REPUBLIC OF KENYA
COUNTY GOVERNMENT OF LAMU

PARTICIPATORY CLIMATE RISK ASSESSMENT REPORT FOR LAMU COUNTY

MAY 2023

FOREWORD

Climate change is a major challenge to sustainable socio-economic development globally. In Kenya and many other developing Nations, the impact of climate change hazards has had far reaching impacts, resulting in huge budgetary implications in attempting to deal with the impacts of climate change and improve adaptive capacity of communities. Effectively, development aspirations have been slowed down. Lamu, being one of the Counties that receives the least budgetary allocations these impacts have and continue to wear down the county's productive assets. The county has had very little resources to deal with emergencies resulting from the impacts of these changes in climate. Lamu County is therefore among the most vulnerable areas in Kenya with the climate related hazards posing challenges to the County's development agenda.

In recent years, the County has experienced long periods of drought, instances of increased resource-based conflicts, occasional flooding in selected parts of the county mostly resulting from overflows in River Tana, high incidences of crop/livestock pest and diseases, frequent and destructive stormy winds and rising sea levels that have submerged parts of our coastline. Consequently, we have had instances of crop failures, livestock mortalities, water shortage, destruction of property, loss of vegetation, human displacements among other direct impacts. The direct impacts of climate in some instances resulted in human injuries especially in the ocean and loss of human lives.

Lamu County recognizes the danger posed by these hazards and is proud to partner with the National Government through the FLLoCA program to design effective programs, projects and policies that will address climate change adaptation and mitigation with a view to enhancing the adaptive capacities of our communities. My government has dedicated resources to this course and will continue to do so in the long term. This participatory Climate Risk Assessment report identifies critical hazards, to improve the adaptive capacity and increasing resilience of communities. We have committed strategies and priority actions in line with our CIDPIII to address these impacts locally.

We, in Lamu County, understand that climate change affects nearly all sectors of our economy. As a government, I give my commitment to integrate climate change adaptation and mitigation considerations across all sectors and will prioritize and allocate sufficient resources to deal with these impacts and contribute to the National and global aspirations as contained in the United Nations Framework Convention on Climate Change (UNFCCC)

H.E ISSA ABDALLA TIMAMMY
GOVERNOR - LAMU COUNTY

ACKNOWLEDGEMENT

The Lamu County Participatory Climate Risk Assessment report is as a result of a comprehensive participatory process. The exercise involved participants from all the ten wards of the County (Witu, Bahari, Hongwe, Mkunumbi, Hindi, Basuba, Shella, Amu, Faza and Kiunga). The report identifies critical hazards, to improve the adaptive capacity and enhancing resilience of communities. As a county, we remain committed and focused to addressing climate related impacts locally. The Climate Change Unit will commit resources, both financial and human and develop concrete and practical strategies and actions needed to cushion our communities.

As the CECM in charge of Climate change, I am particularly grateful to **H.E. Issa A. Timamy** - Governor of Lamu for his visionary leadership and guidance leading up to the preparation of this report. Special thanks to the following institutions for their support during the PCRA process and the development of this report: -USAID-Kuza, Nature Kenya, Kenya Red Cross Society, Wetlands International and Lamu Environment Foundation.

Special consideration also goes to the Chief Officer Public Health, Sanitation and Environment **Mr. Mohamed Rashid Dirie** for the overall guidance of the process of preparing this report.
Special recognition to the County Multi-Sectoral technical working group led by Director Climate Change **Mr. Mohamed Abubakar** for the invaluable input and guidance in the preparation of this report. The team spent a lot of time collecting data and developing this participatory Climate Risk Assessment report.

The County is also grateful to **Mr. George Odera** (Project Manager, Nature Kenya) and **Mr. Kuso Mohamed** (Tana River County Director Climate Change) for steering the process in a highly professional manner.
As it is not possible to list the names of all the persons in this section, a detailed list of all persons who played critical role in preparation of this report is attached to the report in Annex 1.

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RAPHAEL MUNYUA

DEPUTY GOVERNOR / CECM COUNTY CLIMATE CHANGE
LAMU COUNTY.

Abbreviations and Acronyms

ASALs	Arid and Semiarid Lands
ASDS	Agriculture Sector Development Strategy
ASDSP	Agricultural Sector Support Programme
BMU	Beach Management Unit
CCCAP	County Climate Change Action Plan
CCO	County Chief Officer
CBOs	Community Based Organizations
CCIS	County Climate Institutional Support
CCRI	County Climate Resilience Investment
CECM	County Executive Committee Member
CFA	Community Forest Association
CIDP	County Integrated Development Plan
CGL	County Government of Lamu
^{0}C	Degree Celsius
DRM	Disaster Risk Management
EMCA	Environment Management and Coordination Act
EOC	Emergency Operations Center
FADs	Fishing Aggregating Device
FCDC	Frontier Counties Development Council
FLLoCA	Financing Locally-Led Climate Action
FMD	Foot and Mouth Disease
FOLAREP	Forest and Landscape Restoration Action
Plan GHG	Greenhouse Gas
GoK	Government of Kenya
HWC	Human Wildlife Conflict
IGAs	Income Generating Activities
ITCZ	Intertropical Convergence Zone
IUCN	International Union for the Conservation of Nature
KALRO	Kenya Agricultural and Livestock Research
Organization KCSAP	Kenya Climate Smart Agriculture Programme
KDF	Kenya Defence Forces
KEFRI	Kenya Forestry Research Institute

KeFS	Kenya Fisheries Services
KMFRI	Kenya Marine and Fisheries Research Institute
KEMFSED	Kenya Marine Fisheries and Socio-Economic Development
KeNHA	Kenya National Highways Authority
KEPHIS	Kenya Plant Health Inspectorate Service
KEMRI	Kenya Medical Research Institute
KFS	Kenya Forest Service
KMD	Kenya Meteorological Department
KRCS	Kenya Red Cross Society
KWS	Kenya Wildlife Service
LAKWA	Lake Kenyatta Water Association
LAWASCO	Lamu Water and Sanitation Company
LSD	Lumpy Skin Disease
MCAs	Members of the County Assembly
M/E	Monitoring and Evaluation
MLND	Maize Lethal Necrosis Disease
HoH	Ministry of Health
MPCs	Minimum Performance Conditions
MTP	Medium Term Plan
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NDC	Nationally Determined Contribution
NDMA	National Drought Management Authority
NDMU	National Disaster Management Unit
NDOC	National Disaster Operations Center
NEMA	National Environment Management Authority
NGAO	National Government Officers
NHIF	National Health Insurance Fund
NGO	Non-Government Organization
NK	Nature Kenya
NMK	National Museums of Kenya
NPS	National Police Service
NRT	Northern Rangelands Trust
PCRA	Participatory Climate Risk Assessment
PFMPs	Participatory Forest Management Plans

PPR	*Peste des Petits* Ruminants
PSM	Public Service Management
TNC	The Nature Conservancy
TIPs	Transition Implementation Plans
TWG	Technical Working Group
UNFCCC	United Nations Framework Convention on Climate
Change VMGs	Vulnerable and Marginalized Groups
WHO	World Health Organization
WI	Wetlands International
WRA	Water Resources Authority
WV	World Vision
WSTF	Water Sector Trust Fund
WWF	World Wildlife Fund

Definition of Terms

Adaptation: adjustment in the natural or human system in response to actual or expected climatic stimuli or their effects in order to moderate harm or exploit beneficial opportunities.

Adaptive Capacity: The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Afforestation: Planting of new forests on lands that historically have not contained forests.

Assets: Resource with economic value that is owned or controlled with expectation of future benefits

Biodiversity: The variability among living organisms from terrestrial, marine and other ecosystems. Biodiversity includes variability at the genetic, species and ecosystem levels.

Carbon Sequestration: The uptake of carbon containing substances, in particular carbon dioxide (CO_2), in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO_2 from the atmosphere through land-use change (LUC), afforestation, reforestation, revegetation, carbon storage in landfills and practices that enhance soil carbon in agriculture (cropland management, grazing land management).

Climate Change Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Climate Change Mitigation: A human intervention to reduce the sources or enhance the sinks of greenhouse gasses (GHGs).

Climate Change: A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically three decades or longer.

County: Lamu County

County Assembly: County Assembly of Lamu

County Government: Lamu County Government

Constitution: Constitution of Kenya 2010

Deforestation: Conversion of forest to non-forest use.

Desertification- Conversion of fertile land into deserts resulting from drought, deforestation or inappropriate agriculture

Disaster: Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread

adverse human, material, economic or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.

Drought: A period of abnormally dry weather long enough to cause a serious hydrological imbalance.

Ecosystem Services: Ecological processes or functions having monetary or non-monetary value to individuals or society at large.

Ecosystem: An ecosystem is a functional unit consisting of living organisms, their non-living environment and the interactions within, between and among them.

Environment: has the meaning assigned to it in section 2 of the Environment Management and Coordination Act

Exposure- state of having no protection from hazards

Forest and Landscape Restoration: An active long-term process to regain ecological integrity and enhance human wellbeing across deforested, degraded forests and landscapes

Forest: Land spanning more than 0.5 hectares with trees of at least 2 meters and a minimum canopy cover of 15%, and include natural and planted plantation forests on state, community and private land

Forest Cover: Refers to a land area of more than 0.5ha with a canopy cover of at least 15%, a minimum tree height of 2 meters which is not primarily under agricultural or other specific non- forest land use

Hazard: Refers to any source of potential damage/harm. The term is used synonymously with Risk

Land Use: The total of arrangements comprising human actions, activities and inputs undertaken in a certain land- cover type

Landscape: A social-ecological system that consists of a mosaic of natural and/or human-modified ecosystems, often with a characteristic configuration of topography, vegetation, land use, and settlements that is influenced by the ecological, historical, economic and cultural processes and activities of the area

Mitigation: preventing, reducing or slowing down the increase of atmospheric greenhouse gas concentrations by limiting current or future emissions and enhancing potential sinks for greenhouse gasses.

Rangelands: Vast undisturbed natural resources and landscapes in the form of grasslands, bushland, woodlands, wetlands and deserts. They grow primarily indigenous vegetation, rather

than plants established by humans.

Reforestation: Planting of forests on lands that have previously contained forests but that have been converted to some other use.

Rehabilitation: Restoration of the capacity of degraded landscape to deliver goods and services.

Resilience: the ability of a social, economic or ecological system to absorb disturbances while retaining the same basic structure and ways functioning, the capacity for self-organization and the capacity to adapt to stress and change.

Sustainability: A dynamic process that guarantees the persistence of natural and human systems in a trans-generational equitable manner

Storm: a violent and often disturbance of the atmosphere with strong winds and usually rain, thunder, lightning or snow.

Tree Cover: Area covered by tree patches of less than 0.5 hectares outside recorded forest areas

Vulnerability: the condition determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a system to the impact of hazards

Witemere: This is a local term, only used and understood in Lamu County. It refers to the tendency of land encroachment in which individuals/communities clear unadjudicated parcels of land without authorization and claim ownership

Executive Summary

Climate change and its related impacts have increased over the years, negatively affecting the development agenda. This is particularly true in developing Nations which unfortunately contribute the least to global greenhouse gas emissions, but suffer the greatest impacts. Nations across the world are working round the clock to combat and/or increase the resilience of their populations by promoting best adaptation strategies.

The County Government of Lamu is implementing the 'Financing Locally-Led Climate Action' (FLLoCA) program funded by the Government of Kenya, World Bank and other partners, which is an innovative program meant to create resilience at the local (and community) levels to mitigate the impact of climate change. The Participatory Climate Risk Assessment (PCRA) process and subsequent action planning are among the Minimum Performance Conditions (MPCs) for County Climate Resilience Investment (CCRI) grant.

This County PCRA report consolidates the information on climate hazards generated during the ward level PCRA exercise. Major hazards identified during the PCRA process include drought, floods, pest and diseases, resource-based conflicts, windy storm and rising sea level. These hazards have led to increased instances of crop failures, livestock mortalities, water shortage, pests and diseases, destruction of property, loss of vegetation, human displacements and insecurity. At extreme times, these have also resulted in human injuries and loss of lives. Drought was reported as a major hazard in all ten Lamu wards while rising sea level was picked from Kiunga ward.

On climate conditions, the County has a relatively dry and hot climate throughout the year. The average temperature is greater than 25° C throughout the county. The average amount of precipitation for the year in Lamu is 35.2" (894.1 mm). The future climatic scenarios project a rise in temperatures. In Kenya temperatures are projected to continue rising by 1.7° C by the 2050s and by approximately 3.5° C at the end of the century. In response to the increasing temperatures, the sea level off the coast of Kenya is projected to rise. The median climate model projects a sea level rise by 10 cm in 2030, 21 cm in 2050, and 40 cm in 2080. This threatens Kenya's coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs. Precipitation in Kenya is projected to remain highly variable and uncertain. Extreme rainfall events are also expected to increase in frequency, duration and intensity and the proportion of heavy rainfall that occurs in heavy events will increase.
This report has also come up with adaptation strategies and actions that the County will adopt to respond to climate change impacts across all sectors. Various actors across all sectors are expected to join hands in implementing those strategies which have been identified as effective

and sustainable. Proposed actions to address the hazards and their impacts on the community resources and livelihoods will be built on in the County Climate Change Action Plan.

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

1.1 Background

Global atmospheric greenhouse gasses have been on the rise and in 2020, concentrations of greenhouse gasses reached new heights. Real-time data point to continued increases thus continually raising the Earth's temperature. In 2021, the global mean temperature was about 1.1° C above the pre-industrial level (from 1850 to 1900). The years from 2015 to 2021 were the warmest on record (https://unstats.un.org/sdgs/report/2022/Goal-13/)

Climate change and its related impacts have increased over the years, negatively affecting the development agenda. This is particularly true in developing Nations which unfortunately contribute the least to global greenhouse gas emissions, but suffer the greatest impacts. Nations across the world are working round the clock to combat and/or increase the resilience of their populations by promoting best adaptation strategies. Climate change is known to increase disaster risk by altering the frequency and intensity of hazards, affecting vulnerability and changing exposure patterns including flooding, drought, sea-level rise in estuaries, drying up of rivers, poor water quality in surface and groundwater systems, precipitation, water vapor pattern distortions, snow and land ice distribution (Christensen et al., 2007). These effects have devastating impacts on water resources and livelihoods of the communities (AWDR, 2006).

In Kenya, just like in many parts of the world, temperatures have increased throughout the country with increased frequency of extreme weather events, mainly droughts and floods while rainfall patterns have become irregular and unpredictable hence declining livelihoods (Maitima *et al.,* 2009). Ojwang *et al.,* (2010), confirms that droughts degrade the environment, increasing resource conflicts and desertification in the country. The increase in droughts frequency and severity aggravates aridity of the dry lands, making them drier which affects ecosystems balance and impacting on resultant livelihoods (Allen et al., 2010).

Lamu County has been experiencing climate change effects characterized by long-term shifts in temperatures and weather patterns. These shifts may be natural, but since the 1800s, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels (like coal, oil and gas), which produce heat-trapping gases. The population in Lamu County mainly relies on a variety of income generating activities with a bigger percentage mainly

engaged in marginal mixed farming, fishing, pastoral livestock keeping, beekeeping and honey harvesting, tourism, manual labor (Jua Kali artisans including dhow making, carpentry) and trade activities. During floods, farmers turn to floods farming as a means of livelihood. Agricultural activities are also largely practiced in various irrigation schemes.

A number of climate related hazards have been recorded in Lamu County. The most common ones include drought, resource-based conflicts, flooding, pests and diseases, stormy winds and rising sea levels. These hazards have led to increased instances of crop failures, livestock mortalities, water shortage, pests and diseases, destruction of property, loss of vegetation, human displacements and insecurity. At extreme times, these have resulted in human injuries and loss of lives.

Compared to 10 and 20 years ago, droughts have increased both in intensity, frequency and duration with droughts being longer and more intense in recent years. Although the rainfall has decreased significantly in the recent years, the few instances when it rains resulted in serious negative impacts of floods particularly in Mkunumbi and Hongwe wards. More so in Witu ward, villages such as Chalaluma, Moa and Didewaride are mostly affected by floods during such flood seasons. The increase in temperature experienced during drought has resulted in increased prevalence of pests and diseases. Humans experience an upsurge of cases of malnutrition while crop and livestock pests become more active.

Overstocking resulting from influx of livestock from neighboring counties, expansion of settlements (*witemere*) and unplanned developments reduces the tree cover in the rangelands, farms and forests.

In the islands of Pate, Ndau, Kiwayu, Manda and Amu, the impacts of stormy winds have occasionally been devastating. Reports of property destruction, boats capsizing leading to loss of lives among others call for actions to cushion communities from taking risks that expose them and make them more vulnerable. Fishing villages in mainland such as Kiangwe and Kiunga also experience similar impacts of these stormy winds.

In response to climate change effects, the county government of Lamu is responding as follows:

- ➢ The county has established a directorate of disaster management and peace building that carries out disaster response interventions under the disaster risk management Act, 2022.

