BUNGOMA COUNTY

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BUNGOMA COUNTY PARTICIPATORY CLIMATE RISK ASSESSMENT

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Definition of Terms

Adaptation	Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.
Adaptive capacity	The ability of a system to adapt to the impacts, cope with the consequences, minimize potential damages, or take advantage of opportunities offered by climate change or climate variability;
CCCAP	County Climate Change Action Plan
Climate Change	Change in the climate system that is caused by significant changes in the concentration of greenhouse gasses due to human activities, and which is in addition to the natural Climate Change that has been observed during a considerable period.
Environment	Has the meaning assigned to it in section 2 of the Environmental Management and Coordination Act 1999.
Global warming	Observed or projected gradual increase in global surface temperature. It is one of the consequences of Climate Change.
Greenhouse gasses	Gasses that absorb and emit radiant energy within the thermal infrared range. The main GHGs measured in a GHG inventory are, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), per-fluorocarbons (PFCs), hydro-fluorocarbons (HFCs), sculpture hexafluoride (SF6) and nitrogen tri-fluoride (NF3).
Mitigation	Human interventions to prevent or slow down atmospheric GHG concentrations by limiting current or future emissions, and/or enhancing potential sinks for greenhouse gasses.
Resilience	The ability of a social, economic or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization and the capacity to adapt to stress and change.
Vulnerability	The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a system to the impact of hazards.

Acronyms

CBOs	Community Based Organizations
CIDP	County Integrated Development Plan
COK	Constitution Of Kenya
CSO	Civil Society Organizations
CFA	Community Forest Association
ECDE	Early Childhood Development Education
FBO	Faith Based Organizations
FLLoCA	Financing Locally Led Climate Action
GDP	Gross Domestic Product
GESIP	Green Economy Strategy and Implementation Plan
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
ITK	Indigenous Technical Knowledge
KFS	Kenya Forest Service
KMD	Kenya Meteorological Department
KNBS	Kenya National Bureau of Statistics
KWS	Kenya Wildlife Service
LREB	Lake Region Economic Block
SME	Small and Medium Enterprises
MTC	Medical Training College

NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organization
NRW	Non-Revenue Water
NZOWASCO	Nzoia Water Services Company
PCRA	Participatory Climate Risk Assessment
PLWD	People Living with Disability
TTI	Technical Training Institute
TWG	Technical Working Group
UNFCCC	United Nations Framework Convention on Climate Change
VTC	Vocational Training Centre
WCCPC	Ward Climate Change Planning Committee

Foreword

Climate Change remains a threat to the sustainable development of Bungoma County. The impacts of Climate Change in the County have been manifested in erratic rainfall, delayed onset of rains, increasing temperatures and prolonged dry spells. This has affected key livelihood activities such as agriculture which is the major economic activity in the County. The sector has witnessed delays in planting due to prolonged dry spells whereas, increasing temperatures have increased incidences of pests and diseases affecting crops on farm resulting in crop failure and post-harvest losses. The final outcome has been low agricultural productivity leading to food insecurity and general poverty. The situation has been worsened by the encroachment on our water catchment areas such as forests, hills, riparian areas that is accompanied by deforestation, sand harvesting and extensive cultivation using excessive fertilizers and pesticides which degrades the environment further.

Bungoma County is committed to building community resilience to the impacts of Climate Change for posterity. In this regard a multi-sectoral and integrated approach has been adopted. The County developed its County Climate Change Policy, 2020 and the County Climate Change Fund Act, 2022 which clearly elaborate strategies in line with the National Climate Change Action Plan 2018 - 2022 and the National Climate Change Act, 2016. The County legal framework clearly outlines that 2% of the County Development Budget shall be set aside for implementation of Mitigation and Adaptation Strategies to build community resilience.

Community involvement is key for implementation of locally led climate actions. Therefore, the County has put in place structures as per the Bungoma County Climate Change Fund Act, 2022 that include;- the Ward Climate Change Planning Committees in all the 45 Wards for local led action planning and project identification and oversight; the County Climate Change Planning Committee which is technical committee comprising of County Directors and Chief Officers from key Departments under Climate Change and members of the civil society to oversee planning and implementation of climate change projects and programs; and the County Climate Change Steering Committee comprising of the County Executive Committee Members and other key stakeholders, chaired by the Governor is mandated to provide strategic leadership towards building community resilience. All the structures are coordinated by the Directorate of Climate Change and the County Climate Change Unit who coordinate implementation of the County`s climate change programs.

The Participatory Climate Change Risk Assessment (PCRA) is a community centered approach that enables them to identify key climate change hazards affecting their resources, livelihoods, their impacts and propose appropriate adaptation strategies for evidence-based County Climate Change Action Planning and implementation. This approach enables the community to assess historical, current and analyze or project future climatic scenarios and their implications towards their livelihood systems while examining existing and future drivers of vulnerability. The Bungoma County PCRA process has been undertaken with the main objective being to inform the most-effective sector-specific strategies to build community resilience against the identified climate change hazards. It must also be emphasized that the process which has been supported by the National Treasury and the Financing Locally Led Climate Action (FLLoCA) Program, is a key requirement for accessing the County Climate Resilience Investment (CCRI) Grants under the FLLoCA Program.

Bungoma County, having undertaken the PCRA Process which has highlighted key hazards and priority investment areas to build resilience shall endeavor to mainstream climate change across all the sectors from the ward level to the County level in addition to strengthening climate change governance by enhancing the capacity to monitor and report climate actions across all the sectors. Climate Change resilience shall be enhanced through climate information services and early warning systems to reduce the impacts of climate change among communities.

Bungoma County has prioritized investments in increasing its forest cover through reforestation and afforestation programs; promotion of Climate Smart Agriculture (CSA); soil and water conservation, promotion of green energy and energy saving devices as strategies of combating climate change. A County Climate Change Action Plan developed under guidance from the PCRA

report shall provide a coordinated and multi-stakeholder approach towards building Community resilience towards Climate Change. This will ensure the County achieves Sustainable Development Goals which shall foster socio-economic development for improved livelihoods of Bungoma residents while at the same time contribute towards the achievement of Kenya's Vision 2030.

