water Services and Regulatory Board.

WCMA. (2013). *THE WILDLIFE CONSERVATION AND MANAGEMENT ACT NO.47 2013.* KENYA GAZETTE SUPPLIMENT.

WRA. (2017). *Water Reosurce Impact Report.* Water Resource Authority.

WTTC. (2018). *TRAVEL & TOURISMGLOBAL ECONOMIC IMPACT & ISSUES.* WORLD TRAVEL AND TOURISM COUNCIL.

Zhang, X., and F. Yang. 2004. RClimDex (1.0) User Manual. Climate Research Branch, Environment Canada, Downsview, Ontario.

Annex I: List of Heritage Sites in Kenya

Name of Site/Monument	County	Name of Site/Monument	County
Kilombe Arch. site	Baringo	Mama Ngina Drive	Mombasa
Muhanda Fort	Bungoma	Mombasa Golf Club	Mombasa
Chetambe's Fort	Bungoma	Babu Motors	Mombasa
Kakapeli Rock Shelter	Busia	Kilindini House	Mombasa
Old Embu PC's House	Embu	Ivory House	Mombasa
Old Embu PC Servant's Quarters	Embu	Issa Thawar House	Mombasa
Old Armoury	Embu	MSA Hospital Dispensary	Mombasa
Kanam Prehistoric Site	Homa Bay	Central Police Station	Mombasa
Kanjera Prehistoric Site	Homa Bay	District Officer's Office, Mombasa	Mombasa
Government Rest House-Sori	Homa Bay	Anglican Cathedral	Mombasa
The Old SDA Church- Rapedhi	Homa Bay	Mackinnon Market	Mombasa
Tom Mboya Mausoleum	Homa Bay	Alidina Visram School	Mombasa
Olorgesailie National Monument	Kajiado	Grindlay's Bank Intn'l	Mombasa
Selengai Stone	Kajiado	National Bank of Kenya	Mombasa
Selengai Wells	Kajiado	Valentine High School	Mombasa
Kora Cultural Site	Kajiado	Kaya Kiteje	Mombasa
Emugur Cultural Site	Kajiado	Kaya Pungu	Mombasa
Muliro Gardens	Kakamega	Similani Cave	Mombasa
Ikhonga Murwi (Weeping Stone)	Kakamega	Castle Hotel	Mombasa
King George's Tower	Kakamega	Holy Ghost Cathedral	Mombasa
Fort Ternan Palaeo. site	Kericho	Sheikh Mwinyime Shrine	Mombasa
Kericho Wagon Works Ltd.	Kericho	Leven House	Mombasa
Tuluap Sigis	Kericho	St Emmanuel Church, Frere Town	Mombasa
Chemogoch Prehistoric Site	Kericho	Mama Ngina Drive Historical and Archaeological Site	Mombasa
St. Paul's Mother Church (A.C.K) Kabete	Kiambu	Kenya Ports Authority Maritime Museum Building	Mombasa
A.I.C Kijabe Church Ruins	Kiambu	Jomo Kenyatta Public Beach	Mombasa
Fort Smith	Kiambu	Uhuru Gardens Mombasa	Mombasa
Manse, Kikuyu	Kiambu	Fort Jesus National Monument (Formerly Fort Jesus National Park)*	Mombasa
P.C.E.A. Church of the Torch	Kiambu	Little Theatre Club	Mombasa
Watson Scott Memorial, Church Kikuyu	Kiambu	Fort Hall	Murang'a
Githunguri Gallows	Kiambu	Mukuruwe -wa-Nyagathanga	Murang'a
Githunguri Girls Dormitory (Kiriri)	Kiambu	Old Provincial Commissioner's Office, Fort Hall	Murang'a
Jomo Kenyatta's College Residence	Kiambu	Old P.C Office Nairobi	Nairobi
Mbiyu Koinange's College Residence	Kiambu	Central Park Monument	Nairobi
Old Italian Church in Ndarugu	Kiambu	Uhuru Park National Monument	Nairobi
Italian Prisoners of War Brick Manufacturing Plant	Kiambu	Uhuru Gardens National Monument	Nairobi
Italian Prisoners of War Pillar	Kiambu	Kenya National Archives	Nairobi
Ndula Power Station	Kiambu	McMillan Library	Nairobi