- ➢ Provided for a drought contingency budgetary allocation under the department of devolution, disaster management and resource mobilization.

- ➢ The county government has also enacted various climate change policies and acts that ensure that the climate change responses are enhanced and mainstreamed in the county plans. Institutions have been set up and strengthened to deal with climate related impacts.

- ➢ Lamu County has established a county climate change fund constituting 2% of the total Annual County Development Budget in addition to donor funding.

The Government of Kenya together with the World Bank, jointly funded the Financing Locally-Led Climate Action (FLLoCA) program, the program outcome is to strengthened county government capacity to plan, budget, implement, and monitor climate mitigation and adaptation action, which is an innovative program meant to create resilience at the local (and community) levels to mitigate the impact of climate change.

Through the grants, counties are incentivized to:

1. Enact the relevant policies and legislations to enable climate finance flows
2. Establish dedicated County Climate Change Fund & Climate Change Unit
3. Establish mechanisms to engage communities in risk assessment & resilience planning
4. Mainstream Climate action and resilience building in county planning and budgeting
5. Increase County investment budgets that promote social resilience outcomes
6. Prepare and implement, in a participatory manner, County Climate Action Plans

The FLLoCA program is being implemented at the county levels, with Lamu County being a beneficiary. FLLoCA will focus on communities identified as most vulnerable to climate change as determined by the vulnerability assessments developed at the onset of the Program. The Program will aim to strengthen local resilience to the impacts of climate change, natural hazards, and other shocks/stressors by building counties' capacity to plan, budget, implement, environment and social sustainability, and monitor climate change adaptation and mitigation actions in partnership with communities.

The counties are expected to benefit from two (2) FLLoCA Grants:

1. **County Climate Institutional Support (CCIS)**

A provision for county governments notably to put institutional arrangements for County Climate Action in place. Meet the Access conditions and score well on the performance measures for the, much larger, County Climate Resilience Investment grant.

2. **County Climate Resilience Investment (CCRI)**

CCRI Grant to fund implementation of the County Climate Action Plans whilst triggering enhanced own county funding for its County Climate Change Fund and mainstreaming of climate action. Changing attitudes and behavior, instilling institutional processes whilst delivering climate action.

All the 47 Counties are expected to conduct a Participatory Climate Risk Assessment across all its wards to determine the levels of exposure to hazards and social vulnerability. This process is expected to provide information necessary for climate action planning processes in the Counties. The PCRA process and subsequent action planning are among the Minimum Performance Conditions (MPCs) for County Climate Resilience Investment (CCRI)

1.2 Policy Context

Nationally, Kenya has made policies and acts in relation to climate change which includes:

The National Climate Change Response Strategy (NCCRS) 2010

The NCCRS was the first document on climate change formulated in 2010. This strategy outlines the country's commitment to climate change mitigation and adaptation. They focus on reducing greenhouse gas emissions, promoting sustainable agriculture and forestry, and building climate resilience. It focuses on mainstreaming adaptation and mitigation plans in all government planning and development processes. The NCCRS laid the foundation for the current climate change response policy and legislative framework in Kenya including the National Climate Change Action Plan, the National adaptation plan, the National Climate change framework policy of 2016 and the National Climate Change Act.

The National Climate Change Framework Policy (2016)

The policy aims to enhance the adaptive capacity and build resilience to climate variability and

change. The policy identifies the adaptive capacity of individuals and communities as key to improving their socio- economic situations. The policy provides guidance on integrating climate change considerations into national planning, resource mobilization, and budgeting processes. They promote sustainable development, renewable energy, public participation, and climate finance management.

The Kenyan National Climate Change Action Plan (NCCAP) 2018-2022

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. NCCAP 2018-2022 has identified seven priority areas, including: 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.

The National Climate Change Act, No 11 of 2016

The Kenyan National Climate Change Act, also known as Act No. 11 of 2016, is a significant piece of legislation in Kenya aimed at addressing climate change. The Act establishes the Climate Change Council, which coordinates climate change activities in the country. It mandates the development and implementation of a National Climate Change Action Plan and establishes a Climate Change Fund to finance climate change initiatives. The Act also establishes a Climate Change Directorate and promotes research and development efforts related to climate change. It requires the integration of climate change considerations across sectors and levels of government, establishes monitoring and reporting mechanisms, and emphasizes public participation and awareness. Overall, the Act provides a legal framework to guide Kenya's efforts in mitigating and adapting to climate change.

The Kenyan Constitution 2010

The Kenyan Constitution of 2010 provides a legal framework for environmental conservation and sustainable development. It recognizes the right to a clean and healthy environment and emphasizes principles of sustainable development, including environmental responsibility. The Constitution assigns responsibilities to the government and individuals to protect and conserve the environment.

Kenya's Vision 2030

Kenya's Vision 2030, a development blueprint recognizes the importance of sustainable development. Within the vision, several initiatives address climate change. These include

promoting a green economy, developing resilient infrastructure, emphasizing environmental conservation, implementing climate change adaptation measures, and engaging in international cooperation. The government integrates climate resilience and mitigation into various sectors, such as renewable energy, agriculture, and disaster risk reduction, to ensure a sustainable and climate- resilient future for Kenya.

The Bottom-up Economic Transformation Agenda 2022-2027

The agenda highlights the environment and climate change agenda as a commitment to reduce emissions by 32% by 2030. Key actions include climate change, impact mitigation and resilience.

National Determined Contributions (2016)

National Determined Contributions (NDCs) are pledges and commitments made by countries in relation to climate change under international agreements like the Paris Agreement. These NDCs outline targets, policies, and measures for mitigating greenhouse gas emissions and adapting to climate change impacts. Most countries submitted their initial NDCs in 2015 and 2016. NDCs cover aspects such as mitigation targets, policy measures, adaptation strategies, and financial and technological support requirements. NDCs can be revised and updated over time to reflect evolving circumstances and ambitions. The Paris Agreement encourages countries to regularly update and enhance their NDCs to strengthen global climate action. Specific details of NDCs vary by country, and it is important to refer to the latest official sources for specific commitments and updates.

Kenya's Climate Smart Agriculture Strategy (2017-2026)

The strategy encourages sustainable agricultural practices, including climate-resilient farming techniques, efficient water management, and soil conservation. It aims to enhance food security while reducing the environmental impact of agriculture.

National Climate Finance Policy- 2018

The National Climate Finance Policy, introduced in 2018, is a framework developed by the Government to guide the allocation of financial resources for climate change initiatives. Its objectives include mobilizing funds, prioritizing climate actions, promoting coherence among stakeholders, ensuring transparency and accountability, promoting innovation in financial mechanisms, and supporting capacity building. The policy aims to increase funds for climate action, allocate them to key sectors, coordinate stakeholders, and ensure effective and accountable use of funds. It varies between countries but generally aligns with national climate goals and international commitments.

The National Adaptation Plan 2015-2030

A National Adaptation Plan (NAP) is a strategic framework developed by countries to address the impacts of climate change and increase resilience. It typically covers a specific time period, such as 2015-2030, and aims to integrate climate change adaptation measures into national policies and programs. Key elements of a NAP include vulnerability assessments, prioritization of adaptation measures, institutional arrangements, financing and resource mobilization, monitoring and evaluation, and capacity building.

The Kenya National Climate Change Finance Framework Policy 2018

The Kenya National Climate Change Finance Framework Policy 2018 is a policy document that guides the allocation and management of financial resources for climate change initiatives in Kenya. It aims to mobilize domestic and international funding, strategically allocate resources, integrate climate change into development plans, establish institutional arrangements, monitor and evaluate climate finance activities, and build capacity. The policy promotes a balanced approach to address climate vulnerability, mitigation, and adaptation, while emphasizing transparency and accountability in managing climate funds. Its goal is to enhance Kenya's resilience to climate change and promote sustainable development.

The Public Finance Management (Climate Change Fund Regulation 2018)

Public Finance Management Regulations focuses on establishing frameworks for managing financial resources dedicated to addressing climate change. They govern the mobilization, allocation, and utilization of funds for climate change mitigation and adaptation. They also outline the governance structure of a climate change fund, criteria for project selection and funding eligibility, and reporting and monitoring requirements. The National Policy for Sustainable Development of Northern Kenya and Other Arid Lands The policy focuses on sustainable land and natural resource management, resilience building, and livelihood improvement in arid and semi-arid regions.

The Environment Management and Coordination Act 2015

The Act establishes environmental standards, promotes sustainable development, and provides a legal framework for environmental management and conservation.

The Agriculture Sector Development Strategy 2010-2020

The Agriculture Sector Development Strategy 2010-2020, in relation to climate change, would have aimed to address the challenges and opportunities posed by climate change in agriculture. It likely emphasized climate-smart agricultural practices to increase productivity, enhance resilience, and reduce emissions. The strategy may have included measures for adaptation, such as promoting climate-resilient crops and water management strategies. Mitigation efforts might

have focused on sustainable land use, improved livestock management, and organic fertilizers. Research, innovation, policy support, and collaboration with various stakeholders would have been important components of the strategy.

The County Government Act, 2012

The County Government Act 2012 in Kenya does not directly address climate change but provides a framework for county governments to address environmental issues. County governments have powers to develop policies, regulations, and strategies related to environmental conservation, including measures to mitigate and adapt to climate change. They can collaborate with other stakeholders, allocate resources, and promote public awareness on climate change. The specific actions taken by each county will vary depending on their priorities and resources.

The National Drought Management Authority Act (No. 4 of 2016)

The Act in Kenya addresses the challenges of drought and climate change in the country. The Act establishes the National Drought Management Authority (NDMA) as a statutory body responsible for coordinating and overseeing drought management and resilience-building efforts. It recognizes drought as a significant impact of climate change and focuses on proactive and integrated approaches to drought management. The Act aims to enhance Kenya's capacity to respond effectively to drought emergencies and promote long-term drought resilience, taking climate change into account.

The Forest Conservation and Management Act 2016

The Act makes provision for the conservation and management of public, community and private forests and areas of forest land that require special protection, defines the rights in forests and prescribes rules for the use of forest land. Section 6 (3) (a) (iii) highlights the need to develop "programmes for achievement and maintenance of tree cover of at least 10% of the land area of Kenya". Section 37 (1) requires every County Government to establish and maintain arboreta, green zones or recreational parks for use by persons residing within its area of jurisdiction. The act is therefore relevant and supports climate change adaptation and mitigation commitments of the Country.

The Energy Act 2019

The Energy Act 2019 has a very broad scope, covering all forms of energy, from fossil fuels to renewables. The Energy Act mandates the government to promote the development and use of renewable energy, including biodiesel, bioethanol, biomass, solar, wind and hydropower. The Energy Act provides a useful supporting framework for the transition to a green economy with likely gains in environmental protection and climate change.

The Water Act (No 43 of 2016)

The water act provides for the regulation, management and development of water resources and water and sewerage services in line with the Constitution. Water Act establishes National Water Harvesting and Storage Authority.

Locally, the County Government of Lamu has made efforts in domesticating the national policies and to this effect, has legislated the following legal frameworks:

i. County Spatial Plan 2016 - 2026

Spatial planning is an important tool to drive proactive, preventive adaptation of human settlements to the hazards caused or exacerbated by changes in climate patterns and extreme events.

ii. **County Integrated Development Plan (CIDP) (2023 -2027)**

The county, through the CIDP, has mainstreamed climate change mitigation and adaptation measures into the various sector plans.

iii. Disaster Risk Management Act 2022.

The Act aims in building resilience to the communities prone to disasters, easy response, and prevent risks of disasters.

iv. Lamu County Climate Change Act (2022)

The act provides the legal framework and mechanisms for mobilization and facilitation of the county government, communities and other stakeholders to respond effectively to climate change through appropriate adaptation and mitigation measures and action for connected purposes.

v. Lamu County Climate Change Finance Regulations (2022)

The regulation defines the procedures for management, operations and winding up the Fund, and for the planning of climate change response interventions to be funded by the Fund.

vi. Lamu County Climate Change Policy (2022)

Provide policy framework for climate change response actions in the county for the community and other stakeholders. The policy aims at enhancing adaptive capacity and resilience to climate change and promotes low carbon development for the sustainable development of Lamu County.

vii. Lamu County Draft Forest Policy 2023

The forest policy provides a framework for improved forest governance, Resource allocation, partnerships and collaboration with national and county governments and with non-state actors to enable the sector to sustainably contribute to Lamu County and Kenya development

goals.

viii. Lamu County Forest and Landscape Restoration Action Plan (LAMU-FOLAREP) 2021-2030

The document outlines priority actions for the ten-year period in an effort to restore County's degraded forests and other landscapes with the aim of enhancing their capacity to provide services that sustain the livelihoods of the dependent communities.

1.3 Purpose of the PCRA Report

The Lamu County Climate Change Action Plan was undertaken to determine all the risks and social vulnerabilities the communities are exposed to. Lamu County conducted a participatory climate risk assessment exercise across all the 10 wards between 16th and 19th May 2023. The PCRA report is critical as it will help the County Government of Lamu, local communities and development partners apply local knowledge, best adaptation strategies and information on climate change, in a way that best suits the local communities' specific needs and situations. The report also serves to inform the ongoing and planned programs and projects and to encourage mainstreaming of climate change actions across various sectors.

1.4 Key steps in the county's PCRA process

The PCRA process began with the formation of a technical working group on 3rd of May, 2023. The technical team then conducted a stakeholder's analysis on 4th of May 2023 leading up to a stakeholders consultative meeting on 8th May 2023 at the County headquarters boardroom.

The Lamu County PCRA technical team then went through a 4-day Training between 11th to 14th May, 2023 at the Royal Park hotel, Mpeketoni before being split into 5 teams to cover the 10 wards in a period of 4 days. During the training, the PCRA process was broken down into successive steps, using simple but structured methodology allowing data collection even from the most vulnerable community groups. The PCRA process followed the locally led adaptation principles, community engagement at all ward levels, in identifying their adaptation needs, vulnerabilities and priorities. Contextualization, community adaptations to the specific environmental, social and cultural context of the local community. Inclusivity, the PCRA process ensured the participation of marginalized groups, including women, youth and indigenous people in the decision-making process. Sustainability, ensure that adaptation measures are sustainable in the long term, considering the local economic, social and environmental aspects. Knowledge Integration, the community integrates the traditional and local knowledge with scientific information to inform adaptation strategies.

Before the actual data collection which began between 16th and 20th May 2023, the county director in charge of Climate Change made logistical arrangements including gathering all necessary materials necessary for data collection. He shared with the technical teams all the relevant materials including data collection sheets, key reference documents and other necessary materials to be used in the field. The director and the Chief Officer directly worked with the ward administrators to agree on the list of the participants to participate in the process including local actors that was socially inclusive, and included TWG members, Area MCAs, county administration, Local leaders, village elders, field monitors, youth representatives, religious leaders, women representatives and members of the vulnerable/marginalized groups among others.

Actual data collection then went on concurrently across the entire county, with the teams taking two days per ward. Data was collected in line with the PCRA guidelines and training manual.

Following the completion of the field data collection, the technical team then gathered at Royal Park hotel in Mpeketoni between 23rd and 26th of May, 2023 to consolidate the ward level reports into a single Lamu County PCRA report.

The technical multi sectoral working group with other stakeholders then embarked on the preparation of Lamu County Climate Change action plan. The CCCAP and PCRA reports were presented for the stakeholders validation before they were submitted to the Executive and the County Assembly for approval/ adoption.

2. County Climate Hazard Profile

2.1 Current and Historical Climate Hazards and Trends

Lamu is county number 005 from the 47 counties of Kenya. It is located in Kenya's coastal region (among the 6 coastal counties) and covers an area of 6,273 km2. It covers a strip of Northeastern mainland and numerous islands; Amu, Manda, Kitau, Patte, Kiwayu, and Ndau. The county has a total population of 143,920 according to the 2019 census. The dominant tribe in Lamu is the Bajuni though there are other tribes such as the Mijikenda, Orma, Somali, Aweer (Boni), Kikuyus. It has 23 locations and 38 sub locations.

Lamu is divided into two constituencies namely; Lamu-West and Lamu-East. Lamu East borders Tana River County in the Southwest, Garissa County to the North, the Indian Ocean to the East and the Republic of Somalia to the Northeast. There are different wards found in the constituencies. Lamu-West is made up of Witu, Mkunumbi, Hindi, Hongwe, Bahari, Mkomani and Shela wards whereas Lamu-East consists of Faza, Kiunga and Basuba.

Lamu County is characterized by a predominantly hot and arid climate. The mean annual temperature exceeds 25° C throughout most of the county, while the average annual rainfall for the entire county stands at approximately 900mm. notably, the central regions experience the highest levels of rainfall, often surpassing 1000mm per year. In contrast, the northeastern areas receive an average annual rainfall ranging between 500 and 1000mm, and a specific southern pocket encounters the lowest average annual rainfall of less than 250mm in certain locations.
The county faces significant challenges posed by drought, dry spells and heat stress, which greatly contribute to agricultural risks. Droughts in the region adversely impact not only crop and livestock production but also other water-dependent activities such as honey production, fishing, and wildlife preservation, as highlighted in the report.