H. E. HON. KENNETH MAKELO LUSAKA
THE GOVERNOR,
BUNGOMA COUNTY

Acknowledgement

The Participatory Climate Risk Assessment Process (PCRA) was conducted with financial support of the National Treasury under the Financing Locally Led Climate Action (FLLoCA) programme. The exercise would not have been successful without the goodwill and guidance of the Governor, Bungoma County H.E. Kenneth Makelo Lusaka. The County Chief Officer, Department of Environment, Climate Change and Tourism, the Bungoma County Directorate of Climate Change and the County Climate Change Unit provided the coordination which enabled the successful implementation of the PCRA process. The National Treasury's FLLoCA Program Implementation Unit (PIU), GIZ, ADS-Western Kenya provided technical and substantive inputs to the PCRA process.

My appreciation goes to the PCRA Technical Working Group which included representation from the Departments of Agriculture, Health, Water, Kenya Forest Service, Kenya Meteorological Department, Academia, Civil Society Organizations under the coordination of the Directorate of Climate Change.

Lastly, the contributions of the Members of the County Assembly and the active participation of communities in identification and prioritization of Climate Change hazards in their wards that informed this document is much appreciated.

Thank you.

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Executive Summary

Climate Change has affected various sectors and livelihoods of the people of Bungoma County. The PCRA in Bungoma County was conducted in all the 45 wards by the community with the guidance of the Technical Working Group and the Ward Climate Change Planning Committees.

The main objective of the PCRA is to pinpoint the climatic risks and hazards and their impacts on the various sectors, livelihood and producer systems differentiated by their spatial locations, most prevalent and also how they affect the interest group. The local responses from the community were evaluated in terms of their effectiveness and sustainability. The proposed resilience strategies would inform the County Climate Change Action Plan (CCAP), which would be integrated in the CIDP as well as the NCCAP. The Community Led Action Plan would ensure that the investment adaptation strategies are aligned to the priorities and the needs of the community, putting in consideration the resources, knowledge and capacity of the local area.

The PCRA process entailed formation of the technical working group(TWG), training the TWG, mapping of the stakeholders, preparation of the community engagement, conducting the participatory climate risk assessment in the 45 wards, compilation of the data from the ward level risk assessment, analysis and preparation of the County Multi-stakeholder workshop, the multi-stakeholder climate risk workshop and finally the Participatory Climate Risk Assessment Report.

The analysis of the community responses on the climatic hazards trends over the past 30 years indicates significant changes in the climatic conditions such as erratic precipitation and continuously rising temperatures. The County experiences two rain seasons; a short rain season experienced between July and December and a long rain season experienced during February and June. The County also experienced a dry season from December to February. The annual average precipitation in Bungoma County ranges between 1100-1700 mm, while the average annual temperature range for Bungoma is between 10-25°C. (KMD)

The Communities in Bungoma County identified the climatic hazards prevalent in their region and the prioritized hazards included-: flash floods, dry spell/droughts, pests and diseases, and landslides. These climatic hazards have affected the various sectors such as Agriculture, Health, Water, Energy, Infrastructure, Environment and Natural resources. The community together with

other stakeholders have implemented adaptive strategies that would assist them mitigate the impacts of climate change. However, some of these adaptive strategies require technical, financial, and institutional support to make them more resilient to climatic hazards. The PCRA analysis highlighted that the vulnerable groups; the children, elderly, women, PLWDs and the marginalized community are the most affected with the impacts of the climatic hazards.

In addition, the report also looked at the socio-economic and political risks such as covid-19,poverty levels, corruption and poor governance as an impediment to implementation of the identified climate change adaptive strategies in the community. Given that the future projection indicates a more erratic precipitation and rising temperatures, the report prioritizes the adaptive investment strategies that would cushion the community more so the interest group from the impacts of climate change.

Bungoma County is majorly dependent on rain-fed agriculture, and with the current trends of erratic rainfall, the yields have adversely been affected. Anthropogenic activities such as logging, cultivation on environmentally fragile, sand harvesting, quarrying, overgrazing, poor agricultural practices, dependence on pesticides and chemicals have exacerbated the frequency and intensity of climate change hazards occurrence. Some of the impacts of flash floods included-: the soil degradation, loss of biodiversity, landslides, loss of livestock and postharvest among others, while the dry spell causes loss of vegetation, pests and disease and low crop production. Some of the investment strategies proposed include CSA practices, soil conservation practices, agriculture mechanization, irrigation, crop insurance, early warning systems, strengthen extension services, livelihood diversification feed planning, feed conservation and genetic improvement for drought resistant breeds.

The impacts of climatic hazards on the health sector include increased pests and diseases and malnutrition among others and the prioritized resilient investment strategies are-: vaccinations and Climate related disease surveillance and monitoring. The energy sector has experienced both positive and negative effects of climatic hazards. For instance, the flash floods destroy the energy infrastructure, but also increase the potential to produce hydroelectric power. This implies that

with construction of climate proof infrastructure and water storage and conservation in place the county can enhance its power to produce hydroelectric power.

The water sector has experienced low water levels during dry spells resulting in inability to access clean water for domestic use, making women and other vulnerable groups search for clean water at far areas from their locations. The flash floods destroy the water infrastructure hence affecting the water supply. The resilient strategies proposed under this sector include construction of dams, protection of riparian land and construction of climate proof water infrastructure among others.

The Environment sector is equally affected by the climatic hazards. The loss of vegetation and biodiversity are some of the impacts of climatic hazards which could be addressed through the implementation of the following investments resilient strategies-: Increasing County Forest/Tree Cover, Sustainable Waste Management (Solid Waste Segregation, recycling, sanitary landfills and Composting), Agroforestry, Conservation of riparian land, conservation of water catchment areas and degraded sites.

