SAMBURU COUNTY
Participatory Climate Risk Assessment Report

May 2023

Forward

Samburu County falls within the arid and semi-arid region of Kenya. Its environment is, therefore very brittle, and consequently highly vulnerable to climate change induced hazards. These hazards pose innumerable risks and shocks on the County population which is entirely dependent on natural resource based activities for their socio-economic wellbeing. Cyclical droughts, for example, that are ever increasing in intensity and frequency are dimming livelihoods prospects in pastoral nomadism and agro-pastoralism, which are the two most predominant economic activities in the County. To help the County residents navigate this rough climate terrain, it is imperative that ingenious climate change adaptation and resilience mechanisms are devised.

The participatory approach of the PCRA process was deliberate in cognizance of the fact that different individuals and groups of individuals such as the elderly, youth, women, people living with disabilities, indigenous pastoral groups are impacted differently by climate change induced hazards. It ensured that the entire spectrum of voices of all these groups is amplified in the outcome of the process.

Residents of each of the fifteen (15) wards in the County identified their exposures and vulnerabilities to climate hazards. Having done this, it will be incumbent upon them to propose actions in the County Climate Action Plan to be implemented so as to enhance their adaptive capacity and resilience to climate change.

I urge all development partners to use this PCRA report as a reference for gathering background information in development of interventions to address climate change related issues impacting our County residents.

H.E LATI J. LELELIT

GOVERNOR, SAMBURU COUNTY

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Definition of terms

Adaptation means adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive capacity refers to the ability of systems, institutions, humans, and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences.

Carbon credit or offset is a financial unit of measurement that represents the removal of one tonne of carbon dioxide equivalent from the atmosphere. Carbon credits are generated by projects that deliver measurable reductions in greenhouse gas emissions.

Carbon market is a market created from the trading of units of greenhouse gas emissions.

Climate change refers to a change in the climate system that is caused by significant changes in the concentration of greenhouse gases due to human activities, and which is in addition to the natural climate change has been observed during a considerable period.

Climate Risk is the potential for negative consequences for human or ecological systems from the impacts of climate change.

Climate Hazards are agents of disaster in terms of what they may do to human settlements or to the environment.

Global warming refers to the observed or projected gradual increase in global surface temperature. It is one of the consequences of climate change.

Greenhouse gases (GHGs) are gases that absorb and emit radiant energy within the thermal infrared range. The main GHGs measured in a GHG inventory are, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF) and nitrogen trifluoride (NF).

Mitigation refers to human interventions to prevent or slow down atmospheric GHG concentrations by limiting current or future emissions, and/or enhancing potential sinks for greenhouse gases.

Resilience refers to the capacity of social, economic and environmental systems to cope with a hazardous event, trend, or disturbance. It is manifested through responding or reorganizing in ways that assert the essential function, identity, and structure of the system, while also maintaining the capacity for adaptation, learning and transformation.

Vulnerability refers to the propensity or predisposition to be adversely affected. It encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm, and lack of capacity to cope and adapt.

Abbreviations

ASALS	Arid and Semi-Arid Lands
CCAP	County Action Plan
GCM	Global Climate Modelling
KFS	Kenya Forest Service
KMD	Kenya Meteorological Department
MAM	March April May
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NDMA	National Drought Management Authority
NDC	National Determined Contributions
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organizations
NOREB	North Rift Economic Block
OND	October November December
PCRA	Participatory Climate Risk Assessment
RCP	Representation Concentration Pathway
UNFCCC	United Nations Framework Convention on Climate Change
WCCPC	Ward Climate Change Planning Committee
WRA	Water Resources Authority

Acknowledgement

The County Government of Samburu through the Department of Water, Environment, Natural Resources, Climate Change and Energy acknowledges the valuable inputs of all stakeholders for their contribution in the preparation of this Participatory Climate Risk Assessment (PCRA) Report.

We sincerely thank members of the local communities through the ward climate change planning committees in all the fifteen wards of Samburu County. They participated in Focus Group Discussions, and generated grassroots assessment data by sharing their personal experiences through the various tools within the array of PCRA tools.

CSOs are critical partners who provided insight and expertise from their long-time work at the community level. We appreciate their role in reviewing and aligning information on local hazards, priority plans and strategies as outlined in the third generation County-Integrated Development Plan for 2023-2027.

We thank the Samburu County PCRA technical committee for being part of the facilitation of the ward-level PCRA data collection exercise and bringing their local insight to inform the process.

The County appreciates the invaluable input and participation of the following national and county government ministries, departments and agencies; Kenya Meteorological Department, Interior and National Coordination, National Environmental Management Authority, National Drought Management Authority, Kenya Forestry Services, National Drought Management Authority and Ministry of East Africa Community, the ASALS and Regional Development, Department of Agriculture, Livestock and Fisheries, Department of Tourism, County Administration, and Special programs. The data provided and the information gained from the institutions both for sector-based risk assessment was enormous.

Executive Summary

The Participatory Climate Risk Assessment was done against the backdrop of extreme climate events increasing in both intensity and frequency, and the need to address the risks and shocks they cause in order to build the adaptive and resilience capacity of the residents of Samburu County.

This report explains what informed the need for the climate risk assessment and paints a picture of the policy context with an emphasis on policy statements that promote climate risk assessments. The climate risk assessment was done for a reason and this first chapter therefore explains what the report is meant to achieve. It also describes the main steps of the process culminating in the development of this report and how inclusive and participatory the process was.

Chapter 2 gives a profile of both current and past County climate hazards and trends, and the exposure and vulnerability profiles of the different groups and their livelihood systems in the County. It also brings out the reality of how climate risks impact different groups such as the elderly, women, youth, among others differently, and the distribution of these risks in space within the County.

Future climate scenarios in the County will have adverse impacts on different groups of people and their livelihoods in unique ways. This chapter describes such scenarios as downscaled from the national future climate scenarios and identifies the possible impacts on these different groups and their livelihoods.

Chapter 4, identifies and analyses existing climate adaptation and resilience strategies and interventions that are being implemented in the County to address current climate risks, and the effectiveness of these strategies in responding and dealing with future climate scenarios. The chapter also proposes actions and resources to enhance the effectiveness of existing strategies and also proposes alternative ones.

Finally, the report outlines the County strategic investments or actions meant to enhance the adaptive and resilience capacities of the economic, social and livelihood systems of the impacted groups.

INTRODUCTION

1.1 Background

Samburu County is located between longitude 36°15' E and 38° 10'E and latitude 0° 30'N and 2° 45'N which lies within the northern parts of the Great Rift Valley in Kenya. The County, which covers an area of 21,022 km², lies within Kenya's Arid and Semi-Arid Lands (ASALs) region. It is a member of North Rift Economic Block (NOREB). The County is divided into three Sub-Counties and fifteen (15) Wards as shown in the table below.

Table 1: Samburu County administrative units

No.	Sub Counties	Wards	Area (km²)	Villages
1.	Samburu West	Lodokejek, Suguta Marmar, Maralal, Loosuk, Porro	3937.3	33
2.	Samburu East	Waso, Wamba West, Wamba East, Wamba North	10049.7	29
3.	Samburu North	Elbarta, Nachola, Nyiro, Angata Nanyokie, Baawa, Ndoto	7035.1	46

As in other parts of Kenya, its livestock and agriculture sectors depend primarily on rainfall for sustenance. Owing to its location in the Arid and Semi-Arid region of Kenya, Samburu County is vulnerable to and continues to experience extreme climate events such as droughts and floods, that have led to degradation of rangelands and emergence of invasive plant species. Repeated occurrence of these types of severe weather events presents emerging obstacles that limit resilience of communities.

Pastoral nomadic residents of the County have historically employed approaches informed by indigenous knowledge and experiences in response to negative impacts brought on by extreme weather events, especially drought. These approaches include: mobility, communal land tenure system, large and diversified livestock herds, herd segregation and splitting, and local social security programs. While these approaches efficiently worked in the past, human population increase and the ever changing climate have conspired to lessen their efficacy. Recent adaptation and resilience mechanisms to minimize vulnerability and economic losses and to improve resilience include crop farming, salaried employment, livestock business, community led nature and culture based tourism initiatives. Some have even resorted to environmentally devastating ventures such as charcoal burning.

There is need for the local communities to adequately prepare themselves for both gradual and sudden changes brought about by the vagaries of climate change. To do so, the communities need to understand the anticipated changes based on their local experiences and observations, supplemented by scientifically plausible climate projections. This will help them to know how vulnerable they are to those changes, the hazards associated with them, and what adaptive and mitigation measures they should adopt to minimize their risks. The effectiveness of developing such climate actions and interventions requires the involvement of the local communities and stakeholders in a structured way known as Participatory Climate Risk Assessment (PCRA) whose main objective is to come up with sectoral climate action plans, with climate priority area of investment for building long term resilience to the local communities, indigenous people and vulnerable groups at risk of climate change.

Samburu County enacted its Climate Change Act 2022 which is a framework that allows community engagements in identifying climate risks vulnerability and defining actions for management of climate impacts. This participatory process (PCRA) is a build up to the national climate change action planning process through the regional economic blocs.

1.2 Policy Context

Climate change is becoming one of the most serious challenges in Kenya with indications showing that the Country is highly susceptible to climate related events. Climate change projections suggest that both temperatures and precipitation will further increase by the year 2100 accompanied by even more frequent heat waves, floods and landslides. Further warming in Kenya and the rest of continental Africa is projected to be greater than the global mean (2.8°C) during the 21st century. These changes are expected to reduce soil productivity, increase prevalence of pests and diseases and thus worsen people's food security. The Samburu economy is highly dependent on her natural resource base, and thus is highly vulnerable to climate variability and change. Rising temperatures and changing rainfall patterns, resulting in increased frequency and intensity of extreme weather events such as droughts and inland flooding, threaten the sustainability of the county's development. In order to safeguard sustainable development, the County has developed the Climate Change Policy and Act to provide a clear and concise articulation of overall response priorities to climate variability and change. Samburu, which is in the category of ASALS, is highly vulnerable to these extreme atmospheric changes putting the lives and socio-economic activities of thousands of households at risk.

1.2.1 The National Climate Change Policy and Legal Framework

Kenya recognised the problems posed by climate change and the importance of taking the necessary actions to mitigate climate change impacts by ratifying the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and adopting The Paris Agreement.

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

1.2.2 The National Climate Change Response Strategy 2010

The National Climate Change Response Strategy (NCCRS) 2010, was the first national document on climate change. The strategy focused on ensuring that adaptation and mitigation measures are integrated in all government planning and development objectives.

The NCCRS laid the foundation for the establishment of the current climate change response policy and legislative framework in Kenya. The policies, plans and legislations emanating from the implementation of the strategy include: The National Climate Change Action Plans; the National Adaptation Plan; the National Climate Change Framework Policy of 2016; and the National Climate Change Act, 2016.

1.2.3 The National Climate Change Framework Policy-2016

The National Climate Change Framework Policy was ratified by the National Assembly in 2016. The main objective of the policy is to enable a coordinated, coherent and effective response to the local, national and global challenges and opportunities presented by climate change. The policy aims to enhance adaptive capacity and build resilience to climate variability and change, while promoting a low carbon development pathway. The policy identifies the adaptive capacity of individuals and communities as being key to improving their socio-economic situations. Thus, to effectively establish the adaptive capacities of individuals and communities, the policy recognises the need for vulnerability assessment. 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.

1.2.4 The National Climate Change Action Plan (NCCAP)

The National Climate Change Action Plan (NCCAP) 2023-2027 whose aim is to further Kenya's sustainable development by providing mechanisms and measures to achieve low carbon climate resilient development in a manner that prioritises adaptation builds on the gains of the NCCAP 2018-2022. Its goals are twofold: To align climate change actions in the country with the Government's development agenda, including Kenya Vision 2030 and the Bottom-Up Economic Transformation Agenda (BETA), and; to strengthen the participation in the climate change action by the private sector, civil society, women, youth, children and vulnerable groups within society, including older members of society, persons with disabilities, members of minority or marginalised communities, and indigenous peoples. The NCCAP prioritises adaptation actions due to the devastating effects of droughts, floods and other extreme weather events in the country, and the negative impacts of climate change on vulnerable groups, including children,

youth, women, older members of society, persons with disabilities and members of minority and marginalised communities, displaced persons and migrants.

National Determined Contributions

In ratifying the Paris Agreement, Kenya committed to reducing its carbon emissions by 30% against the business-as-usual scenario by 2030 and moot adaptation actions in key sectors. To support implementation of climate change mitigation and adaptation actions, the country has put in place several sectoral policies such as: the National Policy on Climate Finance; Climate Risk Management Framework; the National Livestock Policy 2015; the National Oceans and Fisheries Policy 2008; the Agricultural Sector Transformation and Growth Strategy (ASTGS) 2019-2029; the Kenya Climate Smart Agriculture Strategy 2017-2028; the National Drought Management Authority Act 2016 among others.

1.2.5 The Climate Change Act No. 11 of 2016

The main objective of this 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 is to be applied to all sectors of the economy by both the national and county governments. Specifically, the Act is to be applied to ensure among other objectives: Mainstreaming of climate change responses into development planning, decision making and implementation; Building resilience and enhancing adaptive capacity to the impacts of climate change; Formulating programmes and plans to enhance the resilience and adaptive capacity of human and ecological systems to the impacts of climate change; and, Mainstreaming and reinforcing climate change disaster risk reduction into strategies and actions of public and private entities.

1.2.6 County Policy Context

Samburu County Climate Change Policy 2022

The policy highlights: Strengthening of community resilience to enhance their adaptive capacities to climate change and livelihood diversification; reducing vulnerability of women to climate change impacts thus providing for policy framework for assessment of climate risks and women participation in climate change interventions.

Samburu County Climate Change Act of 2022

The Act stipulates the objective of anchoring the process that ensures climate resilience is enhanced through development, management and implementation of climate actions. This provides the PCRA with the legal framework it requires to facilitate climate action planning.

2.1 Description of the exercise

The Participatory Climate Risk Assessment (PCRA) Report is one of the deliverables of the County Climate Change Action Plan (CCAP) commissioned by the Samburu County Government as part of its core responsibility in delivering climate resilient services and development to the residents of the county and ensuring that negative impacts of climate extremes due to changes in atmospheric processes on key sectors do not derail its programs and projects. It is also aimed at ensuring that people and livelihoods suffer minimum or zero losses and damages due to fluctuating climate shocks and risks. As one of the documents that would inform government programs in the CIDP and also help formulate County Climate Actions, the county considered the exercise a key deliverable informing other policy strategies already enacted to drive the sustainable development agenda in the county.