Based on the community participatory climate risk assessment conducted in the 10 wards of Lamu County, the following hazards were identified and prioritized based on their frequency and severity of impact on people and resources. In Shella Ward, the prioritized hazards were drought, storms, and pests and diseases. Basuba Ward prioritized drought, livestock diseases, and human-wildlife conflict. Hindi Ward identified drought, human diseases, and crops/livestock pesticides and diseases as the prioritized hazards. Hongwe Ward prioritized drought, floods, and conflict. Kiunga Ward prioritized drought, livestock diseases, and rising sea levels. Mkomani Ward prioritized drought, strong winds, and increased pests and diseases. Bahari Ward identified drought, resource-based conflicts, and pests and diseases as the prioritized hazards. Mkunumbi Ward prioritized drought, conflict (resource-based and human-wildlife), and floods. Faza Ward prioritized drought, increase in pests and diseases, and strong winds. Finally, Witu Ward identified drought, human diseases, and crops/livestock's pesticides and diseases as the prioritized hazards. These prioritized hazards reflect the community's assessment of the highest

levels of vulnerability and risk in their respective wards.

Floods and drought

Climate change is becoming one of the most serious development threats in Lamu county. The county is already highly susceptible to climate-related hazards, and in all wards, extreme events and variability of weather are now the norm; rainfall is irregular and unpredictable; droughts have become more frequent and severe floods during the rainy season. For example, in 2017 drought left more than 50,000 residents and approximately 300,000 livestock at the verge of starvation, whereas some areas namely Bonini, Kiunga and Merina in Lamu East experienced floods that displaced about 500 families.

Conflicts and diseases

Human-human conflicts and Human -wildlife conflicts. The availability of the grazing reserves and ranches in the county attracts livestock from neighboring counties of Garissa and Tana River, sometimes causing resource use conflicts. This increases incidences of Foot and Mouth Disease (FMD), Lumpy skin disease (LSD), Contagious Bovine Pneumonia, Contagious Caprine Pleuropneumonia (CCPP), and Peste des Petits Ruminants (PPR). East Coast Fever (ECF) is introduced by hay infested by ticks that is imported from other counties in the Rift Valley.

Historical climate hazards and trends for Lamu County in Kenya include various factors that have impacted the region over time. Some of the notable climate hazards and trends in the area which were identified by the community members are as follows:

1. Temperature Rise: Lamu County has experienced a general increase in temperatures over the years. Rising temperatures usually cause heat stress, increased evaporation rates, and affect agricultural productivity.

2. Drought: The County has a history of recurrent droughts, which have severe implications for water availability, agriculture, and livestock. Droughts have caused food and water shortages, livestock deaths, and increased vulnerability among local communities. It was pointed out by the community members; insufficient rainfall caused by failed rainy season or below normal rains usually leads to crop failure and scarcity of fodder for livestock, resulting in food insecurity and economic losses for farmers and pastoralists.

3. Floods: Lamu County is also prone to periodic flooding, especially in low-lying areas and along riverbanks. Heavy rainfall events, often associated with tropical storms, have caused significant damage to infrastructure, homes, and agricultural lands.

4. Sea Level Rise: Coastal areas in Lamu County are particularly vulnerable to sea-level rise. As global sea levels increase, coastal erosion, saltwater intrusion into

freshwater sources (like Lake Kenyatta), and coastal inundation have become significant concerns.

5. Coastal Erosion: The County has experienced coastal erosion due to a combination of factors such as sea-level rise, wave action, and human activities. Erosion has led to the loss of land, damage to infrastructure, and displacement of coastal communities.
6. Changing Rainfall Patterns: The County has witnessed variations in rainfall patterns, including changes in the timing, intensity, and distribution of rainfall. Shifts in rainfall patterns affected agriculture, water availability, and the overall ecological balance in the region.

2.2 Exposure and vulnerability profiles of the county

Vulnerability refers to the degree to which an asset or population group is susceptible to climate change hazards. In order to determine the vulnerability status of a community and its environs, the following exercises were conducted from all 10 wards in Lamu county:

The community members grouped their resources into five major classes as outlined below:

1. Natural resources: The resources that communities rely on include forests, water bodies, air quality, soils, arable land, mangroves, Lakes, rivers, wildlife, swamps, and the ocean.
2. Physical resources: This category encompasses infrastructure for transportation, water management, energy, and communication, such as roads, hospitals, dwellings, water tanks, schools, wells, boreholes, religious units, and administrative units.
3. Economic and financial resources: This class includes income generated from the sale of agricultural products, mining, farming, and livestock rearing.
4. Social resources: This category encompasses local community groupings, cooperatives, trade unions, families, and other social support networks.
5. Human resources: This class includes the skills, knowledge, capacity, and good health crucial for livelihood pursuits, including agricultural and leadership skills, as well as gender-specific knowledge.

These exercises were undertaken by the community with guidance from the TWG to assess the vulnerability status of the community and its surrounding areas. By categorizing and examining the various resource classes, a comprehensive understanding of the vulnerability to climate change hazards was achieved.

Drought

Drought poses the most severe climatic threat to Lamu County, with detrimental impacts on its vital resources. The communities have expressed that farming and pastoralism bear the brunt of this threat, causing substantial negative effects on arable land and diminishing crop yields due to the depletion of soil moisture. Furthermore, the adverse effects of drought

as a consequence of the high evapotranspiration rate. Only a limited number of resources experience minimal effects from drought, while the most significant ones, which sustain the livelihoods of the Lamu communities, are profoundly affected.

Pest and Diseases

The second hazard with significant implications for the livelihoods of the people in Lamu is the occurrence of pests and diseases, affecting both crops and livestock. Historically, diseases were more prevalent during the rainy seasons; however, there has been an increase in disease incidents during prolonged drought periods and unpredictable rainfall patterns. Disease outbreaks pose a considerable threat to human health, particularly affecting vulnerable groups such as children and the elderly. Moreover, pastoralists bear the brunt of these outbreaks as their livestock succumb to chronic diseases, exacerbated by insufficient pasture resulting from pest infestations in grazing lands.

Resource based and human wildlife conflict

Conflict stands as the third major concern and hazard in the county, exerting a significant impact on arable land and compromising access to this crucial resource during incidents. Additionally, pastoralism, serving as a vital livelihood activity, faces high vulnerability to conflict, leading to the loss or destruction of livestock. Wetlands, known for their fragility, are also prone to the repercussions of conflict, often resulting in the encroachment of displaced individuals into these sensitive ecosystems. Furthermore, conflict disrupts the overall security situation within the county, as wildlife encroachment upon community settlements in search of water hampers the regular course of daily activities.

Floods

The impact of floods on arable land is evident through the destruction of crops caused by submergence. Additionally, flash floods contribute to soil erosion, thereby diminishing the productivity of arable land. Moreover, floods can have significant implications for the security situation within the wards. The inundated environment becomes favorable for bandits, attracted by the abundance of water and the limited accessibility to their hideouts. Consequently, the security situation becomes more vulnerable to attacks from various extremist groups during flood periods. Furthermore, the community itself is highly vulnerable to or impacted by floods. Limited and overstretched resources characterize this period, exacerbating the challenges faced by the community. Floods have had devastating impacts on water sources, leading to pollution and an increase in waterborne diseases. Additionally, dwelling units have been subjected to destruction due to flooding.

Storm and rising in sea level

The rising sea level can be attributed to the melting of ice caps caused by global warming. Although this hazard was not initially prioritized as the most prominent disaster in Lamu County, it has had a significant impact on specific wards, notably Kiunga Ward and Shella Ward, as indicated in the accompanying graph. Kiunga community has tragically experienced the loss of lives and resources located near the sea shores due to the absence of well-structured sea walls in Kiunga and Ndau. In Shella Ward, houses

and properties have been damaged by powerful stormy winds. When fundamental assets of the community are affected, a majority of households face increased vulnerability, leading to the loss of income streams and other sources of livelihood. These impacts are pervasive across communities but are particularly felt by the most vulnerable members, including the elderly, women, people with disabilities, and children.

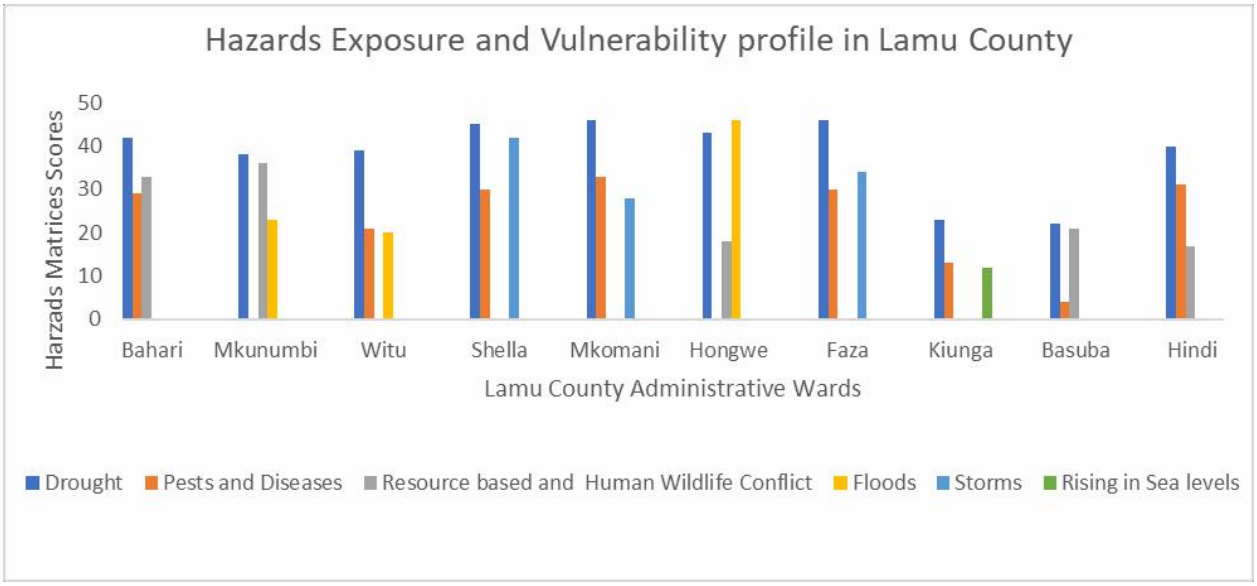


Figure 1: *Hazards exposure and vulnerability*

2.3Differentiated impacts of climate trends and risks

Lamu County residents rely heavily on agriculture, livestock and fishing for their livelihoods. However, climate trends and risks have had different impacts on Lamu County. The graph below gives a summary of the community perception on distribution of the impacts of climate related hazards on the assets and resources they rely on as major sources of livelihood.

Table 1 A discussion on differentiated impacts of climate trends on assets and resources

Hazards	Differentiated impacts of climate trends on assets and resources
Drought	Lamu County is classified as a Semi-arid county. Drought was reported as a major hazard in all ten Lamu wards. Due to this climatic condition, the impacts of drought on sources of livelihoods are greatly significant. The occurrence of climate change has worsened the situation. Further, drought has a significant effect on the country's economy, particularly on agricultural production, livestock farming, and fishing which are the main sources of income for many households. Water scarcity and food shortage also affects access to human basic needs, which in turn lead to health problems and resource-based conflicts.
Pests and Diseases	Climate change and its associated risks, such as droughts and floods, can have significant impacts on the prevalence of pests and diseases as reported by the communities. As vast categorized from agricultural, livestock to human health. Pest and disease is ranked the second prevalent hazard having been prioritized in 8 out of the ten wards. Waterborne diseases, such as cholera and typhoid, are common during floods, while droughts can lead to malnutrition. In livestock farming for example, foot and mouth disease is more prevalent during drought season. The changing climate has further greatly affected pests in crop farming.
Resource based conflicts	Climate change and its associated risks, such as water scarcity and reduced pasture for both livestock and wildlife consumption. This has over time led to resource based (Human-human) and Human-Wildlife conflict. Such conflicts have been occurring as a result of competition for the same resources, such as water and land. From the Lamu communities' perspective, this hazard is ranked as the third most affecting the county as it was prioritized in 5 out of the ten administrative wards of Lamu.
Floods	Heavy rainfall can cause flooding in Lamu County, particularly in low-lying areas such as Mkunumbi, Hongwe, Witu and some parts of Hindi ward. Floods can lead to the destruction of crops and property, displacement of communities, and loss of lives. Soil erosion is also a significant problem in the mentioned wards, where loss of topsoil, reduced soil fertility, and decreased agricultural productivity due to floods have been witnessed over time
Storms	Climate change and its associated risks, such as show line storms, have been increasing over time. From the survey done, (Figure 1), storms were prioritized in Mkomani and Shella wards. This has had and is continually having a significant impact on fishing and mangrove existence. This intern affects the community's livelihoods.
Rising Sea Levels	Rising sea level was reported and prioritized as a significant hazard in Kiunga ward. This has had a serious impact on settlements, physical infrastructure and livestock farming in the ward. This has in turn affected the livelihood of the Kiunga residents.

Waste management	Waste management, both Liquid and solid, was earmarked as one of the potential rising hazards. Though not prioritized in any of the wards as a major hazard, it came out clear as a strong potential hazard across the entire County. The community members pointed out that the main assets and resources affected by this hazard include fishing, human health and livestock production.

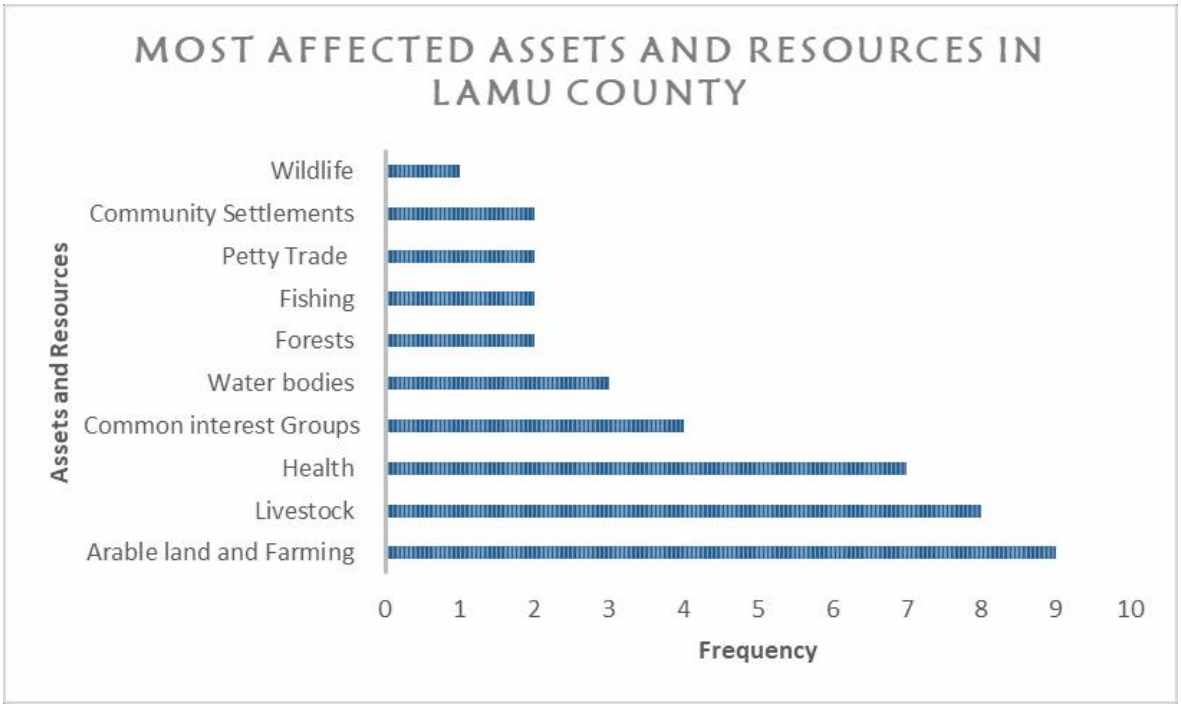


Figure 2: *A graph showing how severe Assets and Resources have been affected by the prioritized hazard*

The provided graph offers a comprehensive overview of the implications of climatic risks and trends on various assets and resources over time. It serves as a summary of the community's perception regarding the severity of climate change impacts on their resources, consequently affecting their livelihoods. Notably, the graph highlights the significant detrimental effects experienced in agricultural and livestock farming, which serve as the primary sources of livelihood. Following closely are the impacts on human health and the existence of common interest groups such as NGOs, CBOs, BMUs, and youth groups, which directly influence the residents' livelihoods. However, it is worth mentioning that the effects of these hazards on fishing, a key economic and livelihood activity in Lamu, were not clearly discernible across the majority of wards based on the data presented. However, existing literature indicates that prolonged droughts and alterations in rainfall patterns have had a profound impact on fishing.

These changes have resulted in the extinction of certain fish species and a decline in the overall volume of fish.

