Financing Locally-Led Climate Action

(FLoCCA)

Program.

Laikipia county

REPUBLIC OF KENYA

WORLD BANK GROUP

DANIDA

Kingdom of the Netherlands

german cooperation

KFW

Sweden Sverige

Table of Contents

ACKNOWLEDGEMENT

This Participatory Climate Risk Assessment Report was drafted by a joint technical team of representatives from various County Departments namely: Water Environment Natural Resources and Climate Change; Agriculture Livestock and Fisheries; Public Health; Infrastructure Land Housing and Urban Planning; Trade Tourism and Cooperative Development; Finance and Economic Planning, representatives from the Civil Society, such as IMPACT Kenya, CETRAD, and SNV-LISTEN Project, the Kenya Meteorological Department, Laikipia County among others. We are grateful for the financial support by the partners in conducting this assessment as well as in writing the PCRA Report.

A Participatory Climate Risk Assessment is a key tool to guide climate related investments and priorities at the county level. This document provides analyses of the underlying causes of vulnerability and on-going and potential climate change adaptation strategies. It also provides a snapshot of the enabling environment for building communities' resilience by providing a synthesis of the policy, institutional and governance context. Complementary materials such as maps, books and annexes of main agricultural and livestock and trading commodities, climate analysis, adaptation options, and methodological details are also provided. Several climatic hazards have been observed in the county e.g. drought, moisture stress and uncertainty on the onset and duration of seasons. These hazards pose a growing threat to the agricultural sector and often lead to significant crop and livestock production losses and food insecurity. Women and youth contribution to select value chains is high, therefore it is important to targeted interventions that maximize on their involvement and increase their resilience to climate shocks.

The PCRA consultative process, write-shop and Multi-Stakeholder Workshop was financed through the world bank funded program to Facilitate Locally Led Climate Action (FLLoCA). I would like to thank the staff members from County Government of Laikipia whose efforts in coordinating the development of this report greatly ensured that the process was seamless. This process benefitted greatly from the support of SNV LISTEN project and IMPACT Kenya and we thank them for their continued partnership with Laikipia County.
As the lead agency in the preparation and implementation of the FLLoCA program, the Department of Water Environment Natural Resources and Climate Change is grateful for the active participation of all stakeholders and their invaluable contribution.

Finally, I would like to thank H.E. Hon. Joshua Irungu, EGH, the Governor of Laikipia County and the County Executive Committee for their insightful inputs into this process.

Leah Njeri

County Executive Committee Member,

Water Environment Natural Resources and Climate Change.

County Government of Laikipia

DEFINITIONS OF TERMS

I. **Weather:** - Refers to the behaviors of the atmosphere on a day-to-day basis in a relatively small area.

II. **Climate**: - Refers to the behaviors of weather parameters for a relatively long period of time, classical period of 30 years and above, for a larger region.

III. **Climate change**: - Refers to a change in the state of the climate that persists for an extended period, typically a decade or longer. A permanent shift in the normal pattern of climate.

IV. **Climate Variability**: - Refers to fluctuations in the mean state and other characteristics of climate.

V. **Adaptation to climate change**: - The adjustment of communities and ecosystem to cope with the adverse effects of climate change (Managing the unavoidable)

VI. **Mitigation:** - Measures undertaken to reduce the climate change causing substances/activities (Avoiding the unmanageable)

VII. **Vulnerability:** - The degree to which a system/community is exposed to, and is unable to cope with, adverse effects of climate change.

VIII. **Resilience**: - The capacity for a socio-ecological system or community to absorb stresses and maintain function in Climate Hazard: - It is a physical process or event that has a potential of harming human health, livelihoods or natural resources.

IX. **Climate Risks**: - Physical damage and financial losses as a result of increasing exposure to climate hazards.

X. **Adaptive Capacity**: - The social and technical skills and strategies of and individual and group (communities) that can be directed towards responding to effects caused by climate change

ACRONYMS

FLLoCA: Financing Locally Led Climate Actions

WB: World Bank

TNT: The National Treasury

PCRA: Participatory Climate Risk Assessment

NCCAP: National Climate Change Action Plan

CCCAP: County Climate Change Action Plan

CIDP: County Integrated Development Plan

CRM: Climate Risk Management

CRA: Climate Risk Assessment

WCCPC: Ward Climate Change Planning Committee

IPCC: Inter-Governmental Panel on Climate Change

CFA: Community Forest Association

WRUA: Water Resources Users Association

GCM: General Climate Model

RCM: Regional Climate Model

RCP: Representative Concentration Pathways

CMIP5: Coupled Model Intercomparison Project 5

CIS: Climate Information Systems

CSA: Climate Smart Agriculture

TWG: Technical Working Group

CCRI: County Climate Resilience Investment

CECM: County Executive Committee Member

NDMA: National Disaster Management Authority

ASDSP: Agricultural Sector Development Support Programme

EMCA: Environmental Management and Coordination Act

KHIS: Kenya Health Information Systems

EXECUTIVE SUMMARY

The Laikipia County Participatory Climate Change Risk Assessment (PCRA) was carried out between April and May 2023. The objective of PCRA is to guide the county to identify climate risks and hazards with their associated impact to the communities and environment in Laikipia County. The findings of this assessment inform the development of the Climate Change Action Plan, integration of climate issues into the CIDP and the National Climate Change Action Plan. PCRA is also one of the conditions for accessing the Climate Resilience Investment Grant from the National Treasury's Financing Locally Led Climate Action, (FLLoCA) programme. The PCRA report documents prevalent climate risks, sources of vulnerability and the prioritized adaptation response actions. The process of implementing the PCRA involved: Formation and training of the Technical Working Group, stakeholders' analysis and mapping, community engagements at ward level, collection of historical, current and projected data of local climatic patterns, socio-economic conditions and vulnerability analysis, conducting county level workshop on climate change risk assessment and finally writing the PCRA report. The assessment revealed that about 21% of the residents of Laikipia primarily depend on dairy farming and crop production while 79% depend on agropastoral and pastoralism production system under low-input rain fed agriculture. With the frequent changes in rainfall patterns, most households that depend on agriculture and livestock are exposed to the impacts of climate change. Furthermore, women are the highest portion of laborers in the agricultural sector (60% household and 40% hired) (ASDSP, 2014) which further makes them more vulnerable to the effects of climate change. Impact of climate change are compounded by human activities such as: cultivation of dry areas, overstocking, overgrazing and unsustainable exploitation of natural resources such as sand and murram.

The main climate hazards identified in the county are prolonged dry spells which led to drought, erratic rainfall patterns, floods, emerging pests and diseases, Environmental degradation (soil erosion, gulley's, water catchment destruction, mud/landslides, wetland degradation, deforestation), frost and extreme temperatures.

The total annual rainfall trends showed a decrease of precipitation in the past which will continue in the future (2020-2040) for the long rainy season while the short rainy season will receive enhanced rainfall for the same period. In both cases, projections show an increase of rainfall for the period 2041-2060. The annual mean temperature trends show an increase of temperature for both seasons in the past and in the future. The short rainy season will remain slightly cooler (KMD 2020). The number of consecutively dry days occurring within a season are about one week and are likely to increase which is an indicator of low precipitation.

Laikipia is an ASAL county and hence water scarcity is a reality, which has been aggravated by climate change. There are no rivers that have sources in the county. The main drainage feature is Ewaso Nyiro North basin with its tributaries having their sources in the slopes of the Aberdares and Mt. Kenya. These tributaries include Nanyuki, Timau, Ewaso Narok, Pesi and Ngobit rivers. Marura Swamp and the Ewaso Narok Swamp are two major swamps in the county, although facing human enchriachment.

Some of the critical challenges facing Laikipia County are: deforestation and land degradation resulting in reduced groundwater recharge and increased runoff; climate variability and change resulting in shifts in precipitation patterns, more frequent droughts, and unpredictable weather events, all of which impact water availability; inefficient water uses in agricultural practices, improper irrigation techniques and the cultivation of water-intensive crops, waste valuable water resources; insufficient investment in water infrastructure, technology, and education hinders the development of effective water management strategies and adaptation to changing conditions among others.

Impact of climate hazards such as soil erosion, prolonged droughts, emergence of invasive plant species and gulley's are more common in the Northern part of the county. Laikipia North and part of Laikipia East sub-counties are exposed to these hazards due to human activities. Drought is more pronounced in Laikipia North as this is a semi-arid area. Homes and farmlands near water sources are vulnerable to floods and flash floods. Extreme temperatures were experienced in all parts of the county with frost being documented in Laikipia West in 2023 causing destruction and loss of crops while pastoralists lost about 70% of their livestock in the same year.

Impact of climate change in the various sectors were identified and response actions prioritized. Adaptation strategies for the water sector include conservation and restoration of water catchment areas and wetlands, promotion of rain water harvesting, afforestation, improved drainage and Integrated water management sources and their catchment areas as well as investment in climate resilient water storage and reticulation infrastructure.

In the agriculture sector, identified strategies include promotion of climate smart agriculture, diversification of livelihoods, strengthening extension services, soil and water conservation and regulation of human activities in riparian areas. Other strategies include integrated pest and disease management to be achieved through establishing crop pest and disease surveillance, capacity building and promotion of insurances in the agriculture and livestock sectors.

Prioritized response strategies for environmental conservation include: afforestation and reforestation, protection of fragile ecosystems, awareness creation and capacity building and improved storm water management. County physical planning was proposed to be undertaken to guide settlements and land use for optimum returns on land resources. Storm water control and conservation infrastructure, household flood proofing, improved waterways and drainage infrastructure was proposed as measures to control floods.

Strategies proposed for addressing climate related disaster risks include: development of Early Warning Systems and enhancing dissemination of weather/climate information, strengthening disaster risk management planning and institutional framework, contingency planning and capacity building, strengthen response capacity, pest surveillance, strengthening extension services and resource mobilization as well as harmonization of all actors

The county will also adopt circular economy approach in solid waste management which is expected to create jobs for youth as well as develop policies to implement this development intervention.

1 CHAPTER 1

1.1 CONTEXT OF THE PARTICIPATORY CLIMATE RISK ASSESSMENT(PCRA)

1.2 BACKGROUND

Laikipia County covers 9,462 square kilometers. It is the 15th largest counties in Kenya in terms of land area. It borders Meru County to the east, Nyeri County to the southeast, Samburu County to the north, Isiolo County to the northeast, Baringo County to the west, and Nyandarua County as well as Nakuru County to the southwest. The topography of Laikipia County is characterized by an altitude range spanning from 1,500 meters above sea level around the Ewaso Nyiro basin and ascending to a peak of 2,611 meters above sea level near the Marmanet forest. The main drainage feature is Ewaso Nyiro North basin with its tributaries having their sources in the slopes of the Aberdares and Mt. Kenya. These tributaries include Nanyuki, Timau, Rongai, Burguret, Segera, Naromoru, Engare Narok, Moyok, Ewaso Narok, Pesi and Ngobit rivers. These rivers largely determine the settlement and livelihood systems in the County. In addition, 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 town.

The county experiences orographic rainfall due to its elevated location, with an annual average precipitation ranging between 400mm and 750mm. Elevated areas bordering the Aberdare Ranges and Mt. Kenya witness heightened precipitation. The distribution of rainfall is marked by short rains during October and November, while the extended rainy season occurs from March to May. Notably, regions around Mt. Kenya and the Aberdare Ranges exhibit distinct rainy seasons, primarily from June to August, influenced by trade winds. The temperature spectrum spans between 16°C and 26°C on average, with cooler conditions prevailing near Mt. Kenya and warmer temperatures in the northern lowlands. But with climate change, the county is experiencing high temperatures and frequent prolonged drought.

According to the 2019 Kenya Population and Housing Census (KPHC) by KNBS, Laikipia County had a total population of 518,560 persons comprising of 259,440 males, 259,102 females and 18 intersex. This population is projected to be 561,223 persons in 2023 and is expected to rise to 583,033 and 605,600 in 2025 and 2027 respectively

The county is cosmopolitan with about 32 commnities comprising of Maasai, Samburu, Rendile, Somali, Pokot, Kalenjin, Meru, Kikuyu, and Turkana among others. The county is largely rural in settlement and a member of the Central Region Economic Bloc (CEREB), Amaya Triangle Initiative and Frontier Counties Development Council. Despite the challenges presented by inconsistent weather conditions characterized by recurrent dry spells and erratic rainfall patterns, agriculture remains the cornerstone of Laikipia County's economy, contributing 75% of household incomes. The population engages in both commercial and subsistence, cultivating crops such as maize, beans, wheat, Irish potatoes, vegetables, and tomatoes. Livestock rearing and dairy is equally an integral part of Laikipia County’s economy. With only 20% of the county's land being arable, over half of the remaining land area is dedicated to livestock production. The main livestock types are cattle, goats, sheep and poultry.

An impressive 60% of the county's populace derives their sustenance from this sector. Crop farming and livestock rearing together provided employment to 141,383 individuals in 2012,

constituting 47% of the employed workforce. Efforts to diversify livelihoods are evident through the emergence of fish farming, which encompasses around 360,000 square meters of fish ponds. Nonetheless, challenges persist. The 2013 Agricultural Sector Development Support Programme. (ASDSP) study revealed that 80% of households faced food insecurity, with female and youth-headed households bearing the brunt. This situation drives a reliance on relief food.

Major tourist attractions in Laikipia include; wildlife, the unique Maa speaking cultural practices and the Thomson Falls with proximity to Mt. Kenya, Meru, Aberdares and Samburu game parks boosting tourism within the county. Most trading activities in the county are concentrated in urban centres of Nanyuki, Nyahururu, Rumuruti, Kinamba, Wiyumiririe, Lamuria, Doldol, Ol Jabet, Sipili and Naibor.

Laikipia is a water scarce county. The main source of water is the 14 water supply systems and borehole and this is hardly enough. In most cases the County Government has to provide water relief to communities, schools and health centers mainly in the north and parts of Laikipia East. Overdependence on rain fed agriculture leads to crop failure as adoption of water harvesting and storage is very low in the county. This puts pressure on the diminishing water resources. Water Resource Authority (WRA) advocates for sustainable water use from rivers. However, illegal abstraction of water for irrigation results in conflict among farmers. Inefficient use of water, poor management of water catchment areas and effects of climate change have dwindled water sources for the county. Women and girls walk long distances in search of water for domestic use while men are forced to migrate their cattle to Mount Kenya in search of pasture and water due to frequent drought.

The County has 6 gazetted forests covering 54,028 ha and 23 non gazette forests covering 100 ha. The forest cover percentage for the County is 6.71%, which is far below the agreed standard forest cover of 10% for the whole country. The county has suffered from wanton destruction of forest for fuel wood and timber for construction. Unregulated sand extraction in 2020/2021 stood at 350,392 metric tons and quarrying at 24,625 metric tons according to the Laikipia Statistical Abstract, 2022. This has further aggravated scarcity of water in the county.

Laikipia County is richly endowed with wildlife, widely distributed in most parts of the County extending to Aberdares Forest, Samburu, Meru, and Mt. Kenya wildlife corridors. Most of the wildlife is found in the large-scale private ranches, which occupy over 50 per cent of the total land area of the County. Most of the wildlife in Laikipia is outside protected areas. Consequently, human wildlife conflict is a constant reality for Laikipia. Crops raids by elephants, human deaths, destruction of water infrastructure and attack on livestock are common. Although electric fence has been erected, this does not cover the entire areas. The communities' agriculture and pastoralism livelihoods have been seriously affected by these occurrences, Crop raiding by wildlife, undermine food security and income generation in these communities who are already vulnerable to climate-related shocks.

1.3 POLICY CONTEXT

The analysis of the climate change legal and policy framework is informed by the global and regional climate change policy and legal framework context, the national climate change policy and legal framework and the county climate change policy and legal framework.

1.3.1 GLOBAL AND REGIONAL

1.3.1.1 Kyoto protocol

Adopted in 1997 and ratified by Kenya in 2005, under the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol has its party countries commit not to emit greenhouse gases over the assigned amounts. Commitments were made towards energy efficiency, renewable energy, protection of natural resources, and phasing out fiscal incentives to industries that are heavy emitters of greenhouse gases. Climate change affects various regions around the world differently, and areas like Laikipia County are particularly susceptible to the consequences of global warming due to their geographical and socioeconomic characteristics.

1.3.1.2 Paris agreement

The Paris Agreement provides a framework for action on climate change, setting the stage for each country, including Kenya, to respond appropriately to mitigate and adapt to its effects. For regions like Laikipia County, the agreement offers opportunities for financial support, technology transfer, and knowledge sharing to tackle climate change challenges effectively. However, the actual impact will depend on the extent of implementation and commitment from all stakeholders, including governments, businesses, and civil society. Adopted in 2016 and ratified by Kenya in the same year. During the 21st Conference of Parties (COP 21), parties to the UNFCCC reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future, with all nations committing to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. Kenya has put up ambitious policies and measures to pursue her low emission climate resilient development pathway to realize Vision 2030. The updated NDC builds on national policies, plans and legal frameworks, which include Climate Change Act, 2016, National Climate Change Action Plan (NCCAP I) 2013-2017, National Climate Change Action Plan (NCCAP II) 2018-2022, Climate Finance Policy among other instruments

1.3.1.3 Sustainable development goals (SDGs)

The Sustainable Development Goals aim to protect the environment while solving key problems like poverty and hunger and creating a world of wealth. This has never been more crucial than it is right now, with the climate crisis. The SDGs define global sustainable development priorities and aspirations for 2030 and seek to mobilize global efforts around a common set of seventeen goals and targets. SDG 13 specifically addresses climate action with the targets including to:

a) Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
b) Integrate climate change measures into national policies, strategies and planning

c) Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
d) Implement the commitment undertaken by developed-country parties to the United NFCCC to a goal of mobilizing jointly $100 billion annually by 2020 to address the needs of developing countries for mitigation actions and on operationalization of the Green Climate Fund.
e) Promote mechanisms for raising capacity for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities

Other SDGs that if met will assist in dealing with climate change include: -
SDG 5, 10 – Gender equality, and reduced inequalities respectively.
SDG 6 - Clean Water and Sanitation so as to help communities become more resilient in the face of climate change related water scarcity due to prolonged drought and high temperatures.

1.3.1.4 Agenda 2063: the Africa we want

This is Africa's blueprint and master plan for transforming Africa towards inclusive and sustainable development. The plan seeks to create climate resilient communities and economies by prioritizing climate adaptation and mitigation in all its actions for the survival of the most vulnerable populations, and for sustainable development and shared prosperity. The plan outlines specific actions to be undertaken under climate action;

- Promoting sustainable agriculture and land-use practices to enhance climate resilience
- Investing in climate-smart technologies and renewable energy sources
- Enhancing water management and conservation efforts
- Strengthening climate change adaptation and disaster risk reduction strategies
- Building capacity and knowledge-sharing to empower communities in climate resilience

Agenda 2063 identifies key flagship programmes across to boost Africa's economic growth and development and lead to the rapid transformation of the continent.

1.3.1.5 East African Community Climate Change Policy, 2010

This policy guides partner states and other stakeholders on the preparation and implementation of collective measures to address Climate Change in the region, while ensuring sustainable social and economic development. The Policy prescribes statements and actions to guide Climate Change adaptation and mitigation to reduce the vulnerability of the region and enhance adaptive capacity and build socioeconomic resilience of vulnerable populations and ecosystems. To actualize this, the East African Community Climate Change Strategy, 2011-2016 was developed.

1.3.1.6 The National Climate Change Policy and Legal Framework

At the national level, the climate change policy and legal framework consists of policies, laws, strategies and plans as discussed in the following sections.

1.3.1.7 Constitution of Kenya, 2010

This provides for the establishment of subsidiary legislations for environmental conservation especially under article 42 which provides for guaranteed right to a clean and healthy environment and requires the environment to be protected for current and future generations

1.3.1.8 National Climate Change Act 2016

The main objective of the Act is to govern the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya. The act provides for mainstreaming of climate change responses into development planning, decision making and implementation; building resilience and enhancing adaptive capacity to the impacts of climate change among other objectives.

1.3.1.9 National Climate Change Framework Policy 2016

This Policy was developed to facilitate a coordinated, coherent and effective response to the local, national and global challenges and opportunities presented by climate change. An overarching mainstreaming approach has been adopted to ensure the integration of climate change considerations into development planning, budgeting and implementation in all sectors and at all levels of government. This Policy therefore aims to enhance adaptive capacity and build resilience to climate variability and change, while promoting a low carbon development path-way. As a policy statement on enhancing climate resilience and adaptive capacity, the Government commits to ensure integration of climate change risk and vulnerability assessment in environmental impact assessments and strategic environmental assessments. The policy further compels the Government to promote public and stakeholder consultation and participation, including with vulnerable groups, to enhance adaptive capacity and climate resilience.

1.3.1.10 The Nationally Determined Contributions

The NDCs are commitments made by countries who are parties to the Paris Agreement to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each party to prepare, communicate and maintain successive NDCs that it intends to achieve.

1.3.1.11 Bottom-up Economic Transformation Agenda

The Laikipia County Action Plan 2023-2027 is anchored and aligned to the Bottom-Up Economic Transformation Agenda (BeTA) which outlines the government priority focus areas for development. The Bottom-Up Economic Transformation Agenda is geared towards economic turnaround and inclusive growth, the agenda aims at increasing investments in the five sectors that form the core pillars. BeTA aims at mainstreaming environment conservation, climate change mitigation and adaptation, halt and reversal of deforestation, biodiversity loss and land degradation in all government programmes.

1.3.1.12 Climate Risk Management Framework (2017)

The Climate Risk Management Framework for Kenya integrates disaster risk reduction, climate change adaptation, and sustainable development, so that they are pursued as mutually supportive rather than stand-alone goals. It promotes an integrated climate risk management approach as a central part of policy and planning at National and County level.

1.3.2 Laikipia County Climate Change Policies and Legal Framework.

1.3.2.1 Laikipia County Integrated Development Plan (2023 - 2027)

The County Government of Laikipia has mainstreamed climate change in its CIDP. It addresses the impacts of climate change through its planned development activities. In the CIDP, Laikipia County has prioritized mitigation and adaptation programs (set to build climate resilience of the communities through cross -sectoral strategies. Carrying out the Laikipia climate change risk and vulnerability assessment will contribute to the realization of the CIPD's objectives of tackling climate change and inform the mainstreaming of climate actions.

1.3.2.2 Laikipia County Climate Change Act 2021

The Act establishes the structure and processes for county government, communities, and other stakeholders to be mobilized and facilitated to respond to climate change effectively through suitable adaptation and mitigation policies and actions for relevant goals.

1.3.2.3 Laikipia County Climate Change Fund Regulation 2023

This is aimed at guiding the implementation of the provisions in the Climate Change Act including but not limited to defining the procedures for management, operations, and winding up of the Fund, and for planning of climate change response interventions to be funded by the Fund.

1.3.2.4 Laikipia County Climate Change Policy2021

The policy outlines various strategies and policy statements that provide direction on mainstreaming climate change into the county CIDP, Plans, Programs and Projects. It sets out clear direction in ensuring that the County departments are responsible in mainstreaming and implementing climate related projects to ensure adaptation and mitigation. It proposes community resilient measures to be adopted.

1.3.2.5 Laikipia County Disaster Management Policy ,2020

This policy aims to address various natural and human-made disasters, including but not limited to droughts, floods, landslides, disease outbreaks, and industrial accidents. These policies typically outline strategies for disaster preparedness, response, recovery, and mitigation. In addition, the **Laikipia County Environmental Management Plan, 2021** outlines strategies and measures for managing and protecting the environment in the County. The plan is designated to promote sustainable development, biodiversity conservation and the responsible use of natural resources while mitigating potential negative impacts on the environment.

1.3.2.6 The Laikipia County Public Participation Act, 2014

This Act governs the involvement of the public in decision-making processes related to government policies, programs and projects. This act is designed to promote transparency, inclusivity, and accountability in governance by allowing citizens to participate in shaping decisions that affect their communities and the environment.

1.4 PURPOSE OF THE PCRA

Involves communities in assessing climate risks and vulnerabilities to foster informed decision-making and action planning. By engaging communities, it ensures that local knowledge, needs, and perspectives are taken into account, leading to more effective and context-specific adaptation measures including informing the preparation of the County Climate Change Action Plan. In addition, the risk assessment also integrates the learnings from counties' experiences implementing the County Climate Change Fund (CCCF) mechanism and participatory budgeting approaches and aligns with counties' climate change acts and regulations. These principles, learnings and legislation inform the different phases, steps and activities of the PCRA and action planning processes. The assessment and action planning are underpinned by the eight principles for locally-led adaptation as follows:

- Devolving decision making to the lowest appropriate level
- Addressing structural inequalities faced by women, youth, children, disabled and displaced people, Indigenous Peoples and marginalized ethnic groups.
- Investing in local capabilities to leave an institutional legacy.
- Building a robust understanding of climate risk and uncertainty.
- Collaborative action and investment.
- Ensuring transparency and accountability.
- Flexible programming and learning.
- Providing patient and predictable funding that can be accessed more easily

1.5 THE LAIKIPIA COUNTY PCRA PROCESS

The PCRA was implemented using 8 key steps, as outlined in the PCRA guidelines. Formation of the technical working group, technical working group training, mapping of stakeholders, preparation for community engagements, participatory risk assessment at the ward level, creation of ward level risk assessment reports, data analysis, preparation for the county level multi-stakeholder workshop, multi-stakeholder climate change risk assessment workshop, and writing of the final report as described below:

1.5.1 Step 1: Establishment of the Technical Working Group

The member of the County Executive Committee in charge of climate change appointed the technical working group in April 2023 with the aim of building a robust understanding of climate risk and uncertainty The National Drought Management Authority (NDMA), Kenya Meteorological Department (KMD), trade and cooperatives, Geographical Information Systems (GIS), civic education, and social services were among the sectors that were taken into account for appointment to the technical working group. The committee was made up of technical officers from the aforementioned sectors so as to convene collaborative action and investment across the various county departments.