Name of Site/Monument	County	Name of Site/Monument	County
Jumba la Mtwana Ruins	Kilifi	High Court Building	Nairobi
Mnarani Ruins	Kilifi	Kipande House	Nairobi
Gede National Monument	Kilifi	Former Parklands Railways Staff quarters	Nairobi
Jamadra Mosque	Kilifi	Jeevanjee Gardens	Nairobi
Mtwapa	Kilifi	The Calton Fenzi Memorial Stone	Nairobi
Kilepwa Island	Kilifi	The War Memorial Statue	Nairobi
Mambrui	Kilifi	Institute of African Studies-Chiromo Campus	Nairobi
Mgangani	Kilifi	Nairobi School	Nairobi
Sheikh Said	Kilifi	Khoja Mosque	Nairobi
Sheikh Othman	Kilifi	Old Mutual Building	Nairobi
Takaungu South	Kilifi	Standard Chatered Building	Nairobi
Takaungu North	Kilifi	Pan African House	Nairobi
Vasco da Gama Pillar	Kilifi	Royalty House	Nairobi
DO's Office, Malindi	Kilifi	Imperial Chambers	Nairobi
Kaya Mudzimiru	Kilifi	Imperial British East African Company (I.B.E.A) Building	Nairobi
Kaya Fungo	Kilifi	Bull Cafe	Nairobi
Kaya Kauma	Kilifi	Prembro House	Nairobi
Kaya Chivara	Kilifi	Pansoms Building	Nairobi
Mosque (Unnamed)	Kilifi	Surat District Association Building	Nairobi
Jumaa Mtwapa	Kilifi	Rahimtulla Trust Library	Nairobi
Kaya Mudzi Muvya	Kilifi	Bohra Mosque	Nairobi
Kaya Lunguma	Kilifi	Dedan Kimathi Statue	Nairobi
Kaya Bomu/Fimboni	Kilifi	War Memorial Pillar	Nairobi
Kaya Mzizima	Kilifi	Nairobi Club	Nairobi
Ronald Ngala's Tombstone	Kilifi	Railway House, Lower Hill Road	Nairobi
Bedida Sacred Grove	Kilifi	Desai House, 2nd Parklands Avenue Nairobi	Nairobi
Ruins of Mtwapa Creek	Kilifi	Land's Offices, Moi Avenue	Nairobi
Brooks Quarry Prehistoric Site	Kisumu	Cottage Nani Road 150 Karen	Nairobi
Songhor Palaeo. site	Kisumu	Shaffi Mosque	Nairobi
Muguruk Arch. site	Kisumu	Westminister House	Nairobi
Old Provincial Commissioner's Office	Kisumu	Siri Gurdwara Ramgarhia	Nairobi
District Commissioner's office, Kisumu	Kisumu	City Park	Nairobi
Kisumu Police Headquarters	Kisumu	City Market	Nairobi
Brandman's House	Kisumu	Nairobi South Cemetery	Nairobi
Kit Mikayi Shrine	Kisumu	Tom Mboya Statue	Nairobi
Ukasi Rock	Kitui	YWCA International House	Nairobi
Nzambani Rock, Kyuluni	Kitui County	Cameo Cinema Building	Nairobi
Kongo Mosque	Kwale	Kenyatta Mausoleum	Nairobi
Shirazi	Kwale	Kenyatta International Conference Centre	Nairobi
Tumbe	Kwale	Makhan Singh House	Nairobi
Kaya Bombo	Kwale	Peponi Road House No.21	Nairobi

Name of Site/Monument	County	Name of Site/Monument	County
Kaya Waa	Kwale	Kaloleni Estate Streetscape	Nairobi
Kaya Sega	Kwale	Kaloleni Social Hall	Nairobi
Kaya Gonja	Kwale	Nairobi (Kariokor) Cemetery	Nairobi
Kaya Jego	Kwale	Desai House	Nairobi
Kaya Tiwi	Kwale	City Park Maze and Adjacent Greens	Nairobi
Kaya Mtswakara	Kwale	Kamukunji Grounds	Nairobi
Kaya Diani	Kwale	Pumwani Community Memorial Hall	Nairobi
Kaya Muhaka	Kwale	Lanet Prehistoric Site	Nakuru
Kaya Galu (Ganzoni)	Kwale	Italian Church near Kijabe	Nakuru
Kaya Kinondo	Kwale	Hyrax Hill Museum and Site	Nakuru
Chale Island Sacred Grove	Kwale	Kariandusi	Nakuru
Shimoni Cave	Kwale	Italian church near Kijabe	Nakuru
Kaya Bogowa	Kwale	Blixen House	Nakuru
Kaya Gandini	Kwale	Lord Egerton Castle	Nakuru
Kaya Mtai	Kwale	Kapurtay Prehistoric Site	Nandi
Dugumura Hill Sacred Grove	Kwale	St. Peters Catholic Church	Narok
Kaya Kwale	Kwale	Old Asian School	Narok
Kaya Dzombo	Kwale	Former Italian Barracks	Narok
Mrima Hill Sacred Grove	Kwale	Mount Suswa Caves	Narok
Kaya Ukunda	Kwale	Ole Ntarakwai Cultural Site	Narok
Diani Ruins	Kwale	Emururwai Site	Narok
Tiwi	Kwale	Naibala Cultural Site	Narok
Kaya Mstwakara	Kwale	Laikipia Samburu War Memorial Garden	Nyandarua
Kaya Chonyi	Kwale	Old Tulaga Colonial Court (Kinyahwe)	Nyandarua
Shimoni Heritage Sites	Kwale	Mau Mau Fig tree	Nyeri
Kaya Chitsanze	Kwale	Nyeri Provincial Police Headquarters	Nyeri
Parcel No. 690 Block 1, Lamu Island	Lamu	Nyeri Club	Nyeri
Takwa Milinga Ruins	Lamu	White Rhino Hotel, Nyeri	Nyeri
Pate Ruins	Lamu	Tumu Tumu P.C.E.A Church, Nyeri	Nyeri
Ishakani III	Lamu	P.C.E.A. Tumu Tumu Secretary's Office, Nyeri	Nyeri
Ishakani II	Lamu	Mau Mau Mass Grave	Nyeri
Ishakani I	Lamu	Mau Mau Cave	Nyeri
Shanga	Lamu	African Retail Traders Store	Nyeri
Omwe	Lamu	New District Commissioner's Office, Nyeri	Nyeri
Kiunga	Lamu	Nyeri Old Clock Tower	Nyeri
Lamu Fort	Lamu	Nyeri Court	Nyeri
Historic Lamu Town	Lamu	Ruringu Police Station	Nyeri
Mambore	Lamu	Ruringu Old African Court	Nyeri
Riadha Pillar	Lamu	The Baden Powell Grave	Nyeri
Siyu	Lamu	Pax-Tu Building	Nyeri
Jamia of Siyu	Lamu	St Peter's Anglican Church, Nyeri	Nyeri
Lango la Shee of Siyu	Lamu	St. Cuthbert's P.C.E.A. Church, Nyeri	Nyeri
Bwana Bakari Mosque	Lamu	Mathari Catholic Mission Church, Nyeri	Nyeri
Manda Town Ruins	Lamu	Italian Memorial Church, Nyeri	Nyeri
Faza	Lamu	Italian Servants' Wall Monument	Nyeri
Mwana	Lamu	Queen Elizabeth Monument	Nyeri
Lamu District Vetenary Office Block	Lamu	Dedan Kimathi's Trench (Kahigaini)	Nyeri
Lamu Water Catchment Area	Lamu	Karima Hill	Nyeri
Kitau Manda Skyline	Lamu	Burguret Mau Mau Shelter	Nyeri