2.4 Spatial Distribution of Risks

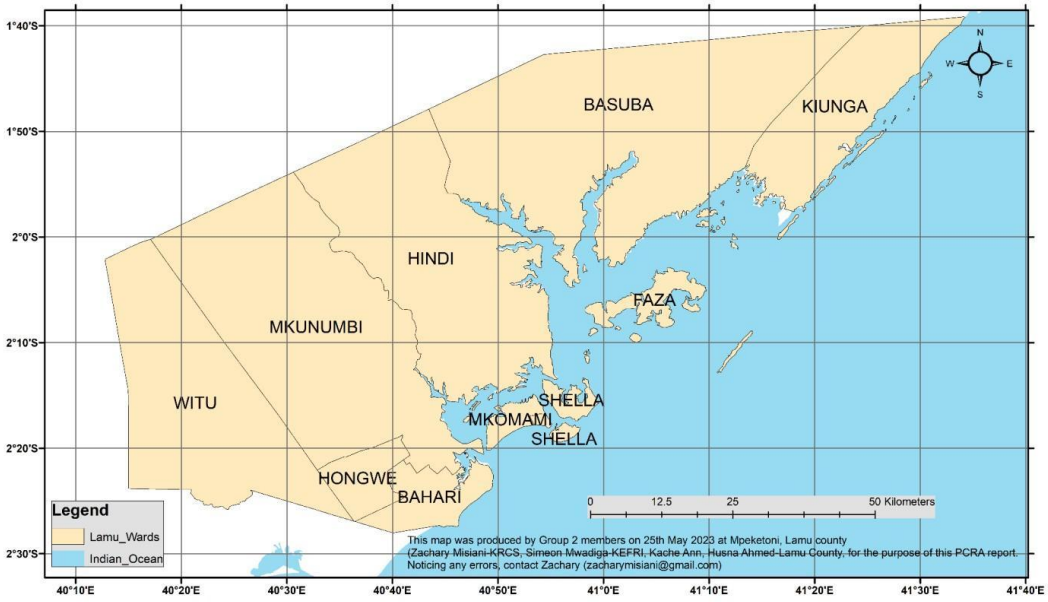
There are various resources found in this county starting from the natural ones to human resources. The following table indicates some of the resources found in this county:

Natural	Indian Ocean, forests, land, grazing fields, minerals, arable lands
Physical	Houses, schools, hospitals, religious units, roads, administrative units
Economic	Fishing, farming, mining, quarrying, livestock rearing, trade
Social	Education, religion, health, administration, security
Human	Skills, security, health, knowledge, faith

Figure 3: Lamu resources

Lamu County wards

Lamu Wards


BASUBA
KIUNGA
HINDI
FAZA
MKUNUMBI
WITU
SHELLA
MKOMAMI
SHELLA
HONGWE
BAHARI
N
W
E
S
0
12.5
25
50 Kilometers
Legend
Lamu_Wards
Indian_Ocean
This map was produced by Group 2 members on 25th May 2023 at Mpeketoni, Lamu county
(Zachary Misiani-KRCS, Simeon Mwadiga-KEFRI, Kache Ann, Husna Ahmed-Lamu County, for the purpose of this PCRA report.
Noticing any errors, contact Zachary (zacharymisiani@gmail.com)
1°40'S
1°50'S
2°0'S
2°10'S
2°20'S
2°30'S
40°10'E
40°20'E
40°30'E
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40°50'E
41°0'E
41°10'E
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41°30'E
41°40'E

Lamu West Sub County

Witu ward: The ward number is 0109 and covers 975.40km^2 with a population of 13,105. The ward comprises Chalaluma, Moa, Pandanguo and Witu sub locations. The main resources/activities affected in the ward are farming and livestock rearing, human health, fishing and lastly petty trade respectively. These resources/ activities are mostly affected by drought, human/crop/livestock pests and diseases and floods, with drought having the most adverse impacts on the resources/activities.

Mkunumbi ward: This ward covers an area of 1428.50km^2. The ward number is 0107 and has a population of 11,724. It is made up of Mkunumbi, Mapenya, Uziwa and Ndambwe sub-location of Lamu County. It borders Hindi to the East, Hongwe to the South, Witu to the West and Bahari wards to the Southeast. Based on the PCRA report, the prioritized hazards (drought, human-wildlife conflict and floods) affect mainly farming, arable land, pastoralism, community and security. Farming and arable land being the most affected followed by pastoralism then thirdly; community and security.

Hindi ward: It is ward number 0106, neighboring Mkunumbi and Basuba. This ward has a population of 10700 and covers 1,150.80km^2. It is composed of Hindi, Bargoni, Mokowe, and Kilimani sub locations. In Hindi the most affected resources/activities by the prioritized hazards are farming, livestock rearing, human health, fishing then petty trade. The farming and livestock rearing activities are the most affected, followed by human health and lastly fishing and petty trade. From the PCRA report the hazards affecting this ward with the highest priorities are drought, human/crops/livestock pests and diseases and human-human/wildlife conflict respectively.

Hongwe ward: 0108 is the ward number of the Hongwe ward. It has a total population of 9,097, covering an area of 128.50km^2 and composed of the Hongwe and Bomani sub-locations. The first three *resources*/activities mostly affected are swamps, farming, livestock rearing, wildlife, arable land, wells and forests. The hazards identified that are likely adversely affecting these resources are floods, drought and human-human/wildlife conflicts. Floods are the first hazard that affects all the resources with the highest magnitude and frequency, followed by drought and lastly the conflicts swamps, livestock rearing and farming are the most affected ones, wildlife then arable land, forests and wells follow.

Bahari ward*:* The ward covers an area of 170.80km^2 with a population of 15706. It is ward number 0110 and comprises Bahari, Tewe, Kiongwe and central sub locations. This ward is faced mostly by drought, human-human/wildlife conflict and human/crop/livestock pests and diseases. These hazards mainly affect farming and arable land, Lake Kenyatta, lastly is livestock, forests, livestock

and human health taking the third place.

Mkomani ward: The ward is generally flat and lies between zero to 50m above the sea level covering 172.km^2. This ward comprises four sub locations; Mkomani, Langoni, Matondoni and Kipugani. Some of the villages found in Mkomani sub location are; India, Wiyoni, Swafaa, Mtaamwini, Gadeni, Bombei, Kashmir and those that are found in Matondoni sub location are Kisisi, Kwa Guyo, Kaloleni, Bwajumaa. It has a total population of 24,328. The main hazards identified in this ward are drought, strong winds (storm) and human/crop/livestock pests and diseases respectively.

Shella ward: The ward is located near Mkomani ward and its number is 0079. It has a population of 43,434 covering an area of 54.70km^2 and comprising Shella area. The most affected resources/activities in this ward are farming/arable land, livestock rearing and health take the second place then followed by business/trade. The prioritized hazards here are Drought, stormy winds and human/crop/livestock pests and diseases respectively in terms of frequency and magnitude.

Lamu East Sub County

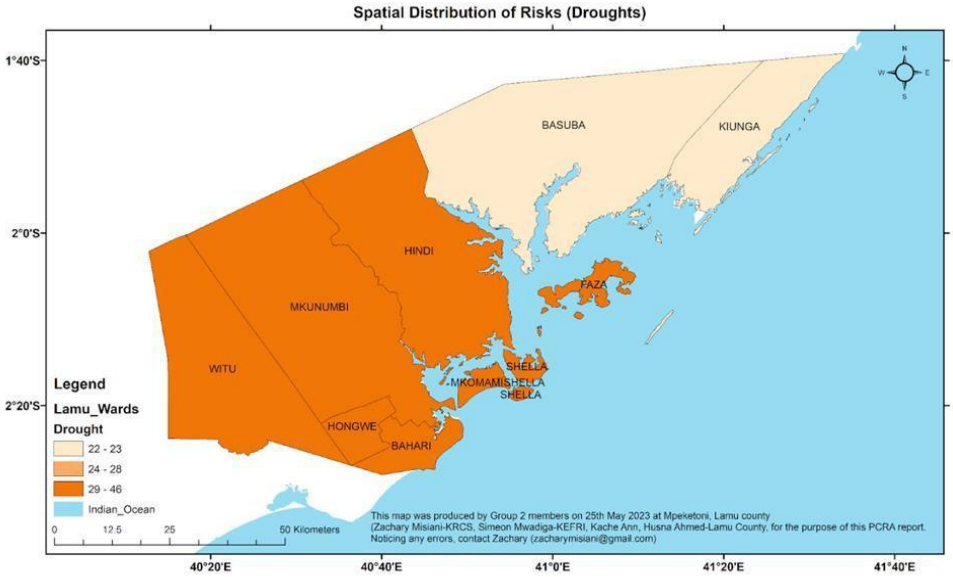
Faza ward This ward covers an area of 9080km2 and is ward number 0101 and has a total population of 13,524. It comprises Pate, Siyu, Tchundwa, Myabogi, Kwatongani, Kwatini, Mtangawanda, Bahamisi, Shanga Ishakani, Mbwajumwali and Kizingitini sub locations. It is largely populated by the Bajuni community and other minority communities are Akamba, Meru, Mijikenda, Kikuyu. These communities are present largely due to intermarriages, business and employment opportunities. From the PCRA report of this ward, the hazards that mostly affect the community is drought as the leading hazard, human/crop/pests and diseases being number two and strong winds (storm).

Kiunga ward This ward covers 513.5km^2 and its total population is 3,351 people, 1,431 females and 1920 male. It has 8 villages namely; Kiunga, Kiwayu, Mwambore, Ndau, Mkokoni, Madina and Ishakani. The ward borders the Republic of Somalia to the North, Basuba ward to the west, Faza ward to the Southwest and Indian Ocean to the East. The most dominant community found in this ward is the Bajuni. The most affected livelihood resources/activities are livestock rearing and families, arable land, water resources and NGOs, lastly; Indian Ocean, settlements, CBOs, Human skills and health.

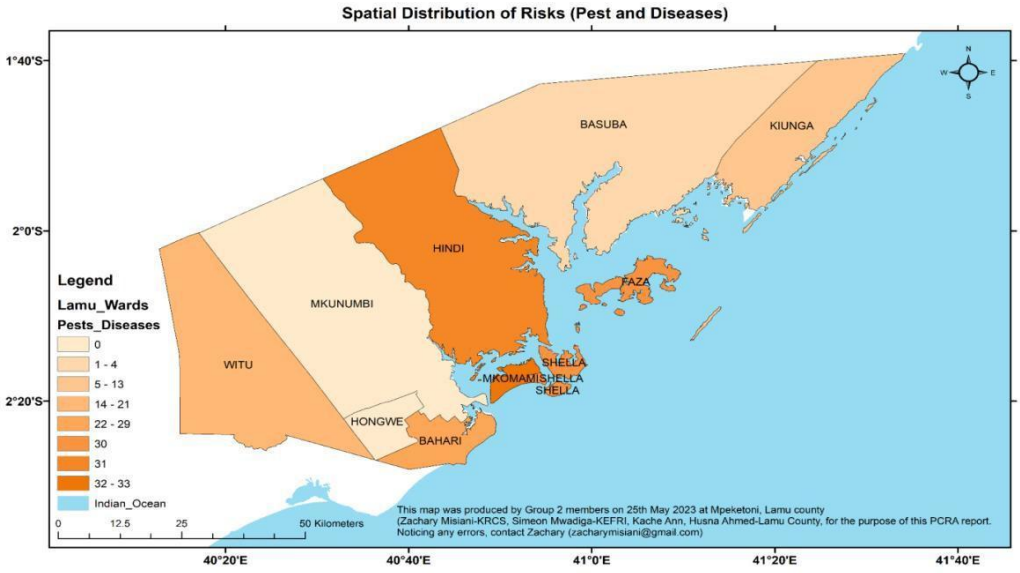
Basuba ward It is ward number 0103 covering an area of 1,708.7km^2. The total population of this

ward as of the recent census is 1,502 and is composed of Mararani, Mangai, and Milimani sub-location of Lamu County. According to the vulnerability matrix of this ward, drought, human-human/wildlife conflict and human/crop/livestock pests and diseases are the prioritized hazards. They affect mainly; livestock keeping, farming as economic activities and Community Based Organizations (CBOs), followed by terrestrial forests and water resources and lastly; farms/arable lands and human skills.

Spatial distribution of risk based on the hazards matrices scores as per the community perception during data collection exercises.



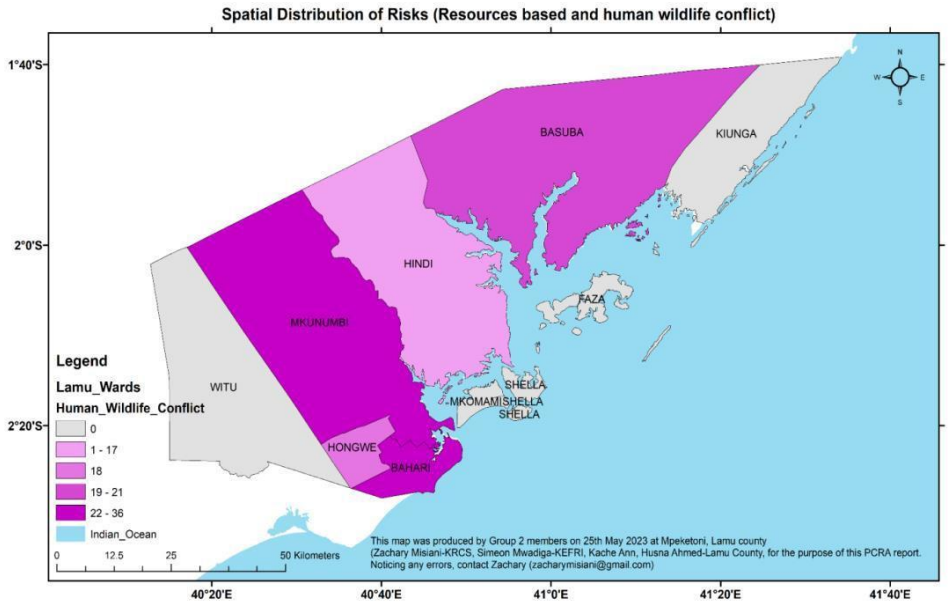
Response from the community members who participated in the ward level PCRA confirmed that drought is the major hazard affecting the entire county. This was reported as a priority hazard across all the ten administrative wards. The map above shows the spatial distribution of drought matrices in Lamu county.



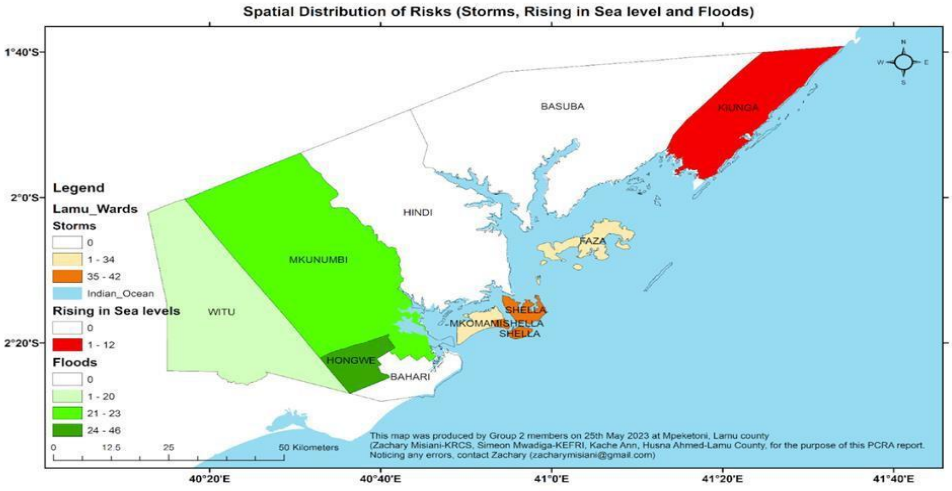
The map above shows the spatial distribution and prevalence of pest and disease hazard in Lamu County. As reported by the interviewed community members, this was the second most severe hazard, from Drought, having been prioritized in eight out of the ten County Wards. Its intensity is significant for it affects all the three main social-economic

factors, ie Human health,

Agricultural production and Livestock production.



Resource based and Human wildlife conflict is one of the hazards that was prioritized by the interviewed community members. This was reported in five out of the ten wards of Lamu with more intensity in Bahari, Mkunumbi, and Basuba wards. The map above shows the distribution of the hazard across Lamu County.



The map above represents spatial distribution of Floods, Rising in sea level, and Storms and strong winds. Floods as one of the identified hazards affects mostly Hongwe followed by Mkunumbi and Witu. Though the rest of the wards are also affected by this hazard, it was not prioritized as a key one affecting the livelihoods activities. Further, Rise in sea level is mostly witnessed in Kiunga ward whereas storms and strong winds were reported and prioritized in Faza, Shella and Mkomani wards. This is per the community responses. From the technical expert opinion, this is attributed due to the strong south easterly monsoon winds.