1.5.2 Step 2: Training of the Technical Working Group

The PCRA process was taught to the Technical Working Group over the course of two days. The training covered understanding the process, its importance in the planning and implementation of development projects, and how to carry out each step of the PCRA process according to the guidelines provided in the PCRA guidance templates for the FLLoCA

program. During the course, the significance of the PCRA document was also highlighted. The CCU oversaw the organization of the training.

1.5.3 Step 3: Stakeholder Identification and Analysis

The key objective of carrying out this step was to identify and involve key stakeholders at different levels in the Participatory Climate Risk Assessment (PCRA) process while addressing structural inequalities faced by women, youth, children, disabled and displaced people, Indigenous Peoples and marginalized ethnic groups The Technical Working Group mapped and analyzed stakeholders, ensuring representation of marginalized and vulnerable groups. Stakeholders included various organizations, institutions, community groups, and statistical data providers. The TWG developed a stakeholder engagement strategy, adhering to public participation guidelines, and communicated with stakeholders using various methods like letters, emails advertisements, social media, and SMS. Responses were expected within seven working days.

Table 1 Stakeholder analysis matrix

High Influence, Low Interest ▪ Ministry of Interior – (Chief/Asst. Chief). ▪ State Department of Youth and Gender ▪ KNCCI ▪ NEMA ▪ Research and Academic Institutions e.g., Dedan Kimathi University of Technology, Karatina University ▪ Community Forest Association (CFA)/ Forester ▪ Social Officers (National Level/County Level) ▪ FBOs (NCCK, SUPKEM) ▪ Commercial Banks (KCB) ▪ Media	*High Influence, High Interest* ▪ Department of Agriculture (crop/ livestock/fisheries/veterinary) ▪ Water Service Provider's /CBOs/NGOs/CSOs ▪ Department of health ▪ Research institution's ▪ Kenya Forest Service ▪ Kenya Meteorological Department ▪ National Drought Management Authority ▪ Rumuruti Municipal Board ▪ Member of County Assembly (MCA)Representative
Low influence, Low Interest	Low Influence, High Interest ▪ Farmer Groups ▪ WCCPC ▪ Business community ▪ GBV champions ▪ Environment officers ▪ Sub County Water Officers

1.5.4 Step 4: Preparation for ward level engagements

The Technical Working Group and the Climate Change Unit conducted education sessions for sub-county technical teams on participatory ward-level climate change risk assessment. Stakeholders were identified through ward mapping, including representatives from WCCPC,

PWD, farmers' groups, cooperatives, CFA, women, youth, and relevant technical officers. Prior to community engagements, programs, tools, and materials were prepared, including community leading questions and feedback forms. Sub-county and ward officers were trained, and the process was facilitated by officers with expertise in various fields.

1.5.5 Step 5: Engagement of Communities at Ward Level on PCRA

During the ward-level engagement forums, 25-35 community representatives participated in the interest of devolving decision making to the lowest appropriate level. The first session was a joint introduction covering the significance of the PCRA process, climate change trends, and its application in county planning. Participants were then split into their respective wards with technical team members and rapporteurs assigned. Climate hazard and resource mapping were conducted, followed by administering climate change risk assessment tools. Investing in local capabilities to leave an institutional legacy, the community identified key risks, prioritized responses, and proposed adaptation strategies.

1.5.6 Step 6: Data Analysis

In Laikipia County, after collecting information at the ward level, the technical working group analyzed data to identify common hazards, historical and current climate patterns, and key climate risks. The analysis involved synthesizing qualitative information from stakeholder engagements at all levels. This process helped understand specific climate-related vulnerabilities across the county, including impacts on sectors like agriculture, health, water resources, and livelihoods. It also assessed existing climate change adaptation measures and their effectiveness in mitigating climate risks. This step offered flexible programming and learning opportunities in relation to climate action planning.

1.5.7 Step 7: Multi Stakeholder workshop

A multi stakeholder workshop was held at the county level. The main goal of the workshop was to ensure transparency and accountability in planning by bringing together representatives from different stakeholder groups, including government officials, community-based organizations (CBOs), community members, NGOs, faith-based organizations (FBOs), civil society organizations (CSOs), and business people. The workshop served as a platform for sharing the findings of the ward engagements and fostering dialogue among stakeholders. It allowed for the application of existing knowledge to enrich the communities' engagement in identification of key hazards and risks, potential adaptation measures, and the prioritization of adaptation options. Through focus group discussions, the workshop also helped in building consensus among stakeholders regarding the most appropriate and effective adaptation strategies in Laikipia County.

1.5.8 Step 8: Drafting of Participatory Climate Change Risk Assessment

The creation of this collaborative climate risk assessment report was the last phase. A PCRA report was created using input from all stakeholders and secondary data. The study listed the identified climate hazards, their possible effects, suggested coping mechanisms, and prioritized areas.

2 CHAPTER TWO:

2.1 CURRENT AND HISTORICAL CLIMATE HAZARDS AND TRENDS

The historical and current trends in climate hazards have been analyzed and compared in this chapter. Data and scientific information gathered during community participation activities have been analyzed.

2.1.1 Historical climate hazards trends

Rainfall time series (1981 to 2018) and temperature time series (1981 to 2018) reconstructed from KMD station observations, remote sensing and other proxies were analyzed and plotted. The Monthly Rainfall Climatology shows mean monthly rainfall for the county. The county experiences bimodal rainfall pattern with peaks from March to May and October to December figure 1.The other months experiences dry and hot climate but a cold period is experienced from June to August. The highest rainfall is experienced in the month of April (being the peak of MAM season) and November (being the peak of OND season) while the lowest monthly rainfall is experienced in the month of February. The county receives the highest monthly rainfall of about 200 mm in April while the lowest monthly rainfall is about 40 mm in February. This has been illustrated in the figures below.

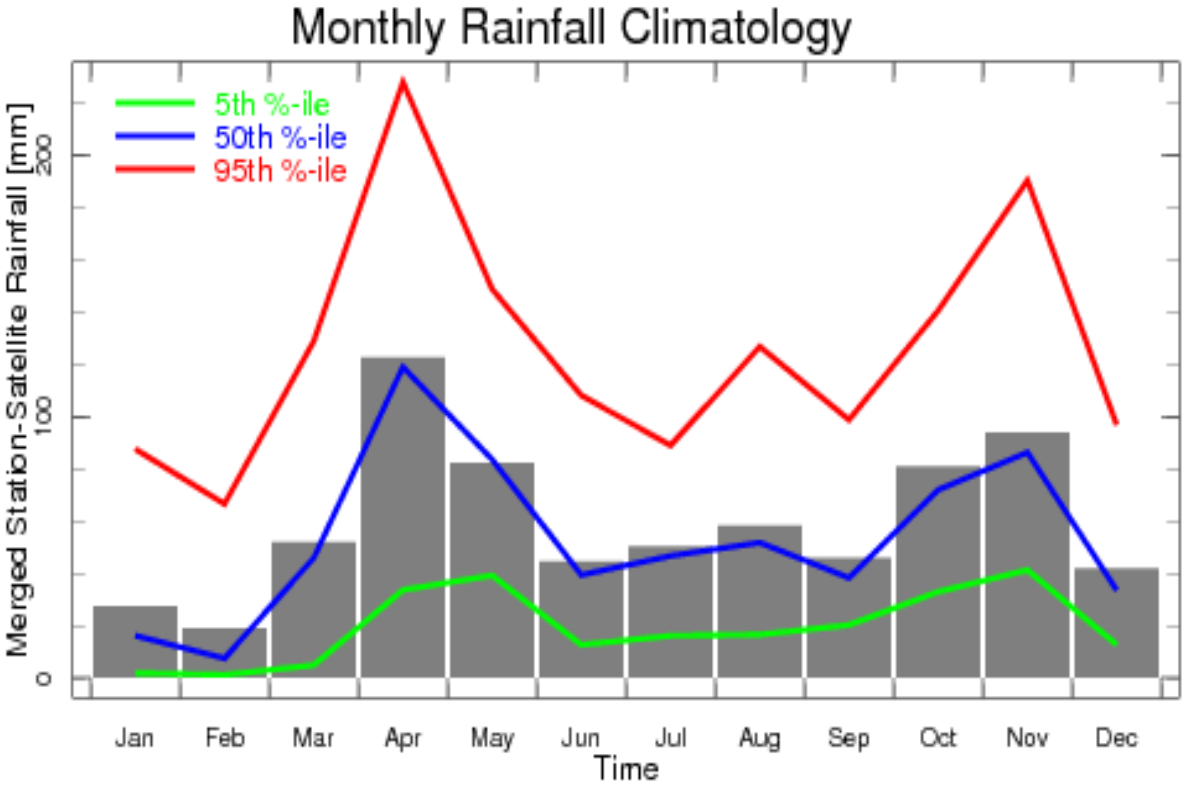


Figure 0-1 Monthly rainfall climatology 1983-2018

The yearly Seasonal Rainfall Anomaly in figure 2 shows a uniform departure from the mean in the negative direction. However, there was a sudden positive departure in 1997 when the El Nino occurred which was experienced nationally and beyond.

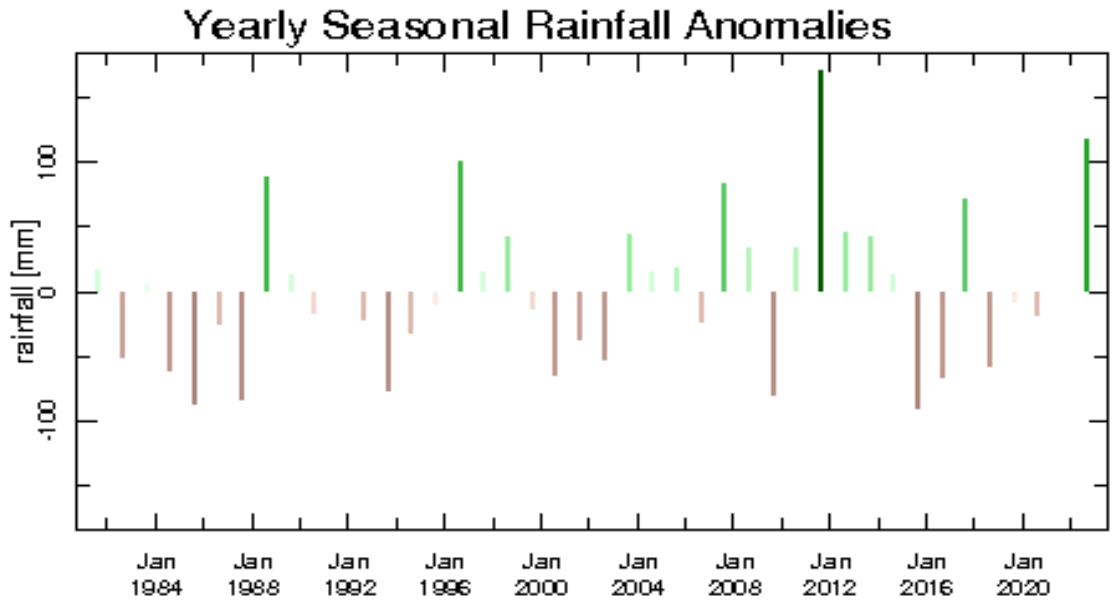


Figure 0-2 Yearly seasonal rainfall anomalies Jan-Jan

The highest Maximum Temperature is normally observed in the month of February while the lowest maximum temperature is normally observed in the month of July. The maximum temperature ranges from 15oc to 24oc annually. The yearly Seasonal Maximum Temperature Anomaly shows a varying departure from the mean yearly by +/-2oc. This as been described in the figure below (3 and 4)

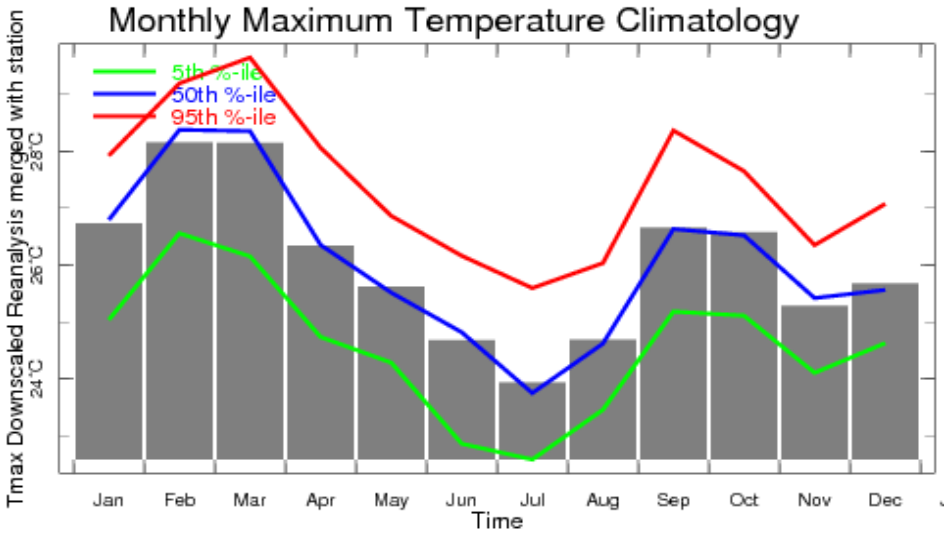


Figure 0-3Monthly maximum temperature climatology 1981-2010

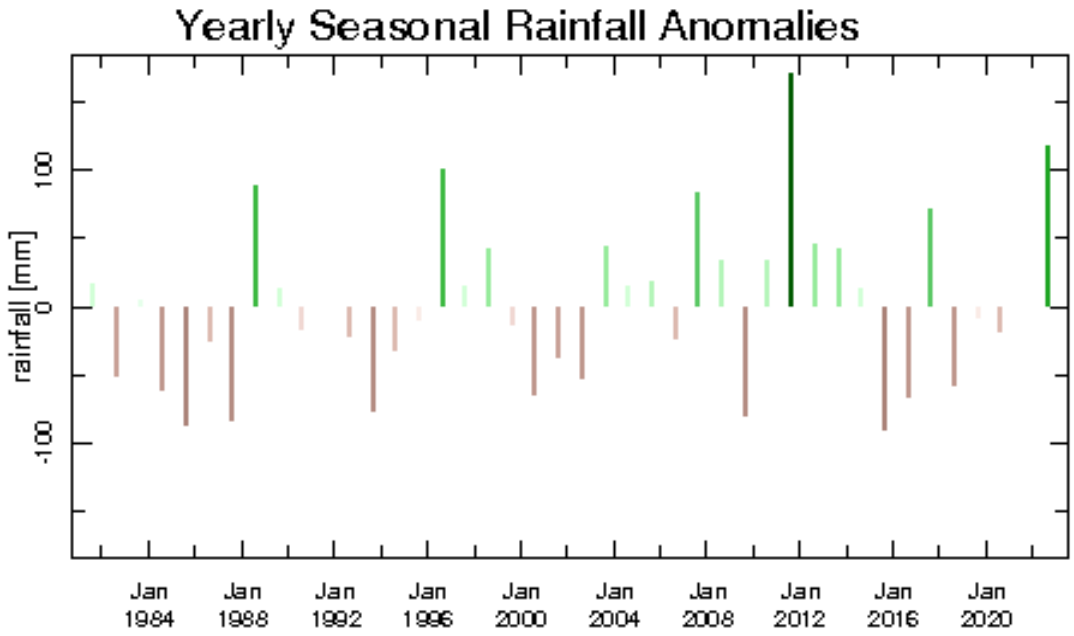


Figure 0-4 yearly seasonal maximum temperature anomalies Jan -Jan

The highest Minimum Temperature is normally observed in the month of May while the lowest minimum temperature is normally observed in the month of July. The minimum temperature ranges from 9oc to 11oc annually. The yearly Seasonal Minimum Temperature Anomaly shows(figure 5 and 6) a varying departure from the mean yearly by +/-2oc.

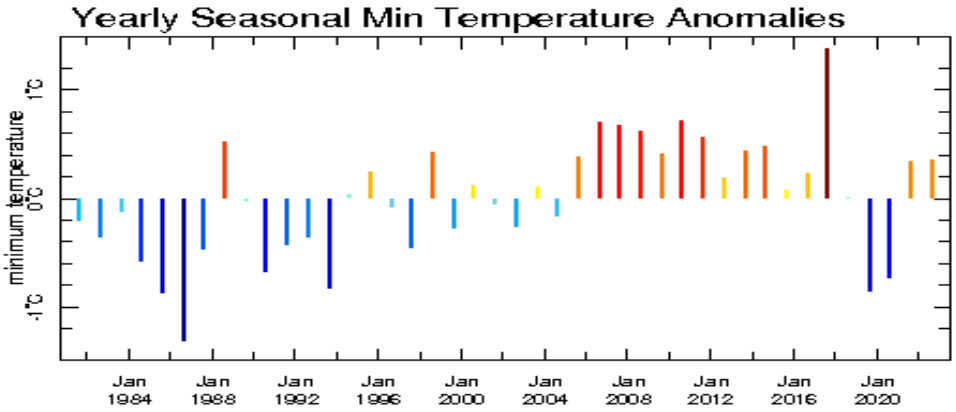


Table 2 yearly seasonal min temperature anomalies Jan -Jan

The Annual Rainfall trend shows an increasing trend in the annual rainfall from 1981 to 2020. The highest

Annual rainfall attained during the period was in 2002 of about 1500 mm. The rainfall was associated with the El Nino phenomenon while the lowest Annual rainfall attained was in 2008/2009 of about 200 mm. Figure 7 and 8 shows varying departure from the mean of the annual rainfall within the county. The highest departure was observed in 2000 in the positive direction and in 2008/2009 in the negative direction. The probability of exceedance shows that the highest rainfall attained within the county is about 1400 mm.

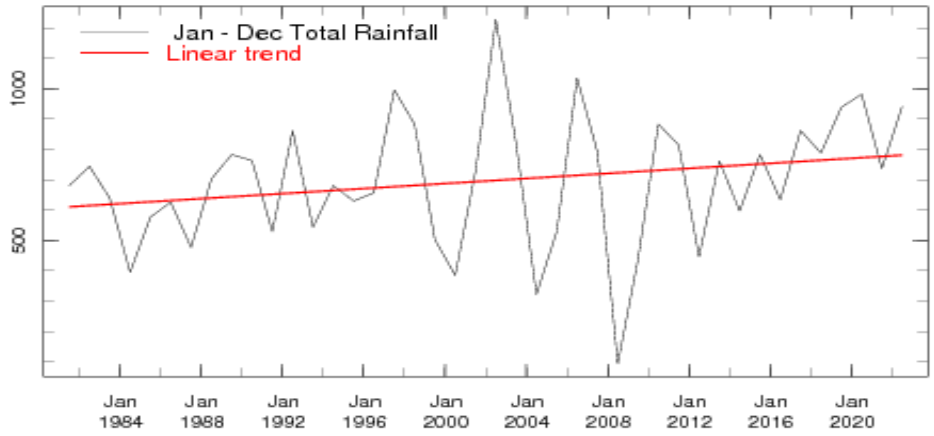


Figure 0-5 Rainfall trends Jan-Dec

The MAM Seasonal Rainfall trend shows an increasing trend in the MAM seasonal rainfall from 1981 to 2018. The highest MAM seasonal rainfall of about 400mm was received in 2020 while the lowest MAM seasonal rainfall of about 200mm was received in 1984.

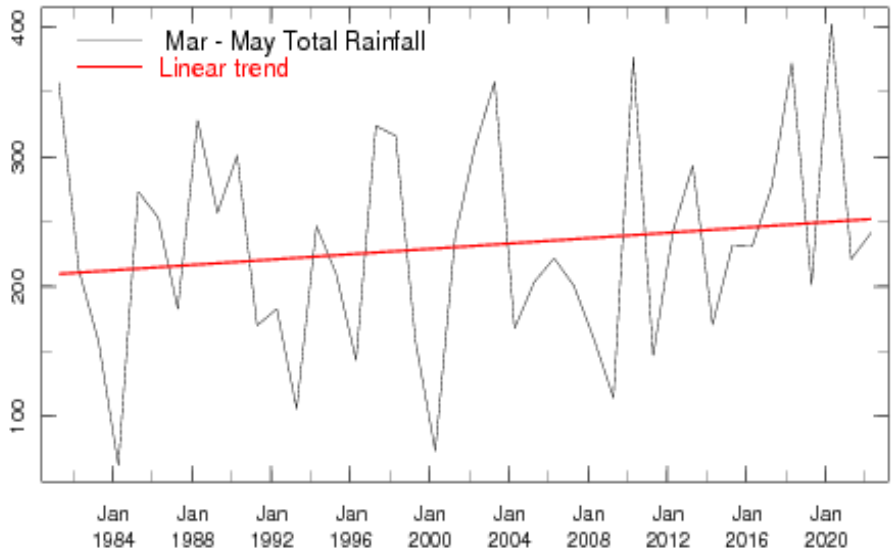


Figure 0-6 MAM trends from 1984-2016

There has been a varying departure from the mean of the MAM seasonal rainfall within the county. The highest departure was observed in 2018 in the positive direction and in 1984 in the negative direction. The probability of exceedance shows that the highest rainfall attained within the county in MAM season was about 400 mm.

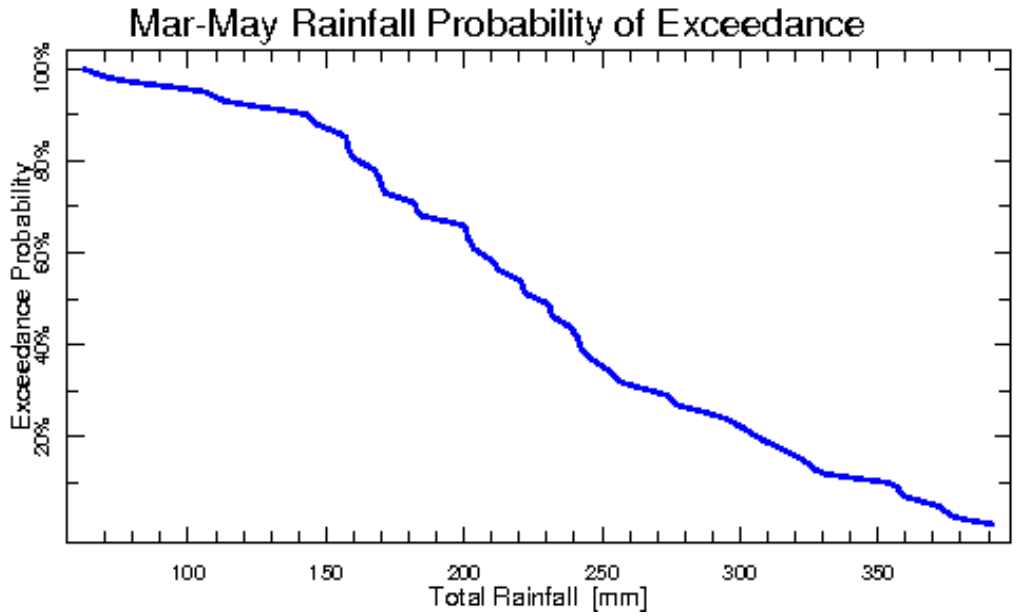


Figure 0-7 March -May rainfall probability of exceedance

There has been a varying departure from the mean of the OND seasonal rainfall within the county. The highest departure was observed in 2020 in the positive direction and in 1997 in the negative direction. The probability of exceedance shows that the highest rainfall attained within the county in OND season was about 450 mm.

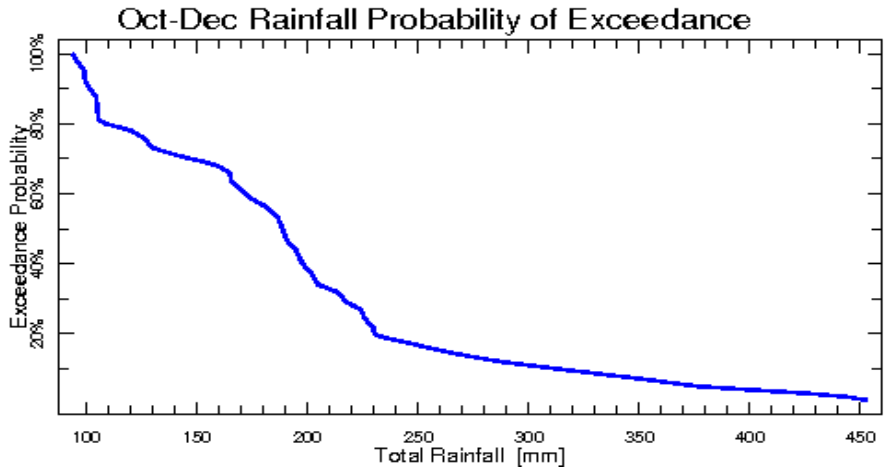


Figure 0-8 OND trends, rainfall anomalies and probability of exceedance

From the graphic presentations, rainfall has been increasing since 1964 to 2018.There have been instances of very high rainfall and low rainfalls which resulted in floods and droughts. The two hazards were identified during the community and multi stakeholders' engagement as a common past hazard whose impact affects al- most all sectors of sustainable development. The continuous decrease in rainfall amounts is projected regress in the future thus recurrence of the stated hazards.

2.1.2 Current Climate Hazards

Severe droughts occur approximately every ten years, and moderate droughts or floods every three to four years. As reported during the ward engagements, the community identified drought as the major current hazard. Repeating patterns of floods and droughts in the county have had large socioeconomic impacts and high economic costs. Crops and livestock loss were identified by the community as the major impacts of drought. From 1983 to 2023 drought appears to be increasing in frequency. All wards in Laikipia county are disaster prone areas and have required significant disaster risk investment. Vulnerability from these hazards poses major challenges for economic stability and fiscal sustainability and have had adverse social and fiscal con- sequences. Indeed, lower-income populations reside in more hazard prone locations, with high potential for significantly increased exposure of already vulnerable populations.