2.2 Purpose of the PCRA Report

The aim of the assessment was to understand the nature and extent of the current and future climate change risks, by analysing potential hazards and assessing the vulnerabilities that could pose potential threats or harm to Samburu County's population, assets, livelihoods, investments and the ecosystem on which they are dependent on.

The overall objective of the assessment is to map out the vulnerability of the county to climate change and develop strategies towards adaptation and resilience. The process has two expected high-level outcomes:

1. To provide a detailed Samburu County Climate Change vulnerability report of high, medium and low risk areas.
2. To propose interventions or measures to increase resilience of the county to climate change impacts

2.3 Key steps in the county's PCRA process

Participatory climate change approaches involved engaging local communities, stakeholders, scientists and decision-makers in the process of understanding and addressing the impacts of climate change. These approaches recognize the importance of local indigenous knowledge and expertise in developing effective climate change responses, and aim to empower communities to take action on climate change. Understanding the past interactions between society and climate hazards, including adaptations that have evolved to cope with these hazards, is a critical first step in developing adaptations to manage future climate risks.

2.3.1 Preparations of the PCRA

The mobilization for PCRA was done through the County Administration structure that is devolved to the village level. The Sub county administrators mobilized ward and village administrators who reached the community members in the wards and villages. The sub county field officers also played a major role in mobilization. Each ward had fifteen community members. The criteria used during the composition of these committees factored in the gender, youth, and people living with disabilities. These are the groups who were involved during the PCRA process. WCCPCs were established under the Samburu County Climate Change Act 2022.

2.3.2 Technical Working group

The technical working group for the Environment sector with the help of facilitators from Kenya Meteorological Department (KMD) carried out the PCRA process at the ward level. The TWG members were divided according to ward clusters. The wards were divided into five clusters due to the vastness of the county. These committees were drawn from the community level through a rigorous process where the community members elected their representatives.

The WCCPC members together with the village and ward administrators participated in the PCRA process. The following is the composition of the ward clusters and the venue for the community engagements for the PCRA.

Table 2: Samburu County PCRA clusters

Wards Cluster	**Venue**	**Lead Facilitator**
Maralal, Angata Nanyoikie, Baawa wards	Leshangri La Hotel, Maralal	Kennedy Ododa, KMD
Lodokejek, Suguta, Porro and Loosuk	Maralal Polytechnic, Maralal	Absae Sedah, KMD Christine Nyagengo, KMD

Wamba East, Wamba North, Wamba West	Sampei Lodge, Wamba	Frankline Kolmokori, KMD
Waso Ward	Camels Gate Hotel, Archers Post	Philip Okello, KMD
Elbarta, Ndoto, Nachola, Nyiro	Baragoi Primary Hall, Baragoi	Dominic Arodi, KMD

2.3.3 The community consultative meetings

Samburu County PCRA exercise was conducted through the following stages in the five clusters from 27th to 29th May, 2023

1. The inception and sensitization of ward climate change committees
2. Capacity building and data collection
3. Validation and sector climate risk assessment

The 15 participants from each ward were involved in the community level engagements for data collection during the PCRA. The facilitators first introduced the PCRA process and what is expected during the exercise in the clusters. The TWG members guided the communities in the process especially in the translation of tasks in local dialect for ease of understanding. Breakout sessions were at ward level hence members were equipped with the knowledge to understand climate change causes, hazards, risks and how to mitigate and adapt to the changing climate. The tools used included hazard maps, vulnerability matrix, seasonal calendars and venn diagrams. The wards also developed their climate change action plans that informed the County Climate Change Action Plan.

2.3.4 Validation and sector climate risk assessment

The TWG and facilitators from KMD analysed and compiled information from the ward level engagements including the community climate change actions. The validation and sector climate risk assessment workshop was conducted on 29th May, 2023. The purpose of the workshop was to conduct a cross sectoral assessment of risks facing the county and propose the climate actions that can address and build resilience of communities in combating climate change. Due to time constraint, two community members from each ward and ward administrators were also present for validation of the PCRA report.


PCRA cluster in Baragoi Primary Hall and; Waso ward community members generating their seasonal calendar .


PCRA cluster in Maralal Polytechnic in focus groups and PCRA cluster in Leshangri La hotel posing for a group photo.

Lodokejek Ward members group photo and Nachola ward members during data collection

Community members participating during data collection sessions

County Climate Profile

3.1 Climatology and Historical Climate Trends

3.1.1 Climatology of Rainfall and Temperature

This section seeks to underscore the importance of the historical calendar in the PCRA process and link it to the impacts of various climate hazards experienced in the past. Based on the ward level findings of this report, drought stands out to be the most prioritised hazard that affects the communities living in the 15 wards of Samburu County. Findings from this PCRA indicate that communities are cognizant of the general climate trends in their various wards, its variability and the impacts of extreme weather events on their livelihoods. The main climate changes perceived by the residents of Samburu County include increasingly erratic and reduced amounts of rainfall, rise in temperature and prolonged and frequent periods of drought. These have in turn led to frequent inter-tribal conflicts over natural resources such as water and pasture, thereby posing a security risk, with the youth bearing the highest cost in terms of injuries and deaths. Pastoralists mainly view population pressure and tree cutting as the major causes of climate change.

Further, this PCRA exercise found that the National Drought Management Authority (NDMA) provides early warning to communities in the county through its monthly Drought Early Warning (DEW) bulletin. This provides timely information on impending drought. The Kenya meteorological Department (KMD) also provides routine climate information and extreme events weather alerts. The NDMA DEW bulletin has helped the agro pastoralists in deciding the types of crops to grow during the short rains.

Importantly, pastoralists reported the negative impacts of climate change on rangelands such as soil erosion and resultant colonization by invasive plant species including *Acacia reficiens*, *Senna didymobotrya*, *Cissus quadragularis*, *Prosopis juliflora*, among others, which in turn impact negatively on livestock production. The severe recurrent drought periods result in shortage of forage and water, leading to livestock starvation and human malnutrition. Pastoralists reported massive livestock deaths and outbreaks of diseases such as contagious bovine pleuropneumonia and tick-borne diseases. Further, reduction in milk production and poor livestock market prices were also reported as negative impacts on livestock production, nutrition and general wellbeing of the people.

The County experiences Tropical climatic conditions. The driest months are January and February. The long rainy season falls in the months of March, April and May. Elevation and orientation of the major topographic features such as the Mathews Ranges and Ndoto Mountains influence rainfall distribution. In Samburu Central short rains occur during the months of July and August, sometimes extending into September. In Samburu North and East, the short rainy season is usually delayed and occurs in October and November and sometimes extends into December.

The southwest plains and the Lorroki Plateau receive between 500 mm and 700 mm of rainfall annually. The Nyiro and Ndoto Mountains and Matthews Ranges receive the highest amount of rainfall between 750 mm and 1250 mm per annum. The central basin and the plains east of the Matthews Ranges are the driest parts of the county with annual rainfall of between 250 mm and 500mm.

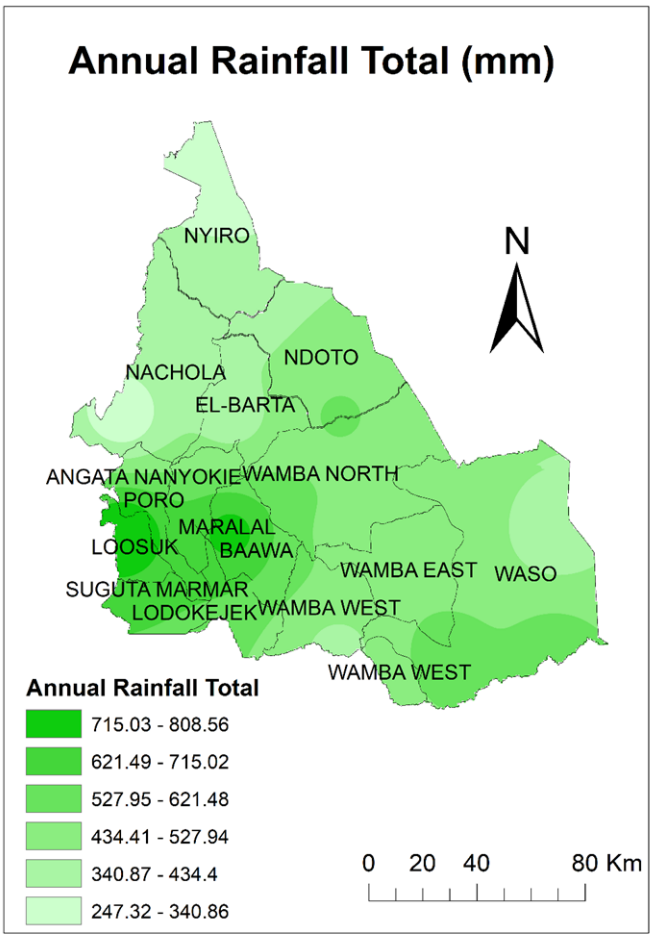


Figure 1: Annual rainfall in Samburu

3.1.2 Annual rainfall distribution over Samburu County

The county has an annual mean temperature of 29°C with the maximum range being 33°C and minimum of 24° C. The central plains and the region east of the Matthews Ranges have the highest temperatures while the highland belts in the North Eastern side of Lorroki Plateau are the coolest.

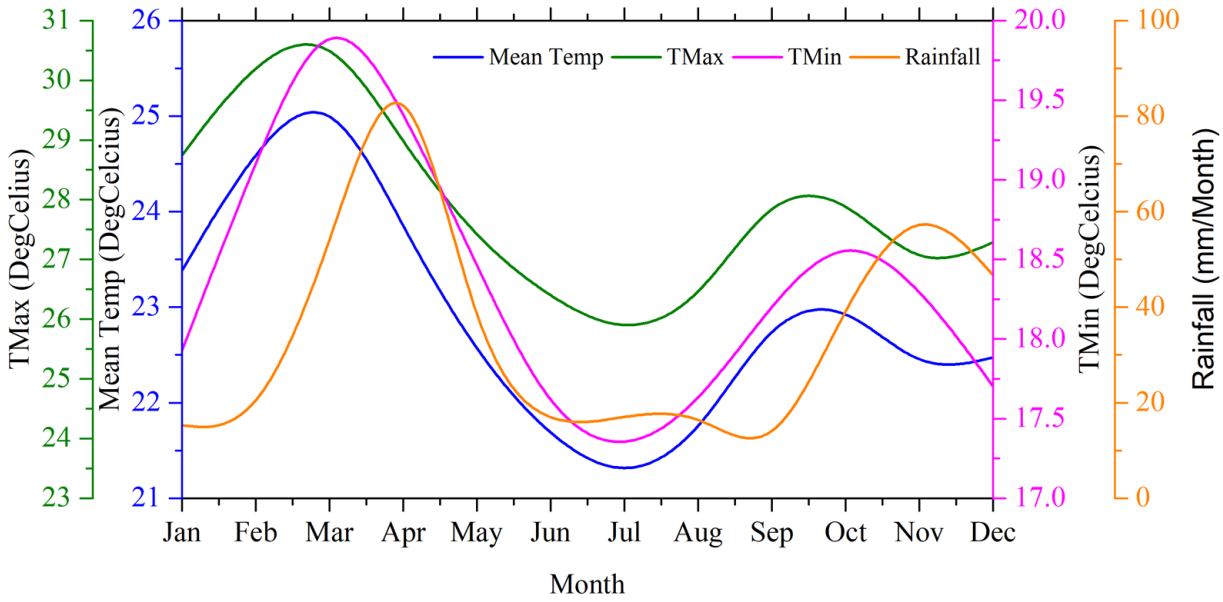


Figure 2: Annual cycles of rainfall, mean temperature, maximum temperatures and minimum temperatures

3.1.3 Annual and Seasonal Rainfall Variation

The droughts highlighted in the sections of this report are observed in the annual anomalies of rainfall as illustrated in *Figure 3*. For instance, the 1984 drought was caused by up to a 160mm deficiency in the annual rainfall total received over Samburu County. Other notable extreme events that can be identified from the analysis of the historical rainfall trends are the 1990-1992 drought as identified by Suguta Ward, the year 2000 drought, 2010 and the recent drought of 2020-2023 that spread all over the county which led to migration of pastoralist from Samburu into Marsabit, Isiolo, Baringo and Laikipia Counties. In addition, the 1990, 1998 floods that ravaged some Wards are visible with a record 280mm positive rainfall anomaly being observed in the 1998 El Nino event. The analysis further depicts a scenario of a rising trend of annual rainfall from 1981 to 2022.

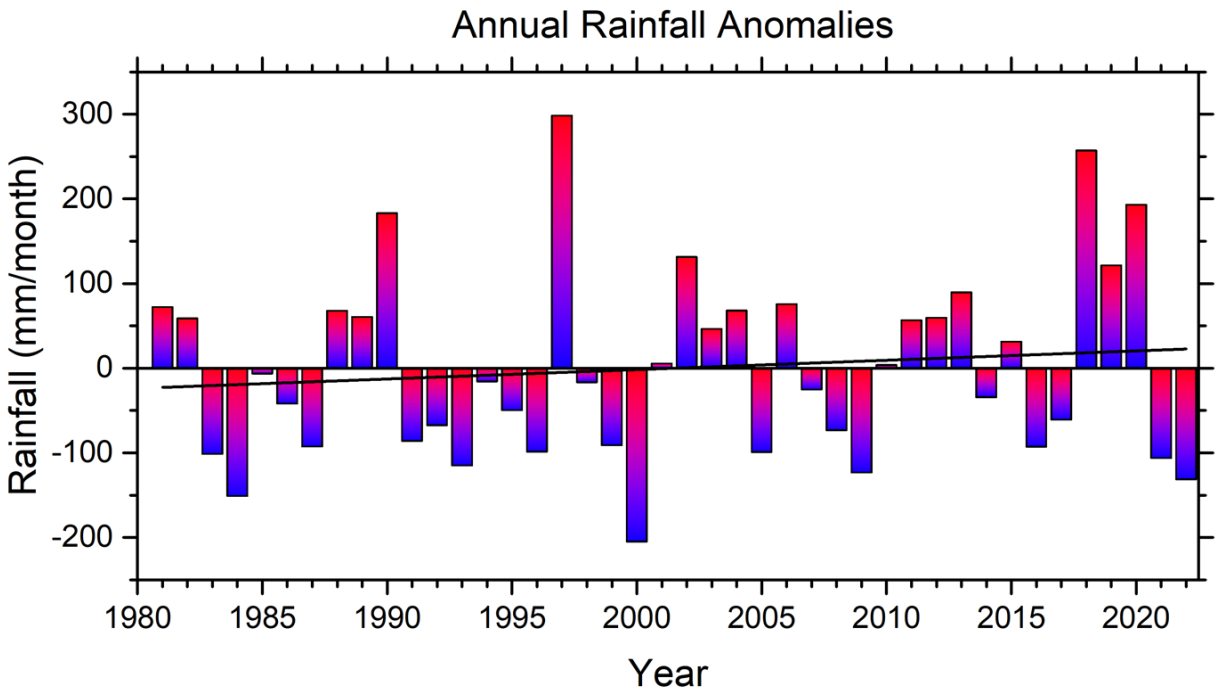


Figure 3: Annual variation of rainfall in Samburu County 1981-2022

The rainfall over Samburu County varies at both temporal (monthly and seasonal scales) and spatial (geographically) over various parts of Samburu County. *Figure 8* demonstrates the seasonal variability of rainfall over the County. Rainfall variability is of great importance since crop and livestock production activities are heavily dependent on rainfall. Notably, Wamba region depends on OND season for crop production with harvesting mainly happening in December and January. It is observed that the historical rainfall trends for both MAM and OND seasons have been on the rise. However, there are also inter-annual variations within the season with some years experiencing failed seasons while other seasons receiving fairly high rainfall amounts.

