BARINGO COUNTY

PARTICIPATORY CLIMATE RISK ASSESSMENT REPORT

May 2023

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Definition of terms

Adaptation (to climate change)	Process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. (IPCC)
Adaptive capacity/ coping capabilities	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Climate	Climate change refers to a change in the components of climate, such as temperature, precipitation, atmospheric pressure, winds or ocean currents, which persists for decades or longer.
Climate change	A change in the state of the climate that can be identified by changes in the means and/or the variability of its properties and that persists for an extended period. Climate change may be due to natural or anthropogenic factors. Climate change is manifested in extreme events such as high/low temperatures, droughts, hail storms and floods.
Climate variability	Commonly observed departures of everyday weather and climate from the usual expectations, often manifested as droughts, severe storms such as hail storms and floods. These events occur naturally, and recur year by year.
Community-based adaptation	A set of or body of climate change adaptation activities developed in partnership with at-risk communities, in order to promote local awareness of, and appropriate and sustainable solutions to, current and future climatic conditions. The higher the adaptive capacity, the lower the vulnerability.
Early warning	The provision of timely and effective information, through identified institutions, that allow individuals at risk of a disaster, to take action to avoid or reduce their risk and prepare for effective response.
Ecosystem	Dynamic complex of plant, animal and microorganism communities and the non- living environment interacting as a functional unit.
Ecosystem services	Benefits people obtain from ecosystems. These include provisioning services such as food, water, timber and fibre; regulating services that affect climate, floods, disease, wastes and water quality; cultural services that provide recreational, aesthetic and spiritual benefits; and supporting services such as soil formation, photosynthesis and nutrient cycling.
Gender	A social construct that defines what it means to be a man or woman, boy or girl in a given society.
Gender equality	The equal enjoyment by people of all genders and ages of rights, opportunities, resources and rewards.

Hazard	Potentially damaging physical event, phenomenon or human activity, which may cause injury, loss of life, property damage, social and economic disruption or environmental degradation.
Livelihoods	The resources used and the activities undertaken in order to live.
Mitigation	Measures to reduce the emission of GHGs (e.g. through use of alternative energy sources to produce energy that do not release GHGs) or to capture and store carbon (e.g. through planting trees that absorb carbon dioxide from the atmosphere).
Resilience	The capacity of social, economic and [ecological] systems to cope with a hazardous event, trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation."
Risk	Probability of harmful consequences, or expected losses such as deaths, injuries, property, livelihoods, disruption of economic activity or environmental damages. RISK=Hazard X Vulnerability
Vulnerability (to climate change)	Propensity or predisposition to be adversely affected." Vulnerability to the same risks may differ based on gender, wealth, mobility and other factors. It is influenced by adaptive capacity.

Abbreviations/ Acronyms

AI	Artificial Insemination
AIDS	Acquired Immunodeficiency Syndrome
ASAL	Arid and Semi-arid Lands
BCG	Baringo County Government
CADP	County Annual Development Plan
CBOs	Community Based Organizations
CCIS	County Climate Investment Support
CCRI	County Climate Resilient Support
CCU	Climate Change Unit
CCVI	Climate Change Vulnerability Index
CDF	County Development Fund
CDF	County Development Fund
CECM	County Executive Committee Member
CFAs	Community Forest Associations
CFAs	Community Forest Associations
CIDP	Baringo County Integrated Development Plan
CMIP	Coupled Model Intercomparison Project
COVID 19	Corona Virus Disease 2019
EWS	Early Warning System
FLLoCA	Financing Locally Lead Climate Actions
GOK	Government Of Kenya
HIV	Human Immunodeficiency Virus
ITCZ	Intertropical Convergence Zone
ITK	Indigenous Technical Knowledge
JJA	June-July-August
KCSAP	Kenya Climate Smart Agriculture Project
KELCOP	Kenya Livestock Commercialization Programme
KFS	Kenya Forest Services
KNBS	Kenya National Bureau Of Statistics
MAM	March-April-May
NAP 2015- 2030	National Adaptation Plan
NCCAP	National Climate Change Action Plan

NGAAF	National Government Affirmative Action Funds
NG-CDF	National Government County Development Funds
NGOs	Non-Governmental Organizations
NGOs	Non-Governmental Organizations
OND	October-November-December
PCRA	Participatory Climate Risk Assessment
RCP	Representative Concentration Pathway
SHA	Self Help Africa
TWG	technical working group
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization

Forward

FORWARD

Climate change is a global phenomenon caused by human activities and is a growing challenge to Ecosystems, humanity and sustainable development. The effects of climate change vary significantly in different parts of Baringo, thus the slogan, "The County of great diversity". It varies across regions due to differences in the level of exposure and vulnerability of various systems, be it ecosystems, economic sectors, or social groups. For these reasons, assessment of the vulnerability of the wards in Baringo is one of the critical steps to identify appropriate adaptation measures to adapt and cope with the current climate risks.

This report portrays a remarkable coordination and collaborative efforts by the county government of Baringo to develop ward climate change vulnerability risk assessment, which is not only useful to understand the entry-point of adaptation interventions, but also useful to understand the sectors and locations that require special attention for overall development planning.

It is most exciting to see communities develop their own ward-level vulnerability maps, which will also help the county government to develop the County Action Plan on Climate Change. Let me take this opportunity to thank the officers and all stakeholders for their unrelenting effort, commitment and collaboration in ensuring that such an important exercise of developing the PCRA Report is realized.

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29 MAY 2023
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His Excellency the Governor
GOVERNOR –BARINGO COUNTY
Hon. Benjamin C. Cheboi, EBS, EGH

ACKNOWLEDGEMENT

The process of developing the participatory climate change vulnerability risks assessment (PCRA) would not have been achieved if not by the efforts of the Department of Environment, Natural Resources, Mining and Climate Change, Baringo County Government. It would not have been possible without the dedication and support of the various officers of the County government at different levels from the County Office to the Ward level, for their time and their accompanying expertise, the lead agencies and state departments of the National Government, the Non-state Actors and the Community Based Organizations and the communities who were involved.

Special acknowledgment is extended to the Technical Working Group (TWG) and a big thank you to the department staff and County staff who participated in the development of the report for their immense commitment, support, and cooperation throughout the PCRA development process. To all those who contributed their time and knowledge, to the good people of Baingo County, we express our deepest gratitude and appreciation.

Finally, I would like to convey my sincere thanks to the National treasury, FLoCCA Programe Climate Change coordinating unit and other line departments of the National government for their financial support through the CCIS grant and Guidance in the development of the PCRA report.

HON. RICHARD TAMAR

County Executive Committee Member – Department of Water, Irrigation, Environment, Natural Resources, Mining and Climate Change

Acknowledgement

Executive Summary

Financing Locally-Led climate action program (FLLoCA). It is a national model of decentralizing funds and devolving decisions to the local communities to have greater influence in investments and solutions in adaptation to climate change. It Supports the counties to engage citizen engagement in identifying disaster risks and adaptation below county level to reach wards and villages.

FLLoCA is Led by the National Treasury and Planning in collaboration with the Ministry of Environment (CCD), Council of Governors and other relevant MDA's. It is a 5 Year program

Chapter 1, highlights the socio-economic information that has a bearing on development of the county. The impacts of climate change are mainly caused by the variabilities of weather which have unprecedented effects on residents and their livelihood system. The chapter provides a description of the county in terms of the location, size, physiographic and natural conditions, demographic profiles as well as the administrative. The descriptions are key in setting out the impact of climate change.

This chapter also illustrates the policy context which this report is grounded, which includes commitment to Kenya's development aspirations, Supporting the delivery of the "Kenya Kwanza" Government Manifesto, the Kenya Vision 2030 Medium Term IV aspirations, the African Union Agenda 2063 Aspirations, the UN 2030 global agenda on Sustainable Development Goals, Sendai Framework of Action on Disaster Risk Reduction and the Paris Agreement on Climate Change Adaptation and Mitigation.

The Climate Change Act, 2016 is the main legislation guiding Kenya's climate change response through mainstreaming climate change into sector functions, and it is the legal foundation of the NCCAP. Besides, Kenya has developed the National Climate Change Response Strategy (2010), first NCCAP (2013-2017), National Adaptation Plan (NAP 2015- 2030), Kenya Climate-Smart Agriculture Strategy (2017-2026), Climate Risk Management Framework (2017), National Climate Change Policy (2018) and National Climate Finance Policy (2018), among other sector plans and policies that address aspects of climate change.

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At the County level, several policies play an essential role in supporting climate change adaptation and mitigation actions. These include: Baringo County Climate Change Act (2022); Baringo County Climate change Policy 2021; Baringo County Climate Change Regulations 2023, which anchor the operationalization of the Climate Change Act (2022), mainstreaming of climate change adoption and financing in the budget-making process; Baringo County Disaster Risk Management Policy, 2017; Baringo County Climate Change Adaptation Plan 2018-2022, Baringo County Integrated Development Plan (CIDP) III, 2023-2027; County Annual Development Plan (CADP) 2022/2023 and Sectoral plans.

Purpose of the PCRA Report (Short section explicitly summarizing what the PCRA report is supposed to inform in terms of planning and action, highlighting different levels of action and target stakeholders)

It further spelts key steps in the development of PCRA which include; formation of eighteen (18) member climate change technical working group (TWG) to spearhead the PCRA process; training of TWG as TOTs for carrying out the PCRAs at ward level; training of ward climate change committees in 30 wards for 5 days with intend to develop community action plans and election of ward climate change planning committee.

Chapter 2: This section describes the current and historical climate trends in terms of rainfall and temperatures; Change related hazards impacts key livelihoods in Baringo; PCRA engagements found out that climate risks and other hazards affecting the county are drought, environmental degradation (including soil erosion, landslides, deforestation, proliferation of invasive species), floods, livestock and crop pests and diseases, human diseases, human-wildlife conflicts and insecurity. It was further found out that climate change effects are becoming intense in the county due to vulnerability and low adaptive capacity by communities

In Baringo there are five (5) main livelihood zones that are identified. These are

i) Pastoral covering Kolowa, Loyamorok, Silale, Tirioko, Rikwo, Mukutani, Tangulbei, Saimo Kipsaraman and Saimo Soi wards

ii) Agro pastoral zone comprising Bartabwa, Barwessa and Kabarnet (Salawa, Sesia) wards.

iii) Marginal Mixed experienced in Mogotio, Emining and Kisanana wards

iv) Mixed Farming in Kabartonjo, Ewalel Chap chap, Tenges, Sacho, Lembus, Lembus kwen, Maji Mazuri/mumberes, Koibatek, Lembus Perkerra and Ravine, Upper Mochongoi and

v) Irrigated Crop covering Marigat, Lower Mochongoi and Barwessa wards.

It is worth noting that all the livelihood zones are increasingly facing challenges due to climate change effects through its interaction with the identified hazards.

Chapter 3, discusses future climate projections which are produced by complex mathematical simulations of the physical processes of the atmosphere and ocean to model the response of the global climate to increasing concentrations of greenhouse gases, aerosols, and other atmospheric constituents that affect the planet's radiative balance.

Temperatures in Kenya are projected to continue rising by 1.7°C by the 2050s and by approximately 3.5°C at the end of the century.

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

Precipitation in Kenya is projected to remain highly variable and uncertain, however average rainfall is expected to increase by mid-century, particularly during the 'short rains', which occur between October and December by 2050. Extreme rainfall events (heavy downpours) are likely to increase in frequency, duration and intensity. The period between heavy rainfall events is likely to increase. The proportion of rainfall that occurs in extreme rainfall events (heavy downpours) is likely to increase. Importantly, rainfall in the arid zones is generally projected to decrease. Annual average precipitation is expected to increase slightly by the end of the century under a high emissions scenario (RCP8.5). The pattern and temporal distribution of rainfall is likely to change.

Future projected changes in rainfall over Baringo county were assessed for near- (2011-2035), mid- (2036-2070), and far- (2071-2100) future climates relative to the historical climate (1981-2005) using CMIP5 model simulations under two emission scenarios (RCP 4.5 and RCP 8.5).

Chapter 4 discusses vulnerability and capacity assessment findings during PCRA in the ward level. An analysis was done on the impacts of various main hazards on the resources and assets found within the community in various livelihood zones.

In the Pastoral livelihood zone, the main hazards were drought and livestock pests/diseases. For drought hazard, its main impact was felt on economic and financial resources and this could be explained by the fact that drought impacts affected the livelihood activities of the communities negatively. About 80 percent of the Pastoral population relied on livestock production as a source of food and income sources

In the Agro-pastoral and Marginal mixed farming livelihood zones, the main hazards identified were drought, livestock pests and environmental degradation. The impacts of drought and livestock diseases were the same as in the Pastoral livelihood zone. Land degradation/deforestation came out strongly as one of the hazards having big impacts on the resources and assets of the Agro-pastoral and Marginal mixed farming communities, scoring big on their impacts on natural, physical as well as economic/financial resources.

In the Mixed farming livelihood zone, the main hazards identified were drought and crop pests/diseases. With regards to the impact of these two hazards, their biggest impacts were felt in economic/financial and social resources as captured in the table. Growing of food crops was the biggest source of food and income for the communities residing in this zone. Prolonged drought episodes occasionally lead to massive crop failures hence exposing the population to hunger due to reduced food availability and income sources. Furthermore, outbreak of crop pests/diseases leads to dismal performance of the crops which affects food availability, one of the important food security pillars.

In the irrigated cropping livelihood zone, the main hazards that were identified were drought, floods and human diseases. With respect to floods, nearly all the resources and assets found in the community were affected negatively. Natural resources such as forests, rivers among others do get sub merged with water hence preventing access to these resources by the community members. Physical resources such as roads and buildings get destroyed by the floods while others are completely submerged by water leading to loss of critical assets such as schools, health facilities among others.

From the PCRA data collection process and the subsequent analysis, drought, Livestock diseases, Crop diseases, land and environmental degradation were the four (4) major hazards identified by the community. However, Floods were identified as the major hazard in the Baringo- Bogoria landscape.

Drought was identified as a major hazard in most of the livelihood zones including Pastoral, Agro pastoral, Mixed farming and marginal mixed farming. Livestock pests and diseases were identified as a major hazard in 2 livelihoods zones i.e. Pastoral and Agro pastoral. On the other hand, Crop pests and disease were found to be prevalent in Mixed farming and Agro pastoral livelihood zones. Environmental Degradation was identified as a major hazard in Mixed farming and marginal mixed farming. However, flooding was ranked as one of the major hazards only in the Ilchamus ward.

Chapter 5 discusses a cross-sectoral perspective and focus on strategic investment priorities that strengthen the adaptive capacity and resilience of key livelihood, social and economic systems within the county, reflecting the key interest/stakeholder groups that were represented in the

participatory climate risk assessment meeting at ward level. The ward priorities are aligned with County Integrated Development Plans and County Climate Policies. The priorities hereunder reflect the differentiated needs of women, youth, ethnic minorities, people living with disabilities and other marginalized and vulnerable groups.

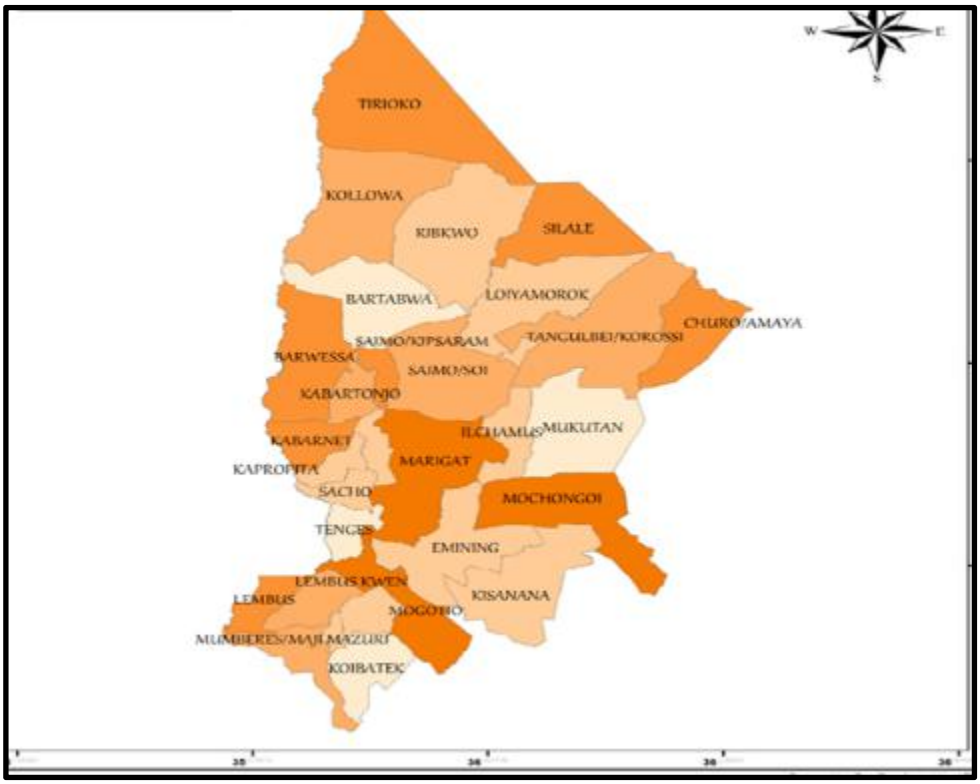
The strategic adaptation prioritization identified in the PCRA are designed to set out measures or actions that enhance adaptive capacity and resilience of communities to climate change effects while promoting low carbon growth for sustainable development. Hence the county government went ahead to develop a county 5-year action plan (CCCAP 2023-2028)

In conclusion Baringo County's vulnerability to the risks of climate change is found to be high and then adaptive capacity low. This is because the major livelihoods (pastoralism and agropastoralism) in the county are dependent on climate with predicted shifts in the future likely to exacerbate the impacts. This PCRA report is therefore of necessity in enhancing climate change adaptation programming by the community and strengthening community resilience to climate change effects.

Chapter 1
Context of the Participatory Climate Risk Assessment (PCRA)

1.1 Background

Baringo county administrative units comprises seven sub counties and 30 wards.The seven (7) sub counties are: Eldama Ravine; Mogotio; Baringo South; Tiaty West; Tiaty East; Baringo North; and Baringo Central. The largest sub county being Tiaty west with an area of 2500 square kilometers and the smallest being Baringo Central with 786.5 square kilometers. Figure 1 shows the administrative boundaries of the wards in the county. The County has a total population of 666,763 people with 336,322 males and 330,428 females and a population density of 61 persons per sq. Km. (KNBS, 2019). Table 1 shows the population of the wards and the proportion of males and females. The County covers an area of about 11,000 Km ^{2} of which 165 Km ^{2} is surface water. Lake Baringo covers an area of 130 Km^2 , Lake Bogoria 34 Km ^{2} while Lake Kamnarok covers 1 Km^2.



It borders Turkana and Samburu counties to the North, Laikipia to the East, Nakuru and Kericho to the South and Uasin Gishu to the South-West, Elgeyo-Marakwet, and West Pokot to the West. The county is located between longitudes 35^0 30’ and 36^0 30’ East and between latitudes 0^0 10’ South and 1^0 40’. The Equator cut across the County on the southern part.

Sub-county	Area in km sq	Sub County Population	Wards	Population		Total Population	Area in km sq	Population Density
				Male	Female			
Baringo north	1703	104,871	Barwessa	14,931	14,974	29,905	475.5	
			Saimo Kipsaraman	5,133	5,278	10,411	85.6	
			Saimo Soi	9,643	9,595	19,238	542	
			Kabartonjo	15,365	15,339	30,706	126.7	
			Bartabwa	7,291	7,314	14,611	473.5	
Tiaty west	2500	79,923	Tirioko	4,042	4,064	8,106	1102.68	20
			Kolowa	15,453	14,805	30,258	752.55	43
			Ribkwo	3,383	3,304	6,668	871.49	18
Tiaty east	2039.5		Silale				335.36	
			Tangulbei				591.25	
			Loiyamorok				597.8	
			Churo/Amaya				289.35	
Mogotio	1304		Mogotio				287.53	
			Emining				529.21	
			Kisanana				487.13	
Baringo South	1985.11		Mukutani				534.9	
			Marigat				682.71	
			Mochongoi				586.8	
			Ilchamus				180.7	
Eldama Ravine	954		Lembus				142.89	
			Ravine				33.55	
			Lembus Kwen				178.01	
			Koibatek				254.37	
			Lembus Perkerra				130.2	

			Maji Mazuri				214.8	
Baringo central	589		Kabarnet				165.68	
			Sacho				105.98	
			Tenges				123.94	
			Kapropita				96.35	
			Ewalel Chapchap				96.57	

The County receives annual rainfall averages of 1000mm and 1500mm in the highlands and 300mm- 600mm in the lowlands. Baringo has three (3) main agro ecological zones namely, highlands, the midlands and the Lowlands 80 % of the county is ASAL.

Climate change has led to some of the worst unprecedented disaster incidents in the county due to extreme variations in weather patterns. This has resulted in drying up of water sources/reducing water levels, occurrence of landslides and frequent flooding resulting in land degradation and massive soil erosion. Water shortages for domestic, livestock, and agricultural purposes are common in some of the drier parts of the county, such as the Lake Baringo-Bogoria basin, parts of Kerio Valley, Mogotio, the western slopes of Ng'elecha (Mochongoi), and the entire area of East Pokot (Kollowa to Tangulbei) (WFP, 2016). Projections for the period 2021–2065 indicate the likelihood of increased heat stress, prolonged moisture stress, and increasingly variable rainfall. collate data

All of these have led to a toll of human suffering including loss of lives, destruction of livelihoods, critical infrastructures, displacement and disintegration of families and societies. The county was faced with increased resource based conflict emergencies in 2014, 2015, 2018, 2019, and 2021, worst floods situation in 2014, 2016 and 2018, coupled with this, drought related disasters have continued to ravage the county with increasing intensity and frequency, worst case drought incidents reported in 2016, 2017, 2018 and 2022. This spate of disaster occurrences resulted in untold humanitarian emergencies that have continuously altered the county's priority focus on development.

Baringo County is extremely susceptible to impacts of climate change because most livelihoods and economic activities are reliant on climate sensitive sectors. The most vulnerable sectors impacted on by climate change in the county are agriculture, livestock, forestry, water, health, energy, tourism, social infrastructure, human settlement and the physical infrastructure.

In order to cushion these key sectors against the impact of climate change, the County needs to undertake Ward and County Climate change vulnerability assessment to provide valuable information that will be used to develop actions in response to climate change. The PCRA is anchored on The Baringo County Climate Change Act 2022, section 23 (1) which stipulates that "The County Executive Committee Member shall in consultation with the County Climate change steering Committee and relevant sectors, through a participatory process involve the community and relevant stakeholders, to formulate a PCRA report and a County Climate Change Action Plan, which shall be reviewed every five years.

