

**STATE OF ENVIRONMENT REPORT**

**LAIKIPIA COUNTY -2013**

Thomson Falls at Nyahururu Participants during LEWA Marathon



Wildlife in Ol Pajeta Conservancy

**Support Green Economy for Development of Vision**

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# PREFACE

# 

# FOREWORD

# ACKNOWLEDGEMENT

The process of preparing the SOE for Laikipia county was coordinated by CDEs Office Laikipia together with the County government of Laikipia with various other departments and Agencies.The lead agencies and depertments that played a role in the writing of this document includes; National management Authority, Kenya forest service, Ministry of agriculture Livestock and Fiheries, Water Resource Management Authority, County Government of Laikipia, County Development Office of Laikipia, Public Health,National Draught Management Authority and Laikipia wildlife forum. These lead agencies played a crucial role in providing primary data and other crucial information without which this report would not have been compiled.

They subsequent participated in validation and adoption of Laikipia County state of Environmental report SOE 2013 whose objective was to ensure that the public was involved.

NEMA Department of Research and planning provided the technical backstopping for the development of environmental indicators, and continued to provide advice and direction on various technical issues. They also provided financial support which enabled development and interrogation of the indicators.

The County Government of Laikipia also participated in the preparation and subsequent validation and adoption of critical environmental indicators which formed the backbone of this state of environment report SOE.

This SOE is therefore not only intended to provide the baseline report but also provide information that would influence and guide our policy direction on matters of environment as well as charting environmental indicator monitoring protocol that will enable continuous monitoring and therefore data and trends that could inform decision makers prompting action.

This SOE is therefore a very important reference document, but also a document to spur commitment from institutions which includes the county government of Laikipia and stakeholders to play their role in environmental monitoring reporting and planning.

# EXECUTIVE SUMMARY

Laikipia is unique and attractive because of its diversity: diversity of people, cultures, landscapes, climate, habitats, wildlife, partners and opportunities. Diversity is an asset that can stimulate long term development, and ensures Laikipia is representative of Kenya as a whole. Laikipia is 9,700 km2, 970,000 hectares or 2.4 million acres. The rural economy of Laikipia is mainly based on farming, livestock and increasingly on tourism. Industry is still a small sector. Rainfall varies between 1200 mm (in pockets in Laikipia West) to 400mm in northern Laikipia. Life depends on two main water catchments, Aberdares range and Mount Kenya. Water is a scarce resource and over abstraction upstream creates conflicts. 90% of Laikipia is “high and dry”: mostly too dry for cultivation. The County falls mainly under agro-ecological zones LH5 (‘Highland Ranching zone’), UM5 (‘Livestock-Sorghum zone’) and UM6 (‘Midland Ranching zone’). The Nyahururu zone is the only areas which has real natural potential for cultivation. Despite this, the highest proportion of land under cultivation occurs in the ‘LH5’ semi- arid ranching zone. As such, most of Laikipia’s farming is marginal, with detrimental effects on people and environmental health.Land use in Laikipia in percentage of land area 37% of Laikipia is under large scale ranching, with owners of both African and European origin, mostly in the ranching zone. 32% under pastoralist grazing use (on group ranches and “abandoned” lands in semi arid and arid areas, mostly in ranching zone 21% is under small holder farmers mostly rain fed, 0.1% is under large-scale intensive horticulture (flower & vegetable) farms. Farming occurs mostly in the ranching zone which has low cultivation potential. Approximately 5% of the county is under wildlife tourism exclusively

# ****ACRONYMS****

ASAL Arid and Semi Arid Lands

BOD Biological Oxygen Demand

CIDP County Integrated development Plan

CEAP County Environment Action Plan

COD Chemical Oxygen Demand

CSG County Steering Group

CEC County Environment Committee

CBOs Community Based Organizations

CEAP County Environment Action Plan

CIDP County Integrated Development Plan

EMCA Environmental Management and Coordination Act

NYAHUWASCO Nyahururu Water and Sewerage Company

KFS Kenya Forest Service

KWS Kenya Wildlife Service

KEBS Kenya Bureau of Standards

LAPSSET Lamu Port Southern Sudan Ethiopia transport Corridor

MoALF Ministry of Agriculture, Livestock & Fisheries

MTP Medium Term Plan

MDGs Millennium Development Goals

NEMA National Environment Management Authority

NRM Natural Resource Management

NWSB Northern Water Services Board

SOE State of Environment

WRMA Water Resources Management Authority

W.H.O World health organization standards

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# CHAPTER ONE: INTRODUCTION

# 1.0 Background information

This is the first ever state of Environment Report (SOE) to be prepared in Laikipia county under the new dispensation of devolved governance with the involvement of the county government. The state of environment report has been produced in line with the state obligation as a signatory to Agenda 21 which was resolved during the earth summit held in Rio de Janeiro in 1992. The Environment Management and Coordination Act no 8 of 1999, part III section 9 subsection 2(p) requires that a state of environment report (SOE) is prepared and submitted to the national assembly for endorsement every year. The act also mandates the national environment management authority to coordinate the process of preparation of (SOE) at the county and national levels and subsequently submit the report to the respective assemblies for discussion and adoption consequently providing guidance to our policy direction in matters relating to environment. This process is being coordinated by the National Environment Management Authority (NEMA). The current preparation of state of environment report (SOE) 2013 entailed the involvement of all the key stakeholders and partners at the county level.

The objectives of preparing Annual State of environment report (SOE) are highlighted below;

* Consolidate environmental data from diverse sources using known environmental indicators and analyze the data to determine trends.
* Indicate clearly whether environmental quality is improving, getting worse or staying the same
* Assess whether policies, laws programmes and other actions are having the desired effect
* Identify emerging issues
* Inform environmental policies interventions.
* Provide tangible environment issues backed by data for planning and compilation of the National Environmental Action plan (NEAP)
* Monitor the NEAP and the CEAPs

# 1.1. Linkages with other processes

# Linkages of the State of Environment with the Kenya Vision 2030, MDGs and the Kenya Constitution 2010 are discussed below; The County environment action Plan mirrors Kenya’s aspirations as envisioned in the Kenya Vision 2030, MDG’s and the Kenya Constitution 2010. This chapter covers the inter-linkages between the states of environment in the county in comparison to envisaged outcome other development blue prints as well as the constitution.

# 1.1.1 Kenya Vision 2030

The Kenya Vision 2030 is the country’s National Policy that entrenches the long term development strategy. The Vision was launched in June 2008 and was legislated as Sessional Paper Number 10 of 2012. It aims at transforming Kenya into “a newly industrialized, middle-income country providing a high quality life and secure environment to all its citizens by the year 2030’. The Vision has three pillars namely the economic, social and political pillars and also the macro-economic foundations/enablers.

The economic pillar aims to achieve an annual economic growth rate of over 10% over the period. The social pillar seeks to build a just and cohesive society with social equity in a clean and secure environment. The political pillar aims to realize a democratic, political system founded on issue-based politics that respects the rule of law, and protects the rights and freedoms of every individual in Kenyan society.

Therefore the state of the environment is prepared with aim of auditing the state of the county environment so that we can understand the current trends and whether the vision 2030 is being realized.

# 1.1.2 Millennium Development Goals

Kenya is committed to achieve the Millennium Development Goals (MDGs) by 2015. The MDGs is a set of eight broad human development goals with defined objectives, 18 targets and 48 indicators. The status of achievement of MDG goal No. 7 and 8 in the county is discussed below.

# 1.1.3 MDG 7: Ensuring Environment Sustainability

Environmental degradation continues to pose a major development challenge in the county. The various ongoing efforts towards re-afforestation, investment in clean energy, catchment protection and access to water, slum upgrading and control of gullys, sustainable sand harvesting/mining, are yet to realize desired impacts. The full conservation of major forests and water catchments is yet to be realized. Natural resource management and sanitation initiatives by stakeholders will be enhanced to improve on environmental sustainability.

# 1.1.4 MDG 8: Develop Global Partnership for Development

The County has continued to benefit from external resources that are either channelled through the government or the NGOs. Some of the NGOs playing a significant role include The Netherlands Development Agency (SNV), Caritas Nyeri, World Vision, Action Aid, World Vision and USAID while CBOs are African wildlife foundation AWF, Laikipia wildlife forum LWF among others. The key sectors which have benefitted include water, health environment, education, agriculture and governance. Another area of partnership has been the British Army Training Unit in Kenya and support by the Japanese International Technical Cooperation (JICA). Membership of Kenya to multiple trade regional blocks and signatory to trade agreements has also benefited the County entrepreneurs and producers. A large potential that lays to be tapped is county development funding from other countries under the guarantee of the National Government.

There is need to harness the relationship between the donors and the recipients so as to win the confidence of the donors and realise the intended objectives behind the funding. The key strategies to ensure this is realised are to ensure that there is frequent monitoring and evaluation of the development projects and that the implementers fulfil the community at needs.

# 1.1.5 The Kenya Constitution 2010

The promulgation of the Kenya Constitution started off the process of devolution. The constitution created the counties governed by the county governments. The constitution further prescribed in the fourth schedule the functions that will be undertaken in the county. The functions include: crop and animal husbandry; health services; control of air and noise pollution and outdoor advertising; cultural activities; transport; animal control; trade development and regulation; planning and development; pre-primary education; natural resources and environmental conservation; public works and services; fire fighting services and disaster management; control of drugs and pornography; coordination of the participation of communities. in article 42 the constitution further emphasized that every person has a right to a clean and healthy environment which includes the right;

* to have the environment protected for the benefit of the present and the future generation through legislations
* to have obligations relating to the environment fullfilled under article 70.

# 1.2 County profile

# 1.2.1 Position and Size

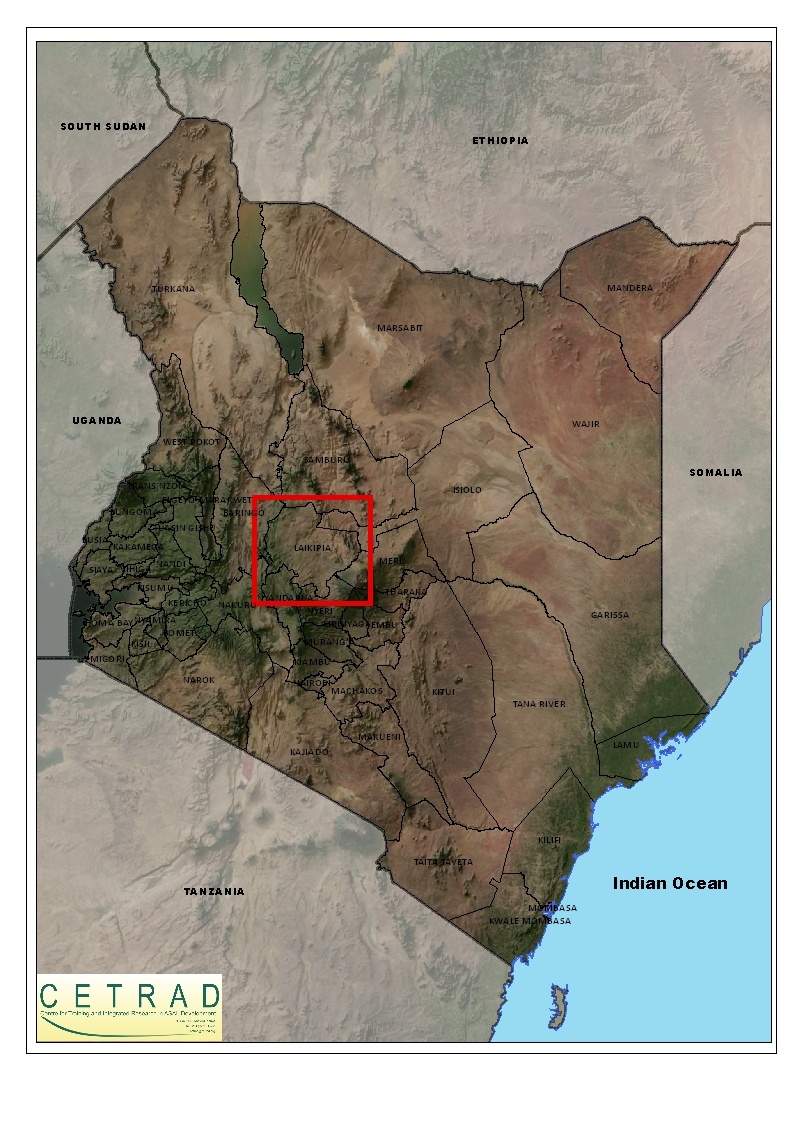
Laikipia County is one of the 47 counties in the Republic of Kenya. It borders Samburu County to the North, Isiolo County to the North East, Meru County to the East, Nyeri County to the South East, Nyandarua County to the south, Nakuru County to the South West and Baringo County to the West. The county lies between latitudes 0o18” South and 0 o51” North and between longitude 36o11” and 37o24’ East. It covers an area of 9,462 km2.The map below shows the geographical position of Laikipia County in Kenya.

# 1.2.2 Physical and Topographic Features

The altitude of Laikipia County varies between 1,500 m above sea level at Ewaso Nyiro basin in the North to a maximum of 2,611 m above sea level around Marmanet forest. The other areas of high altitude include Mukogodo and Ol Daiga Forests in the eastern part of the county at 2,200 m above sea level. The county consists mainly of a plateau bordered by the Great Rift Valley to the West, the Aberdares to the South and Mt. Kenya massifs to the South East all of which have significant effects on the climatic conditions of the county. The level plateau and the entire county drainage is dominated by the Ewaso Nyiro North basin with its tributaries which have their sources in the slopes of the Aberdares and Mt. Kenya and flow from South to North. The tributaries include Nanyuki, Timau, Rongai, Burguret, Segera, Naromoru, Engare, Moyak, Ewaso Narok, Pesi and Ngobit Rivers. The flow of these rivers matches the county’s topography which slopes gently from the highlands in the South to the lowlands in the North. The rivers determine to a large extent the settlement patterns, as they are a source of water for human and livestock consumption as well as irrigation activities.

# 1.2.3 Ecological Conditions

The county is endowed with several natural resources. These include pasture rangeland, forest, wildlife, undulating landscapes and rivers among others. The high and medium potential land constitutes 20.5 per cent of the total county’s land area while the remaining 79.5 per cent is low potential hence unsuitable for crop farming. The major soils in the county are mainly loam, sand and clay. Black cotton soil which has inherent fertility spreads in most parts of the plateaus. The dark reddish brown to red friable soils and rocky soils are mainly found on the hillsides. The limiting factors to agricultural production are the poor weather conditions characterized by frequent dry spells and poor rainfall distribution.

***Source:*** *CETRAD 2013*

# 1.2.4 Administrative and political units

Laikipia County comprises of five administrative sub counties namely Laikipia East, Laikipia North, Nyahururu, Laikipia Central and Laikipia West. The county is further sub-divided into15 divisions, 51 locations and 96 sub-locations.

# 1.2.5 Political units

The county has three constituencies namely; Laikipia East, Laikipia West and Laikipia North. It has 15 electoral wards, 5 in Laikipia East, 6 in Laikipia West and 4 in Laikipia North constituencies respectively. The table below shows land area by constituency.

|  |  |  |
| --- | --- | --- |
| **Constituency** | **No. of wards** | **Area (KM2)** |
| Laikipia North | 4 | 5,434.3 |
| Laikipia East | 5 | 1,448.2 |
| Laikipia West | 6 | 2,579.5 |
| **Total** | **15** | **9,462** |

# 1.2.6 Population Size, Density and Distribution

The enumerated population for the county stood at 399,227 people during the 2009 KNBS Housing and Population Census. This population was projected to be 427, 173 persons in 2012. It is also expected to rise to 457,514 and 479,072 in 2015 and 2017 respectively.

The settlement patterns in the county are uneven as they are influenced by the differences in land potential, livelihood zones, infrastructure development, land use system and availability of social amenities. Laikipia Central Sub-county has pockets of both high and low densities dictated by the differences in land potential. Laikipia North constituency is arid and semi arid in nature and therefore the least populated arising from the limited economic activities such as livestock rearing and sand harvesting. The pockets of high population density include Nanyuki and Nyahururu towns which are the commercial, administrative and transportation hubs of the county.

**Projected population and density by constituency**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Constituency** | **2009** | | | **2012 Projections** | | **2015 Projections** | | **2017 Projections** | |
| **Area (Km2)** | **Population** | **Density**  **(Persons/ Km2)** | **Population** | **Density**  **(Persons/ Km2)** | **Population** | **Density**  **(Persons/**  **Km2)** | **Population** | **Density**  **(Persons /Km2)** |
| **Laikipia East** | 1,448.2 | 118,222 | 82 | 126,498 | 87 | 135,424 | 94 | 141,805 | 98 |
| **Laikipia West** | 2,579.5 | 208,725 | 81 | 223,335 | 87 | 239,280 | 93 | 250,555 | 97 |
| **Laikipia North** | 5,434.3 | 72,280 | 13 | 77,340 | 14 | 82,810 | 15 | 86,712 | 16 |
| **Total** | **9,462** | **399,227** | **42** | **427,173** | **45** | **457,514** | **48** | **479,072** | **51** |

# CHAPTER 2: PEOPLE, ENVIRONMENT AND DEVELOPMENT

# 2.1 Introduction

# 2.2 [Culture and Environment](file:///C:\Users\hp\Downloads\SOE%20%20Edt%20of%2012-6-15%20laikipia%20county.doc#_Toc346723644)

Laikipia County is a home to different communities with diverse cultures which makes it one of the world tourist attraction site attracting thousands of tourists annually. Some attraction sites and unique element in our environment entails wildlife species, undulating landscape hotel and lodges in the conservancies diverse traditional huts, dress depicting their lifestyle as well as food and dance kikuyu, kalenjin, Turkana and Samburu are major communities living in the county.