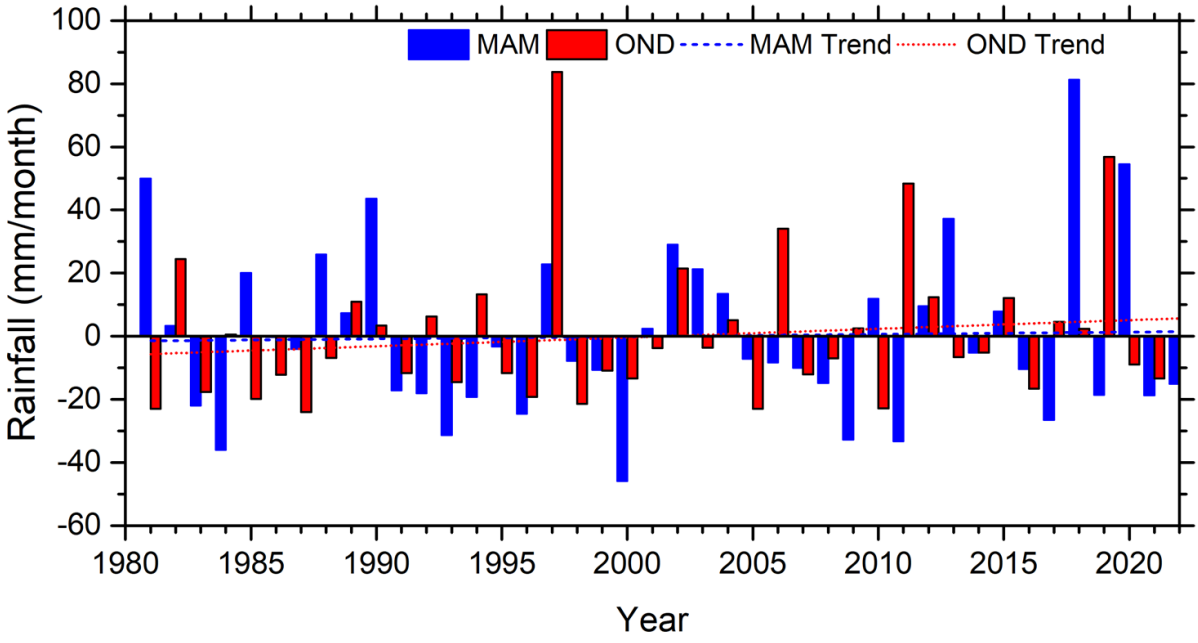


Figure 4: Seasonal rainfall variation over Samburu County

3.2 Future Climate Scenarios for the County

There are many uncertainties in future projections of climate change and its impacts. Several of these are well-recognised, but some are not. One category of uncertainties arises because we don't yet know how mankind will alter the climate in the future. For instance, uncertainties in future greenhouse gas emissions depend on the future socio-economic pathways, which, in turn, depend on factors such as population, economic growth, technological development, energy demands and methods of supply, and land use. The usual approach to dealing with this is to consider a range of possible future scenarios. Many factors have to be taken into account when trying to predict how future global warming will contribute to climate change. The amount of future greenhouse gas emissions is a key variable.

Developments in technology, changes in energy generation and land use, global and regional economic circumstances and population growth must also be considered. The projections for rainfall and temperatures for Samburu County were constructed as part of the PCRA procedure. This concentrated on both the historical and future temporal scales. The main objective of climate analysis in the PCRA process is to aid in generating adaptation options for key assets (natural, physical and social assets), livelihoods, and economic investments in the sectors that are sensitive to climate change and its resulting impacts. Climate projections provide a possible future climate situation based on rainfall and temperature and the likely resultant climate hazards. This helps in defining the climate actions/adaptation strategies to be undertaken with a view to building long term climate resilience.

3.2. 1 National Level Climate Projections

3.2.1.1 Temperature Projections

Future climate trends on temperature and rainfall show that Kenya's economy will continue to be affected. Global Climate Modelling (GCM) data indicates that the mean annual temperature is projected to increase by between 0.8 and 1.5°C by the 2030s and 1.6°C to 2.7°C by the 2060s. Compared to pre-industrial levels, median climate model temperature increases over Kenya amount to approximately 1.4°C by 2030 and 1.7°C by both 2050 and 2080 under the low emissions scenario RCP2.6. Under the medium/high emissions scenario RCP6.0, median climate model temperature increases amount to 1.3°C by 2030, 1.6°C by 2050 and 2.2°C by 2080. All projections indicate decreases in the frequency of days and nights that are considered 'cold' in the current climate. These events are expected to become exceedingly rare, and do not occur at all under the highest emissions scenarios (A2 and A1B) by the 2090s.

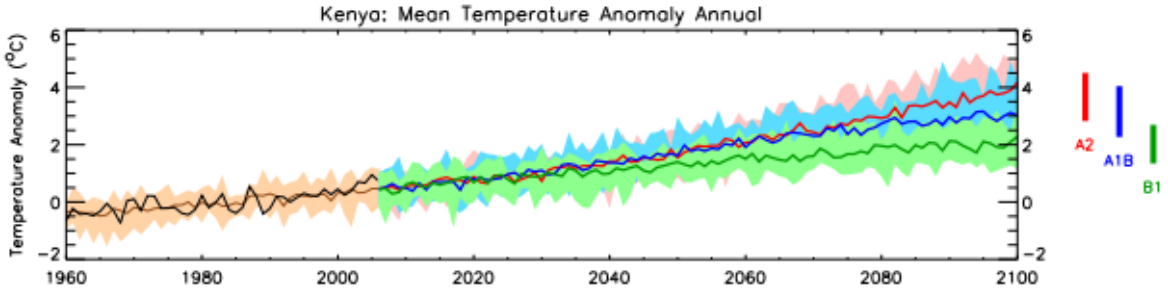


Figure 5: Air temperature projections for Kenya for different GHG emissions scenarios.

3.2.1.2 Rainfall Projections

Future projections of precipitation are less certain than projections of temperature change due to high natural year-to-year variability. Under RCP2.6, median model projections indicate a slight increase towards the year 2030 but an overall decrease towards the end of the century. Under RCP6.0, the projected rainfall increase is likely to intensify after 2050, reaching 53mm per year at the end of the century compared to 2000. Higher concentration pathways suggest an overall wetter future for Kenya. For the A1B emissions scenario, projections for temperature increases over Kenya, of up to around 3°C, show good agreement between the CMIP3 ensemble members.

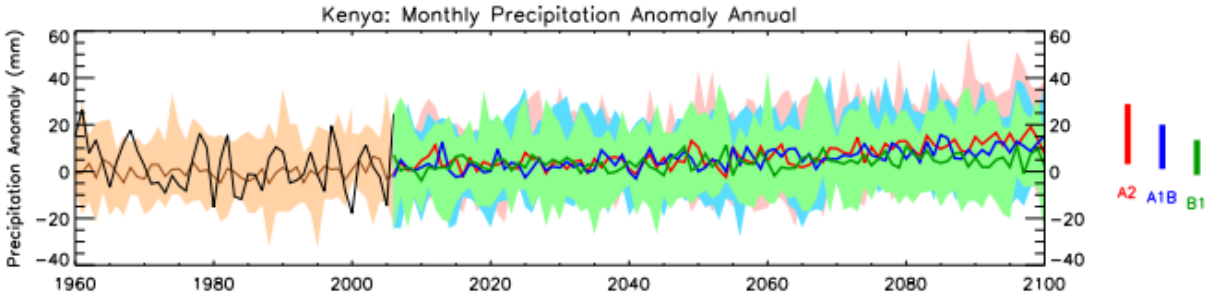


Figure 6: Annual mean precipitation projections for Kenya for different GHG emissions scenarios, relative to the year 2000.

3.2.2 County future climate scenarios

Understanding the potential impacts of climate change is essential for informing both adaptation strategies and actions to avoid dangerous levels of climate change at sub-national level. A range of valuable national studies have been carried out and published, and the Intergovernmental Panel on Climate Change (IPCC) has collated and reported impacts at the global, regional, national and to some extent sub-national scales. But assessing the impacts is scientifically challenging and has, until now, been fragmented. To date, only a limited amount of information about past climate change and its future impacts has been available at national level, while approaches to the science itself have varied between countries. It is therefore vital to develop these scenarios at a local scale to guide the community driven interventions. Samburu County being an ASAL county is likely to benefit from such climate products.

3.2.2.1 Rainfall Projections

Rainfall extremes over Samburu County, either excess or deficit, can be hazardous to human health, societal infrastructure, livestock and agriculture. While seasonal fluctuations in rainfall as shown in Figures 9 & 10 are normal and indeed important for a number of societal sectors (e.g. tourism, farming etc.), serious negative impacts can arise from flooding or drought. These are complex phenomena and often the result of accumulated excesses or deficits or other compounding factors such as changes in land use. The analysis section below deals purely with precipitation changes expressed as percentages.

Annual Rainfall Projection

The projected change of annual rainfall is presented in *Figure 7* with both the RCP4.5 and 8.5 depicting a positive change in annual rainfall in both near future and mid-century scales. The least change is likely to occur in Western wards of Maralal, Loosuk, Suguta, Nachola and Angata Nanyekie. The highest changes are observed in the Waso, Wamba West and Wamba East Wards. This paints a picture of a likely wet future in both scenarios which is likely to result in increased flood frequency. According to the ward PCRA reports, Wamba region is prone to land degradation and therefore this scenario may lead to increased incidences of soil erosion and flash floods with key resources such as roads being highly impacted. High precipitation amounts can lead to flooding of transport infrastructure, especially in areas with low altitudes. This will necessitate higher maintenance costs. Transport infrastructure is vulnerable to extreme weather events, yet essential for agricultural livelihoods. Roads serve communities to trade goods and access healthcare, education, credit and other services.

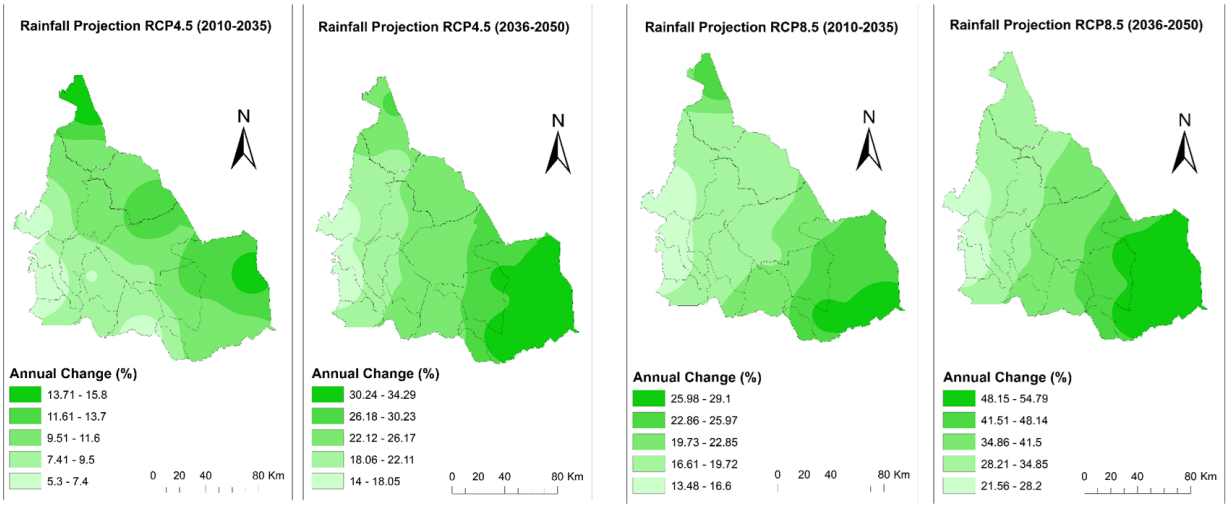


Figure 7: Spatial change of annual rainfall over Samburu County

The annual variation of the projected rainfall under the two RCP scenarios are presented in *Figure 7*. The negative rainfall anomalies represent rainfall deficit years while the positive anomalies show the rainfall surplus years. This shows that future water availability is uncertain, with potential increases in annual run-off masking overall reductions in water availability during certain periods. Climate variability and the steady degradation of water resources are likely to make water availability even less predictable and limit capacities. Even areas which were known to receive high precipitation amounts and to be abundant in freshwater, such as the Loosuk and Maralal wards, experience more dry spells with rivers falling dry with increasing frequency. This leaves the residents of the densely populated regions like Maralal town exposed to water scarcity and water-borne diseases.