Name of Site/Monument	County	Name of Site/Monument	County
Riyadha Mosque and Grounds	Lamu	Naromoru Mau Mau Cave	Nyeri
Machakos DC's Residence	Machakos	Mau Mau Trench	Nyeri
Paul Ngei's Mausoleum	Machakos	Thingine Traditional Shrine	Nyeri
Oldonyo Sabuk House, Kilima Mbogo	Machakos	Mau Mau Cave at Gatei	Nyeri
African Heritage House	Machakos	Wamutitu Mau Mau Cave	Nyeri
Kivaa Sacred Site	Machakos	Kahuru River Mau Mau Caves	Nyeri
Kitonyeo Kya Kivaa Sacred Site	Machakos	Kariba Mau Mau Caves	Nyeri
Kitonyeo Kya Twamiao Sacred Site	Machakos	Mau Mau Mass Grave at Gikondi	Nyeri
Kitonyeo Kya Kasulo Sacred Site	Machakos	Historic Travellers Camp Site (Tigithi Muiru)	Nyeri
Kitonyeo Kya Kithoni Sacred Site	Machakos	Naromuro St. Phillips ACK Church	Nyeri
Kitonyeo Kya Ngaasini Sacred Site	Machakos	Old District Commissioner's Office Nyeri	Nyeri
Paul Ngei Mausoleum	Machakos	Kenyatta House- Maralal	Samburu
The First District Commissioner's Office, Machackos	Machakos	Jaramogi Oginga Odinga Mausoleum	Siaya
Kaya Bate	Kilifi	Got Ramogi Hill	Siaya
Kaya Bura	Kilifi	East Alego Nyangoma Kogelo	Siaya
Kaya Mayowe	Kilifi	Old St. Marks A.C.K. Sagala Church	Taita Taveta
Kaya Singwaya	Kilifi	First Old District Commisioner's House Taveta	Taita Taveta
Muyu wa Kae,Swahili Settlement	Kilifi	Taveta ACK Holy Trinity Church, Mahoo	Taita Taveta
Two Malindi pillars	Kilifi	German Fortress	Taita Taveta
First Sir Ali Bin Salim Primary School Building Malindi	Kilifi	Voi Commonwealth War Graves	Taita Taveta
Marafa Depressions	Kilifi	Maktau Indian Commonwealth War Graves	Taita Taveta
Kaya Dagamura	Kilifi	Taveta Indian Commonwealth War Graves	Taita Taveta
Bildad Kaggia's Mausoleum	Murang'a	Taveta Indian Military Cemetry	Taita Taveta
Ichagaki Parish Church	Murang'a	Taveta Commonwealth War Graves	Taita Taveta
Sibiloi National Park	Marsabit	Taveta ACK Graves	Taita Taveta
El Molo Shrines	Marsabit	Maktau Railway Station	Taita Taveta
Moite Ceremonial Site	Marsabit	Maktau Picket Hill	Taita Taveta
Kaldera (The Birds Island)	Marsabit	Salaita Hill	Taita Taveta
Gaalgulumme Site	Marsabit	Kino Caves (Kenyatta Caves)	Taita Taveta
Ardha Gadamoji Site	Marsabit	Shaka ruins	Tana River
Garab Gudo	Marsabit	Kwa Wanawali Saba	Tana River
Dabel Ceremonial Site	Marsabit	Kwa Ungwana wa Mashaa	Tana River
Njuri Nceke Building, Meru	Meru	Methodist Church, Hola Mission	Tana River
Thaai Sacred Lake	Meru	Mau Mau Memorial Site, Hola	Tana River
Nkunga Sacred Lake	Meru	Kibuka Sacred Site	Tharaka Nithi
Bututia Sacred Lake	Meru	Gakuuni Sacred Site	Tharaka Nithi
Giitune Sacred Forest	Meru	Mukurwairwiga Sacred Site	Tharaka Nithi
M'Mwenda Mau Mau Cave	Meru	Manyirani Sacred Site	Tharaka Nithi
Ndurumo ya Nkari Sacred Site	Meru	Ndiairi Sacred Site	Tharaka Nithi
Ndurumo ya Gakiriro Sacred Site	Meru	Maragwa Sacred Site	Tharaka Nithi
Thimlich Ohingas	Migori	Ururuni Sacred Site	Tharaka Nithi
Macalder Mines	Migori	Ikwa Sacred Site	Tharaka Nithi
Jumaa Mosque	Mombasa	Kiegege Sacred Site	Tharaka Nithi
Luziwa	Mombasa	Nariokotome Site	Turkana
Nossa Senhora	Mombasa	Sirikwa Holes	Uasin Gishu
Ras Uwani	Mombasa	Abatondo Sacred Forest	Vihiga