# 2.3 [Socio-Economic Indicators](file:///C:\Users\hp\Downloads\SOE%20%20Edt%20of%2012-6-15%20laikipia%20county.doc#_Toc346723645)

The main economic activities in Laikipia County includes but not limited to; livestock production, tourism, private and public conservancies, Ranching, small and large scale farming, horticultural farming, sand harvesting and quarrying. The northern part of the County (Doldol) is arid and and semi-arid and therefore cannot support meaningful crop farming, leaving the entire region dependent on pastoralism and a bit of sand harvesting.

# 2.4 Gender and environment

Women play a major role in gathering food, fuel and fodder. Woodfuel consumption may lead to deforestation and soil erosion. Women can regulate its use by using energy saving jikos or use other alternative sources of fuel such as solar energy or biogas. Drought and erratic rainfall force women to work harder to secure food, fuel and energy for their families. If this is done with high intensity it may lead to depletion of natural resources. Literacy levels among different communities also affect the use of natural resources and its care. Some communities like the Maasai do not send girl child to school to acquire sufficient education to, this leads to lack of enough knowledge on the use of environment.

# 2.5 Mainstreaming gender in natural resources utilization

Some of the ways for mainstreaming gender in natural resource utilization include:

Increasing women’s labour force participation and strengthening labour policies affecting women.it may also be done by increasing the number of female extension workers and gender sensitization training for all extension workers. It has also been argued that Promoting women’s political rights and participation also enhance their resource uses and conservation. Other means of mainstreaming gender in natural resources are; Creating a stronger role for women in economic decision making and use of natural resources, Educating girls, Carrying out gender equality workshops especially in communities where women are left out in decision making concerning environmental issues, Providing credit for women and adequate training on the utilization of natural resources and Improving budget process to incorporate gender concerns in natural resource utilization.

# 2.6 [Poverty and Environment](file:///C:\Users\hp\Downloads\SOE%20%20Edt%20of%2012-6-15%20laikipia%20county.doc#_Toc346723647)

Due to constant drought and famine in the county, majority of its inhabitants are poor and in need of regular assistance. These conditions result in migration of people and animals (livestock) to areas with better rainfall and pastures. This leads to influx of livestock and over utilization of the available natural resources namely water, pasture and other vegetation. The Destruction of the available natural resources results in increased in poverty

The poor are highly dependent on natural environment for livelihood making poverty a major contributor to environmental degradation. The following are source of livelihoods for the poor:

**2.6.1 Wetland conversion** to space for cultivation and grazing of cattle resulting to loss of biodiversity and degradation of water storage area since the water is drained. Most of poor people in rural areas use firewood as a source of fuel and for charcoal burning as a source of income.

**2.6.2 Cutting down of trees** for firewood and charcoal leads to deforestation thus soil erosion and land degradation.

Most people in the county cannot afford exotic breeds of cattle hence; they keep a lot of indigenous breeds of cattle.

2.6.3 **Overgrazing** resulting to soil erosion and decrease in biomass.

**2.6.4 Poor farming methods** such as slash and burn and continuous cultivation leads to depletion of soil nutrients thus crops do not do well in subsequent seasons.They also fail to replace soil nutrients.

**2.6.5 Overpopulation** is common among poor people.This increases pressure on natural resources leading to over exploitation and utilization to meet daily needs leading to unsustainable management.

**2.6.6 Washing of clothes** along rivers also causes water pollution. Most households rely on rivers as main source of water for domestic use and most clothe washing activities done along river banks.Wildlife poaching for meat,horns is carried out to earn a living.This leads to loss and extinction of some wildanimals like rhinos, elephants etc.

# 2.7 Mitigation actions

Some of the mitigation measures include the following:

1. Raise awareness and funds around issues of extreme poverty and specifically those related to the environment.
2. The county government should invest in people and communities to inspire conserving the environment.
3. Offering incentives and subsidies to farmers to encourage them use better farming methods that do not pollute the environment.
4. Carrying public campaigns and education on environment degradation.

# 2.8 [Youth and Environment](file:///C:\Users\hp\Downloads\SOE%20%20Edt%20of%2012-6-15%20laikipia%20county.doc#_Toc346723648)

**2.9** [**Development and Environmental Sustainability**](file:///C:\Users\hp\Downloads\SOE%20%20Edt%20of%2012-6-15%20laikipia%20county.doc#_Toc346723650)

‘Sustainability’ has become a popular term which reflects its wide recognition as a critical principle to human endeavour. The term ‘sustainable development’ was coined in the paper Our Common Future, released by the Bruntland Commission in 1987, and broke new ground which is not yet fully integrated into mainstream policy.

The Brundtland Commission pushed for the idea that the terms environment and development need to be understood in relation to each other (because they cannot and should not be distinguished as separate entities): "...the ‘environment’ is where we live; and ‘development’ is what we all do to improve our lot within it. The two are inseparable." The definition also integrates a social element, where equity is encouraged by citizen participation.Thus, rather than seeing ‘production’ and ‘environment’ as competing objectives, a key aspect of ‘sustainable land management’ (SLM) is to promote the integration of agriculture and environment through twin objectives, where it is recognised that high environmental health and productivity is partner to high economic health and productivity, especially in a rural setting. The link between environmental health and economic health is now widely recognized and CDTF (2006) shows clearly the strong relationship between poverty and environmental status in Kenya.

Thus, ecological resources become the raw material upon which livelihoods and the economy are based ; which can be actively managed for increased stocks, to give increased yields, livelihoods, and even social meaning

(aesthetics). For example, good land management practice can increase available water capture and supply at no cost, making higher production possible; rather than regarding water as ‘God-given’, which promotes a diminished sense of responsibility for its management. The shift in thinking underlies the worldwide shift towards ‘conservation farming’ and ‘conservation grazing’, and has been responsible for startling results - with good examples in Laikipia (for example, through no-till cultivation, mulching, planned grazing, etc.).

# 2.10 Tourism

The county has gazetted forest area totalling to 580 Km2 comprising of both the indigenous and plantation forests. This kind of ecosystem provide an ideal habitat for the different species of wildlife found in the county. Laikipia County is richly endowed with wildlife, which is widely distributed in the semi arid areas extending to Samburu, Meru and Mt. Kenya wildlife corridors/ecosystems. Most of the wildlife are found in the large scale private ranches, which occupy over 50 per cent of the total area of the county. The rest are found in group ranches predominantly owned by the Maasai, in the gazetted forests of Mukogodo**,** Rumuruti and Marmanet and the other uninhabited tracts of land in the county. Though this is an important natural resource, it has been a source of conflict between the farming and pastoralist communities. Among the major wildlife species found in this county are the lion, leopard, elephant, buffalo and the rhinoceros though there are other smaller species also in abundance particularly the African wild dog and gazelles.

# 2.10.1 Main tourist attractions

The major tourist attractions are the wildlife, the unique Maasai cultural practices and the Thomson Falls. The proximity to Mt. Kenya, Meru, Aberdares and Samburu game parks have greatly boosted tourism within the county through provision of hospitality services to the tourists.

# 2.10.2 Main wildlife

Laikipia County has the greatest number of wildlife outside of the gazetted protected areas in the country. The wildlife is mainly found in the private ranches but they are also found in the group ranches of Laikipia North, Mukogodo forest and small scale holdings in Laikipia West. The most abundant species are the elephants. Other predominant species include Burchelles zebras, Rhinoceros, Thompson Gazelles, Impalas, Buffaloes, Lions, Elands and Grevy Zebras. The importance of wildlife is manifested by existence of a strong ranching organization called the Laikipia Wildlife Forum.

# 2.10.3 Tourist hotels and lodges

Most of the tourists are hosted in conservancy lodges. The county has four international standard classified hotels i.e. Sweet Waters Tented Camp at Ol Pejeta, Sportsman Arms Hotel at Nanyuki, Thompson Falls Lodge at Nyahururu and Illingwesi Lodge at Illingwesi Community Ranch with a total bed capacity of 306.

# CHAPTER 3: WEATHER AND CLIMATE CHANGE

# 3.1 Introduction

# 3.2 Weather

# 3.2.1 Rainfall

Rainfall is unevenly distributed and varies from one part of the county to another.The most important factor influencing rainfall is relief. Being on the rain shadow of Mt Kenya the rainfall patterns changes drastically as one move away from the mountain. North marmanet has over 900mm of rainfall while parts of mukogodo and Rumuruti divisions have slightly over 400 mm of rainfall annually. The plateau receives about 500mm of rain annually, while Mukogodo Forest receives an average rainfall of about 706mm annually. The level plateau where most of the ranches are situated has about500mm of rainfall annually. The county has generally a bimodal rainfall pattern with long rains falling between March and May and the short rains coming in October and November.

Table 1 shows that the rainfall drastically reduced in 2009 and 2011 in Dol Dol. It further shows that the northern parts of the county represented by Dol Dol receive lower rainfall compared to the southern parts such as Nyahururu.

# 

# Table 3.1: Mean Annual Rainfall in Millimeters 2008-2012

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Station** | **2008** | **2009** | **2010** | **2011** | **2012** |
| Dol dol | 456.25 | 298.3 | 560.8 | 169 | 545 |
| Rumuruti | 741.4 | 535.1 | 1,069.1 | 1,342 | 822 |
| Nyahururu | 812.2 | 635.8 | 1,375.3 | 1,201.2 | 1,500 |
| Nanyuki | 726.7 | 292.1 | 1411.2 | 896.9 | 857.1 |

*Source: Laikipia Meteorological Stations, 2012*

# 3.2.2 Temperature

The annual mean temperature of the county ranges between 16o C and 26o C. This is as a result of relief and trade winds resulting to cooler conditions in eastern side which is near Mt. Kenya and hotter in the low-lying areas in the North. The western and southern parts of the county have cooler temperatures with the coolest month being April and the hottest month being February. The average duration of sunshine is between ten and twelve hours daily.

The table below presents the weather variability and its effects since 2005 to 2010

# Table 3.2: Weather Variability Effect

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Weather Variability Effects** | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 |
| **Rainfall** | **increased** | **increased** | **decreased** | **decrease** | **increased** |
| Floods | Increased chances | Increased chances | decreased chances | decreased chances | Increased chances |
| Drought | decreased chances | decreased chances | increased chances | increased chances | decreased chances |
| Hailstorms | increased chances in  Nyahururu | increased chances in  Nyahururu | decreased chances in  Nyahururu | decreased chances in  Nyahururu | increased chances in  Nyahururu |
| Frost | increased chances in  Nyahururu | increased chances in  Nyahururu | decreased chances in  Nyahururu | decreased chances in  Nyahururu | increased chances in  Nyahururu |
| Storm | increased chances | increased chances | decreased chances | decreased chances | decreased chances |
| Annual variability of temperature, | n/a | n/a | n/a | n/a | n/a |
| Annual variability of humidity | decreased chances | decreased chances | increased chances | increased chances | decreased chances |

**Source: Laikipia Meteorological Services**

**Weather variation**

Figure 1 shows how rainfall variability has evolved from 2005 to 2010. The two stations indicate increased rainfall from 2005 to 2007 and a decrease from 2007 to 2009.Year 2009 to 2010 indicate an increased rainfall.

Table 1 show environmental impacts related to the two scenarios consecutively.

# Figure 3.1 : Rainfall Variabilityin Laikipia Airbase and Nyahururu stations from year 2005 to 2010.

Figure 1 shows how Rainfall has varied over Nyahururu and Laikipia Airbase Weather stations. Although Nyahururu station is in Nyandarua, it is representative of areas around Nyahururu town which is partially in Laikipia and Nyandarua County.

# 3.3 Climate change

# 3.3.1 Threats of climate change

Climate change and its effects in the county

Laikipia County has not been spared the effects of climate change. Its fragile ecosystem has been devastated by heavy soil erosion, deforestation, charcoal burning and destruction of catchment areas thus reducing the carbon sink. The Climatic condition in a given area has a direct bearing on the level of the county’s economic development and way of life. Being an agricultural rural based economy, the county’s economic life is determined by the amount and distribution of annual rainfall and temperature variations from time to time. While the county and the nation at large have contributed little if any to climate change, its impacts have been devastating to the county. The effect of climate change sometimes manifests itself in increased intensity and frequency of erratic weather patterns like floods and droughts.

The resultant impacts of the erratic weather patterns in the county include; decreased volume of surface and ground water resources, reduced land productivity leading to loss of pasture and famine especially in areas within the vicinity of Daiga, Matanya, Ol Moran, Kimanju, Pesi, Kirimon and Dol dol; increased conflicts (Human/wildlife, Human/human) arising from the competition of the inadequate resources like water and foliage leading to insecurity and loss of life and livelihoods; the loss of forest cover ; significantly compounding the issue of frequent fluctuations in temperature , wind speeds, increase humidity and reduce surface run offs and the loss of employment opportunities in tourism, agriculture, fishing and livestock sectors.

# 3.3.2 Evidence/ manifestations of climate change

The resultant impacts of the erratic weather patterns in the County include; decreased volume of surface and ground water resources, reduced land productivity leading to loss of pasture and famine especially in areas within the vicinity of Daiga, Matanya, Ol Moran, Kimanju, Pesi, Kirimon and Doldol; increased conflicts (Human/wildlife, Human/human) arising from the competition of the inadequate resources like water and foliage leading to insecurity and loss of life and livelihoods; the loss of forest cover ; significantly compounding the issue of frequent fluctuations in temperature , wind speeds, increase humidity and reduce surface run offs and the loss of employment opportunities in tourism, agriculture, fishing and livestock sectors.

# 3.3.2 Climatic change mitigation measures and adaptation strategies

There are various measures being put in place to address the effects of climatic change in the county. These measures include: promoting energy efficiency and renewable energy resources which is manifested in the promotion of biogas, solar energy and wind energy, tree planting to enhance forest cover and increase carbon sink; promotion of integrated watershed planning and management for sustainable utilization of the water resources, introduction of drought resistant crops and diversification of crops varieties to mitigate against the shifting rainfall patterns, development of early warning signals within the systems using scientific and indigenous knowledge and the enhancement of effective communication of government policies to reduce the information gap between the locals and policy makers

# 3.3.3. Impacts on systems and sectors in the county

In Laikipia climate change results in the negative change of the ecosystems and therefore more vulnerable livelihoods. Increased global warming could lead to increased wild fires, longer and more frequent droughts, frequent flooding and the increased spread of diseases such as cholera malaria among others. Climate change is expected to cause significant changes in the quality and availability of water resources. As the climate changes, measures need to be put in place to build more resilient communities and also turn some of the disadvantages of climate change to advantages.

# 3.3.4. Agriculture and food security

The Climatic condition has a direct bearing on the level of the County’s economic development and way of life. Being an agricultural rural based economy, Laikipia’s economic life is determined by the amount and distribution of annual rainfall and temperature variations from time to time. While the county have contributed little if any to climate change, its impacts have been devastating to the county. The effect of climate change sometimes manifests itself in increased intensity and frequency of erratic weather patterns like floods and droughts. This leads to crop failure owing to unpredictable rainfall, loss of livestock due to prolonged drought, malnutrition, and resource use conflicts such as sand harvesting conflict in laikipia north, grazing livestock in private ranges and other outcomes which actively contribute to food insecurity.

# 3.3.5 Water resources

The distribution of water sources in the laikipia is uneven across the County with the northern parts experiencing serious water shortages. There are 41 per cent households accessing water from within their dwelling while 12.9 per cent of the households take an average of 1-4 minutes to reach the nearest water point. Similarly 20.3 per cent of households take an average of 5-14 minutes and 11.4 per cent of the households take an average of 15-29 minutes. The remaining 4.6 per cent of the households takes over an hour to reach the nearest water point. Sources of water include permanent rivers, wells, springs and roof catchments. Boreholes, pans and dams are also a common feature in the County for domestic and irrigation purposes. Rock catchment in the northern Laikipia is yet to be fully exploited.

# 3.3.6 Health

The health infrastructure consists of four sub county hospitals at Doldol, Rumuruti, Nanyuki and Nyahururu. The county has eight public health centres and 34 public dispensaries. In addition, there are three private hospitals, one nursing home; one private health centre, six private dispensaries and 33 private clinics. Most of the public facilities have been established with the support of the devolved funds particularly CDF. The average distance to health facilities is six Km. There are about 10 per cent of the households lying in the range of zero to one kilometre from the nearest health facility while 40 per cent lie within the range of 1.1 to 4.9 Km. The remaining 50 per cent of households are found over five kilometres to the nearest health facility. The doctor-population ratio stands at 1:12,500 while the nurse-population ratio is 1:1,000

# 3.3.7 Morbidity

The five most prevalence diseases in the county include pneumonia, upper respiratory tract infections (URTI), typhoid, HIV and AIDS and diarrhoea. The HIV prevalence rate stands at 6.1 per cent.

The total population of the children under five years old was estimated at 62,642 in 2012**.** According to the Nutritional Survey conducted in the county by the Ministry of Health and International Medical Corps in 2012, Global Acute Malnutrition (GAM) rate was 10 per cent while the Severe Acute Malnutrition (SAM) rate was 1.8per cent. The overall prevalence of GAM denotes serious malnutrition that is below the emergency threshold according to the WHO benchmarks. The Middle Upper Arm Circumference (MUAC) findings showed that 19.4 per cent of the under 5’s are at the risk of malnutrition. The prevalence of underweight was 21.3per cent with 4.5 per cent being severely underweight.

# 3.3.8 Human settlement

Population pressure on limited land resources and the growth of towns like Nanyuki, Nyahururu, Rumuruti, Wiyumiririe and other shopping centres have strained the provision of social amenities. The establishment of informal settlements around Nyahururu and Nanyuki towns especially Maina villages, Manguu, Likii have resulted to high levels of pollution, poor sanitation and disposal of waste. In addition, farming in riparian areas, sand harvesting and other quarrying activities in Kimugandura in Laikipia East, Matanya area in Laikipia central and Kimanju in Laikipia North have exacerbated the process of land degradation resulting to high instances of poverty within the county. Other factors contributing to environmental degradation include; overgrazing, cutting down of trees for charcoal burning and farming along the river banks.