The socio-economic factors that exacerbate vulnerability to climate hazards include high poverty and illiteracy levels, communal land tenure systems, poor infrastructure, conflicts and insecurity, low technology adoption, high input prices, and undeveloped markets. Given the challenges being experienced due to changes in climatic conditions occasioned by human activity and environmental degradation, the PCRA is geared towards looking at climate action mitigation and adaptation, through climate change financing options, such as County Climate change fund and FLLoCA programme.

1.2 Policy Context

1.2.1 International Policy Framework

United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC recognizes the importance of involving local communities in the fight against climate change. Locally led climate action is about empowering communities to assess climate risks and identify socially inclusive solutions that are tailored to local needs and priorities. This approach strengthens systems and capacities for locally driven climate action and supports partnerships between governments, communities, and civil society. The UNFCCC supports this by providing a platform for dialogue and collaboration. For example, the UNFCCC has been involved in initiatives that respond to climate change at the local level, integrating climate change adaptation into local governments' planning and budgeting systems in a participatory and gender-sensitive manner, and increasing the amount of finance available to local governments for climate change adaptation. Kenya is a signatory to the UNFCCC and as set out in Article 2(6) of the Constitution of Kenya (2010), now forms part of the law of Kenya.

UN 2030 global agenda on Sustainable Development Goals (SDG)

This SDG 13 on climate action recognizes the increasing frequency and intensity of extreme weather events such as heat waves, droughts, floods, aggravating water management problems, reducing agricultural production and food security, increasing health risks, damaging critical infrastructure and interrupting the provision of basic services such water and sanitation, education, energy and transport as a result of climate change. The SDG gives a number of targets that relate to this PCRA in addressing the effects of climate change. These targets include: target 13.1: strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries; target 13.2: integrate climate change measures into national policies, strategies and planning; and target 13.3: improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

1.2.2 Regional Policy Frameworks

African Union's Agenda 2063

The is a strategic framework for transforming Africa into a global powerhouse of the future. It aims to deliver on Africa's goal for inclusive and sustainable development. Climate change action is an integral part of this agenda. The African Union recognizes that climate-resilient communities and economies are essential to achieving the continental vision for an integrated, prosperous, and peaceful Africa. To support this vision, the African Union has developed the Climate Change and Resilient

Development Strategy and Action Plan (2022-2032).

African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032)

This strategy outlines principles, priorities, and action areas for enhanced climate cooperation and long-term, climate-resilient development. It provides a framework for harmonized and coordinated actions to respond to the impacts of climate change, supporting planning for the continent's low-emission future. The strategy emphasizes the importance of supporting the most vulnerable communities and groups, recognizing that women and youth face challenges in responding to climate impacts but also play a critical role as change agents driving climate responses at local, national, sub-regional, and continental levels.

East African Community (EAC) Climate Change Master Plan (2011 - 2031)

The Climate Change Master Plan provides a long-term vision and a basis for Partner States to operationalize a comprehensive framework for adapting to and mitigating climate change in line with the EAC Protocol on Environment and Natural Resources Management and with international climate change agreements. The main regional issues which have been identified and prioritized by the EAC Partner States, as being vulnerable to climate change are:

Agriculture (crops, livestock, and fisheries) and Food Security

EAC Climate Finance Access and Mobilization Strategy

The Climate Finance Access and Mobilization Strategy sets out a strategic framework and key actions for addressing common barriers and solutions to enable the upscaling of climate finance collaboratively for and across all Partner States. The strategy includes four strategic areas: Strengthening capacity-building to enhance national and regional climate finance skills; Enhancing capacity and mechanisms at national and regional level for the coordination, development, and implementation of mitigation and adaptation projects or development projects with climate change co-benefits.

1.2.3 National and County Policy and Legislative Framework

Kenya has integrated climate considerations into Legal and Governance instruments for some time. There have been notably, progress made in planning and implementing policies, projects and programs in key economic sectors to align Kenya with the international community's approach to reducing greenhouse gas emissions and promote climate resilience.

Kenya Constitution 2010

Article 42 of the Kenya Constitution 2010, which deals with issues related to the environment, and advocates for the right to a clean and healthy environment for all citizens, this includes the right to have an environment protected for the benefit of the present and future generations.

Kenya Kwanza Government manifesto

The report is grounded on the commitment to Kenya's development aspirations, supporting the delivery of the "Kenya Kwanza" Government Manifesto, Key issues. Climate commitment to reduce emissions by 32 percent relative to "business as usual" by 2030 through Climate change impact mitigation, adaptation and resilience enhancement. The Kenya Kwanza Government will carry out the Constitutional mandate to ensure at least 10 percent land area forest cover. The Government is committed to mainstreaming

ecological sustainable development to address climate change impacts.The Kenya Kwanza approach to climate action comprises Bottom up 3P (people,planet profit) solutions. Priority value chains under the 3P includes; biomass energy (woodfuel), agroforestry, solid waste management.

National climate change action plan (NCCAP)

This National Climate Change Action Plan (NCCAP) 2018-2022 is a five-year plan to steer Kenya's climate change action. The Plan derives from the Climate Change Act (Number 11 of 2016), which requires the Government of Kenya (GoK) to develop Action Plans to guide the mainstreaming of climate change into sector functions. NCCAP 2018-2022 furthers the achievement of Kenya's development goals by providing mechanisms to realize low carbon climate resilient development. It emphasizes sustainability, while prioritizing adaptation and enhanced climate resilience for vulnerable groups, including women, youth, persons with disabilities, and marginalized and minority communities. Seven priority areas underpin NCCAP 2018- 2022; Disaster Risk Management; Food and Nutrition Security; Water and the Blue Economy; Forestry; Wildlife, and Tourism; Health, Sanitation, and Human Settlements; Manufacturing; and Energy and Transport. Through these priority areas, climate change action is aligned to the Government's Sustainable Development Goals.

National Rangelands management policy

The main objective of this policy is to provide a coherent and practical framework for the implementation and realization of a new vision for ASAL development in Kenya.

Energy policy, 2019

The main objective of this policy is to enhance climate change mitigation by encouraging the use of energy efficient equipment and renewable energy sources.

Baringo County Integrated Development Plan 2022-2027

The 3rd generation CIDP is the county master plan for development and has mainstreamed climate change in the following key areas. The plan takes cognizance of the drivers of climate change in the county and its impacts on the developmental aspirations as set out in the CIDP. The CIDP provides deliberate measures geared towards climate change adaptation and mitigation strategies, including environmental conservation education and awareness programmes; sensitization and enforcement of environmental law; harmonization of environmental conservation laws; and promotion of renewable energy and energy saving devices, resilience building mechanisms including a proactive approach to Disaster Risk Reduction.

The Baringo County Climate Change Adaptation and Mitigation Plan 2018-2022

Baringo County Disaster Risk Management Policy, 2019

The Policy gives responsibilities to County departments to mainstream DRM and integrate Climate Change Mitigation and adaptation, and provides a policy and institutional framework to promote linkages between disaster risk management and sustainable development for reduction of vulnerability to hazards and disasters. It ensures proactive management of conflict resolution and peace-building efforts in the county and makes available sensitization, awareness creation and functional literacy to the public for disaster management mainstream DRM in policy, plans, programmes and budgets in all

levels and sectors.

Draft Baringo County Agriculture Policy, 2017

The policy acknowledges the climate sensitive nature of agricultural systems in the county, due to its extensive reliance on natural systems such as rain fed crops and pasture. The policy provides for strategies on adaptation to climate change including; mechanisms for investing in irrigation and irrigation infrastructure such as, water harvesting and conservation. It cascades and prioritizes implementation of the national climate change action plan, promotes adoption of climate change research findings relevant to crops, livestock, fisheries and early warning, response and preparedness. It promotes adoption of climate-smart agricultural approaches and promotion of climate financing and broadens mechanisms to attract investments in climate-smart agricultural practices along the commodity product value-chains.

Social protection and Gender policy for Baringo

This policy provides a framework for the government to address the current gender inequalities in many spheres of national and County development in regard to climate issues, given the vital role that women play in natural resource use and management.

2.4 Climate Change Legislations at the County level

The county has established policies, legislation and institutions that provide a framework for climate change related governance. A county executive committee member and chief officer run the department of environment, natural resources, tourism and wildlife. The department also has a climate change unit with a director. Climate Change mainstreaming brings on board institutions, and Departments that play a greater role in Climate Change Mitigation including the Department of Water and Irrigation, Department of Agriculture, livestock and Fisheries, Directorate of Disaster Risk Management among others. The climate change action at the county is provided under the following frameworks;

Lake Bogoria National Reserve Management Plan (2019-2029)

This is a ten year period for Lake Bogoria National Reserve developed in accordance with Section 44 of the Fifth Schedule of the Wildlife Conservation and Management Act 2013.

Climate Change Act 2016

The implementation of the Climate Change Act commenced in May 2016. The Act aims to strengthen climate change governance coordination structures. It outlines key climate change duties of public and private sector entities, and recognises the complementary roles of national and county governments towards addressing climate change. The Act also establishes a high-level National Climate Change Council chaired by the President; a Climate Change Directorate as the lead technical agency on climate change affairs; climate change units in all Ministries, Counties, Departments and Agencies (MCDAs) and a Climate Change Fund as a financing mechanism for priority climate change actions/interventions. Further, the Act establishes a scheme for the recognition and incentivisation of private entities' efforts towards addressing climate change.

The Act obligates national and county governments to mainstream climate change across all

sectors of the economy. In this regard, the PCRA process provides means for the mainstreaming climate change concerns across all sectors through participatory approaches.

The Baringo County Climate Change Act, 2022

Undergoing the Legislative process to, among others, facilitate community initiated Climate Change Adaptation and Mitigation activities; planning for Climate Change Adaptation and Mitigation in the County planning and budgetary framework for resource mobilization from national and international entities, the National Government, the County Government and other relevant organizations.

Baringo County Climate Change Fund Regulations, 2023

Pursuant to the Public Finance Management, Act 2012 for initiating and coordinating financing of Climate Change Adaptation and Mitigation activities at the community level;

Purpose of the PCRA

The main purpose of the participatory climate risk assessment is to empower communities to understand the climate risks they face and assess their ability to manage these risks as the basis for identifying and undertaking concrete local climate adaptation actions/ strategies, raise awareness and identify community based organizations (CBO's) groups' roles, as well as sharing of knowledge and best practices.

Before identifying appropriate County climate change actions, there is need to understand the local vulnerabilities including the most vulnerable economic sectors/livelihoods, social groups and communities. Baringo County has been adversely affected by climate change. Many indicators of climate change effects have been experienced, for example the emergence of prolonged droughts, frequent famine experienced by vulnerable families (Marginalized, Minority, Indigenous People) loss of crops, emergence of invasive species (*Prosopis juliflora* and *Dodonaea spp*., change in rainfall patterns and loss of wildlife both flora and fauna, unprecedented floods and rise in water levels in various water bodies.

The County Government has since put in place strategies and programmes geared towards managing the effects of climate change, however, these initiatives have taken place without a clear community level Assessment of climate change vulnerabilities and risks. This report will enable a coordinated, rational and effective response to the Local, Regional, National and global challenges and opportunities that climate change presents. Implementation of this report will provide for a mainstreaming approach that ensures inclusion of climate change considerations into the development planning, budgeting, implementation, administration processes across all sectors and a robust multi-agency resource mobilization mechanism. Similarly, this report will guide the County Government's processes in formulating a proactive, coherent and integrated climate change response that focuses on reducing vulnerability and building the resilience of the people, property, ecosystems and the economy.

When local vulnerability assessments is conducted, it informs local, regional and national authorities (and international development organizations/donors) on: Underlying causes/factors of vulnerability

including ecological, socio−economic and infrastructure; the most vulnerable wards, sectors and communities and social groups; Potential consequences at the different levels of climate change in the short, medium, and long−term; The sectors that require, immediate, mid−term and long−term action for building local level resilience while defining the need for action.

The Ward and County Climate Change vulnerability risk assessment will lead to the development of Ward and County Climate Change Action Plan 2023-2027. The plan is expected to identify sectoral adaptation needs and detail specific sectoral action plans, key potential implementing partners and indicative costs. The Identified ward climate change action priorities and vulnerabilities of the 30 wards to be integrated in the ward climate change action plans.

Key steps in the county's PCRA process

The County government of Baringo through the department of Environment, Natural Resources and Climate change implemented the Participatory Climate Risk Assessment (PCRA) and Climate change Action plan through the following processes: formation of a twenty-seven (27) member climate change technical working group (TWG) to spearhead the PCRA process , which is designed to implement locally driven climate resilience activities while strengthening the county's ability to address climate threats, in partnership with the national government and other key stakeholders/partners.

In April 2023, the TWG underwent a five day training to enable the officers carry out Participatory Climate Risk Assessment (PCRA) at community level in a systematic manner by guiding the community to prioritize strategies and actions on climate change adaptation and mitigation, the TWG was grouped into nine groups of three members per team with a team leader to undertake ward consultation for six days each per ward (Five days data collection and one day formation of the ward committees.

The PCRA process commenced from 11th April 2023 targeting all the 30 wards, where communities were tasked to prioritize the climate change risks and vulnerabilities within their wards. The activity took 20 days with it being concluded on 5th May 2023. The overall objective was to engage local stakeholders at the ward level through a participatory approach, collate, analyze and produce 30 Ward Climate Change Risk and Vulnerability Assessment reports which led to the development of evidence-based ward climate change action plans for the 30 wards in Baringo. The Ward Climate Change Vulnerability Risk assessment was conducted through a participatory approach, in each ward as per the PCRA handbook/guidelines provided by the department of Environment, Natural Resources and Climate Change,through the County Climate Change Unit. Thereafter, 30 ward Climate Change Action Plans shall be developed, the plans are expected to identify sectoral adaptation needs and details specific sectoral actions plans identified after the vulnerability climate risk assessment report is developed.

This was followed by the Compilation of the report to give a zero draft and a 2 -days Validation workshop by stakeholders within the month of May, where the zero draft was presented bringing

together nearly 100 representatives of the County government departments, National government, local and national NGOs, representatives of the Civil society organizations, local Community based organizations, faith-based organizations and the community, who then critically reviewed the PCRA report. Inclusivity was considered in the invited participants. They were; women, youth, ethnic minorities, people living with disabilities, the marginalized groups (Endorois and Ilchamus) and vulnerable groups, who actively participated and contributed to the PCRA development.

The validated report was presented to the executive committee of the county (Cabinet) for discussion, approval and adoption as a county plan and finally to the county assembly for discussion and adoption through the relevant committee (Assembly Committee on Environment, Natural Resources, Climate Change and Mining) of the house.

The PCRA Report aims to be consistent with existing strategies of the National Climate Change Response Strategy (NCCRS), as well as development and economic plans, principally the County Integrated Development Plan (CIDP 2023/2027) III, National Climate Change Action Plan and Baringo County Climate change policy, 2021. The Ward Climate change Action plans shall not contradict the existing laws on Climate change but instead it must take into consideration the diverse culture and Agro-Ecological zones of Baringo County as one of the ASAL County in Kenya.

Chapter 2
County Climate Hazard Profile

2.1 Introduction

According to the ward PCRA engagements climate risks and other hazards affecting the county are drought, environmental degradation (including soil erosion, landslides, deforestation, proliferation of invasive species), floods, livestock and crop pests and diseases, human diseases, human-wildlife conflicts and insecurity. In the Wards that drought, livestock and crops pests and diseases were experienced there was consensus of the increasing frequency and intensity as a result of climate change with devastating effect on food security and livelihoods.

Drought was found to have serious impacts on agriculture, health and the environment. It is a major cause of mass seasonal migration of people and livestock. It increased the risk of diseases and mortality both in humans and livestock. It also was cited as fueling insecurity due to conflicts over water and pasture resources.

According to W.H.O climate change is impacting human lives and health in a variety of ways. In the Multi Stakeholders' PCRA workshop it came out that there is an increase in the magnitude and persistence of human diseases as a result of climate change. Climate change and increasingly frequent extreme weather events, such as drought and floods are already impacting human health by causing disruption of food systems, increases in zoonoses and food-, water- and vector-borne diseases. The figures below show the distribution of the hazards in the county.

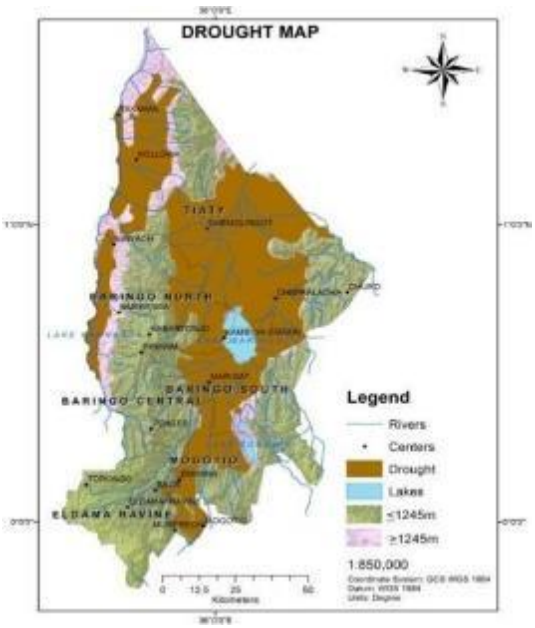


FIGURE 1: DROUGHT MAP OF BARINGO

FIGURE 2: FLOOD MAP OF BARINGO COUNTY

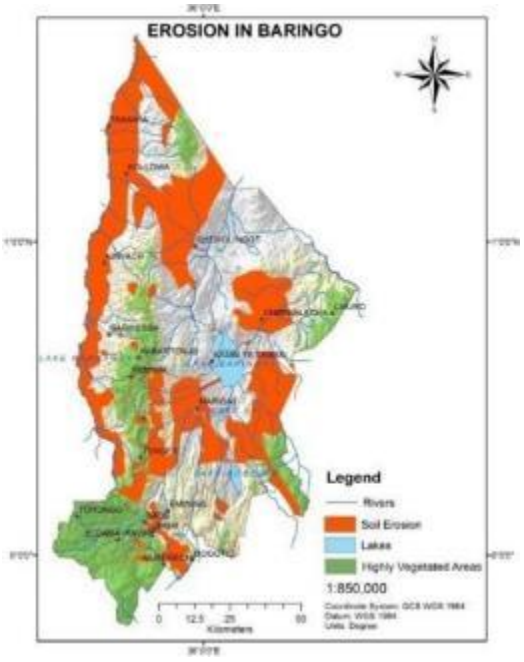


FIGURE 3: EROSION MAP BARINGO

FIGURE 4: LANDSLIDE MAP BARINGO

2.0 Current and Historical Climate Hazards and Trends

Baringo County has diverse topography which results in a wide range of climates. The lowlands are typically hot and dry while the highlands are cooler and wetter. The climate is strongly influenced by the Inter Tropical Convergence Zone (ITCZ) which drives seasonal rainfall in the county during March to May and October to December (MAM & OND) and a westerly incursion from the Congo Basin which drives June, July and August (JJA) Season. Given its diverse topography, temperatures across the county vary significantly, with the highlands experiencing much cooler temperatures than lowland zones. Little seasonal variation in temperature exists. The average temperature range is between 16.3°C at the higher elevations and 29.3°C at lower elevations.

Rainfall varies considerably across the county, with annual average ranging between 625: millimeters (mm) falling in the semi-arid lowlands and 1310 millimeters (mm) in the highland areas.

2.0.1 Historical climate trends

Rainfall time series (1983 to 2018) and temperature time series (1981 to 2010) reconstructed from Kenya Meteorological Department's station observations, remote sensing and other proxies were analyzed and plotted.

Figures 1a. and 1b.show the Monthly Rainfall climatology (1983 to2018) and Yearly Monthly

Rainfall Anomalies respectively. The Monthly Rainfall Climatology shows mean monthly

rainfall for the county. The figure shows that the county experiences tri-modal rainfall patterns with peaks in March to May (MAM) , June to August(JJA) and October to December(OND). The other months remain dry and hot except a cold period extending from June to August. The highest rainfall is experienced during the month of April (being the peak of MAM season) while the lowest monthly rainfall is experienced in the month of February.

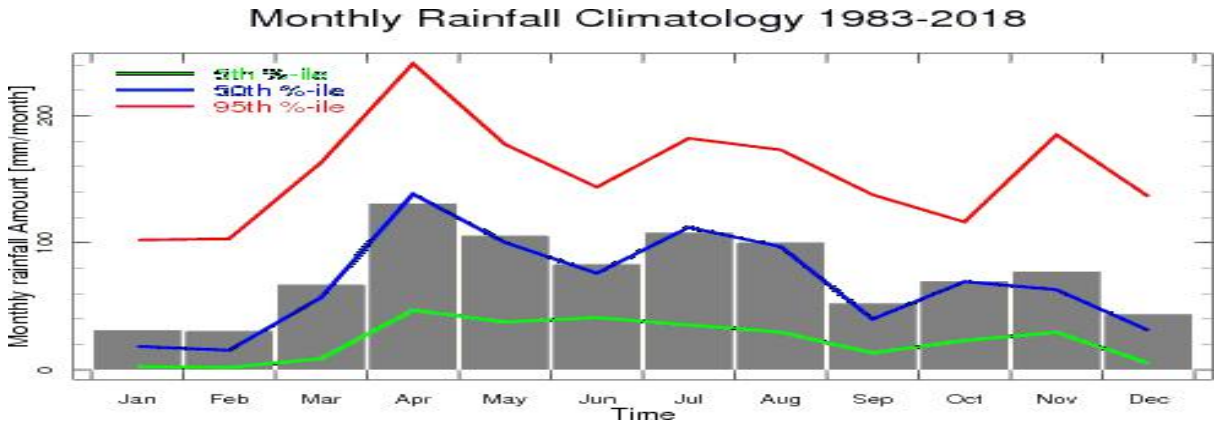


FIGURE 5: MONTHLY RAINFALL CLIMATOLOGY (MM)

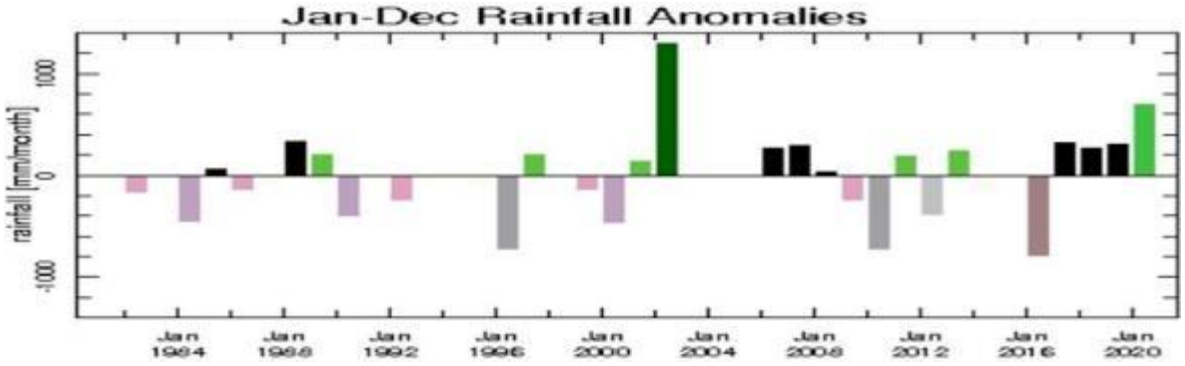


FIGURE 6: YEARLY MONTHLY ANOMALIES

The inter-annual rainfall variability shows years when more/less than usual rainfall was recorded over the county. Positive/negative rainfall anomalies show instances when wetter/drier than normal conditions were recorded.