Technical Working Group Members

S/N	NAME	DESIGNATION
1.	Jane Gitau Mukonambi	County Director Climate Change (Technical Coordinator)
2.	Brian Wamalwa	Environmental Safeguards Focal Point
3.	Vincent Ong'ondi	Climate Change Officer
4.	Benjamin Juma	Climate Change Officer
5.	Jaqueline Makokha	Programme Accountant
6.	Sonny Wekesa	Monitoring and Evaluation Focal Point
7.	Gladys Situma	Social Safeguards Focal Point
8.	Dennis Barasa	Supply Chain Focal Point
9.	Tadayo Siboe	Finance Officer
10.	Salome Rubia	Administrative Assistant
11.	Lynder Kebaso	Agricultural Officer
12.	Stephen Sitati	Department of Trade and Energy
13.	Erick Muge	Livestock Officer
14.	Xavier Tunduli	Public Health Officer
15.	Robert Sawa	Natural Resources Expert
16.	Julius Wanyama	County Director Water
17.	Cynthia Nanyokia	Legal Officer
18.	Noah Eledi	County Director Meteorology
19.	Vincent Mahiva	County Director NEMA
20.	George Wara	County Ecosystem Conservator
21.	Barret Wechuli	Warden, KWS Bungoma County
22.	Mercy Kisuya	County Grievance Focal Point
23.	Dr. John Makokha	Lecturer, Kibabii University

Chapter One

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

1.1 Description of the Assessment Area

1.1.1. Position and Size

Bungoma County is one of the Counties within the Lake Region Economic Block (LREB). The County lies between latitude 00 28' and latitude 10 30' North of the Equator, and longitude 340 20' East and 350 15' East of the Greenwich Meridian. The County covers an area of 3032.4 Km2. It borders the Republic of Uganda to the North west, Trans-Nzoia County to the North-East, Kakamega County to the East and South East, and Busia County to the West and South West. The County is divided into 9 Sub counties, 45 Wards and 236 village units. The Sub Counties are : Kanduyi, Webuye West, Webuye East, Kimilili, Tongaren, Mt. Elgon, Kabuchai, Sirisia and Bumula.

Figure 1: Location of Bungoma County within the Lake Region Economic Block

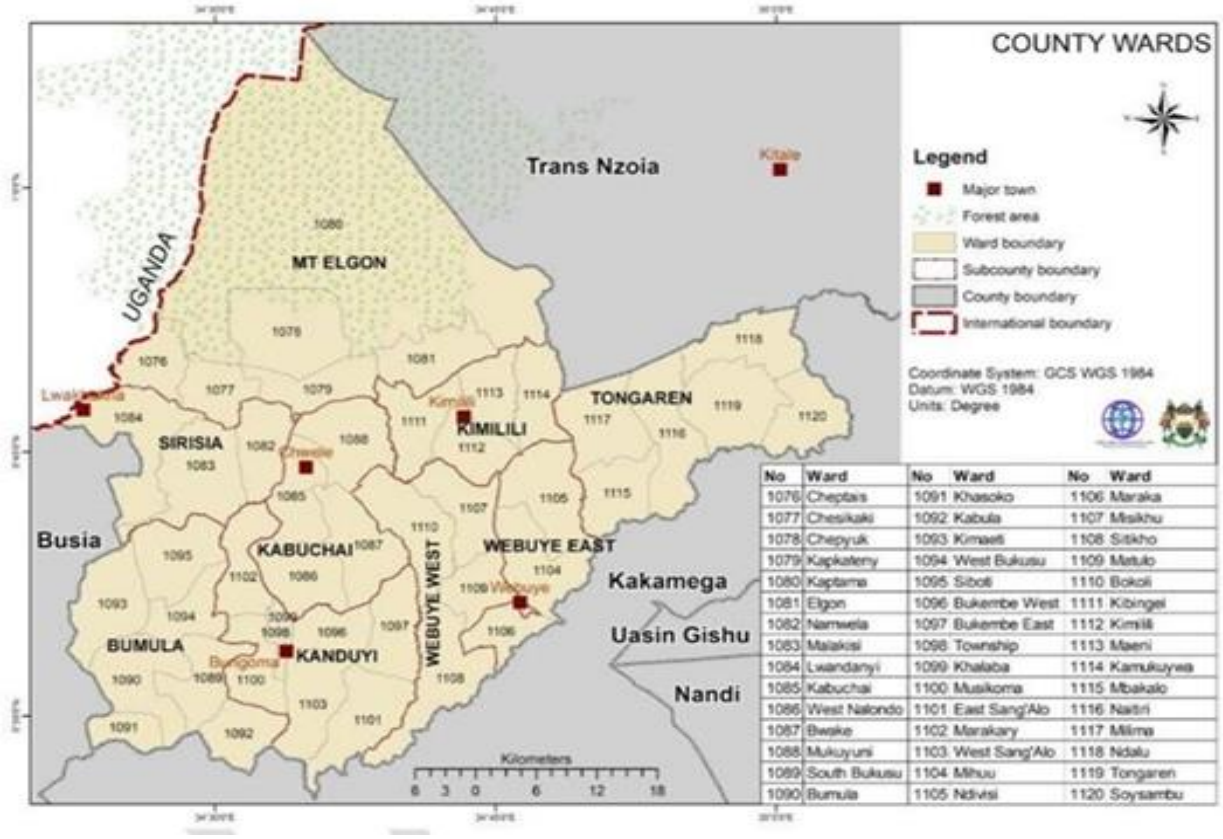

Figure 2: Bungoma County Administration Unit

1.1.2 Socio - Economic Status

The monetary poverty rate for Bungoma is 35.5% which is nearly the same as the national rate of 35.7% with approximately 525,509 people in Bungoma being monetarily poor. When disaggregated by age groups, 69% of children in Bungoma are multidimensionally poor. This is 17-percentage points higher than the national average of 52.5%. Among the youths, 71% are multidimensionally poor compared to a national average of 48.1% while for the elderly population, 75% are multidimensionally poor compared to a national average of 55.7%.

The main economic activities are agriculture, transport and storage which contribute the most to the Gross County Product (GDP) at 44.2% and 11.6% respectively. Public administration and defense, education, water supply and waste collection, wholesale and retail, real estate activities, manufacturing and construction are other socio-economic activities (KNBS Gross County Product report 2021). The County has a multidimensional poverty rate of 74.2 % representing a total of 1,063,914 people against a national average of 55.7%.

1.1.3 Demographics

Bungoma County is the second most populous county in the LREB economic bloc and the fifth in Kenya. With a population of 1.66 million people, it represents 11% of the total population of the bloc. According to KNBS population analytical report 2019, the estimated population of Bungoma County is 1,670,570 (Male; 812,146, Female; 858,389, Intersex; 35) with population density of 595 persons per Km2 and 172,005 households. The population distribution between male and female is 48% and 52% respectively. Kanduyi sub- county is the most populated while Webuye East is the least populated. The County population has grown at similar rates to the national average growth rate over the period 2009 to 2019 (2.2-2.5%). Extrapolating this growth rate, it is predicted that the population of the County will exceed 2 million by 2030.