# 3.3.9 Gender aspects of climate change

In Laikipia as well as other arid Counties, vulnerable groups such as women and children are usually more negatively affected by events such as drought more than men. This is due to the position of women in households whereby they are expected to cater for the family in terms of food, water and general labor such as tilling of land. If climate change results to water stress, women are the ones expected to cover long distances in search of water. To add on this, women in arid areas such as Laikipia have access to fewer income generating activities than men. They are also weighed down by negative cultural beliefs and are also limited in mobility, which often increases their vulnerability to sudden weather-related natural disasters. Drought and erratic rainfall force women to work harder to secure food, water and energy for their homes. Girls drop out of school to help their mothers with these tasks. This cycle of deprivation, poverty and inequality undermines the social capital needed to deal effectively with climate change.

# 3.3.10 Opportunities and endowment value of climate change

# 3.3.10.1 Rainwater harvesting

Rainwater is an increasingly promising complement to other sources of household water, especially in the face of increasing scarcity and rising demand. Laikipia is already facing water stress so rainwater harvesting is expected to enhance access to potable water. Population growth and reduced rainfall have combined to make the traditional rain collection methods insufficient. There is need to employ new, more efficient collection and storage techniques. These may include use of roof catchments and collection in plastic or concrete tanks. Metal tanks are not recommended as they corrode. With the use of appropriate technologies, rainwater could also play a bigger role in irrigation and combating the effects of drought. However, appropriate technologies will need to be made widely available.

# 3.3.10.2 Conservation agriculture

Conservation agriculture is one of the approaches that are envisaged to climate-proof agriculture. Given the significant role that agriculture plays in the country’s economy, in Kenyans’ livelihoods and in the attainment of Vision 2030, conservation agriculture is an important climate change adaptation method. It involves minimizing soil disturbance (no-till), ensuring permanent soil cover (mulch) and using a blend of crop rotation or inter-cropping. The synergy of these factors leads to improved agricultural productivity and food security, increased incomes and enhanced carbon sequestration. The government, with the support of the COMESA Secretariat, has concluded the design of an Investment Framework for up-scaling conservation agriculture. The framework is anchored on both the NCCRS and the Agricultural Sector Development Strategy.

# 3.3.10.3 Clean energy

Clean and renewable energy sources, such as wind and solar, can power small-scale rural industries and hence improve livelihoods. Harnessing them can also help to reduce reliance on hydro electric power whose generation is particularly prone to climate change stressors. They can also enhance reliability of the national electricity supply and lower costs of electricity to the productive sectors, which will in turn help to achieve the economic goals of Vision 2030. For instance, access to electricity would reduce the time rural women and girls spend in search of wood fuel and water, and improve school enrolment and retention rates for the girl child.

# 3.3.10.4 Carbon trading

Laikipia has made efforts in tree planting. Currently, there is an ongoing rapid results initiative to plant 500,000 trees across the County. Tree planting has a positive impact on carbon sequestration. Carbon sequestered by trees and stored in aboveground biomass and soil contributes to reducing greenhouse gas concentrations in the atmosphere. Laikipia farmers can improve their income through planting trees and applying for carbon credits through organizations such as Biodeposit Africa and Musoni Kenya Limited.

# Table 3.3: Climate change

|  |  |  |
| --- | --- | --- |
| Impacts | Increased Rainfall | Decreased Rainfall |
| Threat of climate change | environment, economic growth and sustainable development | |
| Evidence/ manifestations of climate change | * Heat waves, * Variations of onset and cessation of seasonal rainfall * increased incidences of flooding * Drought,etc * Land cover change | |
| Impacts on systems and sectors in the county | increased risk of conflict over scarce land and water resources | |
| Agriculture and food security | Reduced Agricultural production and food security, | |
| Water resources | Animal and human conflicts due to competition of the limited natural resources like water. | |
| Human settlement | Displacements of communities to safer grounds and migration to other neighbouring regions. | |
| Gender aspects of climate change | Women and children long distance walk in search of water and food | |
| Opportunities and endowment value of climate change | Opportunity to remedy environmentally –unfriendly registration especially those that would inhibit the implementation of response strategies. | |
| Partnerships opportunities | * Increased exchange of information leading to interaction across different disciplines. * Increased globalization and international cooperation. | |

# CHAPTER 4: WATER RESOURCES & POLLUTION

# 4.1 Introduction

Environmental degradation has contributed to reduced productivity of land, quality and quantity of water sources, high levels of pollution for both air and water masses, constraining existing effluent and solid waste disposal facilities especially in the urban areas. Increased farming activities in forests are also a threat to the county’s rich biodiversity.

# 4.2 Drainage

The county is traversed by Ewaso Ngiro river .This river is fed by smaller tributaries from the northern and western slopes of mount kenyaa and from northern slopes of aberdare ranges. this tributaries includes; Timau,teleswani,sirimon,kongoni,Ontulili,likii,nanyuki,rongai,burguret and Naromoru from the northern and western slopesof mount Kenya and moyo, Ewaso Ngiro,Ngobit,Sugoroi, mutara,pesi,and Ewasonarokfrom northern part of Aberdares slopes

# 4.3 Water Resources

Proportion of fresh water used for domestic , irrigation industry and other uses

This is the proportion of fresh water use since 2010-2030 as projected by the National Water Master Plan

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Water Demands (MCM/year) | | | | | | |
| Domestic | Industrial | Irrigation | Livestock | Wildlife | Fisheries | Total |
| 2010 | 58 | 1 | 92 | 57 | 0 | 4 | 212 |
| 2030 | 125 | 2 | 2,644 | 79 | 0 | 7 | 2,857 |

* Proportion of population in urban / rural using (safe drinking water, improved water source portable) water.
* River flow levels/volumes by basins
* Ground water levels by potential/volumes

The geology of the area is composed mainly of Volcanics, the Basement System and Sedimentary rocks. Groundwater yields are fair in the volcanic aquifers and the quality is normally good. The yields range from 5m3/hr to over 70m3/hr (NWMP, 2011).

# 4.3.1 Proportion of population using improved sanitation facilities (urban/rural).

# 4.3.2 Level in water storage capacity

The level of water storage capacity in Laikipia County is still minimal and more need to be done to improve the storage capacity. Nawasco in Nanyuki have got some major reservoir tanks for storing their water. WRUAs’ have also manage to buy and issue out storage tanks to institutions and some homesteads

# 4.3.3 Amount of rain water harvested

The of water storage in Laikipia county is minimal but should be increased. WRUAs like Nanyuki, Loisukut,Ngobit, Ngishishi, Likii,Pesi, Suguroi have been purchasing tanks through funds obtained from WSTF and giving the tanks to institutions and communities. Earthdams and Sand dams have been constructed in Doldol Area. The amount is approximately **111,000m3**

# 4.3.4 Area of Water catchment areas rehabilitated

Matsui Springs in Muhotetu area in Rumuruti was rehabilitated

Please go the appendix for the full list

Number of water monitoring stations rehabilitated

The number of rehabilitated RGs Are 3

Rugusu River RGS 5DA04

Ewasongiro 5DC01

# 4.3.5 Boreholes sank and yields in urban and rural areas

The approximate numbers of boreholes in urban and rural areas are 600 boreholes (matrix needed)

# 4.4 Water Pollution

**(table of physica chemical analysis)**

# 4.4.1 Biochemical oxygen demand (BOD) and COD in selected water bodies

Biochemical oxygen demand (BOD) and COD in selected water bodies( is attributed to effluents dischargers in water bodies)BOD

It is an empirical test in which standardized laboratory procedures are used to estimate the relative oxygen requirements of waste waters, effluents and polluted waters.

Micro-organisms use the atmospheric oxygen dissolved in water for biochemical oxidation of organic matter, which their source of carbon.

It is used as approximate measure of the mount of biochemically degradable organic matter present in the sample. It is normally done on effluent dischargers namely COD

It is the amount of oxygen consumed by the organic matter from boiling acid potassium dichromate solution.

It is an important and rapidly measured variable for characterizing water bodies, sewage, industrial wastes and treatment plant effluents.

BOD and COD tests are normally done on the following discharges:

* Nanyuki Water Sewerage Company
* Nyala Dairies
* Mt. Kenya Safari Club
* Nyahururu water and Sewerage Company
* Likii Farm

The compliance level is at 51.5% BOD -40mg/l COD-

# 4.4.2 Concentration of Fecal coliforms/ pathogens

Fecal coliforms are bacteria that live in the digestive tract of warm-blooded animals and are excreted via feces. In themselves, fecal coliforms generally do not pose a danger to people or animals but they indicate the presence of other disease-causing bacteria such as those that cause typhoid, dysentery, hepatitis, and cholera. Unlike fecal coliforms, disease causing organisms generally do not survive in the environment long enough to be detected in water. This makes their direct monitoring very complicated, expensive, and difficult. Consequently, scientists have turned to fecal coliforms as an indicator. The theory behind such a measurement follows that if a fecal contamination event is present, the source water could have been simultaneously contaminated by pathogens which can also exist in fecal material. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria may occur in ambient water as a result of the overflow of domestic sewage or non-point sources of human and animal waste. Fecal coliforms are a common problem among states and areas where livestock is prolific and/or waste treatment is insufficient and leaks or dumps material containing fecal coliforms into a body of water that is a surface drinking water source for a town or city.

It is carried out on surface water, effluent discharge and in pollution surveys

Total coliforms MPN/100ml<400

E .coli MPN/100ml<200

# 4.4.3 Presence of heavy metal

River sediment load by basins

**4.4.4 Number of waste water licenses issued**

Licenced Waste waters treatment facilities in laikipia are;(matrix)

* NAWASCO,
* NYAHUWASCO,
* NYALA DAIRI,
* LIKII FARM and
* MT. KENYA SAFARI CLUB

# CHAPTER 5: LAND AND SOILS

# 5.1 Introduction

About two third of Laikipia county comprises of highly and moderate fertile soils. However, these soils have not been fully exploited owing to the inadequate and unreliable rains. With irrigation these soils can be exploited and boost agricultural production. According to LRP’s District Atlas 1996, fertile soils in Laikipia includes 431,81 h and 78R. The soil here enables soil intensive agricultural practices and the region is county main agricultural base. The northern part of the county is is generally dry with poor soils and pockets of clay soils (26H,254pd,26H). The central plateau is mainly clay which are in general of moderate to high fertility.

The soils of Laikipia are developed on basement systems rocks mainly migmatitites and blotite gneisses. Observations located on foot slopes and uplands areas with smoothly rounded summit and flat to very gentle undulating to rolling relief with slopes of 2-3 % and 5-16%. They are well drained very dar brown, friable sandy loam to sandy clay with 15% fine iron and manganese. the soils are generally neutral to moderate alkalinat the top with PhH –H20 values of 6.8to 7.4 while they are slightly acidic to moderately alkaline with values 6.5 to 7.7 in the sub soil.

There are ten main urban areas and 55 trading centres in the county. There are 43 ranches occupying over 50% 0f the entire land mass in the county. There are 13 group ranches and the rest are privately owned. There are two main swamps namely; Marura and Ewaso Narok. The drainage system is dominated by Ewaso Nyiro river which flows across the county towards the North.

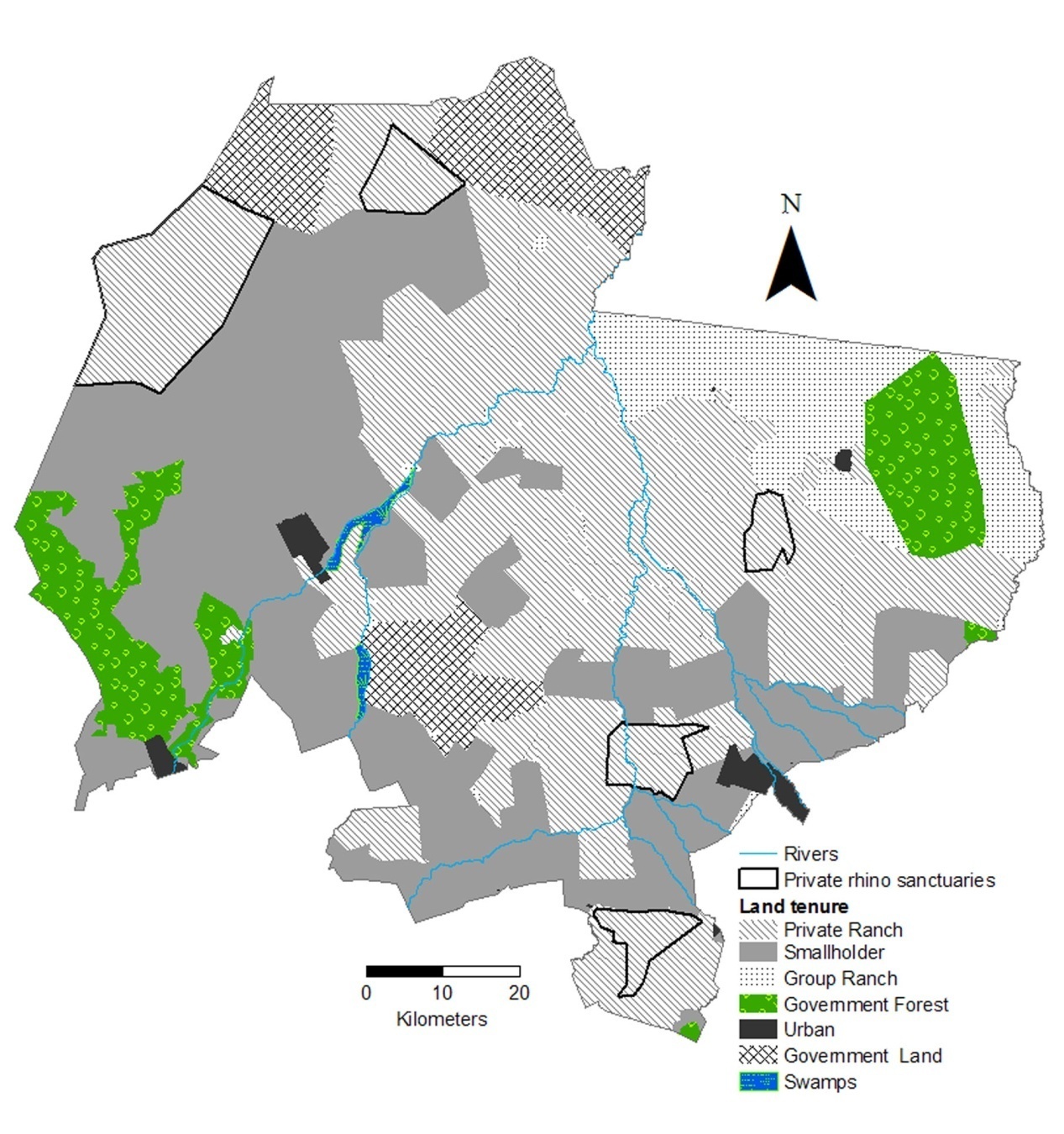
# 5.2 Status of land resources in county

Land ownership in Laikipia falls under three categories; private, communal and government land. The private land is held on freehold titles while communal land is held under group ranches. The government land include the gazetted forests, cattle holding grounds, swamps, rivers, public institutions land, Agriculture Development Corporation (ADC) Mutara Ranch and all leased land in urban centres and ranches.

# Table: Land categories and sizes

There are seven major land tenure systems in the county. These are; small holders, group ranches, private ranches, government forest, urban areas, government land and swamps, as shown in map 3.

# Map: Laikipia County land tenure systems



# Figure 5.1 Map: Laikipia County land tenure systems

*Source: Cetrad 2008*

# 5.3 Land and Land Use

Of the total land mass, arable land constitutes of 1,984 square kilometres. Non arable land constitutes of 7,456 square kilometres. The urban area constitutes 243.3 square kilometres. Gazetted forest land stands at 580 square kilometres. There are 6 distinct land use patterns heavily influenced by the climatic conditions and the ecological zones. These include among others; pastoralism, mixed farming, ranching, agro pastoral, marginal mixed farming and formal employment/trade/business.

# Table 5.1 Land and Land Use

|  |  |  |
| --- | --- | --- |
| **Type** | **Area in Km2** | **Percentage** |
| Arable area | 1,984 | 21.0 |
| Non arable | 6,632.7 | 70.1 |
| Water mass | 22 | 0.2 |
| Urban areas | 243.3 | 2.6 |
| Forest | 580 | 6.1 |
| **Total** | **9,462** | **100** |
| **Type** | **Area in Km2** | **Percentage** |
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| Water mass | 22 | 0.2 |
| Urban areas | 243.3 | 2.6 |
| Forest | 580 | 6.1 |
| **Total** | **9,462** | **100** |

# 5.3 Mean land holding size

The average farm size for small scale holders is 2 acres while for large scale holders is 20 acres. The ranching community holds an average of 10,000 acres. Average land holding in the group ranches per household is 23 acres.

# 5.4 Percentage of land with title deeds

The percentage of land owners with title deeds is 65.3. The low percentage is partially attributed to the absentee landlords and long land adjudication and transfer processes.

# 5.5 Incidence of landlessness

Laikipia has witnessed the emergence of squatters and new settlement schemes such as Solio and Wiyumiririe. The squatters’ problem hinders the realization of improved lives for all. There are about 4,712 squatters in the county with 1,021; 1,090; 400 and 2,201 squatters distributed in Kwa Mbuzi, Kahurura, Kandutura and Ontilili villages respectively.