3. Future Climate Scenarios for Lamu County

3.1 National and downscaled climate change projections

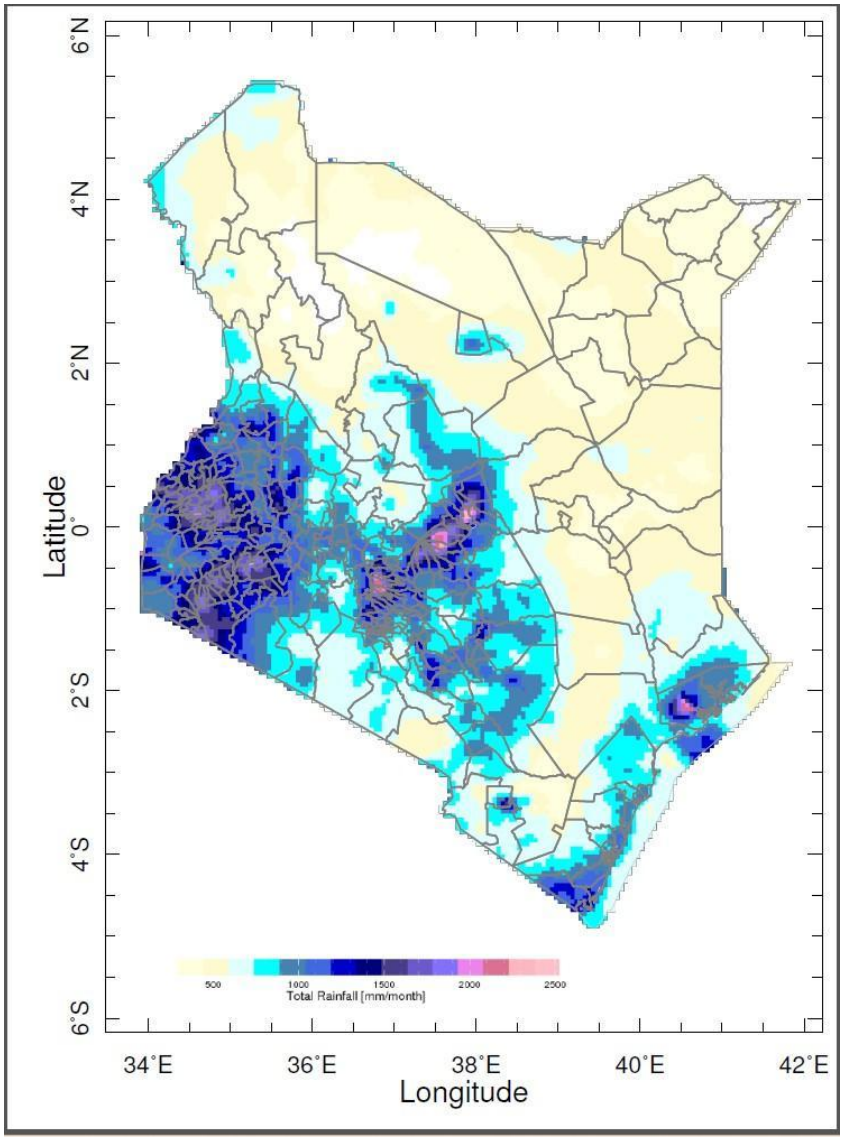


Figure 1: Climatological spatial distribution of the rainfall in Kenya- KMD[4]

Kenya is characterized by a dipole rainy season consisting of two distinct periods of rainfall. The long rains occur from March to May when the Inter-Tropical Convergence Zone (ITCZ) moves northwards, while the short rains take place from October to December as the ITCZ retreats

[4] KMD Map Room (meteo.go.ke)

southwards[5]. The strength and timing of these rains vary significantly across different regions and from year to year. Rainfall amounts range from over 2000mm/year in certain areas to less than 300mm/year in the arid northern regions. Droughts and floods are the most significant climatic hazards in Kenya, with approximately 23 million people affected by a widespread drought in 1999. Additionally, El Niño events have a substantial impact on Kenya's climate, resulting in increased rainfall and flooding. Kenya's diverse topography further contributes to its varied climate, with the coastal regions being hot and humid, inland areas exhibiting more temperate conditions, and the northern and northeastern areas, including Lamu County, characterized by hot and arid climates.

The western, central and coastal regions, which occupy less than 20% of the country, houses nearly 90% of the country's population, and includes productive agricultural land which is principally rain-fed. Kenya also has a diverse natural resource base, which includes forests, wetlands, drylands, aquatic and marine resources. The country's natural resource base is under increasing strain from population pressures, coastal erosion, deforestation, poor land management as well as seasonal variability and climate change. These pressures threaten the country's unique biodiversity, local livelihoods and long-term food security for a significant segment of the Kenyan population.

Given its diverse topography, temperatures across the country vary significantly, with the highlands experiencing much cooler temperatures compared to the coastal and lowland zones[6]. Little seasonal variation in temperatures has been observed, with average temperatures ranging between 18°C at the higher elevations to 26°C along the coast. Rainfall varies considerably across the country, with less than 250 millimeters (mm) falling in the arid zones of north, to over 2,000 mm in the west annually. The highland areas, where the majority of agricultural activities take place, receive approximately 1,000 mm of rainfall each year[7]. The seasonal migration of the ITCZ define four distinct seasons in Kenya, dominated by two rainfall periods: January to March, which is generally considered the 'warm dry season', April to June known as the 'long wet season', July to September the 'cool dry season', and October to December as the 'short wet season

[5] The Inter-Tropical Convergence Zone, is the region that circles the Earth, near the equator, where the trade winds of the Northern and Southern Hemispheres come together. The intense sun and warm water of the equator heats the air in the ITCZ, raising its humidity and making it buoyant. Aided by the convergence of the trade winds, the buoyant air rises. As the air rises it expands and cools, releasing the accumulated moisture in an almost perpetual series of thunderstorms. Seasonal shifts in the location of the ITCZ drastically affects rainfall in many equatorial nations, resulting in the wet and dry seasons of the tropics rather than the cold and warm seasons of higher latitudes. Longer term changes in the ITCZ can result in severe droughts or flooding in nearby areas

[6] Republic of Kenya (2013): National Climate Change Action Plan, 2013 – 2017: Vision 2030.

[7] National Environment Management Authority (2015): Kenya- Second National Communication to the United National Framework Convention on Climate Change

Table 1: Data Snapshot: Summary statistics

Climate Variables	1901-2020
Mean Annual National Temperature (°C)	24.3 (°C)
Mean maximum National annual temperature (°C)	30.3 (°C)
Mean minimum National annual temperature (°C)	18.3 (°C)
Mean annual National Precipitation (mm)	668.6 mm

The county experiences no marked variation in temperatures with annual temperature ranging between 23°C and 32°C. The high temperatures are experienced from December to April while low temperatures occur from May to July[8].

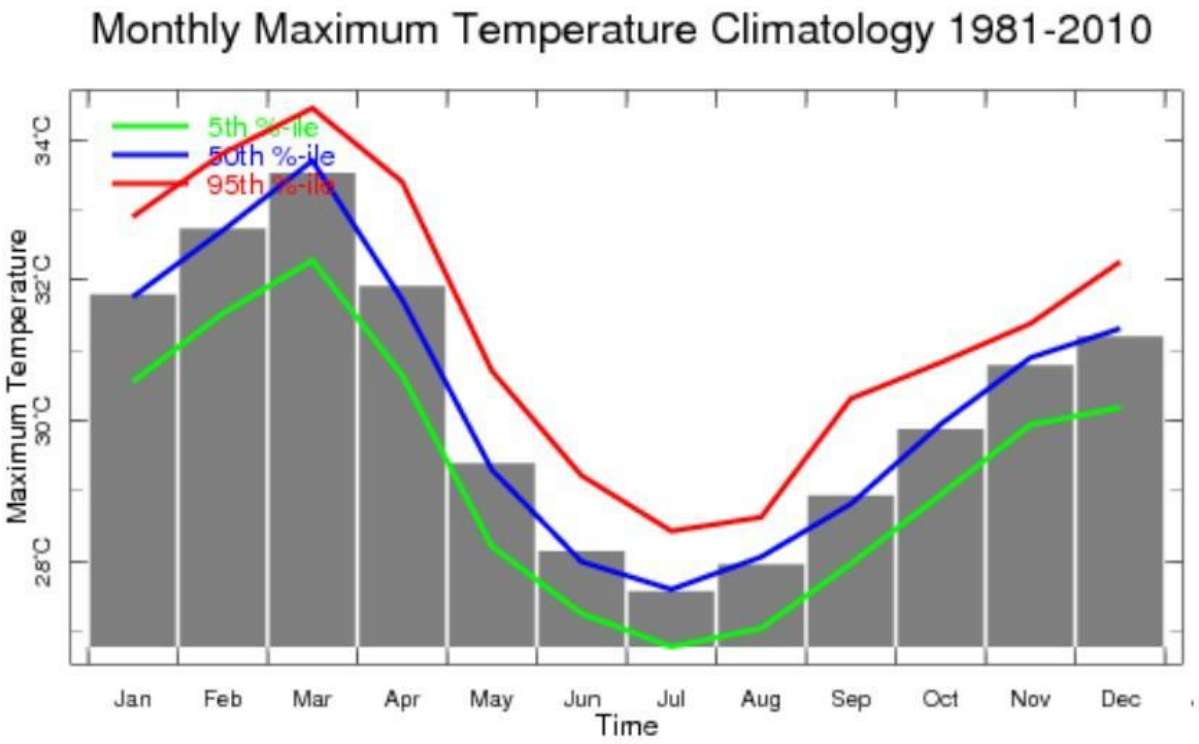


Figure 2: Annual maximum temperature variation for Lamu. (KMD).

The annual mean temperature in the county is 27° C.

[8] Lamu County Drought Contingency Plan 2022

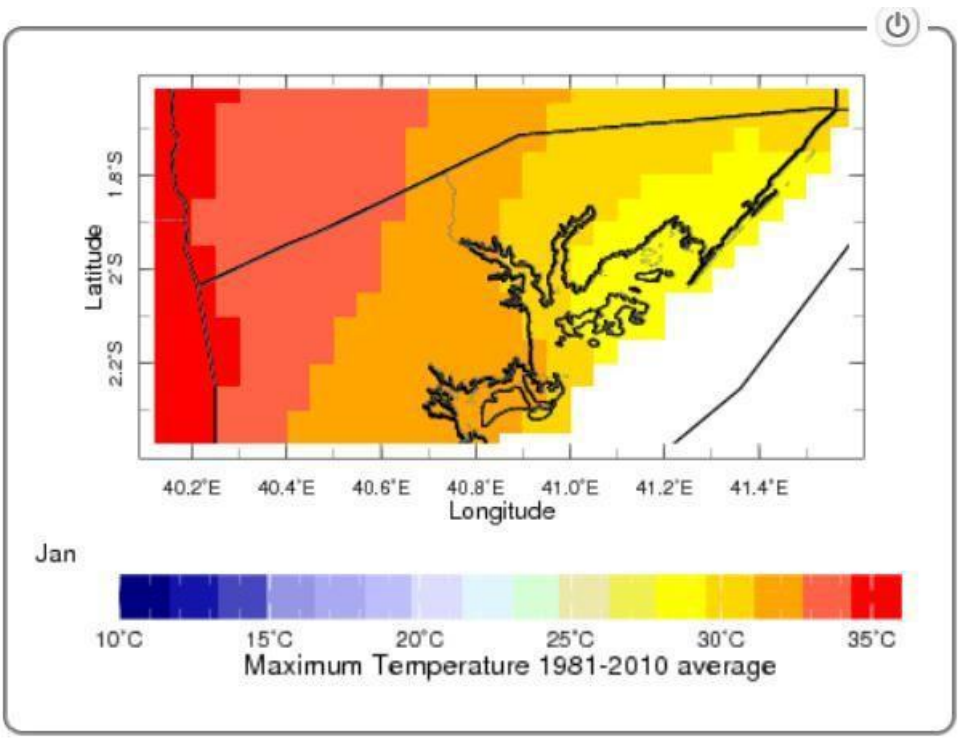


Figure 3: Spatial temperature variation for Lamu. (KMD).

There is a bimodal rainfall pattern (greatly influenced by the Monsoon winds) with long rains occurring from mid-April to the end of June with the highest rainfall recorded in the month of May. The long rains agricultural output accounts for 80 per cent of the annual crop production. Light showers occur in July and decrease from August. Short rains occur in the months of November and December and are generally unreliable. The months of January to March and August to October are usually hot and dry.

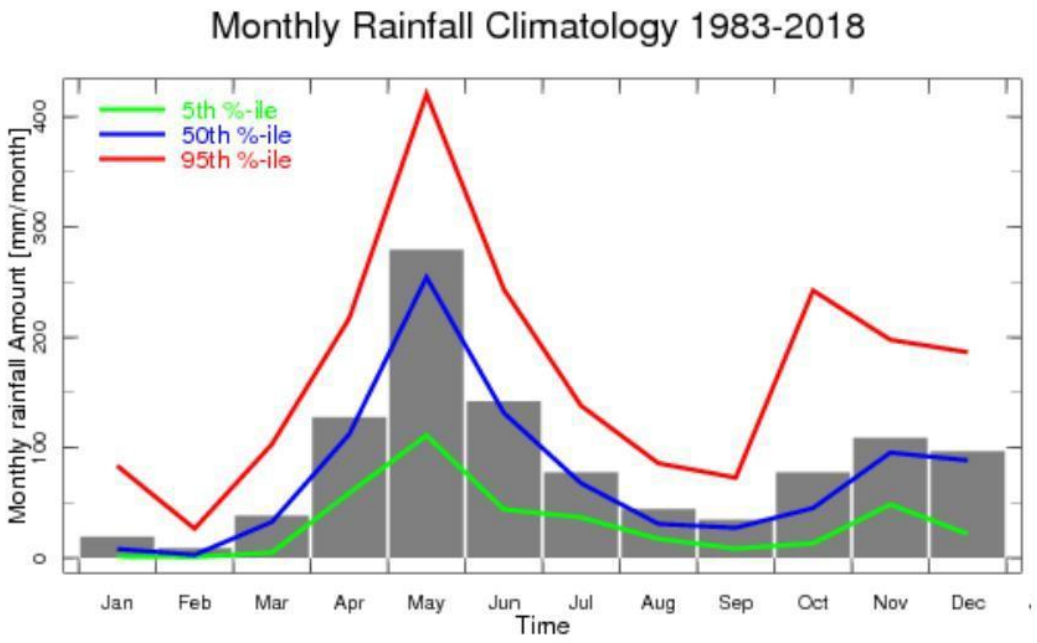


Figure 4: Observations for LAMU. (KMD)

There are three major rainfall zones occasioned by the oceanic effect where rainfall reliability decreases as one moves towards the hinterlands. These three zones are: the arid areas along the northern borders mainly Kiunga, which receives rainfall below 540 mm annually, the semi-arid areas of Amu, Faza and Kizingitini Divisions which receives between 550 mm - 850 mm of rainfall annually and the sub-humid zone covering areas of Witu and Mpeketoni Divisions receiving rainfall between 850 mm-1110 mm annually.

3.1.1 Temperature

While temperatures vary across Kenya, a distinct warming trend is evident, particularly since the 1960s, with inland areas registering larger increases in minimum and maximum temperatures. During this time the annual mean increase has risen by approximately 1.0°C, at an estimated average rate of 0.21°C per decade[9].

In fact, with the recent increases in GHG emissions, air temperature over Kenya is projected to rise by 1.2 to 3.2 °C (very likely range) by 2080 relative to the year 1876, depending on the future GHG emissions scenario. Compared to pre-industrial levels, median climate model temperature increases over Kenya will amount to approximately 1.4 °C in 2030 and 1.7 °C in both 2050 and 2080 under the low emissions scenario RCP 2.6. Under the medium/high

[9] National Environment Management Authority (2015): Kenya- Second National Communication to the United National Framework Convention on Climate Change.

emissions scenario RCP6.0, median climate model temperature increases amount to 1.3 °C in 2030, 1.6 °C in 2050 and 2.2 °C in 2080.

The temperatures along the Kenyan Coast have been increasing, mimicking the national trends over the years between 1901 and 2021 (Fig 1 and 2). The projected monthly trends for consecutive dry days along the Kenya Coast between 2020-2039 with a reference period between 1995 and 2014 are illustrated in Figure 3 below:

Lamu County has a relatively dry and hot climate throughout the year. The average temperature is greater than 25°C throughout the county. As such, heat stress, dry spells, and drought are hazards that strongly contribute to agricultural risks. Experts and farmers alike acknowledge that there have been significant changes and variations in climatic conditions over the past years, affecting agricultural production and livelihoods in the County. Extreme weather events are very common in the county. Drought conditions have been experienced in 1975, 1976, 1980, 1981, 1983, 2001, 2004, and 2009, 2016 and 2021 with Lamu county being the most affected.