Name of Site/Monument	County	Name of Site/Monument	County
Bwana Tamu	Mombasa	Oluchiri Sacred Grove	Vihiga
Ras Mtangawanda Mosque	Mombasa	Asubwe Sacred Grove	Vihiga
Bwana Shali Patani	Mombasa	Orahey Wells Complex	Wajir
Old Watch Towers	Mombasa	Orahey War Bunker	Wajir
Pillar Tomb	Mombasa	Italian War Ties	Wajir
Shatin Tomb	Mombasa	Kenya Armed Forces Old Comrades Association (KAFOCA) Building	Wajir
Kisauni Bell Tower	Mombasa	Officers Mess Building	Wajir
Mbaraki Pillar	Mombasa	Commonwealth Graves Site	Wajir
Old Law Courts	Mombasa	Armory	Wajir
Historic Old Town, MSA	Mombasa	Former District Commissioner's Office	Wajir
Portuguese Shipwreck	Mombasa	District Registrar of Person's Office	Wajir
Redoubt	Mombasa		

Annex 2: Gazetted forests in Kenya as at 31st December, 2017

No	Forest	County	LEGAL NOTICE NO.
1	Chebartigon	Baringo	15/1949
2	Chepkuchumo	Baringo	27/1962
3	Cherial	Baringo	15/1949
4	Kabarak	Baringo	27/1962
5	Kabiok	Baringo	15/1949
6	Kaisungor	Baringo	102/1941
7	Kaptimom	Baringo	15/1949
8	Katimok	Baringo	19/1949
9	Ketnwan	Baringo	15/1949
10	Kinyo	Baringo	15/1949
11	Kiptaber	Baringo	49/1967
12	Marop	Baringo	15/1949
13	Mosegem	Baringo	15/1949
14	Mtarakwa	Baringo	15/1949
15	Kiplombe Hills	Baringo	2/1936
16	Mukutani	Baringo	1470/2017
17	Pemwai	Baringo	15/1949
18	Mukobe	Baringo	27//1962
19	Perkerra	Koibatek/Baringo	27//1962
20	Saimo	Baringo	15/1949
21	Saino	Baringo	15/1949
22	Sekenwo	Baringo	27//1962
23	Sokta Hill	Baringo	15/1949
24	Tarambas Hill	Baringo	15/1949
25	Tutwon	Baringo	15/1949
26	Mumbaka	Busia	284/1986
27	Wanga	Busia	286/1986
28	Namuluku	Busia	285/1986
29	Nanyungu	Busia	283/1986
30	Gembe	Homa Bay	141/2017
31	Simenya	Homa Bay	172/2017
32	Rabour Hills	Homa Bay	173/2017
33	Ruri Hills	Homa Bay	144/2017
34	Kolosasi	Homa Bay	174/2017
35	Rangwa Hills	Homa Bay	124/2017
36	Gwassi Hills	Homa Bay	102/1941
37	God Nyaingu	Homa Bay	125/2017
38	Kodera	Homa Bay	126/2017
39	God Jope	Homa Bay	127/2017
40	Asego Hills	Homa Bay	128/2017
41	Nyasore	Homa Bay	129/2017
42	Samanga Hill	Homa Bay	130/2017
43	God Kopalo	Homa Bay	131/2017
44	Urianda Hills	Homa Bay	132/2017
45	Aywaya Hills	Homa Bay	133/2017
46	Nyakayiemba	Homa Bay	134/2017

No	Forest	County	LEGAL NOTICE NO.
47	Lugongo	Homa Bay	135/2017
48	Homa Hills	Homa Bay	136/2017
49	Chabera	Homa Bay	137/2017
50	Agai Hill	Homa Bay	138/2017
51	Kamondi Hill	Homa Bay	139/2017
52	Onoo Water Point	Homa Bay	102/1941
53	Mfangano	Homa Bay	140/2017
54	Maeta	Homa Bay	102/1941
55	Kegonga	Homa Bay	139/1995
56	Got Okombo	Homa Bay	142/2017
57	God Oogo	Homa Bay	143/2017
58	Wire	Homa Bay	36/2013
59	Embakasi	Kajiado	102/1941
60	Loitokitok	Kajiado	221/1977
61	Namangahill	Kajiado	304/1979
62	Ngong Hills	Kajiado	90/1985
63	Ololua	Kajiado	102/1941
64	Bunyala	Kakamega	421/1956
65	Kakamega	Kakamega	14/1933
66	Lugari	Kakamega	3/1977
67	Maragoli	Kakamega	266/1957
68	Misango	Kakamega	28/2013
69	Malava	Kakamega	14/1933
70	Turbo	Kakamega & Uasin Gidhu	145/1968
71	Kapchorua 1	Elegeyo Marakwet	102/1941
72	Kapchorua11	Elegeyo Marakwet	102/1941
73	Kaptagat	Elegeyo Marakwet	57/1941
74	Kessop	Elegeyo Marakwet	102/1941
75	Kipkabus	Elegeyo Marakwet	64/1961
76	Kipkabus	Elegeyo Marakwet	57/1941
77	Metkei	Elegeyo Marakwet	26/1954
78	Kapchemutwa	Elegeyo Marakwet	102/1941
79	Cheboyit	Elegeyo Marakwet	102/1941
80	Embobut	Elegeyo Marakwet	26/1954
81	Kaisungor	Elegeyo Marakwet	102/1941
82	Kiptanurr	Elegeyo Marakwet	102/1941
83	Kiptaberr	Elegeyo Marakwet	102/1941
84	Tigwa Hill	Elegeyo Marakwet	26/1954
85	Toropket	Elegeyo Marakwet	102/1941
86	Tumeya	Elegeyo Marakwet	64/1961
87	Sogotio	Elegeyo Marakwet	102/1941
88	Chemurokoi	Elgeyo Marakwet	102/1941
89	Kererr	Elgeyo Marakwet	26/1954
90	Chepalungu	Kericho	360/1956
91	Londiani	Kericho	102/1941
92	Dagoretti	Kiambu	104/1938
93	Escarpment	Kiambu	57/1941
94	Kamiti	Kiambu	14/1933
95	Kiambu	Kiambu	44/1932