Rainfall

Rainfall varies considerably across the county, with annual average ranging between 625 millimeters (mm) falling in the semi-arid lowlands and 1310 millimeters (mm) in the highland areas. Average annual rainfall for the county is 900mm. Table 1 shows average monthly rainfall (mm)

Month	Jan	Feb		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall(mm)	30	30		65	130	105	85	110	100	55	70	75	45

Table 1: AVERAGE MONTHLY RAINFALL (MM)

Major Rainfall seasons

There are three distinct rainfall peaks in the County namely: MAM (300mm), JJA (295mm), OND (190mm)which make the county to have tri-modal rainfall regimes.

Temperature

Figures 7 and 8 show the Monthly Minimum Temperature and Maximum Temperature climatology (1981 to 2010).

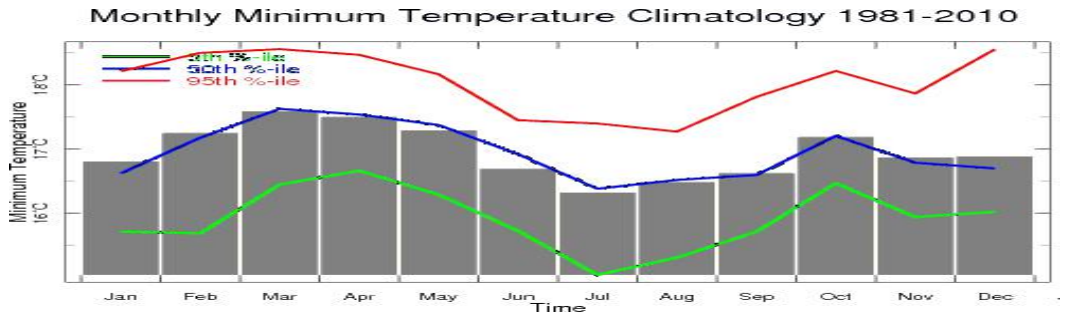


FIGURE 7: MONTHLY MINIMUM TEMPERATURE CLIMATOLOGY 1981-2010

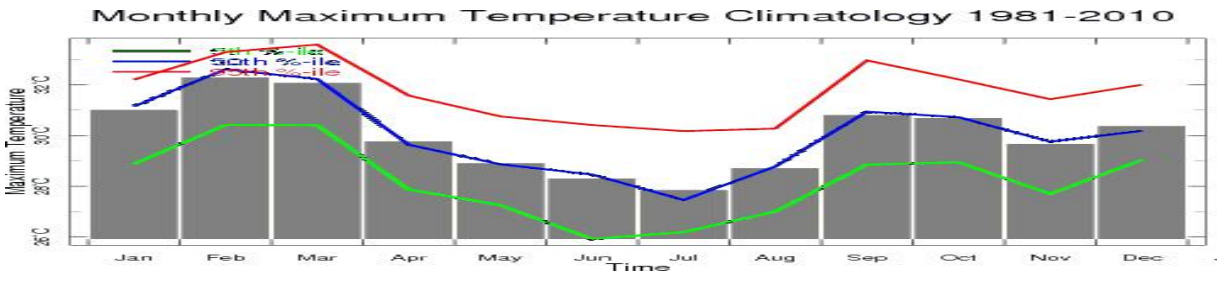


FIGURE 8: MAXIMUM TEMPERATURE CLIMATOLOGY (1981 TO 2010)

Table 2 and 3 below is data for the average monthly minimum and average monthly temperatures respectively.

TABLE 2: AVERAGE MONTHLY MINIMUM TEMPERATURE(°C)

Month	January	February	March	April	May	June	July	August	September	October	November	December
Minimum Temperature(°c)	16.7	17.2	17.7	17.5	17.4	16.8	16.3	16.5	16.7	17.3	16.8	16.8

TABLE 3: AVERAGE MONTHLY MAXIMUM TEMPERATURE(°C)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Temperature (°c)	27.8	29.3	29.2	26.8	25.8	24.8	24.0	25.8	28.0	27.2	25.8	26.8

2.0.2 Historical hazards

Major hazards in Baringo identified through the PCRA process are drought, conflicts (natural resource based conflicts and human-wildlife conflicts), diseases (human, livestock and crop), floods, and land degradation (soil erosion, landslides and mudslides, invasive species proliferation, wetlands and forest fires). Climate change effects are becoming intense in the county due to vulnerability and low adaptive capacity by communities.

In Baringo there are five (5) main livelihood zones that are identified. These are

i) Pastoral covering Kolowa, Loyamorok, Silale, Tirioko, Rikwo, Mukutani, Tangulbei, Saimo Kipsaraman and Saimo Soi wards

ii) Agro pastoral zone comprising Bartabwa, Barwessa and Kabarnet (Salawa, Sesia) wards.

iii) Marginal Mixed experienced in Mogotio, Emining and Kisanana wards

iv) Mixed Farming in Kabartonjo, Ewalel Chap chap, Tenges, Sacho, Lembus, Lembus kwen,

Maji Mazuri/Mumberes, Koibatek, Lembus Perkerra and Ravine, Upper Mochongoi and

v) Irrigated Crop covering Marigat, Lower Mochongoi and Barwessa wards.

The five livelihood zones are increasingly facing challenges due to climate change effects through its interaction with the identified hazards. The hazards prioritized during the livelihoods are drought, livestock pests and diseases, crop and pest diseases, human diseases, floods and environmental degradation. The latter, environmental degradation is a non-climate hazard and includes processes such as deforestation or tree cutting, landslides and soil erosion. While environmental degradation is exacerbated by climate change and climate variability environmental degradation also contributes to increase in the effects of climate change.

2.0.3 Key Trends in Temperature and Precipitation Trends in Rainfall

a) National Precipitation Trends

Precipitation trends for Kenya are highly variable, however there is significant geographical diversity in observed rainfall trends. Northern areas have become wetter, and southern areas have become drier since the 1960s, although this has had a high degree of variability. Extreme rainfall events are occurring with greater frequency and intensity. Increased aridity and droughts have also been observed, with moderate drought events recorded on average every three to four years and major droughts every ten years. Since 2000, prolonged droughts have become more common.

b) Baringo County Precipitation Trends

The figures 9, 10, 11 and 12 show Annual and major seasonal rainfall trends in the county from 1981 to 2018.

Annual mean

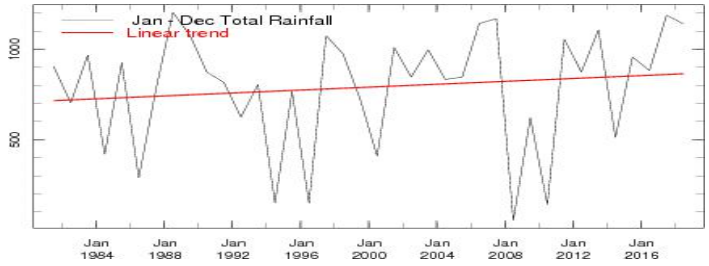


FIGURE 9: ANNUAL RAINFALL TREND

The annual rainfall trend shows an increasing trend in annual rainfall from 1981 to 2018.

Seasonal mean:
March, April, May (MAM)

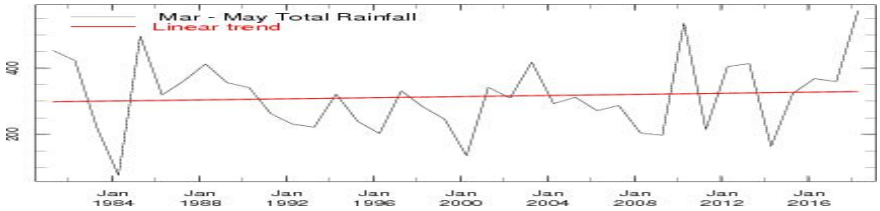


FIGURE 10: MAM SEASONAL RAINFALL TREND

The MAM Seasonal Rainfall trend shows an increasing trend in the MAM seasonal rainfall from 1981 to 2018.

June, July, August (JJA)

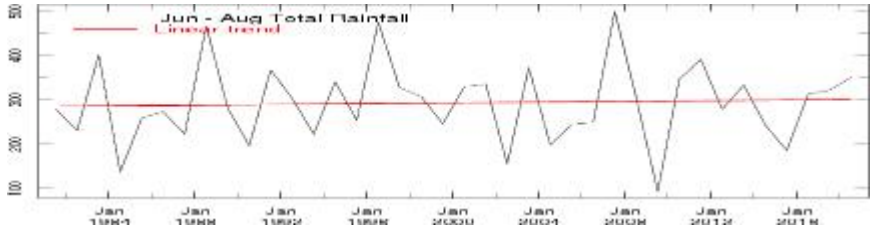


FIGURE 11: JJA SEASONAL RAINFALL TREND.

The JJA Seasonal Rainfall trend shows an increasing trend in the seasonal rainfall from 1981 to 2018

October, November, December (OND)

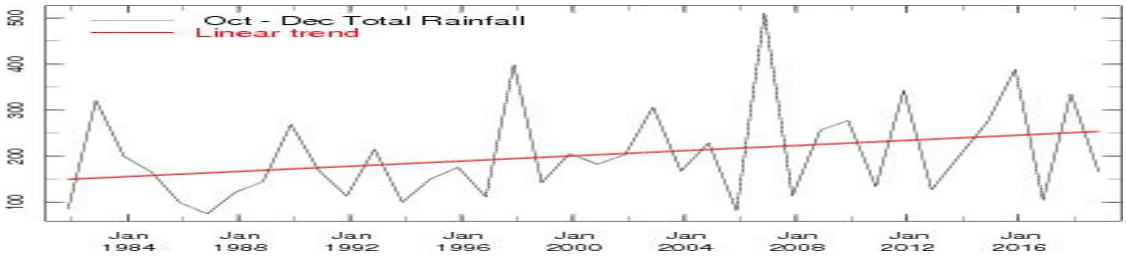


FIGURE 12: OND SEASONAL RAINFALL TREND

The OND Seasonal Rainfall trend shows an increasing trend in the seasonal rainfall from 1981 to 2018

2.0.4 Climate Change Related Hazards Impacts to Key Livelihoods in Baringo

a) Trends in drought and Impacts

The county continues to suffer extreme weather events that adversely affect the livelihoods of the people. Evidence from historic climate data sources show that the drought frequency and duration in the county increased from four droughts every 10 years in the 1980s to 8 droughts every 10 years in the 2000s. The consequences of these events include food insecurity, where approximately 29.5% of the children below 5 years suffered from malnutrition according to the dietary household survey of 2014, and about 21,300, 72,600 and 59,600 people relied on food relief in 2013, 2014, and 2015 respectively and 24,000 families relied on food relief in 2017. This was largely due to crop failure and livestock deaths. For instance, the 1988-1992 droughts

resulted in 88% loss reduction in maize production whereas that of 2017 resulted in the death of approximately 1,500 livestock. Perceptions are that such droughts are the major cause of the historical inter-communal conflicts over pastures and water, an example being the wrangles of 2017, which resulted in huge losses.

b) Climate Change Related Livestock Pest and Diseases and trends

Baringo county with three main agro ecological zones (highland, lowlands and the midlands in-between) is majorly arid and semi-arid. The county is about 80 percent ASAL and has a majority of its population depending on pastoralism. This means that with climate change effects becoming increasingly felt in Baringo, a majority of the pastoralists suffer losses as incidences of climate related diseases increase in terms of spatial distribution and incidences.

Livestock ownership is generally a measure of wealth in the pastoral livelihood zones (Saimo-soi, Saimo Kipsaraman, Ribkwo, Tirioko, Mukutani, Tangulbei, Ilchamus, Koloa, Loyamorok, Silale). The very rich own (cows - 100 and above, goats- 200 and above, camels-70 and above) rich (cows- 20, goats-100 or less, camels- 10) poor (cows- 10, goats- 10-20, camels- 0). In agro-pastoral livelihood zone (Bartabwa, Churo, Kabartonjo, Barwessa), very rich (cows - 30-50, goats - 80-100, sheep - 80-100) medium rich (cows - 10-20, goats - 30-50, sheep - 30-50) poor (cows - 0-4, goats - 0-10, sheep - 0-10).

Bartabwa ward, an agro-pastoral livelihood zone, has 90% of the population depending on pastoral livestock production for survival, both for food and cash income (Field 2023).

Livestock have a great economic importance in the pastoral and the agro pastoral livelihood areas. Increasing effects of climate change as exhibited by prolonged and frequent droughts and floods, rising temperatures or decreasing temperatures in different wards in livestock places a heavy social and economic burden on farmers in these zones.

Climate change affects livestock health due to its effect on climate variables such as temperature, relative humidity and soil moistures. These climate variables have an influence on the diseases causing pathogens, that is viruses, bacteria, microorganisms and pests.

During the PCRA exercise in Lembus Kwen ward the participants said that in the ward there has been witnessed changes in pests and diseases in terms of spatial distribution, incidences and even emergence of pests that were not witnessed before. These they attributed to present climate change effects.

Trends in Livestock pest and diseases

Livestock in Baringo County are mostly affected by diseases such as foot and mouth, Contagious Bovine Pleuro-pneumonia, Contagious Caprine Pleuropneumonia, East Coast fever, Diarrhoea, Mange, Red water, worms and Heart water. All of these diseases are highly contagious and cause immense losses (by death) when they attack animals.

Livestock diseases have shown an increasing prevalence trend in the past 30 years across all the livelihood zones. However, the effects are strongly felt in livelihoods that majorly depend on the livestock sector that is the pastoral and agro pastoral wards.

Livestock diseases like lumpy skin disease (LSD), contagious caprine pleuropneumonia (CCPP)

and Pestes des Petits Ruminanta (PPR) are being diagnosed in Tiaty, Baringo North, Baringo South, Baringo Central and Mogotio sub counties which are in in the said livelihoods (Field data 2023).

Further, other livelihoods like marginal mixed farming (Emining, lower Kisanana, Mogotio, upper Kisanana) and mixed farming (Ewalel Chapchap, Kabarnet, Lembus, Maji Mazuri, Koibatek, Tenges, Lembus Perkerra, Sacho, Ravine, Upper Mochongoi) are also affected by livestock diseases in recent times. Mastitis, East Coast Fever (ECF) and anthrax are among diseases reported in the zones during the ward PCRA activity (Field data 2023).

Relation between Livestock Pests and Diseases and Climate Change

The Intergovernmental Panel on Climate Change (IPCC) projects an increase in global mean temperature of 2.0°c with a range of 1.0 to 3.5° c by the year 2100. The causes of livestock diseases from the PCRA process are identified as Pathogens (fungi, virus and bacteria), disease vectors, pests and parasites, improper farm management practices, drought and floods which results in excess moisture.

Climate appears to be more frequently associated with the seasonal occurrence of non-vector borne animal diseases. It has a strong influence on both the spatial and temporal distributions of the intermediate vectors and the related diseases that they lead to.

Climate change affects pathogens/parasites directly or indirectly, the hosts, the vectors (if there is an intermediate host), epidemiological dynamics or the natural environment.

Higher temperatures resulting from climate change may increase the rate of development of certain pathogens or parasites that have one or more life cycle stages outside their animal host. Pathogens and parasites that are sensitive to moist or dry conditions may be affected by changes to precipitation, soil moisture and the frequency of floods. Changes to winds could affect the spread of certain pathogens and vectors.

Climate change may affect the immune system of some animals as a result of changes in the solar radiation. This would make the non-immune susceptible to disease infection when exposed. Temperature and moisture frequently impose limits on vector distribution. Changes to temperature and moisture will lead to increases or decreases in the abundance of many disease vectors.

Climate change may alter transmission rates between hosts by affecting the survival of the pathogen/parasite or the intermediate vector. The table below shows the historical trend in the occurrence of diseases obtained during the wards PCRA activity. Table 3 also shows how the community was affected and the coping mechanism.

TABLE 4: RELATION BETWEEN LIVESTOCK PESTS AND DISEASES AND CLIMATE CHANGE

Ward	Livestock pest & Diseases	When	Impact	How did they cope

Tirioko	Lumpy Skin Disease ECF, RVF (anthrax, spirit, chepurpurmet)	1984 2007 2012	Loss of livestock Insecurity Food shortage Poverty Starvation Migration Social issues e.g., depression	Restocking Cattle rustling Donation and inheritance Livelihood diversification Introduction of education for school age children
			and family breakages	
Ribkwo	Rinderpest disease outbreak 'Plok' (cattle plague)	1959 1960	- Loss of livestock.	-Provision of yellow maize and canned food. Eating of wild fruits - Chief Lokudo mobilized for vaccination.
	East coast fever livestock	1975	Caused animals not to stand loss of livestock	Use herbal medicines to treat the livestock
	East coast fever & drought (Lokodos)	1979-1980	-Loss of animals -Migrations	- Vaccinations of cattle
Mukutani	ECF ECF FMD RVF	1966 1990 2000 2006	Livestock deaths Spread of zoonotic diseases High veterinary cost	Use of local treatment Migration
Ilchamus	RVF CCPP	2005	loss of livestock, loss	avoiding milk & meat products, ensure proper

			of human life abortion in livestock, loss of income and increased poverty	cooking of animal products, massive vaccinations, maintaining of hygiene
Kolowa	PPR, CCPP and skin infections Outbreak of livestock pests and diseases causing zoonotic diseases	2009		Quarantines, closing of livestock markets, disease surveillance and control, communities were supported with relief food to cushion them from eating dead carcasses of animals.
Loiyamorok	"Loukoi", "Lipis", "Lokrucha" (Pokot)and Lumpy Skin Disease ECF, RVF anthrax, "chepurpurmet" (Pokot)	1984 2007 2012	Loss of livestock Insecurity Food shortage & starvation Increased poverty Migration Social issues e.g. depression and family breakages	Restocking Cattle rustling Donation and inheritance Livelihood diversification Introduction of education for school age children
Silale	ECF, PPR, CCPP, anthrax, foot and mouth diseases		Reduced livestock production (milk, meat) Irritation Death of the livestock Poor livestock health	Treatment Stocking of drugs at household level Isolation of sick animals Mass vaccination

Kabartonjo	ECF FMD Anthrax Coccidiosis Newcastle Lumpy skin disease	(recurrent) (recurrent) (recurrent) (recurrent) (recurrent) (recurrent)	Low livestock production, poor animal health, livestock sickness Zoonotic diseases Poor animal body condition	Use of locally available treatments e.g aloe vera and Busaa (local brews) for FMD, mass vaccination, treatment, destocking, deworming & migration

During the ward PCRA engagements it was found that there are changes in livestock diseases in terms of incidence or spatial temporal distribution, on the animal populations and human communities affected. Participants of the PCRA in Lembus Kwen ward said that there are animal diseases which occurred in specific areas of the ward but were now widespread. Some livestock diseases had become more common in frequency than before. Examples were given of emerging pests and diseases which previously were not experienced in some wards. Beside poor animal husbandry practices the communities cited climate change as a key driver in the current occurrence of livestock diseases. This is associated with increasing incidences of drought, floods, rising temperatures and strong winds like in Barwessa.

Major Livestock Diseases in the Pastoral & Agro Pastoral Zones in Baringo Bacterial diseases

Anthrax is an infectious disease of warm-blooded animals, including humans, with worldwide distribution. Temperature, relative humidity and soil moisture all affect the successful germination of anthrax spores. Outbreaks are often associated with alternating heavy rainfall and drought, and high temperatures.

Viral diseases

Foot-and-mouth disease is a highly contagious, viral infection with considerable economic importance. Transmission is mainly by contact between infected and susceptible animals, or contact with contaminated animal products or equipment. However, spread by 8 wind occurs since the virus survives well at relative humidity below 60% which makes wind-bome spread favorable in humid, cold weather.

Peste des Petits Ruminants (PPR) is an acute, contagious, viral disease of small ruminants. It is transmitted mostly by aerosol droplets between animals in close contact. Appearance of clinical PPR is often associated with the onset of the rainy season or dry cold, a pattern that may be related to viral survival.

Rift Valley Fever (RVF) is a zoonotic viral disease transmitted by Aedes and Culex mosquitoes.

Epizootics of RVF are associated with periods of heavy rainfall and flooding in East Africa, with the combination of heavy rainfall following drought.

Blue tongue is a viral infection of ruminants transmitted by a vector whose distributions are largely dependent on environmental variables such as temperature, moisture and wind.

Direct and indirect impacts of livestock pest and diseases in pastoral and agro pastoral livelihood zones

During events of livestock disease occurrence, livestock body condition is likely to continue deteriorating due to the worsening animal health conditions. This results in a dampening effect on communities that rely on livestock for survival. The average milk produced mainly from cattle, goats or camel per household per day is likely to decline significantly due to deteriorating animal health conditions.

Indirect impacts of livestock disease occurrences are spread of zoonotic diseases such as brucellosis and rift valley fever to humans. This is likely to happen because it is common practice for the community to consume products of infected animals.

Loss of livelihood assets from the death of animals particularly for diseases with high mortality. This in turn would lead to low household income and food and nutrition insecurity. Poverty levels are likely to increase as livelihood assets are lost and the burden of livestock health care increases.

Most vulnerable members of the community including the aged, the poor and PWDs are likely to be mostly affected from increased livestock diseases. This is because of their low adaptive capacity and limited economic opportunities before them. High incidences of livestock diseases is likely to affect accessibility to regional and international livestock and livestock products market by the pastoral communities.