Communities also identified land degradation and invasive plant species as an emerging climate hazard that has affected most parts of Laikipia. Most of the flood prone areas are near major rivers such as Nanyuki and Ewaso Narok.During the community engagements several hazards were identified aligned to different current and historic timelines as tabulated below.

Timeline	*Hazards /Risks*	*Specific Areas*
1983-1992	1984 Drought	All wards
	Pest & diseases eg army worm & locusts	
1993-2002	Flooding (El nino)	All wards
	Drought (la nina)	
	Soil erosion	
	Pest & diseases	
	Human wildlife conflict	Mainly in North and part of Laikipia West
	Invasive plant species	Mainly in North and part of Laikipia East
2003-2012	Drought (2009 and 2011)	All wards
	Loss of biodiversity eg ants	
	Partial flooding	
	Forest fires	
	Invasive plant species	Mainly in North and part of Laikipia East
	Human wildlife conflict	Mainly in North and part of Laikipia West
2013-2023	Pest infestation 2020(Desert locust) 2022(Army worm)	All wards
	Extreme temperatures	
	Ecological imbalances	
	Drought frequencies intensified	

	Invasive plant species	Mainly in North and part of Laikipia East
	Human wildlife conflict	Mainly in North and part of Laikipia West

Table 3 Table 1 Summary of current and Historic hazards/Risks experienced as reported during community engagement

2.2 EXPOSURE AND VULNERABILITY PROFILES OF THE COUNTY

2.2.1 Vulnerability Indicators

To aid in planning and decision making the following vulnerabilities indicators are used to identify how prone a community or an individual is to climate change impacts; -Poverty statistics, Food security/ Food aid and geographical location

2.2.1.1 Poverty statistics

The poverty rate in the county is 47.9% while absolute poverty is 3%. (KNBS 201). The higher the poverty index the higher the vulnerability of a community or a household. During the community engagement com- munities identified poor households and one of the vulnerable groups. Most of the poor households in Laikipia County are located in the urban slums and the few rural slums in the county like TwoTwo in Segera Ward.

2.2.1.2 Food security/ Recipients of food aid

In recent years, increased drought occurrence has led to decreased physical availability of food and forage in the county. Climate hazards and risks have led to reduced income especially to those who heavily rely on agriculture as the main source of income. Consequently, this leads to reduced economic access to food and forage. To cope with food security, most communities highlighted a change in feeding habits and reduction of meal times.

The community vulnerability is also exacerbated by elephant raids that destroy crops, while other carnivorous animals attack livestock. Human wild life conflict in Laikipia North and parts of Laikipia West has undermined food security and income generation in communities already vulnerable to climate-related shocks.

Food poverty index for the county is 15.5%. In recent years (2011 to date) frequent drought has hit some parts of the county. In the first half of the financial year 2022/2023, approximately 27.2% people received food aid.

2.2.1.3 Geographical location

Laikipia County has different agroecological zones hence different climatic conditions. In recent years there has been a change in weather patterns hence change in climate hazards affecting the different agroecological zones. Some parts of Laikipia North have been facing acute drought than other areas in the county. Also, communities living along conservancies and forests have been experiencing human wildlife conflict in recent years. This is a clear indicator that communities are prone to different climate hazards depending on their geo- graphical location as shown in Table 8

Zone	**Description**	**Constituency/ Wards**	**Dominant Enterprises**

UH 2-3 (Upper Highland-SubHumid)	Rainfall is over 1000mm/year. Temperature ranges from19C to 25C.Soils are well drained, fertile with a lot of humic materials. Altitude is over 2100m ASL	**Laikipia West:-** Igwamiti, Githiga	Dairy,Beans, Maize, Wheat, Irish potato, fish farming.
Low Highlands LH 1-5	Rainfall ranges from 700C to 1000mm/year and erratic.Soils are moderatelly well drained with with less humic materials.Temperatures ranges from 15C to 25C. Altitude is between 1500-2100 M ASL	**Laikipia East:-** Ngobit,Umande, Nanyuki, Thingithu. **Laikipia West**:- Igwamiti, Marmanet,Githiga	Maize, Wheat, Dairy, Beans,Fish farming, Sunflower, Barley
UM5 - UM6 (Upper MidlandsZones)	Rainfall ranges from 500mm to 700mm/yea and erratic. Soils are not well drained with less humic materials. Temperature ranges from 15C to 28C. High evaporation	**Laikipia East:-** Segera, Nanyuki, Tigithi **Laikipia West:-** Rumuruti, Salama **Laikipia North:-** Mukogodo East	Beef farming, Sorghum, Hay, Millet
LM3 - LM5 (Lower Midlands)	Rainfall ranges from 400mm to 500mm /year.Temperature ranges from 15C to over 28C.Soils are shallow and poor in fertility.High evaporation.Altitude is around 1500m m ASL.High evaporation	**Laikipia North:-** Mukogodo West, Mukogodo East, Segera, Sosian	Ranching, Beef farming and Sisal

Source: Department of Agriculture, County Government of Laikipia

Table 4 Agro ecological zones in the county :

2.3 Food security/Nutrition status

Child undernutrition in Laikipia County remains a public health challenge with current statistics placing stunting at 15.1%, wasting at 2.4 % and underweight at 2.1% (KHIS, 2021/2022). This is well reflected in the sub- optimal growth of undernourished children. Undernutrition has both short- and long-term ramifications for the health of children, and adversely affects their educational performance and cognitive abilities. In adulthood, it leads to poor economic productivity (NCNAP - Laikipia County Nutrition Action Plan, 2020). Further, KHIS data shows that 1617 children between 0 - 5 years were severely underweight, 936 were severely stunted and 968 had malnutrition. The trend will worsen with increased frequency, severity, and duration of extreme climatic events such as droughts.

2.4 Non-Communicable Diseases

The rapid rise in incidences of Non-Communicable Diseases (NCDs) in Laikipia County presents a growing burden with an enormous social-economic impact at the household level. Close to half of

deaths in the county are caused by NCDs, and about 700 new cancer cases are reported annually (MoH, 2020). For the year 2021/2022, hypertension case stood at 16,466, while diabetes was 10.477. Cardiac Related Complications were the second leading cause of mortality after pneumonia. Cancer came at position 4, as Diabetes Mellitus and Hypertension occupied positions 8 and 9 respectively.

Climate-driven changes will upset agricultural systems and lead to diminished crop yields, reduced food avail- ability, and altered nutritional content of food. These changes will contribute to malnutrition and raise risk factors for NCDs.

2.5 Social Vulnerability

Social Vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss in the event of a climate change hazard occurring. The main focus was laid on culturally disadvantaged groups in the population. The communities identified women, children, poor households and Persons Living with Disabilities.

2.5.1 Women

Women reported that climate change has increased their workload because of frequent drought and its impact of food security. Women and girls are responsible for securing water, food, and fuel, and consequently, they are having to travel longer distances in search of water and fuel and in search of casual labour so as to feed their families.

Women in Laikipia are more vulnerable to hazards and risks of climate change because they depend more on, yet have less access to, natural resources. Most of the women in Laikipia County have limited rights to land ownership and control, hence they cannot utilize the land or the proceeds of the 'land' for their own benefit. This makes it difficult to adopt strategies that help them adapt to climate change impacts. Agriculture is the most important employment sector for women in low- and lower-middle income in Laikipia County. Most women in Laikipia County are casual laborers in farms, especially coffee and tea farms. During periods of drought and erratic rainfall, women, as agricultural workers, work harder to secure income and resources for their families. In many parts of the county, women bear a disproportionate responsibility for securing food, water, livestock forage and fuel. During the drought periods women suffer a lot in search of water, food, forage and jobs especially those working on farms.

2.5.2 Youth

Article 260 of Kenya's Constitution defines a Youth as a person aged between eighteen (18) years and thir- ty-four (34) years. Youth comprises 31.16% of the total population in the county as per the 2019 census. Being the majority in the county they are vulnerable to climate change impacts. Most of the youth face unemployment as the biggest challenge, hence limited resources to adjust to climate change risks and hazards.

2.5.3 Children

Children are more predisposed to climate change risks and hazards because they need more food and water per unit of their body weight, are less able to survive extreme weather events, and are more

susceptible to temperature changes and diseases. In the event of a drought, many children in the county suffer from mal- nutrition, child abuse, early pregnancies and marriages, and mental illnesses, among others. Varying rainfall patterns and protracted droughts due to climate changes will result in water scarcity. Access to clean water will become a challenge. These conditions will compound incidences of water-washed diseases such as skin, eye and helminth infections leading to poor learning outcomes. Flooding, poor waste management and other climate-driven effects contribute to the rise in vector-borne diseases such as malaria.

2.5.4 Elderly or aged persons

Our bodies capacity to counteract the impacts of some environmental stresses decreases with age. According to the 2019 census persons aged 60 years and above form 10.8% of the total population in the county with a projection of 11.9%. Most of the elderly people in the county are more vulnerable to climate risks and hazards.

The elderly population face complex medical conditions impacting physical, sensory, and cognitive abilities to care for oneself and respond to climate disasters. This makes them not to effectively adjust to climate change impacts unlike the other population. Most of them Depend on caregivers and intact medical delivery systems, which can be fragmented during climate disasters. In recent past climate change, rural urban migration has left most of them with no one to look after them. Also, cognitive impairments ranging from minimal to severe de- mentias impairing the ability to assess risks, plan responses, and execute protective behaviors hence difficulty in adapting to climate change impacts.

2.5.5 Poor Households

Most of the poor income earners in rural areas count on natural resources such as forests, rivers, land among others for their livelihoods. When climate change affects these resources, there's overexploitation of these nat- ural resources. In recent years there has been an increase in deforestation in county forests and farmlands as a result of increased drought, hence alternative sources of livelihood. Also, most of the poor households in the county depend on river sources for both domestic water and subsistence irrigation farming. Most of these wa- ter sources have dried up hence greatly affecting them. Most of these poor households depend on agriculture as their main source of livelihood and it's hard for them to adopt climate change smart agriculture technologies to build their climate resilience. In the event of climate change impacts occurring, the poor household face difficulties in adjusting due to the limited resources.

2.5.6 Persons Living with Disability

People with disabilities are more likely to have social and economic risk factors, such as poverty and unemployment, that put them at greater risk to climate change impacts. During the community engagements most of them reported that the decision makers have not fully considered them during planning in the county programs and projects hence they feel neglected. This has limited their access to donations, education and awareness, health care, social amenities and natural resources. Whereas women and youth can travel in search of basic needs like water and food, persons living with disability have a bigger challenge. They are disproportionately affected by climate change and its associated disasters due to limited access to transportation, shelters, and emergency services. Most of them may also face challenges in adapting to climate change due to limited resources.

DIFFERENTIATED IMPACTS OF CLIMATE TRENDS AND RISKS.

2.6 SECTOR IMPACTS

2.6.1 CROP PRODUCTION

Climate change has severe effects on agriculturally based livelihoods in Laikipia. Erratic rainfall leads to reduced production for major crops, negatively impacting food and nutrition security. Extreme temperatures, water scarcity, droughts, floods, pests, and diseases decrease subsistence and cash crop production, affecting the main economic activity in the county. Small-scale farms, particularly relied upon by rural residents, women, and the elderly, suffer the most, with low yields due to rainfed production and inadequate infrastructure. Irrigation-fed agriculture is challenged by reduced water sources. The situation necessitates intervention measures to combat frequent drought conditions and prevent the need for expensive and unsustainable famine relief.

	2017			**2018**			**2019**			**2020***		
Crop	**Area (Ha)**	**Quantity (Ton)**	**Value (KSh '000)**	**Area (Ha)**	**Quantity (Ton)**	**Value (KSh '000)**	**Area (Ha)**	**Quantity (Ton)**	**Value (KSh '000)**	**Area (Ha)**	**Quantity (Ton)**	**Value (KSh '000)**
Fruits												
Pineapples	24	552	22,080	27	621	37,260	29	652	37,546	32	736	44,160
Avocado	39	429	34,320	47	517	41,360	54	537	41,724	122	1,342	107,360
Pawpaw	22	264	13,200	28	336	16,800	29	347	16,928	30	359	17,950
Banana	27	675	27,000	34	850	34,000	34	864	34,620	51	1,275	51,000
Macadamia nuts	12	36	5,400	12	36	5,400	12	42	5,447	13	39	5,850
Oranges	37	740	29,600	38	760	30,400	39	774	30,870	43	860	34,400
Lemons	13	195	5,850	13	195	5,850	15	208	5,946	17	255	7,650
Mango	37	555	27,750	48	720	36,000	52	741	36,374	92	1,380	69,000
Passion fruit	33	495	29,700	34	510	30,600	37	532	30,705	55	825	49,500
Tree Tomato	39	585	35,100	47	705	42,300	56	804	42,960	72	1,080	64,800
Water Melons	22	550	19,250	24	600	21,000	23	612	21,526	30	750	26,250
Straw berries	2	12	1,200	3	18	1,800	4	24	1,876	5	30	3,000
Vegetables												
Cabbages	316	9785	29,084	365	10742	31,928	392	11,241	32,240	434	13,020	39,060
Tomato	-	-	-	-	-	-	-	-	-	829	24,870	1,243,500
Kales	-	-	-	-	-	-	-	-	-	397	3,874	25,603
Onion bulbs	91	628	18,982	125	905	27,534	155	1215	28,115	232	3,536	54,820

Spinach	147	4,398	65,970	184	5,674	85,110	192	5,920	85,920	243	2,651	26,258
Courgettes	31	854	9,076	29	805	16,100	28	817	16,210	34	944	9,499
Snow peas	145	206	866	157	278	1,660	165	392	1,702	180	540	2,345
Garden peas	286	265	17,790	307	335	33,500	326	346	33,601	364	1,529	153,458
Shallots	37	1304	932	45	1378	984	42	1,366	976	48	1,094	818
Butter Nut	-	-	-	-	-	-	-	-	-	32	322	5,882
Capsicum	35	321	4,790	42	368	7,360	45	381	7,392	52	452	9,040
French beans	46	176	14,877	86	256	15,360	92	274	15,604	134	510	30,600
Carrots	73	796	15,920	84	896	17,920	83	897	17,976	98	915	20,650
Chillies	25	167	8,350	28	187	9,350	30	198	9,673	33	218	5,089
Flowers												
Roses	12	43	15,098	12	45	15,800	12	47	15,911	52	156	59,889
Arabicum	38	396	543	42	382	523	43	389	535	47	485	667
Mobbydick	5	19	4,965	4	15	3,919	3	17	3,933	7	21	4,858

Table 5 Crop statistics-Laikipia

Data source: Laikipia County Statistical abstract 2021

Climate Stressors and Climate Risks	
Rising temperatures Increased heat stress on crops	Crop failure/loss, reduced yields and quality
	Changes in crop suitability due to shifting agro-ecological zones
Shifting seasonal rainfall patterns	Increased incidence of pest and diseases (e.g., Fall armyworm, maize stalk borer, coffee berry borer)
Increased frequency and intensity of heavy rainfall	Soil degradation from heavy rainfall, flooding, and erosion

2.6.2 Livestock

Drought, pests, diseases, water scarcity, heavy rainfall events, and extreme temperatures pose significant stressors to livestock species, impacting small-scale livestock rearing, a vital livelihood activity for food security and the local economy. Heat stress reduces livestock productivity, affecting feed intake, reproduction, milk production, and longevity. Rising temperatures and flooding contribute to the spread of diseases carried by ticks. Some wards already face water stress, impacting pastures, fodder crops, and water availability, adversely affecting dairy milk value addition industries.

Vulnerable groups, including indigenous Yaaku minorities and pastoralists, struggle to maintain their livelihoods as climate change disrupts traditional practices and livestock as a production system.

Climate Stressors and Climate Risks	
LIVESTOCK	
Stressors	Risks
Increased temperature Shifting seasonal rainfall patterns Increased frequency and intensity of heavy rainfall	Reduced livestock reproduction, growth rates, and milk production due to heat stress
	Increased milk spoilage due to warmer temperatures, reduced production of milk
	Reduced feeding options due to rangeland degradation and diminished fodder crops
	Early drying or loss of seasonal water sources
	Altered pastoral mobility and increased conflict over scarce resources
	Increased occurrence and outbreaks of some livestock Diseases

2.6.3 Human Health

The changing climatic conditions have led to an increase in vector-borne diseases like dengue fever and tick-borne illnesses due to altered distribution and abundance of disease-carrying vector in Laikipia. Flash-floods due to sudden heavy downpour has also led to increased cases of ground water contamination particularly in areas near the dumpsites in Igwamiti and Nanyuki ward. Vulnerable groups, lacking adequate healthcare

access, are particularly at risk. Moreover, changes in precipitation patterns and extreme weather events have disrupted water availability, sanitation systems, and led to waterborne diseases such as diarrhea and cholera, impacting the community's overall health. Agricultural productivity, crucial for food security, is also under threat due to climate change. Altered climate patterns negatively affect crop yields and livestock health, putting vulnerable groups, like children and pregnant women, at risk of malnutrition. Additionally, climate change worsens air quality, leading to respiratory illnesses like asthma and COPD among the population. The mental health impacts of climate change are notable, with extreme weather events causing displacement, loss of livelihoods, and social disruption. Consequently, heightened stress, anxiety, and other mental health issues are prevalent within the community. Addressing these challenges requires concerted efforts to mitigate climate change's adverse effects, enhance healthcare infrastructure, and promote community resilience.Addressing these challenges requires concerted efforts to mitigate and adapt to climate change. Measures such as reducing greenhouse gas emissions, enhancing healthcare infrastructure, improving water management and sanitation systems, promoting sustainable agriculture, and fostering community

resilience are crucial for minimizing the adverse health effects of climate change on vulnerable groups in Laikipia and similar regions worldwide.

<table>
<tr><td colspan="2">Climate Stressors and Climate Risks
Human Health</td></tr>
<tr><td>Stressors</td><td>Risks</td></tr>
<tr><td rowspan="3">Increased temperature
Shifting seasonal rainfall patterns
Increased frequency and intensity of heavy rainfall</td><td>Increased mortality and morbidity related to heat stress</td></tr>
<tr><td>Increased drowning and displacement of people and flooding
Water scarcity and crop failures, potentially affect nutrition and health. Waterborne illnesses, such as cholera, can be exacerbated by changes in rainfall patterns. Expansion or shifting of habitats for disease-carrying insects, driven by altered rainfall patterns, can increase the transmission of vector-borne diseases like malaria</td></tr>
<tr><td>Increased poverty, food insecurity, and undernutrition caused by crop loss/decreased yields, livestock loss, or rising food prices</td></tr>
</table>

2.6.4 Trade

Climate change significantly impacts trade in Laikipia County, with implications for agriculture, market infrastructure, transport systems, and communication networks. The region's heavy reliance on agriculture and livestock farming makes it vulnerable to disruptions caused by erratic rainfall, prolonged droughts, and intense storms, affecting crop yields and livestock productivity. Damage to market infrastructure due to climate-related events such as floods and extreme temperatures disrupts supply chains and access to essential services, hindering trade. Transportation networks also suffer from weather-related damage, leading to delays and increased costs in moving goods. Communication breakdowns during extreme weather events further impede trade activities and market access. Climate change-induced shifts in agricultural production patterns may affect market dynamics and prices for various products. Moreover, small-scale traders face heightened vulnerability due to limited resources for adapting to changing conditions, risking their livelihoods and the county's economic stability. Effective climate adaptation strategies involving collaboration among local authorities, businesses, and communities are essential to promote resilience and sustainable trade practices .

2.6.5 Wildlife and Tourism

Tourism in Laikipia County, known for its major wildlife migration route and popular private conservancies and ranches, plays a significant role in attracting large numbers of tourists and creating employment for the communities. The growth of tourism, especially in areas like Il Ngwesi, has positively impacted local perceptions of wildlife, turning it into a valuable natural asset that can be leveraged through tourism. Community tourism has the potential to improve livelihoods and reduce poverty, benefiting communities residing around various ranches. However, climate change poses a substantial threat to the tourism industry in Laikipia. Changes in climate directly affect biodiversity and wildlife, leading to alterations in species habitats, migration patterns among other things

particularly in Laikipia North, Mukogodo Forest, Rumuruti Forest, Lariak Forest, Manguo wetland , and Mount Kenya ecosystems. This, in turn, results in increased incidences of human wildlife conflict due to water scarcity in the wildlife area and population declines and even species extinction, raising concerns for the sustainability of the tourism sector. Climate change-induced challenges jeopardize the unique wildlife experiences that tourists seek in Laikipia, necessitating proactive measures to mitigate its adverse impacts on the county's tourism industry.

2.6.6 Cooperatives

The cooperative sector, particularly in agriculture, has suffered negative consequences due to climate change. The frequency and intensity of droughts and floods have significantly reduced farm production especially in dairy, coffee and tea industries, making it increasingly challenging for people to engage in farming activities. Consequently, this has hindered the growth and progress of cooperatives within the county. Furthermore, interventions aimed at value addition have also been affected by these circumstances.

2.6.7 Infrastructure

Infrastructure and energy systems are susceptible to the impacts of climate change, especially with more frequent and intense heavy rainfall events. These events can lead to floods and landslides, causing damage to infrastructure and disrupting essential services such as energy, water, and transportation. As a result, social amenities suffer, and the most vulnerable members of the community bear the brunt of these consequences. Additionally, the reliance on firewood, particularly among women who heavily depend on this resource, ex- acerbates the situation.

While increasing temperatures may reduce heating demands, they also heighten the overall demand for cooling. This increased demand, especially during peak periods, strains transmission and distribution systems. Furthermore, small hydroelectric systems that support agricultural cooperatives and industries, such as tea production, are at risk due to river siltation caused by soil erosion and the heightened demand for water during drought periods. Lastly, flooding events can also inflict damage on the infrastructure of these systems.

Hydro-meteorological and/or climate parameter	Select energy uses
Rainfall	Hydro-generation potential and efficiency, biomass production, demand, demand simulation/modeling
Wind speed and/or direction	Wind generation potential and efficiency, demand, demand, simulation/modeling
River flow	Hydro-generation and potential, hydro-generation modeling (including dam control), power station cooling water demands
Flood statistics	Raw material production and delivery, infrastructure protection and design, cooling water demands

Drought statistics	Water for irrigation output, demand
Storm statistics (includes strong heavy rain	Infrastructure protection and design, demand surges

2.6.8 Ecosystems

The intricate interplay between various factors influencing ecosystem structure, composition, and function makes it challenging to predict the impacts of climate change. However, it is anticipated that rising temperatures and shifting rainfall patterns will exacerbate the strain on the rich biodiversity of Laikipia County, which is already under pressure from human activities such as deforestation, pollution, human-wildlife conflicts, expanding settlements, and conversion of agricultural land.

The county has already experienced a loss of biodiversity, primarily attributed to hazards like droughts and floods. The projected increase in heavy rainfall events and more intense droughts is expected to intensify land degradation and diminish vegetative cover in the county's diverse ecosystems. These ecosystems are essential for providing crucial products and ecosystem services, including forestry, fishery, pastoralism, tourism-re- lated livelihoods, as well as fuel and food supplies, and water regulation through filtration and groundwater recharge.

Additionally, rising temperatures, storms, and floods pose heightened threats to ecosystems through direct damage, altered distributions of native and invasive species (e.g., Mukogodo West), elevated physiological stress, and increased risk of wildfires. Forest fires have already impacted Laikipia County.

2.6.9 Water Sector

Over the past one to two decades, the water resources in Laikipia County have been facing continuous depletion due to the hazards associated with climate change. This depletion has resulted in water scarcity across all wards in the county. Some notable changes in the water resources over this period include the depletion of water pans and springs due to encroachment by human activities such as crop and livestock farming. This encroachment has diminished the effectiveness of these water bodies as vital carbon sinks and important water sources. The water table levels have significantly dropped due to high water demand, limited water recharge caused by excessive runoff resulting from inadequate water storage infrastructure, and the effects of deforestation. As a consequence, borehole drilling costs have risen due to deeper water table/aquifer levels below ground, and there is insufficient water available for domestic use and irrigation purposes. Unpredictable river flow levels have led to water usage restrictions and rationing for farmers engaged in irrigated agriculture. The rivers have become more seasonal and intermittent.

Moreover, there has been an increase in flash floods, particularly during the long rainy seasons, which have caused crop damage and destruction of animal pastures. Therefore, there is an urgent need for extensive extension services and training on modern methods of water conservation and harvesting, as well as infrastructural development to ensure sustainable water availability.

Climate Stressors and Climate Risks Water Sector	
Stressors	**Risks**
Deforestation	Poor underground water recharge leading to lower water table levels. This has caused rise in borehole drilling costs and depletion of shallow wells. Reduced spring water sources and dried wetlands.
Unpredictable river flow levels	This has led to restricted/rationed water usage for farmers engaging in irrigated agriculture hence limiting crop production and pasture growth.
Increased flash floods occurrences	Increased siltation of dams and water pans hence reduced water availability and extinction/death of subaquatic life. Increased pollution of surface water sources. Leading to low quantity and quality of these sources available for use by the community.
Rising temperatures	High evaporation and wetlands' encroachment rates leading to depletion of open wetlands. This has also led to an increased water demand, depletion of water pans and springs therefore causing a significant ineffectiveness of these water bodies as carbon sinks and as major sources of water.

2.6.10 Social-Economic Impacts

Disintegration of families: Communities cited an increase in family breakage in the county as a result of many factors which are related to climate change hazards and risks, such as unemployment and migration in search of alternative livelihoods. Increased rural-urban migration: In many parts of the county the majority of the youth who form the biggest proportion of active workforce have migrated to the urban areas hence reduced workforce in the rural areas.

Lifestyle diseases: Laikipia County has been ranked 2nd leading in overweight and obesity in Kenya, one of the risk factors for Non-Communicable Diseases (NCDs). Child undernutrition is also still a major public health problem with stunting levels being at 15.1%, wasting at 2.4% while underweight at 2.1%. These unacceptable high levels of malnutrition, over-nutrition and micronutrient deficiency have remained a public health concern and a hindrance to achieving the county's developmental agenda.