1.1.4. Agriculture

Kenya Vision 2030 identifies agriculture (crop, livestock, and fisheries) as one of the key sectors in the delivery of the 10% annual economic growth rate as envisaged under the economic pillar. The agriculture sector contributes 44% to the County Gross Product. The crops, livestock and fisheries sub-sectors are the main components of the agricultural sector.

The major food crops grown in the County include maize, beans, finger millet, sweet potatoes, bananas, sorghum, Irish potatoes and assorted vegetables. Cash crops include;- sugarcane, coffee and tea though significant production of cotton, palm oil, tobacco and sunflower are present. The average farm size in the county is 2.5 acres with variations in the food basket areas of Mt. Elgon and Tongaren which range from 10 - 50 acres. The area under food crops is 202,494 ha while that under cash crops is 19,091 ha.

Animal husbandry is an integrated part of land use. Traditionally, wetlands and rangelands were used for grazing. The emphasis on crop production has reduced grazing land, hence reduction of animal stock. Main livestock in the County include cattle, sheep, goats, donkeys, pigs, rabbits, poultry and bees. The average land carrying capacity is 3 livestock units per acre (LUs/acre). The most common livestock is indigenous chicken and cattle whose production is low. Apiculture and aquaculture are being embraced by members of the community.

1.1.5. Health Services

Bungoma County has a total number of 197 health facilities which include ;- 1 County referral hospital, 1 county hospital, 8 sub county hospitals, 19 health centers,89 dispensaries, 60 private clinics and 19 faith-based facilities. The major diseases affecting the community include; Malaria, Anaemia, Pneumonia, Diarrhea and Peptic ulcers. HIV/AIDS prevalence rate is 2.8% whereas the malaria prevalence rate is 19%.

1.1.6. Environment, Water and Natural Resources

The County covers a land area of 3032.4 km2, out of which 618 km2 is gazetted forest reserve, 61 km2 is non gazetted forest, and 50.7 km2 is Mt. Elgon National Park. The major forested areas in the County include Mt. Elgon and Chepkitale Forests; Mt. Elgon National Park, Mt. Elgon Forest Reserve and Chepkitale game reserve; Sangalo, Kabuchai and Chetambe hills; The county's current forest cover is 14% while her tree cover is 21%.

Although the County houses one of the 5 water towers in Mt. Elgon Forest, only 25.8% of the County residents have access to clean potable water which is below the National average of 57%. The forest cover is 14% whereas the tree cover is 21%. The rate of urbanization has increased solid waste generation which stands at over 600 tons per day.

The major physical features include Mt. Elgon, several hills (Chetambe, Sang'alo and Kabuchai), rivers (Nzoia, Kuywa, Sosio, Kibisi and Sio-Malaba/Malakisi), waterfalls such as Nabuyole and Teremi. Mt. Elgon and Sang'alo hill have attractive caves.

1.1.7. Transport and Infrastructure

Bungoma County is rated motorable with rural access index of 94% and 5231 Km of road classified under the Kenya Roads Board Classification criteria. The county paved road network consists of bitumen surface of 246.15 Km, gravel surface of 2444.20 Km and earth surface of 2540.97 Km. The County Government has moved to modernize road transport infrastructure by expanding and upgrading urban roads, opening new feeder roads, maintenance of existing roads and construction of bridges and box culverts to improve connectivity. The main transport vessels in the County are motorcycles, passenger service vehicles, private cars, bicycles and donkeys.

1.1.8 Energy

About 36.4% of households in Bungoma County use solar energy for lighting, 21.6% use electricity while 18.5% use Paraffin. A further 11.4 % use Paraffin Lenten, 8.2% use Torch /spotlight- solar charged, 1.1% use Candle, 0.9% use Wood fuel, 0.7% use Battery car/charged, 0.6% use Torch spotlight- dry cell, 0.4% use Paraffin pressure lamp, and 0.2% use Biogas and Gas lamp. The county households/ residences do not use Generator diesel/petrol 0.0%.

According to Kenya National Bureau of Statistics (KNBS) 2019, Bungoma has 357,714 households. Firewood is the most common cooking fuel being used by 78.3% of the households, down from 85% in 2013, 11.0% use Charcoal, 7.2% use LPG (Gas) up from 1% in 2013, 2.6% use Paraffin up from 2.0% in 2013, 0.4% use Biogas, 0.4% use Electricity and 0.2% of the residents use solar.

1.1.9 Gender, Culture and Youth

Climate change is likely to affect marginalized and vulnerable groups as they are more susceptible and have the least resources to undertake the adaptive and mitigation strategies. This group is more vulnerable during extreme events and disasters.

In Bungoma county females make 52% (858,389) of the total with those females above 15 years being 487,913. Women face different challenges because of climate variability that affects their livelihoods at various geographical levels. This is because of their gender inequalities and social roles they face in terms of their control of resources, access to land and decision making. This means that women play a key role in climate change and therefore the inequalities have to be minimized through different affirmative actions to combat climate change in the county.

The projected youth population of Bungoma County in 2022 is 509,382, 60% of whom are unemployed. Youths play a critical role in combating climate change by enhancing climate change mitigation and adaptation. Some of their diverse initiatives include educational, awareness creation and behavior change campaigns. Youths also engage in different climate change projects.

The population of children in the county between the ages of 0-17 are 592,780. As climate change interferes with the environment, children have to grow up in an increasingly dangerous world. This is a crisis that affects their education, nutrition, health, development, survival and future. These

children experience multiple climate shocks combined with poor essential services such as water, sanitation and healthcare. Almost every child on earth is exposed to at least one of these climate and environmental hazards leaving these children vulnerable to malnutrition and disease.

The total number of persons with disability in the County is estimated to be 40,186 which is 2.4% of the county population. 0.7% of people living with Seeing Difficulties, 0.4% with hearing difficulties, 0.7% with Mobility Difficulties, 0.4 with cognition challenges, 0.2 with self-care challenges and 0.3% of the total population with communication difficulties. Persons with disabilities are disproportionately affected by the impacts of climate change because most persons with disabilities live in poverty.