Further, the market prices fetched by livestock is likely to decline and also there will be migration to disease free zone areas which would compound the fight to control disease spread.

c) Trends in crop pests and diseases

The main agricultural activities in the county are crop production and livestock rearing, bee keeping, aquaculture and fishing. Arable land covers 109,500ha, representing 9.9% of the total land area in the county and about 1.9% of the national arable land (GOK, 2013). Total acreage under food and cash crops represents about 8% of the arable land (GOK, 2013).

The African maize stalk borer is primarily a pest of maize and sorghum; other hosts include pearl millet, finger millet and sugarcane. Many wild grasses are also hosts, including Johnson grass (Sorghum halepense), elephant grass (Pennisetum purpureum), wild Sudan grass (Sorghum verticilliflorum) and guinea grass (Panicum maximum).

Crop pest and diseases in baringo is prone in irrigate, mixed and marginal mixed farming livelihood zones; (Marigat, Ilchamus, Lower Mochongoi,Ewalel chapchap, Kabarnet, Lembus, Maji Mazuri, Koibatek, Tenges,Lembus Perkerra, Sacho, Ravine, Upper Mochongoi, Bartabwa,Churo, Kabartonjo, Barwessa wards). The main crops grown in the county are maize, finger millet, sorghum, beans, cowpeas, green grams, garden peas, Irish potatoes, and sweet potatoes, as well as coffee. Livestock types include East African Zebu cattle, poultry, dairy cows,

goats, sheep, rabbits, camels, pigs, and donkeys.

Baringo livelihoods are majorly dependent on mixed farming and pastoralism. Farming takes place in the highland regions of Baringo Central and Koibatek sub-counties as well as the mid-lowland regions of Mogotio sub-counties. Farmers in Baringo County are most often affected by Crop diseases.

According to most farmers interviewed in the crop growing sub-counties, perennial crop diseases have emerged in the region and can be traced directly or indirectly to the changing weather and climatic patterns experienced in the county.

These diseases include: Maize Lethal Necrosis Diseases (MLND), Tuta absoluta, Bacterial Wilt, worm attacks, Aphids, tomato blight and blossom end rot. Some of these diseases, for instance, Tuta absoluta results in instant wilting of the plant leading to subsequent massive loss of the crop accounting for zero to approximately 10% yield at any given farm in any season.

d) Trends in Human diseases

Since AR5 of the Intergovernmental Panel on Climate Change (IPCC), new evidence and awareness of current impacts and projected risks of climate change on health, well-being, migration and conflict have emerged, including greater evidence of the detrimental impacts of climate change on mental health (IPCC-AR6-WGII{ES-Ch7}). Observed societal impacts of climate change, such as mortality due to floods and droughts are much greater for regions with high vulnerability compared to regions with low vulnerability (IPCC-AR6-WGII{ES-Ch8}). A wide range of risks across scales, sectors and regions could become severe under particular conditions of hazards, exposure, and vulnerability. Severe health impacts are projected to occur where vulnerability is currently high and is assumed to persist into the future. (IPCC-AR6-WGII{ES-Ch16}).

Climate change and related extreme events will significantly increase ill health and premature deaths from the near- to long-term. An excess of 250,000 deaths per year by 2050 attributable to climate change is projected due to heat, undernutrition, malaria and diarrheal disease, with more than half of this excess mortality projected for Africa (compared to a 1961-1991 baseline period for a mid-range emissions scenario). The burdens of several climate-sensitive food-borne, water-borne, and vector-borne diseases are projected to increase under climate change, assuming no additional adaptation. {ESCh7}.

With proactive, timely and effective adaptation, many risks for human health and well-being could be reduced and some potentially avoided. Early warning systems based on targeted climate services can be effective for disaster risk reduction, social protection programmes, and managing risks to health and food systems (e.g. vector-borne disease and crops). {ES-Ch9}

During the ward PCRA engagements, human diseases emerged to have increased due to climate change. *In Barwessa ward participants in the PCRA engagement explained that presently there is an increase in strong winds in the ward especially during drought. This was not the case in the past. They attributed this to observed increasing temperatures. In account of this the participants explained an increase in respiratory diseases in humans as a result of strong winds which generated a lot of dust in the air.*

During the PCRA ward engagements climate water related human disease were found to be prevalent in; Marigat, Ilchamus and Lower Mochongoi. The diseases are malaria, typhoid, amoebic dysentery and cholera, kala-azar (*Visceral leishmaniasis*). Climate related respiratory diseases were found to be on the increase in Barwessa wards including also Lembus Kwen ward and other wards in Eldama Ravine sub county.

Substantial co-benefits from climate action can result from investing in health systems, infrastructure, water and sanitation, clean energy, affordable healthy diets, low-carbon housing, public transport, improved air quality, and social protection. These benefits are in addition to the avoided health impacts associated with climate change.

Seasonal calendar and climate variability

A seasonal calendar is a visual method of showing the distribution of seasonally varying phenomena (e.g. seasonal changes, economic activities, resources, production activities, illness/disease, migration, natural events, etc., in relation to specific months of the year. The calendar helps in understanding seasonal differences during livelihoods analysis and vulnerability analysis, the time of the year when different social groups are more/less vulnerable, Identifying periods when specific groups of people usually suffer particular hardships so that appropriate "safety nets" can be set in place or other remedial actions taken and helps to tell seasonal variations in vulnerability, risk, and access to assets and resources and the likely impact of proposed policy change on seasonal risk and vulnerability amongst different households or groups. Table 5 indicates a seasonal calendar in the perspective of climate change.

Table 5: seasonal calendar for a good year across all livelihood zones

The seasonal calendar for a good year across all livelihood zones												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Seasons												
Dry												
Long rains												
Short rains												
CROP PRODUCTION												
Land preparation												
Planting												
Weeding and spraying												
Harvesting												
LIVESTOCK PRODUCTION												
Livestock in-migration												
Livestock out-migration												

Milk production												
High												
Low												
Calving												
High/Peak												
Low												
Kidding (Peak)												
High/Peak												
Low												
Food prices												
High												
Medium												
Low												
Livestock prices												
High												

Medium												
Low												
Fishing/Fish sales												
High/Peak												
Low												
Disease outbreak												
Highly likely												
Low/not at all likely												
Water Stress												
Risk of Conflicts (e.g. cattle rustling)												
Ceremonies (marriage, wedding & circumcision)												
Food Security Assessments (ASALs)												

In a good year the long rains start in March and end in May. The onset of the short rains is October, November and December. The dry spell is experienced in the month of January and ends in March.

People are occupied with work almost throughout the year apart from the month of July. The rest of the months from January to October are filled with farm work with land preparation in

January and February, planting from March to May, weeding and spraying from April to June, harvesting starting August up to November.

The analysis of the seasonal calendar during the ward PCRAs showed variations especially precipitation where the onset of MAM in some indicated a shift form the normal season. The shift observed was the onset being April instead of March. This shift means planting beginning April going through May. The observation by the community in the seasonal calendar matches observed variation in precipitation and temperature discussed in the climate data.

Seasonal calendars showed that livestock diseases/ outbreaks are common in January, February to May. The common diseases that occur are; Pestes des petits Ruminants(PPR), Rift Valley Fever, Blue tongue and Foot and mouth diseases. They provided important information on when to undertake interventions to prevent and control livestock diseases.

The seasonal calendar can improve local communities abilities to cope with climate risks and support development adaptation actions that respond to community needs.

2.1 Exposure and vulnerability profiles of the county

In the county the pastoral and the agro pastoral livelihood zones were established to be at a high risk of the impacts of climate related livestock diseases. The exposure to the risk of livestock pests and diseases is high due to the physiographic and ecological conditions of these zones. The zones are ASAL and therefore already suffer deficiency in precipitation in addition to experiencing high temperatures and evapotranspiration rates. These livelihoods are climate dependent meaning compounding effects of climate change and other related hazards such as drought and high temperatures would increase the severity of livestock diseases on the livelihood. As weather and climate elements including temperatures and precipitation continue to shift leading to an upward trend in climate change, livestock disease causing bacteria, parasites, vectors, viruses and pathogens will continue to thrive. This in turn will result in high exposure and vulnerability of the communities in the pastoral and agro pastoral to livestock pests and diseases. Vulnerability from climate related pests and diseases poses major challenges for economic stability and fiscal sustainability and have had adverse social and fiscal consequences. The PCRA findings established that floods occurrences affect human elements at different degrees, the survivability also is different per the age, gender, degree of exposure etc, the age bracket of under 5s and the aged (60yrs & above)are the *highly* affected with waterborne diseases, and malaria, being the most vulnerable groups. The productive age(18-59 yrs) in most the active

Crop pest & diseases

Participatory Climate Risk Assessment (PCRA) findings for different age groups in all livelihoods shows that children below 5 years, the special group (pregnant women, breastfeeding and differently abled group) both genders were highly affected by crop pests and diseases because they depend on their parents and relatives during the hazard event, they do not have any other alternatives. 18-35 are medium affected by crop pests and diseases because they have the energy to look for alternative sources of livelihood, 35-36 are also highly affected because they only depend on crop production to feed their families and also parents depend on them.

Drought

According to the Participatory Climate Risk Assessment (PCRA) report, drought poses a threat to people's livelihoods, increases the risk of diseases and deaths, and fuels mass migration. Other effects of drought include outbreaks of livestock diseases that can lead to zoonotic diseases due to the migration of livestock among pastoral communities. Despite women playing a significant role in crop and livestock production and providing the highest family labor, they are the most vulnerable to the effects of drought. The impacts of these hazards include increased household burdens for women, food and nutritional insecurity for children, and limited alternative sources of income and productive assets for youth engaged in income-generating activities.

2.2 Differentiated impacts of climate trends and risks

Gender-differentiated impacts of extreme weather events due to climate change were highlighted in all ward PCRA engagements. It was stated that the adverse effects of drought, environmental degradation, catchment destruction, human diseases, livestock diseases, human-wildlife conflicts, insecurity, floods, landslides, extreme rainfall events and sea level rise are often felt more keenly by women than men as a result of systemic gender discrimination and societal expectations related to gender roles. These adverse effects have varied social, financial and economic dimensions.

It was found out that a complex interaction of social factors puts women and marginalized groups at greater risk of experiencing the adverse effects of climate change over a prolonged period. This is in line with the recognition in the climate risk assessment that climate change affects groups differently as a result of the intersection of discrimination based on social factors such as urban or rural location, sexual orientation, educational background, income, gender, ethnicity, age, class and (dis)ability, access of different genders to key livelihood resources and decision making in the use of resource.

a) Differentiated impacts of climate related livestock diseases trends and risks

Due to the increase of climate related livestock diseases boys and girls under the age of 5 are at high risk of malnutrition as they solely rely on lactation. In the event of an outbreak of livestock diseases, their alternative source of nutrition becomes compromised. due to lactation.

Male and female 6 - 18-years old face challenges such as lack of school fees which may lead to school dropout cases, early pregnancies and early marriages. Male and female 19 – 35 years face challenges in raising school fees and for the young families trying to settle, destruction of their livelihood leads to raise in case of stress and depression.

Adults between 35 and 60, both male and female, experience exhaustion of available resources, domestic violence, and broken marriages. The elderly, Pregnant and lactating women, minority or disadvantaged groups, and PLWDs are also adversely affected due to their nature of predisposition to the hazard, hence highly dependent and helpless.

Gender, age and VMGs differentiated impacts relating to climate related livestock diseases was found to be as a result of a number of factors during the ward PCRA engagements. This included the location of the element at risk that made some to be more exposed and vulnerable. Gender defined roles make females to be more exposed than males. Bad practices such as consuming the

products of diseased animals put children under 5 years and mothers more at risk of being infected with zoonotic diseases. Cultural practices that place very high economic and social value on owning livestock at the expense of other economic activities increases exposure and vulnerability.

b) Differentiated impacts of climate related droughts trends and risks

Participatory Climate Risk Assessment (PCRA) findings for different age groups in all livelihoods shows that children under 5 years old, both boys and girls were highly affected by drought hazard because most of them are at home or at play groups in schools. Also like the school going children, these groups are vulnerable to risks of malnutrition, school dropouts because of challenges of food insecurity. The livestock die of hunger and complications arising from severe effects of the hazard. Failure of crops leads to food shortages and with these conditions, the locals are exposed to hunger and food deficiency related conditions and other diseases take undue advantage to the patients. The elderly and people living with disabilities are severely impacted by the effects of the drought. This is complicated by their physical conditions and their dependency on other family members who are equally devastated by the effects. People with special conditions who include pregnant, lactating mothers are highly affected by the hazard which is exacerbated by migration. Maternal care including antenatal care becomes extremely challenging as the drought continues to hit due to migration of the communities in search of pasture and water. This exposes them to morbidity and possible mortality. Youth in that bracket of 18-35 years of age are highly affected by the hazard since they are in the field herding and searching for pasture and water for livestock. They are actively involved in herding and banditry.

2.3 Spatial Distribution of Risks

Spatially break down the climate risk projections into smaller geographical planning units, preferably Wards, linking to the main livelihood and economic sectors in each respective Ward (This is important for more targeted county climate change action planning).

This section provides the climate risks projections in the ward level linking with main livelihood and economic sectors. This is as indicated in table 6.

TABLE 6: SEASONAL CALENDAR FOR A GOOD YEAR ACROSS ALL LIVELIHOOD ZONES

Livelihood zones	Ward Representation	Climate Hazards	Economic Sectors
Pastoral Livelihood zone	Saimo-soi, Saimo Kipsaraman, Ribko, Tirioko, Mukutani, Tangulbei, Ilchamus, Koloa, Loyamorok, Silale	Drought Crop pests and diseases Livestock diseases	Livestock markets/ business. Honey production Mining Fish farming

Agro-pastoral Livelihood zone	Bartabwa, Churo, Kabartonjo, Barwessa	Drought Crop pests and diseases Livestock diseases	Cash crops Horticultural crops. Eco-tourism Mining Honey Production
Mixed Farming	Ewalel Chapchap, Kabarnet, Lembus, Maji Mazuri, Koibatek, Tenges, Lembus Perkerra, Sacho, Ravine, Upper Mochongoi	Drought Crop pest and diseases Environmental degradation	Cash crops, Dairy farming, Horticultural crops. Large scale farmers for Maize, Seed maize. Pasture Production
Marginal mixed farming	Emining, Lower Kisanana, Mogotio, upper Kisanana	Drought Environmental degradation	Pasture production, sisal farms , Eco-tourism
i**rrigated**	Ilchamus, Marigat, lower Mochongoi	Drought Human diseases Floods	Honey production, Horticultural crops, Large scale seed maize production, Eco-tourism,

Chapter 3

Future Climate Scenarios

3.1 Climate Projections under RCP 4.5 and RCP 8.5 Scenarios over Kenya

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

The models used for these projections are Coupled Model Intercomparison Project 5 (CMIP5). CMIP5 data ensemble for global climate change projections presented in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Models are based around 4 different greenhouse gas emissions pathways (called RCP2.6, RCP4.5, RCP6.0 and RCP8.5) which correspond to different mitigation scenarios (the degree to which global emissions have been successfully reduced).

A medium (RCP4.5) and a high (RCP8.5) emission scenario in this profile were employed for the downscaled county scenarios over four different time horizons.

3.2 National and downscaled climate change projections

CMIP5 ensemble projected change (32 GCMS) in annual temperature by 2040–2059 and by 2080–2099 (right), relative to 1986–2005 baseline under RCP8.5. Climate projections for Kenya were undertaken as indicated in the figures.

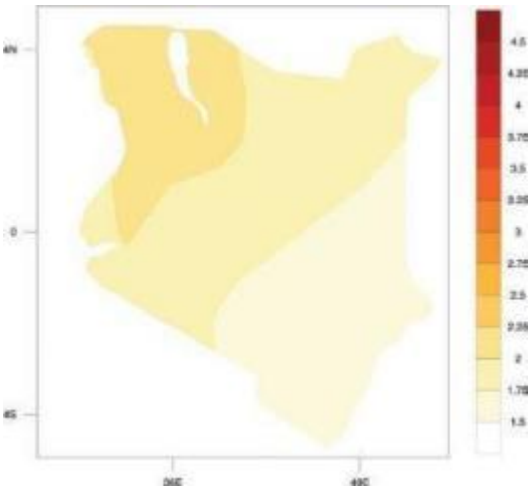


FIGURE 14 PROJECTED ANNUAL TEMPERATURE BY 2040–2059

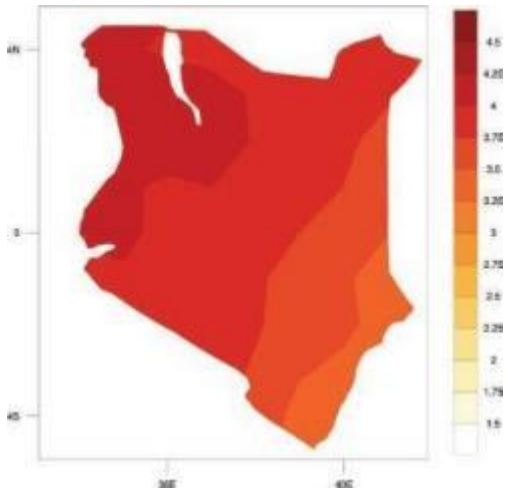


FIGURE 13: PROJECTED ANNUAL TEMPERATURE BY 2080–2099

CMIP5 ensemble projected change (32 GCMs) in annual precipitation by 2040–2059 and by 2080–2099 (right), relative to 1986–2005 baseline under RCP8.5

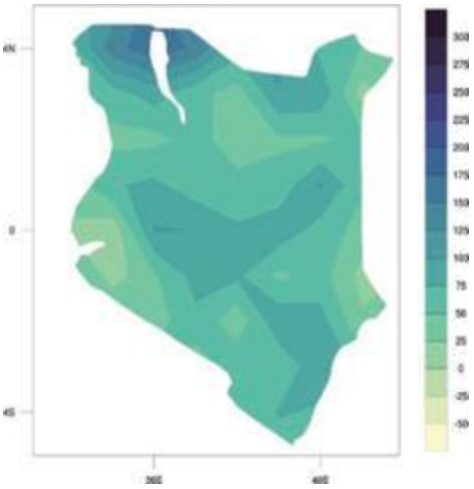


FIGURE 15: PROJECTED CHANGE IN ANNUAL PRECIPITATION BY 2040-2059

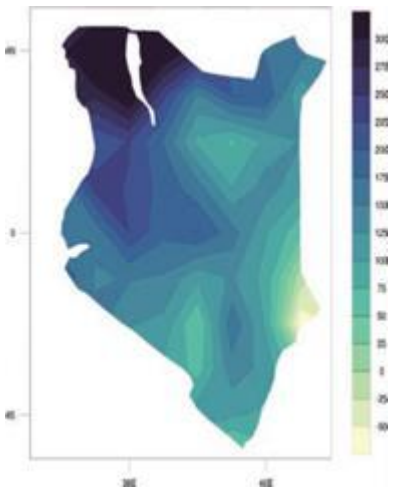


FIGURE 16: PROJECTED CHANGE IN ANNUAL PRECIPITATION BY 2080-2099

3.1.1 Key Trends in Temperature

Temperatures in Kenya are projected to continue rising by 1.7°C by the 2050s and by approximately 3.5°C at the end of the century. The number of hot days and hot nights will increase, with hot days projected to occur on 19%- 45% of days by mid-century. Hot nights are expected to increase even more rapidly, projected to occur on 45%-75% of nights by 2050. Cold days and nights are expected to become increasingly rare. Table 7 shows CMIP5 ensemble projections.

TABLE 7: TABLE 7. NATIONAL AND DOWNSCALED CLIMATE CHANGE PROJECTIONS ON TEMPERATURE

CMIP5 Ensemble Projection	2020–2039	2040–2059	2060–2079	2080–2099
Annual Temperature Anomaly	(°C) +0.5 to +1.4 (+1.0°C)	+1.2 to +2.4 (+1.7°C)	+2.0 to +3.7 (+2.5°C)	+2.7 to +5.1 (+3.5°C)
Annual Precipitation Anomaly (mm)	-13.7 to +21.6 (2.6 mm)	-17.1 to +25.2 (3.5 mm)	-17.0 to +34.0 (6.7 mm)	-17.8 to +44.0 (10.5 mm)

3.1.2 Key trends in Precipitation

Precipitation in Kenya is projected to remain highly variable and uncertain, however average rainfall is expected to increase by mid-century, particularly during the 'short rains', which occur between October and December by 2050. Extreme rainfall events (heavy downpours) are likely to increase in frequency, duration and intensity. The period between heavy rainfall events is likely to increase. The proportion of rainfall that occurs in extreme rainfall events (heavy downpours) is likely to increase. Importantly, rainfall in the arid zones is generally projected to decrease. Annual average precipitation is expected to increase slightly by the end of the century under a high emissions scenario (RCP8.5). The pattern and temporal distribution of rainfall is likely to change.

Climate change is expected to increase the risk and intensity of flood events, as well as increase average annual rainfall amounts, while also furthering drought likelihoods for some areas across Kenya. Intense rainfall and flooding may increase the likelihood of mudslides and landslides, particularly in mountainous areas. As the incidence of extreme rainfall rises, additional soil erosion and water logging of crops is likely to reduce yields and increase food insecurity. Rising temperatures are also likely to increase the periods of aridity in the northwest regions. Furthermore, as temperatures rise and droughts are prolonged, water storage capacities will likely be reduced. This may result in significant economic losses, damage to agricultural lands and infrastructure as well as human casualties. Additionally, land degradation and soil erosion, exacerbated by recurrent floods, will negatively impact agricultural productivity, disproportionately affecting the livelihoods of the rural poor.

3.2 County future climate scenarios Rainfall

Climate Projections under RCP 4.5 and RCP 8.5 Scenarios for Baringo County

Future projected changes in rainfall over Baringo county were assessed for near- (2011-2035), mid- (2036-2070), and far- (2071-2100) future climates relative to the historical climate (1981-2005) using CMIP5 model simulations under two emission scenarios (RCP 4.5 and RCP 8.5).

Annual rainfall changes (mm/day) over Baringo expressed in percentage obtained from the cmip5 model under the RCP4.5 and RCP8.5 scenarios for future thirty-year periods from 2011 relative to historical simulations for the period 1981–2005.