Mental health issues: The community highlighted mental health as a main social economic risk which partly can be attributed to the climate change risks and hazards.

Female-headed households: Increased urban migration in search of jobs has led to an increase in female head- ed households as many men move to urban areas.

Gender Based Violence as a result of imbalance in providing for the family: The community cited an increase in GBV as a result of economic imbalances in the families. GBV is affecting both women and men in the county.

Drug and substance abuse: There has been an increase in drug and substance abuse in the county, among the youth and older persons, with men being the most affected. This has led to family breakage, reduced workforce and increased insecurity.

High cost of living: Increased inflation has led to high cost of living which has also led to increased environ- mental degradation as people look for alternative sources of living to supplement their income such as charcoal burning.

Increased conflicts over natural resources: Increased drying up of rivers and other water sources due to drought has led to increased conflicts as communities scramble for the little water available

2.7 Spatial distribution of risks

The agricultural sector is the mainstay of the economy of Laikipia County. Agriculture comprises mainly cultivation of cash and food crops, and rearing of livestock and bee keeping. It employs approximately 66% of the labor force and contributes roughly 57% to household incomes (GoK, 2013). The major cash crops grown in the county include horticulture crops, mostly grown near rivers in Laikipia East and Laikipia West sub coun- ties. The major food crops grown in the county include maize, Irish potatoes, beans, and vegetables whereas the major livestock kept include dairy cattle, poultry, goats, sheep and donkey. Bee keeping is also practiced especially in Laikipia North Sub County.

Climate variability is a reality in Laikipia that has manifested itself in many forms as community members and the stakeholders engaged. The variability has manifested through prolonged dry seasons, which are associated with floods human wildlife conflict, migration and conflict over resources. The intensity and frequency of effects/impacts that are drought related have increased over time, all the sub counties are now affected. The agro ecological zoning and geographical zoning of this wards plays a big role in differentiating the hazards impacts felt e.g. Human wildlife conflict affect the wards closer to Forests and conservancies than others.

Physical distribution of the hazards in all the three sub counties (15 wards) has been done below;

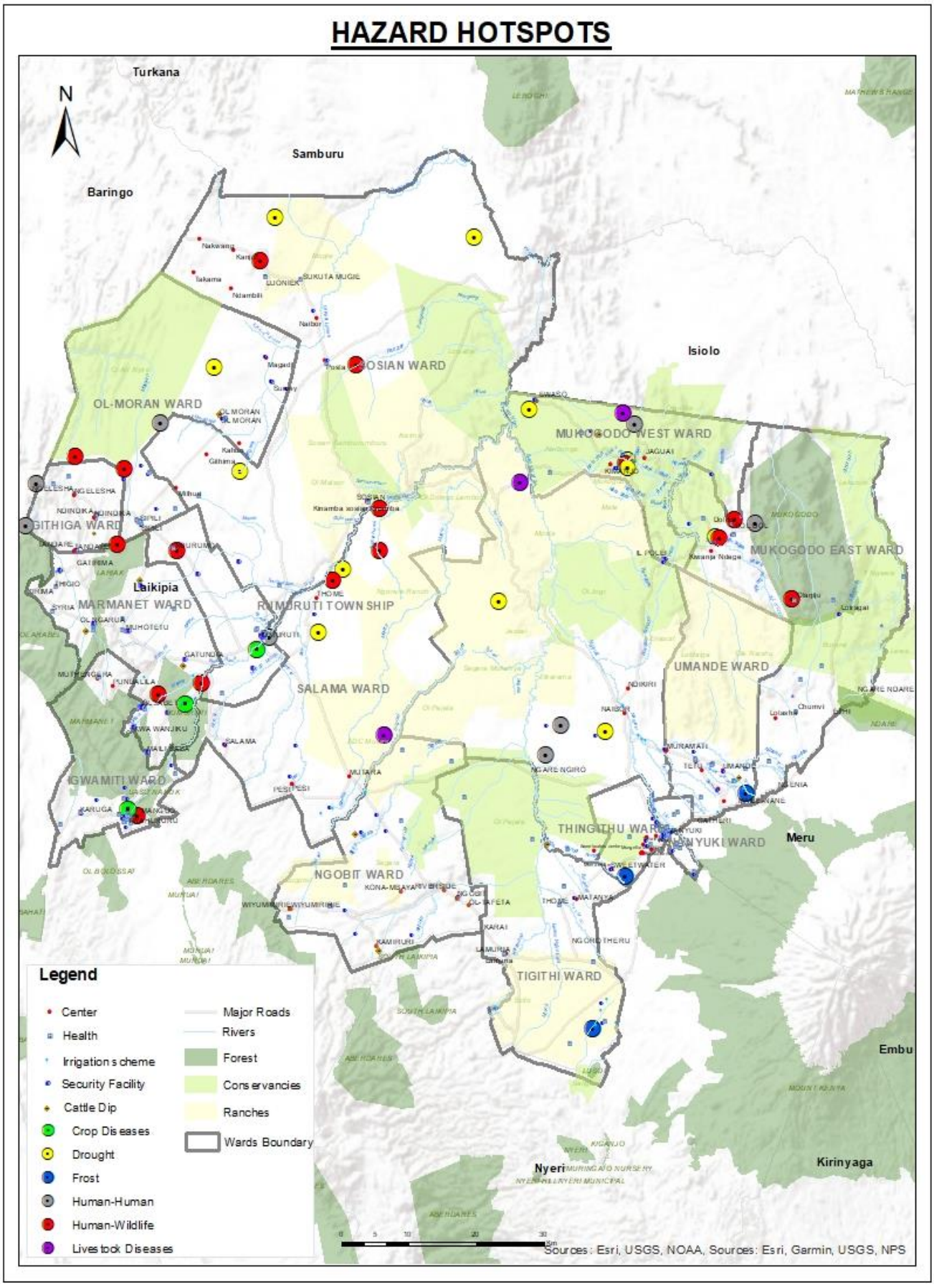


Figure 0-9 Physical distribution of the hazards in all the three sub counties (15 wards)

3 CHAPTER THREE: FUTURE CLIMATE SCENARIOS FOR LAIKIPIA COUNTY

3.1 Climate change projections under RCP 4.5 and RCP 8.5 scenarios

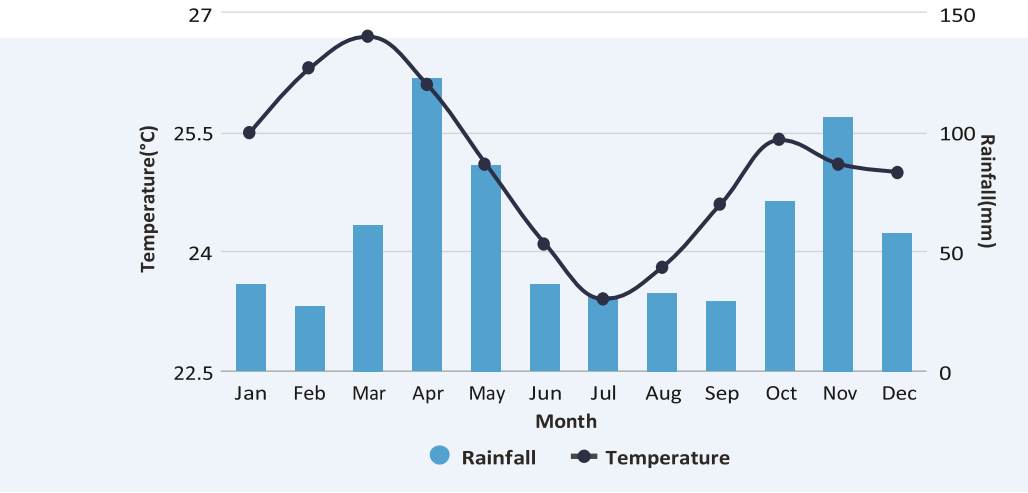
Future climate projections are produced by complex mathematical simulations of the physical processes of the atmosphere and ocean to model the response of the global climate to increasing concentrations of green- house gases, aerosols, and other atmospheric constituents that affect the planet's radiative balance. There is considerable uncertainty associated with these projections, particularly at lower scales; this is in part because the models are large-scale approximations to complex physical systems, but also because future emissions pathways are not yet known.

3.2 National and downscaled climate change projections

Future projected changes in rainfall over Kenya were assessed for near- (2011-2040), mid- (2041-2070), and far- (2071-2100) future climates relative to the current climate (1976-2005) using CORDEX-Africa regional climate model (RCM) runs forced by GCM simulations under three emission scenarios (RCP2.6, 4.5, 8.5). Based on assessment of the performance of 24 model runs from five CORDEX-EA simulations, Ogega et al (2020) identified four RCM runs that outperform the all-model or individual model ensemble means in describing the spatio temporal characteristics of precipitation over Eastern Africa. All four models' data were used for the present assessment of projected precipitation changes over Kenya under RCP8.5 scenario, but only three of the models were available to assess projected changes under the RCP4.5 scenario.

Although there is spatial variability over the 8 future decades, there is generally a reduction in projected seasonal rainfall over northern Kenya and increase over southern regions for both RCP4. and RCP 8.5 scenarios compared to the 1981-2005 present climate simulations of best-model ensemble mean. Except for MAM 2081-2090 decadal rainfall change, the projected reduction appears to intensify and expand south- wards under the RCP 8.5 scenario.

The projected decadal OND season- al rainfall changes (mm/day) over Kenya based on the ensemble means of the best four model runs under RCP 4.5 and RCP 8.5 scenarios. Although there is spatial variability over the 8 future decades, there is generally an increase in projected seasonal rainfall over Kenya for both RCP4.5 and RCP 8.5 scenarios compared to the 1981-2005 present climate simulations of best-model ensemble mean. The OND 2081-2090 decadal rainfall change shows the highest increase in future rainfall under the RCP 8.5 scenario.



Climate Variable	1901-2020
Mean Annual Temperature (°C)	24.3 (°C)
Mean Annual Precipitation (mm)	668.6 mm
Mean Maximum Annual Temperature (°C)	30.3(°C)
Mean Minimum Annual Temperature (°C)	18.3 (°C)

Table 6 Data snapshot: Summary statistics:

3.2.1 Temperature

Analysis of data from the World Bank Group's Climate Change Knowledge Portal (CCKP) (Table 2) shows Kenya's seasonal cycle for the latest climatology, 1991–2020. Mean annual mean temperatures for Kenya is 24.3°C, with average monthly temperatures ranging between 22°C (July) and 25.6°C (March). Mean annual rainfall is 668.6 mm. While rainfall does occur throughout the year, depending on area, the majority of rainfall is received between March and June and October to December Figure 3 shows the spatial variation of observed average annual precipitation and temperature across Kenya

a. At the national level, under the worst case RCP8.5 scenario:

b. Average temperatures nationally are expected to continue rising by 1.7% by the 2050s and by

Figure 3-1 monthly temperature and rainfall for Kenya, 1991–2020

3.5% at the end of the 21st century.

c. The number of hot days and hot nights will increase, with hot days projected to occur on 19%-45% of days by mid-century. Hot nights are expected to increase even more rapidly, projected to occur on 45%-75% of nights by 2050.

d. Cold days and nights are expected to become increasingly rare.

e. Rainfall

f. Precipitation will remain highly variable and uncertain.

g. Nationally, average rainfall is expected to increase slightly by 2050, especially for the 'short rains' which occur between October and December. However, each county's experience is likely to highly contextual and localized, in particular:

h. Rainfall in arid zones is likely to decrease.

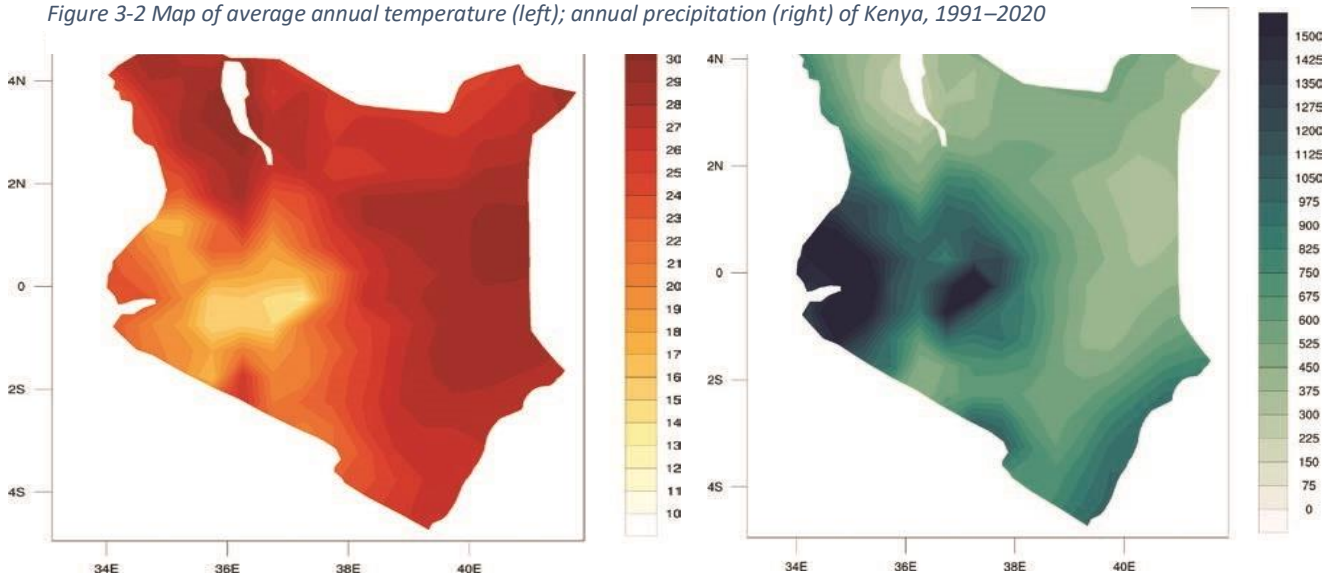
i. The pattern and temporal distribution of rainfall is likely to change:

j. Extreme rainfall events (heavy downpours) are likely to increase in frequency, duration and intensity.

k. The period between heavy rainfall events is likely to increase.

l. The proportion of rainfall that occurs in extreme rainfall events (heavy downpours) is likely to

Figure 3-2 Map of average annual temperature (left); annual precipitation (right) of Kenya, 1991–2020



Climate Change Projections under RCP 4.5 and RCP 8.5 Scenarios over Laikipia County

Future projected changes in rainfall over Laikipia were assessed for near- (2011-2035), mid- (20362070), and far- (2071-2100) future climates relative to the historical climate (1981-2005) using CMIP5 model simulations under two emission scenarios (RCP 4.5 and RCP 8.5).

Four Representative Concentration Pathways (i.e. RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing (cumulative measure of GHGT emissions from all sources) pathway and level by 2100. The RCP2.6 for example represents a very strong mitigation scenario, whereas the RCP8.5 assumes business-as-usual scenario. These scenarios are referred to as a low (RCP2.6); a medium (RCP4.5) and a high (RCP8.5) emission scenario in this profile. Table 3 provides CMIP5 projections for essential climate variables under high emission scenario (RCP8.5)

over four different time horizons. Figure6 presents the multi-model (CMIP5) ensemble of 32 Global Circulation Models (GCMs) showing the projected changes in annual precipitation and temperature for the periods 2040–2059 and 2080–2099.

CMIPS Ensemble projection	2020-2039	2040-2059	2060-2079	2080-2099
Annual Temperature Anomaly (°C)	+0.5 to +1.4	+1.2 to +2.4	+2.0 to +3.7	+2.7 to +5.1
	(+1.0°C)	(+1.7°C)	(+2.5°C)	(+3.5°C)
Annual Precipitati onAnomaly (mm)	-13.7 to +21.6	-17.1 to +25.2	-17.0 to +34.0	-17.8 to +44.0
	(2.6 mm)	(3.5 mm)	(6.7 mm)	(10.5 mm)

Table 7 Data snapshot: CMIP5 ensemble projections

CMIP5 ensemble projected change (32 GCMs) in annual temperature (top) and precipitation (bottom) by 2040–2059 (left) and by 2080–2099 (right), relative to 1986–2005 baseline under RCP8.

The MAM and OND projected seasonal trends show highly variable trends of increasing and decreasing rainfall for both RCP 4.5 and RCP 8.5 scenarios. Fig. 2 shows the future trends of rainfall for MAM season under scenario RCP 4.5 and RCP 8.5. There is an increase of rainfall in the near future (2011-2035) for RCP 4.5 followed by a decrease of rainfall in the mid future (20362070) under the same scenario. However, there is a general decrease of rainfall in the MAM rainfall season for both near future (2011-2035) and mid future (2036-2070) under the RCP 8.5 scenario. Fig. 3 shows the future trends of rainfall for the OND season under RCP 4.5 and RCP 8.5 scenarios. There is an increase of rainfall in the near future (2011-2035) for RCP 4.5 followed by a decrease of rainfall in the mid future (2036-2070) under the same scenario. However, there is a general decrease of rainfall in the OND rainfall season for both near future (2011-2035) and mid future (2036- 2070) under the RCP 8.5 scenario. The seasonal rainfall change shows the highest decrease in future rainfall under the RCP 8.5 scenario. Further, climate change effects have caused the distribution, onset and cessation of rainfall within the county to vary significantly. The overall annual increase of rainfall within the county and the significant decrease of both MAM and OND seasons is attributed by shift of season from the current main rain season to either January, February (JF) or June, July, August and September (JJAS).

3.3 Key Trends

3.3.1 Temperature

Temperatures in Kenya are projected to continue rising by 1.7°C by the 2050s and by approximately 3.5°C at the end of the century.24 Additionally, the number of hot days and nights will increase, with 'hot days' project- ed to occur on 19%–45% of days by mid-century. Hot nights are expected to increase more quickly, projected to occur on 45%–75% of nights by mid-century and on 64%–93% of nights by end of century. Cold days and nights are expected to become increasingly rare.25

Across all emissions scenarios, temperatures in Kenya will continue to rise. As shown in Figures 7 and 8 below, under a high emission scenario (RCP 8.5), average temperatures are expected to increase rapidly by mid-century. Increased heat and extreme heat conditions will result in significant implications for human and animal health, agriculture, and ecosystems.

3.3.2 Precipitation

Precipitation in Kenya is projected to remain highly variable and uncertain, however average rainfall is expected to increase by midcentury, particularly during the 'short rains', which occur between October and December. Extreme rainfall events are also expected to increase in frequency, duration and intensity and the proportion of heavy rainfall that occurs in heavy events will increase. However, the period between heavy rainfall events may increase. Importantly, rainfall in the arid zones are generally project- ed to decrease. As seen in figure 9, annual average precipitation is expected to increase slightly by the of the century under a high emissions scenario.

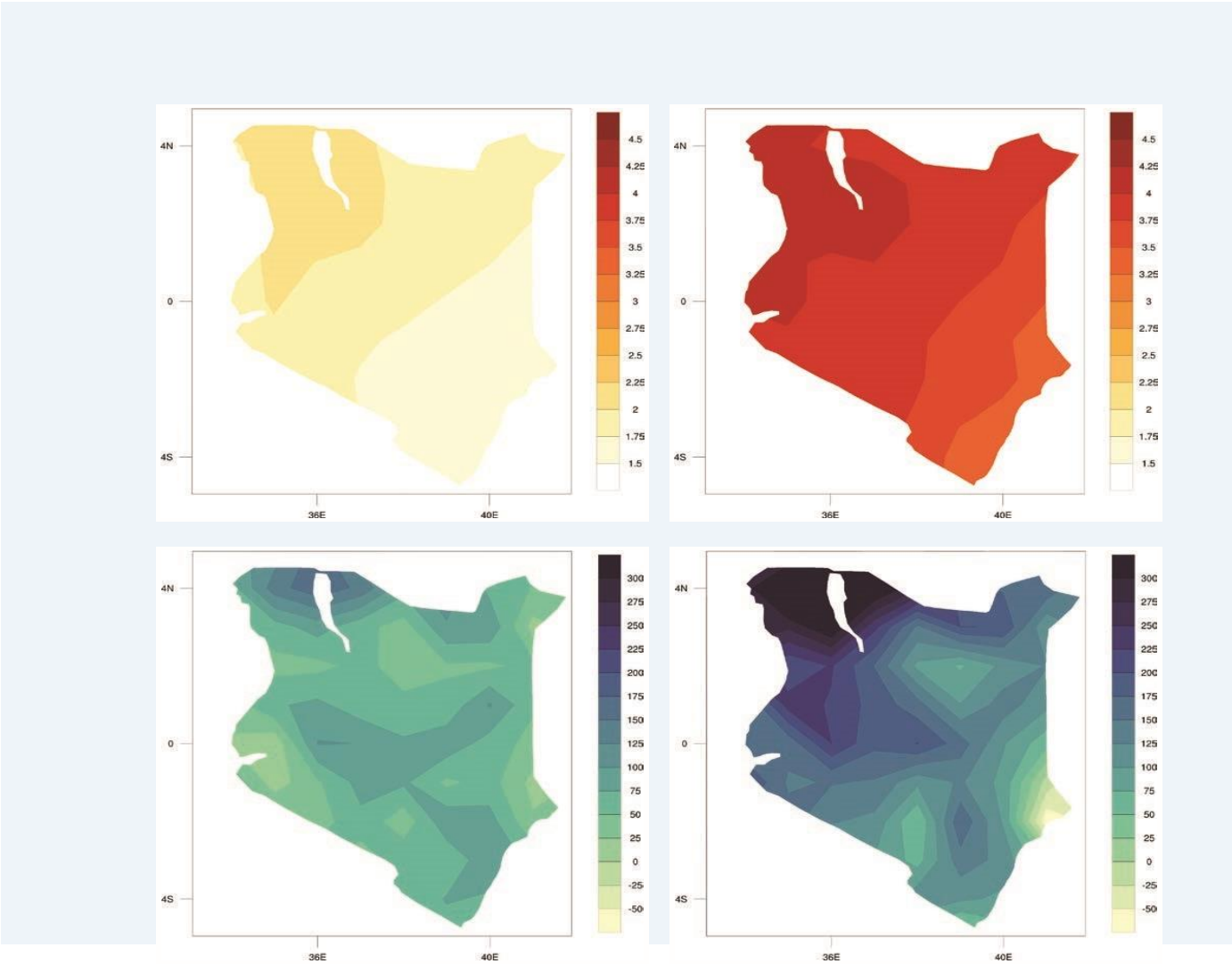


Figure 3-3 CMIP5 ensemble projected change (32 GCMs) in annual temperature (top) and precipitation (bottom) by 2040–2059 (left) and by 2080–2099 (right), relative to 1986–2005 baseline under RCP8523

4 CHAPTER FOUR:

4.1 OVERVIEW OF EXISTING ADAPTATION/RESILIENCE STRATEGIES AND THEIR EFFECTIVENESS TO CURRENT CLIMATE RISKS

4.1.1 Background

Laikipia county faces a plethora of climate risks and hazards, including drought, floods, landslides, pests and diseases, human wildlife conflict, extreme temperatures, and erratic rainfall. The adverse effects of these cli- mate hazards are far-reaching and dire, manifesting in water scarcity, crop failure, death of livestock, increase in tropical diseases, food shortage, poverty, and even loss of lives. The community has implemented several adaptation strategies to mitigate the risks and consequences of climate change at the local levels.

4.2 Drought

To counter the menace of drought which has an impact chain of water scarcity, low yields and famine, the community has embraced innovative practices such as rainwater harvesting both roof and surface runoff and drilling boreholes to ensure water security during dry season for domestic and livestock use. In the agricultural sector and NRM, farmers have adopted drought tolerant crops such as sweet potatoes, beans, cassava, millet, hay and sorghum and irrigation farming. Additionally, farmers have diversified their livelihoods and embraced CSA practices such as intercropping, use of certified seeds and early maturing use of conservation agriculture, pasture conservation, production of aquaculture under greenhouse as well as irrigation projects crops to counter the effects of erratic rainfall.

Hunger is being alleviated through the provision of relief food by the government, nongovernmental

FIGURE 7. Historical and projected average temperature for Kenya from 1986 to 2099[26]

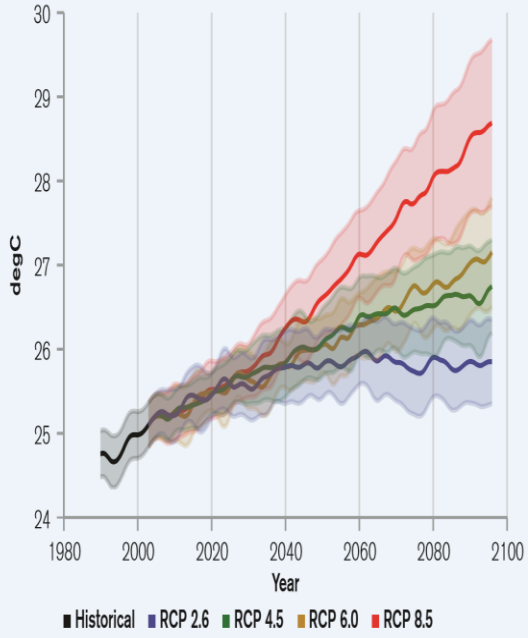
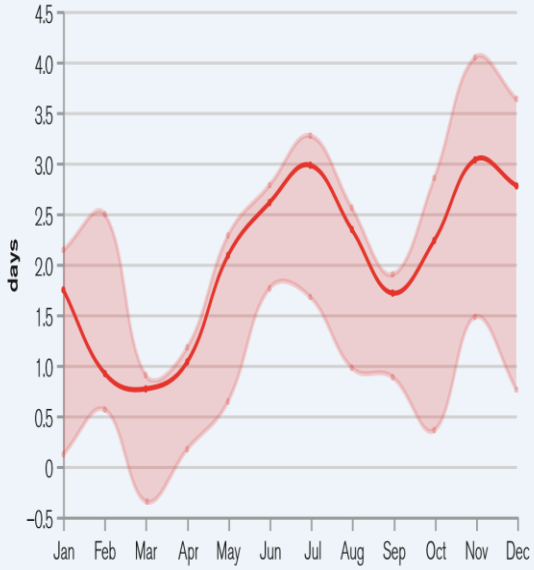


FIGURE 8. Projected change in summer days (Tmax >25°C)[27]



organizations, and philanthropists. Furthermore, the community has tapped into indigenous knowledge

and traditional weather forecasting techniques to predict weather patterns and plan their agricultural activities accordingly. Residents of semi-arid areas of Laikipia traditionally predict weather and climate variation through the observation of diverse bio-physical entities including livestock, insects, birds, trees and wildlife.