Minority and marginalized communities within the County include;

- Batura who are over 30, 000 and settled in Bumula sub county having migrated from Uganda through Busia.
- Bongomek who are over 20,000 and are spread over in Mt. Elgon, Kabuchai. Kanduyi. Tongaren and Kimilili sub counties. Being pastoralists, they move in search of pasture from Mt. Elgon to Kabuchai to Kanduyi.
- Ogiek who are over 5,000 in number and live in Mt. Elgon in isolation

Bungoma County Summary

S/NO	THEME	DESCRIPTION
1.	Area	3032.4km2
2.	Population (2019 Census)	Total: 1,670,570; Male (812,146), Female (858,389), Urban: 190,112 Rural: 1,480,458
3.	Households (2019 Census)	No: 358796 Average Household size: 4.6
4.	Density (2019 Census)	552 people per square km

5.	Constituencies/Sub Counties	9 (Kanduyi, Bumula, Sirisia, Kabuchai, Mt. Elgon, Webuye East, Webuye West, Tongaren and Kimilili)
6.	No. of Wards	45
7.	No. of Village Units	236
8.	Geography	Within the Lake Victoria Basin, with an altitude range of 1200 meters to 4321 meters above sea level
9.	Climate	Experiences two rainy seasons, the long rains - March to July and short rains - August to October. The annual rainfall - 400mm (lowest) to 1,800mm (highest). The annual temperature - °C and 32°C due to different levels of attitude.
10.	Key National Resources	Mt Elgon Forest Reserve; Mt. Elgon; Hills; Rivers; Arable land
11.	Economic Activities	Dominated by Agriculture and Micro, small and Medium Scale enterprises
12.	Tourist Attractions	Mt. Elgon National Park; Mt. Elgon Forest Reserve; Chepkitale Forest; Nabuyole and Malakisi Falls; Sang`alo, Musikoma and Kabuchai Hills; Caves (Mlango nane and Chebin); Chetambe Fort ruins
13.	Hospitality	Several hotels mostly around urban areas
14.	Key National trunk roads and railway link	A104 (Webuye - Malaba), A1 (Webuye-Kitale-Lokichogio), Mombasa-Nairobi-Malaba-Kampala railway line
15.	Agriculture and Food Security	Area of agricultural land is 223,269 Ha; 202,494 Ha under subsistence agriculture while 19,091 Ha under commercial agriculture. Dependence on rain-fed subsistence agriculture
16.	Health and Wellbeing	Variability in health services capacity, readiness and availability

		of essential packages of services in the County health facilities. Services mostly provided by level 1,2,3 and 4 as well as private health facilities
17.	Education and Skills	Served by over 1,292 ECDE centres; 961 primary schools; 306 Secondary schools of which there are 16 extra county schools, 2 National Schools - Friends School Kamusinga, Lugulu Girls High School; 90 VTCs; Several TTIs - Sang`alo Institute of Science and Technology, Kisiwa TTI, Matili TTI; Musakasa TTI, Sirisia TTI, Chepkurkur TTI, Bungoma North TTI, Webuye West TTI, 3 KMTCs - Webuye MTC, Bungoma MTC, Chwele MTC, Bumula MTC, Tongaren MTC and 1 University - Kibabii, MMUST satellite campuses
18.	Housing and Urban Development	Predominantly semi-permanent with corrugated roofs, mud walls and earthen floors
19.	Water services	Water service provider - NZOWASCO, Water Resource Users Associations, Water Users Associations, water treatment plants at Kamtiong in Kimilili, Webuye at Nabuyole falls and Matisi among others.
20.	Enablers- Road and transport, financial services, ICT	Served by all-weather roads that link to major national trunk roads such as A104 - Webuye-Malaba, A1-Webuye-Kitale, C33-Mumias-Bungoma, D258 - Musikoma - Buyofu, C42 Chwele Sirisia, D277 - Sirisia -Lwakhakha, D279-Sikata Kimilili. Matulo airstrip and Bungoma airstrip. Financial services are provided by commercial banks, microfinance institutions, insurance services, mobile phones and agency banking.
21.	Cottage industries	Naitiri Division Women Sacco/ Lungayi Animal Feed

		Processing Plant Bumula Multi-purpose Co-operative Society Limited Animal Feed Processing Plant Musakasa Community Driven Development Centre- Peanut Processing Plant Bukembe Needy Women Tailoring Training Community Driven Development Centre Mwai Coffee Factory Community Driven Development Centre Kabula Ripening Plant Community Driven Development Centre Bumula Hand Looming Weaving and Tailoring Community Driven Development Centre Namwacha Potato Processing Plant Community Driven Development Centre Namubila Tomato Value Addition Processing Plant Community Driven Development Centre Chepkube- Banana Ripening and processing Chamber
22.	Industrial establishments	Nzoia Sugar Company Webuye Paper Mills Naitiri Sugar Factory Webuye Dairy Processing Chesikaki Coffee Mill Musese Coffee Mill Chwele chicken slaughter house
23.	Security and safety	A network of police stations, police posts and patrol bases. One Military base in Mt. Elgon. Private security firms across the County.
24.	Natural resources	Land, Water, Flora, Fauna, Air, Sunshine, Mountains, Hills, Caves, Soils, Minerals, Biomass.

1.2 Policy Context

The Bungoma County Participatory Climate Risk Assessment has been influenced by the following policy and legal frameworks;

- **The United Nations Framework Convention on Climate Change (UNFCCC) that** outlines commitments expected from parties to the convention. About vulnerability assessments, the convention calls on parties to take climate change considerations into account in their social, economic and environmental policies and actions.
- **The Paris Agreement** that calls on the parties to engage in adaptation planning processes and the implementation of actions including the development of relevant plans and policies that may include, the assessment of climate change impacts and vulnerability with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems
- **Green Economy Strategy and Implementation Plan (GESIP) 2016 -2030 which** is the country's blueprint in advancing towards a low-carbon, resource efficient, equitable and inclusive socio-economic transformation.
- **The Nationally Determined Contributions (NDCs)** which are commitments made by countries who are parties to the Paris Agreement to reduce national emissions and adapt to the impacts of climate change.
- **The Constitution of Kenya 2010** which makes it a right for every Kenyan to reside in a clean and healthy environment.
- **National Climate Change Response Strategy (NCCRS), 2010** that focuses on ensuring that adaptation and mitigation measures are integrated in all government planning and development objectives.
- **National Climate Change Framework Policy, 2016** that identifies the adaptive capacity of individuals and communities as being key to improving their socio-economic situations. It emphasizes on vulnerability assessments as an effective tool for establishing adaptive capacities and therefore proposes appropriate strategies to build community resilience.
- **Climate Change Act, No. 11 of 2016** that outlines structures to govern the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya.