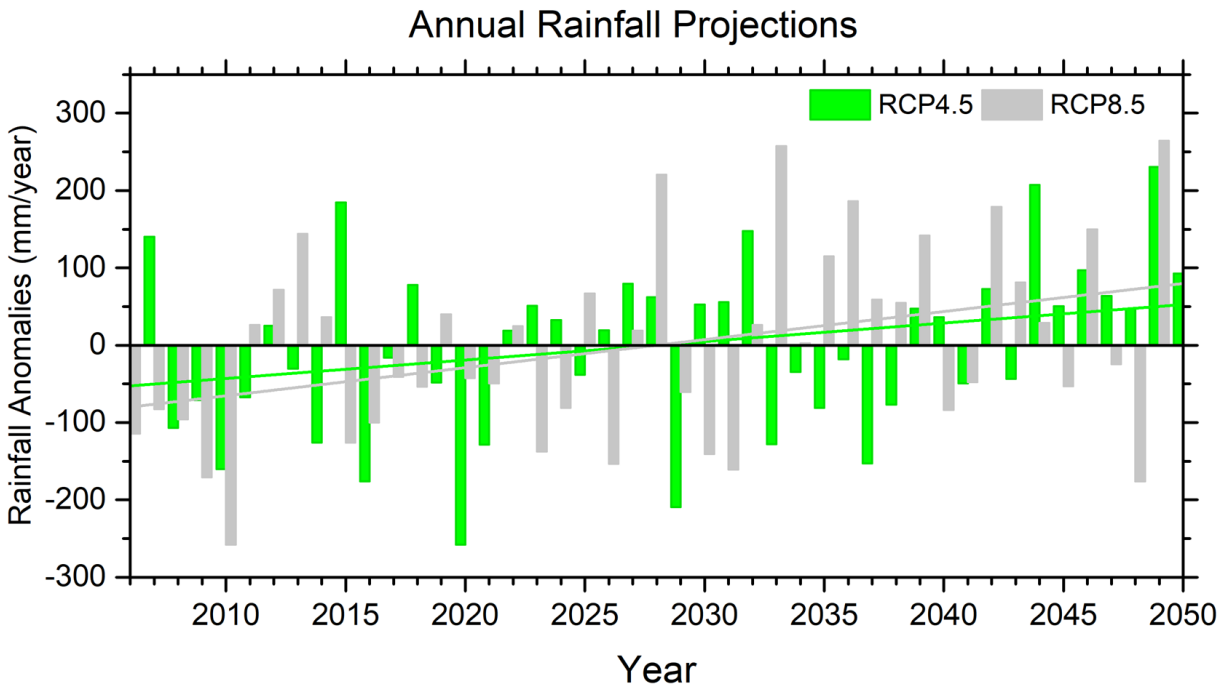


Figure 8: Temporal variation of the annual rainfall projection over Samburu County

Seasonal Rainfall Projection

Samburu County depends mainly on rainfall to support its crop and livestock production. Smallholder farmers in Samburu are increasingly challenged by the uncertainty and variability of weather caused by climate change at seasonal scale. Since most crops are rain fed, yields depend on water availability from rainfall. However, the length and intensity of the rainy season is becoming increasingly unpredictable and the use of irrigation facilities remains limited due to poor extension services and irrigation management, and lack of credit and technical equipment.

Most of the Wards experience two rainfall maxima which is observed in March-April-May (MAM) and October-November-December (OND) and confirmed by the historical calendar developed during the PCRA process. The PCRA process further developed the seasonal scale rainfall projections for the two RCPs 4.5 and 8.5 to determine the seasonal rainfall change. *Figures 9 & 10* demonstrate the seasonal patterns of rainfall change over Samburu County in the latter climate scenario. During MAM, all the scenarios at different scales show an increased rainfall with the eastern sector having a significant increase represented by 5% to 20% in RCP4.5. However, under RCP8.5, the changes in mid-century scale are significantly higher compared to the near future scale. Notably, the OND change depicts a homogeneous positive change except the near future projection at near future under RCP4.5 which shows both negative and positive changes of rainfall over the County. Dry OND season is expected over the western Wards of Nachola, Loosuk and towards Lodokejek. This is likely to expose the crop lands to dry conditions leading into food insecurity in some parts of the County.

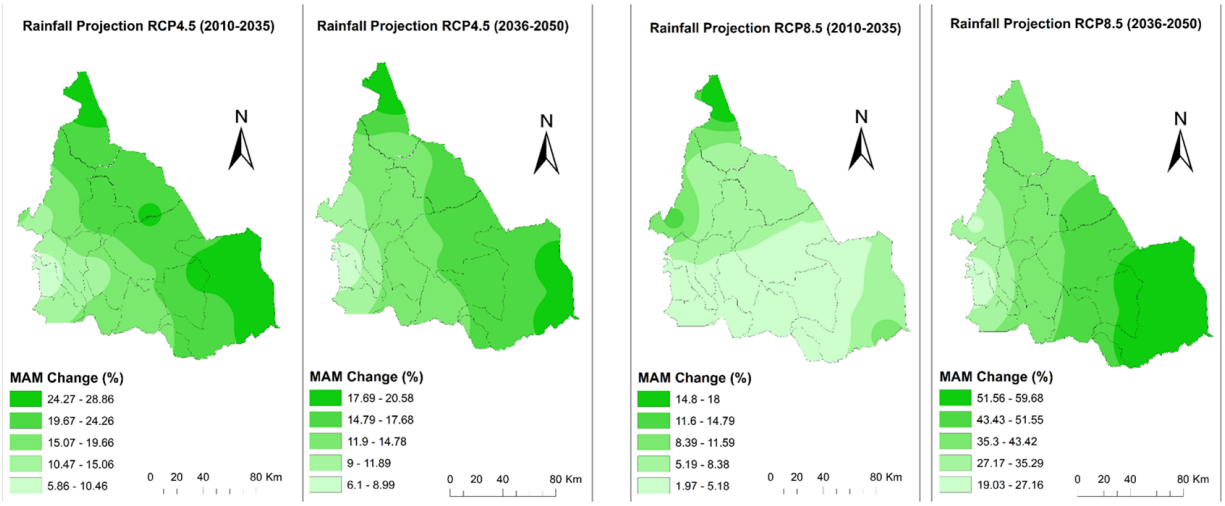


Figure 9: MAM rainfall change

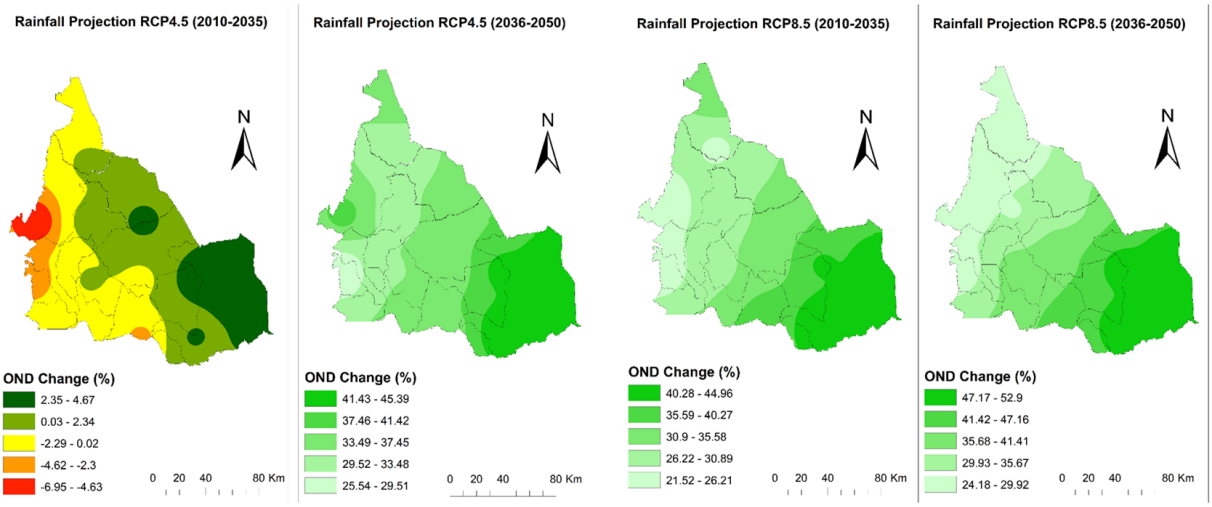


Figure 10: OND rainfall change

3.2.2.2 Temperature Projections

Both hot and cold temperature extremes can place many demands on society. While seasonal changes in temperature are normal and indeed important for a number of societal sectors (e.g. tourism, farming etc.), extreme heat or cold can have serious negative impacts. Importantly, what is 'normal' for one Ward in the County may be extreme for another that is less well adapted to such temperatures. *Figures 11 & 12* show a rising pattern of both the minimum (night time) and maximum (day time) temperatures over the County.

Climate change is expected to have a significant influence on the ecology and distribution of tropical ecosystems, even though the magnitude, rate and direction of these changes are uncertain. With rising temperatures and increased frequency and intensity of droughts, wetlands and riverine systems are increasingly at risk of being converted to other ecosystems, with plant populations being succeeded and animals losing habitats. Increased temperatures and droughts

can also affect succession in forest systems while concurrently increasing the risk of invasive plant species, all of which affect ecosystems. In addition to these climate drivers, low agricultural production and population growth might motivate further agricultural expansion resulting in increased deforestation, land degradation and forest fires, all of which will negatively impact biodiversity.

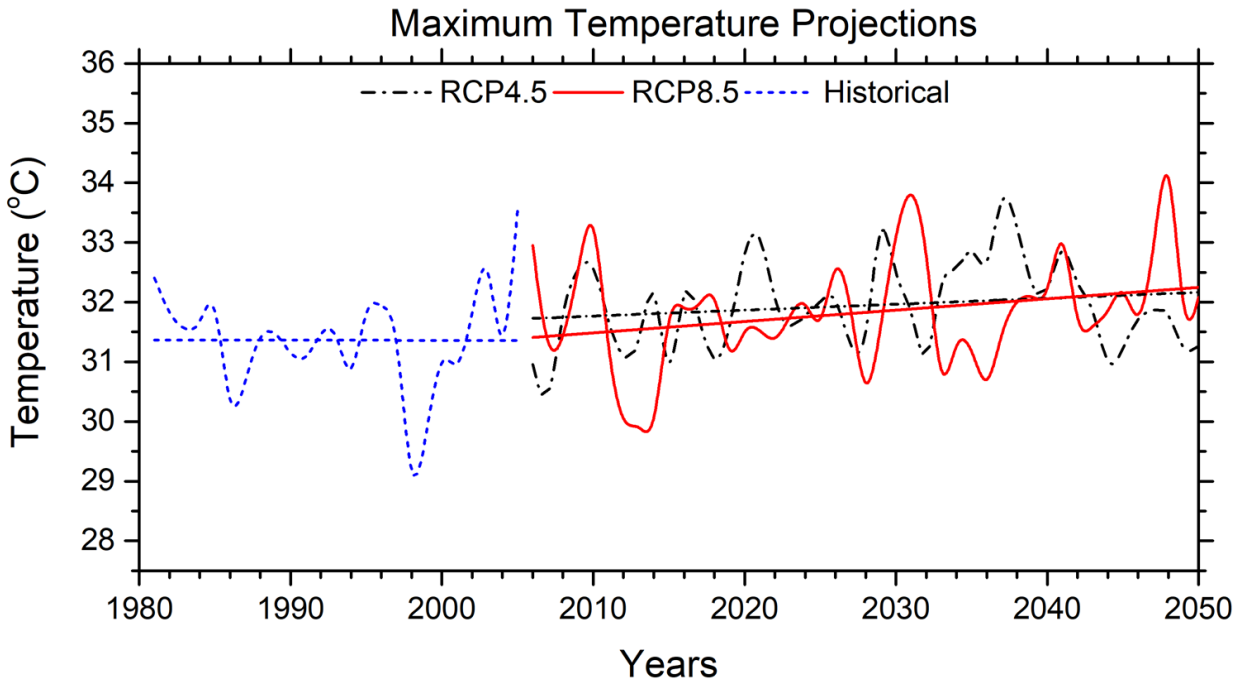


Figure 11: Maximum projected temperature trends

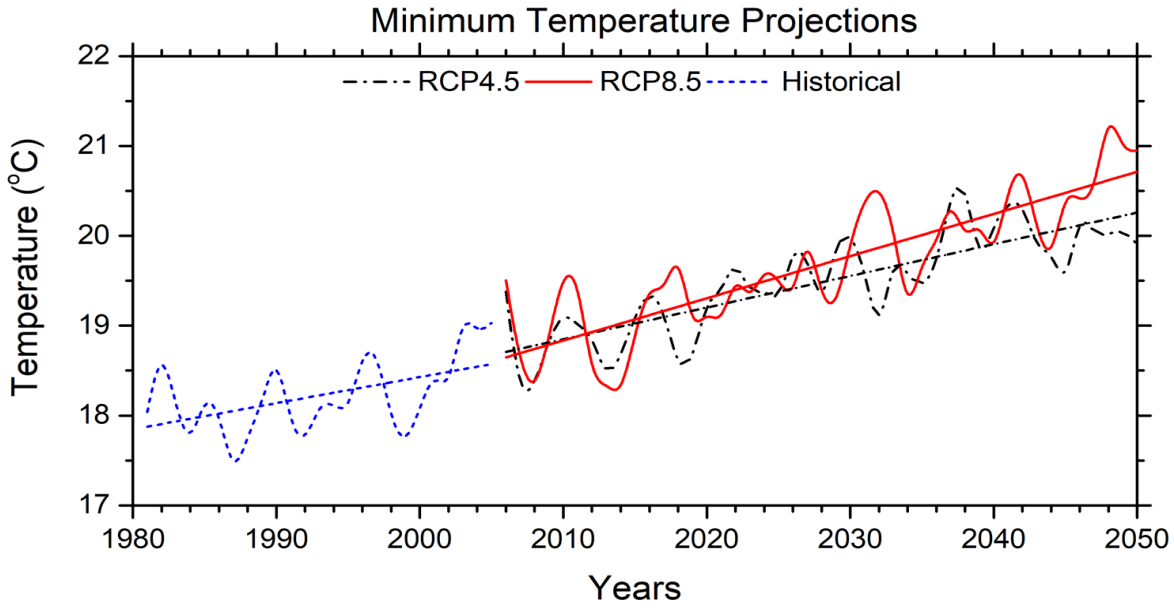


Figure 12: Minimum projected temperature trends

4.1 Historical Climate Hazards and Trends

4.1.1 Historical documented hazards

<u>Droughts</u>

- 1980 – 1984 Catastrophic drought that led to the migration of Samburu and Turkana Cattle herds to the vast areas of Suguta Escarpments. It wiped 90% of the land's total livestock herds.
- 1990 – 1992 Drought that wiped 70% of the land's total livestock herds. It led to the migration of people to as far as Isiolo and Garissa areas.
- 2000 – 2002 Drought that wiped 50% of livestock herds in the land and led to the migration of people and livestock to neighbouring districts.
- 2008 – 2010 Drought that killed 50% of the livestock population on the land and led to the migration of the people and livestock to neighbouring districts.
- 2019 – 2023 Drought that led to the migration of people to the neighbouring counties. It killed 60% of the clusters' livestock.