# 5.6 Land use types and land cover changes within the last 30 years

There are several land use types in Laikipia County, this include:

* Pastoralism
* Mixed farming
* Large scale ranching- Ranches and conservancies
* Agro-pastoralism
* Marginal mixed farming
* Trade/ towns/ shopping/trading centres
* IDPs settlements
* Forestry
* Sand harvest lay and Quarrying
* Agriculture small and large scale farming as well as horticultural farming

The South-western part of the county has the highest potential for forestry and mixed farming due to its favorable climatic conditions. These conditions have resulted in some areas especially around Marmanet being the most densely populated. The eastern and northern parts of the county are suitable for grazing while the plateau lying in the central and the northern parts of the county is suitable for ranching.

# 5.7 Land cover changes

The land cover has generally decreased, with significant areas being converted to settlement. This has been mainly through the land buying companies and government resettlement schemes. Tree cover has also been reduced by encroachment of forests in the wetter regions. The ranching and the pastoral land cover have remained comparatively intact, although charcoal burning and overstocking are proving to be a challenge.

Other noticeable changes that have occurred includes:

* Loss of gazette forest to settlement in the Marmanet forest block
* Loss of high forest to bush lands and grasslands due to fires
* Change of wetland to Agricultural lands e.g. in Rumuruti river Ewaso Narok
* Change of conservation area to settlement e.g. IDP settlement in Laikipia central near Solio ranch
* Change of large holdings to small holdings
* Loss of Biodiversity

# 5.8 Small holder cultivation

Small holder farmers grow some 70% of the food they need; they rely on other sources of income for the balance; the majority of Laikipians are occupied in this sector; and local inputs make up approx. 50% of the value of their crops. Small holder farmers also employ casual labour at peak times providing sources of income for local people. Returns per acre are 2-3 times higher where irrigated and where agricultural potential is highest (Nyahururu); and up to x2 where conservation agriculture is practiced (low/no till, mulching, etc.).

Constraints: water scarcity, declining fertility due to unsuitable practices to climate and soil conditions, reduced profitability, market access in numerous areas, low quality of farm inputs, land fragmentation in some areas, only households in highest potential areas are food secure. Climate change is predicted to exacerbate these constraints.

Small holder farmers feel they have potential to increase productivity, especially in high potential zones, by improving farming practices (conservation agriculture) and increasing inputs except in Tigithi and Withare areas (LH5) where performance is perceived as optimal.

Generally found to be unsustainable when considering social, economic and environmental factors mostly because carried out in areas with low farming potential (LH5).

# 5.9 Commercial horticulture

The horticultural sector provides the highest returns and employment rates per acre but there are high barriers to entry to this sector, large capital investment are needed in order to ensure water access and adequate infrastructure. Practices used in horticulture in Laikipia are often innovative to mitigate climatic constraints. Constraints: requires high investments to enter the land use, in Laikipia it is partly carried out in semi arid areas with low potential for cultivation. DDO Fact Sheet, Laikipia, 2012

Intensive agriculture is generally unsustainable environmentally especially in marginal lands due to high water needs, carbon footprint, high input and fertiliser use causing pollution and soil degradation. Due to market, legal and peer pressures, most intensive farms in Laikipia have adopted water storage and conservation methods to ensure efficient water management; increasingly adopt sensitive chemical application regimes, integrated pest management systems and most recycle water to reduce pollution threats, p reserve soil organic matter and increase sustainability. Farming land in Laikipia generates 20 times more food value than private ranching but is generally environmentally unsustainable and low economic viability due to existing constraints.

# 5.10 Large-scale farming

Larger scale extensive farming returns are lower, but costs are lower and these are profitable in areas where small holder farming struggles. This is partly due to using conservation agriculture. Using suitable practices to the climate and soil conditions can have significant impacts on yields. For example, Lengetia farm is able to harvest crops when rains fail in the area, and gets a minimum of double the yield of other farms in the area in good rains.

**Horticultural farms in Laikipia county**

|  |  |
| --- | --- |
| 1. | Kitawi Farm |
| 2. | Kongoni Farm |
| 3. | Likii River Farm |
| 4. | K.H.E Farm |
| 5. | Kisima Farm |
| 6. | AAA Growers |
| 7. | Country Wide Connections |
| 8. | Agrifresh |
| 9. | Everest Enterprises |
| 10. | Homegrown-Sirimon Farm and Siraji Farm |
| 11. | Timflor Farm |
| 12. | Booty Farm |
| 13. | Mwanzi ltd |
| 14. | Turaco Farm |
| 15. | Equinox Horticultural limited |
| 16. | Everest Lusoi Farm |
| 17. | Everest Njumbi Farm |
| 18. | Silapan Produce Limited |
| 19. | Kantara Kitawi Limited |
| 20. | Kongoni River Farm |
| 21. | Tambuzi Limited |
| 22. | The African Herb Limited |
| 23. | Lobelia Farm Ltd |
| 24. | Protea Farm Ltd |

# 5.11 Pastoralism

Livestock provides a gainful occupation to the majority of people in pastoralist areas. Pastoralists employ labour thus to a certain degree creating jobs in the local area, and inject cash in the economy through inputs. However, they increasingly diversify income sources to cover livelihood needs, there is high food insecurity. Community based tourism generates, through operations and philanthropy at least 117 Million Ksh (10% from tourism activity, 90% from philanthropic sources).Income generated is used to fund Group Ranch development.

**Constraints:** water scarcity, management practices, land degradation, increased reliance on agricultural products and declining terms of trade between livestock and agricultural products in time of need, decline of traditional support systems, insecurity of land tenure (in abandoned lands where there is no security of land tenure at all, and in group ranches which future is still misunderstood).Half of pastoralists interviewed feel there are opportunities to increase productivity by changing management practices. Currently generally found unsustainable on abandoned lands and on Group ranches when considering social, economic and environmental aspects.

*Extensive ranching* was divided into two land uses: pure ranching and mixed ranching. *Pure ranching land use* produces livestock products exclusively whilst mixed ranching properties, usually larger scale) have a diversified activities including wildlife conservation, wildlife based tourism, livestock, British Army training leases. Due to their management practices, ranches and mixed ranches often have better grass and tree cover than community lands and often provide access to grass and forest products during the dry season. “Pure Ranches” produce meat, milk and other livestock products on an extensive basis in semi arid and arid areas. There are few remaining pure livestock ranches, and most large land holdings have diversified.

**Constraint**: political pressure which creates land tenure uncertainty for large land holdings involved in conservation, national policy.

Mixed ranches are currently considered as environmentally sustainable.

Some mixed ranches provide a platform for the British Army to train. The presence of the British army has significant impact on the Laikipia economy as it is estimated to spend approximately 10 Bn ksh per year in Laikipia County.

# 5.12 Wildlife based tourism land use

Wildlife based tourism as a land used is often carried out on smaller land holding (<5000 acres with one exception), these represent a minority of tourism operations in Laikipia most of which are based on private mixed ranches and group ranches. Wildlife base tourism properties buy most of their inputs and supply in the County and pay corporate tax, catering levies and other county level taxes. Surplus is invested in development of neighbouring communities and infrastructure (education, land management, water, enterprise development, health etc).

Tourism properties generate at least a minimum of 320 Million per year overall in the semi arid and arid areas of Laikipia Spend 150 Million on supplies a high percentage locally. Pay 55 Million in wages to 90% local.Tourism land use contributes at least 13 Million Ksh of taxes per year (national and local taxes)

It is estimated that more than 72 Million Ksh is spent per year in the form of development projects and outreach, using surplus generated by tourism operation and philanthropy generated funds. Private ranch lands (mixed ranch, tourism, pure livestock) were found to provide an anchor for continued ecosystem services, many of which benefit Kenya as a whole.

# 5.13 Tourism and conservation in Laikipia

Some facts about Laikipia Tourism sector as a whole 43 active tourism facilities and 1230 beds, at least 1250 people employed Visitor numbers were multiplied by 14 between 1996 and 2009.

Reliant on Laikipia’s unique wildlife diversity, including endangered species (black rhinoceros, Grevy’s zebras, wild dogs) Attracts significant funds from NGOs and international agencies Wildlife tourism properties. Most mixed ranches some group ranches invest in wildlife conservation, protecting internationally and nationally important endangered species (e.g black rhinoceros) which contributes to maintaining Kenya as a favoured tourism destination, and ensuring Laikipia’s attractiveness as an international destination. In addition, wildlife conservation has been a platform for NGOs to get involved in Laikipia and also invest in the development of Laikipia communities. Political pressures and land tenure uncertainty may affect the future profitability of large scale private properties where most wildlife is hosted. In addition tax disincentives for wildlife conservation may threaten the willingness of some to maintain this national asset and its habitat.

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# Plate 5.1 Wildlife in Ol Pajeta Conservancy



# Pate 5.2 Thompsonfalls in Nyahururu

**DIPSIR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Thematic area | state | Drivers | Pressure | Impacts | Responses |
| Land | Degraded | -Land tenure  -Inappropriate landuse practices  -Population increase | * Markets * Need to improve the County economy * Lack of information on the soils to be irrigated * Lack of knowledge about irrigation water * Lack of knowledge about soil irrigation engineering * Lack of farmer and peasant training * Lack of knowledge about land management | -Reduced crop yields  -Siltation of water bodies  -Loss of biodiversity | -Afforestation programmes  -Soil and water conservation measures  -awareness creation |

***Out look***

***Conclusion***

# CHAPTER 6: FOREST, WOODLANDS AND GRASSLANDS

# 6.1 Introduction

Vegetation distribution in laikipia in general is strongly influenced by altitutinal diversity, with dry forest occurring on the highest elevations and gradients of *acccia Themeda* bush on the plains (Mugie Ranch 2004).exception to the overall regional ecological gradient are edaphic communities of *acacia drepanolobium* in the central plains south of mukogodo , escapment vegetation and secondary communities induced by historical management factors.

Forests:

Laikipia has a network of 10 main forests which play important social and economic roles. Forests are under the responsibility of the Kenya Forest Service. Devolution of management has been implemented under the umbrella of the Forest Act of 2005 through Community Forest Associations (CFA). Forest provide essential services to people, livestock and wildlife in Laikipia, including watershed protection, dry season grazing, a wide range of traditional non-timber forest products (food and medicinal plants, fungi etc.), habitats and forage, and timber products such as firewood. They also provide a sink for carbon. Laikipia forests are however, under threat from human activities such as illegal logging, charcoal production, and intense grazing.Rangelands cover more than 70% of Laikipia. They are characterised by a patchwork of conservation and grazing

areas which are under high pressures. 37 % of Laikipia is under large-scale ranching under extensive livestock production. Pastoralist communities use approximately 32% of the County land area including 10% of “abandoned

land” (240,000 acres of land purchases in the 1970s and abandoned due to insufficient rainfall for cultivation).

Intense land degradation threatening communities’ livelihood base has occurred in communally owned areas.

Figure 5. Map Laikipia vegetation cover (Source: Mpala Research Centre)

# 6.2 Land cover under forests, woodlands and rangelands

The county has gazetted forest totaling 66693 hectares this translates to a proportion of land cover area under forests, woodlands and rangelands in gazetted forest area to 672 square km this equals 6.9% of land area and these are divided into administrative units. There are both indigenous and plantation forests. These are Laikipia forest block Uaso narok 2040.5 ha ,South marmanet 5150.6 ha ,North marmanet 9964.65 ha ,Rumuruti 6217.81 ha ,Lariak 5173.87 ha ,Mukogodo 30189.5 ha,Lusoi hill 259.5 ha and Gitundaga 2696.8 ha. In summary they are as shown below.

Protected forest -60468.91 ha

1. Plantations -6224.32 ha
2. Cypress -5999.42 ha
3. Pines -4811.56 ha
4. Eucalyptus -352.8 ha
5. Indigenous -224.9 ha

# 6.3 Forest types and sizes of forests

There are six gazetted and one non gazetted forests in Laikipia covering a total area of 580 square kilometres. Mukogodo is one of natural forests within the county. Artificial forests include Lariak, Marmanet, Ng’arua, Rumuruti and Shamaneik. Part of the forests especially in Ng’arua and Rumuruti have been excised for agricultural and settlement purposes. Recovery of farmland has been successful through farm forestry. However, deforestation, forest fires and grazing have contributed to gradual depletion of the forest cover over the years.

# 

# 6.4 Forest products

The main forest products are timber, poles, wood fuel and pastures. Forests have also contributed significantly in provision of natural herbs, setting of bee hives, research ground on flora and wildlife habitat especially for birds and elephants.

# 6.5 Afforestation/Deforestation/Reforestation

The county rate of afforestation has been recorded at 30% while the rate of deforestation is documented at 20%. Reforestation of bare land is recorded at 15%.

# 6.6 Protected forests areas against total forests areas

Though Laikipia county is Arid and semi arid county with some part of the county being extremely ASAL eg Laikipia north and others being arable eg Laikipia west quite a proportion of area or land has been set aside as protected forests areas against total forests areas 82.18% this effort is intended to raise the county forest cover.

# 6.7 Forests under sustainable forests management

There are a number of areas within the county forest where sustainable use of forest is in practice, where stakeholders among them community forest associations CFAs partner with KFS to sustainably manage forest resources through participatory forest management. CFAs engage themselves in activities such as PELIS, bee rearing, ecotourism, among other nature based activities. This has been estimated to be about 55226.71Ha of forests under sustainable forests management

# 6.8 Dry lands

Laikipia County covers an area of 9,700 km2 and is ecologically classified as semi arid, therefore a dry land area. The County has five main livelihood zones namely; mixed farming, marginal mixed farming, pastoralism, formal employment and ranching. Due to the semi arid nature of the county, Laikpia is an ideal place for livestock production and wildlife conservation. Currently, 64% of the County land mass is utilized under ranching. There are 48 large-scale ranches that are greater than 2,000 acres in size, under private ownership (mean=19,426 acres). These large-scale ranches cover a total area of 3,824 km2 (39% of Laikipia). Eleven communally owned group ranches in north Laikipia cover 712 km2 (7%) of Laikipia County. With the exception of two properties, all ranches are used for commercial livestock production with sixteen of these properties also engaged in some form of wildlife-based enterprise (either tourism or wildlife research). Twenty-nine ranches are managed in favor of wildlife conservation. There are two ranches where wildlife is actively excluded in favor of commercial livestock production.

Therefore, a total of approximately 3,118 km2 of Laikipia is used for informal grazing by semi-nomadic pastoralists. The remaining area of Laikipia covering 2,103km2 is under small scale and commercial agriculture. This includes rain fed cultivation, where possible, irrigated cultivation along the permanent rivers, combined with some subsistence livestock production, particularly in the more marginal areas of settled smallholder land. Both of Laikipia’s swamps are under intensive irrigated cultivation. The forests of south-west Laikipia are heavily used, informally, for illegal timber extraction, charcoal burning and to provide informal livestock grazing for the surrounding residents. There is extensive commercial wheat and irrigated flower and vegetable cultivation in East Laikipia, near the growing urban centre of Nanyuki.

Subsistence farmers who live outside the ranches and own livestock have entered into a memorandum of understanding with ranchers and are allowed to graze their livestock in the ranchers with a fee during drought. Olpejeta charges Kshs 50 per head per month. Other ranches charge Kshs 200 per head per month. The challenge is the illegal grazers who use force to access pasture and water in the ranches and conservancies. They destroy fences, poach wildlife, rob workers and destroy ranch infrastructure with impunity.

# 6.9 Rangeland degraded

Acreage destroyed by fire

Laikipia county being pre dominantly semi Arid county, incidences of wild fires are common especially in the indigenous forest and grass lands. Documented records indicate that an average of 75Ha is destroyed by fire yearly in gazetted forests]

# OUT LOOK

Land ownership in Laikipia falls under three categories; private, communal and government land. The private land is held on freehold titles while communal land is held under group ranches. The government land include the gazetted forests, cattle holding grounds/ tracks, swamps, rivers, Agriculture Development Corporation (ADC) Mutara Ranch and all leased land in urban centres and ranches. In the county, land is generally used for the following purposes: mixed farming, pastoralism, ranching (livestock keeping and wildlife), crop farming (irrigation), urban centres and forestry.

**DIPSIR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Thematic area | state | Drivers | Pressure | Impacts | Responses |
| FOREST | Degraded | -Land tenure  -Clearing the forest for farm land  -Demand for more land to settle Internally Displaced persons IDPs  -Population increase  - High demand for timber and other building materials | * Need to improve the County economy * Lack of Forest management plan * Lack of knowledge and involvement of local population about sustainable forest use * Lack of knowledge about land management | * Reduced forest cover * loss of biodiversity * Reduce amount of rainfall * loss of natural aesthetic value | * Initiatea fforestation programmes * Encourage local community participation in forest management * Create awareness creation |

# CHAPTER 7: BIODIVERSITY

**7.1 Introduction**

Laikipia County is one of East Africa’s most important areas for wildlife conservation. Reasons for this includes: a higher populations of large mammals than any protected or unprotected landscape in Kenya, outside of the Masai Mara National Reserve. The county is rich in biodiversity, that includes a large array of wildlife species including large mammals (Elephants, -18% of the national population, black rhino (44%), white rhino (69%) and highest density of large carnivores (Lions; wilddogs-6th largest population worldwide; hyenas and over 1000 species of invertebrates identified).Thirdly wildlife in Laikipia is generating significant benefits of revenue, jobs and other economic incentives than any other county in Kenya. Furthermore, the county is a model for community participation in conservation with a significant number of community owned conservancies and sanctuaries, and a global hub of learning on the relationships between people and wildlife in a shared landscape.