- **The National Climate Change Action Plan (NCCAP) 2018 -2022** that outlined key actions that the country intended to take to tackle climate change from 2018 to 2022.
- **The National Adaptation Plan (NAP)** that outlines key adaptation actions across various sectors of the economy to enhance resilience of vulnerable populations to climate shocks through adaptation and disaster risk reduction strategies.
- **Bungoma County Climate Change Policy** that looks to ensure climate change is mainstreamed into all sectors of the County to build climate change resilience. The policy emphasizes on Stakeholder Engagement and Public Participation (consultations, negotiations and consensus building as a key factor in building community resilience.
- **Bungoma County Climate Finance Policy** that outlines strategies for mobilization, management and prioritization of Climate Change financial resources to build community resilience
- **Bungoma County Environment and Social Safeguards Policy** that seeks to mainstream environmental and social safeguards are mainstreamed into the County`s programs and projects for sustainable development
- **Bungoma County Climate Change Fund Act, 2022** that creates a Fund in the County for the purpose of facilitating Climate Finance for climate change adaptation and mitigation projects at the community level to build resilience.

1.3 Purpose of the PCRA Report

Participatory Climate Risk Assessment (PCRA) is an effective tool of strengthening Communities participation in assessing their climate risks and developing adaptation strategies. Therefore, the PCRA Report has been developed to clearly outline countywide levels of exposure, vulnerability to climate change and other disasters. The report developed using information gathered from all stakeholders from the ward level to the County level aims to outline key community specific mitigation and adaptation strategies to strengthen the threatened livelihood resources to build community resilience taking into consideration the needs of the most vulnerable in the society on the basis of gender, marginalization and access to opportunities. This shall be the foundation of developing a County Climate Change Action Plan and subsequent integration into the County Integrated Development Plan (CIDP) and the National Climate Change Action Plan for relevant

and coordinated county and national response to Climate Change through a community-led risk identification process.

1.4 Key Steps in the County's PCRA Process

The PCRA guidelines outline 8 key steps of undertaking the PCRA which are: - Formation of the technical working group; training of the technical working group; mapping of stakeholders; preparation for community engagements; conducting participatory risk assessment at ward level; preparation of ward level risk assessment reports; data analysis and preparation for county level multi-stakeholder workshop; multi-stakeholder climate change risk assessment workshop and final report writing. The Bungoma County PCRA Process was conducted as follows;-

Table 1: Bungoma County PCRA Process Schedule

STEP	ACTIVITY	DURATION
1	Formation of Cross-sectoral Multi-stakeholder Technical Working Group	2 Days
2	Training of the Technical Working Group	3 Days
3	Stakeholder Mapping	3 Days
4	Preparation for Community Engagements	3 Days
5	Ward Based Engagements on PCRA	18 Days
6	Data Analysis and Preparation of County Level Workshop on PCRA	10 Days
7	County Level Workshop on PCRA	4 Days
8	Development of the PCRA Report	21 Days
TOTAL		**64 Days**

Step 1: Formation of the Technical Working Group

The cross-sectoral Technical Working Group (TWG) was appointed by the County Chief Officer in Charge of Environment, Climate Change and Tourism to lead the Participatory Climate Risk Assessment Process. The team brought together key stakeholders from the various County Departments including; Agriculture, Health, Energy; and members from Semi-Autonomous Government Agencies such as the National Environment Management Authority (NEMA), Kenya

Forest Service (KFS), Kenya Meteorological Department (KMD) and the County Climate Change Unit. A total of 15 members were appointed to the TWG which was supported through wider consultations from the County Climate Change Steering Committee, County Climate Change Planning Committee, the Ward Climate Change Planning Committees, the academia and Civil Society Organizations (CSOs).

Step 2: Training of the Technical Working Group

The Technical Working Group was trained for three days on the PCRA process. The training involved understanding of the process, its relevance in development planning and implementation and how each step of the PCRA process should be conducted as described in the PCRA guidance templates. The training was supported by Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and was undertaken in Eldoret.

Step 3: Stakeholder Identification and Analysis

The stakeholders were identified by the Technical Working Group during the training session broadly categorized to represent: Individuals/organizations formally responsible for climate action and building resilience; involved in climate action and responses to climate impacts; those with knowledge and expertise relevant to climate adaptation and building resilience and community representatives and those impacted by climate change**.**

Table 2: Stakeholder Mapping Summary

Category	Stakeholder
County Government of Bungoma	Department of Environment, Natural Resources, Water, Climate Change & Tourism. Department of Agriculture, Livestock, Fisheries, Irrigation and Cooperatives Department of Trade, Energy and Industrialization**,** Department of Health and Sanitation, Departments of Gender, Culture, Youth, and Sports Department of Roads, Public Works & Infrastructure

National Government Agencies	Kenya Forest Service (KFS), Kenya Meteorological Department (KMD) Kenya Wildlife Service (KWS), National Environmental Management Authority (NEMA)
Development Partners	GIZ, MESPT GEAP, KCIC
Non- State Actors	Ripple Effect , JATONET Kenya , Bungoma Water Resources Users Association, Tree Initiative Africa, Bungoma Hoteliers Association, Kimaeti Farmers Association, CREADIS, Chepkitale Indigenous Development Project, Buteyo Miti Park, Wealth hunger Soil Project (WHH), Pinemark Africa, GFA Bungoma, VI - agroforestry, REAP Africa, CEFOS, SUNCULTURE, WETPA, SOCAA, REDO AGEFA
Financial Institutions	Commercial Banks

Step 4: Preparation for ward level engagements

Community sensitization and mobilization for the PCRA was undertaken through various fora organized by Ward Climate Change Planning Committees, Ward Administrators and Members of the County Assembly. The TWG clustered the wards according to the 9 Sub Counties and each Sub County was allocated 2 days for the exercise. The TWG took 3 days to prepare the Programs, engagement tools and other materials relevant to the community engagements. The materials included; questionnaires, registration forms and other relevant materials for the exercise.