4.3 Floods

Floods occurrences in different wards of the county, have led to destruction /loss of biodiversity pollution of water bodies and spread of water and vector borne diseases; the communities have adopted planting of cover crops, terracing, and establishment of cut off drains in the farms to reduce the impacts of the floods. Use of early warning systems through the Red Cross and the National Disaster Management Authority are also used. In addition, construction of drainage systems, construction of gabions, were reported by the communities. The communities also incorporate desilting of intakes and dams/pans to improve carrying capacity, water storage and water quality, which was found to be effective. To implement some of these initiatives the community has been funded through both National and County Governments' initiatives and in some cases NGOs.

4.4 Pest and diseases

The county is vulnerable to a number of diseases as a result of climate change including malaria, typhoid, diarrhea and dengue fever. The diseases are currently mitigated through provision of adept health services in hospitals, accessibility to clean water and sanitary facilities to limit the outbreak of waterborne diseases, heightened surveillance for new outbreaks, and setting up vaccination and immunization programs against dis- eases whose occurrences have been exacerbated by climate change and climate variability. Traditionally, the community has relied on wood ash, Mexican Marigold leaves, and other herbs to combat pests and diseases. However, with the advent of technology, pesticides are now being employed to combat the invasion of Desert locusts, Fall armyworm and African armyworms on farmlands. To combat tropical diseases such as malaria and typhoid, the community has adopted preventive measures such as the use of mosquito nets and treating drinking water. Planting of pest tolerant crops has also been practiced over time.

4.5 Environmental degradation

Environmental degradation has been witnessed in various forms in different parts of the county such as land/ mudslides, soil erosion, deforestation, destruction of water sources and reduced levels of groundwater that have affected agricultural activities, health, trade and the transport sector. The community has implemented measures to counter these forms of degradation such as Sustainable Land Management practices (terracing, construction of gabions), catchment conservation, reforestation and afforestation of degraded land, rehabilitation of riparian land, such as wetlands restoration, and support conservation of communal forest resources.

The strategies applied have partly been effective and can be made more effective if farmers are trained and have access to information, improved infrastructure and technology e.g irrigation systems; financial support and incentives as well as strengthened environmental organizations.

4.6 Human- Wildlife conflict

Destruction of wildlife habitats and degradation of natural resources has led to human wildlife conflict due to competition of available resources such as invasion in to farmlands in search of food. In areas near forests and adjacent to wildlife conservancies, the community has devised ways to mitigate human-wildlife conflict, such as community sensitizations, erecting physical barriers, thorny fences

and electric fences, provision of water and food to animals in dry seasons and enlisting the services of wildlife rangers to monitor and manage animal populations. There are also compensation schemes initiated by the government to cushion community members from the loss of crops, livestock and property.

Livelihood diversification by the communities adjacent to forests, early warning systems and rapid response teams, conservation friendly land use planning such as wildlife corridors and buffer zones, collaborations and partnerships as well as strengthening law enforcement and deterrent measures will be key in making these strategies highly effective.

4.7 Effectiveness of adaptation/resilience strategies to future climate risks

Climate change has serious ramifications in four dimensions of food security that is food availability, food accessibility, food utilization and food systems stability. As elaborated and discussed above, a wide array of adaptation and resilience strategies is employed in addressing the identified climate risks and hazards. These strategies have a varying level of effectiveness as assessed during this process.

The section below presents the climate related hazards, affected livelihood and economic systems, ranked adaptation strategies and the community segment applying the strategy as well as Gender and Social Inclusion information. The ranking was done by popular ranking which considered the cost of the strategy, current rate of use, and its technical/operation effectiveness. This was done from community consultation at the ward level; county multi-stakeholder climate risk assessment and further review and input by technical working group (TWG) at the county level. In order to make the adaptation strategies more effective, there is need for improved access and use of climate information; capacity building through strengthened extension services and sensitization strategies; better coordination between all actors for optimal outcomes.

Risk/Hazard	Livelihood/Economic System	Climate Resilience Strategies	Stakeholder Group Applying the Strategy	Gender and Social Inclusion	Effectiveness
Drought	Agriculture	Enhancing climate smart irrigation	-Farmers	Both men and women will benefit from an increase in agricultural produce	+++
		Planting of Drought tolerant crops	-Farmers	The strategy is gender inclusive.	+++
		Proper food preservation and storage(e.g.,Post-harvest-management)	Farmers Women	The whole community but women and children will benefit more	+++
		Diversification of livelihood	-Farmers -Traders -Consumers	Both men and women benefit from the strategy	++, The need for awareness

		Agroforestry	Farmers CFA PWD	The strategy should in-corporate men, women and youth	++, technolo gical adoption to be enhanced
		Soil fertility management (soil testing, low-cost composting)	Farmers	The strategy is all gender inclusive for increased agricultural produce.	++
		Incorporation of fast-growing crops	Farmers	The strategy is all gender inclusive	+++
		Value addition of agricultural produce	-farmers -traders	The strategy is all gender inclusive	+++
		Early planting, upland planting, crop rotation	-farmers	Both men and women benefit from the strategy	+++
	Livestock	Drought resilient livestock	-Livestock keepers -consumers	The strategy is all gender inclusive because it also captures goats and sheep which are considered women -owned livestock.	++
		Drought tolerant fodder crops, like acacia tortilis	-Livestock keepers -Consumers	Involve all community members	+++
		Restoration of rangelands	Livestock farmers	Involves men and women and youth & children	+++
		Cattle breeding	-Livestock keepers -Consumers	Men and youth for the market Women for milk for household nutrition & for selling the market.	++
		Petty trading and selling of asset such as livestock	Farmers	Both Men and Women, PWDs,	+++

			Livestock Marketing Groups	would benefit with Men benefiting more since they are asset owners.	
		Apiculture	Women, men, youth groups Pastoralists PWD	Benefit both Men and Women and youth especially from ASAL region in Laikipia.	+++
	Water	Promote Water harvesting technics e.g., Rain water-harvesting, construction of dams, and water pans. Provision of storage tanks both masonry and portable plastic tanks	-Farmers, -water resource users -Women groups - Institutions	Both men and Women will benefit but Women will benefit more from water harvesting, reduced distances to water point and hence reduced workload and time.	+++
		Promote waste water recycling for irrigation	Farmers Youth PWD	Both men and women will benefit from an increase in irrigation water	+++
		Alternative water sources e.g., Repair, Drilling and equipping of boreholes,	-Farmers, -Water resource users	Inclusivity of all community members	+++ Use of clean energy sources for water pumping
		Afforestation and re-afforestation Supporting groups from a business perspective and ensuring tree growing	-Farmers, - water resource users CFA Tree Nursery growers	Women and you are the main beneficiaries.	+++
		Desilting of existing dams and river intakes	-Farmers, -water resource users	Both men and women will benefit from an	++

				increase in irrigation water.	
		Modification fishing and fish farming techniques	Fish farmers	The strategy is all gender inclusive.	+
	Forestry	Reafforestation Afforestation (this will encompass a business perspective where agro tree nursery operators will be engaged.	Foresters Farmers CFA PWD Women and youth	Involvement of all Community members to ensure everyone is reached. Women and you stand to benefit the most	+++
		Growing of drought tree tolerant species e.g. *Fraxinus berlandieriana*	Farmers	The strategy is all gender inclusive	+++
		Diversification of livelihoods	Farmers, saw millers community PWD	Involvement of all community members to ensure everyone is reached.	++
	Health	Improvement of health care services	Government	The strategy is all gender inclusive.	++
		Food diversification, preservation and storage to curb malnutrition	Farmers, consumers	Involvement of all community members to ensure everyone is reached.	++
		Enhance access to clean and safe water	Community, water resource users	Involvement of all community members to ensure everyone is reached.	+++
	Trade	Diversification of Livelihoods	Traders, consumers	The strategy is all gender inclusive.	++
		Value chains improvements	Industries. farmers	Both men and women will benefit but women will benefit more.	++
		Promote ecotourism	Youth PWD	Involvement of all community members to	+

			Water resource users	ensure everyone is reached.	
		Promote circular economy and recycling	Youth, women PWD	Women, youth and PWDs will benefit most.	++
	Domestic Household	Water-harvesting strategies (storage water tanks, roof-water harvesting)	Households	Women and girls are the main beneficiaries as distances to water is reduced and they have more water for domestic use.	+++
		Government/ NGO interventions on EWS to facilitate relocation of drought victims	Government NGO	Inclusion of all community members to ensure everyone is reached.	+
		Diversification of livelihoods.	Households	Women, children, the elderly, PWD will benefit the most.	++
Floods	Agriculture	Early-warning systems	MDAs, Farmers, community	This strategy is all inclusive	++
		Sensitization of farmers on flood-proofing measures such as terraces	MDAs, agriculture officers, TOTs	This strategy is all inclusive	++
		Soil fertility management- cover crops planting	Farmers	The strategy should target Men, Women, Youth and PWDs	+++
		Early planting, upland planting, crop rotation and adoption of early maturing plants	Farmers	The strategy should target Men, Women, Youth and PWDs	+++
		Petty trading and selling of asset such as livestock	Farmers, traders	The strategy should target Men, Women, Youth and PWDs	++

		Upland structures for livestock	Livestock keepers	The strategy should target Men, Women, Youth and PWDs	++
	Water	-Flood water harvesting technologies –Rain water harvesting, construction of dams, and water pans, provision of storage tanks at household and learning institutional level	Government, water resource users, Learning institutions.	The strategy will benefit Women, girls, the elderly and PWDs access to water for domestic use, For irrigation the beneficiaries are women, men and youth	+++
		Construction of modern drainage systems for managing water flow and preventing soil saturation. and erosion	Government	The strategy should target Men, Women, Youth and PWDs	++
		Repair drainage systems for managing water flow and preventing soil saturation. and erosion	Government Youth	The strategy should target Men, Women, Youth and PWDs	++
	Environment	Recycle solid waste	Women, youth and men and PWDs	Women, youth and men and PWDs	+++
	Health	Water- treatment systems to curb waterborne diseases	WSPs, community	The strategy should target Men, Women, Youth and PWD	+++
		Fumigation to eradicate breeding grounds for disease causing organisms such as mosquitoes	CHVs, community	The strategy should target Men, Women, Youth and PWDs	++
		Improvement of health care services	Government	The strategy should target Men, Women, Youth and PWDs	++

		Strategic of location of dumpsites	Government	The strategy should target Men, Women, Youth and PWDs	++
	Infrastructure	Climate-proofing of the built environment– culverts, roads, bridges etc.	Government	The strategy should target Men, Women, Youth and PWDs	++
		Installation of flood protective systems	Government	The strategy should target Men, Women, Youth and PWDs	++, road, quarry water harvesting
		Establishment of urban green spaces	Government	The strategy should target Men, Women, Youth and PWDs	+++
	Trade	Diversification of livelihoods	Traders, consumers	The strategy should target Men, Women, Youth and PWDs	++
		Climate-proofing of built environment –culverts, roads, bridges etc, to facilitate transport of market products	Government	The strategy should target all genders	++
	Domestic/ household	Government/NGO interventions to facilitate relocation of flood victims	Government, NGOs	The strategy should target Men, Women, Youth and PWDs	+
		Water-harvesting strategies (storage water tanks, roof-water harvesting)	Households	The strategy should target Men, Women, Youth and PWDs	+++
		Diversification of livelihoods	Households	The strategy should target Men, Women, Youth and PWDs	++

Soil Erosion	Infrastructure	Early warning systems	Government	The strategy should target Men, Women, Youth and PWDs	++
		Geo-hazard mapping	Government, GIS experts	this strategy is all inclusive, targeting everyone	+
		Regulation of development	Government	this strategy is all inclusive, targeting everyone	+
	Water	De-siltation of dams and rivers intakes.	Government	this strategy is all inclusive, targeting everyone	+++
		Harvesting of Storm water to manage run-off	Government Community	The strategy should target Men, Women, Youth	+++
		Construction, maintenance and repair of water distribution systems	Government, community	The strategy should target Men, Women, Youth	+++
	Agriculture	Cover crops to regulate rain water velocity	Farmers	this strategy is all inclusive, targeting everyone	+++
		Agroforestry	Farmers, Community	this target is all inclusive	+++
		Terracing	Farmers, community	this target is all inclusive	+++
	Trade	Diversification of livelihoods	Traders, consumers	The strategy should target Men, Women, Youth and PWDs	++
		Climate-proofing of built environment –culverts, roads, bridges etc. to facilitate transport of market products	Government	The strategy should target Men, Women, Youth and PWDs	+++

		Early warning systems to know about landslide prone areas	Government	The strategy should target Men, Women, Youth and PWDs	+
		Diversify supply chain	Traders, farmers	The strategy should target Men, Women, Youth and PWD	++
	Domestic households	Utilize information from early warning systems	households	The strategy should target Men, Women, Youth and PWDs	++
		Resettlement of victims of landslides	Government, NGOs	The strategy should target Men, Women, Youth and PWDs	+
		Planting trees, shrubs, and ground cover can help stabilize the soil and reduce erosion.	Community	This target is all inclusive	+++
		Constructing retaining walls, installing erosion control measures, or implementing slope reinforcement	Households	The strategy should target Men, Women, Youth and PWDs	+++
Pest and diseases	Agriculture	Preservation of traditional seedbanks	Government NGO community	The strategy should target Men, Women, Youth and PWD	+++
		Organic production	Farmers, researchers	The strategy should target Men, Women, Youth and PWD	+++
		Livestock vaccination	Government Researchers NGOs	The strategy should target Men,	+++

				Women, Youth and PWD	
		Early warning systems	Government NGO	The strategy should target Men, Women, Youth and PWD	+++
		Spraying of farms	Farmers Government	The strategy should target Men, Women, Youth and PWD	++
	Trade	Diversification of livelihoods	Farmers, pastoralists etc.	The strategy should target Men, Women, Youth and PWDs	+
		Pest monitoring and surveillance	Government NGO	this strategy is all inclusive to everybody in the community, including the minority groups	+++
		Use of chemical pesticides, biological control agents, resistant crop varieties, cultural practices (e.g., crop rotation, sanitation),and integrated pest management (IPM) strategies	Farmers, traders, pastoralists	The strategy targets Men, Women, Youth and PWDs	+
		Develop risk assessments and risk management strategies e.g. implementing quarantine measures establishing inspection protocols, and developing certification	Government NGO	This strategy is all inclusive to everybody in the community, including the minority groups	++
		Developing certification programs for pest free or disease-free products.	Government NGO	this strategy is all inclusive to everybody in the community,	++

				including the minority groups	

Table 8 Table 4 4. Analysis of Existing Resilience/Adaptation Strategies

The afore-mentioned adaptation strategies are crucial in addressing the impacts of global warming and ensuring community resilience and ecosystems. Most adaptation strategies were seen to be effective in addressing future scenarios, while others varied at medium effectiveness.

Strategies that were found to be highly effective in addressing future climate scenarios include: Climate smart agriculture, intensification of irrigation, adoption of drought-resistant crops and livestock, application of water harvesting technologies, afforestation and reforestation programmes, food diversification, preservation and storage to address prolonged droughts; Early planting, upland planting, crop rotation and adoption of early maturing plants, soil fertility management, sensitization of farmers on flood-proofing measures such as terraces, expansion of current water sources, relocation of water facilities to higher elevations, climate-proofing of built environment (culverts, roads, bridges etc.) to address more frequent/ intense floods; Geo-hazard mapping, regulation of developments, de-siltation of dams and rivers, agroforestry, resettlement of victims of landslides to address more intense mud/landslides; Integrated pest management, preservation of traditional seedbanks, organic production, livestock vaccination, pest monitoring and surveillance to address wide-spread pests and diseases; and, use of green houses, use of wind breakers, overhead irrigation, community outreach and educational campaigns to address frost.

4.8 County climate information management system

Early warning systems, diversification of livelihoods, and community awareness were found to be the most effective adaptation/ resilience strategies in addressing future scenarios in the county. There were resources and/or actions that were identified to be crucial in enhancing effectiveness of current strategies in addressing future scenarios. These include: funding, strengthening of institutional capacity, research and innovations, value-addition, trade restrictions and embargoes to prevent invasive pests, improvement of market systems, simplified early warning systems that are accessible to vulnerable groups, utilization of media for widespread community awareness, exploration of alternative practices, development and implementation of County climate information system for knowledge management to enhance information capture, processing and sharing to all the segments of the population in the county through bulky sms, local radios and articles

5 CHAPTER FIVE: INVESTMENT ACTION PRIORITIES

5.1 Participatory risk assessment priority actions

This section focuses on the summary of priority actions as per the major climate hazards and risks which includes, Drought, Floods, Livestock and Crop pest and diseases that were identified during com- munity engagement in all wards and multi-stakeholder workshop. The priority actions cover the wide range of strategies, including strengthening local livelihoods, economic systems as well as physical infrastructure investments. The process integrated the needs of vulnerable groups including; women, children, elderly, poor resource households, youths and people with disability post-harvest structures.

Participatory risk assessment priority actions

S/No.	Risk/Hazard	Livelihood/Economic System/Infrastructure/Natural Resources	Specific Priority Area Of Investment	Gender And SocialInclusion Information
1.	**Drought**	**Agriculture, livestock and aquaculture** **(**To increase agricultural production, productivity, food and nutrition security)	-Bio-Energy systems, -Value addition and postharvest management	Poor resource household, Women and children, farmers, pastoralists
			-Pest and disease control	
			Restoration of the rangelands.	
			-Expansion of irrigated agriculture	
			-Enhance mechanization. -Provision of quality farm input.	
			- Training existing farmer cooperativeson adopting drought resistant crops. (capacity building)	
			-Promotion of heathy nutrition (promoting kitchen gardens)	
			-Enhance lobbying for the sector	

			-Enhance public private partnership	
			-Federation of farmers into common interest groups and producer organization	
			- Encourage value chain-based financing	
			- Encourage community contribution in project implementation	
			-Incentivize community towards the Sector development ownership	
			Leverage on opportunities in carbon credit	
		Water. To increase access to water for domestic and Agriculture	**Water Harvesting and storage technologies.** Water pans Dams Roof water harvesting facilities, Masonry Tanks	Women
			-**Groundwater Exploration** - Drilling andEquipping of boreholes Rehabilitation of existing boreholes	Women Farmers, Women
			- Irrigation water projects	
		Environment	-Wetland /Riparian /River Catchments Protection	Women PWD
		(Forestry)Promotion ofForestry Activities	Reforestation/afforestation Growing of drought resistant/tolerant species e.g.,*Fraxinus berlandieriana*	Women, youth
		Health	Creation of awareness on prevention of waterborne diseases, and malnutrition.	Children, Elderly, PWD
			-Integrated disease surveillance	

			-Promotion of Sanitation and Hygiene (WASH	
		Energy	-Investing on Low carbon/clean technologies e.g., Biogas, energy efficientcook stoves, Solar Street energy, harnessing on wind energy.	Women and Children
		Trade	-Diversification oflivelihood	Women
2.	**Floods**	Agriculture	Early warning systems Sensitization of farmers on flood proofing methods	Women PWD Vulnerable
		Water	-Flood water harvesting technologies -Rainwater harvesting, construction of dams, digging of water pans, provision of storage tank	
		Environment	Recycling of solid waste	Women youth & PWDs
		Infrastructure	-Construction and maintenance of infrastructure (Bridges, Culverts and drainages) -Capacity building to community to Improve the ability of people to cope with floods -Construction of artificial water ways -Construction of gabions -Compensation of the victims as a result ofproperties destruction -Proper /improved drainage system	Women, poor resource household
		Health	-Fumigation of mosquito breeding grounds -Supply of Long Lasting Insecticidal Nets -Establishing of UrbanGreen spaces	Elderly, Children

		Trade and cooperative	-Building of climate resilient markets -Capacity building tofarmers on production systems (e.g., coffee)	Women, Poor resource farmer
3.	**Crop Pest and Diseases**		-Creation of awareness to community onemerging pest and diseases -Advertisements in resistant varieties and breeds Investments onIntegrated Pest management -Investments in drugs and vaccines -Bio security measures -Development of frameworks and research -Agro-chemical and fencing investments in antimicrobial residualsmanagement -Pest monitoring and surveillance	Farmers, poor resource farmer

6 CONCLUSION

Drought and prolonged dry spells were identified as the hazard with the most negative effects in Laikipia County. The consequences of droughts discussed included spending more kilometers and hours to fetch water, migration- disrupting families; food insecurity; and human, crops and livestock diseases. The vulnerability to drought and the other hazards was found to be driven by exposure due to general geographical position of the county and the social-cultural conditions of households, poor resource ownership, and type of income sources.

Other hazard identified include invasive plant species, floods, solid waste, pest and diseases and of late invasion by locusts. These hazards impact negatively on communities' livelihood if not mitigated. Adaptation mechanisms should be employed to cushion farmers and pastoralists of these vagaries of nature.

This PCRA report will be implemented through a process of integration, whereby climate response actions will be mainstreamed into sectoral priorities at all stages of decision making and implementation. This is responsive to the national approach adopted by Kenya, where the Climate Change Act requires county governments to mainstream climate change responses across the departments and programmes. For this reason, the County Government of Laikipia will enhance coordination across all sectors, county departments and stakeholders. Consequently, the implementation of FLLoCA will leverage on existing activities by all stakeholders in the county, thereby creating harmony in identifying climate change risks and vulnerabilities and framing response actions for mainstreaming in implementation of the County Climate Change Action Plan. Arising from this PCRA, the County Government and all stakeholders from the community to non-state actors and private sectors will be involved in developing the Laikipia County Climate Change Action Plan.

For effective implementation of this report, the County Government through the Department of Water Environment Natural Resources and Climate Change shall prioritize capacity strengthening for all stakeholders especially in mainstreaming climate change.

ANNEXES:

Appendix 1: Prioritized adaptation strategies done during community engagements

Thingithu Ward

Hazard	Capacities		
	Existing capacities	Required capacities	Gaps
Drought related water shortage	Small scale planting tree	Large planting scale tree	-Capacity building on tree planting and growing -Large scale tree planting through collective effort -Reseeding of the denuded areas.
	Curbing deforestation at the local level	Deforestation control at a large scale	-Community sensitization -Capacity building -Strict surveillance and reporting to relevant authorities -Legal action
	Small scale prevention of emission of greenhouse gases	An area free of air pollution	-Community sensitization on prevention of any form of air pollution, however small. -Adoption of innovation (TIMPS) that are climate smart
	Small scale communal control of gullies, reseeding of denuded areas	A well conserved environment	-Training in environmental conservation. -Proper stocking rates. -Proper natural resource management
	Small boreholes, dams, small roof harvesting scale small scale	Availability of accessible water	-Drilling of boreholes -Desilting of dams -Rehabilitation and solarization of existing boreholes -Excavation of large water pans/ dams -Springs development and protection
	Small scale use of AI services	Ideal breeds of livestock for the environment that are	-Breeds improvement through AI

		high yielding	
	Planting of drought tolerant crops at small scale (planting once a year/one season).	Have the right crops for the area and use of appropriate technology	-Provision of drought escaping crops' seeds -Training in better agronomic practices ideal for the area. -Introduction of appropriate technology.
	Small scale preservation of food for the dry season Use of alternative source of income e.g	Enough food preserved to last the whole dry spell season Diversified form of livelihoods.	-Capacity building in food preservation techniques. -Cottage industries for preserving food/ food products. - Trainings and engagement in different IGAs.
	Small scale supplementation feeding of livestock & pasture production	Have enough reserve concentrates/ supplements feed	-Support large scale pasture production -Storage of concentrates/ supplements. -Feed/ Hay stores/storage facility. -Training in pasture production and conservation.
	Existence of small non-designated livestock markets	Well structured Modern livestock marketing systems/ infrastructure	-Construction of modern livestock markets and systems
	Existence of Ineffective Early warning systems	Well organized, efficient and effective early warning systems in the ward	-Development warning systems of reliable early
	Inadequate and unreliable control of water usage	Adequate and effective control of the water usage along	-Controlled use of irrigation water -Organized distribution of irrigation water
Crop pest and diseases	-Small scale use of chemicals to kill pests -Use of traditional method	Complete eradication of crop pests and related diseases	-Capacity building of members on control and eradication of crop pests -Effective early warning systems -Actual control of pests by the relevant agencies

Poultry Disease	-Small scale irregular vaccination of poultry against diseases	-Complete eradication of poultry diseases	-Sensitization on vaccination and eradication of poultry disease -Systematic and regular vaccination of birds against diseases
	-Treatment of opportunistic infections -Use of indigenous treatment herbs		of birds against diseases -Research on disease resistant bird breeds
Fire	-A few firefighting equipment and knowledge	Efficient and equipment firefighting systems and infrastructure	-Acquisition of additional fire engine in every ward -Public awareness and training on firefighting -Re-afforestation after fire damage -Proper planning of urban centres -Emergency kitty for compensation of the fire victims -Establishment of more hydrant points
Storm water floods	-Small scale control of flooding (use of gabions and healing of galleys) -Small scale rehabilitation of degraded water degraded water catchment areas	-Fully controlled flooding	- Construction of drainage systems -Rehabilitation of water catchment areas -Construction of check dams, and valleys
Waste management	Availability of waste collection trucks	Efficient collection and disposal of waste	Compaction of dumpsites Expanding waste collection area
			Increased enforcement, monitoring and evaluation of waste disposal practices

Nanyuki Ward

Hazard	Capacities		
	Existing capacities	**Required capacities**	**Gaps**
Drought related water shortage	Small planting Scale tree	Large planting Scale tree	-Capacity building on tree planting and growing -Large scale tree planting through collective effort -Reseeding of the denuded areas.
	Curbing deforestation at the local level	Deforestation control at a largescale	-Community sensitization -Capacity building -Strict surveillance and reporting to relevant authorities -Legal action
	Small scale Prevention of Emission of greenhouse gases	An area free of air pollution	-Community sensitization on prevention of any form of air pollution, however small. -Adoption of innovation (TIMPS) that areclimate smart
	Small scale communal control of gullies, reseeding of denuded areas	A well conserved environment	-Training in environmental conservation. -Proper stocking rates. -Proper natural resource management
	Small scale boreholes, small dams, small scaleroof harvesting	Availability of accessible water accessible water	-Drilling of boreholes -Desilting of dams -Rehabilitation and solarization ofexisting boreholes -Excavation of large water pans/ dams -Springs development and protection -Sensitization/ support in various waterharvesting technologies
	Small scale use of AI services	Ideal breeds of livestock for the environment that arehigh yielding	-Breeds improvement through AI
	Planting of drought tolerant crops at smallscale (planting once ayear/one season).	Have the right crops for the area and use of appropriate technology	-Provision of drought escaping crops' seeds -Training in better agronomic practicesideal for the area. -Introduction of appropriate technology.