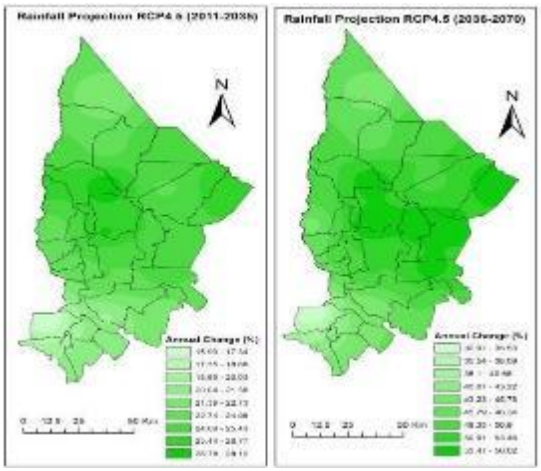


FIGURE 17: RAINFALL PROJECTIONS USING RCP4.5

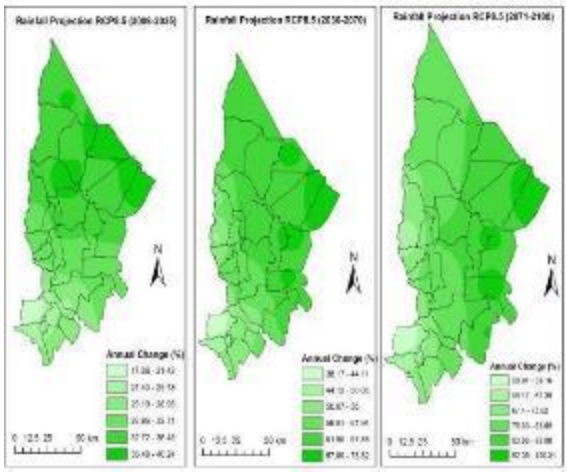


FIGURE 18: RAINFALL PROJECTIONS USING RCP4.5

March-May (MAM) Seasonal rainfall changes (mm/day) over Baringo expressed in percentage obtained from the CMIP5 model under the RCP4.5 and RCP8.5 scenarios for future thirty-year periods from 2011 relative to historical simulations for the period 1981–2005. This is as shown in figure 19 and 20

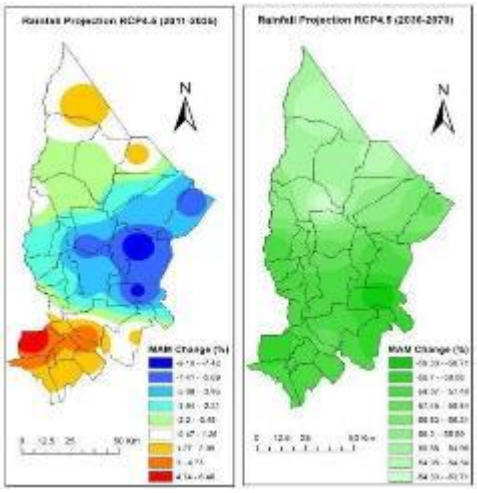


FIGURE 19: MARCH-MAY (MAM) SEASONAL RAINFALL CHANGES (MM/DAY) RCP4.5

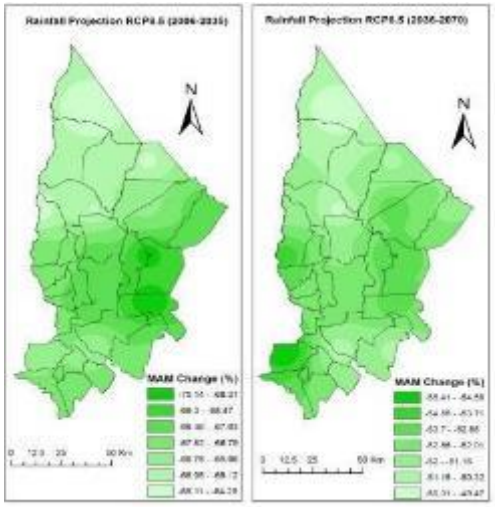


FIGURE 20: MARCH-MAY (MAM) SEASONAL RAINFALL CHANGES (MM/DAY) RCP8.5

Simulations for June-August (JJA) seasonal rainfall changes (mm/day) over Baringo expressed in percentage obtained from CMIP5 model under the RCP4.5 and RCP8.5 scenarios for future thirty-year periods from 2011 relative to historical simulations for the period 1981–2005.

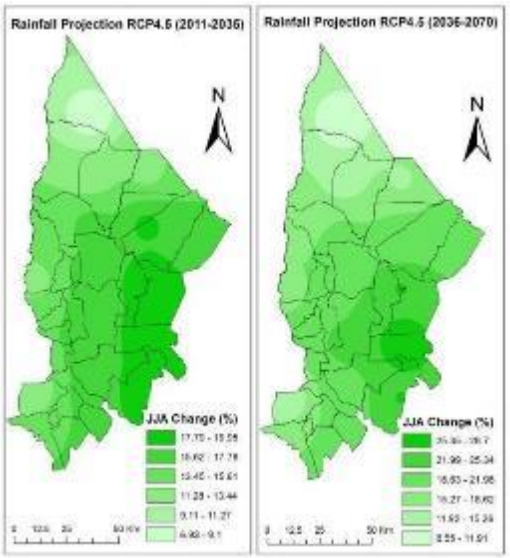


FIGURE 21: (JJA) SEASONAL RAINFALL CHANGES (MM/DAY) USING RCP4.5

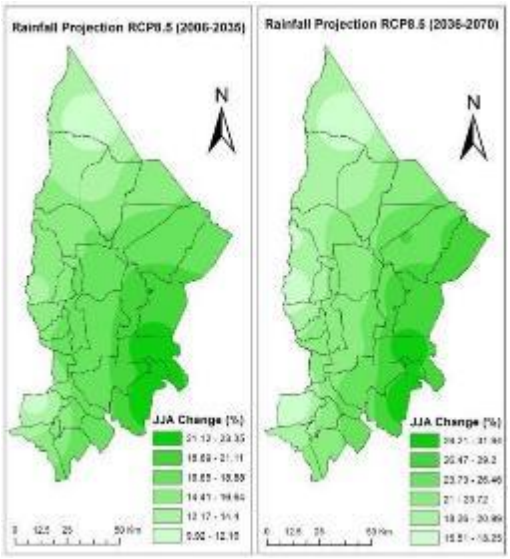
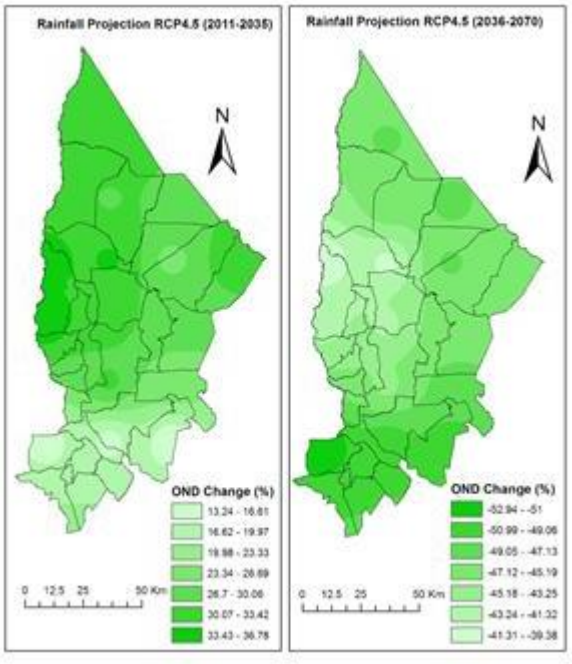


FIGURE 22: (JJA) SEASONAL RAINFALL CHANGES (MM/DAY) USING RCP8.5

Simulations for October-December (OND) seasonal rainfall changes (mm/day) over Baringo expressed in percentage obtained from CMIP5 model under the RCP4.5 and RCP8.5 scenarios for future thirty-year periods from 2011 relative to historical simulations for the period 1981–2005.



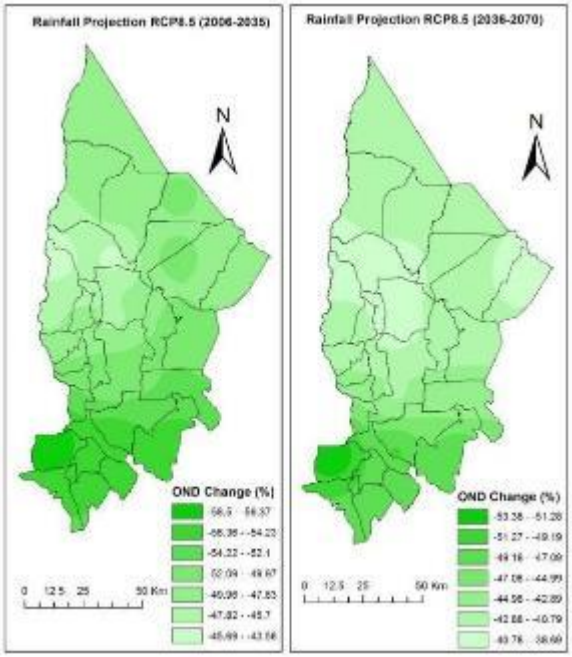


FIGURE 24: OND SEASONAL RAINFALL CHANGES (MM/DAY) USING RCP4.5

FIGURE 23: OND SEASONAL RAINFALL CHANGES (MM/DAY) USING RCP8.5

The projected Annual, MAM, JJA and OND rainfall changes are shown in Figures 1, 2, 3 and 4. The projected rainfall changes (mm/day) expressed in percentage over Baringo County based on the CMIP5 model runs under RCP 4.5 and RCP 8.5 scenarios were analyzed. Although there were spatial and temporal variability over the future projections i.e. near future (2011-2035), mid future (2036-2070) and far future (2071-2100), there is a general increase in projected annual rainfall over Baringo County for both RCP4.5 and RCP 8.5 (Fig. 1) scenarios compared to the 1981-2005 present climate simulations of best-model ensemble mean. The MAM and OND projected seasonal trends show highly variable trends of increasing and decreasing rainfall for both RCP 4.5 and RCP 8.5 scenarios, while JJA projected seasonal climate trends are increasing rainfall for both RCP 4.5 and RCP 8.5 scenarios. Fig. 2 shows the future trends of rainfall for MAM season under scenario RCP 4.5 and RCP 8.5. There is an increase and decrease of rainfall in the near future (2011-2035) for RCP 4.5 followed by a decrease of rainfall in the mid future (2036-2070) under the same scenario. However, there is a general decrease of rainfall in the MAM rainfall season for both near future (2011-2035) and mid future (2036-2070) under the RCP 8.5 scenario. Fig. 3 shows the future trends of rainfall for JJA season under RCP 4.5 and RCP 8.5 scenarios and Fig. 4 shows the future trends of rainfall for OND season under RCP 4.5 and RCP

8.5 scenarios. There is an increase of rainfall in the near future (2011-2035) for RCP 4.5 followed by a decrease of rainfall in the mid future (2036-2070) under the same scenario. However, there is a general decrease of rainfall in the OND rainfall season for both near future (2011-2035) and mid future (2036-2070) under the RCP 8.5 scenario. The seasonal rainfall change shows the highest decrease in future rainfall under the RCP 8.5 scenario.

The climate change effects have caused the distribution, onset and cessation of rainfall within the county to vary significantly. Overall there is an increase of rainfall annually and during JJA season within the county and there is significant decrease of rainfall in both MAM and OND seasons which is attributed to the shift of seasons from the current main rain season to either January, February (JF) or June, July and August (JJA).

Projected Temperature Changes in the County

The projected changes in temperature over Baringo county were analyzed based on CMIP5 model simulations under two emission scenarios (RCP 4.5 and RCP 8.5) future climates relative to the historical climate (1981-2005) as shown in figure 25 and figure 26.

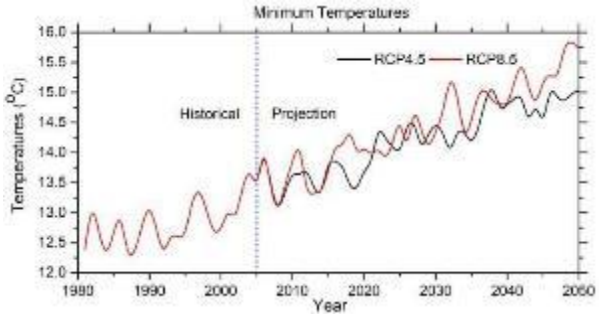


FIGURE 25: THE PROJECTED MINIMUM TEMPERATURE CHANGES OVER BARINGO

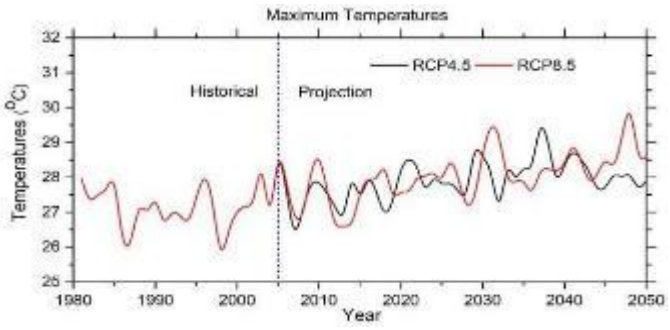


FIGURE 26: THE PROJECTED MAXIMUM TEMPERATURE CHANGES OVER BARINGO

As shown in figure 26 The projected maximum temperature changes over Baringo County were obtained from the CMIP5 model under the RCP4.5 and RCP8.5 scenarios for future climate up to the mid-century relative to historical simulations for the period 1981–2005.

Analysis of the projected changes in temperature indicates that all areas of Baringo County are projected to experience warming in near future time based of RCP4.5 and RCP8.5 by 2050

Historically models show that the temperature has a higher inter-annual variability. models project a likelihood of consistent increase in temperature in future periods.

Future projections indicate temperatures will continue to rise. There is therefore a need for intervention to manage current climate variability through adaptation and mitigation in the view of the projected temperature rising. Baringo County's economy largely depended on pastoralism, tourism and rainfed agriculture, and is susceptible to climate change and extreme weather events. In account of the future projections indicating increasing heat and recurrent droughts will contribute to severe crop and livestock losses, leading to famine, displacement, and other threats to human health and wellbeing.

Chapter 4

Vulnerability and Capacity Assessment of Human and Non-Human Elements

4.1 Vulnerability Indicators used in the assessment

The new Climate Change Vulnerability Index (CCVI), released by global risks advisory firm Maple croft, enables organizations to identify areas of risk within their operations, supply chains and investments. It evaluates 42 social, economic and environmental factors to assess national vulnerabilities across three core areas. These include: exposure to climate-related natural disasters and sea-level rise; human sensitivity, in terms of population patterns, development, natural resources, agricultural dependency and conflicts; thirdly, the index assesses future vulnerability by considering the adaptive capacity of a country's government and infrastructure to combat climate change.

4.2 Vulnerability assessment for non-Human elements

An analysis was done on the impacts of various main hazards on the resources and assets found within the community in various livelihood zones.

In the Pastoral livelihood zone, the main hazards were drought and livestock pests/diseases. For drought hazard, its main impact was felt on economic and financial resources and this could be explained by the fact that drought impacts affected the livelihood activities of the communities negatively. About 80 percent of the Pastoral population relied on livestock production as a source of food and income sources. Prolonged failure of rainfall seasons leads to deterioration of forage resources and decline in water availability for livestock consumption. This causes deterioration in livestock body condition which affects livestock productivity, leading to reduced milk production and decline in live carcass weight. The emaciated animals lose market value hence fetching low prices which directly affects income sources for the Pastoral households. Livestock disease and pests equally affected income and food sources for the Pastoral households as the diseased animals cannot be taken to the markets for sale. Outbreaks of livestock diseases do lead to closure of livestock markets thus shutting down critical sources of household income. The two hazards also had an impact on natural, social and human capital resources as summarized in the table. For natural resources such as forests, exposure to degradation was evident through livestock migration in search of pastures, human-wildlife conflict among other factors

In the Agro-pastoral and Marginal mixed farming livelihood zones, the main hazards identified were drought, livestock pests and environmental degradation. The impacts of drought and livestock diseases were the same as in the Pastoral livelihood zone. Environmental degradation/ deforestation came out strongly as one of the hazards having big impacts on the resources and assets of the Agro-pastoral and Marginal mixed farming communities, scoring big on their impacts on natural, physical as well as economic/financial resources. On natural resources, deforestation and land degradation has been blamed on the dwindling of the resource base of

both flora and fauna while the physical resources such as roads and buildings were affected negatively through their designs, foundation base as well as affecting routing of roads.

In the Mixed farming livelihood zone, the main hazards identified were drought and crop pests/diseases. With regards to the impact of these two hazards, their biggest impacts were felt in economic/financial and social resources as captured in the table. Growing of food crops was the biggest source of food and income for the communities residing in this zone. Prolonged drought episodes occasionally lead to massive crop failures hence exposing the population to hunger due to reduced food availability and income sources. Furthermore, outbreak of crop pests/diseases leads to dismal performance of the crops which affects food availability, one of the important food security pillars. With lack of food, households have to adopt other coping strategies to deal with food shortages which include borrowing, seeking help from relatives, dependency on relief food, reducing the number of meals taken per day and meal potions. These coping strategies have a way of affecting the social structures of the communities hence leading to high incidents of destitution, petty crime, family breakups among other social vices.

In the irrigated cropping livelihood zone, the main hazards that were identified were drought, floods and human diseases. With respect to floods, nearly all the resources and assets found in the community were affected negatively. Natural resources such as forests, rivers among others do get sub merged with water hence preventing access to these resources by the community members. Physical resources such as roads and buildings get destroyed by the floods while others are completely submerged by water leading to loss of critical assets such as schools, health facilities among others. Floods cause immense economic losses due to destruction of livelihood resources and assets such as farms, livestock animals, fishing points among other assets. As a result, households end up losing their sources of income and food thus increasing poverty incidents in the community, leading to other social vices such as destitution, begging etc. Displaced populations are likely to bring social issues such as the creation of IDP camps which brings other challenges such as cohesion with the host community, sanitation and hygiene issues among others. Floods were also associated with the outbreak of human diseases such as malaria and water borne diseases. This was due to the creation of a favorable environment for the breeding of mosquitoes and high chances of contaminating water sources. This has the potential to affect human capital resources as productivity of the diseased persons such as teachers, farmers among others goes down. Table 7 represents vulnerability assessment of non-human elements. The following scoring system was used by participants to rate the impact of prioritized hazard on the resources.

3 = high impact on the resource

2 = medium impact on the resource

1 = low impact on the resource

0 = no or positive impact on the resource

TABLE 8: VULNERABILITY ASSESSMENT FOR NON-HUMAN ELEMENTS

	Livelihood/ assets	**Drought**	**Livestock pests and diseases**	**Floods**	**Land degradation/ Deforestation n**	**Crop pests and diseases**	**Human diseases**	**Score**	**Average**	**Rating**
Natural	Forest Hills Sand Caves Quarry Springs	2	1	3	3	2	1	12	2	medium
Physical	Roads Buildings Dams Wells Markets	0	0	2	3	1	1	7	1	Low
Economic Financial	Livestock income Crop income Honey Sand Harvesting Marketing	3	3	2	3	3	2	16	3	High

Social	Hospital Churches/ Mosque Schools	2	2	2	1	3	2	12	2	Medium

Human	Teachers Herders Doctors Farmers Spiritual leaders Businessmen n	2	2	1	3	3	3	14	2	Medium
	Total	7	6	9	10	9	6	47	8	
	Average	1.75	1.5	2.25	2.5	2.25	1.5	2	2	
	Rating	medium	medium	medium	medium-high	medium	low-medium	medium	medium	

4.2.1 Analysis of Vulnerability assessment for non-Human elements

An analysis was done on the impacts of various main hazards on the resources and assets found within the community in various livelihood zones.

In the Pastoral livelihood zone, the main hazards were drought and livestock pests/diseases. For drought hazard, its main impact was felt on economic and financial resources and this could be explained by the fact that drought impacts affected the livelihood activities of the communities negatively. About 80 percent of the Pastoral population relied on livestock production as a source of food and income sources. Prolonged failure of rainfall seasons leads to deterioration of forage resources and decline in water availability for livestock consumption. This causes deterioration in livestock body condition which affects livestock productivity, leading to reduced milk production and decline in live carcass weight. The emaciated animals lose market value hence fetching low prices which directly affects income sources for the Pastoral households. Livestock disease and pests equally affected income and food sources for the Pastoral households as the diseased animals cannot be taken to the markets for sale. Outbreaks of livestock diseases do lead to closure of livestock markets thus shutting down critical sources of household income. The two hazards also had an impact on natural, social and human capital resources as summarized in the table. For natural resources such as forests, exposure to degradation was evident through livestock migration in search of pastures, human-wildlife conflict among other factors

In the Agro-pastoral and Marginal mixed farming livelihood zones, the main hazards identified were drought, livestock pests and environmental degradation. The impacts of drought and livestock diseases were the same as in the Pastoral livelihood zone. Land degradation/deforestation came out strongly as one of the hazards having big impacts on the resources and assets of the Agro-pastoral and Marginal mixed farming communities, scoring big on their impacts on natural, physical as well as economic/financial resources. On natural resources, deforestation and land degradation has been blamed on the dwindling of the resource base of both flora and fauna while the physical resources such as roads and buildings were affected negatively through their designs, foundation base as well as affecting routing of roads.

In the Mixed farming livelihood zone, the main hazards identified were drought and crop pests/diseases. With regards to the impact of these two hazards, their biggest impacts were felt in economic/financial and social resources as captured in the table. Growing of food crops was the biggest source of food and income for the communities residing in this zone. Prolonged drought episodes occasionally lead to massive crop failures hence exposing the population to hunger due to reduced food availability and income sources. Furthermore, outbreak of crop pests/diseases leads to dismal performance of the crops which affects food availability, one of the important food security pillars. With lack of food, households have to adopt other coping strategies to deal with food shortages which include borrowing, seeking help from relatives, dependency on relief food, reducing the number of meals taken per day and meal potions. These coping strategies have a

way of affecting the social structures of the communities hence leading to high incidents of destitution, petty crime, family breakups among other social vices.

In the irrigated cropping livelihood zone, the main hazards that were identified were drought, floods and human diseases. With respect to floods, nearly all the resources and assets found in the community were affected negatively. Natural resources such as forests, rivers among others do get sub merged with water hence preventing access to these resources by the community members. Physical resources such as roads and buildings get destroyed by the floods while others are completely submerged by water leading to loss of critical assets such as schools, health facilities among others. Floods cause immense economic losses due to destruction of livelihood resources and assets such as farms, livestock animals, fishing points among other assets. As a result, households end up losing their sources of income and food thus increasing poverty incidents in the community, leading to other social vices such as destitution, begging etc. Displaced populations are likely to bring social issues such as the creation of Internal Displaced People (IDP) camps which brings other challenges such as cohesion with the host community, sanitation and hygiene issues among others. Floods were also associated with the outbreak of human diseases such as malaria and water borne diseases. This was due to the creation of a favorable environment for the breeding of mosquitoes and high chances of contaminating water sources. This has the potential to affect human capital resources as productivity of the diseased persons such as teachers, farmers among others goes down.