Step 5: Engagement of Communities at Ward Level on PCRA

The ward level engagements involved an average of 10 - 12 participants and involved members mobilized according to different livelihood groups such as farmers, traders, marginalized, youth and PLWDs. The Sub County Environment Officers and Ward Administrators were among the participants.

The PCRA Ward engagement exercise was divided into 3 phases; Phase I involved an introduction session for all participants covering a brief overview/outline of weather, climate and Climate Change trends, the PCRA process and its significance to climate change resilience and its application to the county planning and development cycle. The 2nd phase involved the participants

clustered in their respective wards where members of the TWG guided the wards in prioritizing their hazards and adaptation strategies. This commenced with community members sketching a climate hazard map which also included key resources, assets and livelihood activities. Thereafter, the climate risk assessment questionnaire was administered to determine the main hazards, prioritize them, identify vulnerabilities, local response actions and propose adaptation strategies. The output of this process was that the community identified key climate change risks and hazards and priority response measures. Each Sub County was allocated 2 days and the exercise took 18 working days to cover all the 45 Wards.

Step 6: Data Analysis and Preparations for County Level Participatory Climate Change Risk Assessment

The data collected from the wards was summarized into the reports and risk maps developed by a GIS expert. The TWG met for 3 consecutive working days to develop the workshop program and agree on the workshop execution strategy. Climatic projections on historical, current scenarios were prepared by the Director of Kenya Meteorological Department. A summary report of the ward engagements was developed by the TWG for presentation to the Stakeholders detailing the spatial distribution of the hazards across the County.

Step 7: County Level Workshop on Participatory Climate Change Risk Assessment

The 2-day workshop was held from 17th to 18th May 2023 in Bungoma and later proceeded for 3 days in Eldoret 22nd to 24th May 2023 with the support of GIZ. The objectives of the Workshops were to validate findings from the wards and also have the stakeholders input to be incorporated in the final PCRA report. The workshop had over 50 participants drawn across various Departments/Sectors such as Public Health, Agriculture, Livestock, Environment, climate change, Water and Tourism; representatives of Civil Society Organizations implementing climate change related projects; academia; community representatives among others. The participants were introduced to the general county overview, current and projected climate change scenarios from KMD, hazards prioritized and adaptation strategies identified during ward engagements. The workshop participants who were grouped as per the Sub Counties then prioritized the hazards, response measures as well as drivers of climate change vulnerability in the County.

Step 8: Participatory Climate Risk Assessment Report

The TWG undertook the process of developing a participatory Climate Risk Assessment Report through consolidating all the data collected during the two engagements from the ward engagements to the County level. It took about 1 month and a half cumulatively to develop the report which was finalized by the Directorate of Climate Change.