No	Forest	County	LEGAL NOTICE NO.
96	Kikuyu Escarpment	Kiambu	48/1943
97	Muguga	Kiambu	104/1938
98	Nyamweru	Kiambu	57/1941
99	Boni Ijara	Garissa	262/2017
100	Ribe(Kaya)	Kilifi	88/1994
101	Jibana (Kaya)	Kilifi	88/1994
102	Arabuko Sokoke	Kilifi	48/1943
103	Kambe Kaya	Kilifi	88/1994
104	Chonyi Kaya	Kilifi	88/1994
105	Molinduko	Kirinyaga	385/1994
106	Njukiini West	Kirinyaga	385/1994
107	Karateng	Kisumu	175/2017
108	Nuu	Kitui	303/1961
109	East Ngamba	Kitui	101/1978
110	Endau	Kitui	102/1941
111	Gaikuyu	Kitui	253/1993
112	Maai	Kitui	26/2013
113	Imbachakuyu	Kitui	321/1993
114	Makongo	Kitui	303/1961
115	Mumoni	Kitui	253/1993
116	Mutito Hill	Kitui	25/1962
117	Mutha	Kitui	25/2013
118	Ngamba	Kitui	303/1961
119	Chemorogok	Koimbatek	15/1949
120	Kilombe Hill	Koimbatek	13181
121	Lembus	Koimbatek	280/1959
122	Maji Mazuri	Basringo	44/1932
123	Mt. Londiani	Kericho	44/1932
124	Kamuthetu	Tharaka-Nithi	181/2017
125	Karagwaru Hill	Tharaka-Nithi	182/2017
126	Mutaragwa Hill	Tharaka-Nithi	179/2017
127	Gitugu Hill	Tharaka-Nithi	180/2017
128	Kaura Hill	Tharaka-Nithi	183/2017
129	Mariene Hill	Tharaka-Nithi	184/2017
130	Muugi Hill	Tharaka-Nithi	185/2017
131	Nkarini Hill	Tharaka-Nithi	186/2017
132	Rwara Wa Takiutha	Tharaka-Nithi	187/2017
133	Tunyai Hill	Tharaka-Nithi	188/2017
134	Karauri Hill	Tharaka-Nithi	189/2017
135	Kiunguni Hill	Tharaka-Nithi	190/2017
136	Gambare Hill	Tharaka-Nithi	191/2017
137	Mukeria Hill	Tharaka-Nithi	192/2017
138	Kamanyole And Rancha	Tharaka-Nithi	193/2017
139	KIAMARA & Ranchai	Tharaka-Nithi	194/2017
140	Mwarera &Irigo	Tharaka-Nithi	195/2017
141	Kaguma & Njiru	Tharaka-Nithi	196/2017
142	Ntamaini & Inarua	Kwale	197/2017
143	Buda	Kwale	44/1932
144	Gogoni	Kwale	44/1932
145	Gonja	Kwale	304/1961
146	Shimba Hills	Kwale	407/1956
147	Jombo	Kwale	102/1941
148	Mailuganji	Kwale	107/1941

No	Forest	County	LEGAL NOTICE NO.
149	Marenji	Kwale	44/1932
150	Mkongani North	Kwale	406/1956
151	Mkongani West	Kwale	406/1956
152	Mrima	Kwale	304/1961
153	Mwachi	Kwale	104/1938
154	Laliak	Laikipia	44/1932
155	Lusoi	Laikipia	215/1984
156	Muruai	Laikipia	177/2017
157	Marmanet	Laikipia	44/1932
158	Kirima	Laikipia	178/2017
159	Rumuruti	Laikipia	44/1932
160	Ol Arabel	Laikipia	107/1941
161	Mukogodo	Laikipia	89/1937
162	Uaso Narok	Laikipia	386/1960
163	Ndare	Meru	44/1932
164	Mangrove Swamps	Tana River Kilifi, Lamu&Mombasa	44/1932
165	Mbalambala	Tana River	40/2013
166	Hirimani	Tana River	196/2017
167	Hewani	Tana River	30/2013
168	Kokani	Tana River	32/2013
169	Mwina	Tana River	31/2013
170	Bangali	Tana River	39/2013
171	Wayu	Tana River	29/2013
172	Witu	Lamu & Tana River	454/1932
173	Ikilisa	Machakos	532/1960
174	Iveti	Machakos	14/1933
175	Nduluni-Kalani	Machakos	532/1960
176	Uuni	Machakos	532/1960
177	Kalimani	Makueni	532/1960
178	Katende	Makueni	532/1960
179	Kemeto	Makueni	15/1949
180	Kenze	Makueni	532/1960
181	Kibwezi	Makueni	80/1936
182	Kilala	Makueni	532/1960
183	Kilungu	Makueni	14/1933
184	Kiongwani	Makueni	532/1960
185	Kioo	Makueni	532/1960
186	Kiteta Hill	Makueni	14/1933
187	Kithendu	Makueni	532/1960
188	Kitondu	Makueni	532/1960
189	Kitoo	Makueni	532/1960
190	Kitumbuuni	Makueni	532/1960
191	Kiu (Ngungu)	Makueni	532/1960
192	Kyai	Makueni	532/1960
193	Momandu	Makueni	20271
194	Mutuia	Makueni	532/1960
195	Nzaui	Makueni	532/1960
196	South Mbooni	Makueni	14/1932
197	Kyemundu	Makueni	532/1960
198	Tulimani	Makueni	532/1960
199	Utangwa	Makueni	532/1960
200	Utunene	Makueni	532/1960
201	Nthangu	Makueni	532/1960