Summary of vulnerability assessment for non-human elements (resources)

From the analysis of the non-human elements:

- *The overall impact of drought, livestock pests and diseases, floods, crop pests and diseases and human diseases on the resources (natural, physical, economic, financial, social and human) is medium. However its impact on the (financial and economic resources);*
- *The overall impact of drought, livestock pests and diseases, floods, crop pests and diseases and human diseases on the economic and financial resources is rated high due to its direct effect on the livelihoods that is livestock and crop farming; and*
- *The overall impact of drought, livestock pests and diseases, floods, crop pests and diseases and human diseases on the physical resources is rated low.*

From the analysis of climate trends in Baringo the predicted rise in temperatures is likely to increase the impacts of the analyzed hazards on the resources. The cost of enhancing adaptive capacities is therefore likely to increase.

4.3 Vulnerability assessment for Human Elements

From the PCRA data collection process and the subsequent analysis, drought, Livestock diseases, Crop diseases, land and environmental degradation were the 4 major Hazards identified by the community. However, Floods were identified as the major hazard in the Baringo-Bogoria landscape.

Drought was identified as a major hazard in most of the livelihood zone including Pastoral, Agro pastoral, Mixed farming and marginal mixed farming. Livestock pests and diseases were identified as a major hazard in 2 livelihoods zones i.e. Pastoral and Agro pastoral. On the other hand, Crop pests and disease were found to be prevalent in Mixed farming and Agro pastoral livelihood zones. Environmental Degradation was identified as a major hazard in Mixed farming and marginal mixed farming. However, flood was ranked as one of the major hazards only in the Ilchamus ward.

The community carried out vulnerability analysis for both non-human and human elements exposed to the ranked hazards. Table 8 and 9 to give detailed analysis of human elements exposed to the hazards.

As indicated in table 8 with respect to drought hazard, it was found out that children aged below five years old, youth aged six to 18 years old, the elderly people, pregnant and lactating women and people living with special conditions such as disability, chronic illness among others were at the highest risk of being affected by drought impacts and therefore requiring special attention in terms of targeted interventions.

Table 9 shows vulnerability assessment of livestock pests and diseases, environmental degradation and crops pests and diseases.

In account of livestock pests and diseases, it was found out that children aged below five years old, youth aged six to 18 years old, females aged 19 to 60 years old, the elderly, pregnant and lactating women as well as persons living with special conditions were at the highest risk of being affected by livestock disease impacts. The risk is high especially during drought because of the practice of eating the products of diseased animals and more so for those usually found at home. Locally-led adaptation strategies are therefore necessary for addressing the impacts of livestock pests and diseases, giving consideration to this category of the population in the most affected areas.

On environmental degradation, it was found out that children aged below five years old, the youth aged six to 18 years old, persons aged 19 to 60 years old, the elderly, lactating and pregnant women as well as persons living with special conditions were at the highest risk of being affected with the impacts of environmental and land degradation.

With respect to crop pests and diseases, children aged below five years old, males aged 19 to 35 years old, persons aged 35 to 60 years old, the elderly people, pregnant and lactating women as well as persons living with special conditions were at the highest risk of being affected by the impacts of crop pests and diseases.

Wealth Ranking

Vulnerability assessment of the human element involved carrying out poverty analysis through understanding wealth ranking. Wealth ranking understanding the criteria used in the ranking of wealth and the resulting inequalities and vulnerabilities.

Among the pastoral communities such as in Silale ward they attribute their wealth to the number of livestock, the number of children, number of wives and number of businesses owned/ employment. The criteria involved placing people in terms of being:

- very rich
- medium rich
- poor

Wealth ranking among the pastoral communities is as indicated in the table.

Very rich	**Medium- rich**	**poor**
Cows- 100 and above	Cows- 20	Cows- 0
Goats- 600 and above	goats<100	Goats- < 10
Camels-50 and above	Camels- 0	Camels- 0
Wives- 10	Wives- 1 or 2	Wives- 1

Tangulbei Ward a Pastoral livelihood zone the main determinants of wealth in this livelihood zone are livestock holdings, source of income and type of house or dwelling unit.

Social classes of people in the mixed farming wards were placed in terms of rich, very rich and poor. The criteria that was used to determine the social classes was; size of the land, number of the livestock, number of vehicles and houses. This categorization is as shown in the table below.

Assets	**Rich**	**Middle rich**	**Poor**
Size of the land	50-100 acres	10-50 acres	½-or non
Number of vehicles	3-5 vehicles	1 vehicle	non
Number of the livestock	20-100 livestock	10-50 livestock	non
Houses	Modern classy structures	Middle class structure	Mud-structure

In account of the wealth ranking and the assets involved it was found that all populations were vulnerable to the effects of climate change. A person categorized as very rich could lose all the livestock because of drought. However it was agreeable that the poor were more vulnerable to the effects of climate change. The rich could afford to buy feed.

TABLE 9: VULNERABILITY ASSESSMENT ON HUMAN ELEMENT FOR DROUGHT HAZARD

Hazard profile	Livelihood Zone	Elements at risk	Location of element	High	Medium	Low	Why the elements at risk is in that location and exposed to hazard
Drought	**Pastoral, Agro Pastoral, Mixed Farming, Marginal Mixed Farming,**	**< 5 years**	Home School	✓			● Depends on caregivers. ● Low body immunity ● Lack of exclusive breastfeeding
		6-18 years male	Home School	✓			● Depends on caregivers. ● School dropouts ● Child labor ● Taking care of younger siblings. ● Drug and substance abuse
		6-18 years female	Home School	✓			● Early and forced marriages ● Lack of sanitary pads ● Early parenting (pregnancies) ● Complications during deliveries ● GBV ● School dropouts ● Drug and substance abuse

		19-35 years male	Home Businesses Collages		✓		● Family break ups ● Have dependents ● Loan defaulters ● Low purchasing power ● Diseases (HIV and Aids and STDs) ● Poor Market prices ● Long trekking distance in search of water and pasture
		19-35 years female	Home Businesses Collages	✓			● Family break ups ● Have dependents ● Loan defaulters

							● Low purchasing power ● Poor Market prices ● Long trekking distance in search of water and pasture ● Separation and divorce ● Diseases (HIV and Aids and STDs) ● GVB ● Lack of family planning (Large families)
		36-60 years male	Home Working Collages		✓		● Lack of sustainable income ● Increased economic responsibilities ● Family conflicts ● Drug and substance abuse ● Family break ups
		36-60 years female	Home	✓			● Family breadwinners ● GBV ● Drug and substance abuse ● Single parenting ● Lack of sustainable income ● Increased economic responsibilities ● Family break ups

		> **elderly**	Home	✓			● Neglected ● Depend on their children ● Poor hygiene ● Low immunity ● Low mobility
		Pregnant and lactating mothers	Homes, Hospitals Work places, Farmlands	✓			● Lack of pre- and post-natal care ● High nutritional requirement ● Low mobility
		PLWD	Home	✓			● Lack of aiding materials

			Schools Marketplaces Secluded places				● High dependency rates ● Stigmatized ● Difficulty on accessing critical facilities ● Immobility ● Denied basic education

TABLE 10:VULNERABILITY ASSESSMENT OF HUMAN FOR LIVESTOCK PEST AND DISEASES

Hazard profile	LIVELIHOOD ZONE	Elements at risk	Location of element	High	Mediu m	Low	Why the elements at risk is in that location and exposed to hazard
Livestock Pests and Diseases	**PASTORAL, AGRO PASTORAL**	**< 5 years**	Home School	✓			● Depends on caregivers. ● Low body immunity ● Lack of exclusive breastfeeding
		6-18 years male		✓			● Depends on caregivers. ● School dropouts ● Child labor ● Taking care of younger siblings. ● Drug and substance abuse
		6-18 years female		✓			● Early and forced marriages ● Lack of sanitary pads ● Early parenting (pregnancies) ● Complications during deliveries ● GBV ● School dropouts ● Drug and substance abuse

		19-35 years male	Home Businesses Collages		✓		● Family break ups ● Have dependents ● Loan defaulters ● Low purchasing power ● Diseases (HIV and Aids and STDs) ● Poor Market prices ● Long trekking distance in search of water and pasture
		19-35 years female	Home Businesses Collages	✓			● Family break ups ● Have dependants ● Loan defaulters ● Low purchasing power

							● Poor Market prices ● Long trekking distance in search of water and pasture ● Separation and divorce ● Diseases (HIV and Aids and STDs) ● GVB ● Lack of family planning (Large families)
		35-60 years male	Home Working Collages	✓			● Lack of sustainable income ● Increased economic responsibilities ● Family conflicts ● Drug and substance abuse ● Family break ups
		35-60 years female		✓			● Family breadwinners ● GBV ● Drug and substance abuse ● Single parenting ● Lack of sustainable income ● Increased economic responsibilities ● Family break ups

		60 > elderly	Home	✓			● Neglected ● Depend on their children ● Poor hygiene ● Low immunity ● Low mobility
		Pregnant and	Home Hospitals	✓			● Lack of pre- and post-natal care ● High nutritional requirement

		lactating mothers	Markets Farms				● Low mobility
		PLWD	Home Schools Market places Secluded places	✓			● Lack of aiding materials ● High dependency rates ● Stigmatized ● Difficulty in accessing critical facilities ● Immobility ● Denied basic education

TABLE 11: VULNERABILITY ASSESSMENT ON HUMAN ELEMENT FOR ENVIRONMENTAL DEGRADATION & CROP PESTS AND DISEASES HAZARDS

Hazard Profile	Livelihood Zone	Elements At Risk	Location Of Element	High	Medium	Low	Why The Elements At Risk Is In That Location And Exposed To Hazard
Land And Environmental Degradation	**Mixed Farming and Marginal Mixed Farming**	**< 5 years**	Home	✓			● Depends on caregivers. ● Immobility ● No capacity to respond
		6-18 years male	Home, School, Farms,	✓			● Low capacity to respond ● Dependent
		6-18 years female		✓			● Low capacity to respond ● Dependent .
		19-35 years male	Home Businesses Collages	✓			● Family break ups ● Have dependents ● Loan defaulters ● Poor Market prices ● Inadequate knowledge ● Obsolete technology (Timber harvesting, Land use, Settlement)

		19-35 years female	Home Businesses Collages	✓			● Family break ups ● Have dependents ● Loan defaulters ● Poor Market prices ● Inadequate knowledge ● Obsolete technology (Timber harvesting, Land use, Settlement) ● GBV ● Lack of family planning (Large families)

		35-60 years male	Home Working Collages	✓			● Lack of sustainable income ● Increased economic responsibilities ● Family conflicts ● Family break ups ● Obsolete technology (Timber harvesting, Land use, Settlement) ● Inadequate knowledge
		35-60 years female		✓			● Family breadwinners ● GBV ● Lack of sustainable income ● Increased economic responsibilities ● Family conflicts ● Family break ups ● Obsolete technology (Timber harvesting, Land use, Settlement) ● Inadequate knowledge.
		60 > elderly	Home	✓			● Neglected ● Depend on their children ● Poor hygiene (Pollution) ● Low immunity ● Low mobility. ● Inadequate knowledge.

		Pregnant and lactating mothers	Home Hospitals Markets Farms	✓			● Lack of pre- and post-natal care ● High nutritional requirement ● Low mobility
		PLWD	Home Schools Marketplaces Secluded	✓			● Lack of aiding materials ● High dependency rates ● Stigmatized ● Difficulty in accessing critical facilities ● Immobility
			places				● Denied basic education
Hazard profile	**LIVELIHOOD ZONE**	**Elements at risk**	**Location of element**	**High**	**Medium**	**Low**	**Why the elements at risk is in that location and exposed to hazard**
Crop Pests And Diseases		**< 5 years**	Home	✓			● Depends on caregivers. ● Low body immunity ● Lack of exclusive breastfeeding
		6-18 years male	Home, School, Farms,		✓		● Depends on caregivers. ● School dropouts ● Child labor ● Taking care of younger siblings. ● Drug and substance abuse

	Mixed Farming Agro Pastoral	**6-18 years female**			✓		● Early and forced marriages ● Lack of sanitary pads ● Early parenting (pregnancies) ● Complications during deliveries ● GBV ● School dropouts ● Drug and substance abuse
		19-35 years male	Home Businesses Collages	✓			● Family break ups ● Have dependents ● Loan defaulters ● Low purchasing power ● Diseases (HIV and Aids and STDs) ● Poor Market prices ● Long trekking distance in search of water and pasture
		19-35 years female	Home Businesses		✓		● Family break ups ● Have dependents ● Loan defaulters ● Low purchasing power
			Collages				● Poor Market prices ● Long trekking distance in search of water and pasture ● Separation and divorce ● Diseases (HIV and Aids and STDs)

							● GVB ● Lack of family planning (Large families)
		35-60 years male	Home Working Collages	✓			● Lack of sustainable income ● Increased economic responsibilities ● Family conflicts ● Drug and substance abuse ● Family break ups
		35-60 years female		✓			● Family breadwinners ● GBV ● Drug and substance abuse ● Single parenting ● Lack of sustainable income ● Increased economic responsibilities ● Family break ups
		60 > elderly	Home	✓			● Neglected ● Depend on their children ● Poor hygiene ● Low immunity ● Low mobility

		Pregnant and lactating mothers	Home Hospitals Markets Farms	✓			● Lack of pre- and post-natal care ● High nutritional requirement ● Low mobility
		PLWD	Home Schools Marketplaces Secluded places	✓			● Lack of aiding materials ● High dependency rates ● Stigmatized ● Difficulty in accessing critical facilities ● Immobility ● Denied basic education

Chapter 5

Capacity Assessment: Non-Human Element

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

An analysis of the existing strategies in terms of their effectiveness and sustainability varies across livelihood zones and sectors with respect to various climatic hazards.

a) Pastoral livelihood zone

In the Pastoral livelihood zone, most of the strategies applied in responding to drought impacts had limited effectiveness and sustainability as they had a score of two (Moderate). With regards to the impacts of climatic hazards on natural resources, some of the strategies applied included migration of livestock to other areas in search of water and pastures, use of reserved grazing areas, livelihood diversification among others. On the impacts of the hazards on water resources, the community resorted to use of alternative water sources which translated to trekking longer distances in accessing the water sources. Other options included reducing the amount of water used for human consumption, livestock consumption and irrigating the crops, a strategy that was not very effective and sustainable in the long run. The local response to do afforestation and agroforestry was indeed highly effective and highly sustainable in solving the land degradation hazard on the environment.

On economic and financial resource impacts, drought impacts caused shrinkage of income sources by impacting negatively on market prices for livestock animals. This leads to poor terms of trade whereby pastoral households have to spend more money during the drought events in accessing the same amount of cereals compared to a typical year. For instance, during the 2022 drought event, a household had to sell three goats in order to get a 90kg bag of maize compared to a normal year where sale of one goat was sufficient to obtain the same amount of cereals. An analysis of the local response strategies was observed to have limited effectiveness and sustainability. Some of the response strategies included migration to urban areas, looking for casual labor, charcoal burning, borrowing from friends/relatives and selling of their productive animals at throw away prices (Salvage prices). Government issued livestock pellets to resuscitate weakened livestock and migration elsewhere in search of water and pasture was highly effective but was not sustainable.

On physical resources such as roads, buildings, powerlines among others, drought impacts were observed to be very minimal or none hence there were minimal local responses.

On social resources, drought and to some extent livestock disease hazards seemed to overstretch the social fabric in the community. With reduced household incomes, overdependence on few

earning family members increases significantly while incidents of borrowing and begging among community members goes up. As a result, the available response strategies such as mediation, counseling among others are overwhelmed leading to family break ups, separation, gender-based violence. As such, the local response strategies have gaps that need to be addressed. These strategies were not sufficient in cushioning the vulnerable members of the community such as persons living with disability. The elderly, pregnant and lactating mothers, , persons living with special conditions as well as the minority groups in the community.

On human capital, the drought impacts were hitting the various professionals in the community adversely. For teachers, there were faced with increased incidents of absenteeism and over enrolment in schools that have school feeding programs. Health professionals were faced with increased incidences of malnutrition and other disease cases. These scenarios were most likely to cause increased workload and pressure, causing anxiety, stress, depression among other psycho social issues. Most of the local responses that were applied in the community in dealing with these issues had moderate effectiveness and sustainability, implying that there were some gaps that needed to be addressed.

b) Agro-Pastoral livelihood zone

An analysis of the various local responses for the main hazards in this livelihood zone shows the existence of some gaps that need to be addressed.

With regards to the response strategies applied on the hazard impacts on natural resources such as forests, swamps, rivers, among others, most of the strategies had moderate effectiveness and sustainability in addressing issues concerning the community. Some of the strategies applied include migrating livestock to areas with greener pastures and water, searching for alternative water sources once the rivers have dried up, formation of natural resource management committees among others.

With regards to physical resource impacts, the impacts were minimal hence minimal strategies were applied in responding to the hazard impacts.

On economic and financial impacts, most of the strategies had very limited effectiveness and sustainability in meeting the needs of the community. With depressed livestock market prices, disposable household incomes decrease, causing households to adopt unsustainable strategies such as charcoal burning, petty trading, dependency syndrome, begging, migration of some household members, relying on relief food following crop failure among others.

With regards to social resource impacts, the existing response strategies get overwhelmed by the impacts of the various hazards in the community. In particular, drought impacts have an influence on resource-based conflicts leading to banditry issues, gender based violence among other conflicts. The net effect of this is to cause displacement of community members, leading to creation of IDP camps in schools, churches and other social buildings in Saimo Soi and Bartabwa wards. The strategies need to be beefed up in order to come up with permanent solutions in this livelihood zone.

With respect to the impacts on human resources, the local response strategies that are applied in addressing the impacts on human capital are weak in terms of effectiveness and sustainability. Teachers have to cope with overcrowded classes due to human displacement while in some schools, teachers are displaced to conflict issues. Other professionals such as medical workers are unable to discharge their duties effectively due to perennial conflict flare ups in the area. Some of the strategies being applied in this zone include human migration, peace campaigns, livelihood diversification among others.

c) Marginal mixed farming livelihood zone

In the Marginal mixed farming livelihood zone, the main two hazards were drought and environmental degradation and the type of local response strategies applied differed depending on the type of resource being affected.

The natural resources found in the zone include rivers, quarries, community forests among others. Some of the local responses applied in the area include livestock migration, sand harvesting and quarrying, use of alternative pasture sources such as use of hay, destocking among others. Some of the strategies applied were very effective and sustainable such as adoption of pasture establishment and conservation while other strategies proved to be non- effective and not very sustainable.

With respect to physical resources in the area, there were very minimal impacts resulting from the hazards found in the area hence requiring minimal interventions.

On economic and financial resources, the effectiveness and sustainability of the local response strategies in reacting to the impacts of drought and environmental degradation varied from being highly effective to in-effective. On the loss of livestock income due to depressed livestock prices, some of the strategies applied include use of relief food from Government, migration of households, reduced meal quantities and sizes, adoption of casual labor, charcoal burning, selling of productive livestock animals at salvage prices among others. Most of these strategies have low effectiveness and sustainability hence requiring further enhancement.

On social resource impacts, the available local responses were somehow moderate in terms of effectiveness and sustainability. Most of the social amenities such as churches, schools, have not been affected so much by the drought impacts but the social community structures get somehow overwhelmed during drought events. In response, communities' resort to migration to urban areas, high dependency syndrome on breadwinners, increased cases of destitution among other responses. These strategies are not effective and sustainable in the long run.

For human capital resources, the existing local response strategies to the impacts of various climatic hazards in this zone had moderate effectiveness and sustainability. Some of the strategies being applied include counseling and guidance, adoption of alternative income sources among others.

d) Mixed farming livelihood zone

Prolonged dry spell causes a catastrophic drought hazard that results in drying of water wells, rivers, drying of pasture fields, whirlwinds, increase in surface temperatures, failure of crops and

livestock loss in the entire ward. With respect to the impacts on natural resources, the community's involvement to plant trees and enhance policy on forest protection was very effective and more sustainable. Digging of shallow wells and purchasing water was a temporary solution to water shortage but never sustainable. There were other community initiatives for protection of the catchment areas in places like Koibatek, Sacho, Kabarnet and Tenges wards and these were very effective and sustainable strategies.

On economic and financial resource impacts, there were different strategies applied in coping up with reduced household incomes due to the impacts of drought and other hazards such as crop pests/disease on crop production. However, to solve the food crisis, the local response to diversify enterprises, planting early maturing crops was more effective and sustainable than relying on provision of relief food. Consequently, starting small businesses and farming to reduce impact of low income and productivity was an effective local response but not sustainable because the hazards affected assets and resources equally. Other interventions like doing good agricultural practices, promoting soil & water conservation, terraces and gabions construction was a milestone in controlling degraded areas.

The physical resources were not that highly impacted by the prevailing hazards of drought and crop pests and diseases, thus attracting little interventions.

On social resources, the local response strategies that were being applied to cope up with the impacts of drought and crop diseases were somehow effective and sustainable but had some gaps that needed to be addressed. They include fencing of land to minimize human wildlife, use of chiefs barazas for conflict management and inter village agreements to solve land disputes.

On human capital resources, there were minimal impacts being observed due to drought and crop pests/diseases. Most of the strategies such as capacity building of professionals, counseling, and guidance, adherence to the local early warning systems were relatively effective and sustainable in this zone.

e) Irrigated livelihood zone

The main hazards found in this zone were drought and floods. With respect to flood hazard events, a number of local response strategies were identified and their effectiveness and sustainability level depended on the sectors where they were being applied.

Most of the natural resources such as forests, pasture fields, rivers, land, wildlife among others were very vulnerable to floods. The strategies that were being applied included movement to safer areas, migration of livestock to safer grounds among others. These strategies were very effective but not sustainable in the long run.

Most of the physical resources were highly vulnerable to the effects of floods. Some of the strategies that were applied include rerouting of roads for the case of flooded roads, relocating schools and health facilities to safer grounds and abandoning dwelling structures that were flooded. These strategies were very effective but not sustainable hence requiring enhancement.

On economic and financial resources, the impact of floods on livelihoods sometimes forces affected groups into abject poverty. Affected families can seek assistance from relatives, start alternative sources of income generating activities, others may opt for rural –urban migration.