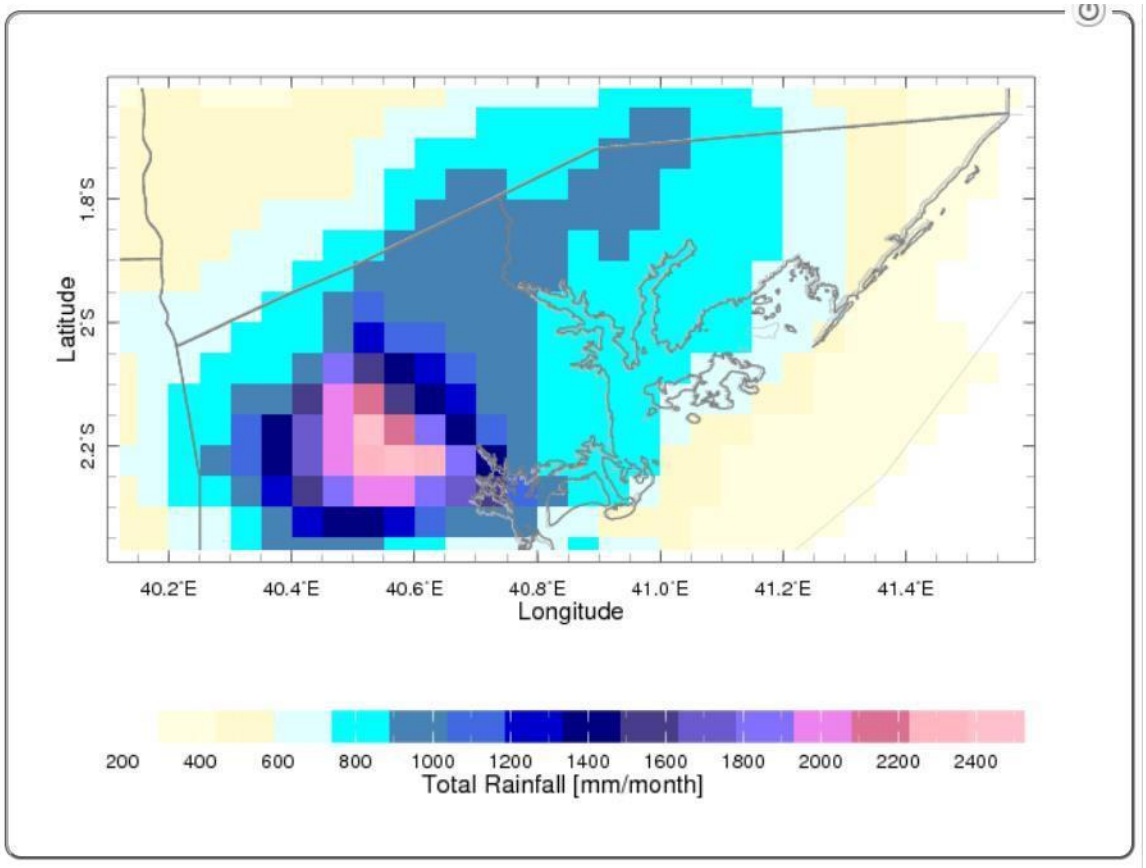


Figure 5: Seasonal Climate Analysis, 1981-2020- KMD.

3.1.2 Precipitation

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.
Along the Kenyan Coast, precipitation levels and Mean Temperatures have also varied over the years. Figure 3 shows the observed precipitation levels in Lamu[10].

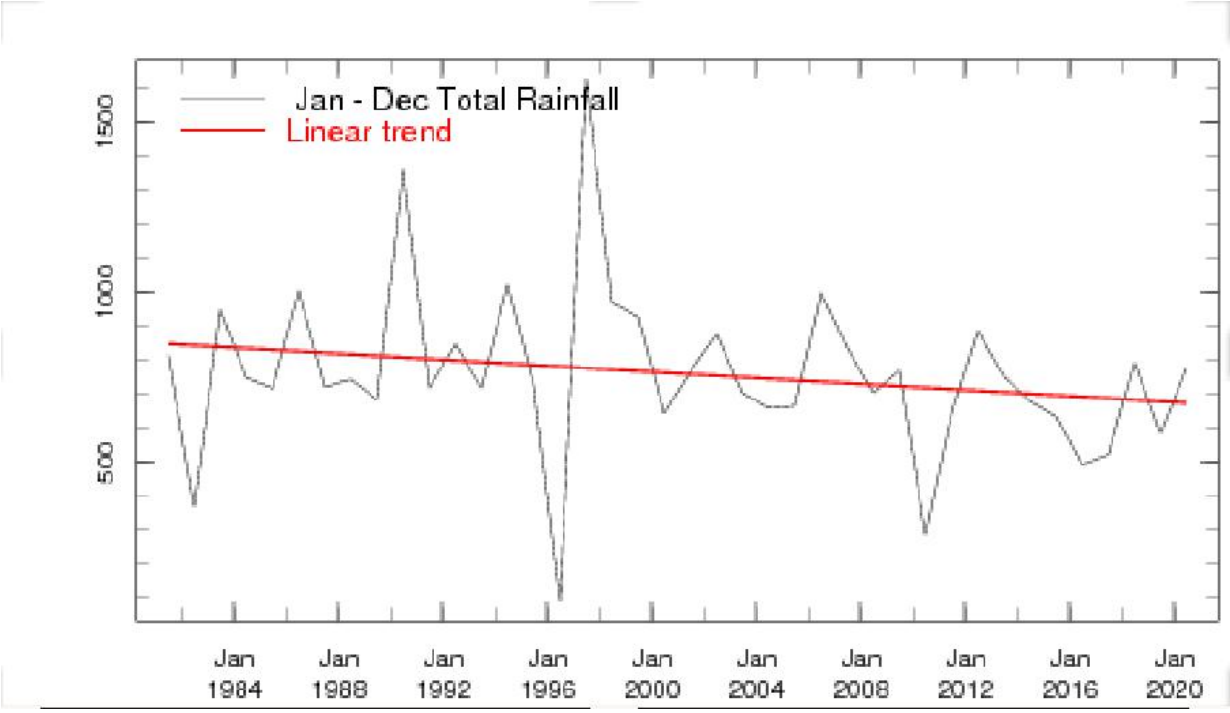


Figure 6: Trend in Rainfall (1984-2020) in Lamu

Based on the time series analysis of rainfall data in Lamu County, Kenya, spanning the period from 1984 to 2020, a notable finding emerges. The analysis reveals a clear linear trend, indicating a decreasing pattern in rainfall levels over the specified timeframe. The analysis of the seasonal calendar also has revealed a significant shift in the rainfall patterns in all wards. It is evident that the rainy season has experienced a reduction in duration and intensity, while the dry season has exhibited an increase in duration. This observation highlights a notable alteration in the seasonal distribution of precipitation. This observed decreasing trend in rainfall suggests a

[10] Seasonal Climate Analysis: Dataset Documentation (meteo.go.ke)

concerning shift in the climatic conditions of Lamu County. The implications of this trend are significant, as it has potentially impacted various sectors and activities reliant on adequate rainfall, such as agriculture, water resources, and overall ecosystem health.

The average amount of precipitation for the year in Lamu is 35.2" (894.1 mm). The month with the most precipitation on average is May with 11.8" (299.7 mm) of precipitation. The month with the least precipitation on average is February with an average of 0.1" (2.5 mm). There is an average of 55.0 days of precipitation, with the most precipitation occurring in May with 12.0 days and the least precipitation occurring in January with 1.0 days.

A large part of Lamu County receives less than 800 mm of precipitation per year with the rest receiving less than 1200 mm annually. However, floods along the Lamu County mostly affect Chalaluma, Moa and Dide Waride villages in Witu Division, Lamu West were caused by River Tana and the Nyongoro tributary which break their banks recently due to heavy rains. Serious El Nino rains occurred between 1982-1983 and also 1997-1998[11]. Bodhei, Mangai, Milimani, Mararani and Bargoni villages were left stranded after water flooded some parts of Hindi-Kiunga Road. Occasional floods are also seen in Mokowe area during heavy rains. The same situation obtains in areas of Pangani and Lumshi due to overflows of River Tana. Flash floods are also noticeable in areas bordering Tana River County even during the dry season mainly due to heavy rains in the central highlands.

Characterized by a bi-modal rainfall pattern, the area has experienced variable rainfall based on observational records from 1979-2000 and verified by observations of community members. Models generally project an increase in rain day frequency from November through to April, with most positive change in extreme rainfall occurring in October and November, with a decrease between June to September for all types of rainfall frequency. A decrease in the dry spell duration during the dry season (January – April) is shown for most models suggesting that the period between rain events may increase into the future (CSAG 2012).

3.2 Climate Future Projections

Climate projections for the period 2021-2065, based on two representative concentration pathways (RCPs12)[12], indicate that under both scenarios mean temperatures are expected to continue to increase. Of significance is that under the high emissions scenario the number of days with temperature greater than 35°C rises from less than 20 days historically in the first season to greater than 40 days and from less than 5 days in the second season to approximately 17 days. Although the increases are not as large under the low emissions scenario, they are still

[11] Impacts of the 1997-98 El Niño Event in Kenya

[12] 2 The two RCPs, RCP2.6 and RCP8.5, are named after a possible range of radiative forcing values in the year 2100 relative to pre-industrial values (+2.6 and +8.5 W/m2, respectively). The pathways are used for climate modeling and research. They describe two possible climate futures, considered possible depending on how much greenhouse gasses are emitted in the years to come. RCP 2.6 assumes that global annual GHG emissions (measured in CO2-equivalents) peak between 2010 and 2020, with emissions declining substantially thereafter. In RCP 8.5, emissions continue to rise throughout the 21st century.

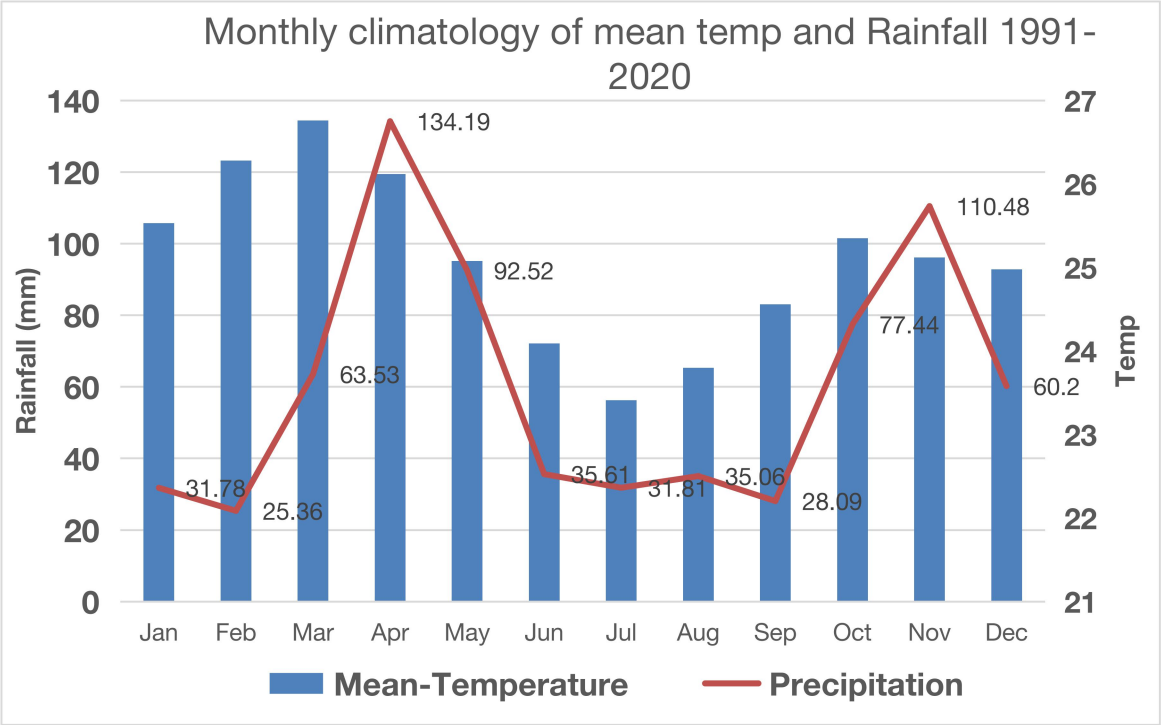
significant. A major impact of this continued rise in temperatures is an increase in the number of consecutive drought stress days in the first season from approximately 45 days historically to approximately 75 days under the conservative GHG emissions scenario to as much as 80 days in the high emissions scenario.
The length of both seasons under the two scenarios is also expected to decrease, both scenarios indicating a reduction of greater than five days in first season length and a backward shift in the start of the second season. Total seasonal precipitation on the other hand is expected to reduce slightly in the first season (≈5%) and increase in the second (≈20%) under the low emissions scenario, while under the high emissions scenario the first season rainfall total remains fairly constant although second season rainfall increases by as much as 35% from the historical average. Peculiarly despite the increases in temperature both scenarios indicate that there could also be a reduction in days with moisture stress in the county. Overall, although the projections of future climate change under the two GHG emissions scenarios show some differences, both indicate the likelihood of significant changes in the weather and climate of a county already vulnerable to drought, dry spells and heat stress.

Key trends

3.2.1 Temperature

Temperatures in Kenya are projected to continue rising by 1.7° C by the 2050s and by approximately 3.5° C at the end of the century[13]. Additionally, the number of hot days and nights will increase, with 'hot days' projected to occur on 19% – 45% of days by mid-century. Hot nights are expected to increase more quickly, projected to occur on 45% – 75% of nights by mid- century and on 64% – 93% of nights by the end of the century. Cold days and nights are expected to become increasingly rare. Across all emissions scenarios, temperatures in Kenya will continue to rise. Under a high-emission scenario, average temperatures are expected to increase rapidly by mid-century. Increased heat and extreme heat conditions will result in significant implications for human and animal health, agriculture, and ecosystems.

[13] Climate Knowledge Portal, World Bank



Very hot days

In line with rising mean annual temperatures, the annual number of very hot days (days with daily maximum temperature above 35 ° C) is projected to rise substantially and with high certainty, in particular over central and eastern Kenya[14]. Under the medium/high emissions scenario RCP6.0, the multi-model median, averaged over the whole country, projects 25 more very hot days per year in 2030 than in 2000, 36 more in 2050 and 59 more in 2080. In some parts, especially in northern and eastern Kenya, this amounts to about 300 days per year by 2080. The projected number of hot days with a maximum temperature above 35^0C along the Kenyan Coast is given in Figure 9

3.2.2. Sea level rise

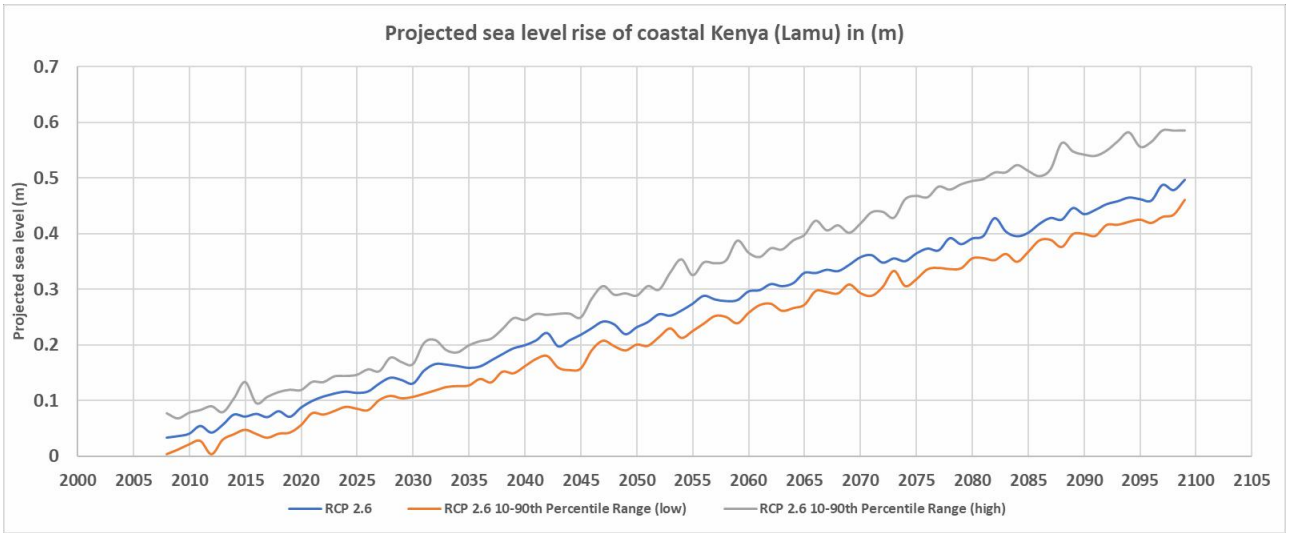


Figure 7: Projected Sea level rise of coastal Kenya (Lamu) in (m)

In response to globally increasing temperatures, the sea level off the coast of Kenya is projected to rise[15]. Until 2050, very similar sea levels are projected under both emissions scenarios. Under RCP6.0 and compared to year 2000 levels, the median climate model projects a sea level rise by 10 cm in 2030, 21 cm in 2050, and 40 cm in 2080. This threatens Kenya's coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs.