No	Forest	County	LEGAL NOTICE NO.
202	Nthoani	Makueni	27/2013
203	Mataa	Makueni	532/1960
204	Ndatai	Makueni	532/1960
205	North Mbooni	Makueni	14/1933
206	Waiya	Makueni	532/1960
207	Makongo	Makueni	532/1960
208	Makuli Nguuta	Makueni	532/1960
209	Mandunguni	Malindi	109/2004
210	Boni Lungi	Lamu	261/2017
211	Panda Nguo	Lamu	263/2017
212	Marsabit	Marsabit	44/1932
213	Lodwar Town	Turkana	198/2017
214	Kakuma	Turkana	149/2017
215	Loima Hill	Turkana	264/2017
216	Kiagu	Meru	335/1959
217	Kibithewa	Meru	335/1959
218	Kieiga	Meru	335/1959
219	Kierera	Meru	335/1959
220	Kijegge	Meru	335/1959
221	Kikingo	Meru	335/1959
222	Maatha	Meru	335/1959
223	Meru (Lower Imenti)	Meru	104/1938
224	Meru (Upper Imenti)	Meru	104/1938
225	Thunguri Hills	Meru	335/1959
226	Munguni	Meru	335/1959
227	Mutejwa	Meru	335/1959
228	Mutharanga	Meru	335/1959
229	Ngaia	Meru	335/1959
230	Njuguni	Meru	335/1959
231	Ntugi	Meru	335/1959
232	Nyambene	Meru	335/1959
233	Thuuri	Meru	335/1959
234	Timau	Meru	335/1959
235	Kimanyi	Migori	34/2013
236	Marabu Magina	Migori	219/1992
237	Mukuro	Migori	284/1986
238	Migori Town	Migori	200/2017
239	God Bim	Migori	201/2017
240	God Kogalo	Migori	202/2017
241	Biangongo Hill	Migori	203/2017
242	Nyangena Hill	Migori	204/2017
243	Nyamarere	Migori	205/2017
244	Agongo Hill	Migori	206/2017
245	Nyandwi	Migori	207/2017
246	Tigira Hill	Migori	208/2017
247	Obembo	Migori	209/2017
248	Otacho	Migori	219/1992
249	Sagegi Hill	Migori	219/1992
250	Got Achama	Migori	210/2017
251	Got Keyo	Migori	211/2017
252	Got Otaro	Migori	33/2013
253	Getambwega Hill	Migori	212/2017
254	Omange Hill	Migori	213/2017
255	Nyalgwena Hill	Migori	214/2017

No	Forest	County	LEGAL NOTICE NO.
256	Makarangwe Hill	Migori	215/2017
257	Marabu-Magina	Migori	219/1992
258	Tarangwiti Hill	Migori	216/2017
259	Kebaroti Hill	Migori	218/2017
260	Kwa Hill	Migori	219/1992
261	Rabour	Migori	219/1992
262	Giribe	Migori	219/1992
263	God Agulu	Migori	139/1995
264	God Kwach	Migori	139/1995
265	Nyasumbi	Migori	139/1995
266	Nyaitara	Migori	80/1997
267	Raga	Migori	218/2017
268	Ranen	Migori	37/2013
269	God Kwer	Migori	37/2013
270	Kuja Bull Camp	Migori	38/2013
271	Kagure	Muranga	185/1961
272	Karaini	Muranga	385/1994
273	Karua(A)	Muranga	185/1961
274	Karua(B)	Muranga	185/1961
275	Karua©	Muranga	185/1961
276	Kiambicho	Muranga	185/1961
277	Kiamuti	Muranga	185/1961
278	Karura	Nairobi	44/1932
279	Arboretum(Nbi)	Nairobi	44/1932
280	Ngong Road	Nairobi	44/1932
281	Amara	Nakuru	69/2012
282	Bahati	Nakuru	44/1932
283	Eastern Mau	Nakuru	57/1941
284	Eburu	Nakuru	44/1932
285	Kijabe Hill	Nakuru	184/1980
286	Mau Narok	Nakuru	110/1967
287	Menengai	Nakuru	127/1977
288	Likia Extension	Nakuru	68/2012
289	Nakuru	Nakuru	128/1977
290	South Western Mau	Kerich,Bomet & Nakuru	44/1932
291	Western Mau	Nakuru &Kericho	44/1932
292	West Molo	Nakuru	44/1932
293	Transmara	Narok	102/1941
294	Olposimoru	Narok	196/1957
295	South Western Mau	Narok	44/1932
296	Bonjoge	Nandi	371/1984
297	Nandi North	Nandi	76/1936
298	South Nandi	Nandi	76/1936
299	Ururu	Nandi	76/1936
300	Kaptaroi	Nandi	76/1936
301	Teressia	Nandi	76/1936
302	Kipipiri	Nyandarua	218/1956
303	Ol Bolossat	Nyandarua	104/1938
304	Magumo North	Nyandarua	253/1978
305	Magumo South	Nyandarua	305/1979
306	Muruai	Nyandarua	177/2017
307	Kirima	Nyandarua	178/2017
308	Aberdare	Nyandarua/Nyeri/Muranga	48/1943