# 7.2 Challenges facing biodiversity conservation and management in the County

* Illegal poaching for trophies especially for trophies e.g. rhino horn and elephant tusks
* Bushmeat –subsistence and commercial mostly in Laikipia East and Laikipia central districts
* Illegal grazing in conservation areas e.g. Laikipia National Park and Rumuruti, Lariak forests, severe sand harvesting in water catchment areas and rivers.
* Illegal logging and charcoal burning e.g. Rumuruti forest and Lariak forest.
* Unregulated sand harvesting
* Settlement along the wildlife migratory corridors and riparian land-escalates conflicts.
* Human –wildlife conflicts-Spearing, snaring, poisoning of problematic animals e.g. elephants, buffaloes, lions and wilddogs.
* Changing land uses due to increasing population and other anthropogenic activities.
* Climate change and environmental stochasticities.



# Plate 7.1

# Table 7.1 Forest, woodland and Rangeland cover (‘000 Ha)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Cover(acreage) | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| Forest |  |  |  |  |  |  |
| Woodland |  |  |  |  |  |  |
| Bushlands |  |  |  |  |  |  |
| Rangeland |  |  |  |  |  |  |
| Total land area |  |  |  |  |  |  |
| % of forest |  |  |  |  |  |  |
| % of woodland |  |  |  |  |  |  |
| % of rangeland |  |  |  |  |  |  |
| Indigenous closed canopy |  |  |  |  |  |  |
| Mangroves |  |  |  |  |  |  |
| Public plantation forests |  |  |  |  |  |  |
| Private plantation forests |  |  |  |  |  |  |
| **Sub-total closed canopy forests** |  |  |  |  |  |  |
| Open woodlands |  |  |  |  |  |  |
| **Sub-total of forest areas** |  |  |  |  |  |  |
| Bush-land |  |  |  |  |  |  |
| Grasslands |  |  |  |  |  |  |
| Trees on farmlands |  |  |  |  |  |  |
| Indigenous closed canopy |  |  |  |  |  |  |
| Mangroves |  |  |  |  |  |  |
| Public plantation forests |  |  |  |  |  |  |

Source: Kenya forest service

# Table 7.2 forest intervention measures

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Area | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| Protected forest |  |  |  |  |  |  |
| Sustainable forest |  |  |  |  |  |  |
| Afforestation |  |  |  |  |  |  |
| Reafforestation |  |  |  |  |  |  |

Surce: Kenya Forest service

**Biodiversity in Ol pejeta conservancy**

**7.3 Key biodiversity that needs to be conserved restored and protected**

The key biodiversity that requires conservation attentions includes:

* Large mammals including white and black rhino and African elephant,
* Large carnivores including lions, wild dogs, cheetahs
* Wildlife habitats that includes; riparian habitats, savannah grasslands and remnant forests that forms key wildlife habitats.
* Wildlife movement and migration corridors that connects to various habitats and conservation areas in the county and adjacent county.

Water loss and its impacts in wildlife conservation in Laikipia County

# 7.4 Proportion of terrestrial and protected areas

**7.5 Number of initiatives for protection of ecosystems**

Initiative to resolve Human/wildlife conflictis widespread and affects both safety and food security in some areas. The map below shows the areas with high incidents of conflicts. The main source of conflicts is elephants. Laikipia elephant

Population is the second largest in Kenya. In an attempt to mitigate conflict, the Laikipia wildlife Forum, County Government of Laikipia and 41 of its members is supporting the establishment of an electric fence to separate elephant tolerant and elephant intolerant areas. This fence though difficult to manage, has had significant positive impacts on peoples’ capacity to grow

crops in areas where crops had not been harvested for years. Reports show a 70% decreased in crop raiding incidents (SFG, 2012). The reduction in crop raid is highly linked to the quality of fence management and in some

areas, this remains a problem. As shown below intensities of conflicts are located in Mwenje, close to Rumurui

forest and around Mutara.

# 7.6 threatened plant species

# 7.7 known plant and animal species

# 7.8 threatened animal species

# 

# 7.9 Proportion of species threatened with extinction compared to the total known plant/animal species

# 7.10 Invasive species

***Out look***

Food security is low in Laikipia, especially in pastoralist and marginal farming areas suggesting that the land uses do not enable people to have access to sufficient food. Social cohesion is challenged which can affect people’s capacity to work together in the context of shared resources (e.g group ranches), learning levels are low, access 42and to health services relatively is poor. Although crime is perceived as low and life as getting better by key

informant, high incidences of conflicts in pastoralist areas, especially in the context of abandoned land can threaten the performance of land uses.

By contributing to developing health and education services, as well as providing opportunities of employment the private sector contributes to reducing food insecurity, and developing social capital. However, more information needs to be gathered on social cohesion (or lack of) and how this impacts the economy and the County’s capacity to achieve its vision.

**DIPSIR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Thematic area | state | Drivers | Pressure | Impacts | Responses |
| FOREST | Degraded | -Land tenure  -Clearing the forest for farm land  -Demand for more land to settle Internally Displaced persons IDPs  -Population increase  - High demand for timber and other building materials | * Need to improve the County economy * Lack of Forest management plan * Lack of knowledge and involvement of local population about sustainable forest use * Lack of knowledge about land management | * Reduced forest cover * loss of biodiversity * Reduce amount of rainfall * loss of natural aesthetic value | * Initiatea fforestation programmes * Encourage local community participation in forest management * Create awareness creation |

# CHAPTER 8: WETLAND RESOURCES

# 8.1 Introduction

Laikipia is water scarce, it is mostly classified as arid and semi arid The lack of water in the dry season, due to high abstraction upstream has recently resulted in some perennial rivers becoming seasonal and created serious conflicts and life threatening situations. Water is governed by the Water Act of 2001 under the responsibility of the Water Resource Management Authority (WRMA).Devolution of management has been implemented through the 23 Water Resource Users Associations.

There are two major swamps in the county namely: Marura Swamp which runs along the Moyot valley in Ol Pajeta Ranch and the Ewaso Narok Swamp around Rumuruti Township. The swamps have some agricultural potential if properly protected and managed. However, they are currently under pressure due to encroachment for human settlement and agricultural production. Other wetlands in laikipia county includes;

* Pesi near ADC Mutara Ranch-intact and mostly used by wild and domestic animals
* Ngare Ndare swamp near Lewa conservancy

In addition to these major wetlands, there are a total of 24 rivers which forms important catchment for water reservoirs in the county.

**Unique biota in Laikipia Wetlands**

Hippopotamus,Water bucks,Reedbucks,Fish e.g. mudfish,Water snakes,Water birds e.g.Egyptia Geese,Amphibians e.g. toads and salamanders,Papyrus plants

# 8.2 Management of wetlands

Wetlands in Laikipia are the most threatened and vulnerable habitats due to anthropogenic activities. To protect these wetlands, WARMA and other relevant water stakeholders have prescribed a number of initiatives to protect these fragile ecosystems. These include;

Enacting legislations to protect water bodies e.g. Wildlife conservation and management act, 2014,; Water Act, Forest Act,Education and awareness by government agencies and NGOs (e.g. KWS, KFS, Nema, Water and Pipeline Corporation etc; NGOs-Laikipia Wildlife forum, EAWS, Mount Kenya Trust, LAICONAR, CETRAD.,Resource Mapping and gazettement of wetlands,Control and regulation of water abstraction activities e.g. irrigation, illegal diversion of water bodies,Management plans for water related biodiversity e.g Hippos, reed bucks, and water bucks by KWS and Attempts are also being made to fence off the key wetlands in Laikipia County.

*“This*

# CHAPTER 9: AGRICULTURE LIVESTOCK AND FISHERIES

# 9.1 Introduction

# 9.2 Agriculture

# 9.2.1 Unsustainable Farming/cropping practices

Clearing of land to pave way for cultivation has resulted in reduced forests cover and on the other hand increased soil erosion and overall land degradation leading to increased siltation of water bodies and eutrophication as well as increased pressure on wildlife habitat (human-wildlife conflicts). It has also been observed that burning of crop residues/trash results in air pollution, and reduced soil cover and consequently reduced diversity of flora and fauna. Other practices employed by farmers that are unsustainable includes; Continuous cropping on farmlands resulting into nutrient depletion, increased soil erosion, reduced land productivity, build up of crop pests and diseases and loss of biodiversity. Use of ploughing/conventional tillage techniques results in noise, emission of carbon dioxide gases, dust, fuel/oil wastes leading to contamination of soil and water resources.

# 9.2.2 Agro-chemical use and integrated pest management

Use of pesticides (insecticides, fungicides, bactericides, nematicides, miticides, herbicides etc.) kills not only the target organisms but also untargeted useful ones; it also pollutes soil, water and air, and leads to disease causing organisms becoming resistant to chemicals/drugs. The chemical residues in human and livestock may be passed through the food chain causing diseases such as cancer, kidney problems.

Use of inorganic fertilizers and plant hormones - Eutrophication, soil pH changes and nutrient imbalance, migration of some soil organisms to new undisturbed environment, and accumulated used fertilizer/plant hormone packages in the surroundings.

# 9.2.3 Reduced crop yields

The most important factor influencing crop yields has been soil moisture. There has been a gradual reduction in farm productivity as a result of climate change, improper use of farm inputs (seeds, fertilizer, agro-chemicals, machinery, etc) and inadequate application of modern technology. However, total production has generally been rising as a result of opening up of new farms.

# 9.2.4 Arable land that is protected from soil erosion

There have been efforts to conserve soil and protect it from erosion in the whole county. Notable methods on-farm include Grass/Napier strips, agroforestry, trash lines and terracing. Off farm measures include gully control, diversion ditches, tree planting and range rehabilitation.

The arable land currently under erosion control is 122 km2. This represents 16.2% of the total arable land. About 8,500 tons of soil is lost per year from the land under protection.

# 9.2.5 Irrigated Agriculture

The total irrigated area in Laikipia County is only 1, 591 hectares representing only 2% of the cultivated area. This is mainly in large farms because it requires high investment. However, small-scale irrigation ventures are to be found along the county’s rivers and in small schemes like Thome, Kiamariga-Raya and Gatitu-Muthaiga. A lot more farming is being carried out in green houses. Currently new investors have constructed greenhouses in various parts of the countyto grow rose fowers. The photo below was taken from AAAgrowers in Rumuruti laikipia west.



# Plate 9.1 Green house at AAA Growers simba farm

# 9.2.5 Invasive species

***Opuntia stricta*,** also known as **Australian prickly pear or pest pear,** is an invasive cactus native to the Americas. It was introduced to East Africa decades ago. Today, it is having a devastating effect on people’s lives, reducing land productivity, impacting livestock health, and driving people from their homes and land. The plant covers approximately 11,500 ha Laikipia north and part of Laikipia west. The level of destruction the cactus has brought becomes all too clear. This cactus is a threat because it is so invasive. Most animals cannot eat the plant itself because it has spines, which are known to cause serious injuries to livestock trying to forage under or near the plants. However, the cactus fruits are tasty to a number of animals. When goats, sheep and other animals feed on them, tiny spines on the fruit are deposited in their mouths causing abscesses, which inhibit feeding. Spines also lodge in their stomach and intestine, causing secondary infections, and in some cases death.

*Lantana camara, +*another invasive species, covers 118 ha all over the county. This spp was introduced as fencing material and fodder for small stock. In addition to its low nutritional value, this plant is a heavy feeder and results in heavy loss of productive Land.

*Prosopis spp* Covers about 18 ha. It was introduced through animal movement from the north. Its thorns are dangerous to humans and livestock and it has low fodder nutritional status.

# 9.2.6 Crop Yields

The main crops grown in Laikipia County are: Maize, beans, wheat and irish potatoes, in order of importance. Maize is Laikipia’s staple as well as being a major cash earner for farmers.

# Table 9.1 Crop Yields

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 2009 | 2010 | 2011 | 2012 | 2013 |
| Maize (Tonnes) | 14,549 | 170,460 | 115,683 | 113,419 | 172,954 |
| Wheat (Tonnes) | 1,967 | 8,798 | 5,829 | 12,472 | 26,208 |
| Beans (Tonnes) | 3,565 | 10,212 | 8,923 | 70,281 | 17,485 |
| Irish potato (Tonnes) | 2,061 | 5,425 | 1,662 | 6,242 | 11,399 |

Source: Ministry of Agriculture

The production trend for the last 5 years has shown a general increase mainly because of opening new land for farming and use of improved technology.

Constraints in crop production include water scarcity, declining soil fertility due to practices unsuitable to climate and soil conditions, reduced profitability, market access in numerous areas, low quality of farm inputs and land fragmentation in some areas.

# 9.2.7 Pesticide and fertilizer use

The use of fertilizers and pesticides has gradually increased as a result of opening up of new farmlands and evolving production technology. This has resulted into increased soil acidity, making soil more unsuitable for production even in times of sufficient rainfall. In addition, fertilizer and pesticide residues and wash-offs result in pollution of water sources

# Table 9.2 Soil Erosion control measures (2013)

|  |  |
| --- | --- |
| Acreage/lengths | 2013 |
| Fanya juu (Km) | 18.65 |
| Grass strips (Km) | 15 |
| Unploughed strips (Km) | 5.6 |
| Gullies controlled (Km) | 4.13 |
| Bench Terraces (Km) | 5.2 |
| Total arable land under erosion control (Km2) | 122 |
| Total arable land (Km2) | 754 |
| Proportion of arable land under soil erosion control (%) | 16.2 |

Source: Ministry of Agriculture

# 9.3 Livestock

# 9.3.1 Livestock rearing

Mixed farming livelihood zone: agro-ecological zone 2, 3carrying capacity: tropical livestock unit 1/8 acre under improved pasture and fodder marginal mixed livelihood zone: agro-ecological zone 3, transition 3 and 4

# 9.3.2 Carrying capacity

Tropical livestock unit require between 4 and 5 acres under improved and natural pastures.

Pastoral livelihood zone: agro-ecological zone 4, transition 4 and 5

Carrying capacity: tropical livestock unit requires 10-15 acres under natural pasture and browse as shown in plate below.



# Plate 9.2 Cattle grazing at Naibor grounds

# 9.3.3. Main livestock bred

Livestock production is dominant in the Northern parts of the county. According to the 2009 population and housing census report on livestock, there were 189,685 heads of cattle in the county and 623,648 sheep and goats. Others include poultry, camels, donkeys, rabbits and bees. Livestock infrastructure is supported by 50 holding grounds, stock routes and out spans, two public and three private abattoirs, five auction yards and 33 slaughter slabs. The main livestock products include beef, mutton, milk, eggs, and pork among others.

# 9.3.4 Number of ranches

Laikipia is dominantly a pasture land with 43 ranches registered by 2012.These ranches occupy over 50 per cent of the total land area in the county. There are 30 ranches owned by companies and individuals and 13 owned by the community as group ranches. The private ranches practice wildlife conservancy and beef cattle rearing. The average size of the ranches is 10,000 acres. The group ranches are mainly in the northern part occupying about 72,544 hectares.

# 9.3.5 Total land under

Improved pasture estimated at 80 km2

Fodder crop estimated at 18km2

Natural pasture and browse estimated at 5772.80 km2

**No of livestock**

|  |  |
| --- | --- |
| Population | Estimates |
| Beef cattle | 220000 |
| Dairy cattle | 52000 |
| Sheep | 350000 |
| Goats | 320000 |
| Camel | 8500 |
| Poultry | 350000 |

# 9.3.6 Land degraded due to overstocking

|  |  |
| --- | --- |
| Laikipia north sub-county | 1500 acres |
| Laikipia east sub-county | 800 acres |
| Laikipia west sub-county | 500 acres |

These represent areas under common use in pastoral zone livelihoods and marginal livelihood zones across the county. Increase in population is always followed by livestock increase and intensity of cultivation in marginal areas leading to increase in de-vegetation and subsequent soil erosion.

# 9.3.7 Livestock disease incidence

Viral diseases

* Foot and mouth disease
* Lumpy skin disease
* Sheep and goat pox
* New castle disease
* PPR(Peste dies petites Rumuruti)

# 9.3.8 Bacterial livestock Diseases

* Anthrax –reported in Nyahururu and Rumuruti
* CBPP
* CCPP
* Tick born disease
* East coast fever
* Heart water
* Babesiosis
* Anaplas mugs

**Tick born disease**

East coast fever

Tick borne disease

Major killer disease for dairy animals

Local cattle like Zebu have high resistance for the disease. Other breeds are prone to the disease. Treatment is costly eg. It goes for about 5000/=

Foot and mouth disease (cattle).

Viral disease

Countywide

Livestock movement

Trade disease

Currently there is an outbreak since may 2013. It started at Laikipia and later spread to the whole country. Vaccination is ongoing.

**Lumpy skin disease**

Manifestated by formation of lumps and rising of hair. It may escalate to formation of wounds. It is a viral disease with no cure.

***Management***

Vaccination and quarantine

Contagious borine pleura pneumunia (CBPP

Commonly found in garissa but it was reported last year2013 August

This result in death of about 20 animals.Owners lost 20 herds. Team from kabete came to assess and pick samples.

Samples were taken to kabete for analysis

**Sheeps and Goats Disease**

The following sheep and goats diseases are common in Laikipia County**;**

Sheep and goats pox

Manifested by skin swellings which then burst and form wounds

Contagious caprine pleuropneumonia

It is a lung disease (bacterial)

**Poultry Diseases**

New castle disease is a major killer of poultry in laikipia. the disease is a viral disease is considered for vaccination every six months to keep the disease at bay.

It has been recommended that disinfection of foot/hands for chicken handlers be carried out.