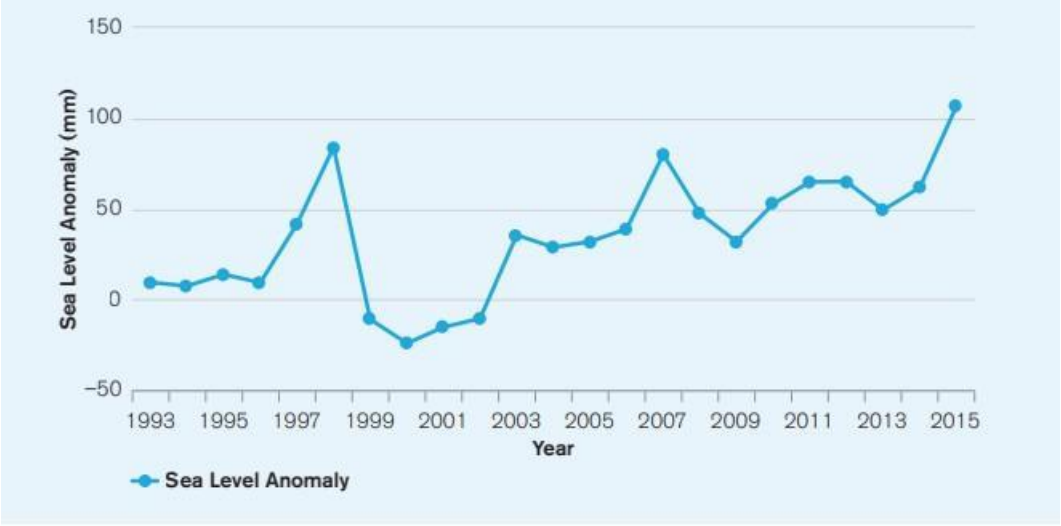


Figure 8: Sea level anomaly of Kenya, 1993 – 2015

As a matter of fact, this scenario is already experienced in parts of Lamu especially Lamu town, Ndau, Kizuke, Faza, Kiunga, Kizingitini, Mbwajumwali and Mkokoni village where sea water intrusion has become a major setback for the scouring of the sea walls and displacement of settlements. Villages experience the impacts of sea level rise with sea water intruding community farmlands, nearly 30 km inlands. Fresh water fisher-folk have also reported reduced catch volumes per unit effort within the areas of sea water influence.

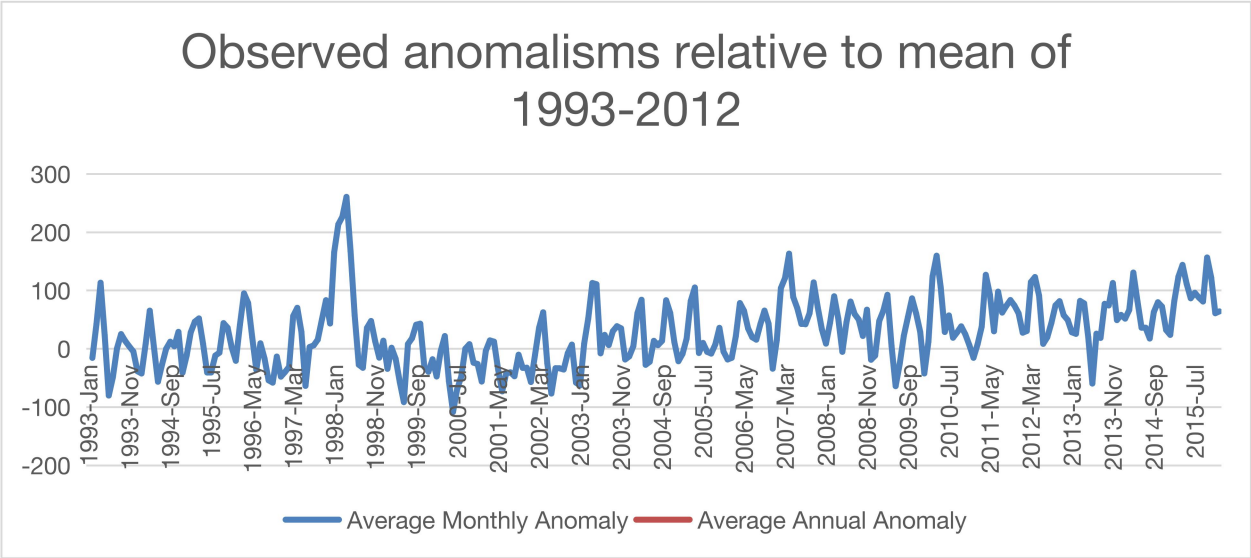


Figure 9: Observed anomalisms relative to mean of 1993-2012.

3.2.3 Precipitation

Precipitation in Kenya is projected to remain highly variable and uncertain[16]; however, average rainfall is expected to increase by mid-century, particularly during the 'short rains', which occur between October and December. Extreme rainfall events are also expected to increase in frequency, duration and intensity and the proportion of heavy rainfall that occurs in heavy events will increase. However, the period between heavy rainfall events may increase. Importantly, rainfall in the arid zones is generally projected to decrease. The annual average precipitation is expected to increase slightly by the of the century under a high emissions scenario

The projected annual precipitation for 2020-2039 along the Kenyan Coast is illustrated in Figure 10 with the monthly projected precipitation over the same area and period illustrated in Figure 11 above.

Heavy precipitation events

In response to global warming, heavy precipitation events are expected to become more intense in many parts of the world due to the increased water vapour holding capacity of a warmer atmosphere. At the same time, the number of days with heavy precipitation events is expected to increase. This tendency is also found in climate projections for Kenya with climate models projecting an increase in the number of days with heavy precipitation, from 7 days per year in 2000 to 9 days per year in 2080 under RCP6.0. Under RCP2.6, the number of days with heavy precipitation remains unchanged.

In Lamu County precipitation is projected to decrease by 5% in the first wet season, and increase 14% in the second wet season of the years 2021-2065[17]. Increased extreme precipitation is projected to occur during the second season, with the highest single day of precipitation increasing on the order of 25%. The first wet season is projected to experience no change or even a slight decrease in the single day greatest precipitation

Lamu County is vulnerable to seasonal variability and long-term climate change. Increasing vulnerability is expected to result in cumulative impacts across the county's social, economic and environmental systems, with a high likelihood to reverse much of the positive development progress the county has made. Droughts and floods can have devastating consequences on the environment, society and the wider economy. Significant impacts are expected for the county's water resources, agriculture, health, and forestry sectors, as well its coastal zones. Heavy rains, floods, droughts and sea level rise put both urban and rural infrastructures at risk, particularly for poor and vulnerable groups. Environmental degradation, altered water resources, and loss of biodiversity and ecosystem services constitute serious obstacles to the county's continued development. In addition, rising temperatures will have a negative impact on key parts of the economy, e.g., forestry, agriculture, and livestock. Changes in precipitation patterns can have far-reaching consequences for ecosystems and biodiversity, food production, the water industry and rivers

3.2.4 Strong Winds and Sea Navigation

Lamu typically receives strong North Easterly winds all the way from Arabia which are the cause of the strong tides and rough waves. This situation normalizes briefly during certain times of the day or week. This situation is hazardous to sailors playing renowned dangerous channels in the ocean until the end of March as the tides in these areas are normally triple as powerful as what is normally experienced in the rest of the ocean. These channels have been nicknamed 'killer channels' because of their impossibility to navigate especially in extreme weather conditions and also over the fact that they account for most fatal accidents in the region. They include Mlango wa Tanu in Mkokoni, Mlango wa Ali in Kiwayu, and Mlango wa Bomani in Kiunga, all in Lamu East Sub-County. Others are the Manda Bruno, the Mkanda and Shella channels, and Mlango wa Kipungani in Lamu West. They are known for being impossible to manouver due to the gigantic waves and tides. These tides normally stabilize by the end of May.

In Kenya, there are two wind seasons per year: Kaskazi, N/NE trade wind, blowing from mid- December until mid of March and Kusi, S/SE trade wind, blowing from June until mid- September.

The Kaskazi wind is a very reliable and steady wind with an average wind speed of 15-20 knots. Wind usually starts blowing about 10.30am and lasts all day until 6/7pm. As the general air temperature is very hot, the density of the air is not as high as in cooler spots around Europe, USA or South Africa.

The Kusi season is the cooler season and referred to as our “winter”. The wind generally blows stronger with an average of 18-22 knots, but is slightly less consistent. Due to tropical rain storms passing through the wind and weather are more difficult to predict. The Kusi usually brings decent sized swell with it: From June until October there are waves between 1.5m and 3m on big days.

2.0 WINDS AND SIGNIFICANT WAVE HEGHTS FORECAST FOR THE PERIOD 16TH MAY TO 22ND MAY, 2023.

2.1 Tuesday 16th May, 2023: Significant Wave Height and wind speed (Wave scale in meters; Wind scale in m/s)

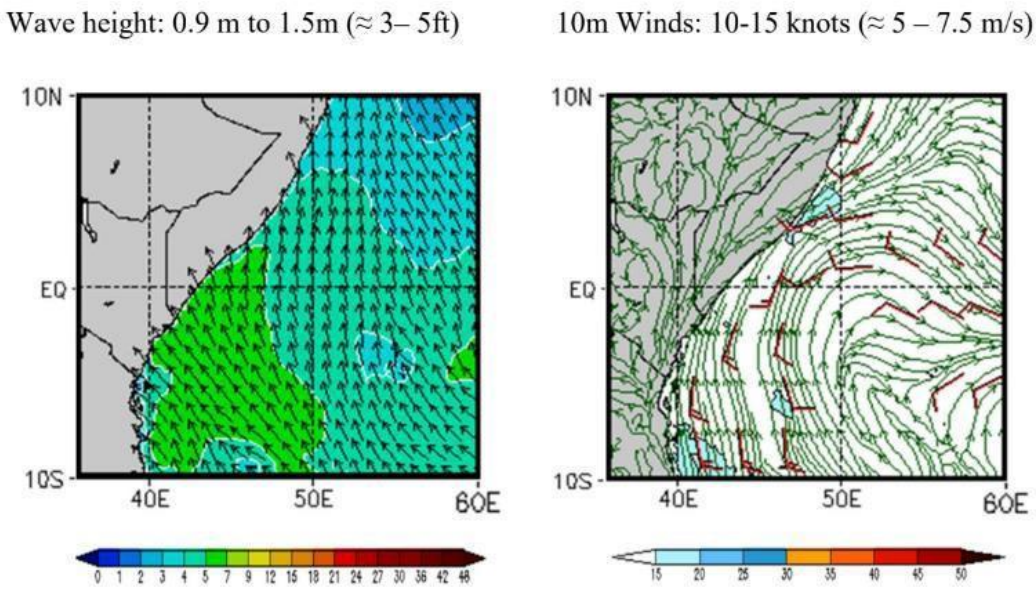


Figure 10: Example of the REF.NO: KMD/FCST/5-2023/MARINE/20 Date: 15th May, 2023. (KMD).

Wind Speed & Direction: South-easterly winds are expected over Tanzania and Kenya waters; south-easterly winds turning into south-westerly over Somalia waters with wind speeds of 10 to 15 knots (5- 7.5 m/s) throughout the forecast period.

Sig. Wave Height and Direction: South-easterly waves expected over Tanzania and Kenya waters; southerly waves expected over Somalia waters with wave heights of 0.6 – 1.5m (≈ 2– 5ft) throughout the forecast period.

Coastal Winds stem from large storm systems moving onshore that can pack quite a punch. Often these storms move inland, knocking over power lines and leaving residents in the dark for days. Homes and businesses may be damaged when a strong storm moves onshore. In addition to damaging property, these winds can cause damage to the natural environment, knocking down trees and causing coastal erosion along the beaches. Along the immediate coast, items that are not properly secured may end up being washed out to sea.

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

The chapter provides resilience/adaptation strategies that can be implemented or enhanced to build the County resilience to climate change hazards. It looks at the adaptation and resilience strategies which the community in Lamu County use to combat the impacts of hazards brought about by climate change. The hazards identified in order of severity were as follows: drought, livestock pests and diseases, resource-based conflicts, floods, stormy winds and sea level rising. In addition, waste management has also been considered in this report. This is because the impacts of poor waste management exacerbate the impacts of climate change in all the wards of Lamu County.

The analysis looks at how the different segments of society and their livelihoods are vulnerable to climate change. The analysis also looks at how the vulnerable and the marginalized groups (VMGs), women and youth, will be included and be made to benefit from these strategies. The community projects will be considered for their technical, social and economic viability to guide on their implementation.

The table also summarizes the hazards or risks, livelihood or economic systems impacted on, climate resilience strategies, the possible stakeholders to implement the strategies and actions under the strategies and gender inclusions.

Risk/ Hazard	Livelihood/ economic system	Climate Resilience strategies	Stakeholder applying the strategy	Gender and social inclusion information (effectiveness of the strategy)
Drought	Water resource	Improve access to sufficient, clean and safe water	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects

	Crop production	● Mitigate the effects of drought on Crop Production ● Increase Crop Production & productivity ● Enhance Value addition Improve policy & regulatory framework in agriculture	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
	Livestock Production	● Mitigate the effects of drought on Livestock production ● Improve livestock production & productivity ● Enhance Value addition & Marketing Improve policy & regulatory framework in Livestock production	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
	Fishing	● Improve fisheries production & productivity ● Enhance Value addition & Marketing ● Improve policy & regulatory framework in	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects

		Fish production		
	Wildlife	● Wildlife conservation ● Improve policy & regulatory framework in wildlife conservation	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
	Forest	● Sustainable management of forestry and natural resources [Protect, manage and conserve] ● Improve policy & regulatory framework in forest conservation	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
	Sand dunes	● Sustainable management of sand dunes [Protect, manage and conserve] ● Improve policy & regulatory framework in sand dunes conservation	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
Increase in pests and diseases (in crops, livestock and human beings)	Crop Production	● Management of crop pests and diseases	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects

	Animal production	● Management of Livestock pests and diseases		
	Human resource/ skills	● Prevention and control of human pests and diseases		
Resource based conflicts	Crops and livestock resources	● Promote peaceful coexistence between farmers and livestock keepers ● Improve policy & regulatory framework to promote peaceful coexistence	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations NGAO	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
	Crop, livestock and wildlife	● Improve policy & regulatory framework to promote peaceful coexistence ● Promote peaceful coexistence between humans and wildlife ● Improve policy & regulatory framework to promote peaceful coexistence between humans and wildlife		

Floods	Crop production	● Minimize crop losses from floods	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
	Human & Livestock Settlements	● Minimize the effects of floods on humans and livestock		
Stormy winds	Infrastructure	● Minimize effects of stormy winds on infrastructure	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects
	Fishing	● Minimize effects of stormy winds on fishing		
Rising sea level	Infrastructure	● Minimize effects of rising sea level on infrastructure	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects

Waste	Health and sanitation	● Improve on waste management practices ● Formulate and implement policy & regulatory framework on waste management	County Govt of Lamu Development partners Government Agencies NGOs, CSOs Charity Organizations	Women, youth and VMGs to be involved in planning, implementation and benefits sharing of projects

5. Lamu County Climate Strategic Adaptation Investment/Action Priorities

The section lists priority areas/actions that the County will invest in to respond to the climate change effects and hazards. The actions are categorized under various County livelihoods across various sectors and aligned to the projects and programs contained in the County Integrated Development Plan III. Actors for the respective areas of investments have also been identified.