Short drought that usually runs from January to March nowadays extends to the months of May and June while Clusters periodic long drought that runs from the Months of June to October nowadays extends to January creating a full cycle of year-round drought.

Floods

- **1990** – Seren village was hit by floods with mudslides burying homesteads, livestock and a nursery school.
- **1998** – During the El-Nino rains, Arsim village got hit by mudslides causing livestock deaths and settlements displacements. Marti village also experienced flash floods whereby a number of homesteads and livestock were washed away.
- **2011** – Loonjorin village was washed away by flash floods carrying away a number of livestock and homesteads.
- **2013** – Waso Rongai village was hit by flash floods.
- **2018** – Arsim village experienced flash floods. Several manyattas and livestock were swept away. Three people lost their lives because of the disaster.
- **2002** – Tuum village was hit by flash floods. Four people were killed through the event. Several homesteads were swept away.
- **2022** – Tuum village was hit by the floods. Livestock were washed away.
- **2023** – Ntaletiani village and Loonjorin were swept away by flash floods. Several livestock herds and homesteads were washed away. Kurungu Laparran village was affected by floods. Parkati area was also affected where a village was washed away. Naichamunye village of Waso Ward was also affected by floods where goats, sheep and huts were washed away.

Locust Invasion

- **1940** – Locust invasion where vegetation cover was adversely affected resulting to heavy livestock losses.
- **2020 – 2022** Locusts invaded vegetation, forage and crops and caused a reasonable number of livestock deaths. The insecticide used by the government to control the locusts ended up killing bees and other agents of pollination and wild fauna that fed on the dead insects. The most affected sub counties were East and North.

Vector borne Diseases

- **1981 – 1983 –** Eastern parts of Ndoto ward was invaded by Malaria causing mosquitoes resulting in a big number of human deaths.
- **1998** – The same area of Ndoto was again hit by Malaria causing a number of human deaths
- **1998** – To Date – Lesirikan, Baragoi Marti and Nyiro areas have been invaded by Malaria causing mosquitoes that were never there before.

4.1.2 Differentiated impacts of climate trends and risks

The information captured from the five clusters shows a clear indication of increasing trends of droughts and floods in all the Wards over time.

Drought

The areas' short drought period (*Lamei dorop*) has extended from three months to between five and six months, while the long dry spell has extended from four to six months leading to prolonged periods of drought annually.

Floods

The trends on flash floods show an increase in terms of time and space. **Arsim** and **Seren** areas were historically the only parts of the cluster prone to floods, but in the recent past, **Lesirikan**, **Tuum**, **Waso Rongai**, **Marti** and **Kurungu** have started experiencing flooding.

Forest Fires

Forest fires have increased recently leading to rampant loss of vegetation and forest covers. For example, **Ndoto Forest** has suffered major forest fires 6 times in a period of one year.

4.2 Exposure and vulnerability profiles of the county

The main assets (livestock, crop farming, forest and business) of Samburu County appear to be significantly affected by the four main climatic hazards affecting the County. Livestock, crop farming and forestry are highly impacted by drought. This implies that more effort and resources should be directed towards these assets.

Table 3: Vulnerability matrix of various livelihoods to climate related hazards in Samburu County

No.	Hazzard / ASSET	Drought	Floods	Conflicts	Wildfire
1.	Livestock	3	2	3	1
2.	Crop Farming	3	3	0	1
3.	Forest	3	0	0	3
4.	Business	2	0	3	0

Score Analysis

0 – Not Important
1 – Less important
2 – Important
3– Very important

4.3 Spatial Distribution of Risks

As shown in *Figure 13* Samburu County's dominant livelihood is livestock production. Crop production is mainly done in Poro, Loosuk, Lodokejek, and Suguta Marmar wards. Other livelihoods are bee keeping and aquaculture. Dominant risks result from drought, its direct impact and the indirect impacts that include water scarcity, crop failure, livestock diseases and crop pests and diseases. Other hazards include floods, forest fires and soil erosion that affect both settlements and livelihoods. In areas along the County boundaries with Turkana, Baringo and Isiolo counties, climatic hazards and risks are exacerbated by cross border conflicts over natural resources and other reasons, resulting in animal losses and loss of human lives.

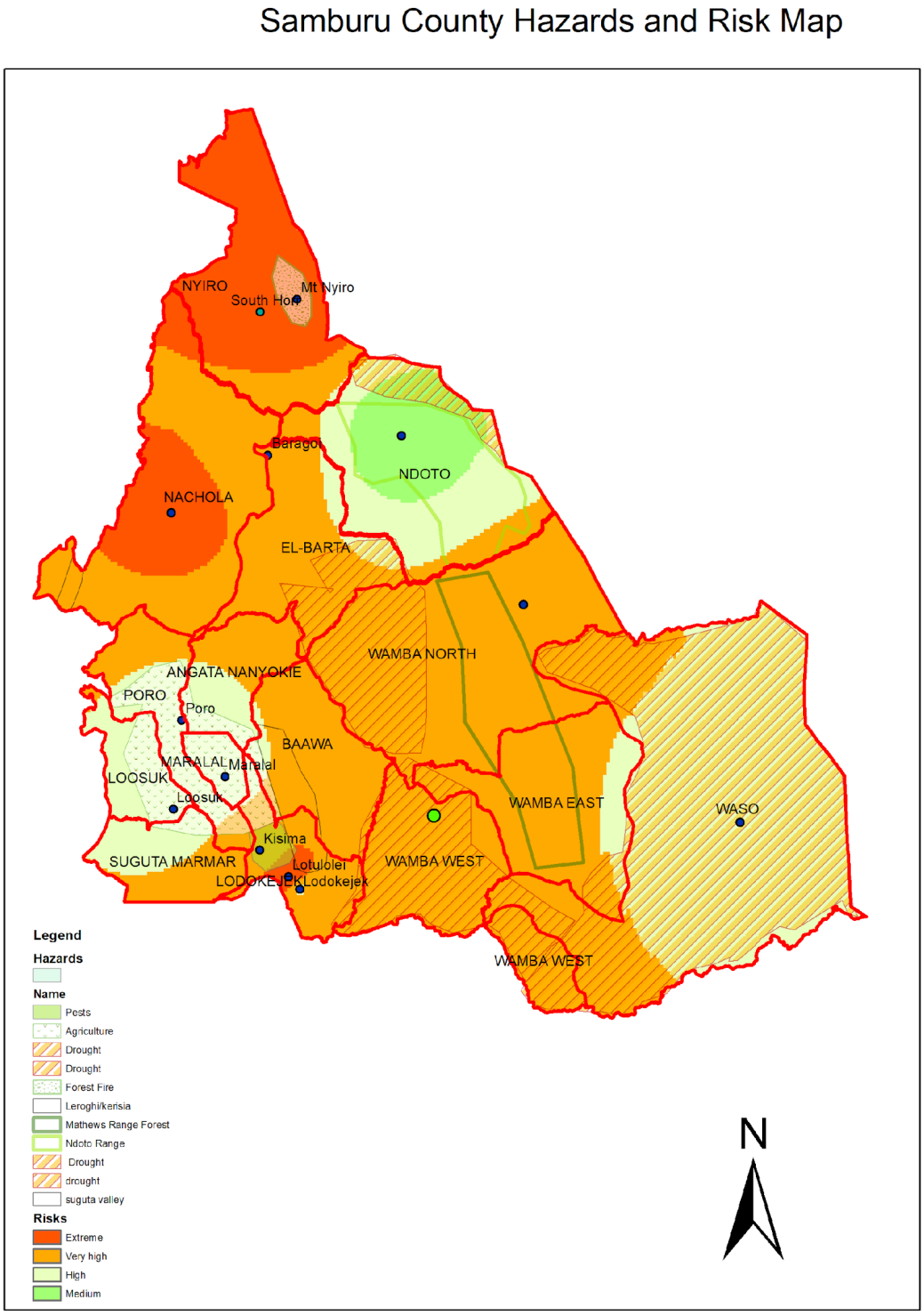


Figure 13: Samburu County hazards and risk maps

Table 4: Distribution of risks per Ward

No.	Clusters	Hazard-Priority 1	Hazard-Priority 2	Hazard -Priority 3
1.	Waso, Wamba West, Wamba East and Wamba North	Drought, Drought, Drought, Drought	Floods, Livestock diseases Land degradation Livestock diseases	Dust storms Land degradation Livestock diseases Land degradation
2.	Nachola, Elbarta, Ndoto, Nyiro	Drought, Drought, Drought Livestock diseases	Floods Land degradation Floods Conflict	Livestock diseases, Conflict Forest Fires Locust invasion
3.	Suguta, Poro, Loosuk Loldekejek,	Drought, Drought, Drought High temperatures	Floods Pest and diseases Pests Drought	Pest and diseases Desertification Floods Land degradation
4.	Baawa, Angata Nanyekie, Maralal	Drought, Drought, Floods	High temperature, High temperature, Drought	Floods Livestock Diseases, Pest and disease

Analysis of Existing Resilience/Adaptation Strategies to Current and Future Climate Risks

5.1 Overview of existing adaptation/resilience strategies and their effectiveness to current climate risks

Drought

a) Migration in search of water and pasture;
b) Destocking and saving for restocking;
c) Establishment and Conservation of fodder;
d) Planned grazing;
e) Reliance on traditional and formal early warning systems for decision making;
f) Livestock insurance;
g) Livestock supplementation;
h) Application of copping household- based strategies – example is reducing the number, size and the type of food for the household members; and
i) Distribution of risks- having herds at different areas to evade drought
livelihood diversification- kitchen gardening, bee keeping, aquaculture, poultry keeping adoption of drought resilient breeds (for livestock and crops).

Floods

a) Moving to higher grounds;
b) Construction of dams;
c) Control of forest fires;
d) Control of soil erosion; and
e) Tree planting.

Vector borne diseases

a) Vaccination;
b) Timely and Routine Disease surveillance;
c) Pest control and use of protective gears; and
d) Adoption of disease resistant breeds.

Conflicts

a) Conducting peace initiatives and cross boarder information sharing;
b) Joint settlements for protection;
c) Equitable distribution of resources;
d) Livelihood diversification;
e) Breed improvement; and
f) Social cultural behaviour and integration.

5.2 Effectiveness of adaptation/resilience strategies to future climate risks

Proper grazing plans – application of proper grazing plans will inform good land practices methods to present and future times and ensure all year availability of pasture and healing of the rangelands.

Effective/timely Early Warning systems- comprises knowledge of risk, monitoring and warning services, dissemination and communication and community response capability. It helps reduce economic losses and mitigate the number of injuries or deaths from climate risks by providing information that allows individuals and communities to protect their lives and put in place effective responses. Early warning information empowers people to take action when disaster is close to happening.

Construction of water reservoirs – Attainment of effective water harvesting and storage mechanisms like construction of dams, roof water harvesting, roadside water harvesting and micro catchments will ensure proper water drainage systems and storage for future use.

Establishment of proper nature-based resource management and conservation plans – whereby all the livelihood activities inside forests and community wildlife conservancies are well coordinated and planned and this will give solutions to the risk of forest fires (development of firebreaks) and wild animal migration.

The table below indicates response to climate change by communities. A group of participants in all Wards proposed local responses for every impact and whether it was effective and sustainable.

Table 5: Assessment of communities' response to climate change

Hazard/ Risk	Impact	Local Response	Effectiveness	Sustainability
Drought	Death of livestock	Collection of kitchen waste for livestock feeds Buying of animal feed (hay) Migration Using local herbs Destocking	++ + ++++ ++ ++	+ + ++ + +
	Water shortage	Long distance trekking in search of water Purchase of water Economical use of available water Digging wells	++ ++ ++ ++++	0 0 + ++
	Outbreak of diseases	Treat animals Use of local herbs	+++ ++	+ +
	Loss of income	Manual jobs Begging and dependency Alternative source of livelihoods	+ +++ ++	0 + ++
	Lack of food	Buy food Food rations and relief food Reduce the quantity and quality of food Reduce number of meals per day	+++ ++ +++ ++	+ ++ + +
	Loss of crops/ crop failure	Feed livestock on crop residue	+	+
Soil Erosion	Low soil fertility	Application of fertilizers Crop rotation	+++ +++	+ +++
	Damage of road networks	Advocate for: Grading and gravelling Building cut-off drains Culverts	+++ +++ ++	++ ++ ++
	Water pollution	Water treatment Looking for alternative clean water	+++ +++	+++ ++

Hazard/ Risk	Impact	Local Response	Effectiveness	Sustainability
	Destruction of vegetation	Planting cover crops	+++	+++
Floods	Fatalities	Migration to higher grounds	++	0
	Soil degradation	Rehabilitation of degraded lands	+++	+
Pests and diseases	Low production	Spraying with pesticides Uprooting the affected crops Use of local herbs	++ + ++	+ + ++
	Loss of income due to death of animals	Begging Livelihood Diversifications Casual jobs	+ ++ ++	0 ++ +
	Food shortage	Buying food Diversification/ crop rotation	+++ ++	+ ++
	High mortality rate (Livestock)	Selling of animals Vaccination and treatment	+++ +++	+ +
Dust storm	Eye infections	Go for treatment	+++	+
	Respiratory diseases	Buy medicine	+++	+
	Destruction of Building	Renovation	+++	+

Key

+	low
++	Medium
++ +	High
0	None

As shown in the table, the local response to the impacts includes an increase in non-farm activities such as fetching and selling firewood to substitute income from livestock. This response was rated to be highly effective BUT not sustainable. On water shortage, the community members are forced to seek alternative water sources, hence, travel for long distances in search of water. This is also not sustainable. It was noted that, crop rotation, diversification on income generating activities, and treatment of water were found to be more effective and sustainable in responding to the impacts of pests and diseases, and soil erosion, as well as drought. This thus, recommends the government to intervene on water supply through investing in capital intensive water infrastructure.

Adaptation strategies by Local communities

Various strategies were proposed by the communities as adaptation strategies to hazards and risks. As shown in the table below, the adaptation strategies for the impacts caused by drought, pests and diseases, floods, dust storms by local communities include: exploring alternative water sources, rain water harvesting, water storage using tanks, construction of dams and water pans, growing drought resistant/escaping crops, proper drainage – culverts, terracing and gabion building, afforestation, adopting modern farming methods, crop rotation and use of pesticides and insecticides (routine spraying).