Apart from the livestock diseases, humans were also exposed to infections caused by contaminated water following flooding events. Malaria infection was also prevalent in this zone due to favorable breeding grounds for mosquitoes. To tame this the community boiled drinking water, drained stagnant water and slashed or sprayed vegetation around near homesteads. In case of extremities, the situation was reported to relevant authorities to initiate diagnosis, treatment or massive livestock vaccination.

On social resource impacts, locals scream/yelling was one of the strategies applied in warning off others to move their livestock and children to safer or higher grounds. In that process they move household items if they can but saving life is given top priority.

Human resources are also highly affected by floods due to displacement. Teachers, health workers and other professionals found in this zone are unable to offer their services effectively and in a sustainable manner due to displacement, illness due to malaria and other water borne disease infection among other issues. Some of the local response strategies applied in this zone include transfers to other stations which was not effective and sustainable

5.2 Capacity Assessment Human Element

Individual survivability is a function of the capacity of the community to cope, Adapt and mitigate the impact related to the Hazards. The community carried out capacity assessment to determine what activities individuals do before and during the hazard in order to avoid or reduce the impacts.

From the field analysis each group had existing capacities before and during the Hazards. Different human categories have differentiated strength to survive under a given exposure. The young one under 5 years were found to have minimal capacity to survive under a climatic related exposure, women, People living with disability and the elderly were also found to have low capacity to cope with the prevailing hazards. In general, comparing Female and Male, it was found that females were the most vulnerable and lowly capacitated in tackling the hazards.

Table 11 shows the capacity assessment of the human elements under prioritized hazards.

TABLE 12: CAPACITY ASSESSMENT FOR HUMAN ELEMENT FOR LIVESTOCK AND CROP PESTS AND DISEASES HAZARD

Elements at risk		Capacities		
Individual survivability on Drought	Time element	Existing	Required	Gaps
0-5 years	Before	Availability of food Balanced diet Parental care School feeding program ECDE Food Supplements Shelter Medical facilities	Improved access to medical facilities Better and sustainable school feeding program Good shelter Enhance food supplements Good food storage	Inadequate medical facilities Food shortage -Inadequate supply of food Supplements -Inadequate storage facilities -In adequate health personnel
	During	Preserved food Wild fruits School feeding program Honey Medical facilities School feeding program Safe nets Outreach clinics	value addition on animal products enhancing of sustainable school feeding program empowering the community on keeping dairy cattle and goats Enhance outreach clinics	modern food preservation methods lack of sustainable school feeding program lack of dairy animals shortage of water for fruits planting

5-18 years male and female	Before	School feeding program Bursaries Roof catchment	Enhanced feeding school program Improved farming methods Establishment of better boarding schools Activation of the Environmental and Agricultural Clubs in schools.	Inadequate feeding programs Lack of better agricultural skills Inadequate boarding facilities Inadequate water harvesting in schools
	During	Hunting and gathering of wild fruits and animals Animal products i.e. milk, meat and blood	Planting of fruit trees Empowering of farmers Enhancing sustainable school feeding program	Inadequate school feeding programs Lack of technological know-how Shortage of water supply Inadequate boarding schools
		School feeding program Rationed food Water trucking	Enhance school feeding program Enhanced Water trucking programs	
18-35 male and female	Before	Availability of food Employment Own property Self-help groups Casual labor Rainfall Loan facility Water sources Pasture/Browse resource	Empowerment on better financial skills Better livestock management skills Sensitization on modern methods of farming Activation of the self-help groups. Capacity building on Value Addition. Financial empowerment and trainings on business opportunities Introduction of drought Tolerant/resistant crops Capacity building on Value Addition Establishment of strategic water points	Inadequate capital insufficient livestock keeping skills certified seeds Inadequate skills on poultry and bee keeping Insufficient subsidized farm inputs Inadequate extension services Knowledge gap on value addition and Technology access
	During	-Safe nets	Capacity building on alternative	Lack of capital

		-Government initiatives-Kazi - mtaani, Cash transfers, -Livestock off take Programme -Alternative livelihood e.g. Bee keeping Migration Wild fruits and Honey Rationed food	sources of livelihood Employ water use management technologies Enhanced safe nets Water trucking Rehabilitation of water sources	Inadequate knowledge on modern farming methods Enhancement of the Government initiatives Low access to certified seeds and improved livestock breeds. In adequate water sources. Knowledge gap on value addition and Technology access
35-60 years male and female	Before	Savings and investments Readily available human resource Availability of food	Introduction of modern irrigation technologies. Provision of modern beekeeping methods	Inadequate trained personnel on business skills Un organized marketing structure Lack of use of modern irrigation

		Employment Own property Self-help groups Casual labor Rainfall Loan facility Water sources Pasture/Browse resource Livestock markets Grain storage facilities (Cereal stores)	Training on pasture harvesting and storage Empowerment on better financial skills Better livestock management skills Sensitization on modern methods of farming Activation of the self-help groups. Financial empowerment and trainings on business opportunities Introduction of drought Tolerant/resistant crops Establishment of strategic water points Improvement of livestock sale yards Operationalization of the existing Cereals and granaries. Establishment of modern grain drying beds stores Establishment of strategic feed stores.	technologies Inadequate reliable sources of water Lack of extension officers Lack of storage facilities Lack of knowledge on modern beekeeping methods Knowledge gap on value addition and Technology access.

	During	Own property and livestock Available human resource Sustainable income Indigenous Knowledge Safe nets Government Initiatives-Livestock offtake.	Sustainable farming Practices Training on better Livestock management. Education on pasture harvesting, management and storage Sensitization on modern methods of farming Capacity building on Value Addition Activation of the self-help groups. Financial empowerment and	Inadequate trained personnel on business skills Un organized marketing structure Lack of use of modern irrigation technologies Inadequate reliable sources of water Lack of extension officers Lack of storage facilities Lack of knowledge on modern beekeeping methods
			trainings on business opportunities Introduction of drought Tolerant/resistant crops Establishment of strategic water points Improvement of livestock sale yards Operationalization of the existing Cereals and granaries	
60> elderly	Before	They own property Indigenous Knowledge They have caretakers Safe nets Government Initiatives-Social Protection Livestock off take.	Enhance access to health facilities Health Insurance cover Documentation of the ITK Enhance social protection programs Establishment of care centers for old Food supplements	Insufficient social protection program Improved market Lack of care centers for old Enhanced access to the food supplements

	During	Preserved food ITK Depend on family members	Access to government remittances Access to medical services Empowerment to enhance livestock within the farm by introducing pasture management and dairy farming	Lack of capital Inadequate medical facilities Lack of financial saving schemes
Pregnant and lactating mothers	Before	Pre-natal post-natal care Availability of food stuff Food supplements Preserved food stuff Kitchen garden	Improved food production at household levels Capacity building on maternal health care Better water supply Enhancing water facilities nearest to the people	Minimal maternal services Shortage of water Shortage of food at household level Enhance pyramid gardening
	During	Gathering of wild fruits Depend on family members Food supplement	Establishment of modern health facilities Empowering to plant fruit trees Capacity building on SMEs	Inadequate access to health facilities Lack of fruit farms Enhance Pre-natal post-natal care
PLWDs	Before	- Proper care -Depend on caretakers -Low mobility Health Facilities	- Capacity building in gender and social inclusion Special School Home of the Disability (Rescue Centre)	- Lack of experts to train PLWD Insufficient facility for the PLWD Health Care/covers Enhancement of Social Protection
	During	- Good health -Low mobility Health Facilities	- stigmatized Support from well wishers	- Lack of experts to train PLWD Insufficient facility for the PLWD Health Care/covers Enhancement of Social Protection
Elements at risk		**Capacities**		

Individual survivability on Crop and Livestock Pests And Diseases	Time element	Existing	Required	Gaps
0-5 years	**Before**	- Availability of Livestock products (Meat and Milk) - Balanced diet - Parental care - School feeding program ECDE - Food Supplements - Shelter - Medical facilities	- Improved access to medical facilities - Better and sustainable school feeding program - Good shelter - Enhance food supplements - Good food storage	- Inadequate medical facilities - Food shortage -Inadequate supply of food Supplements -Inadequate storage facilities -In adequate health personnel
	During	- Preserved food - Wild fruits - School feeding program - Honey - Medical facilities - School feeding program - Safe nets	- value addition on animal products - enhancing of sustainable school feeding program - empowering the community on keeping dairy cattle and goats - Enhance outreach clinics	- modern food preservation methods - lack of sustainable school feeding program - lack of dairy animals - shortage of water for fruits planting
		- Outreach clinics - Porridge and packaged milk products		
5-18 years male and female	Before	- School feeding program - Bursaries - Available livestock products - Available food stuff	- Enhanced feeding school program - Improved farming methods - Improved livestock management - Activation of the Environmental and Agricultural Clubs in schools.	- Inadequate feeding programs - Lack of better agricultural skills - Inadequate extension officers - Inadequate food storage facilities

	During	- Hunting and gathering of wild fruits and animals - School feeding program - Porridge and packaged milk products	- Enhancing sustainable school feeding program - Enhanced 4K and young farmers' clubs - Enhanced value addition of agricultural products	-Inadequate school feeding programs -Inadequate knowledge and facilities for value addition
18-35 male and female	Before	- Availability of food - Employment - Own property - Casual labor - Loan facility - Pasture/Browse resource - Operation livestock saleyards - Available pest and disease control skills - Livestock vector facilities - Active cooperative societies	- Better livestock management skills - Sensitization on modern methods of farming - Capacity building on Value Addition. - Capacity building of dip committees - Financial empowerment and trainings on business opportunities - Capacity building on Value Addition - Introduction disease tolerant crops - Introduction of improved breed that tolerant to diseases - Improvement of existing livestock saleyards - Routine vaccination, deworming and vector control	- Inadequate funding for procurement of vaccines, acaricides and dewormers - certified seeds - Insufficient subsidized farm inputs - Inadequate extension services - Knowledge gap on value addition and Technology access - Poor management skills of dip committees - Inadequate knowledge and skills in sustainable farming methods
	During	-Safe nets -Government initiatives-	- Capacity building on alternative sources of livelihood	- Inadequate disease control and personal protective equipment

		Kazi -mtaani, Cash transfers, -Livestock off take Programme -Alternative livelihood e.g. Bee keeping -Migration -quarantine -Wild fruits and Honey	- Enhanced safe nets - Enhanced livestock off take programmes - Enhanced vaccination programmes - Enforcing quarantine - Regular vector control measure - Sustainable pests and disease control management	- Low access pest and disease control chemicals - Low access to certified seeds and improved livestock breeds. - Inadequate extension service
35-60 years male and female	Before	- Availability of food - Employment - Own property - Casual labor - Loan facility - Pasture/Browse resource - Operation livestock saleyards - Available pest and disease control skills - Livestock vector facilities -Active cooperative societies	- Better livestock management skills - Sensitization on modern methods of farming - Capacity building on Value Addition. - Capacity building of dip committees - Financial empowerment and trainings on business opportunities - Capacity building on Value Addition - Introduction disease tolerant crops - Introduction of improved breed that tolerant to diseases - Improvement of existing livestock saleyards -Routine vaccination, deworming and vector control	- Inadequate funding for procurement of vaccines, acaricides and dewormers - certified seeds - Insufficient subsidized farm inputs - Inadequate extension services - Knowledge gap on value addition and Technology access - Poor management skills of dip committees -Inadequate knowledge and skills in sustainable farming methods

	During	-Safe nets -Government initiatives-Kazi -mtaani, Cash transfers, -Livestock off take Programme -Alternative livelihood e.g. Bee keeping	- Capacity building on alternative sources of livelihood - Enhanced safe nets - Enhanced livestock off take programmes - Enhanced vaccination programmes - Enforcing quarantine	- Inadequate disease control and personal protective equipment - Low access pest and disease control chemicals - Low access to certified seeds and improved livestock breeds. - Inadequate extension service
		-Migration -quarantine -Wild fruits and Honey	- Regular vector control measures - Sustainable pests and disease control management	
60> elderly	Before	- They own property - Indigenous Knowledge - They have caretakers - Safe nets - Government Initiatives-Social Protection - . - Retirement schemes	- Enhance access to health facilities - Health Insurance cover - Enhance social protection programs - Establishment of care centers for old - Food supplements - Improvement of existing livestock saleyards - Routine vaccination, deworming and vector control - Kitchen gardens - Local poultry	- Insufficient social protection program - Improved market - Lack of care centers for old - Enhanced access to the food supplements - Insufficient access to health insurance programmes
	During	- Preserved food - ITK - Depend on family members - Livestock off take	- Access to government remittances - Access to medical services - Enhanced safe nets - Enhanced livestock off take programmes - Enhanced vaccination programmes	- Inadequate medical facilities - Lack of financial saving schemes - Inadequate livestock off take programs - Inadequate vaccination programs

Pregnant and lactating mothers	Before	- Pre-natal post-natal care - Availability of food stuff - Food supplements - Preserved food stuff - Kitchen garden	- Improved food production at household levels - Capacity building on maternal health care	- Inadequate access to maternal services - Shortage of food at household level - Enhance pyramid gardening
	During	-Depend on family members -Food supplement - Use of packaged milk products - Importing food stuff from other areas	- Adequate access to quality health services - Enhance Prenatal and postnatal care - Empowering to plant fruit trees - Kitchen gardens - Capacity building on SMEs	- Inadequate access to quality health services - Inadequate access to nutritious food
PLWDs	Before	-Depend on caretakers -Low mobility -Cash transfers -Aiding equipment	- Capacity building in gender and social inclusion -Special School -Home of the Disability (Rescue Centre) -Enhanced access to aiding equipment -Health insurance cover	- inadequate funding for establishment of rescue centers -Insufficient facility for the PLWD
	During	-Low mobility - Cash transfers -Aiding equipment	- Capacity building in gender and social inclusion -Special School -Home of the Disability (Rescue Centre) -Enhanced access to aiding equipment -Health insurance cover	-inadequate funding for establishment of rescue centers -Insufficient facility for the PLWD

5.3 Effectiveness of adaptation/resilience strategies to future climate risks

Table 14 summarizes the effectiveness of the adaptation strategies being applied in the county with regards to the various hazards being applied in the county, the stakeholders involved in the application of the strategies and the emerging social and inclusion issues. For the drought hazard, some of the strategies being applied include livestock migration, trekking longer distances in search of alternative water sources during drought, livestock offtake programs, adoption of EWS systems for warning messages, adoption of alternative livelihoods such as planting of drought tolerant crops among other crops. The stakeholders involved include community members, County/National government and the development partners. However, minority groups, populations living with special conditions as well as women ought to be fully involved in the application of these strategies.

For flood events, some of the strategies being applied include relocation of families to safer grounds, livestock migration to safer grounds, use of local early warning systems such as screaming, ITK among others as a warning strategy. The stakeholders involved include community members, County/National government, Red Cross among others.

With respect to environmental degradation/deforestation, the strategies that were being applied included formation of natural resource management committees, communal surveillance of forests, water sources, land dispute management committees, use of indigenous knowledge among other strategies. The stakeholders involved included formation of natural resource management committees, communal surveillance of forests/water sources, land dispute management committees among others. Issues of social inclusion include minority communities, pregnant and lactating women, the elderly and people living with special conditions.

On crop pests and diseases, the most common strategies being applied were crop rotation, use of pesticide for pest control, adoption of better improved breeds for planting, limited use of certified seeds, intercropping and adoption of appropriate post harvesting management structures. The stakeholders involved were the County/National government and development partners.

TABLE 13: CAPACITY ASSESSMENT FOR NON-HUMAN ELEMENT FOR DROUGHT HAZARD

Risk/Hazard Livelihood/ Economic System	Climate Resilience Strategies	Stakeholder Group Applying the Strategy	Gender and Social Inclusion information

Drought	● Livestock migration ● Trekking longer distances in search of alternative water sources during drought ● Livestock offtake programs ● Adoption of EWS systems for warning messages	● Community members ● County government ● National Government including NDMA, RVSB ● Development partners including S.H.A,	● Minority communities in Baringo county ● Pregnant and lactating women
	● Adoption of alternative livelihoods such as planting of drought tolerant crops, pastures etc. ● Cushioning of vulnerable populations through social protection programs such as cash transfers ● Adoption of high yielding and drought tolerant livestock breeds ● Adoption of livestock supplementary feeding programs ● Deployment of outreach services for management of acute malnutrition. ● Food relief	World Vision, Red Cross, WFP, Save The Children, Give Direct	● The under five children ● Youth ● PWLD
Floods	● Relocation of families to safer grounds ● Livestock migration to safer grounds ● Use of local early warning systems such as screaming as a warning strategy ● Boiling of drinking water ● Slashing of tall vegetation for clearing mosquito breeding grounds	● Community members ● County government ● National Government including NDMA, ● Red Cross,	

Environmental degradation	▪ Formation of natural resource management committees ▪ Communal surveillance of forests, water sources ▪ Land dispute management committees	● Community groups, ● KFS, County government, KWS, Conservancies ● SHA, WRUAs, CFAs, WSPs	
Crop pests and diseases	● Crop rotation ● Use of pesticide for control ● Adoption of better improved breeds for planting ● Limited use of certified seeds ● Intercropping ● Adoption of appropriate post harvesting management practices ● Physical scaring tactics against birds, locusts and other wild animals such as monkeys ● Open drying of cereals by use of sunlight ● Issuance of relief food to vulnerable population	● Local communities ● County Government ● SHA ● Kenya Climate Smart Agriculture project ● Ministry of Interior ● Red Cross	● Women and children aged 5 years old ● Women and child headed households ● The elderly population

Effectiveness and sustainability assessment for the resilience strategies:

The session was designed to analyze the effectiveness and the sustainability of the identified adaptation Strategies to the community.

The adaptation matrix identifies the main hazards, Climate Resilient strategies, their Effectiveness and sustainability analysis. The analysis was assessed using the below rating scores;

3 = Very high

2 = High

1= Medium

0 = Not effective or not sustainable

From the analysis some strategies were quite effective but not sustainable, others were not effective neither sustainable while others were effective and sustainable as indicated in table 13. Based on the future climatic scenario, the community should therefore adapt the strategies which

are both effective and sustainable.

TABLE 14: EFFECTIVENESS AND SUSTAINABILITY OF THE ADAPTATION STRATEGIES FOR VARIOUS HAZARDS

Risk/Hazard Livelihood / Economic System	Climate Resilience Strategies	Effectiveness of Strategy	Sustainability	Further Improvement Of Strategy
Drought	Livestock migration	2	0	Establish protected grazing fields with sustainable management
	Trekking longer distances in search of alternative water sources during drought	1	0	Established strategic watering points
	Water trucking	2	1	Provision of Strategic water storage points
	Construction of water storage infrastructure	3	3	Designs to take into consideration the changing future climate scenarios.
	Rehabilitation and expansion of the existing water Facilities,	3	3	Optimization of their utilities Capacity building Community service providers and WRUAs
	Livestock offtake programs	3	2	Enshrine livestock offtake in the legislation at county and national level
	Disease surveillance	3	2	Deploying of animal health officers Develop reporting and feedback mechanisms
	Routine vaccination	3	2	Budgetary allocation at the county level
	Quarantine	3	2	Enhance Enforcement.
	Research on Crops and livestock diseases	3	1	Liaising with research institutions and linkage to farming communities Enhanced funding of local research institutions

	Adoption of EWS systems for warning messages	3	3	Capacity building the communities on early warning systems
	Diversification of agricultural enterprises e.g. bee keeping, fruit farming	3	3	Capacity building the community on enterprise diversification and value addition
	Cushioning of vulnerable populations through social protection programs such as cash transfers	2	0	Support the communities to start sustainable enterprises so that the can become financially independent
	Adoption of high yielding and drought tolerant livestock breeds and crop varieties	3	3	Provide Improved livestock breeds and subsidized and certified agricultural inputs.
	Pasture production and conservation	3	3	Establishing strategic feed reserves
	supplementary feeding programs	2	1	Food feeding programs to be enhanced in children under 5 years in local health centers.
	Deployment of outreach services for management of acute malnutrition	2	2	Recruitment and up scaling awareness and sensitization. Training of Community Health promoters.
	Food relief	2	1	Provision of farm subsidies,
Floods	Relocation of families to safer grounds	3	2	Survey and mapping of the highest water marks, Planning of Settlements
	Livestock migration to safer grounds	3	2	Mapping of the hotspots and the safe zones
	Construction of water retention structures.	3	3	Construction of water pans and or other water structures Designs to take into consideration the changing future climate

				scenarios.
	Use of local early warning systems such as screaming as a warning strategy	3	3	Employment of the participatory Scenario planning Inter and intra generational transfer of Traditional knowledge.
	Adoption of simple drinking water treatment.	3	3	Creation of Awareness, provision of water treatment chemicals,
Environmental degradation	Formation of natural resource management committees	3	3	Strengthening of the environmental conservation and management committees
	Protection and conservation of water sheds/Catchment areas.	3	3	Survey, mapping , recording and gazettement of the fragile ecosystem Formulation of Catchment management plans and strategies. Effective enforcement
	Soil and water conservation Structures	3	3	Mapping and surveying of the degraded areas, Awareness creation on Environmental conservation Catchment conservation approach, Enhance cash for assets. Tree Growing
	Awareness creation on Environmental conservation	3	3	Development of teaching learning aids e.g. Flyers, Brochures. School and community environmental education and awareness. Development of Demonstration plots e.g. woodlots in schools.
	Promotion of alternative livelihoods to discourage unsustainable use of Natural Resources.	3	3	Awareness creation, Provision of incentives (Beehives, Poultry keeping, Agroforestry, PELIS)

CHAPTER 6

6.0 Baringo County Climates Strategic Adaptation Investment as Proposed by the Community and Multi-Stakeholders

This section is a record of the adaptation strategies identified by the participants during the PCRA ward engagement process. This is as shown in table 14.