	Small scale preservation of food for the dryseason	Enough food preserved to last the whole dryspell season	-Capacity building in food preservation techniques. -Cottage industries for preserving food/food products.
	Use of alternative source of income e.g. Small scale supplementation feeding of livestock & pasture production	Diversified form of livelihoods. Have enough reserve concentrates/ feed and supplements	- Trainings and engagement in different IGAs. -Support large scale pasture production -Storage of concentrates/supplements. -Feed/ Hay stores/storage facility. -Training in pasture production and conservation.
	Existence of small non-designated livestock markets	Well structured Modern livestock marketing systems/ infrastructure	-Construction of modern livestock markets and systems
	Existence of Ineffective Early warning systems	Well organized, efficient and effective early warning systems in the ward	-Development of warning systems Reliable early
	Inadequate and unreliable control of water usage	Adequate and effective control ofthe water usage along water catchment areas	-Controlled use of irrigation water -Organized distribution of irrigationwater
Crop pest and diseases	-Small scale use of chemicals to kill pests -Use of traditional methods	Complete eradicationof crop pests and related diseases	-Capacity building of members oncontrol and eradication of crop pests -Effective early warning systems -Actual control of pests by therelevant agencies
Poultry Disease	-Small scale irregularvaccination of poultry against diseases	-Complete eradication of poultry diseases	-Sensitization on vaccination anderadication of poultry disease -Systematic and regular vaccination of birds against diseases

	-Treatment of opportunistic infections		of birds against diseases -Research on disease resistant bird breeds
Fire	-A few firefighting equipment and knowledge	Efficient and equipment firefighting systems and infrastructure	-Acquisition of additional fire engine in every ward -Public awareness and training onfirefighting -Re-afforestation after fire damage -Proper planning of urban centres -Emergency kitty for compensationof the fire victims
Storm water floods	-Small scale control of flooding (use of gabions and healing of galleys) -Small scale rehabilitation of degraded water catchment areas	-Fully controlled flooding	- Construction of drainage systems -Rehabilitation of water catchment areas -Construction of check dams, and valleys
Waste managem ent	Availability of waste collection trucks	Efficient collection and disposal of waste	Compaction of dumpsites Expanding waste collection area
			Increased enforcement, monitoring and evaluation of waste disposal practices

Ngobit Ward

Hazard	**Capacities**		
	Existing capacities	**Required capacities**	**Gaps**

Drought	Small scale tree planting	Large scale tree planting	-Capacity building on tree planting and growing -Large scale tree planting throughcollective effort -Reseeding of the denuded areas.
	Curbing deforestationat the local level	Deforestation controlat a large scale	-Community sensitization -Capacity building -Strict surveillance and reporting torelevant authorities -Legal action
	Small scale preventionof emission of greenhouse gases	An area free of air pollution	-Community sensitization on prevention ofany form of air pollution, however small. -Adoption of innovation (TIMPS) that are climate smart
	Small scale communal control of gullies, reseeding of denuded areas	A well conserved environme nt	-Training in environmental conservation. -Proper stocking rates. -Proper natural resource management
	Small scale boreholes, small dams, small scale roof harvesting	Availability of accessible water	-Drilling of boreholes -Desilting of dams -Rehabilitation and solarization of existing
			boreholes -Excavation of large water pans/ dams -Springs development and protection -Water pipeline extension -Sensitization/ support in various water harvesting technologies
	Small scale use of AI services	Ideal breeds of livestock for the environment that are high yielding	-Breeds improvement through AI
	Planting of drought tolerant crops at small scale (planting once ayear/one season).	Have the right crops for the area and use of appropriate technology	-Provision of drought escaping crops'seeds -Training in better agronomic practicesideal for the area. -Introduction of appropriate technology.
	Small scale preservation of foodfor the dry season	Enough food preserved to last the whole dry spell season	-Capacity building in food preservation techniques. -Cottage industries for preserving food/food products.
	Use of alternative source of income e.g Honey/bee keeping,poulty	Diversified form of livelihoods.	- Trainings and engagement in different IGAs. - Provision of loans in the different IGAs.

	production.		
	Small scale supplementation feeding of livestock & pasture production	Have enough feed reserve and concentrates / supplements	-Support large scale pasture production -Storage of concentrates/ supplements. -Feed/ Hay stores/storage facility. -Training in pasture production and conservation.
	Existence of small non-designated livestock markets	Well structured modern livestock marketing systems/ infrastructure	-Construction of modern livestock markets and systems
	Existence of ineffective Early warning systems	Well organized, efficient and effective early warning systems in the ward	-Development of reliable early warning systems
	Inadequate and unreliable control of water usage	Adequate and effective control of the water usage along water catchment areas	-Controlled use of irrigation water -Organized distribution of irrigation water
Human-human conflict	meetings -Holding of joint peace barazas at a lower level -Meetings -Tradition norms -Dialogue	kumi/peace committees' systems. -Holding of joint peace frequent barazas Intercounty establishment of National police reserve -Structured laws stipulated in the Kenyans constitution. -Disarmament of illegal firearms -Community patrol vehicle	police posts -Capacity building of Nyumba kumi/peace committee - Continuous peace meetings -Coordination of intercounty peace committees. -The government to establish National Police Reserve. -Capacity building on constitution especially in the bill of right. -Capacity building on proper setting by-laws. -Illegal firearms disarmament to be conducted by government. Purchase of community patrol vehicles. Social cohesion e.g sporting activities among the youth and aged -Construction of social amenities -Improvement of stadiums -Strengthening of boundaries

	-Escaping by running -Migrating to the server places	-Well established infrastructure -The police posts to be established within the community	-Construction of good roads, bridges & mobile networks -Construction of police posts
	Weak fences in neighbouring ranches/ conservancies Small scale fencing	Strong electric fencesKWS camps	-Sensitize ranchers on building necessaryfencing -Electric fence installation around Lariakforest, Laikipia Nature conservancy andMarmanet forest -Build KWS camps -Raise community awareness on need to engage with KWS and private ranchers -Compensation of the affected families -Compensation of the affected families -Insurance policy -Compensation policy targeting conservancies -Corporate social responsibility
	Inadequate rangers in wildlife sanctuaries	-Strong presence of KWS personnel -Adequately staffedwild life sanctuaries	-Additional KWS officers and camps -Recruitment of adequate, well trained and properly armed rangers
	-Poor means of transport -Poor roads	-Tarmacked or all-weather murram roads	Grading and gravelling of roads in hotspotareas
	-Private patrol vehicles	-Community patrol	Acquisition of community patrol vehicles
	Existence of community that arenot well structured/ empowermen t	Well-coordinated and structured community organizations/syst ems that take care of the prevailing circumstances.	-Formation of the groups/ committee for various resources/ functions. -Capacity building in group dynamics. -Having constitution and by-laws.
	Poor communicatio nsystems	-Proper and modern communicatio n systems e.g Radio equipment	Acquisition and supply of moderncommunication systems

Fall Army Worm	-Small scale use of chemicals to kill FAW -Use of traditional methods	Complete eradicationof FAW and related crop pests	-Capacity building of members on controland eradication of crop pests -Effective early warning systems -Actual control of pests by the relevantagencies
Foot and MouthDisease	-Low knowledge andskills on disease management -Irregular vaccination -Restriction of waterpoints and grazing land	-Full knowledge andskills -Disease control. -Appropriate use of vaccines -Well Fenced wateringpoints and grazing lands	-Animal health trainings. -Regular vaccinations -Availing vaccines. -Open water points and grazing lands. -Fencing of all watering points.
New Castle Disease	-Small scale irregular vaccination of poultryagainst NCD -Treatment of opportunistic infections -Use of indigenous treatment herbs	-Complete eradication of NCD	-Sensitization on vaccination and eradication of NCD -Systematic and regular vaccination ofbirds against NCD -Research on NCD resistant breeds
Fire	-A few firefighting equipment and knowledge	Efficient and equipment firefighting systems and infrastructure	-Acquisition of additional fire engine inevery ward -Public awareness and training onfirefighting -Re-afforestation after fire damage -Proper planning of urban centres -Emergency kitty for compensation of the fire victims -Establishment of more hydrant points
Floods	-Small scale control of flooding (use of gabions and healing of galleys) -Small scale rehabilitation of	-Fully controlled flooding	- Construction of drainage systems -Rehabilitation of water catchment areas -Construction of check dams, lagas andvalleys

	degraded water catchment areas		
Frost	-Small scale sprayingwith fungicides -Planting frost resistantcrops -Small scale use of dripirrigation	Modern farming Technologies leadingto high yields of the crops.	-Up-scale use of fungicides -Up-scale drip irrigation -Planting frost tolerant crops

Mukogodo West

Hazard	**Capacities**		
	Current Situation	**Gaps**	**Solutions to be implemented**
Drought	Migration Planting drought resistant crops Drilling boreholes and water pans/dams construction Use of certified seeds Reduced Deforestation and improve re-afforestation Rearing of local breed livestock	Insufficient water for farming Inadequate knowledge and equipment for farming Lack of access to weather information	knowledge on improved Farming methods Increase water resources- Boreholes Support from extension officers Improved access to Weather information storage facilities Ecosystem restoration programs

Human disease	-one healthcare -clean water is only supplied From Ol-Pejeta ranch boreholes	-Inadequate health facilities -Insufficient points of clean and safe water	-Addition of health facilities -increase safe and clean water points boreholes -Water purification
Livestock Diseases	-Availability of Agrovets -limited Veterinary services -Local breeds -cattle dips infrastructure -equipped with knowledge On livestock management	-Easily accessible veterinary services -Working cattle dips -Few extension officers -Lack of sufficient clean water	-Revive extension services and facilities -Increase veterinary services -Linking farmers to VET officers -capacity development on improved livestock farming practices -Farmers exchange programs
Human Wildlife Conflicts-HWC	-Fencing	-adequate fencing -compensation	-Prompt compensation by KWS to affected persons -Identification and marking of migration routes -Fencing -Predator deterring mechanism

Umande

Hazard	Capacities		
	Existing capacities	Required capacities	Gaps
Drought	Small scale tree planting	Large scale tree planting	-Capacity building on tree planting and growing -Large scale tree planting through collective effort -Reseeding of the denuded areas.
	Curbing deforestation at the local level	Deforestation control at a large scale	-Community sensitization -Capacity building -Strict surveillance and reporting to relevant authorities -Legal action
	Small scale prevention of emission of greenhouse gases	An area free of air pollution	-Community sensitization on prevention of any form of air pollution, however small. -Adoption of innovation (TIMPS) that are climate smart
	Small scale communal control of gullies, reseeding of denuded areas	A well conserved environment	-Training in environmental conservation. -Proper stocking rates. -Proper natural resource management
	Small scale boreholes, small dams, small scale roof harvesting	Availability of accessible water	-Drilling of boreholes -Desilting of dams -Rehabilitation and solarization of existing boreholes -Excavation of large water pans/ dams -Springs development and protection

			-Water pipeline extension -Sensitization/ support in various water harvesting technologies
	Small scale use of AI services	Ideal breeds of livestock for the environment that are high yielding	-Breeds improvement through AI
	Planting of drought tolerant crops at small scale (planting once a year/one season).	Have the right crops for the area and use of appropriate technology	-Provision of drought escaping crops' seeds -Training in better agronomic practices ideal for the area. -Introduction of appropriate technology.
	Small scale preservation of food for the dry season	Enough food preserved to last the whole dry spell season	-Capacity building in food preservation techniques. -Cottage industries for preserving food/ food products.
	Use of alternative source of income e.g Honey/bee-keeping, poultry production.	Diversified form of livelihoods.	Trainings and engagement in different IGAs. Provision of loans in the different IGAs.
	Small scale supplementation feeding of livestock & pasture production	Have enough feed reserve and concentrates/ supplements	-Support large scale pasture production -Storage of concentrates/ supplements. -Feed/ Hay stores/storage facility. -Training in pasture production and conservation.

	Existence of small non- designated livestock markets	Well structured modern livestock marketing systems/ infrastructure	-Construction of modern livestock markets and systems
	Existence of ineffective Early warning systems	Well organized, efficient and effective early warning systems in the ward	-Development of reliable early warning systems
	Inadequate and unreliable control of water usage	Adequate and effective control of the water usage along water catchment areas	-Controlled use of irrigation water -Organized distribution of irrigation water
	Existence of community that are not well structured/ empowerment	Well-coordinated and structured community organizations/systems that take care of the prevailing circumstances.	-Formation of the groups/ committee for various resources/ functions. -Capacity building in group dynamics. -Having constitution and by-laws.
Human/ Wildlife conflicts	Weak fences in neighboring ranches/ conservancies Small scale fencing	Strong electric fences KWS camps	-Sensitize ranchers on building necessary fencing -Electric fence installation around Lariak forest, Laikipia Nature conservancy and Marmanet forest -Build KWS camps -Raise community awareness on need to engage with KWS and private ranchers -Compensation of the affected families -Compensation of the affected families -Compensation policy targeting conservancies

	Inadequate rangers in wildlife sanctuaries	-Strong presence of KWS personnel -Adequately staffed wild life sanctuaries	-Additional KWS officers and camps -Recruitment of adequate, well trained and properly armed rangers
	-Poor means of transport -Poor roads	-Tarmacked or all- weather murram roads	Grading and gravelling of roads in hotspot areas
	-Private patrol vehicles	-Community patrol vehicles	Acquisition of community patrol vehicles
	Poor communication systems	-Proper and modern communication systems e.g Radio equipment	Acquisition and supply of modern communication systems
New Castle Disease	-Small scale irregular vaccination of poultry against NCD -Treatment of opportunistic infections -Use of indigenous treatment herbs	-Complete eradication of NCD	-Sensitization on vaccination and eradication of NCD -Systematic and regular vaccination of birds against NCD -Research on NCD resistant breeds

Fall Army Worm	-Small scale use of chemicals to kill FAW -Use of traditional methods	Complete eradication of FAW and related crop pests	-Capacity building of members on control and eradication of crop pests -Effective early warning systems -Actual control of pests by the relevant agencies
Foot and Mouth Disease	-Low knowledge and skills on disease management -Irregular vaccination -Restriction of water points and grazing land	-Full knowledge and skills -Disease control. -Appropriate use of vaccines -Well Fenced watering points and grazing lands	-Animal health trainings. -Regular vaccinations -Availing vaccines. -Open water points and grazing lands. -Fencing of all watering points.
	-Operational veterinary livestock office (one officer shared by several locations)	-Fully equipped veterinary officer with at least 3 officers -Appropriate and adequate drugs Structures for the isolated animals	-Putting up a well-equipped veterinary office with 2 officers. -Additional appropriate and adequate drugs Proper structures for handling isolated animals

Human/ human conflicts	-Nyumba kumi meetings -Holding of joint peace barazas at a lower level -Meetings -Tradition norms -Dialogue	-Structured Nyumba kumi/peace committees' systems. -Holding of joint peace frequent barazas Intercounty establishment of National police reserve -Structured laws stipulated in the Kenyans constitution. -Disarmament of illegal firearms -Community patrol vehicle	-Construction of security infrastructure e.g police posts -Capacity building of Nyumba kumi/peace committee - Continuous peace meetings -Coordination of intercounty peace committees. -The government to establish National Police Reserve. -Capacity building on constitution especially in the bill of right. -Capacity building on proper setting by-laws. -Illegal firearms disarmament to be conducted by government. Purchase of community patrol vehicles. Social cohesion e.g sporting activities among the youth and aged -Construction of social amenities -Improvement of stadiums -Strengthening of boundaries
Fire	-A few firefighting equipment and knowledge	Efficient and equipment firefighting systems and infrastructure	-Acquisition of additional fire engine in every ward -Public awareness and training on firefighting -Re-afforestation after fire damage -Proper planning of urban centres -Emergency kitty for compensation of the fire victims -Establishment of more hydrant points

Floods	-Small scale control of flooding (use of gabions and healing of galleys) -Small scale rehabilitation of degraded water catchment areas	-Fully controlled flooding	- Construction of drainage systems -Rehabilitation of water catchment areas -Construction of check dams, lagas and valleys
Frost	-Small scale spraying with fungicides -Planting frost resistant crops -Small scale use of drip irrigation	Modern farming Technologies leading to high yields of the crops.	-Up-scale use of fungicides -Up-scale drip irrigation -Planting frost tolerant crops

Githiga Ward

Hazard	**Capacities**		
	Existing capacities	**Required capacities**	**Gaps**
Drought	Small scale tree planting	Large scale tree planting	-Capacity building on tree planting and growing -Large scale tree planting through collective effort -Reseeding of the denuded areas.
	Curbing deforestation at the local level	Deforestation control at a large scale	-Community sensitization -Capacity building -Strict surveillance and reporting to relevant authorities -Legal action

	Small scale prevention of emission of greenhouse gases	An area free of air pollution	-Community sensitization on prevention of any form of air pollution, however small. -Adoption of innovation (TIMPS) that are climate smart
	Small scale communal control of gullies, reseeding of denuded areas	A well conserved environment	-Training in environmental conservation. -Proper stocking rates. -Proper natural resource management
	Small scale boreholes, small dams, small scale roof harvesting	Availability of accessible water	-Drilling of boreholes -Desilting of dams -Rehabilitation and solarization of existing boreholes -Excavation of large water pans/ dams -Springs development and protection -Water pipeline extension -Sensitization/ support in various water harvesting technologies
	Small scale use of AI services	Ideal breeds of livestock for the environment that are high yielding	-Breeds improvement through AI
	Planting of drought tolerant crops at small scale (planting once a year/one season).	Have the right crops for the area and use of appropriate technology	-Provision of drought escaping crops' seeds -Training in better agronomic practices ideal for the area.

			-Introduction of appropriate technology.
	Small scale preservation of food for the dry season	Enough food preserved to last the whole dry spell season	-Capacity building in food preservation techniques. -Cottage industries for preserving food/ food products.
	Use of alternative source of income e.g Honey/bee-	Diversified form of livelihoods.	Trainings and engagement in different IGAs. Provision of loans in the different IGAs.
	Small scale supplementation feeding of livestock & pasture production	Have enough feed reserve and concentrates/ supplements	-Support large scale pasture production -Storage of concentrates/ supplements. -Feed/ Hay stores/storage facility. -Training in pasture production and conservation.
	Existence of small non- designated livestock markets	Well structured modern livestock marketing systems/ infrastructure	-Construction of modern livestock markets and systems
	Existence of ineffective Early warning systems	Well organized, efficient and effective early warning systems in the ward	-Development of reliable early warning systems
	Inadequate and unreliable control of water usage	Adequate and effective control of the water usage along	-Controlled use of irrigation water -Organized distribution of irrigation water

		water catchment areas	
	Existence of community that are not well structured/ empowerment	Well-coordinated and structured community organizations/systems that take care of the prevailing circumstances.	-Formation of the groups/ committee for various resources/ functions. -Capacity building in group dynamics. -Having constitution and by-laws.
Human/ human conflicts	-Nyumba kumi meetings -Holding of joint peace barazas at a lower level -Meetings -Tradition norms -Dialogue	-Structured Nyumba kumi/peace committees' systems. -Holding of joint peace frequent barazas Intercounty establishment of National police reserve -Structured laws stipulated in the Kenyans constitution. -Disarmament of illegal firearms -Community patrol vehicle	-Construction of security infrastructure e.g police posts -Capacity building of Nyumba kumi/peace committee - Continuous peace meetings -Coordination of intercounty peace committees. -The government to establish National Police Reserve. -Capacity building on constitution especially in the bill of right. -Capacity building on proper setting by- laws. -Illegal firearms disarmament to be conducted by government. Purchase of community patrol vehicles. Social cohesion e.g sporting activities among the youth and aged -Construction of social amenities -Improvement of stadiums -Strengthening of boundaries
	-Escaping by running	-Well established infrastructure	-Construction of good roads, br networks -Construction of police posts

	-Migrating to the server places	-The police posts to be established within the community	
Human/ Wildlife conflicts	Weak fences in neighbouring ranches/ conservancies Small scale fencing	Strong electric fences KWS camps	-Sensitize ranchers on building -Electric fence installation around Laikipia Nature conservancy an -Build KWS camps -Raise community awareness of KWS and private ranchers -Compensation of the affected -Compensation of the affected -Insurance policy -Compensation policy targeting -Corporate social responsibility
	Inadequate rangers in wildlife sanctuaries	-Strong presence of KWS personnel -Adequately staffed wild life sanctuaries	-Additional KWS officers and ca -Recruitment of adequate, well armed rangers
	-Poor means of transport -Poor roads -Private patrol vehicles Poor communication systems	-Tarmacked or all-weather murram roads -Community patrol vehicles -Proper and modern communication systems e.g Radio equipment	Grading and gravelling of roads Acquisition of community patrol Acquisition and supply of mod systems
Fall Army Worm	-Small scale use of chemicals to kill FAW	Complete eradication of FAW and related crop pests	-Capacity building of members eradication of crop pests -Effective early warning system -Actual control of pests by the

	-Use of traditional methods		
Foot and Mouth Disease	-Low knowledge and skills on disease management -Irregular vaccination -Restriction of water points and grazing land	-Full knowledge and skills -Disease control. -Appropriate use of vaccines -Well Fenced watering points and grazing lands	-Animal health trainings. -Regular vaccinations -Availing vaccines. -Open water points and grazing -Fencing of all watering points.
	-Operational veterinary livestock office (one officer shared by several locations)	-Fully equipped veterinary officer with at least 3 officers -Appropriate and adequate drugs Structures for the isolated animals	-Putting up a well-equipped veterinary office with 2 officers. -Additional appropriate and adequate drugs Proper structures for handling isolated animals
	-Operational veterinary livestock office (one officer shared by several locations)	-Fully equipped veterinary officer with at least 3 officers -Appropriate and adequate drugs Structures for the isolated animals	-Putting up a well-equipped veterinary office with 2 officers. -Additional appropriate and adequate drugs Proper structures for handling isolated animals
New Castle Disease	-Small scale irregular vaccination of poultry against NCD -Treatment of opportunistic infections -Use of indigenous treatment herbs	-Complete eradication of NCD	-Sensitization on vaccination and eradication of NCD -Systematic and regular vaccination of birds against NCD -Research on NCD resistant breeds

Fire	-A few firefighting equipment and knowledge	Efficient and equipment firefighting systems and infrastructure	-Acquisition of additional fire engine in every ward -Public awareness and training on firefighting -Re-afforestation after fire damage -Proper planning of urban centres -Emergency kitty for compensation of the fire victims -Establishment of more hydrant points
Floods	-Small scale control of flooding (use of gabions and healing of galleys) -Small scale rehabilitation of degraded water catchment areas	-Fully controlled flooding	- Construction of drainage systems -Rehabilitation of water catchment areas -Construction of check dams, lagas and valleys
Frost	-Small scale spraying with fungicides -Planting frost resistant crops -Small scale use of drip irrigation	Modern farming Technologies leading to high yields of the crops.	-Up-scale use of fungicides -Up-scale drip irrigation -Planting frost tolerant crops

Igwamiti Ward

Hazard	Capacities		
	Existing capacities	Required capacities	Gaps
Drought	Small scale tree planting	Large scale tree planting	-Capacity building on tree planting and growing -Large scale tree planting through collective effort

			-Reseeding of the denuded areas.
	Curbing deforestation at the local level	Deforestation control at a large scale	-Community sensitization -Capacity building -Strict surveillance and reporting to relevant authorities -Legal action
	Small scale prevention of emission of greenhouse gases	An area free of air pollution	-Community sensitization on prevention of any form of air pollution, however small. -Adoption of innovation (TIMPS) that are climate smart
	Small scale communal control of gullies, reseeding of denuded areas	A well conserved environment	-Training in environmental conservation. -Proper stocking rates. -Proper natural resource management
	Small scale boreholes, small dams, small scale roof harvesting	Availability of accessible water	-Drilling of boreholes -Desilting of dams -Rehabilitation and solarization of existing boreholes -Excavation of large water pans/ dams -Springs development and protection -Water pipeline extension

			-Sensitization/ support in various water harvesting technologies
	Small scale use of AI services	Ideal breeds of livestock for the environment that are high yielding	-Breeds improvement through AI
	Planting of drought tolerant crops at small scale (planting once a year/one season).	Have the right crops for the area and use of appropriate technology	-Provision of drought escaping crops' seeds -Training in better agronomic practices ideal for the area. -Introduction of appropriate technology.
	Small scale preservation of food for the dry season	Enough food preserved to last the whole dry spell season	-Capacity building in food preservation techniques. -Cottage industries for preserving food/ food products.
	Use of alternative source of income e.g Honey/bee-keeping, poultry production.	Diversified form of livelihoods.	Trainings and engagement in different IGAs. Provision of loans in the different IGAs.