No	Forest	County	LEGAL NOTICE NO.
309	Kiganjo	Nyeri	44/1932
310	Nyeri Municipality	Nyeri	200/1987
311	Nyeri Hill	Nyer	26/1944
312	Nyeri	Nyeri	44/1932
313	Muringato Nursery	Nyeri	44/1932
314	South Laikipia	Nyeri	44/1932
315	Mount Kenya	Nyeri, Meru, Embu and Kirinyaga	48/1943
316	Mathews Range	Samburu	454/1956
317	Ndotos Range	Samburu	454/1956
318	Mount Nyiru	Samburu	454/1956
319	Leroghi	Samburu	13181
320	Abiero	Siaya	42/2013
321	Ramogi	Siaya	42/2013
322	Lambwe	Suba	43/2013
323	Insaria	Kisii	117/2017
324	Nyangweta	Kisii	119/2017
325	Ndomyo	Kisii	120/2017
326	Ngeri Hill	Kisii	121/2017
327	Ritumbe	Kisii	122/2017
328	Basi/Masige Forest Nursery	Kisii	123/2017
329	Mdengu	Taita Taveta	235/1991
330	Ngangao	Taita Taveta	125/1991
331	Choke(Mnjonyi)	Taita Taveta	235/1991
332	Figi	Taita Taveta	235/1991
333	Fururu	Taita Taveta	235/1991
334	Goye	Taita Taveta	235/1991
335	Kasigau	Taita Taveta	102/1941
336	Kilulunyi	Taita Taveta	235/1991
337	Kinyesha Mvua	Taita Taveta	235/1991
338	Kulundu	Taita Taveta	235/1991
339	Macha	Taita Taveta	235/1991
340	Ngomenyi	Taita Taveta	235/1991
341	Mbili	Taita Taveta	235/1991
342	Mchungunyi	Taita Taveta	235/1991
343	Modagache(Weni-Tole)	Taita Taveta	235/1991
344	Mtege	Taita Taveta	235/1991
345	Mwachora	Taita Taveta	235/1991
346	Mwakamu	Taita Taveta	235/1991
347	Weni Mbogho	Taita Taveta	235/1991
348	Yale	Taita Taveta	235/1991
349	Susu	Taita Taveta	235/1991
350	Weni Mwana	Taita Taveta	235/1991
351	Mwandongo	Taita Taveta	235/1991
352	Ndiwenyi	Taita Taveta	235/1991
353	Kapolet	Trans-Nzoia	57/1941
354	Kitalale	Trans-Nzoia	128/1977
355	Sekhendu	Trans-Nzoia	152/1977
356	Kitale Township	Trans-Nzoia	44/1932
357	Mount Elgon	Trans-Nzoia & Bungoma	44/1932
358	Eldolet 1 & 11	Uasin Gishu	258/1966
359	Kapsaret	Uasin Gishu	44/1932
360	Nabkoi	Uasin Gishu	44/1932
361	Timboroa	Uasin Gishu	44/1932

No	Forest	County	LEGAL NOTICE NO.
362	Tinderet	Uasin Gishu, Kericho & Nandi	44/1932
363	Tumeya	Uasin Gishu	57/1941
364	Maragoli	Vihiga	266/1957
365	Kapkanyar	West Pokot	49/1967
366	Lelan	West Pokot	128/1958
367	Mnangei/Siyoi	West Pokot	22/2013
368	Makunga	Bungoma	23/2013
369	Mulinduko	Embu	385/1994
370	Maranga	Embu	24/2013

Annex 3: County Mapping on Legal and Institutional Arrangements

County Name	Financing Locally Led Climate Change Action (FLLCOA) Programme -County Mapping on Legal & Institutional Arrangements											CCF institutional arrangements					Membership of regional economic blocs
	Climate Change Act	Climate Change Policy	Climate Change Action Plan	Climate Change Unit established	CIS plan	DRM Acts/Plans	Any other legislation/Plans	M&E units	Municipality Act/Plan	Gazzeted County Environment Committee	Signed Forest Transition Implementation Plans	CCCF Legislation	County Climate Change planning committee	ward committee	Rural ward committee	Urban ward committee	
Mombasa	No	No	No	No		Yes				Yes	No						Jumuia ya Kaunti za Pwani
Kwale	No	In devt	No	Yes	YES	Yes				Yes	No						Jumuia ya Kaunti za Pwani
Kilifi	In devt	No	No	In dev	No			yes		Yes	Yes	In devt					Jumuia ya Kaunti za Pwani
Tana River										Yes	No						FCDC,Jumuia ya Kaunti za Pwani
Lamu	No	No		in dev					Yes	No	Yes						FCDC,Jumuia ya Kaunti za Pwani
Taita Taveta	No	No	No	No	No			Yes		Yes	Yes						Jumuia ya Kaunti za Pwani
Garissa	No	In devt	In devt	Yes	Yes		The Garissa County Environmental Management and Co-ordination Act, 2018			Yes	No	Yes	Yes	Yes	Yes		FCDC
Wajir	Yes	No	No	No	Yes	Yes		yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		FCDC
Mandera	In devt	No	No							Yes	Yes						FCDC
Marsabit	No	No	Yes							Yes	Yes						FCDC
Isiolo	Yes	No	No	No	yes	yes		Yes	In devt	Yes	Yes	2018	Yes	Yes	Yes		FCDC
Meru	In devt	In devt	In devt	Yes						Yes	Yes						Mt. Kenya and Aberdares Region Economic Bloc
Tharaka-Nithi	Yes	in devt	No	Yes	no					Yes	No	Yes	Yes	No	No		Mt. Kenya and Aberdares