Table 6: Adaptation strategies by the local communities

Hazard/ Risk	Impact	Local Response	Stakeholder Group applying the Strategy	Gender and social inclusion information
Prolonged dry spell	Low crop yields	• Doing Non-farm activities e.g. activities such as fetching and selling firewood • Buying food • Irrigation • Growing drought escaping crops	Women Farmers Community/ Households	Women and youth participated in the response. The women, youth, PWDs and other vulnerable groups were involved during focus group discussion.
	Water shortage	• Long distance trekking in search of water • Economical use of available water or reuse • Purchase of water	Women Household heads	
	Food shortage	• Rationing meals • Buying food • Borrowing food from relatives and neighbours • Relief food and cash transfer	Women, Household heads,	

Hazard/ Risk	Impact	Local Response	Stakeholder Group applying the Strategy	Gender and social inclusion information
	Loss of income	• Manual jobs • Borrowing	Farmers Vulnerable groups	
	Fodder/ pasture shortage	• Grazing in the forest • Destocking • Buying pasture/ animal feeds	Pastoralist/ farmers/ communities	
Soil Erosion	Low soil fertility	• Application of fertilizers • Crop rotation • Construction of soil erosion control structures like terraces, gabions etc.	Farmers Communities	
	Damage of road networks	• Building cut-off drains • Culverts • Grading and gravelling	County government	
	Water pollution	• Water treatment • Looking for alternative clean water	Women / household heads/ community	
	Destruction of vegetation	• Planting trees and cover crops	Farmers / communities	
Hail stones	Low crop production	• Planting of cover crops	Farmers	
	Loss of income	• Diversification	Household heads/ communities	
	Impact on livestock	• Construction of shelters/sheds	Farmers, pastoralists	
Pests and diseases	Low of crop production	• Spraying with pesticides • Uprooting the affected crops	Farmers Communities	
	Loss of income	• Borrowing • Diversifications • Casual jobs	Vulnerable groups Household heads	

Hazard/ Risk	Impact	Local Response	Stakeholder Group applying the Strategy	Gender and social inclusion information
	Food shortage	• Buying food • Livelihood diversification	Farmers communities	
	High mortality rate (Livestock)	• Selling of animals • Vaccination	Pastoralist/ farmers	

Risk/Hazard	Livelihood/Economic System	Climate Resilience Strategies	Stakeholder Group Applying the Strategy	Gender and Social Inclusion information
Drought	Farming	Irrigation Growing of drought tolerant crops	National government County government (Selected committee at the county level) NGOs Community	
	Livestock keeping	Selected/ controlled grazing sites Establishment of pasture	Community Local conservancies County government	
Livestock Diseases	Livestock keeping	Trainings (capacity building to local community on diseases and prevention (CDR)	National government County government	
		Vaccinations and timely disease survaillance	County government	
		Setting up of veterinary emergency services including (vehicles)	NGOs Community County government	
Land degradation	Farming Grazing	Building of soil erosion control structures relocation strategies resettlement plans Grazing management	National Govt County Govt. NGOs	
Floods	Farming Human communicable diseases	Re-location to higher grounds Construction of flood control structures	National government County government	

		Water treatment Protection of sanitary facilities from floods		

Samburu County Climate Strategic Adaptation Investment/Action Priorities

6.1 Sectoral climate change adaptive strategies

6.1.1 Agriculture and Livestock

To curb the impacts of climate change in the County, various strategies were given out by the respondents in the region. Most of the local respondents opted to shift to growing crops that are more tolerant to drought conditions. Examples of such crops include drought-tolerant maize, sorghum, and millet. These crops are more resilient to water stress and require less water to grow, making them better suited to the region's changing climate.

Shifting from rain fed crop farming to irrigation farming is a strategy. This can be done through harvesting and storage of rainwater in small to large scale water structures such as water tanks, dams, ponds, and terraces which can be used for irrigation during dry season as well as promotion of micro-catchment. Farmers can also diversify their crops to reduce their vulnerability to climate change. This involves growing a variety of crops that are suited to the region's changing climate. Crop diversification can help to ensure that farmers have a range of crops to fall back on if one crop fails due to weather conditions. Farmers can also adopt soil conservation practices such as terracing, cover cropping, and conservation tillage. These practices help to improve soil health, reduce soil erosion, and increase the amount of water that is retained in the soil. Proper drainage infrastructure must be done to reduce the effects of flooding.

To mitigate the impacts of pests and diseases, farmers in the County can use integrated pest management strategies, such as crop rotation, use of resistant varieties, use of pesticides and insecticides and biological control methods. Additionally, the government and other stakeholders can invest in research and extension services to develop and disseminate effective pest and disease management strategies to farmers.

Livestock farmers can adopt climate-smart livestock farming practices such as improving pasture management, keeping drought-tolerant livestock breeds, livestock control and integrating livestock with crops. Further, the respondents suggested planting and storage of animals feeds, and increase of veterinary services to curb livestock disease. These practices help to reduce the impact of climate change on livestock farming.

6.1.2 Water resources

To arrest the impact of climate change hazards on the water sector, the respondents prioritized that increased water storage facilities such as dams, reservoirs (water pans) and ponds will help to ensure a reliable supply of water during the drought. The County government and other stakeholders can invest in water infrastructure, such as dams and boreholes, to increase water availability and reduce the impact of prolonged dry spells.

Managing watersheds can help to improve the quality and quantity of water resources. This can be done through activities such as reforestation, which help to reduce soil erosion and increase infiltration of water into the soil. Additionally, farmers can adopt conservation agriculture practices, which improve soil health and reduce soil erosion. Protection of riparian land to be done in order to reduce water pollution. Proper drainage can be done to reduce the impacts of floods to water sources. In addition, the County can maximize on harvesting storm water to reduce chances of flooding and its impacts.

Education and awareness campaigns can help to inform residents about the impacts of climate change on water resources and the need to adopt sustainable water management practices. These campaigns can be conducted through workshops, training sessions, and community meetings and barazas.

6.1.3 Human Health

To ease the effects brought by climate change hazards in the County, some of the responses from the locals include; improving food security, increasing access to clean water, provision of treated mosquito nets and strengthening health systems by construction of more dispensaries per ward and a health centre in each sub-county.

To curb the problem on foodborne diseases such as malnutrition and related illnesses, the agriculture sector which has been greatly affected by climate change can be relied on to increase food security in the County. Samburu County can promote food security by investing in climate-resilient agriculture, improving access to markets, and supporting small-scale farmers in Samburu West Sub-County.

Strengthening disease surveillance: Climate change can lead to the spread of diseases such as malaria, dengue fever, and cholera. Samburu County can strengthen its disease surveillance system to monitor the incidence of these diseases and respond quickly to outbreaks. In addition, proper drainage in urban centres such as Maralal, Wamba, Archers Post and others can be done to control the chances of stagnation and pooling of water. The county government can also provide its residents with treated mosquito nets to minimize chances of malaria disease.

Increasing access to clean water: Samburu County can invest in water treatment facilities and boreholes to ensure that residents have access to clean and safe water for drinking and sanitation.

Strengthening health systems: Extreme weather events can strain healthcare systems, particularly in rural areas. Samburu County can strengthen its healthcare system by investing in healthcare infrastructure, increasing the number of healthcare workers, and providing training to healthcare workers on climate-related health issues.

6.1.4 Infrastructure

Infrastructure design: Infrastructure can be designed to withstand the impacts of climate change, such as increased rainfall and extreme temperatures. This can be done by incorporating climate change projections into infrastructure design and construction.

Maintenance and repairs: Regular maintenance and repairs of infrastructure can help to ensure that it remains functional and resilient to climate change. This can involve the repair of damaged infrastructure or the retrofitting of existing infrastructure to make it more resilient to climate change.

Infrastructure relocation: In some cases, infrastructure may need to be relocated to avoid the impacts of climate change, such as floods or landslides. This can involve the relocation of roads, bridges, and other infrastructure to safer locations, for example the Wamba-Archers Post-Maralal road junction where the road has developed into a gulley.

Early warning systems: Early warning systems can help to alert residents and infrastructure managers of impending weather events, such as storms or floods. This can give them time to prepare and take appropriate actions to protect infrastructure.

Public awareness: Public awareness campaigns can help educate residents and infrastructure managers about the impacts of climate change on infrastructure and the need for adaptation measures. This can be done through community outreach programs, public education campaigns, and the dissemination of information through various media channels, such as local TV and FM radio stations.

6.1.5 Forestry

The respondents prioritised reforestation and afforestation, forest conservation, forest restoration and management in order to reduce the impacts of climate change on forest and increase forest cover in the County.

The PCRA recommends the following strategies:

Reforestation and afforestation: Planting new trees and restoring degraded forests can help increase forest cover and enhance the resilience of forests to climate change impacts, such as drought and wildfires.

Agroforestry: Introducing agroforestry practices, such as intercropping trees with agricultural crops, can help improve soil health, increase biodiversity, and provide additional sources of income for local communities.

Forest conservation: Protecting existing forests through conservation measures, such as community-based forest management, can help maintain biodiversity, carbon sequestration, and other ecosystem services provided by forests.

Forest restoration and management: Restoring degraded forests and implementing sustainable forest management practices, such as selective harvesting, can help improve the health and productivity of forests and reduce the risk of wildfires and other disturbances.

Diversification of tree species: Planting a diverse range of tree species, including both indigenous and exotic species, can help increase the resilience of forests to climate change impacts and enhance the ability of forests to provide a range of ecosystem services.

Education and awareness-raising: Educating and raising awareness among local communities, stakeholders, and policymakers about the impacts of climate change on forestry and the importance of sustainable forest management practices can help build support for adaptation and mitigation measures.

Samburu County Climate Strategic Adaptation Investment/Action Priorities

6.2 Identification of strategic climate action priorities

This assessment has identified strategic areas where climate change action will be linked to the CIDP key activities (e.g. health, pastoralism, water provision, food security, environmental conservation, development of agricultural value chain). It was established that negative impacts affecting the communities include; an increase in vector-borne diseases, such as malaria and cholera; death of livestock and loss of livelihoods due to drought, damage to infrastructure in homes, schools, hospitals, and public places; and food insecurity due to prolonged dry spells, increased cases of human-human and human-wildlife conflicts because of increased pressure on the eco-system.

6.3 Priority County Climate Change Actions

For each of the seven priority areas for adaptation, two priority areas for mitigation and five cross-cutting strategies, specific actions are identified that will be required to implement each of the sub-objectives in the short, medium and long term. Lead and supporting government

agencies and other stakeholders responsible for implementation of each of the activities are identified.

6.2.1 Adaptation

Adaptation refers to adjustments in natural or human systems to respond to the potential impacts of climate change, thereby reducing the risk of harm and exploiting beneficial opportunities. In its climate change response, Samburu County will prioritise the adoption of adaptation strategies as a means of urgently addressing its high vulnerability and low ecological, social and economic resilience to climate change. Several adaptation interventions also support priorities for development identified in its CIDP.

Adaptation Objective: To reduce Samburu County's vulnerability to climate change through enhancing its adaptive capacity and resilience to the impacts of climate change.

To achieve the adaptation objective and in support of its sustainable development goals, actions in the following priority areas shall be implemented:

Table 7: Strategies on food security and nutrition

Food security and nutrition			
Objective: To integrate environmental management and risk reduction and management strategies into agricultural development.			
Sub-objectives	Activity	Timeframe	Lead agency (and key collaborators)
1. Integrate climate change and risk reduction and management criteria into legislation, regulations, policies, plans and programmes in the agricultural and fisheries sectors.	a) Undertake an assessment of the laws and policies governing the agricultural and Livestock sectors, including the relevant institutions and their authority.	Short-term	Departments of Agriculture and livestock+ Disaster Management + Department of Climate Change + farmers associations +community elders
	b) Identify areas of the regulatory framework where decision-making relevant in climate change preparedness could be strengthened, including gaps or conflicts which undermine objectives, and develop and execute proposals for undertaking amendments or revisions to the regulatory system to address these challenges.	Short-term	
	c) Capitalise on existing regional cooperation efforts e.g. North Rift Economic Block to integrate climate change considerations into agriculture and livestock through incorporation of agreed commitments into legislation, relevant sectoral strategies, and work plans.	Short-term	
	d) Integrate and harmonise climate change adaptation and risk reduction and management in designing policies, plans and programs.	Medium-term	
2. Facilitate and promote climate-smart practices in the agricultural and livestock sector, including through investments in improved practices, technology and infrastructure that result	a) Develop an accessible database and system observation, analysis and dissemination of climate information on weather patterns for farmers.	Medium-term	KMD, NDMA, Departments of Agriculture and livestock

in enhanced efficiency and capacity, increased resilience to climate change and natural disasters..	b) Develop and test adaptive measures in drought-prone areas through combining appropriate crops, livestock, new cropping patterns and land and water management practices.	Medium-term	Departments of Agriculture and livestock + farmers' associations + KMD+ Climate change directorate, KFS
	c) Promote and employ climate-smart agricultural and livestock practices, including soil and water conservation best practices such as the use of hard and soft erosion control methods; increased water storage capacity for harvesting water in the wet season; non-chemical based integrated pest management systems; shade trees in pastures and live fences to provide fodder and lessen the impacts of hot weather; alternative farming methods that are suitable for emerging climatic conditions (e.g. dry farming, drip irrigation); and sheltered production systems (shade and greenhouses).	Short-Medium-term	
	d) Develop and implement integrated pest and disease management systems.	Short-Medium-term	
	e) Develop a monitoring and response systems for pests, disease and invasive species.	Medium-term	
	f) Promote the practice of backyard gardening and small stock rearing to reduce dependence on food support.	Short-term	
	g) Strengthen veterinary services systems, including disease surveillance and timely vaccinations to prepare for the possible impacts of climate change.	Short-Medium-term	

	h) Identify areas where agro-forestry could best be practiced and develop and execute training and educational programs for farmers and relevant departmental officers to support the practice. Ensure that climate change considerations are reflected in the Physical Development Plan and support activities regarding appropriate tree species and land use.	Short-Medium-term	
3. Explore synergies with other sectors to develop innovative agricultural and livestock programmes that support economic diversification and promote enhanced natural resource management, including via agro-forestry, agro-tourism and food festivals.	a) Ensure that climate change considerations are reflected in the *relevant policies*.	Short-Medium-term	County attorney + department of climate change and Departments of Agriculture and livestock
	b) Develop a resource network to provide technical assistance, through capacity building and dissemination of accessible knowledge products to improve preparedness for climate change impacts.	Short-term	Department of Climate Change + Small Business Association + farmers associations+ KMD +NDMA and Departments of Agriculture and livestock
	c) Improve and expand the agriculture, livestock and fisheries sub-sectors through bee keeping, poultry, aquaculture and kitchen garden extension services especially to highly vulnerable individuals and communities.	Short-Medium-term	Department of Agriculture + Ministry of Health +Disaster
4. Enhance extension activities and support services to small scale farmers and enable them to better prepare for and respond to climate impacts to	a) Develop strategies to encourage youth involvement in agriculture and livestock via promotion of agriculture as a career and awareness creation	Short-Medium-term	Department of Agriculture + Economic Development and Trade + farmers associations+ Directorate of Climate change

protect and sustain their livelihoods.	b) Improve public risk financing structures to enhance the development of agricultural insurance, including crop and livestock insurance mechanisms, and educate farmers as to the benefits of participating in these programs.	Medium-term	
	c) Strengthen farmer associations and their capacity to address climate change risks.	Short-term	