# 9.3.9 Cases of resources use conflicts

Conflict drivers:

* population influx into wildlife habitats
* Illegal grazing in commercial ranches
* Crop destruction in small holder farms by livestock and wildlife(especially elephants)
* Use of natural resources namely water and pasture

Conflicts over pasture on private ranches estimated at 800 per year showing upsurge during the prolonged dry periods

Conflicts over water estimated at 600 per year across the county with upsurge during the prolonged dry periods

Conflicts over crops destruction on small holder farms estimated at 2000 in a year. Most cases go unreported

# 9.3.10 Initiatives of sustainable livestock management

# 9.4 FISHERIES

# 9.4.1 Introduction

Fishing farming is becoming a major economic activity and is commonly being practiced in high potential natural dams and artificial ponds. In 2012, the county had 811 fish ponds and 59 stocked dams, 3 fingerling multiplication farms of which majority were initiated under the ESP in 2009. The main species produced are Catfish, Common carp and Tilapia.

# 9.4.2 Aquaculture sustainability

Aquaculture contributes a significant proportion to Laikipia’s GDP. It also plays an important role in ensuring food security. A sizable population depends on fisheries both directly and indirectly for livelihood through fish farming, fishing and linkages to fish processing and trade. Apart from aquaculture, there is the dam and riverine fishery in the county.

Implementation of aquaculture development programs in Laikipia has observed and addressed environmental effects of aquaculture by curtailing unsustainable fish farming practices that would affect the environment and natural resources negatively. The actions taken includes; prohibiting establishment of fish ponds and other fish production systems on river banks, swamps and wetlands, controlled exploitation of fish resources, restocking, use of appropriate fishing methods, barring release of effluent back into the rivers and dams, outlawed use of chemicals in diseases control and regulating the introduction of new species to elude the possible introduction of invasive species. However, apart from aquaculture, the overall state of Laikipia’s fishery resources and their ecosystems is deteriorating due to unsustainable fishing practices, habitat destruction and pollution. These practices include; destructive fishing practices e.g. use of chemicals, ghost fishing due to loss and abandonment of fishing gear in the resources, use of non-selective fishing gear and riverine resources encroachment. To reverse this trend and achieve sustainability of fisheries, careful stewardship is required to conserve and protect all aquatic habitats for present and future generations

# 9.4.3 Fish stock utilization

Fish as food provides large quantities of animal protein in the nutrition. They are also a source of income and employment. Fish also is a raw material in animal feeds, and other economically high value product and byproduct production. Fish also are used in research and learning, biological control of disease vectors, and in restocking of over fished water bodies for conservation purposes.

# 9.4.4 over exploitation

Over exploitation of fisheries resources has not been experienced in Laikipia county. Over exploitation concerns are addressed through restocking, controlled fish resource utilization and awareness creation.

# 9.4.5 Total per capita aquaculture fish

During the period under review, in Laikipia County a total of 45,681 kgs were produced from aquaculture practices and inland fishing. This translates into a per capita production of 42 kg per farmer per year.

# 9.4.6 Fish ponds in wetlands.

There are no fish ponds in the wetlands in Laikipia County.

# 9.4.7 Acreage of wetlands loss to aquaculture

In Laikipia there are no wetlands lost to aquaculture development.

# 9.4.8 Alien invasive species

Laikipia county has no invasive fish species. The cray fish a fresh water crustacean that has invaded fish ponds and dams is of no concerns. It’s a delicacy in many tourist hotels. Also it can be used in animal feed formulation. Haplochromis fish is another fresh water fish species that has been considered invasive due to its large population which is as a result of its non exploitation due to its low economic value. The fish species can be used in animal feed formulation. The other fish species considered invasive is the mosquito fish (Gambusia alfinis). Due to its low economic value its exploitation is very low. Its non exploitation coupled with its prolific breed its population its very high in ponds, dams and rivers hence the invasive concerns. The fish has an economic importance in biological control of mosquito larvae there by reducing malaria prevalence and also can be used in animal feed formulation. Another fish species considered invasive is common carp (Cyprinus carpio) a fresh water cyprinid introduced from Asia. Due to its many sharp intramuscular y shaped bones its palatability is of great concern especially to many laikipians. This has lead to its low exploitation and hence its high population. Capacity building on its utilization is essential to clear the fears of its invasive notion. Awareness creation on the exploitation and utilization of these wrongly considered invasive fish species will be a milestone in their management hence addressing the many concerns of their perceived invasive nature.

# 9.4.9 Catch per unit effort/catch assessment

Fish catch assessment is determined through sampling of the fishing units that include ponds dams and rivers in a particular period of time. This can pose many challenges because it is very difficult to determine actual fish population in a production unit. Estimation is always done. The average catch per unit effort which is determined by the total catch from all production units divided by total production units and the effort to produce the catch. The average catch per unit effort in Laikipia county in 2013/14 operation year was 736.790 fish/unit effort.

IPSIR

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **3.Agriculture ,livestock and Fisheries** | | |  |  |  |  |
| Theme | Subtheme | State | Drivers | Pressures | Impacts | Response |
| Agriculture | * farming/cropping practices (inappropriate and unsustainable) | * Reduced Agricultural productivity | * Inappropriate/ Unsustainable farming methods * Lack of knowledge on the appropriate fertilizers | * lack of know how regarding appropriate soil conservation techniques | * Low yeilds | * Adopt modern farming practises that are sustainable   Undertake soil fertility analysis, mapping and management  Promote appropriate cultivation practices(conservation farming)  Promote use of appropriate inputs  . |
| Livestock | * livestock rearing vs carrying capacity | * Too many livestock * acreage degraded land due to overstocking * no of diseases incidences * no of cases of resources use conflicts | * Cultural believes that measures ones wealth status to the number of livestock he has. * Dowery demands | * Lack of know how on the modern livestock keeping. * Lack of changes among the community to modern lifestyle | * loss of biodiversty, * Siltation of rivers due to soil erosion. * Gully erosion arising from vegetation clearing | * Educate the local population on modern Livestock farming methods |
|  | * aquaculture/Mari culture (inappropriate and unsustainable) * -fish stock utilization * (over exploitation | * Total and per capita marine fish catch * Total and per capita aqua culture fish * no of fish ponds in wetlands and in mangroves * -acreage of wetlands loss to aquaculture * -no of alien invasive species * catch per unit effort/catch assessment   aquaculture/Mari culture (inappropriate and unsustainable) | * Inappropriate fishing gear * Over fishing * lack of know how on fish farming * cultural issues among the local community | * Population explosion * poor attitude on fish farming | * loss of fish stock and low yied per unit time | * Educate the local population on modern Fish farming methods |

# 

Agricultural Land, States, Drivers and Proposed Responses

| **Agricultural land** | **State** | **Causes/ drivers** | **Pressures** | **Impacts** | **Responses** |
| --- | --- | --- | --- | --- | --- |
|  | Low productivity | Inadequate extension services.  Low technology adoption,  Pre and post- harvest losses,  Low and declining soil fertility,  High cost of inputs;  Erratic and unpredictable rains, drought | To increase agricultural productivity and outputs. | Low food supply.  Poverty among those who depend on farming as a means of livelihood.  Results in overdependency among the population engaged in food production. | Undertake capacity building (empowerment and technical backup)  Undertake soil fertility analysis, mapping and management  Promote appropriate cultivation practices(conservation farming)  Promote use of appropriate inputs  Pre and postharvest management ( trainings, construction of storage structures),  Undertake crop diversification with bias on drought escaping /tolerant crops,  Provide water harvesting for irrigation,  Develop a County Strategic Grain Reserve |
|  | Inappropriate policy and legal framework | Poor or inadequate policy enforcement,  Absence of streamlined enforcement mechanisms,  Lack of localized policies,  Obsolete policies  Conflicting policies | Create enabling environment for agricultural development | Unsustainable agriculture that leads to dwindling food production. | Create policies for key enterprises in the county e.g. maize, potatoes, horticulture.  Establish enforcement mechanism for the laws.  Harmonize county laws and policies with national and inter- county policies |
|  | Inadequate market access | Poor infrastructure- (markets, roads, stores)age,  Poor development of value chains,  Inadequate access to market information,  Low and skewed contract farming,  Farming as a business concept has not been embraced. | Promote market access and product development | Provide market information,  Promote market development,  Promote value chain development,  Promote commercial agriculture, and  Promote cross- county, regional and international agricultural trade. | Develop user- friendly e.g. SMS- based County Agricultural Farmers Information System/ portal, promote NAFIS,  Built rural access roads,  Form marketing groups/ cooperatives,  Promote farming as a business concept- record keeping/ accounts  Develop crop- specific hubs e.g. Maize hub,  Enhance small holder participation in public tendering/ procurement in line with 15% Public Procurement and Disposal Act |
|  | Inadequate access to affordable credit and input | Inadequate information on credit facilities,  High interest rates,  Lack of collateral, limited agricultural credit providers;  High cost of inputs and accessibility | Enhance linkages to accessible and affordable credit and inputs. | Increase access to credit  Increase access to inputs | Subsidize the cost of inputs,  Establish credit guarantee scheme,  Introduce warehouse receipting,  Capacity building on credit access/ management,  Undertake bulk purchasing and distribution. |
|  | Inappropriate land use practices | Mono cropping,  Wrong choice of enterprise;,  Land fragmentation to uneconomical units,  Inappropriate land tenure system,  Poor conservation and utilization policies. | Promote sustainable land use and environmental conservation | Promote soil and water management,  Promote agro forestry farming systems,  Promote mechanization | Promote water harvesting and storage,  Protect of river banks, catchments and wetlands,  Promote conservation agriculture and Public Private Partnerships (PPP),  Map (GIS) and regularize agricultural land,  Develop a County Agricultural mechanization station/ Technology development centre |
|  | Inadequate institutional capacity and linkages | Inadequate skilled extension personnel,  Reduced mobility/ inadequate transport,  Poor collaboration and coordination in sector players,  Inadequate ICT infrastructure | Enhance institutional efficiency and effectiveness in implementation and service delivery. | Strengthen PPP,  Develop and sustain well trained human resource, | Foster and institutionalize positive organizational culture,  Institutionalize public service integrity programme,  Improve access to information and ICT- based tools,  Establish County sector forum. |

# 

# Fish farming-Issues, Causes and proposed interventions by Sub Sectors

| **Thematic area** | **Issues/ status** | **Causes/Drivers** | **Pressures** | **impacts** | **Proposed Intervention** |
| --- | --- | --- | --- | --- | --- |
| Fish farming | Seepage of water in earthen ponds;  Low production of fish in dams, rivers and ponds;  Inadequate Certified fish seeds(fingerlings);  high price of fish feeds;  High cost of pond liners(PVC);  Post-harvest losses of fish and fish products;  Low prices of fish and fish products;  Inadequate fishing gears and equipments;  Inadequate production of fish from dams;  Inadequate extension services;  Low production of fish in rivers. | Highly porous soils;  Low capacity building of farmers and fishermen;  Lack of preservation facilities;  Inadequate value addition and processing facilities;  Poor market for fish and fisheries products;  high cost of fishing gears equipments, feeds, PVC liners;  Poor management of dams;  Inadequate technical staff, transport and operational funds;  Uncontrolled fishing and low stock densities | Enhance food security and employment creation. | Loss of Revenue among the fish farmers  Low returns on fish farming investment  Loss of revenue due to poor post harvesting storage and poor eating habits among the communitties | Installation of pond liners  Construction of more fish ponds and dams;  stocking of ponds, dams and rivers;  Setting-up of feed manufacturing facilities;  Construction of hatcheries, fish preservation facilities;  Undertake value addition of fish;  Recruitment of more technical staff;  Purchase motorcycles, motor-vehicles, fishing gears, fish transportation trucks and equipments;  Capacity build farmers;  Promote establishment of marketing associations.  Establish fisheries ward offices;  Conduct more fish eating campaigns. |

**Out look**

**Conclusion**

**CHAPTER 10: ENERGY, TRANSPORT AND MINING**

# 10.1 Introduction

Laikipia being a semi-arid county, reliable sunshine throughout the year provides unexploited natural resource for solar energy. The county needs to invest more in renewable energy to boost the energy base for the local population. Over reliance on the national grid power supply has left most part of the county in darkness and backward in terms of development. Opportunities in production of *Jetropha carcus, croton megalocarpus* (Mukinduri), castor oil and sweet sorghum already exist for production of bio-fuel in the county.

# 

**10.2 Energy Access**

The national power grid serves 27 centres out of 55 centres in the county. The households using electricity for lighting constitute 18 per cent of the total households. There are 39 out of 63 health facilities and 50 out of 96 secondary schools connected to electricity respectively. Being a semi-arid county, reliable sunshine throughout the year provides unexploited natural resource for solar energy. The county has several institutions supported by the photovoltaic programme. Commercial wind electricity may also be generated with proper assessment along the escarpments towards the Rift Valley floor.

The table below shows the proportion of energy usage by households in the county

# Table 10.1 The proportion of energy usage by households in the county

|  |  |  |
| --- | --- | --- |
| **No.** | **Energy source** | **% of HH served** |
| **HH distribution by main cooking fuel** |
| 1. | Firewood | 16.1 |
| 2. | Paraffin | 72.4 |
| 3. | Electricity | 1.2 |
| 4. | Charcoal | 10.1 |
| 5. | Biogas | 0.2 |
|  | **HH distribution by main lighting fuel** |  |
| 1. | Firewood | 5.1 |
| 2. | Paraffin | 70.1 |
| 3. | Electricity | 17.7 |
| 4. | Solar | 5.9 |
| 5. | Gas (LPG) | 0.7 |
| 6. | Other | 0.5 |

# 10.3 Transport

# 10.3.1 Road transport

The total classified road network is 1,038.1 Km of which over 80 percent are feeder roads. The bitumen road surface in the county stands at 139.3 kilometres, it covers mainly the Nyeri-Nanyuki, Nyeri-Nyahururu, and Nyahururu-Kinamba-Rumuruti roads. The gravel surface stands at 296.9 Km and the earth surface at 601.9 Km. Whereas the main urban centres are relatively well served by road communication network, the rural areas have low access hence movements to the major urban centres is hindered.

# 10.3.2 Railways

The railway network in the county covers 23 kilometres serving Nanyuki Town and a small stretch of about 2 Kilometres in Nyahururu Town. There are 7 airstrips across the county majority of which are managed by the private ranching community.

# 10.3.3 Air transport

There are 7 airstrips across the county majority of which are managed by the private ranching community. There are two in Laikipia east and others evenly spread to the various parts of the county. The two Air strips located within the Nanyuki municipality are Nanyuki military Airbase and Nanyuki Air strip located along Nanyuki - Nairobi Highway.

# 10.3.4 Communication

# 10.3.5 ICT and environment

**10.3.6 Licenses on ICT**

# 10.3.7 Radio, television, mobile phones, newspapers, Billboards and posters

Based on the 2009 population and housing census, radio ownership is estimated at over 80 per cent in Laikipia East and West and 46 percent in Laikipia North of the total number of households. TV ownership is 45 per cent in East, 28 per cent in West and 6.5 per cent in North.

# 10.3.8 Impact and challenges

# 10.3.9 E- waste tonnage

# 10.3.10 Waste mining

# 10.4 Mining

# Ongoing activities

The common mining activity in the county consists of red sand harvesting along river beds in Laikipia North. Excavation of gravel and murram for road construction is also ongoing. Crushing of ballast is also an important activity within the county. This forms an economic livelihood for about 1,400 persons.

The main product in this category is sand and ballast. They contribute to the building industry both in and around county. Sand harvesting is done mainly in Mukogodo division while stone ballasting is done in central division. Laikipia County has minimal deposits of stones and minerals if any. So the level of extraction is also quite low. People in the district get stones for construction from Kiganjo in Nyeri and Meru.

# 10.4.1 Quarrying

Laikipia North Sub County is arid and semi-arid in nature and therefore the least populated arising from the limited economic activities such as livestock rearing and sand harvesting. Sand harvesting in Laikipia north is being done by pastoralist who have shifted their source of livelihood from pastoralism to sand mining to supplement their income. The land tenure in this part of the county is private (individually or communally owned private lands- group ranches) (source-LWF, 2009),

# 10.4.2 Sand harvesting

This is mostly done by community members through a cooperative society known as Loata Sand Dealers cooperative Society Limited, who indirectly engage in the activities of mining sand as a form of livelihood. The cooperative society was formed by four group ranches who directly engage in the business of harvesting and selling sand. These groups are;

* Ilpolei group ranch
* Makurian group ranch
* Morupusi group ranch
* Munishoi group ranch
* Kuri Kuri group ranch

These group ranches subscribe to LOATA co-op. society by remitting a percentage of sand proceeds and are directly responsible for harvesting, selling and allocating sand proceeds to various interests. Loata co-op society is managed by officials elected by the group ranches to represent their interest. All group ranch members are bona fide members of LOATA co-op society and benefit from bursary allocations from the society. However individual members living amongst the group ranches and who own land individually are not members of the SACCO neither are they eligible to be members and do not benefits from the sale of sand either directly or indirectly.

**10.4.3 Sources of Sand**

Laikipia North is the only region where sand harvesting is harvested in Laikipia County. Sand harvesting in involves scooping, loading and transportation. Sand is predominantly harvested from Osinyei and Loisukut Rivers, in Mumunyot Location, Mukogodo Division (mostly known as Doldol) in Laikipia North. Sand harvested in this region are supplied for construction in the urban centers namely; Rumuruti, Narumoru, Nanyuki, Nyeri, Nyahururu and Karatina towns.

**Issues arising from sand harvesting.**

* Resource use conflict;

The community has apportioned certain areas of the rivers as water conservation areas (sub-surface water dams) and other areas such as sand mining sites. The problem arises from when the community water points was located in common boundary between individual land owner (Murogol) and a group ranch known as Makurian group ranch. The individual land owner protested on citation of water point that technically locks them from conducting any sand harvesting activities from the same river.