County Name	Financing Locally Led Climate Change Action (FLLCOA) Programme -County Mapping on Legal & Institutional Arrangements											CCF institutional arrangements					Membership of regional economic blocs
	Climate Change Act	Climate Change Policy	Climate Change Action Plan	Climate Change Unit established	CIS plan	DRM Acts/Plans	Any other legislation/Plans	M&E units	Municipality Act/Plan	Gazzeted County Environment Committee	Signed Forest Transition Implementation Plans	CCCF Legislation	County Climate Change planning committee	ward committee	Rural ward committee	Urban ward committee	
																	Region Economic Bloc
Embu	No	No	No	No	No			yes		Yes	Yes	In devt					Mt. Kenya and Aberdares Region Economic Bloc
Kitui		In devt	No	yes	yes			Yes		Yes	Yes	Yes	Yes	Yes	Yes		South Eastern Kenya Economic Bloc
Machakos		No	No	Yes						Yes	No						South Eastern Kenya Economic Bloc
Makueni	Yes	In devt	No	yes	yes	Yes		Yes		Yes	Yes	2015	Yes	Yes	Yes		South Eastern Kenya Economic Bloc
Nyandarua	No	No	N0	in dev						Yes	No						Mt. Kenya and Aberdares Region Economic Bloc
Nyeri	In devt			Yes				yes		Yes	Yes						Mt. Kenya and Aberdares Region Economic Bloc
Kirinyaga			In devt	Yes			Disaster Management Bill in Dev			Yes	No	In dev					Mt. Kenya and Aberdares Region Economic Bloc
Murang'a										Yes	No						Mt. Kenya and Aberdares Region Economic Bloc

County Name	Financing Locally Led Climate Change Action (FLLCOA) Programme -County Mapping on Legal & Institutional Arrangements											CCF institutional arrangements					Membership of regional economic blocs
	Climate Change Act	Climate Change Policy	Climate Change Action Plan	Climate Change Unit established	CIS plan	DRM Acts/Plans	Any other legislation/Plans	M&E units	Municipality Act/Plan	Gazzeted County Environment Committee	Signed Forest Transition Implementation Plans	CCCF Legislation	County Climate Change planning committee	ward committee	Rural ward committee	Urban ward committee	
Kiambu				Yes						Yes	Yes						Mt. Kenya and Aberdares Region Economic Bloc
Turkana			Yes	in dev				Yes		Yes	Yes						NOREB
West Pokot										Yes	Yes						NOREB
Samburu	No	No	No	No				yes		Yes	No						NOREB
Trans Nzoia	No	In devt	No	Yes	In devt	No		Yes		Yes	Yes						LREB, NOREB
Uasin Gishu	No	No	No	Yes			Environment Policy			Yes	Yes						NOREB
Elgeyo-Marakwet				Yes		Yes				Yes	Yes						NOREB
Nandi	In devt	yes	In devt	No	No			Yes		Yes	Yes	In devt					LREB, NOREB
Baringo								yes		Yes	Yes						NOREB
Laikipia	No	Yes								Yes	Yes						Mt. Kenya and Aberdares Region Economic Bloc
Nakuru						Yes		yes		Yes	Yes						Mt. Kenya and Aberdares Region Economic Bloc
Narok	No	in dev	No	No	Yes		Environment Act	Yes		Yes	No						
Kajiado										Yes	Yes						
Kericho								yes		Yes	Yes						LREB
Bomet	in devt	in devt	in devt	No	in devt	No		yes		Yes	Yes	in devt					LREB
Kakamega	in devt	yes	no	No	in devt	yes		yes		Yes	Yes	in Devt					LREB

County Name	Financing Locally Led Climate Change Action (FLLCOA) Programme -County Mapping on Legal & Institutional Arrangements											CCF institutional arrangements					Membership of regional economic blocs
	Climate Change Act	Climate Change Policy	Climate Change Action Plan	Climate Change Unit established	CIS plan	DRM Acts/Plans	Any other legislation/Plans	M&E units	Municipality Act/Plan	Gazzeted County Environment Committee	Signed Forest Transition Implementation Plans	CCCF Legislation	County Climate Change planning committee	ward committee	Rural ward committee	Urban ward committee	
Vihiga	Yes	yes	yes	yes	no	yes	The Vihiga County environment policy, Vihiga County agroforestry policy	yes		Yes	Yes	yes	yes				LREB
Bungoma								Yes		Yes	Yes						LREB
Busia	No	In devt	No	Yes	No			Yes		Yes	Yes	in dev					LREB
Siaya		In devt	No	Yes	Yes	in devt		Yes	yes	Yes	Yes						LREB
Kisumu	In devt	yes	yes	Yes	in devt	in devt		Yes	yes	Yes	Yes	in devt					LREB
Homa Bay	Yes	yes		Yes		Yes		Yes		Yes	Yes		Yes	in dev			LREB
Migori	In devt	In devt	No	Yes	in devt	Yes				Yes	No						LREB
Kisii	in devt	in devt	in devt	No				yes		Yes	Yes	in dev					LREB
Nyamira				No						Yes	Yes						LREB
Nairobi										No	No						