HAZARD	LIVELIHOOD /ECONOMIC SYSTEM	ADAPTATION STRATEGY	PRIORITY ACTIONS	ACTORS
Drought	Water resources	Improve access to sufficient, clean and safe water	1. Pipe water from River Tana 2. Install and rehabilitate water desalination plants 3. Construct mega dams, water pans, dams, djabias, wells, boreholes – Climate proof 4. Desilt water sources e.g., Lakes, water pans, wells & swamps 5. Enhance water trucking services 6. Extend water piping [Water reticulation] 7. Provide water harvesting and storage tanks 8. Provide solar panels/solar machines for water pumping 9. Best practices in waste water management and wetland conservation	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Crop production	Mitigate the effects of drought on Crop Production Increase Crop Production & productivity Enhance Value addition	1. Enhance drought and disaster contingency fund 2. Enhance Irrigated agriculture 3. Promote mechanized farming services (tractor plough, planting, spraying, weeding and harvesting) 4. Strengthen research-extension-farmer linkages 5. Enhance and strengthen extension services	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.

		improve policy & regulatory framework in agriculture	6. Empower farmer organizations to purchase inputs in bulk 7. Procure and distribute inputs to vulnerable farmers 8. Carry out surveillance of inputs in the county 9. Introduce farmers friendly credit products 10. Improve farmer-credit linkages 11. Empower the vulnerable and marginalized groups to participate in agriculture 12. Facilitate farmers to undertake soil testing 13. Establish demonstration farms within the wards 14. Promote growing of indigenous/drought tolerant food crops 15. Enhance post- harvest management 16. Construct storage facilities 17. Enhance use of technology in agricultural production & marketing 18. Construct collection centers 19. Invest in market infrastructure 20. Establish processing plants for fruits and vegetables, Cotton and Cashew nuts in the County 21. Establish cottages industries 22. Fabricate simple technologies for home-based processing 23. Capacity build CIGs and VMGs on value addition technologies 24. Development of policies and legislations for agricultural development such as agricultural inputs distribution	
	Livestock Production	Mitigate the effects of drought on Livestock	1. Procure and administer drugs and vaccines to vulnerable livestock 2. Promote feedlot systems	County Govt of Lamu Government Agencies

		production Improve livestock production & productivity Enhance Value addition & Marketing Improve policy & regulatory framework in Livestock production	3. Enhance livestock structures including dips and crushes 4. Improve the livestock breed [drought tolerant] 5. Undertake destocking during drought 6. Promote the uptake of Livestock insurance 7. Promote diversification of livestock in drought prone areas 8. Provide emergency alternative livestock feeds such as hay and pellets 9. Rangeland rehabilitation by reseeding 10. Develop Internal Quarantine facilities targeting export 11. Strengthen extension services 12. Strengthen artificial insemination, vaccinations and treatment of Livestock 13. Promotion of fodder production and conservation 14. Establishment of watering infrastructure for livestock 15. Adopt improved livestock breeds 16. Linkage of local producers to external traders 17. Strengthen livestock marketing cooperative societies 18. Construct modern slaughter facilities 19. Empower producer marketing organizations to be able to process and package goods for the market 20. Establish processing facilities for Livestock products 21. Clear survey and demarcation of grazing facilities and livestock corridors 22. Formulate policy on range land management 23. Land use planning and development of village grazing plans	Development Partners Charity Organizations Non Govt Organization Civil Society Org.

	Fishing	Improve fisheries production & productivity Enhance Value addition & Marketing Improve policy & regulatory framework in Fish production	1. Restock of fish in the fresh water lakes, fish farms and ponds 2. Promote mariculture and aquaculture 3. Procure and supply of modern fishing equipment and vessels 4. Enhance of deep-sea fishing 5. Increase investment in crab and seaweed farming 6. Train fishermen on modern fishing technologies such as use of FADs, Fish finder equipment 7. Support adoption of Mari culture and fresh water aquaculture 8. Provide solar freezers for storage of fish 9. Promote recreational fisheries 10. Restore mangrove forest/ coral reef restoration and seagrass restoration 11. Invest in processing, storage and value addition 12. Secure of breeding grounds and land sites 13. Promote blue carbon initiatives 14. Strength market linkages 15. Establish fish processing plant and value addition 16. Construct and rehabilitate ice plants and fish cold storage facilities at fish landing sites 17. Empower local fish processors to process and package fish and their products 18. Train fishermen and fish traders on best fish handling practices and preservation 19. Strengthen co management structures in the county 20. Mainstream climate change and other cross cutting issues in management of fisheries	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.

			resources 21. Amend and implement Lamu County Fisheries Development Act 2015 22. Finalize fisheries sub sector Development Strategic plan 2022-2027 23. Recruit and train technical fisheries personnel to bridge staffing gap 24. Collaborate with partners in the implementation of programs in the sub sector	
	Wildlife	Wildlife conservation	1. Construct water pans in wildlife zones 2. Drill solarized boreholes 3. Water trucking 4. Feed supplementation 5. Wildlife translocation 6. Provide veterinary services 7. Enhance wildlife surveillance 8. Provide and supply of equipment and gears 9. Empower community rangers to support wildlife management 10. Train community scouts on protection and management of wildlife and natural resources 11. Operationalize devolved wildlife functions 12. Develop & Adopt policies and legislations for Wildlife Conservation and Management 13. Form & operationalize Community wildlife Conservancies 14. Recruit County wildlife rangers 15. Promote eco - tourism ventures that directly benefit the community economically	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Forest	Sustainable management of forestry and natural resources *[Protect, manage*	1. Reclaim degraded areas through tree planting and protection against encroachment 2. Promote Partnerships to conduct forest resource assessments with a view to benefit from Carbon Credits for both County and	County Govt of Lamu Government Agencies Development Partners Charity Organizations

		and conserve] *Improve policy & regulatory framework in forest conservation*	communities 3. Increase investment in Agro forestry 4. Investment in drought resistant tree species 5. Mangrove rehabilitation & restoration 6. Promote growth of indigenous tree species 7. Empower community rangers/scouts to support forest management 8. Capacity build CFAs, on protection and management of forests and natural resources 9. Promote land restoration actions at community level 10. Promote adoption of non-wood beneficial activities by forest adjacent communities e.g., Beekeeping by the Awer Community. 11. Enhance capacity building of environmental officers and community members 12. Equip CFAs with firefighting equipment and patrol gears 13. Investment in Boardwalk for eco-tourism 14. Facilitate and empower environmental officers to enforce regulations and natural resource management 15. Facilitate and empower environmental officers to conduct/undertake regular Environmental Inspections and surveillance on degraded areas for action. 16. Implement FOLAREP 17. Formulate & Implement Participatory Forest Management Plans – PFMPs 18. Implement TIPs for Lamu 19. Adopt devolved forestry functions 20. Capacity build CFAs on Forest management and conservation 21. Develop & Adopt policies and legislations for	Non Govt Organization Civil Society Org.

			Environmental/Forest Conservation and Management 22. Mainstream Climate Change and other cross cutting issues in management of environment and natural resources 23. Recruit & train County Environment officers and Foresters	
	Sand dunes	Sustainable management of sand dunes [Protect, manage and conserve Improve policy & regulatory framework in sand dunes conservation	1. Reclaim degraded areas through increasing vegetation cover and protection against encroachment 2. Promote eco-tourism activities on the sand dunes 3. Clear, demarcate and mark sand dunes 4. Promote the protection and conservation activities on the sand dunes 5. Fence the sand dunes 6. Formulate & implement Sand harvesting regulations and adopt NEMA guidelines 7. Revoke title deeds on ecologically sensitive sand dune sites	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
PESTS & DISEASES	Crop production	Management of crop pests and diseases	1. Control Crop pest and disease 2. Promote the adoption of pests and disease tolerant crops 3. Promote the adoption of crop insurance 4. Procure farm inputs and supplies 5. Enhance capacity building of both extension staff and farmers 6. Promote the use of integrated pest management 7. Institute early warning systems for notifiable pests and diseases 8. Undertake regular surveillance of crop pests and diseases 9. Regulate the use of harmful pesticides	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.

	Livestock Production	Management of Livestock pests and diseases	1. Vaccinate susceptible livestock against pests and diseases 2. Treat sick livestock 3. Undertake regular livestock pests and disease surveillance 4. Undertake pests and disease control measures (Quarantine, movement restriction, livestock relocation) 5. Enhance the supply and administration of emergency drugs and vaccines 6. Enhance livestock structures including dips and crushes 7. Facilitate mass vaccination of livestock during outbreak of destructive pests and diseases 8. Strengthen extension services 9. Improve the livestock breed [disease tolerant]	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Human Health	Prevention and control of human pests and diseases	1. Carry out disease surveillance and response 2. Adopt integrated vector management 3. Monitor water quality and promote water safety 4. Upgrade & equip the existing Health facilities 5. Improve sanitation and hygiene practices 6. Improve access to health services 7. Equip and operationalize local health facilities 8. Strengthen community health structures 9. Enhance emergency preparedness and response to pests and diseases 10. Set up specialized health services 11. Enhance the adoption of health insurance scheme	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
RESOURCE BASED CONFLICTS	Crops and livestock resources	Promote peaceful coexistence between farmers	1. Invest in complementary livelihood projects to supplement incomes of conflict prone communities	County Govt of Lamu Government Agencies

		and livestock keepers Improve policy & regulatory framework to promote peaceful coexistence	2. Equip and activate emergency response centers 3. Promote Security among affected communities 4. Promote alternative dispute resolution 5. Promote insurance on livestock and high value crops 6. Enhance Demarcation and land tenure 7. Strengthening/empowering peace committees 8. Restore livestock grazing corridors	Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Crop, livestock and wildlife	Promote peaceful coexistence between humans and wildlife Improve policy & regulatory framework to promote peaceful coexistence between humans and wildlife	1. Promote fencing of individual farms 2. Enhance security patrols to control problem wildlife 3. Promote awareness and sensitization on peaceful coexistence with wildlife 4. Formulate policies on relocation of farms along wildlife migratory corridors 5. Secure wildlife corridors 6. Speed up compensation for damages caused by wildlife i.e. crop, livestock and human life	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
FLOODS	Crop production	Minimize crop losses from floods	1. Promote agroforestry, afforestation and reforestation 2. Strengthen early warning systems and flood mapping to enable action 3. Sensitize farmers to cultivate on land safe from floods	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Human & Livestock Settlements	Minimize the effects of floods on humans and livestock	1. Enhance early warning system 2. Establish emergency operation centers - EOC 3. Initiate human and livestock resettlement program 4. Enhance evacuation structures during floods 5. Rehabilitate the affected infrastructure such as roads, bridges, hospitals etc.	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.

			6. Provide emergency food and medical care to flood victims 7. provide emergency relief livestock feed and veterinary care 8. Construct drainage and sewer systems in settlement areas 9. Build gabions on flood prone areas 10. Operationalize flood risk assessment mapping 11. Construct dams & dykes to harness excess water 12. Construct storm water drainage systems 13. Construct flood-proof infrastructure in flood prone areas 14. Protect and restore riparian land & other water catchment areas 15. Promote tree planting to increase vegetation cover along shoreline, riparian and bare land 16. Formulate & implement sand harvesting 17. regulations and adoption of NEMA guidelines	
STORMY WINDS	Infrastructure	Minimize effects of stormy winds on infrastructure	1. Promote construction of Climate proof permanent infrastructure 2. Promote tree planting/Mangrove restoration to act as wind barriers 3. Enhance weather forecast and early warning systems 4. Enhance complimentary livelihood projects for communities living stormy wind prone areas 5. Equip and operationalize emergency operations centre (EOC)	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Crop production	Minimize effects of stormy winds on farms	1. Promote agroforestry to act as wind breakers in farms 2. Provide emergency relief seeds and relief food 3. Promote planting of crops less vulnerable to	County Govt of Lamu Government Agencies Development Partners

			winds such as sweet potatoes and water melons	Charity Organizations Non Govt Organization Civil Society Org.
	Fishing	Minimize effects of stormy winds on fishing	1. Procure & supply rescue boats to stormy wind prone areas 2. Operationalize the disaster response teams at local community level 3. Enhance weather forecast and early warning systems 4. Establish Maritime training centers 5. Operationalize emergency operations centers (EOC)	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Forests	Minimize effects of stormy winds on forests	1. Increase forest/ forest cover 2. Plant trees in public spaces and areas prone to wind storms 3. Train CFAs	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
RISING SEA LEVEL	Infrastructure and human settlements	Minimize effects of rising sea level on infrastructure	1. Construct Climate proof infrastructure along the sea shores- Jetties, Sea walls 2. Enhance weather forecast and early warning systems 3. Strengthen disaster response teams at the local community level 4. Establish Maritime training centers 5. Operationalize emergency operations centers (EOC)	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
	Fishing	Reduce the effects of rising sea level on fishing	1. Secure the fish and other marine life breeding areas through planting of mangroves 2. Capacity builds the fishing communities to protect fish breeding areas 3. Protect coastline from erosion 4. Initiate community programs to support	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization

			5. livelihood diversification	Civil Society Org.
	Tourism	Reduce the effects of rising sea level on tourism	1. Initiate community programs to support livelihood diversification 2. Enhance coastline infrastructure to protect vulnerable tourist attractions and recreational facilities on the coastline	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.
WASTE	Health and sanitation	Improve waste management Improve policy & regulatory framework on waste management	1. Enhance solid waste management and pollution control 2. Construct waste transfer stations, dumpsites and disposal sites 3. Construct and rehabilitate sewer and drainage systems 4. Construct storm water drainage systems 5. Allocate and secure disposal/dumping sites for waste 6. Procure and supply sanitation equipment and protection gears e.g., wheelbarrows, rakes to cleaners 7. Establish animal carcass burial sites 8. Procure and install incinerators to manage medical and veterinary wastes 9. Establish waste recycling plants 10. Promote community involvement in waste collection & recycling 11. Train officers and community on emerging environmental issues 12. Undertake regular supervision of Waste management by the environment officers 13. Sensitize communities on waste segregation into organic & inorganic 14. Set aside burial site for asbestos wastes 15. Develop waste management legislations	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.

			[policy, Act and regulations] 16. Develop/Formulate Pollution control legislations and implementation 17. Formulate and implement water quality control policies and regulations	
	Marine life	Protect marine resources from waste pollution Improve policy & regulatory framework on waste management	1. Promote community involvement in solid waste collection & recycling 2. Treat liquid waste to the required standards before discharge 3. Provide waste bins along the sea 4. Promote waste separation/segregation before disposal 5. Initiate programs that support collection of plastic waste from the ocean 6. Enforce the ban on plastic carrier bags 7. Enact regulations that ban use of plastic bottles 8. Enforce the ban on use of plastics in marine protected areas	County Govt of Lamu Government Agencies Development Partners Charity Organizations Non Govt Organization Civil Society Org.

Conclusion

Lamu County being one the 6 coastal counties that were established within the 2010 constitution and mandated to make sure that the citizen needs are included within the government decisions through citizen participation. It is from this core value that the department of environment had to put up legislation that will align itself with UNFCCC and the National Climate Change Act 2016. The enactment of the Lamu County Climate Change Act, 2022 enabled the operationalization of the instruments of Participatory Climate Risk Assessment (PCRA) and making sure there are concrete actionable mitigations and adaptations that will build resilience to the Lamu communities. From the participatory finding conducted within all the wards, there is a similarity of the hazards namely floods, drought, pest and diseases. Sea level rise was only noted in Kiunga ward. From this finding it is shown that the geographical nature of the county with 27% of the land mass being on the Indian ocean and that the ASAL nature of Lamu County will require climate adaptation interventions in order to cushion the communities and increase their resilience and improve adaptive measures in the face of climate change. The inclusion of different categories of people such the youth, women, PWDs, marginalized, vulnerable and the indigenous communities across all the wards showed that the different communities have realized that climate change has impacted them differently and all of them were aware of the need to have a participatory approach in the interventions. It is through this participatory approach that has enabled the secretariat (CCU) to be able to interpret the analyzed data which showcased cross-cutting hazards within the 10 wards and the right approach to tackle the hazards is to have a consolidated actionable document that will tackle the effect of the hazards within the sectors in the county departments that are affected by climate change.

References

1. County Government of Lamu, County Integrated Development Plan 2023-2027
2. Lamu County Climate Change Act 2022
3. Trends in Climate Variables (Temperature and Rainfall) and Local Perceptions of Climate Change in Lamu, Kenya, Maingey Yvonne, Gilbert Ouma , Daniel Olago , Maggie Opondo, https://icca.uonbi.ac.ke/sites/icca.uonbi.ac.ke/files/2021-04/Trends%20in%20Climate%20Variables%20%28Temperature%20and%20Rainfall%29%20and%20Local%20Perceptions%20of%20Climate%20Change%20in%20Lamu%2C%20Kenya%2C.pdf
4. Climate Risk Profile: Kenya *(2021)*, https://agrica.de/2021/01/18/kenya-climate/
5. Climate Projections, Mean Projections, https://climateknowledgeportal.worldbank.org/
6. Karanja F.K, Mutua F.M (2000) *Reducing the Impact of Environmental Emergencies through Early Warning and Preparedness - The Case of El Niño-Southern Oscillation (Enso),* UNFIP
7. The Star, https://www.the-star.co.ke/counties/coast/2023-03-16-lamu-small-boats-forced- out-of-business-owing-to-strong-winds-in-indian-ocean

Annex

Lamu PCRA Task Force

Name	Designation
Mohamed Rashid Dirie	Chief Officer, Public Health, Sanitation and Environment
Andrew Waweru	Director Planning and Budget
Amos Okello	Agricultural Officer
Dr. Felix Rachuonyo	Veterinary Officer
Kahindi Yeri	Environment officer - **NEMA**
Zachery Misiani	Kenya Redcross
Linet	Kenya Redcross
Simeon Mwadiga	Kenya Forest Research Institute - **KEFRI**
Hillary	Kenya Wildlife Service - **KWS**
Lucas Msasia	Kenya Forest Service - **KFS**
Leli Ngao	Kenya Meteorological Department - **KMD**

Secretariat/ Lamu County Climate Change Unit

Mohamed Rashid Dirie	Chief Officer - Climate Change
Mohammed A. Mohammed	County Director - Climate Change
Mohamed Abubakar	Environmental Safeguards officer
Anthony Mbuthia	Monitoring & evaluation officer
Ishaq Abubakar	Social Safeguards
Kulthum Ahmed	Communications officer
Fatma Bwana Heri	Citizen Participation
Husna Abdallah	Budget & planning officer
Firdaus Mohamed	Fisheries officer
Evans Gathuri	Project Accountant