TABLE 15: ADAPTATION STRATEGY FOR CROP PESTS AND DISEASE, DROUGHT, ENVIRONMENTAL DEGRADATION, LIVESTOCK PESTS AND DISEASES & FLOODS

Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
Crop Pests and Diseases	-Crop failure -Nutrition deficiency among children, lactating and pregnant mothers -Inadequate foods -Low income	-Use of integrated Pest Management (IPM) -Adopt organic agriculture and climate smart practices	-Increased crop production and productivity -Increased availability of Nutritious food -Reduced use of Agro-chemicals -Reduced fungicide and	Increased agricultural production and productivity by 2032 Increased food and nutrition security in Baringo county by 2032	-Health services -Agriculture -Environment
		-Adoption of disease tolerant varieties			-Agriculture -Environment
		-Use of Certified seeds			-Agriculture
		-Use of Agro-chemicals for pest and disease control			Agriculture
		-Biological control			Agriculture Environment
		-Intercropping e.g. use of trap crops and repellant			Agriculture Environment
		-Crop rotation			Agriculture Environment

		-Adopt appropriate Post harvesting management practices	herbicide resistance		Agriculture
		-Physical scaring tactics against predators; birds, locusts	-Reduced cost of production		Agriculture
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
		and other wild animals such as Monkey	-Improved quality and quantity of crop produce -Improved and sustain biodiversity -Reduced pest resistance to chemicals -Reduced food contamination -Enhancement of farmers knowledge and skills -Reduce diseases in crops -Improve crop		
		-Capacity building of farmers on pest and disease control; Best agronomics practices			Agriculture
		-Enhancing agricultural extension services -Enterprise diversification			Agriculture Trade, enterprise Agriculture, Livestock
		Establishment of plant doctor clinics			Agriculture

			and disease control -Fall back option -Reduce vulnerability -Increased diagnosis and treatment		
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
Livestock pest & diseases	Loss of livestock	-Livestock disease control and management -Pasture development, conservation and storage -Rehabilitation of non-operational dips -Research on emerging livestock pests and diseases -Diversification of enterprises -Livestock breed improvement	Reduce loss of livestock in Baringo county by 2025	Reduced incidences of livestock diseases in Baringo county by 2030	Livestock Agriculture Health Veterinary
	Closure of market				
			Increase acreage under pasture production in Baringo county by 2026		
	Low livestock production				
	Zoonotic diseases		Increased livestock production in Baringo County by 2027		
	High cost of				

	production	-Capacity development of livestock keepers and community structure on proper livestock management -Development of agribusiness models -Formation and strengthening of marketing structures -Promote modern livestock			
			Reduced cost of livestock production in Baringo County by 2026		
	Low market prices for livestock and livestock products				
			organized livestock		
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
		production systems -value addition of livestock products	marketing in Baringo County by 2025		
	Low household income				
			increased household income in Baringo county by 2026		
	Migration		-Improved food and nutritional		

	Food insecurity		security -Increased number of farmers implementing the developed agribusiness models		
Drought	Poor forages	-Enhance the early warning systems on drought -Enhance emergency drought response capabilities by the various stakeholders -Pasture establishment and conservation -Formulate and adoption of		-Improved livestock productivity -Improved livestock market prices -Improved pasture access and availability -Reduces incidence	Water, Agriculture including Livestock, Health, Education, Environmental & Natural
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	

		grazing management plans -Livestock feed supplementation -Establishment of strategic watering points for livestock -Provision of subsidized livestock feeds -Capacity building of farmers on appropriate livestock management practices -Enhance livestock off take programs -Promote introduction of improved livestock breeds -Improve marketing infrastructure and linkages -Promote value addition to livestock products -Enhance livestock diseases surveillance, cattle dips and have regular vaccination programs		of livestock disease outbreaks	Resources, Tourism
	Reduced water for livestock consumption	-Rehabilitation and expansion of the existing water facilities -Enhancing of water storage facilities -Capacity building of the water management committees -Enact relevant policies addressing water issues			
	Poor livestock body condition				
	Reduced productivity in terms of milk				

Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
	production, live carcass weight	-Adopting use of modern technologies in designs, water supply systems and water use management. -Enhance water treatment at water facilities and household level -Establishment of a surveillance system on water quality and usage -Establishment of strategic emergency water Supply stations -Promote planting of drought tolerant crops -Food relief -Promote use of certified seeds -Enhance crop pest and disease surveillance and reporting systems -Input subsidies -Market linkages -Value addition -Promote utilization of drought			
	Depressed livestock market prices				
	Loss of livelihoods in terms of income source, food sources				
	Outbreak of opportunistic livestock diseases			-Reduce trekking distances and waiting time at water sources by 2025 -To ensure Optimal functionality of water supplies by improving management standards and ensuring good governance by 2025 -Ensure that at least 50% of the Baringo	
	Drought related livestock mortalities				
	Unusual livestock migration				
	Human-wildlife conflict				
	Resource based conflict				
	Poor terms of trade				

	Reduced water availability for human consumption	tolerant crop varieties -Enhance appropriate post-harvest management practices -Capacity building of farmers on modern crop management		households have access to safe and clean water at all times by 2025	
	Increased trekking				
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
	distances to water sources	practices -Adoption of smart and green farming technologies			
	Breakdown of critical water facilities due to overuse and congestion				
	Contamination of water sources due to congestion at watering points				
	Compromised water quality due to concentration of fluoride				
	Increased cost of water				
	Crop failure			-Enhance crop yield per unit of land by at least 20% by 2025 -Reduce incidents of	
	Household food scarcity	-Enhance outreach programs on management of malnutrition -Enhance immunization			
	Increase food				

	market prices	coverage from the current 80% to 90% -Equipping and staffing of the existing health facilities -Enhance disease surveillance and reporting in the county		crop pests and diseases by at least 25% by 2025. -Ensure that children under the age of five years old who are at risk of malnutrition are reduced from the	
	Increased cases of malnutrition				
	Increased infection from other opportunistic diseases due to				
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
	compromised immunity			current average of 20% to10% by 2025. -Ensure that incidents of drought related outbreak of human diseases are reduced by at least 25% by the year 2025. -Ensure reduction of drought related insecurity incidents by 25% by the year 2025	
	Drought related human mortalities	-Enhance inter and intra county peace initiatives -Enhance issues of law enforcement -Promote adoption of alternative livelihoods that do not attract criminality -Promote psycho-social support programs -Promote sensitization and awareness campaigns against			
	Increase in petty crimes				
	Resource based conflicts Increase in GBVs				

		retrogressive cultural practices -Upscale school meals feeding programs -Enhance provision of dignity kits -Establish centers of academic excellence with boarding facilities -Enhance law enforcement and administration of justice		-Ensure that incidents of social vices are reduced by 25% by 2025.	
	Family break ups				
	Increased destitution cases				
	Teen pregnancies				
	Early marriage				
	Child labour				
	Psycho-social effects				
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
	Human migration				
	Low enrolment				
	School drop outs				
	Compromised academic performance				
Floods Environmental/ land degradation	Increased Displacements of HHs in flooded areas	1. Proper Environmental measures, (afforest ration, Soil & water conservation Climate smart, Agro-ecology,) and	- Information sharing of DRR	Reduced Flooded lands through proper environmental conservation	Public Health Water Health Education, Social

	Loss of lives & livelihoods	interventions be utilized to enhance food & Nutrition Security. 2. Timely Early Warning Information /advisories dissemination to the community. 3. Establish environmentally friendly innovations that will accelerate land use for production purposes.	- Enhanced water management systems. - Flood alert messaging	measures to enhance sustainable livelihoods for food security in Baringo County by 2030	protection, Youth & Gender, Agriculture & Livestock. Nutrition, Roads & infrastructure, Disaster risk Management, environment
	Increased Human Diseases				
	Increased Environmental Degradation				
	Diversion of Rivers				
	Increased Destruction of Critical facility				
	Soil Erosion/infertility				
	Increased Loss of arable lands & destruction of				
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
	crops				
	Ecosystem Change				
	Increasing runoff and flooding (physical infrastructures))	Use ecosystem-based adaptation -Improving disaster risk			

	Increasing siltation of surface water bodies (lakes, dams, rivers)	reduction and management -Capacity building on ecological conservation -promote reclamation, rehabilitation & restoration of degraded areas. catchment & riparian conservation and protection -Conservation and protection of hilltops and steep slopes -Enhance sustainable management of invasive species -Establish & support community conservancies -Develop and promote alternative Livelihoods -Establish and strengthen strong and diverse mix of voluntary community organizations across all degraded ecosystems.			
	Destruction of vegetation & increased soil erosion and derelict (unproductive) land				
	Increased food & nutrition insecurity				
	Change in the amount, timing & intensity of rainfall				
	Reduced availability & quality of water				
Hazard	Impact	Adaptation strategies	Goals		Affected sectors
			Short term (5 years)	Long term (5 to 10 Years)	
	resources in the watershed	- establish & enhance			

	Increased greenhouse gas emissions	opportunities for community access & investment in green businesses including the carbon market			
	Increased incidences of earth/mud flows				
	Proliferation of invasive species				
	Human wildlife conflicts and migration of wildlife				

Chapter 6

Conclusion

From the ward PCRA engagements some of the adaptive measures to climate change hazards by the community have low sustainability. A significant high ratio of vulnerability was witnessed in almost all the wards within Baringo County. Some effective adaptive mechanisms are adopted by the communities within the County. The socioeconomic aspects that exacerbate the population vulnerabilities in the livelihoods are found to include resource based conflicts on land, water and pasture, illiteracy, exposure to climate risk due to location, high poverty rates and overdependence on pastoralism and rain fed farming.

The populations in Agro-pastoral and marginal farming livelihoods are worst affected by drought despite the fact that the agro-pastoral have a number of alternatives, they are till undermined by the population densities and higher poverty rates and the exposure to climatic stress, sensitivity to climate stress and adaptive capacity. Natural systems in Baringo County are affected by climate changes, particularly temperature increases, and that these temperature increases. Community vulnerability to climate change can be conceptualized as an aggregate of three vulnerability components: exposure to climatic stress, sensitivity to climate stress and adaptive capacity.

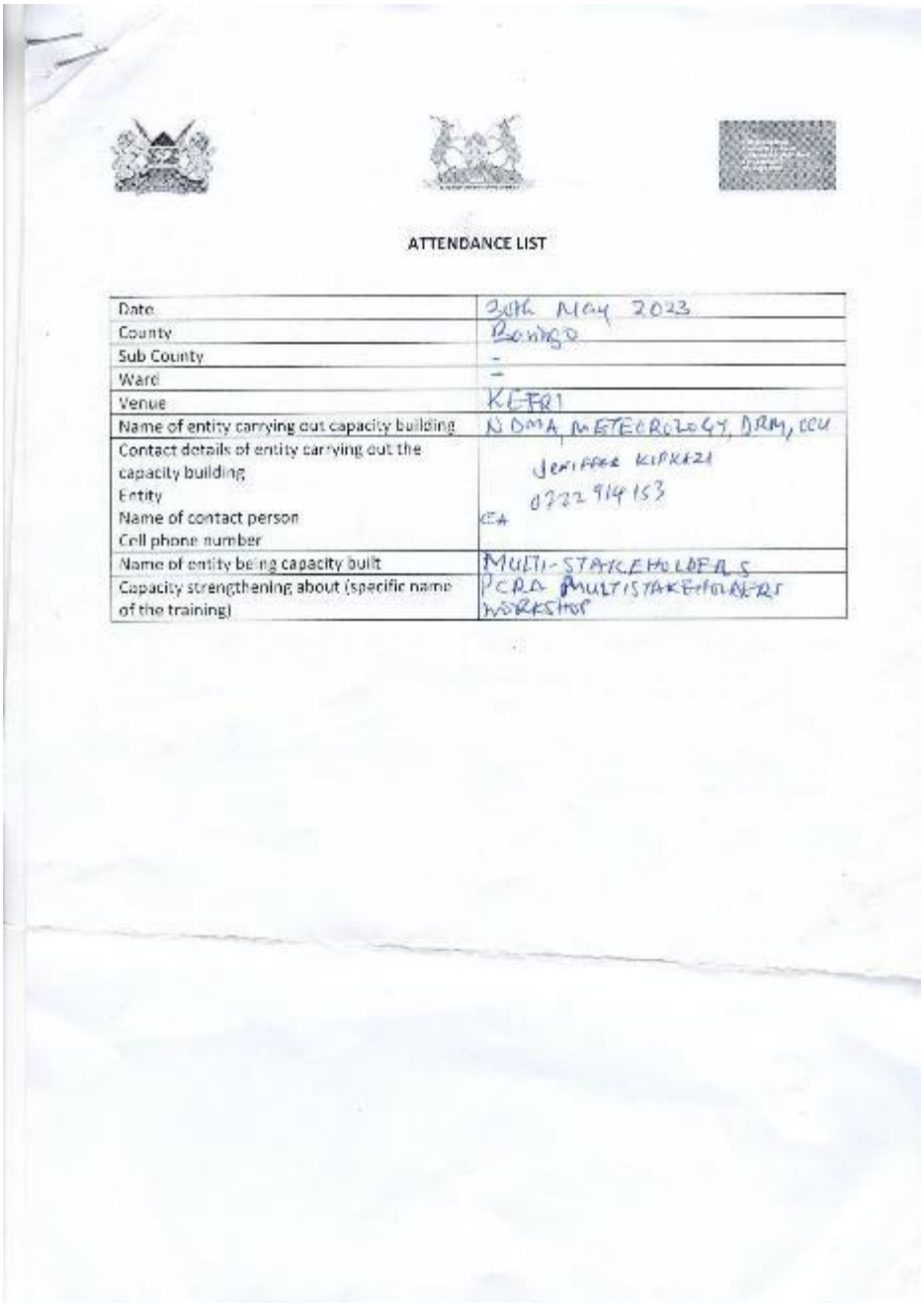
In account of this the strategies provided by the community during the PCRA exercise will contribute much to the strengthening of community resilience and adaptive capacity. This is achieved through the investment proposals to be included in the action plan. The PCRA contributes to sustainability and effectiveness due to the aspect of inclusiveness and adaptation to the local situation.

Reference

1. Ward Participatory Climate Risk Assessment Reports (PCRA) for Tirioko, Kolowa, Ribkwo, Silale, Loiyamorok, Tangulbei/Korossi, Churo/Amaya, Saimo Soi, Bartabwa, Barwessa, Kabartonjo, Saimo Kipsaraman, Kabarnet, Sacho, Tenges, Ewalel Chapcahap, Kapropita, Marigat, Ravine, Maji Mazuri/Mumberes, Lembus Perkerra, Lembus Kwen, Lembus, Koibatek, Emining, Mogotio, Sirwa, Ilchamus, Mochongoi, Mogotio,Kisanana and Kisanana.
2. The new Climate Change Vulnerability Index (CCVI)
3. Kenya National Bureau of Statistics (KNBS)
4. Meteorology data base: CMIP5 model Simulations
5. Baringo County GIS laboratory
6. FLLoCA templates and PCRA hand book

Annexes

Annex 1: Participants to the Multistakeholder PCRA Workshop



ATTENDANCE LIST

Date	24th May 2023
County	BOMET
Sub County	-
Ward	-
Venue	KEFRI
Name of entity carrying out capacity building	NDMA METEOROLOGY, DRM, CCU
Contact details of entity carrying out the capacity building Entity Name of contact person Cell phone number	JENIFFER KIPKAZI 0722 914 153 CA
Name of entity being capacity built	MULTI-STAKEHOLDERS
Capacity strengthening about (specific name of the training)	PCRA MULTISTAKEHOLDERS WORKSHOP

SNo	Name	IDNO	Organization	Contact	Gender		Age		PLWD	Minority/ Marginal/ Indigenous People	Signature
					M	F	<35 yrs	>35 yrs			
1.	Paul Taliam	13067207	Mkuwalkophia WRUA	0723313130	✓			✓	N/A	N/A	[signature]
2.	Philip Tomno	20404562	BACSOF	0721560972	✓			✓	N/A	N/A	[signature]
3.	[illegible]	2315714	BCG	[illegible]	✓			✓	N/A	N/A	[signature]
4.	Christopher Cheminio	21371063	CFA [illegible]	0725102 634	✓			✓	N/A	N/A	[signature]
5.	Richard K Kemng'ony	0335340	Endorois welfare council	0724241071	✓			✓	N/A	✓	[signature]
6.	Mary Kuket	11842952	BACSOF	0729895352		✓		✓	N/A	✓	[signature]
7.	Samson Kitur	24606391	Slow Food Kenya	0719100913	✓			✓	N/A	N/A	[signature]
8	Simon Choge	5999751	KEFRI	0722862366	✓			✓	N/A	N/A	[signature]
9	Silas Langat	23784990	Smart Help Africa	0720342316	✓			✓	N/A	N/A	[signature]
10	Titus Amdany	20689662	BCG-Tourism	0721343808	✓			✓	N/A	N/A	[signature]
11	Michael Ngetich	20507878	BCG	0722577342	✓			✓	N/A	N/A	[signature]
12	Purity Kibai	20906739	BCG	0721 808 328	✓	✓		✓	N/A	N/A	[signature]
13.	Lucy Ntongai	22211722	ActionAid I Kenya	0719961636		✓		✓	N/A		[signature]
14	Susan Jepkemoi	27920529	BCCA	0721481467		✓		✓	N/A	✓	[signature]
15	Godfrey Kiptum	23657079	CIPAF	0725509757	✓			✓	N/A		[signature]
16	Francis Kiogora	9836582	[illegible]	0722699283	✓			✓	N/A		[signature]
17	Stanley Chelagat	23878400	AWPF org.	0724014406	✓			✓	N/A		[signature]
18	Peter Omollo	8637340	BCG	0115558757	✓			✓	N/A		[signature]
19	LILY ROTICH	23712535	BCG	0705663693		✓		✓	N/A		[signature]
20	SYMION CHOSHANG	6436973	IRONG NATURAL BEE PRODUCERS SHG	0721757025	✓			✓	N/A		[signature]

SNo	Name	IDNO	Organization	Contact	Gender		Age		PLWD	Minority/ Marginal/ Indigenous People	Signature
					M	F	<35 yrs	>35 yrs			
21	SAMWEL MONTOROSI	13071657	BARINGO C.P.A	0727037648	✓		✗	✓	N/A	✓	[illegible]
22	Hellen J. Sikuku	11659996	KFS	0724997886		✓		✓	N/A	N/A	[illegible]
23	Jeremiah Hyggah	11698613	WRA	0722161353	✓			✓	N/A	N/A	[illegible]
24	Okoyo Morphat	21900741	BCG	0722627443	✓			✓	N/A	N/A	[illegible]
25	Vincent Adigo	21660169	BCG	0725698500	✓		✓			N/A	[illegible]
26	ISAIAH Biwott	20367096	CEPAF	0726110889				✓	N/A	N/A	[illegible]
27	Catherine Simaa	27945995	BCG	0724796354		✓	✓		N/A	N/A	[illegible]
28	Owino Joshua Okeke	20196169	RECONCILE	0701350077	✓		✓		N/A	N/A	[illegible]
29	LAGAT DENNIS	35483391	BCG	0722295796	✓		✓		N/A	N/A	[illegible]
30	Chengat Francis	36002901	BCG	0706183 27	✓		✓		N/A	N/A	[illegible]

SNo	Name	IDNO	Organization	Contact	Gender		Age		PLWD	Minority/ Marginal/ Indigenous People	Signature
					M	F	<35 yrs	>35 yrs			
31	OBAM J ZOBER	11586424	NDMA	0725266624	✓			✓			[illegible]
32	Joshua K. Chepkoy	28680467	BCG	0727390092	✓			✓			[illegible]
33	Fredrick Kipkirui		BCG	0725817165	✓			✓			[illegible]
34	Richard Tuwei	20140106740	BCG	0715855296	✓			✓		✓	[illegible]
35	Samuel Mafei	9601616	KMD	0727791866	✓			✓			[illegible]
36	ANITA BIWOTT	42137235	BASICO	0714558623		✓	✓				[illegible]
37	Peter Lomechan	21835208	ACTIONAID	0711537799	✓	✗					[illegible]
38	JUDY KIPKOIDA	25923964	KOWYN	0798573232		✓	✓			✓	[illegible]
39	SHEKAL ISAAC	24712234	PACSO	0727453360				✓			[illegible]
40	CHRISPINUS MOSIKA	22650636	Religious	0716114536	✓			✓			[illegible]

SNo	Name	IDNO	Organization	Contact	Gender		Age		PLWD	Minority/ Marginal/ Indigenous People	Signature
					M	F	<35 yrs	>35 yrs			
41	Monicah [illegible]	26022354	[illegible]	0712547332		✓		✓		✓	[signature]
42	Raphael Kimaiyo	22539397	WCPU	0725661887	✓			✓		✓	[signature]
43	Jonah Kipleta	6472809	LABO [illegible]	0712420646	✓			✓		✓	[signature]
44	James Kimaiyo	20216082	[illegible]	072[illegible]646	✓			✓		✓	[signature]
45	Jackson Kimaiyo	22597259	Lordan	0790084064	✓			✓		✓	[signature]
46	Philip Nandwa	[illegible]	CLRD	0720458953	✓			✓	N/A	N/A	[signature]
47	Jennifer Kipkogi	22948735	BRG	0722914463		✓		✓		✓	[signature]
48	Felista Kiptoo	22463926	BCC	0724698818		✓		✓			[signature]

Annex 2: Technical Working Group that led the PCRA Ward Engagements

	NAME	DEPARTMENT
1	Nancy Kiplagat	Agriculture, Livestock & Fisheries
2	Richard Tumeiyo	Economic Planning
3	Susan Kiprotich	Agriculture, Livestock & Fisheries
4	Jane Lentupuru	Environment & Climate Change
5	Ronald Onsase	Water & Irrigation
6	Limo Kibet	Agriculture, Livestock & Fisheries
7	Benaline Chepkemoi	Agriculture, Livestock & Fisheries
8	Stanley Limo	Environment & Climate Change
9	Francis Cheruiyot	Environment & Climate Change
10	Philip Nandwa	Environment & Climate Change
11	Mike Kukat	Devolution
12	Dorcas Lagat	Agriculture, Livestock & Fisheries
13	Raphael Kimosop	Environment & Climate Change
14	Samuel Mutai	National Drought Management Authority
15	Cicilia Chemobo	Agriculture, Livestock & Fisheries
16	Charles Koech	Environment & Climate Change
17	Cassim Zuberi	National Drought Management Authority
18	Lily Chepkemoi	Agriculture Livestock & Fisheries
19	Dennis Lagat	Environment & Climate Change
20	Fridah Kiptolong	Environment & Climate Change
21	Esther Barasa	National Drought Management Authority
22	Kiprono Kimokiy	Environment & Climate Change
23	Leah Sang	National Drought Management Authority
24	Obeta Sirma	Devolution
25	Caroline Kipsang	Agriculture, Livestock & Fisheries
26	Benson Kangogo	Disaster Risk Management
27	Irine Jebichi	Agriculture, Livestock & Fisheries

Annex 3: PCRA Photographs From Selected Wards

LOWER KISANANA, DISCUSSING ADAPTATION STRATEGY

PCRA IN TANGULBEI WARD TIATY EAST

RESOURCE MAP ACTIVITY DURING PCRA-RIBKWO WARD

COMMUNITY RESOURCE MAP BARTABWA WARD

PCRA IN PROGRESS SACHO WARD