* Inequitable sharing of proceeds earned from the sale of sand

The local community does not regard individual land owners as equal partners in the resource use. This is demonstrated in the manner in which;

-sand harvesting and water points are located /designated

-bursaries are dispersed to student in these areas which only targets students from ranching communities excluding the students from individual families

**Establishment of sand harvesting management committees**

Sand harvesting management committee was established to;

- oversee sand harvesting activities within all the rivers in Laikipia North,

- Ensure sustainable utilization of resources, and

-Ensure equitable sharing of resources (sand and water) and proceeds earned from the sale of sand. Other quarrying activities in the county include stone-crashing at Modsan in Nanyuki town.

Number of licenses issued for Quarrying/Sand Harvesting

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| EIA Quarrying and sand mining licences | - | - | - | - | 6 | 1 |
| Disused quarries |  |  |  |  |  |  |
| Rehabilitated quarries |  |  |  |  |  |  |

*Source: NEMA*

No of EIA licences issued for development

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|  |  |  |  |  |  |  |
| Number of project proposal licensed | 10 | 8 | 18 | 7 | 37 | 135 |

Source: National Environment Management Authority

Number of licenses issued

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| Number of licences issued |  |  |  |  |  |  |
| EIA licences | - | - | - | - | 13 | 37 |
| Effluent Discharge License | 4 | 6 | 12 | 6 | 2 | 30 |
| Waste transport | 6 | 2 | 6 | 1 | 2 | 4 |
| Waste sites (Facilities) | - | - | - | - | - | - |
| Noise & Excessive vibrations | - | - | - | - | 20 | 64 |
| Biodiversity | - | - | - | - | - | 1 |
| Wetland permits |  |  |  |  |  |  |

Source: National Environment Management Authority

# DIPSIR

# Energy Sub-Sector Priorities, Strategies and Constraints

| **Thematic area** | **Status** | **Causes/Drivers** | **Pressure** | **Impacts** | **Proposed Intervention/ Responses** |
| --- | --- | --- | --- | --- | --- |
| Energy | Inadequate power supply | Non availability and over reliance on wood fuel and charcoal;  Depleting of resources (wood);  High cost of energy i.e. electricity and fuel. | Population explosion, and  Poverty among the Rural population, | Unemployment among the youth, low economic growth, wide spread poverty among the population | Sensitize the communities and promote the use of alternate sources of energy. E.g. solar and biogas;  Introduction of forest farming system (introduce kitchen wood lots);  Encourage communities to form groups to benefit from Umeme Pamoja Programme and similar initiatives. |

# On-going Projects/Programmes

1. **Flagship Projects/Programmes**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Name** | **Location/**  **Sub-County/ Constituency** | **Objectives** | **Targets** | **Description of activities** |
| Photovoltaic Programme | Laikipia North and Laikipia East sub county headquarters | Provide alternative source of energy | Public Institutions | Assessment and installation of solar equipment |

# Issues, Causes and proposed interventions

| **Thematic area** | **Status/issue** | **Causes/ drivers** | **Pressure** | **Impacts** | **Proposed Intervention** |
| --- | --- | --- | --- | --- | --- |
| Roads | -Poor roads development,  maintenance and rehabilitation | -Poor profile of soils and drainage patterns  -Increased heavy traffic  -Insufficient funds allocation  -lack of monitoring of roads during construction  -unequal distribution of funds | Increased road users  Poor rood network  Poor workmanship in road construction and maintenance | -Roads are non motorable  -loss of revenues by farmers,  And other road users | -Tarmac more roads- 305km  - tarmac approximately 2 to 3 km within the existing centers |
|  | -Road encroachment and narrow roads | -Road side farming  -Illegal roadside developments.  -Roadside bushes  -Poor land survey | Dwindling agricultural resource land  -lack of bush clear regularly  Lack of clear demarcation of road reserve | -poor visibility among the motorist, regular road accidents involving pedestrians and other road users. | -Demarcate and acquire all the road reserves |
|  | -Reduction of road lifespan | -Overloading and general misuse of roads | - lack of Control axle of loads  - lack of Control the use of roads | - loss of tax payers’ money,  economic loss on the part of the government | -Procure and commission a mobile weighbridge  Commission a monitoring unit to enforce road use policies |

**Out look**

**Conclusion**

# CHAPTER 11: URBANIZATION, HEALTH, SANITATION AND WASTE

# 11.1 Introduction

# 11.2 Urbanization Developmental Control

# 11.2.1 Urban land use

Of the total land mass, the urban area constitutes 243.3 square kilometres. The major land use in urban centres is housing with main activities being formal employment, trade and business.

# 11.2.2 Urban Population

There are four major urban centres in the county namely: Nanyuki, Nyahururu, Rumuruti and Kinamba. The population within the four towns is expected to grow from 135,979 in 2009 to 145,498; 155,832; 163,175 persons in 2012, 2015 and 2017 respectively. Other centres in the county that continue expanding include Sipili, Ol-jabet (Marmanet), Wiyumiririe, Lamuria, DolDol, and Ol-Moran. The table below shows population projections by urban centres.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Urban Centres** | **2009 Census** | | | **2012(Projections)** | | | **2015(Projections)** | | | **2017(Projections)** | | |
|  | **Male** | **Female** | **Total** | **Male** | **Female** | **Total** | **Male** | **Female** | **Total** | **Male** | **Female** | **Total** |
| Nyahururu | 25,183 | 26,251 | 51,434 | 26,946 | 28,089 | 55,035 | 28,860 | 30,083 | 58,943 | 30,220 | 31,501 | 61,721 |
| Nanyuki | 25,046 | 24,187 | 49,233 | 26,799 | 25,880 | 52,679 | 28,703 | 27,718 | 56,421 | 30,055 | 29,024 | 59,080 |
| Rumuruti | 15,956 | 17,037 | 32,993 | 17,073 | 18,230 | 35,303 | 18,286 | 19,524 | 37,810 | 19,147 | 20,444 | 39,592 |
| Kinamba | 1,142 | 1,177 | 2,319 | 1,222 | 1,259 | 2,481 | 1,309 | 1,349 | 2,658 | 1,370 | 1,412 | 2,783 |
| **Total** | **67,327** | **68,652** | **135,979** | **72,040** | **73,458** | **145,498** | **77,157** | **78,675** | **155,832** | **80,792** | **82,382** | **163,175** |

***Source:*** *Laikipia Statistics Officer, 2012*

**11.2.3 Health and Sanitation**

There are 78,390 households with latrines in the county. The distribution of main toilet facility reflects that 11.8 per cent use flash toilets, 3.7 per cent use pit VIP latrines, 72.8 per cent use ordinary pit latrines, 0.7 per cent use buckets whereas 11 per cent use other methods of disposal such as natural bushes. On garbage disposal, 61 per cent of the households in the county have their garbage collected by the local authorities, 15 per cent use garbage pits whereas 10 per cent use public garbage heaps. Only one percent of the households use neighbourhood community groups.

**11.2.3 Informal settlements**

Laikipia has witnessed the emergence of squatters and new settlement schemes such as Solio and Wiyumiririe. The squatters’ problem hinders the realization of improved lives for all. There are about 4,712 squatters in the county with 1,021; 1,090; 400 and 2,201 squatters distributed in KwaMbuzi, Kahurura, Kandutura and Ontulili villages respectively.

# 11.3 Health and sanitation

# 11.3.1 Under five mortality rate

# 11.3.2 General population mortality

# 11.3.3 Access to primary health care

# 11.3.4 Proportion of urban population living in informal settlements

# 11.3.5 Environmental related diseases

# 11.4 Waste Management

# 11.4.1 Pollution and Waste Generated from Human Settlement

# 11.4.2 Types of solid waste

There are various classification methods of solid wastes. Other people will classify solid wastes e.g domestic, industrial, commercial etc. others will combine the domestic and commercial wastes to term them ‘municipal waste’. Whatever the classification, the most common type of waste in laikipia district is the combination of domestic and commercial wastes. Statistics are not available for the other types of wastes except scanty ones for domestic wastes.

# 11.4.3 Solid waste

Solid waste are all those materials arising from human and animal activities that are normally non-liquid and that are discarded as useless/unwanted. They encompass the heterogeneous mass of throwaways from residences and commercial activities as well as the more homogeneous accumulations of a single industrial activity.

# 11.4.4 Domestic wastes ( Nanyuki and Nyahururu towns)

The mass of waste generated in major towns of Laikipia namely Nanyuki Nyahururu per person per day lies between 250g-1000g with an average of 0.45 kg/person/day and its density varies from 100kg/cubic metres to 600kg/cubic meters ;thus the volume of domestic wastes generated ranges from between ½ liter to 10 liter/person/day. It should be noted that this applies only to the big towns like Nanyuki and nyahururu.

The main constituents of domestic wastes generated in the major towns vary as follows;

|  |  |
| --- | --- |
| Vegetable/putrescible matter | 20-75% |
| Inert matter | 5-40% |
| Paper | 2-60% |
| Glass | 0-10% |
| Metals | 0-15% |

Source; public health department-

Laikipia county Waste generated in the rural areas mainly comprise animal wastes plus the residential refuse.

**Industrial wastes** industrial solid wastes are those arising from industrial activities and typically include rubbish, ashes, demolution and construction wastes. Industrial wastes in the main towns do not appear to be significant in amount compared with domestic and shop wastes. This is because most industries in the district operate on small scale. Industries in the major towns i.e Nanyuki and Nyahururu generate more of liquid wastes than solid wastes. The solid wastes generated are either recycled or sold (recovered)

# 11.4.5 Hazardous solid wastes

Waste that pose substantial danger immediately or over a period of time to human, plant or animal life are classified as hazardous. A waste is classified as hazardous if it exhibits any of the following characteristics;

Ignability,Corrosivity,Reactivity or Toxity.

These types of wastes are generated by the various hospitals and other health facilities in the district and are in most cases disposed of properly (either in pits or burnt in incinerators). Some private clinics though, do not dispose off their wastes in the designated sites and this explains why a spot check at the Nyahururu disposal site revealed that sharps (needles and other surgical wastes) were being dumped together with the other wastes. Industries also generate this type of wastes, though in small quantities.

**Collection and disposal of solid wastes**

1. **Nyahururu town**

Collection-those activities associated with the gathering of solid wastes and hauling of waste after collection to the location where the collection vehicle is emptied.The responsibility of solid waste management within the municipality is under the public health department. Waste accumulated at several locations in and around low and medium rise residential dwellings are placed in storage containers to await removal (collection) by the waste collection agency mostly municipal council. These are then disposed off at a site which is a former quarry located about 2.5 kms from the town centre within the forest land. Crude dumping is what is practiced here with all the types of wastes being dumped together. A spotcheck showed that even hazardous waste like the clinical/medical wastes e.g used syringes and needles are disposed off in the dumping site.

**b) Nanyuki town**

Nanyuki town centre has its solid waste collected thrice weekly (Monday,Wednesday and Friday) while the other areas have their wastes collected twice weekly(Tuesday and Thursday). Most residences have the small capacity disposable paper and plastic bags for onsite storage of the wastes. These are placed by the road side when full to await collection by the municipal trucks.

**Disposal of solid waste**

Disposal of solid waste presently in the county is pre- dominantly open dumping.In nyahururu and Nanyuki towns designated dumpsites have been set aside with fencing having been done to secure the facilities. However, the facilities have not been licensed by Nema in accordance with waste management Regulations. In the rural areas there could be some little composting and burning of waste. Crude dumping is practiced in the major towns where the wastes are simply dumped in a selected open area and frequently burnt. A visit to the disposal site in the 2 major towns revealed that these areas are not fenced and hence a lot of scavenging (both humans and animals) takes place. A lot of residential premises have also mushroomed next to these dumping sites ignoring the requirement the they be atleast 500m away. Rumuruti town has no particular site for solid waste disposal.

**Health and environmental aspects (impacts) of poor waste disposal/management**

* Direct health risks concern mainly the workers in the field, who need to be protected, as far as possible, from skin contact with wastes. There are also specific risks in handling wastes from hospitals and clinics
* For the general public, the main risks to health are indirect and arise from the breeding of disease vectors, primarily flies and rats.
* The most obvious environmental damage caused by solid wastes is aesthetic; the ugliness of street litter and the destruction of the beauty of the towns by uncontrolled dumping of the wastes
* More serious, however, and often unrecognized, is the transfer of pollution to water; which occurs when the leachate from a refuse dump enters surface or ground water.
* Organic matter – extremely high oxygen demand on water bodies
* Nutrients – eutrophication, algal blooms
* Air pollution is also caused from the inefficient burning of wastes, either in the open air or in plants that lack effective treatment facilities for the gaseous effluents
* Finally there is the specific danger of the concentration of heavy metals in the food chain, a problem that illustrates the relationship between solid and other wastes. There is possibility that liquid industrial effluents containing heavy metals discharged to a drainage system would contaminate the sludge leaving the treatment plant. These metals can be taken by plants growing on land on which sludge has been deposited, creating risks to the animals which graze and the humans who consume the animals or even the plants.

**Liquid waste management**

The two major towns of the county i.e Nanyuki and nyahururu have functional sewerage treatment plants (stabilization ponds) with the nyahururu one being assisted by artificial aerators because it has not been de-sludged for a long time, causing overloading. To enhance its efficiency, Effective Microorganisms (Ems) are also being used. A visit to this site showed that they either do not have laboratories or lack the necessary equipment and reagents to measure the various parameters like BOD,COD, faecal coliforms and PH. This activity has been left to the ministry of water, which takes samples monthly for testing. Recent results though, show that both treatment plants are efficient and effective. For instance the effluent at the nyahururu treatment plant has an average BOD of 13mg/l (compared to the requirement of 20-25mg/lit).

**Nyahururu town**

Liquid waste in the town is managed through a trunk sewer line that covers a distance of about 6kms. The sewerage system serves 75% of the population in the town. Areas situated at lower levels than the lines are not covered and are therefore served by pit latrines. It should be noted that the water level in these areas is very high which results into latrines getting waterlogged anytime it rains. Kwamaina and manguo slums are typical examples. In these areas most residents collect their water for domestic use from the rivers passing within the slums. These rivers are highly polluted with raw sewage. Environmental sanitation in these areas is in deplorable state.Milk factories like Kenya cooperative creameries (KCC) are discharging raw sewer into the aquatic environment.

**Facilities under EDL regime in Laikipia County.**

# List of sewerage facilities

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name of facilities | Location | Status |
| 1 | Nanyuki water and sewerage company | Nanyuki | Licenced |
| 2 | Nyahururu water and sewerage company | Nyahururu | Licenced |
| 3 | Laikipia University | Nyahururu | (New)not commissioned yet |

List of hotels and lodges in Laikipia County

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name of facility | Location | Status |
| 1 | Olpajeta House | olpajeta conservancy | Not Compliant |
| 2 | Ol-tome Camp | Kimanju | Applied |
| 3 | Sweetwater’s Tented Camp | olpajeta conservancy | Applied |
| 4 | Pelican House | olpajeta conservancy | Not Applied |
| 5 | Rift Valley Adventures(RVP) Wilderness Camp | olpajeta conservancy | Licensed |
| 6 | Sosian Ranch and Lodge | Laikipia West | Not Applied |
| 7 | Tassia Lodge | lakipia North | Not Applied |
| 8 | Mt.Kenya Safari Club Hotel | Nanyuki | Licensed |
| 10 | Oljogi Resort Lodge | Laikipia North | Licensed |
| 11 | SabukSuguroiLodge | North | Applied |
| 12 | Kirera Holding Hotel | East | Under construction |
| 14 | Storms Resort | Jua Kali | Licensed |
| 16 | Sportsman’s Arm Hotel | Nanyuki | Not Applied |
| 17 | Kicheche Laikipia Camp | olpajeta conservancy | Licensed |
| 18 | Porini Rhino Camp | olpajeta conservancy | Licensed |
| 19 | Laragai House(Borana Ranch) | Borana Ranch | Licensed |
| 20 | Borana Lodge | Borana Ranch | Licensed |
| 21 | Sirai House(Borana Ranch) | Borana Ranch | Licensed |
| 22 | Solio Lodge | Central | Licensed |
| 23 | Mukima House Ltd Lodge | East | Licensed |
| 24 | Mugie Camp/Lodge(Ranch) | West | Licensed |
| 25 | Segera lodge(Ranch) | North | Applied |
| 26 | LoisabaLodge(Ranch | loisab | Licensed |
| 27 | Makena’s Hill (Laikipia Nature Conservancy) | Nyahururu | Licensed |
| 28 | Loll Daiga Farm House | East | Applied |
| 30 | Enasoit Lodge | North |  |
| 31 | Impalla Lodge | North | Not Applied |
| 34 | Elkarama | Edana |  |
| 35 | Il Ngwesi Lodge(Mukogongo) | North | Not Applied |
| 36 | Sirikoi Lodge(Lewa Conservancy) | Laikipia East | Applied |
| 37 | Olpajeta Bush Camp | Laikipia Central | Applied |
| 39 | Olentile Lodge | Kimanju |  |
| 43 | Suyan Ranch | Laikipia West |  |
| 44 | Ol Masior Ranch | Laikipia North |  |
| 45 | Ol Naishu | Laikipia North |  |
| 46 | Il Motiok | Laikipia North |  |
| 47 | Ngobit Lodge (Sirima) | Laikipia Central |  |
| 48 | Wiyumiririe Travellers Hotel | Laikipia Central |  |
| 49 | Simangua House(Borana Ranch) | Laikipia East |  |
| 51 | Jim and Lori Denooyer House at Loisaba Wilderness Ltd | Laikipia North |  |
| 52 | Lions Court Lodge | Nanyuki |  |
| 54 | Simbas Lodge | Nanyuki |  |
| 55 | Sabul lodge | Laikipia East |  |
| 56 | Kirera holding(hotel) | Laikipia East |  |
| 57 | Mpala lodge | Laikipia north |  |