Table 8: Strategies on ecosystems and resources

Natural ecosystems and resources			
Objective: To ensure the health and productivity of natural ecosystems to improve their resilience to climate change and their ability to provide ecosystem services that act as adaptation measures.			
Sub-objectives	Activity	Timeframe	**Lead agency** (and key collaborators)
1. Strengthen natural resource management legislation, regulations, policies, plans and programmes through integration of climate change and risk reduction and management considerations into ecosystem based management approaches.	a) Ensure that regulations and other relevant legislation reflect climate change considerations.	Short-term	**Department of** Climate Change + County Attorney + County assembly
2. Conduct assessments of ecosystem and species vulnerability to climate change and integrate in biodiversity conservation planning.	a) Undertake vulnerability assessments for key terrestrial ecosystems (forests, watersheds, wetlands) and develop management plans to address risks from climate change.	Medium-term	**Department of** Climate Change + NEMA + KFS + KWS
	b) Integrate climate change considerations into protected area management plans.	Medium-term	
	c) Ensure that species action plans for vulnerable species that are at risk from climate change address climate change considerations.	Medium-term	

	d) Build the capacity of communities, local conservation organizations, government agencies to understand and respond to the impact of climate change on biodiversity.	Short-Medium-Long	
	d) Habitat connectivity analysis; Analyse the connectivity of habitats and migration corridors for wildlife in the context of climate change and identify and protect critical corridors that allow species to move in response to changing environmental condition.	Medium term	
3. Manage ecosystems and species to reduce other threats that weaken their resilience, including through reducing the spread of invasive plant species, deforestation and forest and rangeland degradation, and unsustainable uses of forest resources.	a) Develop invasive species management strategies and incorporate risks due to climate change.	Short-term	**Department of Environment** Climate Change + NEMA, KFS, NRT
	b) control of invasive species *e.g acacia reficiens and* value addition of the invasive species products i.e *Prosopis juliflora* and *opuntia exaltata.*	Short term, medium term and long term	
	c) Promote integrated land use planning that takes into account the need of both conservation and development. Ensure that zoning and land-use regulations protect critical ecosystems.	Medium term	
	d)Mapping of degraded rangeland and forest areas and development and implementation of restoration plan.	Short term	

4. Protect and enhance forest ecosystems to capitalise on ecosystem services, such as watershed protection and soil stabilisation services to build resilience to impacts of heavy rainfall, drought and high winds.	a) Monitor and evaluate the impacts of climate change on hydro-geological conditions.	Medium-term	**Department of** Climate Change + NDMA NEMA KFS WRA
	b) Conduct forest restoration and protection and use soil and water conservation methods to limit flash flooding and soil erosion in vulnerable areas.	Short-Medium-term	
	c) Integrate nature based solutions into infrastructure development such as incorporating green infrastructure for flood control and erosion prevention (permeable pavements, urban forests)	Long term	
	d) Design and implement erosion control measures in areas prone to soil erosion measures e.g planting of cover crops to stabilize soils and prevent erosion.	Long term	
	e) Forest restoration through afforestation and reforestation.	Short-Medium-long term	
5. Protect forests from human activities e.g. charcoal burning	a) Provide energy saving Jikos and improved cook stoves to women.	Short term	Department of Climate Change + NEMA, KFS
	b) Sensitize communities on reforestation.	Short-medium term	
	c) Encourage adaption of alternative livelihood sources to discourage charcoal burning	Long term	

	d) Fuelwood plantation/ Woodlots: establish fuelwood plantation using fast growing and sustainable tree species. These plantations can provide a sustainable source of fuelwood and charcoal reducing the need to harvest trees from natural forests.	Long term	
	e) Agroforestry initiative; encourage agroforestry practices among local farmers.	Long term	
	f) Forest restoration programs: implement forest restoration programs that involve local communities in tree planting and habitat rehabilitation efforts.	Long term	

Table 9: Strategies on water security and management

Water security and management			
Objective: To provide a safe and reliable supply of water to Samburu County's population and ensure sustainable use of this resource			
Sub-objectives	Activity	Timeframe	**Lead agency** (and key collaborators)
1. Create an enabling legal, institutional and regulatory environment to govern the sustainable use of water resources and address possible inefficiencies, conflicts and gaps.	a) Identify areas of the regulatory framework where decision-making relevant in climate change preparedness in the water sector should be strengthened, including gaps or conflicts which undermine objectives, and develop and execute proposals for undertaking amendments or revisions to the regulatory system to address these challenges.	Short-term	**Department of water** + Water Co. + County Attorney + County assembly + Climate Change
	b) Clarify the role and authority of Samburu Water and Sanitation Company in the implementation of policies specific to the sector or regarding climate change.	Short-term	
2. Mainstream climate change and disaster risk reduction and management considerations into policies, plans and programmes for water management.	a) Develop a water strategy which incorporates an Integrated Water Resources Management approach and addresses climate change and disaster risk reduction and management concerns. Strategies should include increased rain water harvesting and storage, water conservation and water recycling and reuse.	Short-term	**Department of water** + Samburu water co. + County Attorney + Lake Victoria south water works

	b) Review and strengthen as appropriate legislative measures to conserve and monitor water in large commercial users.	Short-term	
	c) Ensure revisions to the *Building Code* and stipulate the minimum tank size for rain water harvesting and safe storage as determined by the size of house and or family and provide fiscal incentives to encourage implementation.	Short-Medium-term	**Physical Planning department +** Economic Development and Trade.
3. Reduce the vulnerability of the water supply system through climate-proofing water storage, supply, and distribution infrastructure.	a) Undertake an inventory of underground and surface water resources, and an assessment of water use and demand by sector in order to determine the water balance.	Short-term	**Department of water** + Samburu Water and Sanitation Company.
	b) Promote the use of renewable energy sources to produce water thereby reducing vulnerability to electricity outages and reducing the cost of water.	Short-Medium-term	
4. Protect water sources from pollution including through suitable watershed and wastewater management strategies.	a) Develop *Conservation and Environmental Management Bill* to address water contamination issues to enhance the resilience of water resources.	Short-Medium-Long-term	**Department of Environment** + Department of water + Samburu Water and Sanitation Company+ NEMA.
5. Design and implement programmes for increased community and private sector participation in water resource management and conservation, including through enhancing	a) Promote the installation of water conservation devices in large water users.	Short-Medium-term	**Samburu Water and Sanitation Company** + Department of Climate Change.

efficiency of use, use of storage tanks, rainwater harvesting for agriculture and recycling of grey water.	b) Encourage the use of grey water for gardening and irrigation, etc.	Short-term	
	c) Develop a system for harvesting rain water for irrigation of agriculture.	Medium-term	

Table 10: Strategies on human health and well being

Human health and well-being			
Objective: To reduce the negative impacts of climate change on human health and well-being.			
Sub-objectives	**Activity**	Timeframe	**Lead agency** (and key collaborators)
1. Assess the vulnerability of the health sector to climate change impacts.	a) Undertake assessment of climate risks to health service delivery and produce a strategic sector plan that builds resilience to climate change impacts.	Medium-term	**Department of Health** + NDMA + Department of Environment
	b) Evaluate climate vulnerability of existing and proposed waste management systems and climate proof vulnerable systems.	Medium-term	
2. Mainstream climate change and disaster risk reduction and management considerations into health sector policy, plans and programmes, with emphasis on vulnerable groups.	a) Ensure health service delivery can address anticipated impacts from climate change.	Short-term	**Department of Health**
	b) Incorporate indegenous knowledge into the development of health policies.	Short-Medium-Term	
	c) Address climate change impacts on human health in health financing, medical and disability policies and insurance.	Medium-term	**Department of Health** + Department of Finance & Economic Planning + County Assembly
	d) Develop vector control programmes.	Short-term	**Department of Health**

3. Integrate nutrition and food security into health sector planning.	a) Address climate change impacts on food security and nutrition in updates to the nutrition policy and plan.	Medium-term	**Department of Health**
4. Facilitate the development of integrated waste management systems to improve sanitation, sewage and solid waste and disposal in towns.	a) Undertake evaluation of liquid and solid waste management in towns and risks from climate change.	Short-term	**Department of Health + NDMA+ NEMA + Maralal Municipality+ Department of Environment**
	b) Develop integrated waste and sewage management plans to address risks from climate change.	Medium-term	
	c) Establish liquid and Solid waste management and treatment facilities and transfer stations for sustainable solid waste management	Short-Medium-Long -term	
	e) Capacity building of communities on waste management and encourage separation waste at the source	Short-Medium-Long -term	
5. Improve systems to efficiently monitor environmental health indicators, such as air and water quality.	a) Undertake comprehensive water quality monitoring.	Short-Medium-Long -term	**Department of Health + Department of Water + WRA**
	b) Develop *Conservation and Environmental Management Act* to reduce levels of pollution that affect human health and wellbeing.	Short-Medium-Long -term	**Department of + Health+ Department of Environment**
6. Strengthen information and knowledge of linkages between disease and climate change.	a) Improve coordination and information sharing on temperature forecast data to enhance preparedness and response to health-related illnesses.	Short-term	**Kenya Meteorological department + Department of Health, NDMA**

Table 11: Strategies on Sustainable physical development

Sustainable physical development			
Objective: To climate-proof existing and planned physical infrastructure in Samburu County			
Sub-objectives	**Activity**	Timeframe	**Lead agency** (and key collaborators)
Intensify efforts to strengthen the enabling legal, institutional and regulatory environment governing physical development and land-use zoning to address inefficiencies, conflicts and gaps with regard to climate change responses. 2. Harmonise physical development planning with other strategies for enhanced water and energy efficiency, security and management and land use to support agriculture and other uses.	a) Identify areas of the regulatory framework where decision-making relevant in climate change preparedness in the physical development sector should be strengthened, including gaps or conflicts which undermine objectives, and develop and execute proposals for undertaking amendments or revisions to the regulatory system to address these challenges.	Short-term	**Physical Planning department +** Ministry of Agriculture + Ministry of Health + Ministry of public works + Disaster Management Department.
	b) Ensure that physical development plans address climate change impacts, including through using proper setbacks for urban development and Environmental Impact Assessments (EIAs).	Medium-term	

3. Integrate climate change and disaster risk reduction and management considerations into physical development policies, plans, programmes and projects.	a) Ensure that climate change risks are considered during the project EIA process and are integrated into any environmental management plan.	Short-Medium-term	**Physical Planning department + NEMA** + associations of architects and engineers + Disaster Management department
4. Assess the vulnerability of critical infrastructure and develop and implement plans to climate-proof critical infrastructure.	a) Draw on existing work by the Disaster Management unit and integrate climate change considerations into vulnerability mapping and development of community-based climate change and disaster response plans.	Short-term	**Physical Planning department +** associations of architects and engineers + Disaster Management department +
	b) Support the use of climate-resilient building designs and models.	Short-Medium-term	
	c) Establish and climate proof road and utilities network in the County	Medium-term	
	d) Construct silt traps in streams to conserve soil.	Short-Medium-term	
5. Expand or improve transportation networks, particularly to vulnerable communities.	a) Increase and/or improve access roads to vulnerable communities.	Medium-term	**Department of roads** + Disaster Management Unit +

Conclusion

The climate change hazards and risks are devastating to the County's economy and peoples' livelihoods. The County is actively addressing some of these risks through interventions such as the construction of alternative water sources, providing veterinary services, promotion of climate smart agriculture, adoption of climate resilient crops and livestock breeds, reseeding of degraded areas, and construction of climate proof infrastructure. The county is also building resilience of communities through support and promotion of livelihoods diversification in coping with climate change.

This PCRA report will help the County government to prepare climate change action plan for short, medium, and long-term interventions. The increasing impacts of climate change, especially the changing rainfall patterns, increased frequency of drought, soil erosion, and flooding will pose challenges to the County's socio-economic development aspiration. Current anthropogenic atmospheric changes are extremely rapid, which places additional stress both on the human and animal health, food security, capacity of ecosystems to cope and on the lifespan of infrastructure. Samburu County therefore needs to urgently invest in building resilient systems to address the impact of climate change. All stakeholders, including the government, development partners and private sector as well as local communities buy-in is of utmost neccesity. This will be achieved through public participation, continuous capacity building and sensitization of all stakeholders involved in the implementation of climate change actions.