	Small scale supplementation feeding of livestock & pasture production	Have enough feedreserve and concentrates/ supplements	-Support large scale pasture production -Storage of concentrates/ supplements. -Feed/ Hay stores/storage facility.

			-Training in pasture production and conservation.
	Existence of small non-designated livestock markets	Well structured modern livestock marketing systems/ infrastructure	-Construction of modern livestock markets and systems
	Existence of ineffective Early warning systems	Well organized, efficient and effective early warning systemsin the ward	-Development of reliable early warningsystems
	Inadequate and unreliable control of water usage	Adequate and effective control of thewater usage along water catchment areas	-Controlled use of irrigation water -Organized distribution of irrigation water
	Existence of community that are not well structured/ empowerment	Well-coordinated and structured community organizations/systemsthat take care of the prevailing circumstances.	-Formation of the groups/ committee forvarious resources/ functions. -Capacity building in group dynamics. -Having constitution and by-laws.

Human/ human conflicts	-Nyumba kumi meetings -Holding of joint peace barazas at a lower level -Meetings -Tradition norms -Dialogue	-Structured Nyumba kumi/peace committees' systems. -Holding of joint peacefrequent barazas Intercounty establishment of National police reserve -Structured laws stipulated in the Kenyans constitution. -Disarmament ofillegal firearms -Community patrolvehicle	-Construction of security infrastructure e.g police posts -Capacity building of Nyumba kumi/peace committee - Continuous peace meetings -Coordination of intercounty peace committees. -The government to establish NationalPolice Reserve. -Capacity building on constitution especially in the bill of right. -Capacity building on proper setting by-laws. -Illegal firearms disarmament to be conducted by government. Purchase of community patrol vehicles.Social cohesion e.g sporting activities among the youth and aged

			-Construction of social amenities -Improvement of stadiums -Strengthening of boundaries
Human/ Wildlife conflicts	-Escaping by running -Migrating to the server places	Well established infrastructure -The police posts to be established within the community	-Construction of good roads, br networks -Construction of police posts

	Weak fences in neighbouring ranches/ conservancies Small scale fencing	Strong electric fences KWS camps	-Sensitize ranchers on building -Electric fence installation arou Laikipia Nature conservancy an -Build KWS camps -Raise community awareness o KWS and private ranchers -Compensation of the affected -Compensation of the affected
	Inadequate rangers in wildlife sanctuaries	-Strong presence of KWS personnel -Adequately staffed wild life sanctuaries	-Additional KWS officers -Recruitment of adequate, well armed rangers

	-Poor means of transport -Poor roads	-Tarmacked or all-weather murram roads	Grading and gravelling of roads
	-Private patrol vehicles	-Community patrol vehicles	Acquisition of community patrol vehicles

	Poor communication systems	-Proper and modern communication systems e.g Radio equipment	Acquisition and supply of mod systems
Fall Army Worm	-Small scale use of chemicals to kill FAW -Use of traditional methods	Complete eradication of FAW and related crop pests	-Capacity building of members eradication of crop pests -Effective early warning system -Actual control of pests by the

Foot and Mouth Disease	-Low knowledge and skills on disease management -Irregular vaccination -Restriction of water points and grazing land	-Full knowledge and skills -Disease control. -Appropriate use of vaccines -Well Fenced watering points and grazing lands	-Animal health trainings. -Regular vaccinations -Availing vaccines. -Open water points and grazing -Fencing of all watering points.
	-Operational veterinary livestock office (one officer shared by several locations)	-Fully equipped veterinary officer with at least 3 officers -Appropriate and adequate drugs Structures for the isolated animals	-Putting up a well-equipped veterinary office with 2 officers. -Additional appropriate and adequate drugs Proper structures for handling isolated animals

	-Operational veterinary livestock office (one officer shared by several locations)	-Fully equipped veterinary officer with at least 3 officers -Appropriate and adequate drugs Structures for the isolated animals	-Putting up a well-equipped veterinary office with 2 officers. -Additional appropriate and adequate drugs Proper structures for handling isolated animals
New Castle Disease	-Small scale irregular vaccination of poultry against NCD -Treatment of opportunistic infections -Use of indigenous treatment herbs	-Complete eradication of NCD	-Sensitization on vaccination and eradication of NCD -Systematic and regular vaccination of birds against NCD -Research on NCD resistant breeds

Fire	-A few firefighting equipment and knowledge	Efficient and equipment firefighting systems and infrastructure	-Acquisition of additional fire engine in every ward -Public awareness and training on firefighting -Re-afforestation after fire damage -Proper planning of urban centres -Emergency kitty for compensation of the fire victims -Establishment of more hydrant points
Floods	-Small scale control of flooding (use of gabions and healing of galleys) -Small scale rehabilitation of degraded water catchment areas	-Fully controlled flooding	- Construction of drainage systems -Rehabilitation of water catchment areas -Construction of check dams, lagas and valleys

Frost	-Small scale spraying with fungicides -Planting frost resistant crops -Small scale use of drip irrigation	Modern farming Technologies leading to high yields of the crops.	-Up-scale use of fungicides -Up-scale drip irrigation -Planting frost tolerant crops

Marmanet Ward

Hazard	Capacities		
	Existing capacities	Required capacities	Gaps
Drought	Small scale tree planting	Large scale tree planting	-Capacity building on tree planting and growing -Large scale tree planting through collective effort -Reseeding of the denuded areas.
	Curbing deforestation at the local level	Deforestation control at a large scale	-Community sensitization -Capacity building -Strict surveillance and reporting to relevant authorities -Legal action
	Small scale prevention of emission of greenhouse gases	An area free of air pollution	-Community sensitization on prevention of any form of air pollution, however small. -Adoption of innovation (TIMPS) that are climate smart
	Small scale communal control of gullies, reseeding of denuded areas	A well conserved environment	-Training in environmental conservation. -Proper stocking rates. -Proper natural resource management

	Small scale boreholes, small dams, small scale roof harvesting	Availability of accessible water	-Drilling of boreholes -Desilting of dams -Rehabilitation and solarization of existing boreholes -Excavation of large water pans/ dams -Springs development and protection -Water pipeline extension -Sensitization/ support in various water harvesting technologies
	Small scale use of AI services	Ideal breeds of livestock for the environment that are high yielding	-Breeds improvement through AI
	Planting of drought tolerant crops at small scale (planting once a year/one season).	Have the right crops for the area and use of appropriate technology	-Provision of drought escaping crops' seeds -Training in better agronomic practices ideal for the area. -Introduction of appropriate technology.
	Small scale preservation of food for the dry season	Enough food preserved to last the whole dry spell season	-Capacity building in food preservation techniques. -Cottage industries for preserving food/ food products.
	Use of alternative source of income e.g Honey/bee-keeping, poultry production.	Diversified form of livelihoods.	Trainings and engagement in different IGAs. Provision of loans in the different IGAs.

	Small scale supplementation feeding of livestock & pasture production	Have enough feed reserve and concentrates/ supplements	-Support large scale pasture production -Storage of concentrates/ supplements. -Feed/ Hay stores/storage facility. -Training in pasture production and conservation.
	Existence of small non- designated livestock markets	Well structured modern livestock marketing systems/ infrastructure	-Construction of modern livestock markets and systems
	Existence of ineffective Early warning systems	Well organized, efficient and effective early warning systems in the ward	-Development of reliable early warning systems
	Inadequate and unreliable control of water usage	Adequate and effective control of the water usage along water catchment areas	-Controlled use of irrigation water -Organized distribution of irrigation water
	Existence of community that are not well structured/ empowerment	Well-coordinated and structured community organizations/systems that take care of the prevailing circumstances.	-Formation of the groups/ committee for various resources/ functions. -Capacity building in group dynamics. -Having constitution and by-laws.

Human/ human conflicts	-Nyumba kumi meetings -Holding of joint peace barazas at a lower level -Meetings -Tradition norms -Dialogue -Escaping by running	-Structured Nyumba kumi/peace committees' systems. -Holding of joint peace frequent barazas Intercounty establishment of National police reserve -Structured laws stipulated in the Kenyans constitution. -Disarmament of illegal firearms -Community patrol vehicle -Well established	-Construction of security infrastructure e.g police posts -Capacity building of Nyumba kumi/peace committee - Continuous peace meetings -Coordination of intercounty peace committees. -The government to establish National Police Reserve. -Capacity building on constitution especially in the bill of right. -Capacity building on proper setting by-laws. -Illegal firearms disarmament to be conducted by government. Purchase of community patrol vehicles. Social cohesion e.g sporting activities among the youth and aged -Construction of social amenities -Improvement of stadiums -Strengthening of boundaries -Construction of good roads, bridges &-Construction of good roads, br networks

			-Construction of police posts

	-Escaping by running -Migrating to the server places	-Well established infrastructure -The police posts to be established within the community	
Human/ Wildlife conflicts	Weak fences in neighbouring ranches/ conservancies Small scale fencing	Strong electric fences KWS camps	-Sensitize ranchers on building -Electric fence installation around Laikipia Nature conservancy an -Build KWS camps -Raise community awareness o KWS and private ranchers -Compensation of the affected -Compensation of the affected -Insurance policy -Compensation policy targeting -Corporate social responsibility
	Inadequate rangers in wildlife sanctuaries	-Strong presence of KWS personnel -Adequately staffed wild life sanctuaries	-Additional KWS officers and ca -Recruitment of adequate, wel armed rangers
	-Poor means of transport -Poor roads	-Tarmacked or all-weather murram roads	Grading and gravelling of roads
	-Private patrol vehicles	-Community patrol vehicles	Acquisition of community patrol
	Poor communication systems	-Proper and modern communication systems e.g	Acquisition and supply of mod systems

		Radio equipment	
Fall Army Worm	-Small scale use of chemicals to kill FAW -Use of traditional methods	Complete eradication of FAW and related crop pests	-Capacity building of members eradication of crop pests -Effective early warning system -Actual control of pests by the
Foot and Mouth Disease	-Low knowledge and skills on disease management -Irregular vaccination -Restriction of water points and grazing land	-Full knowledge and skills -Disease control. -Appropriate use of vaccines -Well Fenced watering points and grazing lands	-Animal health trainings. -Regular vaccinations -Availing vaccines. -Open water points and grazin -Fencing of all watering points.
	-Operational veterinary livestock office (one officer shared by several locations)	-Fully equipped veterinary officer with at least 3 officers -Appropriate and adequate drugs Structures for the isolated animals	-Putting up a well-equipped veterinary office with 2 officers. -Additional appropriate and adequate drugs Proper structures for handling isolated animals

	-Operational veterinary livestockoffice (one officer shared by several locations)	-Fully equipped veterinary officer withat least 3 officers -Appropriate and adequate drugs Structures for the isolated animals	-Putting up a well-equipped veterinary office with 2 officers. -Additional appropriate and adequatedrugs Proper structures for handling isolated animals

New Castle Disease	-Small scale irregular vaccination of poultry against NCD -Treatment of opportunistic infections -Use of indigenous treatment herbs	-Complete eradicationof NCD	-Sensitization on vaccination and eradication of NCD -Systematic and regular vaccination of birds against NCD -Research on NCD resistant breeds
Fire	-A few firefighting equipment and knowledge	Efficient and equipment firefighting systemsand infrastructure	-Acquisition of additional fire engine inevery ward -Public awareness and training on firefighting -Re-afforestation after fire damage -Proper planning of urban centres -Emergency kitty for compensation of thefire victims -Establishment of more hydrant points
Floods	-Small scale control offlooding (use of gabions and healing ofgalleys) -Small scale rehabilitation ofdegraded water	-Fully controlled flooding	- Construction of drainage systems -Rehabilitation of water catchment areas -Construction of check dams, lagas and valleys

	catchment areas		
Frost	-Small scale sprayingwith fungicides -Planting frost resistantcrops -Small scale use of dripirrigation	Modern farming Technologies leadingto high yields of the crops.	-Up-scale use of fungicides -Up-scale drip irrigation -Planting frost tolerant crops

Sossian Ward

Hazard	Capacities		
	Current Situation	**Gaps**	**Solutions to be implemented**
Drought	-Migration -Planting drought resistant crops -Drilling boreholes and water pans/dams construction -Use of certified seeds -Reduced Deforestation and improve re-afforestation -Rearing of local breed livestock	Insufficient water for farming Inadequate knowledge and equipment for farming In sufficient extension services and partners to transfer the required technologies in terms of funds, equipment and machineries	-knowledge on improved farming methods -Increase water resources-boreholes -Support from extension officers -Improved access to weather information -storage facilities -Ecosystem restoration programs

Floods	-Provision of relief food -Evacuation of people and livestock -Increased production of tree crops and pasture -Increased water harvesting through water pans and dams -Destruction of property	-Treatment of drinking water -Water treatment equipment and chemicals	-Enhanced effective water treatmenttechnologies -Efficient repair of damaged structures and other infrastructureseg roads, dams.
Livestock Diseases	-Availability of Agrovets -limited Veterinary services -Local breeds -cattle dips infrastructure -equipped with knowledge onlivestock management	-Easily accessible veterinary services -Working cattle dips -Few veterinary extension officers -Lack of sufficient clean water -No regulated livestock movement -Vaccinations required	-Revive extension services and facilities -Increase veterinary services -Linking farmers to VET officers -capacity development on improved livestock farming practices and breeds -Farmers exchange programs -enhance regulated livestock movement
	-Private patrol vehicles	-Community patrol vehicles	Acquisition of community patrol vehicles
	Poor communicationsystems	-Proper and modern	Acquisition and supply of moderncommunication

		communication systems e.g Radio equipment	systems
Fall Army Worm	-Small scale use of chemicals to kill FAW -Use of traditional methods	Complete eradicationof FAW and related crop pests	-Capacity building of members on controland eradication of crop pests -Effective early warning systems -Actual control of pests by the relevant agencies
Foot and Mouth Disease	-Low knowledge andskills on disease management -Irregular vaccination -Restriction of water points and grazing land	-Full knowledge andskills -Disease control. -Appropriate use of vaccines -Well Fenced wateringpoints and grazing lands	-Animal health trainings. -Regular vaccinations -Availing vaccines. -Open water points and grazing lands. -Fencing of all watering points.

Salama Ward

Hazard	Capacities		
	Current Situation	Gaps	Solutions to be implemented

Drought	-Migration -Planting drought resistant crops -Drilling boreholes and water pans/dams construction -Use of certified seeds -Reduced Deforestation and improve re- afforestation -Rearing of local breed livestock	-Insufficient water for farming -Inadequate knowledge and equipment for farming In sufficient extension services and partners to transfer the required technologies in terms of funds, equipment and machineries	-knowledge on improved farming methods -Increase water resources-boreholes -Support from extension officers -Improved access to weather information -storage facilities -Ecosystem restoration programs
Human disease	-Three healthcare facilities -clean water is only from the roof water harvesting (through tanks)	-Inadequate health facilities -Insufficient points of clean and safe water	-Addition of health facilities -increase safe and clean water points boreholes -Water purification

Human disease	-Three healthcare facilities -clean water is only from the roof water harvesting (through tanks)	-Inadequate health facilities -Insufficient points of clean and safe water	-Addition of health facilities -increase safe and clean water points boreholes -Water purification

	- boreholes		
Livestock Diseases	-Availability of Agrovets -limited Veterinary services -Local breeds -cattle dips infrastructure -equipped with knowledge on livestock management	-Easily accessible veterinary services -Working cattle dips -Few extension officers -Lack of sufficient clean water -No regulated livestock movement	-Revive extension services and facilities -Increase veterinary services -Linking farmers to VET officers -capacity development on improved livestock farming practices and breeds -Farmers exchange programs -enhance regulated livestock movement
Human Wildlife Conflicts- HWC	-Electric fences in ADC Mutara and Ol pajeta	-adequate fencing -compensation	-Prompt compensation by KWS to affected persons -Identification and marking of migration routes -Fencing -Predator deterring mechanism

Ol Moran Ward

Hazard	**Capacities**		
	Current Situation	**Gaps**	**Solutions to be implemented**

Drought	-Migration -Planting drought resistantcrops -Drilling boreholesand water pans/dams construction -Use of certified seeds -Reduced Deforestation andimprove re-afforestation -Rearing of local breed livestock	-Insufficient water for farming -Inadequate knowledge and equipment for farming In sufficient extension services and partners to transfer the required technologies in terms of funds, equipment and machineries	-knowledge on improvedfarming methods -Increase water resources- boreholes -Support from extension officers -Improved access to weather information -storage facilities -Ecosystem restoration programs
Locust Invasion	-Aerial spraying -Scaring them away withdrums and smoke	-Inadequate spraying technologies	-Localized spraying programs

Livestock Diseases	-Availability of Agrovets -limited Veterinary services -Local breeds -cattle dips infrastructure - equipped with knowled ge on livestock manage ment	-Easily accessible veterinary services -Working cattle dips -Few veterinary extension officers -Lack of sufficient clean water -No regulated livestock movement -Vaccinations required	-Revive extension services and facilities -Increase veterinary services -Linking farmers to VET officers -capacity development on improved livestock farming practices and breeds -Farmers exchange programs -enhance regulated livestock movement
Crops, Pests and Diseases	-Resistant crop varieties to pest and diseases -Good agricultural practices -Extension services -Control and management of pests and diseases	-Inadequate extension services -Inadequate research and extension liaison to come up with resistant crops variety.	-Enhanced extension services -Enhanced research on resistant varieties of crops -Enhanced agricultural information dissemination through public private partnership and digital technologies.

Environmental Degradation	-Establishing of tree nurseries and growing for both exotic, indigenous andagro-forestry trees -Establishing soil and water conservation structures e.g., gabions, terraces -Charcoal burning -Destruction of water catchment areas	-Inadequate information on how to control and establish the structures - Inadequ ate funding by the relevant stakehol ders	-Enhance information transfers torelevant stakeholders -Regulate charcoal burning -Enhance establishment of tree growing and soil conservation structures -
Human Wildlife Conflicts-HWC	-Electric fences in Lariakand Laikipia Nature Conservancy	-adequate fencing -compensation	-Prompt compensation by KWS to affected persons -Identification and marking of migration routes
Human-human Conflict- HHC	-Establishment of peace committees -Establishment of peacecaravan -Intervention of securityorgans by County and National Government	-Inadequate capacity for the communitypeace committee	-Enhance on capacity building for the peace committees

	Current Situation	Gaps	Solutions to be implemented
Drought	-Migration -Planting drought resistant crops -Drilling boreholes and waterpans/dams construction -Use of certified seeds -Reduced Deforestation and improve re-afforestation -Rearing of local breed livestock	-Insufficient water for farming -Inadequate knowledge and equipment for farming -Lack of access to weather information	-knowledge on improved farming methods -Increase water resources- boreholes -Support from extension officers -Improved access to weather information -storage facilities -Ecosystem restoration programs
Human disease	-one healthcare -clean water is only supplied from Ol Pejeta ranch boreholes	-Inadequate health facilities -Insufficient points of clean and safe water	-Addition of health facilities -increase safe and clean water Points boreholes -Water purification
Livestock Diseases	-Availability of Agrovets -limited Veterinary services -Local breeds -cattle dips infrastructure -equipped with knowledge on livestock management	-Easily accessible veterinary services -Working cattle dips -Few extension officers -Lack of sufficient clean water	-Revive extension services and facilities -Increase veterinary services -Linking farmers to VET officers -capacity development on improved livestock farming practices -Farmers exchange programs

Human Wildlife Conflicts- HWC	-fencing	-adequate fencing -compensation	-Prompt compensation by KWS to affected persons -Identification and marking of migration routes -Fencing -Predator deterring mechanism
Crop Pests and Diseases	-Availability of agrovets	-Inadequate extension officers -Early surveillance on possible	-increase agricultural extension officers

Mukogodo East

Crop Pests and Diseases	-Availability of agrovets -Availability of certified seeds -Availability of agricultural offices	-Inadequate extension officers -Early surveillance on possiblebreak out of diseases -inadequate knowledge oncontrol of the pests anddiseases	-increase agricultural extensionofficers -Capacity development on control ofpests and diseases. -Increase number of extension officers reaching out to community members
Environmental degradation	-conservation of rangelands	-Land use plans -Limited knowledge on conservation and restoration -limited knowledge on improved farming practices -limited knowledge on natural resource management	-develop land use plans and enforcethem -Capacity development on naturalresource management, restoration andimproved farming practices. -Ecosystem restoration programs

Invasive species	-labour -Manpower -Data	Knowledge on control mechanisms	-Partnership with research institute to device mechanisms of control -Sensitization and awareness of effective control mechanism

Rumuruti Ward

Hazard	**Capacities**		
	Current Situation	**Gaps**	**Solutions to be implemented**
Drought	-Migration -Planting drought resistant crops -Drilling boreholes and water pans/dams construction -Use of certified seeds -Reduced Deforestation and improve re-afforestation -Rearing of local breed livestock	-Insufficient water for farming -Inadequate knowledge and equipment for farming In sufficient extension services and partners to transfer the required technologies in terms of funds, equipment and machineries	-knowledge on improved farming methods -Increase water resources-boreholes -Support from extension officers -Improved access to weather information -storage facilities -Ecosystem restoration programs
	-Charcoal burning -Destruction of water catchment areas	stakeholders	
Human Wildlife	-Electric fences in Lariak and Laikipia	-adequate fencing -compensation	-Prompt compensation by

Conflicts-HWC	Nature Conservancy		KWS to affected persons -Identification and marking of migration routes -Fencing -Predator deterring mechanism
Human-human Conflict-HHC	-Establishment of peace committees -Intervention of security organs by County and National Government	-Inadequate capacity for the community peace committee	-Enhance on capacity building for the peace committees

Tigithi Ward

Hazard	**Capacities**		
	Current Situation	**Gaps**	**Solutions to be implemented**
Drought	-Migration -Planting drought resistantcrops -Drilling boreholes and water pans/dams construction -Use of certified seeds -Reduced Deforestation andimprove re-afforestation	-Insufficient water forfarming -Inadequate knowledge andquipment for farming In sufficient extension servicesand partners to transfer the required technologies in terms of funds, equipment and	-knowledge on improved farming methods -Increase water resources-boreholes -Support from extension officers -Improved access to weather information -storage facilities -Ecosystem restoration programs

	-Rearing of local breedlivestock	machineries	
Floods	-Provision of relief food -Evacuation of peopleand livestock -Increased productionof tree crops and pasture -Increased water harvesting through water pans and dams -Destruction of property	-Treatment of drinking water -Water treatment equipment and chemicals	-Enhanced effective water treatmenttechnologies -Efficient repair of damaged structuresand other infrastructures eg roads, dams.
Livestock Diseases	-Availability of Agrovets -limited Veterinary services -Local breeds -cattle dips infrastructure -equipped with knowledge on livestock management	-Easily accessible veterinary services -Working cattle dips -Few veterinary extension officers -Lack of sufficient clean water -No regulated livestock movement -Vaccinations required	-Revive extension services andfacilities -Increase veterinary services -Linking farmers to VET officers -capacity development on improved livestock farmingpractices and breeds -Farmers exchange programs -enhance regulated livestock movement

Crops, Pests and Diseases	-Resistant crop varieties to pest and diseases -Good agricultural practices -Extension services	-Inadequate extension services -Inadequate research and extension liaison	-Enhanced extension services -Enhanced research on resistantvarieties of crops -Enhanced agricultural information dissemination through public private
Crops, Pestsand Diseases	-Resistant crop varieties to pest and diseases -Good agricultural practices -Extension services -Control and management of pests and diseases	-Inadequate extension services -Inadequate research and extension liaisonto come up withresistant crops variety.	-Enhanced extension services -Enhanced research on resistantvarieties of crops -Enhanced agricultural information dissemination through public privatepartnership and digital technologies.
Environmental Degradation and pollution	-Establishing of tree nurseries and growing forboth exotic, indigenous and agro-forestry trees -Establishing soil and water conservation structures e.g., gabions,terraces -Charcoal burning -Destruction of watercatchment areas	-Inadequate information on how to control and establish the structures - Inadequate funding by therelevant stakeholders	-Enhance information transfers to relevant stakeholders -Regulate charcoal burning -Enhance establishment of treegrowing and soil conservation structures -
Human Wildlife Conflicts-HWC	-Electric fences in Lariakand Laikipia Nature Conservancy -Establishment of peacecommittees -Intervention of securityorgans by County and National Government	-adequate fencing -compensation - Inadequate capacityfor the community peace committee	-Prompt compensation byKWS to affected persons -Identification and marking of migration routes Fencing -Predator deterring mechanism

Segera Ward

Hazard	**Capacities**		
Drought	**Current Situation**	**Gaps**	**Solutions to be implemented**
	-Migration -Planting drought resistant crops -Drilling boreholes and water pans/dams construction -Use of certified seeds -Reduced Deforestation and improve re-afforestation -Rearing of local breed livestock	-Insufficient water for farming -Inadequate knowledge and equipment for farming -Lack of access to weather information	-knowledge on improved farming methods -Increase water resources-boreholes -Support from extension officers -Improved access to weather information -storage facilities -Ecosystem restoration programs
Human disease	-one healthcare -clean water is only supplied from Ol Pejeta ranch boreholes	-Inadequate health facilities - Insufficient points of clean and safe water	-Addition of health facilities -increase safe and clean water points boreholes -Water purification
Livestock Diseases	-Availability of Agrovets -limited Veterinary services -Local breeds -cattle dips infrastructure -equipped with knowledge on livestock management	-Easily accessible veterinary services -Working cattle dips -Few extension officers -Lack of sufficient clean water	-Revive extension services and facilities -Increase veterinary services -Linking farmers to VET officers -capacity development on improved livestock farming practices - Farmers exchange progra