**List of flower farms Laikipia County**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name of flower farm | Location | Status |
| 1 | Kitawi Farm ( Kantara) | Lamuria | Licensed |
| 2 | Kongoni Farm | Kalalu | Licensed |
| 3 | Likii River Farm | Nanyuki |  |
| 4 | K.H.E Farm | Nanyuki | Licensed |
| 5 | AAA Growers (Turi) | Nanyuki | Applied |
| 6 | AAA Growers (Simba) | Rumuruti | Applied |
| 7 | Timaflor Farm 1 | Timau | Licensed |
| 8 | Timflor Farm 2 | Timau | Licensed |
| 9 | Timflor Farm 3 | Timau | Applied |
| 10 | Timflor farm 4 | Timau | Applied |
| 11 | Mwanzi ltd | Rumuruti | Licensed |
| 12 | Turaco Farm | Timau |  |
| 13 | Equinox Horticultural limited | Umande | Licensed |
| 14 | Everest Lusoi Farm | Luisoi |  |
| 15 | Everest Njumbi Farm | Naromoru |  |
| 16 | Kongoni River Farm | Timau | Licenced |
| 17 | Tambuzi Limited | Gakawa/Githima | Licensed |
| 18 | The African Herb Limited | Jalua Kali | Licensed |
| 19 | Marania LTD-Lolomakk Farm | East | Licensed |
| 20 | Kitawi Farm ( Kantara) | Lamuria | Licensed |
| 21 | Kongoni Farm | Kalalu | Licensed |

**Slaughter houses in Laikipia County**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name of facility | Location | Status |
| 1 | Municipal Council of Nanyuki Slaughter House | Nanyuki |  |
| 2 | NgareNarok Meat Industries | Narok |  |
| 3 | Olpajeta Abattoir | Olpajeta | Not Licenced |
| 4 | Kimaiyo Slaughter House |  |  |
| 5 | Sipili slaughter Slab | Sipili | Not Licenced |
| 6 | Francis KariukiMuthee | Sipili | Applied |
| 7 | Kinamba Slaughter Slab | Kinamba | Not Compliance |
| 8 | Kabucho Slaughter Slab | Gatero B | Licensed |
| 9 | Kanyamwi Slaughter Slab | Gatero | Not Licenced |
| 10 | Gatundia Slaughter | Gatundia | Not Licenced |
| 11 | Mary WambuiKiburi | Nyahururu | Applied |
| 12 | Nyahururu Slaughter House | Nyahururu |  |
| 13 | Wiyumiririe Slaughter Slab | Wiyumiririe | Not Licenced |
| 14 | Marina Slaughter Slab | Marina Centre | Not Licenced |
| 15 | Mt. Kenya (Naromoru) | Naromoru | Applied |

# CHAPTER 12: ENVIRONMENTAL EDUCATION, INFORMATION, COMMUNICATION AND AWARENESS

**Environmental education Activities in Lakipia County**

The following institutions carry out environmental awareness and education programmes in some parts of Laikipia County:

**Laikipia Wildlife Forum (LWF)**

* **Bringing Eco Schools to Laikipia** LWF is venturing into new territory this year by introducing the concept of eco schools (eco – friendly) in 5 schools spread out across Laikipia.These will serve as conservation learning/demo sites for other schools and surrounding communities. Eco-Schools is an international initiative designed to encourage whole-school action on sustainable development education issues. It is an environmental management tool and a learning resource that empowers young students to be the change our sustainable world needs by engaging them in fun, action-orientated learning.
* **Establishment of an environmental education centre in Nanyuk**i. In 2013, LWF established a resource centre in Kimanjo which has proven very useful to surrounding communities. This year, plans are underway to develop the Mount Kenya Eco Resource Centre in Burguret into properly functioning environmental education centre. This will afford schools from Laikipia East and Central an opportunity to engage in hands on learning.Thecentre will be designed to offer experiential learning whilst exploring other outdoor teaching methodologies.
* The **bus** making trips to conservancies with both school groups and community groups.
* The **environment education officers** teaching pupils, students and community groups on game drives.
* The environment education officers together with the **Community Liaison Officers** (CLOs) attending festivals with environmental displays.
* LWF also through **workshops** trains people in villages on environment education and how to conserve natural resources.

**African Wildlife Foundation (AWF)**

AWF invests heavily in education and training in order to empower Africans to be Africa’s stewards. AWF provides university scholarships for Africans, offers training in conservation and sustainable agriculture, and lends its expertise to governments seeking additional knowledge in natural resource management.

**Olpejeta conservancy**

**OlPejeta Community Outreach Program**

The OlPejeta Conservancy is committed to promoting environmental and conservation education to children and offers highly discounted rates to school groups. The number of students visiting the Conservancy has tripled over the years, and in 2012, more than 22,000 children came through the gates.

The Conservancy has plenty to offer. Not only do children enjoy game drives around the Conservancy, but the [**Morani Information Centre**](http://www.olpejetaconservancy.org/must-sees/morani-information-center) and the [**Sweetwaters Chimpanzee Sanctuary**](http://www.olpejetaconservancy.org/must-sees/chimpanzee-sanctuary) provide a huge opportunity for school children to learn more about current conservation efforts as well as gain a deep knowledge of the wildlife species found on Ol Pejeta Conservancy.

**Conservation Guides Training Course**

Immense untapped potential exists amongst guides, scouts and community educators in Laikipia that can greatly advance environmental education in our County. The education program has developed a ‘Guides Training Course’ for the above mentioned group which is also geared towards fostering a cascade training system for educators in Laikipia. The course covers basic introductions to nature interpretation; Ornithology, Mammalogy, Entomology and Herpetology as well as human wildlife conflict and the geography of Laikipia.

This year LWF plans to partner with teachers who have already benefited from its 2013 **training workshops** in delivering a series of mini workshops at village level. The workshops will introduce different teaching methodologies for environmental education as well as provide an opportunity for LWF to monitor and evaluate teachers it has trained in previous workshops.

**Celebrating World Days**

Celebrating and participating in various environmentally related World Days with keen interest provides a platform for awareness creation. Some of the days to be celebrated include; World Water Day, World Forest Day, World Environment Day, World Rhino Day and the recently declared World Wildlife Day.

**Mpala Research Centre**

**Community conservation day**

Students, community members, and researchers gather to enjoy presentations from the member schools of the Northern Kenya Conservation Clubs. The students demonstrate what they have learned throughout the year about conservation and the environment with songs, poems, plays, and games. In addition, each school share posters, dramas, and a variety of other projects.

**Discovery Day**

Local community members, students, staff, and researchers all gather at Mpala Research Centre for a day of learning and fun. A number of researchers present on their work and answer questions about their research

**Workshop**

A workshop on human-elephant conflict was held by the **Kenyan Wildlife Service** and Cambridge University through the **Darwin Initiative.** The workshop focused on ways to mitigate human-elephant conflict in Kenya and a new comprehensive five-year Kenya National Elephant Strategy. Holistic Management International held two workshops at Mpala for participants from the Laikipia Wildlife Forum, Mpala Ranch and Research Centre, regional NGOs, and neighboring ranches and communities.

Mpala researchers held a workshop on monitoring rangeland health where they worked on designing a comprehensive monitoring program. The program, detailed in a manual, can be used by managers to determine whether they are meeting their long-term management objectives such as forage production or minimizing soil erosion.

**CETRAD**

**Workshops and awareness trainings** CETRAD conducts workshops and training to WRUAs. This encourages conservation of water bodies and also controls pollution of water resources.

**EIA course**

CETRAD conducts a three weeks EIA/EA course to professionals from public and private institutions.

**Environmental Information System**

**The types of data available in the county are in form of books, magazines, pamphlets, reports, maps, posters and in electronic form.**

**These are found in the county environment office, the county library, the DIDC(District information and document centre) and other institutions dealing with environment such as KWS, Research(CETRAD) and other private ones such as Impala Research Centre among others.**

**Most of the information is readily accessible to the public e.g the li brary and the environment office. Others can be available at a cost.**

**Status of environmental information management systems**

**Information sharing in the district is poor. Communication mechanisms between institutions /lead agencies, committees or taskforces, data collection is only done for a particular reason e.g. a project and the report is handed to the donor. It ends up not assisting other departments or the community. Institutional skills in information management is lacking in some places where information is found. For example there are not extra staffs to deal with information organization in environment office and the DIDC is understaffed.**

**Indigenous knowledge**

**Ignored for many decades, the role of indigenous knowledge in providing the basis for a sustainable approach to development is now being recognized in many areas. In many parts of Laikipia, indigenous biodiversity plays a crucial role in the economic and socio-cultural profiles of the people. This biodiversity has been maintained though an indigenous system of management for generations using the resource available without overexploiting them.**

**Laikipia district is home to different communities of Kenya. Maasai, kikuyu, meru, Somali, turkana are some of them. However, indigenous knowledge of a group tend to circulate just within itself. Thus it is very difficult for other communities to benefit from another by gaining indigenous knowledge.**

**Indigenous knowledge is very rich among different groups when it comes to herbal medicine knowledge, conservation of forests, healing of eroded areas, rotational grazing and farming and preservation of special sites such as caves.**

**Unfortunately, all this has been ignored even by the people possessing it due to the onslaught of ‘development’. It is seen as being backward and that ideas from the ‘west’ provide us with all the solutions to our local problems.**

**Proposed intervention**

* **Community training through workshops and barazas to create awareness of the importance o indigenous knowledge**
* **Preservation of indigenous knowledge through documentation in electronic and book form.**
* **Encourage preservation of our rich culture by e.g teaching of mother –tongue in lower primary schools.**
* Data types and sources of Environmental Information in the County
* Status of Environmental Information Management

# CHAPTER 13: ENVIRONMENTAL GOVERNANCE

**Status of environmental governance and institutional arrangements**

The environmental management and co-ordination act is the main guide in the management of the environment in the county.

The defunct county environment committee is the highest organ of environmental governance in the county. Its chairman is the county commissioner while the secretary is the county environment officer. Membership contains civil society to allow public participation and government departments which are stakeholders in matters of environment or as stipulated in the first schedule.

**Collaborating government departments**

Most government departments are active collaborators in matters of environment. This is so far departments which are environmental sector like water, forest, agriculture, fisheries, livestock and others.

Sometimes environment is a security issue thus departments like police and administration are collaborators with environment.

# Table 13.1 Number of meetings held in a year

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| year | Yearly targets | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| Number of meetings conducted |  |  |  |  |  |  |  |
| PEC |  |  |  |  |  |  |  |
| CECs |  |  |  |  |  |  |  |
| BMU |  |  |  |  |  |  |  |
| FA |  |  |  |  |  |  |  |
| DAB |  |  |  |  |  |  |  |
| PPLC |  |  |  |  |  |  |  |

Source; NEMA, KFS, Fisheries department, department of Agriculture

**Active NGOs Environmental Governace**

A number of NGOs are active in matters related to environment at the county level.

These are;-

Laikipia wildlife forum

World vision

Tree is life

Red Cross

Netherlands Development Agency (SNV) and many others.

**Active donor organizations**

Donor Organizations active in matters of environment in the county include;-USAID,SIDA,ADB(African Development Bank), WFP(World Food Programme), World bank and others

**Regulatory and management tools**

EMCA is also a tool of environmental management. Others include;- Water Act, Forest Act, Public health Act, Agriculture Act, Chief’s Act and others.

Other tools of environmental management include Environmental Impact Assessment(EIA) and Environmental Audits(EA).

**Key issues in compliance and enforcement**

Enforcement is done in a sectoral manner

Different departments have different resources

Ignorance of the community on the need to comply.

**Environmental Governance**

Types and number of environmentally friendly technologies adopted (transfer agreements, green technologies)

**Funding**

Percentage of County budget allocated for environmental management

Amount of money from development partners for environmental management

Percentage of funding for \env \research

**Environmental Compliance and Enforcement**

Number of licenses issued

Numbers of functional CECs, Forest associations, water user associations, DICs, Agricultural Boards, BMUs (minutes and reports)

Number of EIAs/EAs and SEAs issued

Number of illegal equipments seized (eg fishing gears,)

Number of complains, and prosecutions on environmental pollutions

# CHAPTER 14: EMERGING ENVIRONMENTAL ISSUES (from all the sectors)

**Introduction**

The people of Laikipia County largely depend on natural resources for their livelihood. These natural resources are increasingly under pressure from human activities, resulting in environmental degradation and depletion. The major concern is to ensure sustainable use of the natural resources by educating the public on how they can utilize the natural resources without exceeding their regeneration capacity. Major environmental concerns in the county are related to poverty and the lack of value attached to the community based natural resources encouraging overexploitation. Laikipia population relies heavily on surface water resources to sustain their livelihoods and since Laikipia is a water scarce county, the available surface water resources are becoming under pressure resulting into depletion and degradation . People should be sensitized on sustainable use of water resources to the extent that they can regenerate naturally. Poverty may also contribute to the excessive exploitation of the water resources leading to depletion.

**Environmental challenges in the county.**

Among the noted emerging challenges that hinder environmental conservation in Laikipia County include the following;

* Millipede infestation
* Erratic weather
* Opuntia stricta invasion
* IDPs resettlement
* Insecurity
* Frequent Drought
* Human/wildlife conflicts
* Maize lethal necrosis disease
* Water use conflicts and pollution

# Table 14.1 Emerging environmental issues and their mitigation measures

| **Emerging issue** | **Impacts on the environment** | **Mitigation measures (Actions to be taken)** | **Responsible agency** | **Cost in Kshs (Millions)** |
| --- | --- | --- | --- | --- |
| Millipede infestation | * Destruction of soil organic matter * Loss of soil productivity * Chemical pollution | * Integrated pest management * Research into least toxic chemical control methods | * Ministry of Agriculture * Researchers * Community * County Government | 10M |
| Maize lethal necrosis disease | * Loss of productivity | * Research * Awareness creation * Clean seed * Soil fertility management programmes | * Ministry of Agriculture * Researchers * Community * County Government * National Government | 5M |
| Frequent Drought/ erratic weather | * Depletion of natural resources- trees, grass, and other vegetation, water bodies * Loss of livelihoods * encroachment into wetlands * massive livestock losses | * Diversify livelihoods * Irrigation systems * Create awareness * Use of climate information * promotion of high value drought resistant crops * conservation agriculture * water harvesting * fodder conservation through community groups | * National government * County government * Ministry of Health * NGOS, * Community * NEMA * KFS * Planning * Meteorological Dept * CETRAD * NDMA | 300M |
| IDP resettlement | * Land degradation, * Deforestation * Over use of water resources * Insecurity * Waste disposal problem | - Control the influx  - Avail land for resettling the landless | * County government * NGOS * NEMA * National government | 50M |
| Opuntia stricta invasion | * Land degradation * Displacement of other species * Injury to livestock and people | * Encourage tree planting * Increase forest cover * Utilization of Opuntia | * National government * County government * NGOS, * the community * Agriculture * NEMA * Livestock * KFS * Planning * Meteorological Dept | 50M |
| Water use conflicts and pollution | * Catchment degradation * health effects to both human, livestock, wild animals, water creatures and vegetation | * Enforcement of EMCA/ Water acts * Sensitization of the community | * WRMA/WRUAs * NEMA | 30M |
| Insecurity | * Low agricultural production due to displacement as a result of inter ethnic clashes | * Formation of peace committees * Inter-cultural events | * County government * National government | 5M |
| Human/ wildlife conflicts | * Crop damage * Land degradation * Death of livestock and loss of human lives | * Electric fencing * Translocation of elephants * Ecotourism | * County government * National government * KWS * Community | 50M |

# Issues, Causes and Proposed Interventions

| **Strategic Issues** | **Causes** | **Strategic Development Objectives** | **Immediate**  **Objectives** | **Proposed Intervention** |
| --- | --- | --- | --- | --- |
| **Cross cutting**  **Issues.** | | | | |
| Emergency preparedness | Drought  Diseases out breaks | **Strengthen emergency preparedness** | Develop a County Contingency Plan | Establish a restocking and enterprise development fund;  Develop emergency livestock off-take strategy;  Enhance early warning and response systems;  Establish five strategic feed reserves;  Introduce hay pelleting technology alongside the strategic feed reserve;  Procure three complete hay making equipment (mower, baler, hay rake, tractor). |
| Inadequate collaboration and linkages with other local, regional and national agencies | Strategic areas of cooperation not identified;  Inadequate participation in consultative meetings/forums;  No joint Action Plans with other key stakeholders. | Create synergy among the stakeholders. | Improve synergy between key stakeholders. | Identify strategic areas of cooperation in the livestock sector;  Participate in consultative meetings/for a;  Develop and implement joint Action Plans (JAPs). |
| Inadequate environmental conservation**.** | Overstocking;  Land degradation | Increase land productivity | Reduce pressure on land through Increased off-take | Promote use of environmentally friendly technologies e.g. biogas and manure;  Promote agro-forestry in livestock production;  Promote soil and water conservation in the rangelands;  Enforce proper grazing practices |

# References

**Appendices**

**List of participating agencies**

1. National management Authority
2. Kenya forest service
3. Ministry of agriculture Livestock and Fiheries
4. Water Resource Management Authority
5. County Government of Laikipia
6. County Development Office of Laikipia
7. Public Health
8. National Draught Management Authority

**List of participants**

***MEMBERS PRESENT***

1. **Job Owak- WRMA**
2. **KarumbaNderitu- Fisheries**
3. **Vincent Mahiva- NEMA**
4. **Stella wairimu- NEMA**
5. **James Mwangi- LWF**
6. **Denis Mwanzia- NDMA**
7. **Margret Mwangi- KFS**
8. **Gilbert Magut- NEMA**
9. **Arthur Maathai- Agriculture**
10. **J.K. Lesorogol- Livestock**
11. **Joel Mbugua- Public Health**
12. **Margret Mwangi- Meteorology**
13. **Simon Tonui- NEMA**
14. **Michael Anyonge- NEMA**

Other bulky materials