Annexes

QUESTIONNAIRE RESULTS

Samburu County Ward Adaptation and Resilience Strategies/Priorities

No.	WARD	Traditional solutions to climate problems	Are the solutions currently practical, effective	Government programs that are supportive to resilience	Short and Long term Support to increase resilience against the identified hazards	Suggested strategies for building resilience against climate change, requirements and priorities
1.	WAMBA EAST	Drought; Drilling boreholes Livestock diseases; Restocking Land degradation; Managed grazing	N/A	Drilling of boreholes Rangelands management Vaccination and veterinary services	Construction of gabions Reseeding of grass Planting of trees Introduction of drought resistant breeds Introduction of Agricultural activities	Control of soil erosion Pasture establishment Disease surveillance
2.	WAMBA NORTH	Drought: Digging of shallow wells	Not sustainable	Partnerships between all stakeholders	Planting of trees Rangeland management Drilling boreholes Vaccination	Capacity building Commitment Funds
3.	WASO	Livestock pests; early planting, use of ash/herbs to control pests Floods; Direct water to water sources, build of gabions	Sustainable Sustainable	Planned rangelands Peace meetings Planned grazing	Functional grazing management plan Planning an agreeable destocking/restocking formula	Adoption of irrigation Strengthen grazing management structures Rehabilitation of degraded lands

4.	WAMBA WEST	Livestock pests and diseases: use of local herbs Digging of shallow well during drought Controlled grazing	sustainable	Rangelands rehabilitation Vaccination	Construction of gabions Reseeding of grass Planting of trees Introduction of drought resistant breeds Introduction of Agricultural activities	Borehole drilling Degraded land rehabilitation and rangeland management Vaccination of livestock
5.	ANGATA NANYOKIE	Drought-Migration Livestock Diseases-Traditional herbs Water Shortage-Migration Flood- Migration to higher grounds	Not sustainable Not sustainable Not sustainable Not sustainable	Partnerships	Provide food rations Building bridges Planting of trees	Training on climate change Support systems for the community
6.	BAAWA WARD	Drought- Migration and Destocking High temperature-Migration Floods- Planting of trees	Not sustainable Not sustainable Not sustainable	Stock offtake programmes Vaccination Provision of certified seeds Pasture establishment Tree planting initiatives	Destocking Controlling soil erosion Conservation Planting grass Plant drought resilient Improve dispensaries and health centers	Controlling soil erosion Introduction of drought resistant crops and livestock Conservation Planting trees

7.	NACHOLA	Livestock diseases- Restrict herders from affected areas Conflicts-Holding peace meetings	Not sustainable Sustainable	Training of farmers on new farming methods	Construction of water pans Changing mode of farming	Adoption of irrigation Strengthen grazing management structures
8.	ELBARTA	Drought- Migrating to other areas Planned grazing Conflict- peace meeting Planned resource utilization with neighbours	Not sustainable Sustainable	Planned rangelands Peace meetings Planned grazing	Functional grazing management plan Planning an agreeable destocking/restocking formula	Diversification of livelihoods Adoption of irrigation Strengthen grazing management structures
9.	NDOTO	Drought- Migrating to other areas Planned grazing Conflict- peace meeting Planned resource utilization with neighbours	Sustainable	Borehole drillings Peace initiatives	Destocking Controlling soil erosion Conservation	Pasture establishment Soil erosion control Land rehabilitation
10.	NYIRO	Migration in search of greener pastures during drought Migration to higher grounds during floods Peace meetings	Sustainable	Stock offtake programmes Vaccination Provision of certified seeds Pasture establishment	Borehole drilling	Borehole drilling Climate smart agriculture Grazing management

11.	LODOKEJEK	Livestock Diseases-Restrict herders from affected areas Conflicts-Holding peace meetings	Sustainable Sustainable	Funding community projects	Construction of dams Capacity building Construction of water pans Changing mode of farming	Capacity building Infrastructure development Re-stocking
12.	PORRO	Drought-Digging of wells Drought resistance crops, dividing stock, planned grazing.	Sustainable Sustainable	Provision of seeds Construction of dams Training of farmers on new farming methods	Improve livestock breeds, construction of dams, water harvesting, rotational grazing and fattening of livestock	Awareness creation Re-afforestation Planting of drought resistant crops Practice of pasture production Improvement of livestock breeds
13.	LOOSUK	Drought- Planting pasture, Migration, digging shallow wells, Livestock pests; early planting, use of ash/herbs to control pests Floods; Direct water to water sources, build of gabions	Not sustainable Not effective Sustainable	Provision of tree seedling to communities Alternative cultivation methods e.g improved agriculture bags for growing vegetables	Drilling boreholes Education and awareness creation Provision of pasture seeds	Improved supply of water Construction of dams
14.	SUGUTA	Drought – Planned grazing, drought resistant crops Conflicts- Peace meetings	Not sustainable Sustainable	Provision of certified seeds Drilling of boreholes Training of WRUAs Pasture establishment Certified seeds	Construction of dams and boreholes Providing alternative source of livelihood Promotion of smart climate technologies Diseases control Improved infrastructure	Multi-sectoral engagements Funding Awareness creation

15.	MARALAL	Drought- Conservation of water sources Floods- Construction of gabions	Sustainable Sustainable	N/A	Management of water sources Harvest rain water Construction of dams	Community forest conservancies Community associations Stakeholder collaborations

Samburu County Wards Experiences of past and current local weather and climate

No.	WARD	Hazards facing the community in the last 20-30years	Changes in climate last 10,20-30years	Intensity and frequency of identified climate hazard last 10,20-30years	Three most threatening climate risks and hazards	Effect of these climate hazards	Why are some hazards more harmful to resources than others	Assets most affected and those not affected	Where and how has vulnerability increased in recent years
1.	SUGUTA	Drought Conflict Deforestation Pest and diseases Floods	Yes Frequent drought Increased temperatures More instances of flooding Increase of pest and diseases	Frequent and prolonged drought; Reduced rainfall; Deforestation as a economic activity due to loss of livelihoods; Increased rainfall intensity	Drought; Livestock diseases; Conflict	Women spend more time looking for water and firewood Men migrate with livestock looking for pasture Both face conflict due to dwindling resources	Droughts affect all livelihoods There is less awareness on impacts of climate change High levels of poverty Inadequate alternative sources of livelihood	Most affected Livestock Water sources Pasture Forests Roads Least affected Schools Hospitals	Increased lack of food and purchasing power Increase in conflict Loss of property More Displacement

2.	LOOSUK	Drought Pests Flash floods	Yes. Frequent drought Unpredicted rainfall patterns	Prolonged dry spells Unpredictable rainfall patterns	Drought Conflict Pests	Women lack maternal care due to migration Children are more vulnerable to diseases Elderly are also vulnerable to diseases	Drought leads to livestock diseases, human diseases and scarcity of water.	<u>Most affected</u> Livestock School drop outs Water sources dry up <u>Least affected</u> Churches	Seasonal calendar is unpredictable hence poor planning and loss of livelihood.
3.	PORO	Drought Pest invasion Desertification Land degradation	Yes Severe drought Unpredictable rainfall patterns Poor rainfall	Long rains are shorter Drought is more frequent	Drought Pest invasion Desertification	Children are suffering malnutrition Women Elderly PWD	Drought has become more frequent and severe affecting livelihoods	<u>Most affected</u> Livestock Land Forests <u>Least affected</u> Businesses Poultry	Poor rains causing low crop and livestock production Theres also land degradation

4.	WASO	Drought Floods Dust storms	Yes	The rainy periods are shorter	Drought Floods Dust storms	Pastoralists livelihood affected due to prolonged drought, flash floods and outbreak of diseases Person living with disability Migration of Youth affecting their studies		Most affected Pastoralists Agriculture Road and builidings Lease affected Bee keeping Sand harvesting Trade	
5.	LODOKEJEK	High temperatures Droughts Wild fires	Yes High temperatures	Increasing temperatures	Drought Pests Livestock diseases	Children suffer malnutrition Lack of water for sanitation	Drought causes loss of livestock resulting to poverty and banditry Crop failure leading to	Most affected Livestock due to drought Poor yields due to lack of rains	Reduced livestock due to prolonged drought Water scarcity Human wildlife conflict Banditry

							food scarcity		Deforestations
6.	ELBARTA	Drought Land Degradation Conflict	Yes Frequent drought Unreliable rainfall patterns	Frequent droughts Increased rainfall intensity Increased poor rainfall	Droughts Resource based conflict Land degradation	Women, children and the elderly suffer from effects of drought	Drought has led to loss of livelihood	Most affected Livestock Crops Least affected Communication infrastructure networks	Significant loss of main source of livelihood.
7.	NACHOLA	Drought and famine Floods Diseases Locust invasion	Yes Shifts in rainfall patterns	Frequent droughts	Drought Famine Conflicts Forest fires	The entire community is affected including the elderly	Conflicts due to scarce resources	Most affected Livestock Crops Houses Least affected Land	N/A

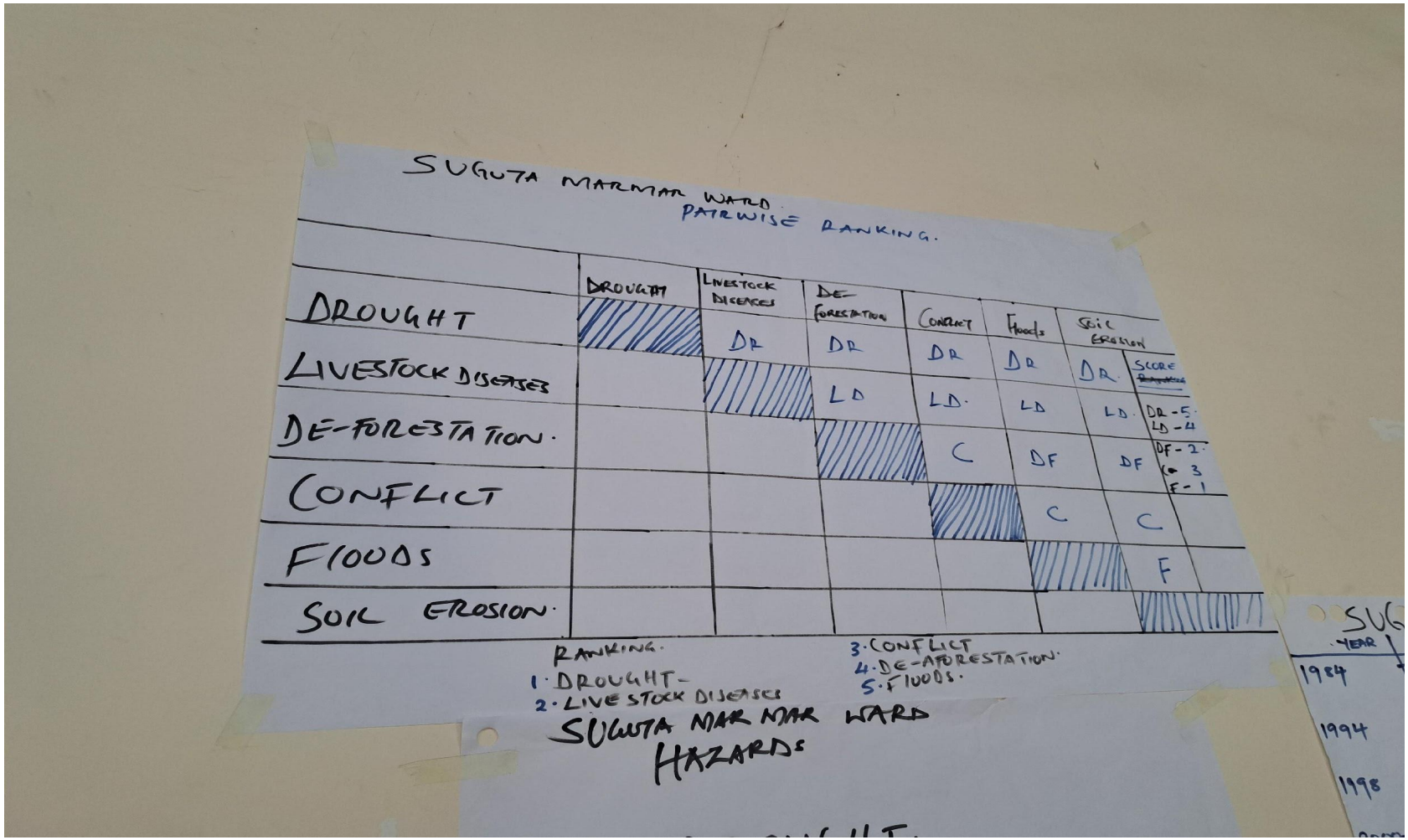
8.	BAAWA	Drought High temperatures Floods	Yes Drought has become more frequent Increased floods High temperatures	Yes Theres frequent droughts, more flooding	Drought High temperatures Floods	Pastoralist and famers are most affected by hazards	There are higher risks from some hazards as opposed to others	Most affected Schools Forest Rivers Dams Lease affected Hospitals Roads Urban centres Springs Boreholes	The low lying area have been affected by floods
9.	MARALAL	Drought Floods High temperature Strong winds	Unpredictable rainfall	Increased drought occurrences	Drought Floods High temperatures	Pastoralists most affected	Hazards like droughts are widespread	Most affected Schools Forest Rivers Arable lands	Forest degradation is causing warming
10.	ANGATA NANYOKIE WARD	Drought High temperatures Low rainfall	Yes Rainfall patterns have changed	Increased dry spells in the year	Drought High temperatures	Women and children		Most affected Forest Schools Rivers Livelihood Hospitals	The entire ward has been affected.

11.	WAMBA NORTH	Drought Livestock diseases Land degradation	Yes Change in rainfall interfalls Prolonged drought	Increased drought periods Reduced rainfall periods	Drought Livestock diseases Land degradation	General public is affected and livelihoods too	Frequency and duration makes the risk higher Magnitude of the hazard is also impactful	Most affected Water sources Vegetation Least affected Mountain	Theres more conflict due to scarce resources
12.	WAMBA WEST	Drought Livestock diseases Land degradation	Unreliable rainfall patterns	Increased drought frequency	Drought Land degradation Livestock diseases	Children, women, elderly ad PWD are most affected	The snowball effect of hazards e.g drought leads to conflict	Most affected Drought Livestock Land Household income Schools Least affected Commmunity resilience	Community's vulnerability has increased over the years

13.	WAMBA EAST	Drought High land degradation Increased diseases Soil erosion	High intensity of droughts, Change in rainfall patterns	N/A	Drought Livestock and human diseases Land degradation	Elderly, PWD, Children, Youth are affected during conflict	Drought is wide spread and not easily controllable	Most affected Livestock Crops People Land Least affected Vegetation	The entire community's vulnerability has increased.

Some of the ward maps generated by the WCCPC from the Northern Cluster

Group work: Classification of Ward Hazards



PCRA Validation workshop at Samburu Guest House on 29th May 2023

WARD CLIMATE COMMITTEE ATTENDANCE SHEETS

Samburu Central Sub County Wards


Lodokejek ward 27th.pdf


Loosuk ward 27th.pdf


Maralal Ward 27th.pdf


Suguta Ward 28th.pdf


Poro Ward 28th.pdf

Samburu North Wards


Angata Nanyokie 27th.pdf


Baawa ward 28th.pdf


Elbarta Ward 27th.pdf


Nachola Ward 28th.pdf


Ndoto ward 27th.pdf


Nyiro ward 28th.pdf

Samburu East Wards


Wamab East 28th.pdf


Wamba North 27th.pdf


Wamba West 28th.pdf


Waso ward 27th.pdf

PCRA Validation meeting