Human Wildlife Conflicts- HWC	-fencing	-adequate fencing -compensation	-Prompt compensation by KWS to affected persons -Identification and marking of migration routes -Fencing
Crop Pests and Diseases	-Availability of agrovets -Availability of certified seeds -Availability of agricultural offices	- Inadequate extension officers - Early surveillance on possible break out of diseases - inadequate knowledge on control of the pests and diseases	-increase agricultural extension officers -Capacity development on control of pests and diseases. -Increase number of extension officers reaching out to community members
Environmental degradation	-conservation of rangelands	-Land use plans - Limited knowledge on conservation and restoration -limited knowledge on improved farming practices -limited knowledge on natural resource management	-develop land use plans and enforce them -Capacity development on natural resource management, restoration and improved farming practices. -Ecosystem restoration Programs
Invasive species	Labor Manpower Data	Knowledge on control mechanisms	Partnership with research institute to device mechanisms of control -Sensitization and awareness of effective control mechanism

SUMMARY OF THE ADAPTATION STRATEGIES

Risk/Hazard	Livelihood/ Economic System Affected	Climate Resilience Strategies	Stakeholder Group Applying the Strategy	Gender and Social Inclusion information
Drought	Crop and Livestock Agriculture and value addition Marketing and Trading Forestry Health Transport	Adoption of improved agricultural practices through irrigation, drought resistant crops, early maturing crops, as well as improved food storage and value addition Enhanced water supply at household and farm levels through water harvesting and storage technologies eg roof water harvesting, construction, rehabilitation of dams, construction of lined water pans and boreholes construction Rehabilitation of degraded forest land and riparian land through reforestation,	Farmers Women groups County Government	Both men and women will be able to increase agricultural yields and address food insecurity.

		agroforestry and afforestation Adoption of Climate Smart Agriculture (CSA) such as green houses, promotion of early maturing and drought tolerant crops,		
		Investment in Sustainable Land Management practices (terracing, construction of gabions) 6. Promotion of Soil conservation strategies		
Erratic rainfall patterns	Farming Small scale trading	Promotion of livelihood diversification practices such as bee keeping and other nature-based enterprises Capacity build farmers on modern farming techniques Strengthen Climate information services and early warning	Farmers	All the genders to benefit from the strategies

Prolonged dry season	Farming	Construction of water reservoirs and water protection infrastructures Promotion of smallholder irrigation Promotion of modern farming techniques	Farmers/Community based Organizations	This will ensure that women spend less time in search for water and invest more time in other productive activities
Pest and Diseases	Farming Trade	1.Investment in soil and Land Management practices 2.Integrated crop pests and disease management. 3.Increase investment in Pest and disease control measures	-County Government •	This will enhance food security thus enhancing the economic status of both genders, children and PWDs

Appendix 2: Photos of community engagements

Public Participation and Committee Formation at Ward Level

Public Participation and Committee Formation at Ward Level


Laikipia North : PCRA Committees discussions


Laikipia West : PCRA Committees discussions

Laikipia West: PCRA Committees discussions

Five Wards in Laikipia East: PCRA Committees discussions

Appendix 3 : Multi stakeholder engagement

PCRA Report Writing Workshop

Laikipia County : PCRA Validation Meeting

Laikipia County : PCRA Validation Meeting

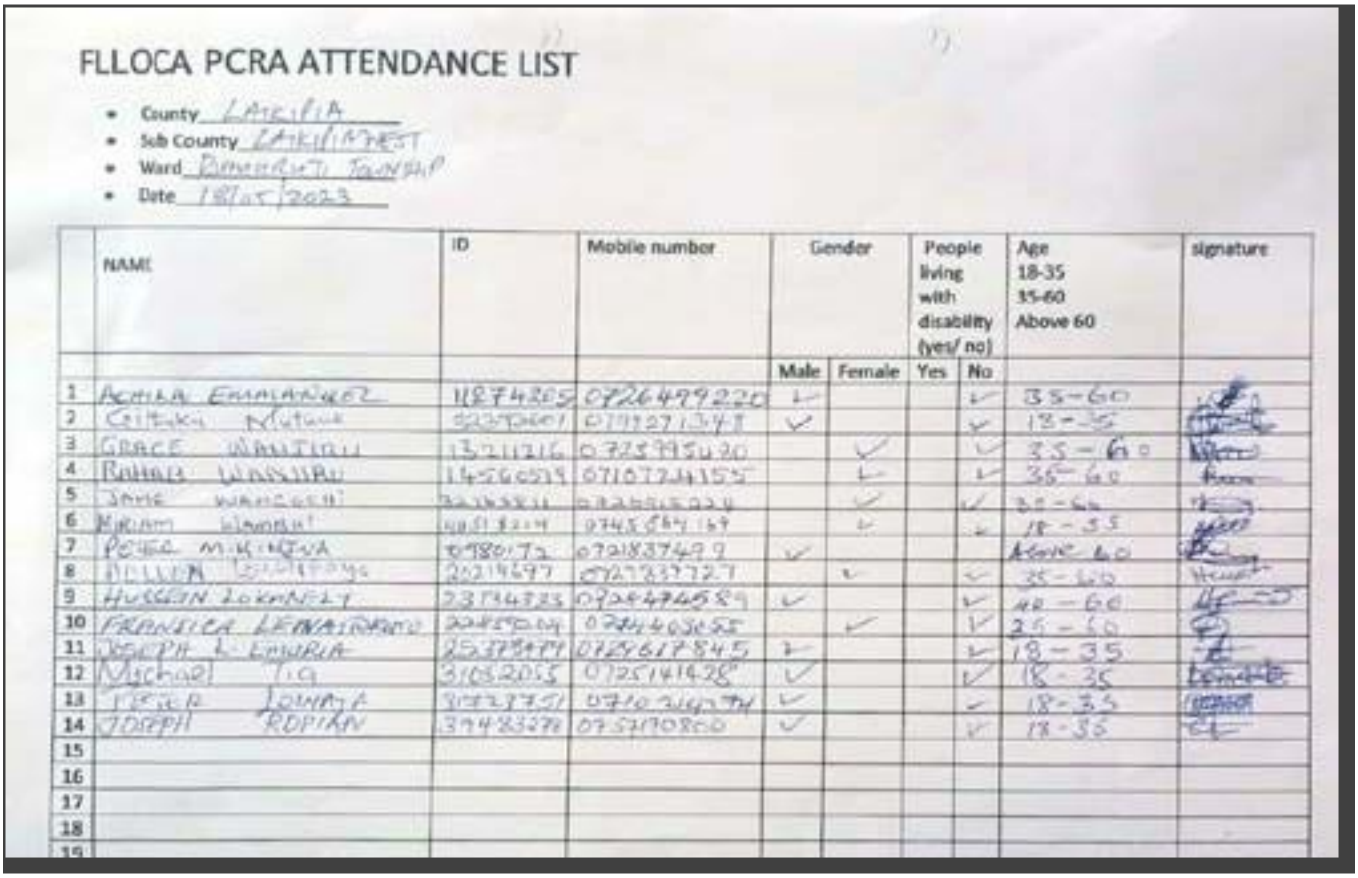
Appendix 4 : Stakeholders matrices

Attendance List for the various days that stakeholders met during and after the public engagement and subsequent workshop that birthed this report.

FLLOCA PCRA ATTENDANCE LIST

- County
- Sub County
- Ward Rumuruti Township
- Date 17/5/23

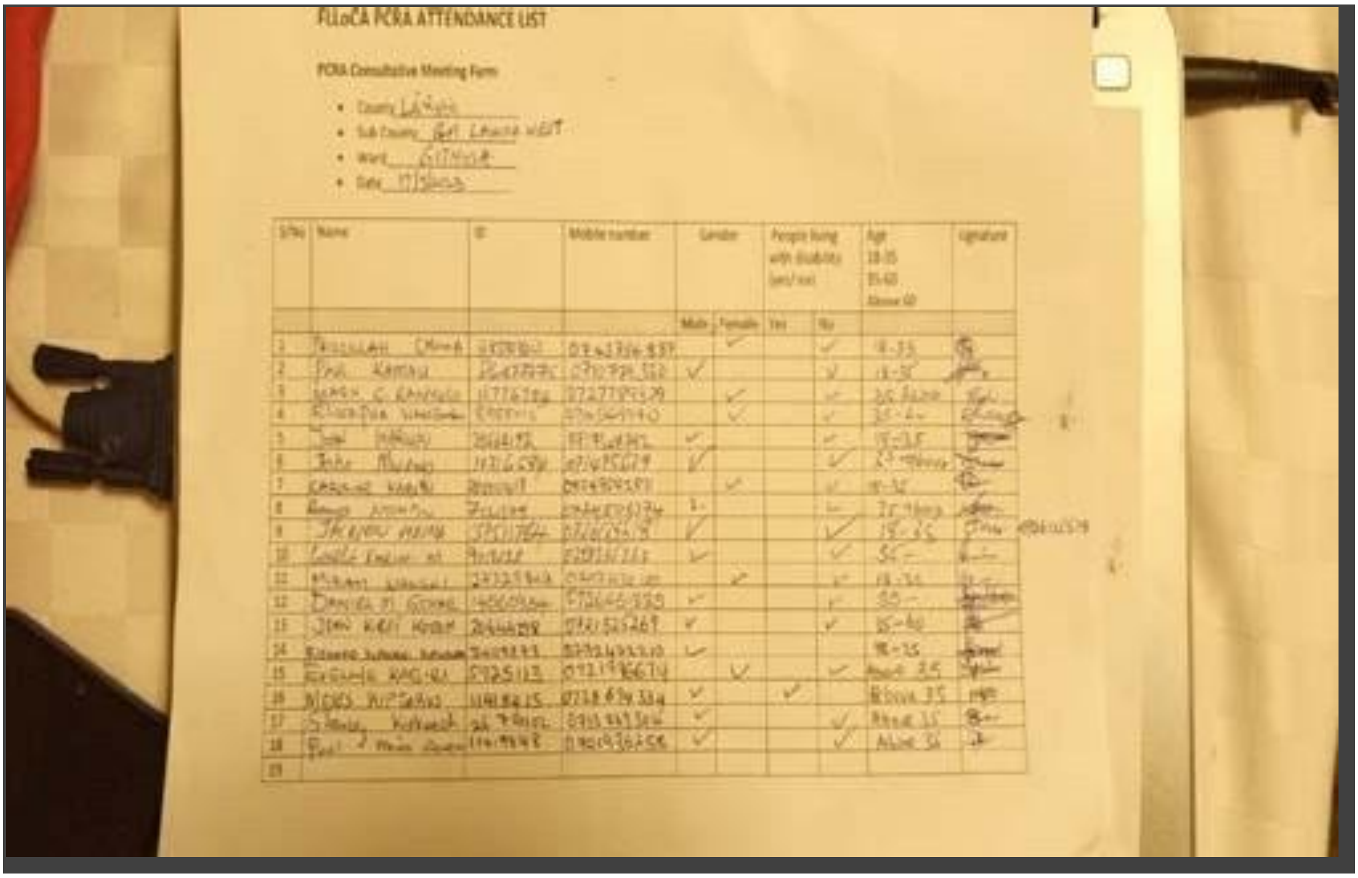
	NAME	ID	Mobile number	Gender		People living with disability (yes/ no)		Age 18-35 35-60 Above 60	signature
				Male	Female	Yes	No		
1	Michael Tia	31052055	0725741478	✓			✓	18-35	[illegible]
2	Githaka Kiluta	32253007	0798271348	✓			✓	18-35	[illegible]
3	Joel Mwreu	02356493[illegible]	0725625976	✓			✓	35-6	[illegible]
4	Mary Kakei	[illegible]	0712165100		✓		✓	35-60	[illegible]
5	Jane Wangechi	32163511	[illegible]		✓		✓	40-50	[illegible]
6	Miriam Wambui	[illegible]	0745564169		✓		✓	18-35	[illegible]
7	Grace Wamtiru	12210216	0725995160		✓		✓	35-60	[illegible]
8	Achila Emmanuel	11274205	0726499220	✓			✓	35-60	[illegible]
9	Joseph L [illegible]	25170479	0729617845	✓			✓	35-60	[illegible]
10	Francisca [illegible]	2285[illegible]	0714605051		✓		✓	35-60	[illegible]
11	Andrew [illegible]	2312[illegible]	0706[illegible]	✓			✓	40-60	[illegible]
12	Hellen [illegible]	20219697	0727839727		✓		✓	40-60	[illegible]
13	Joseph Ropian	39483278	0757170800	✓			✓	18-35	[illegible]
14	Peter Lowara	[illegible]	0790344174	✓			✓	18-35	[illegible]
15	Peter M Kinyua	0980172	0721837499	✓				Above 60	[illegible]
16	Mary Kakei	11261004	0712165100		✓		✓	35-60	[illegible]
17	Joseph Ropian	39483278	0757170800	✓			✓	18-35	[illegible]
18	Anna [illegible]	14264514	0710724165		✓		✓	35-60	[illegible]
19									



FLLOCA PCRA ATTENDANCE LIST

- County LAIKIPIA
- Sub County LAIKIPIA WEST
- Ward [illegible] TOWNSHIP
- Date 18/05/2023

	NAME	ID	Mobile number	Gender		People living with disability (yes/ no)		Age 18-35 35-60 Above 60	signature
				Male	Female	Yes	No		
1	ACHILA EMMANUEL	11874305	0726499220	✓			✓	35-60	[signature]
2	GITAKA MUTUA	[illegible]	0799271348	✓			✓	18-35	[signature]
3	GRACE WANJIRU	13211216	0725995420		✓		✓	35-60	[signature]
4	RAHAB WANJIRU	14560579	0710724155		✓		✓	35-60	[signature]
5	JANE WANGECHI	[illegible]	[illegible]		✓		✓	35-60	[signature]
6	MIRIAM WAMBUI	[illegible]	0745584169		✓		✓	18-35	[signature]
7	PETER M. KINYUA	0980172	0721837499	✓				Above 60	[signature]
8	[illegible]	20219697	0727837727		✓		✓	35-60	[signature]
9	HUSSEIN LOKANELY	23734323	0724474589	✓			✓	40-60	[signature]
10	FRANSICA LEWAIRIANO	[illegible]	07244035055		✓		✓	35-60	[signature]
11	JOSEPH L EMURIA	25378479	0729617845	✓			✓	18-35	[signature]
12	Michael Tia	31032055	0725141428	✓			✓	18-35	[signature]
13	PETER LOWAYA	[illegible]	[illegible]	✓			✓	18-35	[signature]
14	JOSEPH ROPIAN	39483278	0757170800	✓			✓	18-35	[signature]
15									
16									
17									
18									
19									



FLLOCA PCRA ATTENDANCE LIST

PCRA Consultative Meeting Form

- County Laikipia
- Sub County [illegible] LAIKIPIA WEST
- Ward GITHIGA
- Date 17/5/2023

S/No	Name	ID	Mobile number	Gender		People living with disability (yes/ no)		Age 18-35 35-60 Above 60	Signature
				Male	Female	Yes	No		
1	PRISCILLAH [illegible]	[illegible]	[illegible]		✓		✓	18-35	[signature]
2	[illegible] KAMAU	[illegible]	[illegible]	✓			✓	18-35	[signature]
3	[illegible]	[illegible]	[illegible]		✓		✓	35 Above	[signature]
4	[illegible]	[illegible]	[illegible]		✓		✓	35-60	[signature]
5	[illegible]	[illegible]	[illegible]	✓			✓	18-35	[signature]
6	John [illegible]	[illegible]	[illegible]	✓			✓	35 Above	[signature]
7	[illegible]	[illegible]	[illegible]		✓		✓	18-35	[signature]
8	[illegible]	[illegible]	[illegible]	✓			✓	35 Above	[signature]
9	[illegible]	[illegible]	[illegible]	✓			✓	18-35	[signature]
10	[illegible]	[illegible]	[illegible]	✓			✓	35-	[signature]
11	[illegible]	[illegible]	[illegible]		✓		✓	18-35	[signature]
12	[illegible]	[illegible]	[illegible]	✓			✓	35-	[signature]
13	[illegible]	[illegible]	[illegible]	✓			✓	35-60	[signature]
14	[illegible]	[illegible]	[illegible]	✓				18-35	[signature]
15	[illegible]	5725113	[illegible]		✓		✓	Above 35	[signature]
16	[illegible]	[illegible]	[illegible]	✓		✓		Above 35	[signature]
17	[illegible]	[illegible]	[illegible]	✓			✓	Above 35	[signature]
18	[illegible]	[illegible]	[illegible]	✓			✓	Above 35	[signature]
19									

COUNTY GOVERNMENT OF LAIKIPIA

DEPARTMENT OF WATER, ENVIRONMENT, NATURAL RESOURCES &CLIMATE CHANGE
DIRECTORATE OF CLIMATE CHANGE
P.O. BOX 1271-10400 NANYUKI
Email:

PARTICIPATORY CLIMATE RISK ASSESMENT, PCRA ATTENDANCE LIST

- County Laikipia
- Date 25/05/2022

S/No	Name	ID	Mobile number	Gender		signature
				Male	Female	
1	Hezron F. Kinyua	7469865	0722345061	✓		
2	TRIZAH ETAKAE	30058151	0717315097		✓	
3	ENG. J. M MAINA	9013294	0707807616	✓		
4	KINGORI D. KARIUKI	4695375	0726614131	✓		
5	EMMA ODERA	0412255	0726075587		✓	
6	Edward Njuguna	24239561	0727584436	✓		
7	MARGARET W. EVANSON	5772760	0720578196		✓	
8	MAINA MUTHONI	29732006	0712967970	✓		
9	ANN NGUNJIRI	34384520	0702392533		✓	
10	Lewis Mwei	29236137	0722137711	✓		
11	Joseph Kagongoi	35147921	0726494465	✓		
12	MARTIN MARTIN MUTETHIA	29862811	0710184708	✓		
13	Julius Gikonyo	24132922	0729229125	✓		
14						

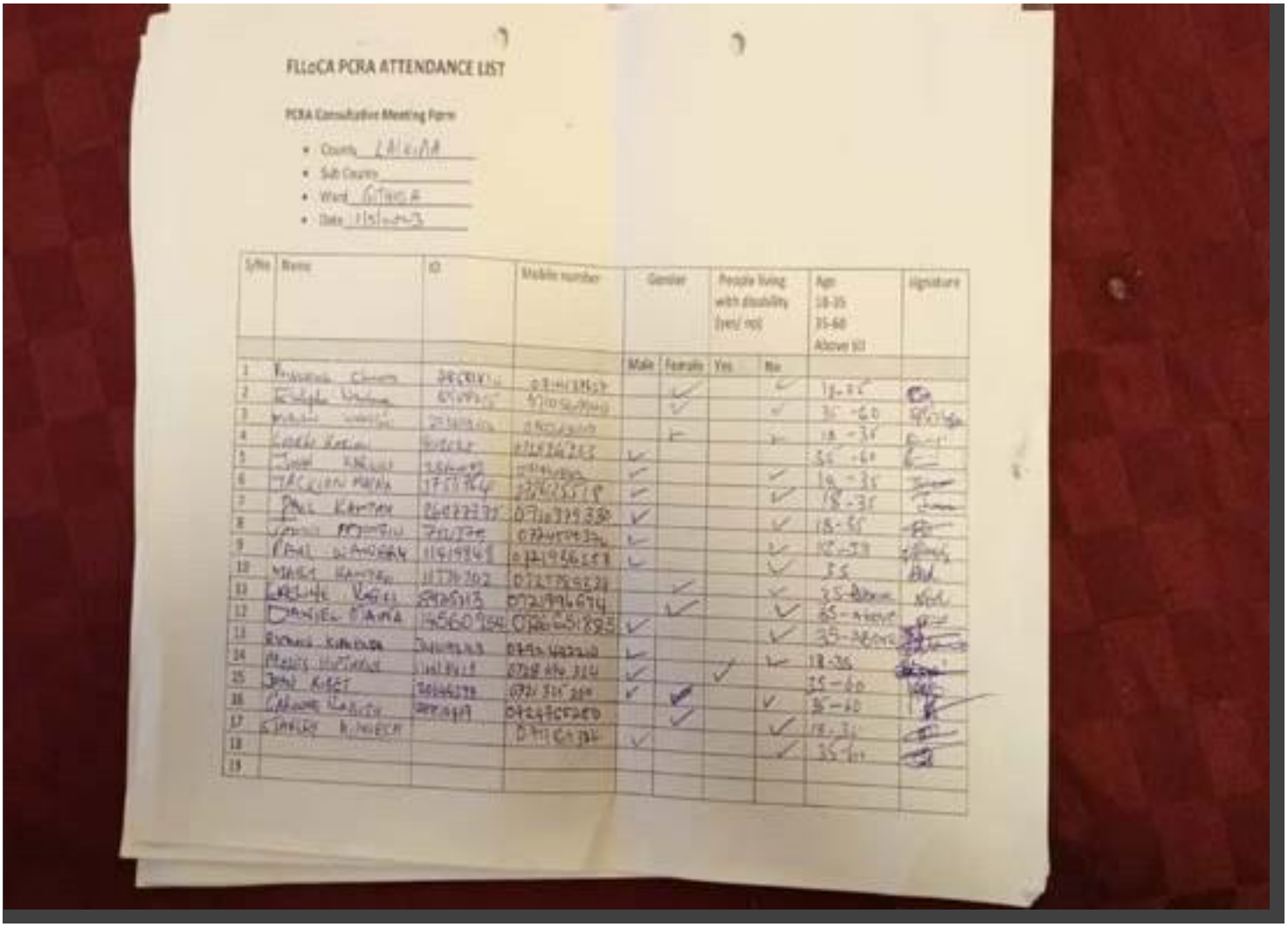
COUNTY GOVERNMENT OF LAIKIPIA

DEPARTMENT OF WATER, ENVIRONMENT, NATURAL RESOURCES &CLIMATE CHANGE
DIRECTORATE OF CLIMATE CHANGE
P.O. BOX 1271-10400 NANYUKI
Email:

PARTICIPATORY CLIMATE RISK ASSESMENT, PCRA ATTENDANCE LIST

- County LAIKIPIA
- Date 25/05/2022

S/No	Name	ID	Mobile number	Gender		signature
				Male	Female	
1	Pius A. Butiewi	10561473	0724670511	✓		
2						
3	Alex M. Njau	22718441	0724615349	✓		
4	David Njiru	9819830	0721213209	✓		
5	JOSEPH WAIGWA	8797780	0721882009	✓		
6	SALINAH BUNDOTICH	6631632	0726987268		✓	
7	JOHN LETAI	11260205	0722670503	✓		
8	Vanae Jungaseka	29084764	0757418020	✓		
9						
10						
11						
12						
13						
14						



FLLoCA PCRA ATTENDANCE LIST

PCRA Consultative Meeting Form

- County LAIKIPIA
- Sub County
- Ward GITHIGA
- Date 11/5/2023

S/No	Name	ID	Mobile number	Gender		People living with disability (yes/ no)		Age 18-35 35-60 Above 60	Signature
				Male	Female	Yes	No		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

Appendix 5: References

a. *County Government of Laikipia. (2022). Retrieved from https://www.laikipia.go.ke/1368/innovation-in dustrialization-enterprisedevelopment-go-global/*

b. *Ministry of Agriculture. (1983). A pre-investment study of human and natural capital: Arid and Semi- Arids Branch Laikipia District. Nairobi: Ministry of Agriculture.*

c. *National Climate Change Action Plan (NCCAP) 2018 - 2022. National Climate Change Action Plan (NCCAP) 2018 - 2022. | UNEP Law and Environment Assistance Platform. (n.d.). https://leap.unep.org/ countries/ke/national-legislation/national-climate-changeaction-plan-nccap-2018-2022*

d. *Riginos, C., Porensky, L., Veblen, K. E., & Odadi, W. O. (2012). Lessons on the relationship between pastoralism and biodiversity from the Kenya Long-term Exclosure Experiment.(KLEE). Pastoral ism Research Policy and Practice.*

e. *WeatherSpark.com. (2022). Retrieved from support@weatherspark.com: https://weatherspark.com/ countries/KE/29-kenya/laikipia*

f. *Kenya Assessment - Climate Centre. (n.d.-b). https://www.climatecentre.org/wpcontent/uploads/RCRC_ IFRC-Country-assessments-KENYA.pdf*

g. *County Government of Laikipia. (2020, December 11-18). Laikipia's hidden treasure with a potential to transform Kenya. Laikipia Weekly Newsletter, pp. 1-8.*

h. *WorldData.info. (2022). Retrieved from https://www.worlddata.info/africa/kenya/climate-laikipia.php*

i. *(PDF) gender equality and social inclusion in ..ResearchGate. (n.d.-e). https://www.researchgate.net/publication/329736405_gender_equality_and_social_inclusion_ in_agriculture_research_for_development_guidelines_1*

j. *The adaptive and coping strategies of pastoralists to climate change in Baringo, Laikipia and Nyeri counties of Kenya. (n.d.). http://www.lrrd.org/lrrd27/12/syom27248.html*

k. *MoALF. (2017). Climate Risk Profile for Laikipia County. Kenya County Climate Risk Profile Series.Nairobi, Kenya: The Ministry of Agriculture,Livestock and Fisheries (MoALF).*

l. *Resource center - ndma.go.ke. (n.d.-e). https://ndma.go.ke/index.php/resource-center*

m. *Ministry of Agriculture. (1983). A pre-investment study of human and natural capital: Arid and Semi- Arids Branch Laikipia District. Nairobi: Ministry of Agriculture.*

n. *Letai, J. (2021). Laikipia Land Crisis: A Ticking Time Bomb. The Elephant. Retrieved from https://www. theelephant.info*

Participatory Climate Risk Assessment

Laikipia county

2023

CETRAD
Centre for Training and Integrated Research in ASAL Development

LISTEN

IMPACT
Indigenous Movement For Peace Advancement &