Figure 3: Technical Working Group Planning Meeting

Figure 4: Training of the Technical Working Group by GIZ

Chapter Two

2. Bungoma County Climate Hazard Profile

2.1 Current and Historical Climate Hazards and Trends

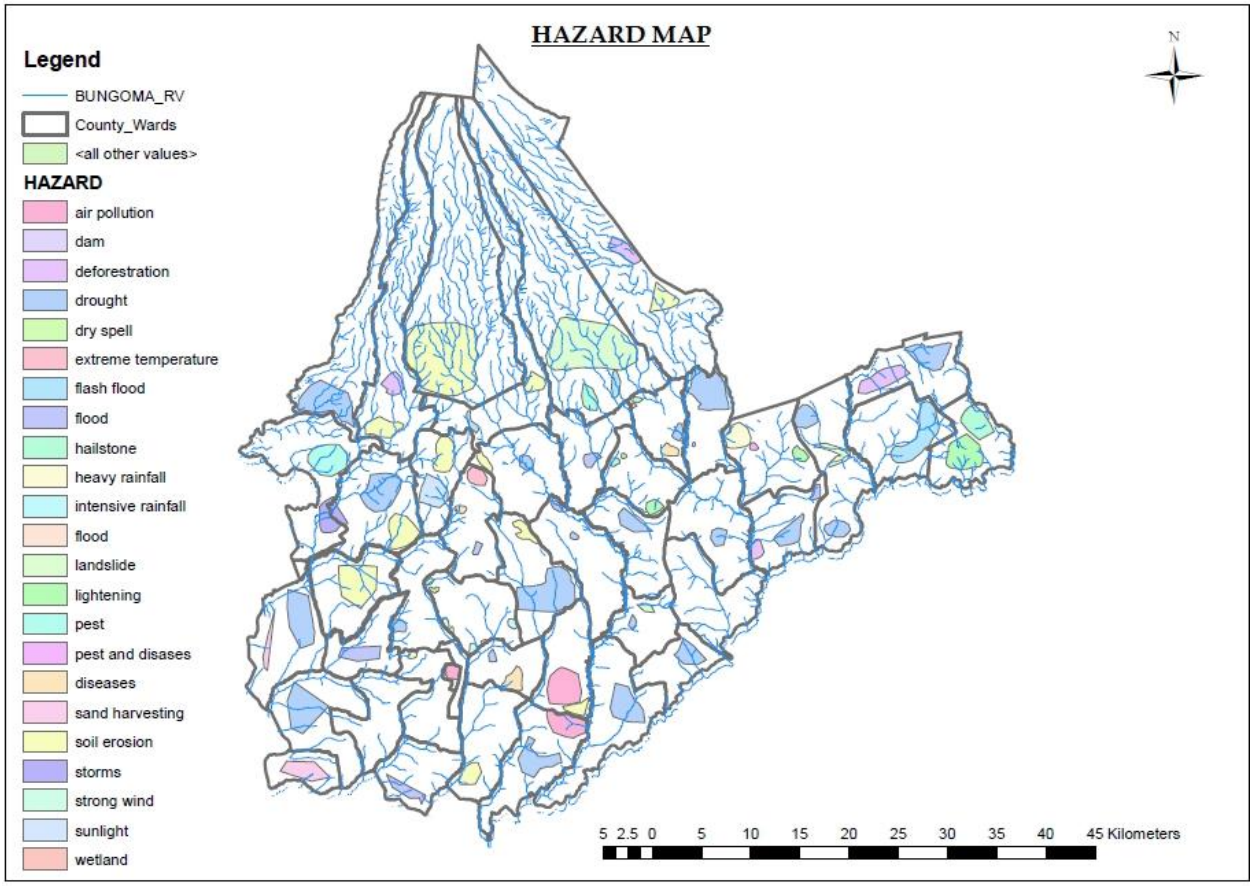

Figure 5: Bungoma County Climate Hazard Map

Historically (defined as 1985-2015), Bungoma County has had monthly temperatures of 15-29°C. The long rainy season, which runs between February and June, is wetter than the second rainy season, experienced between late July and December. A dry season (characterized by fewer than 80 mm rainfall) is experienced from December to February. April and May receive the highest rainfall (more than 200 mm per month). The annual average precipitation in the county is 1100-1700 mm. Most of Bungoma County receives an annual average precipitation of more than 1400 mm. The annual average temperature range for Bungoma is between 10-25°C, although elevation affects temperatures and most of the land area experiences an annual average temperature of more than 20°C. The eastern part of the county, primarily Tongaren and Webuye sub-counties, is the

driest, receiving less than 1000 mm of average rainfall every year. The northern part of the county, covering the Elgon region, is significantly cooler than the southern parts (Mainly covering Bumula and Kanduyi sub-counties), with temperature differences in the order of 10°C or more.

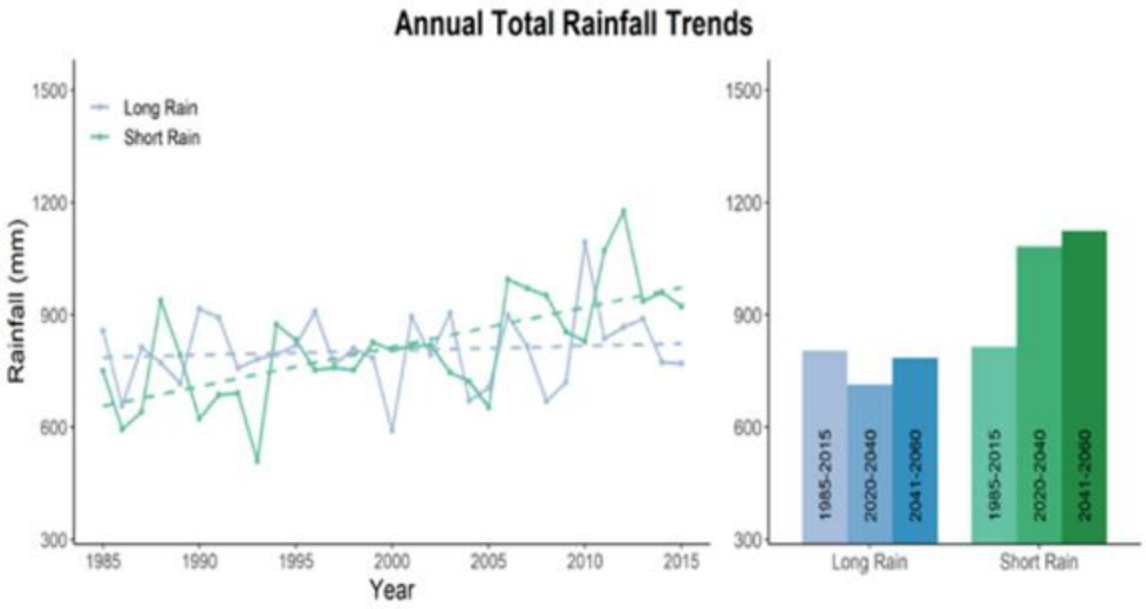

Figure 6: Annual total rainfall trends for the long rainy and short rainy seasons in the past (1985-2015) and in the future (2020- 2040 and 2041-2060

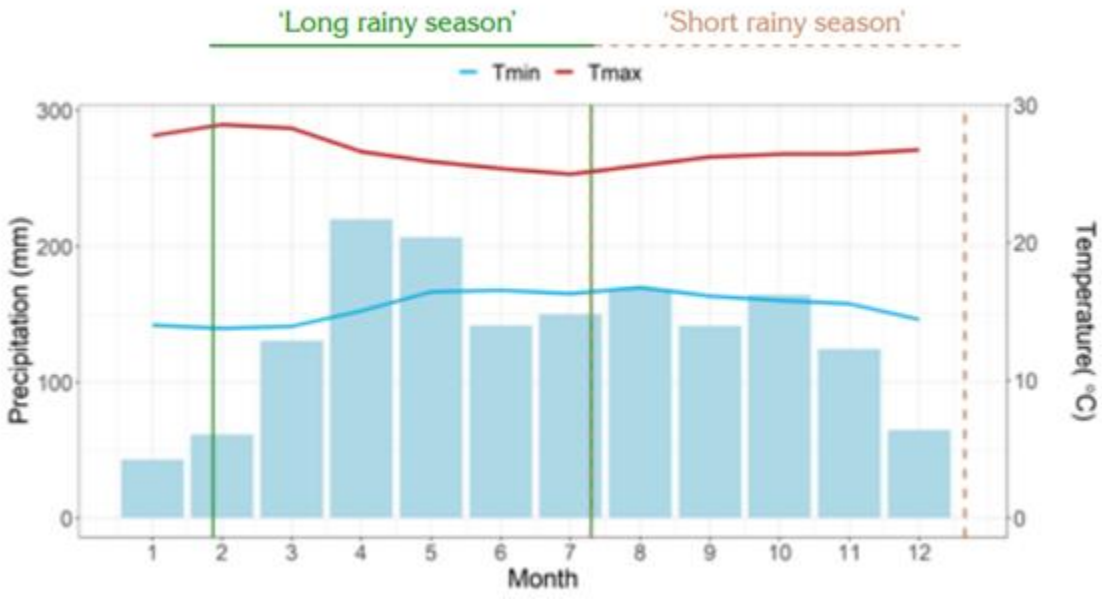

Figure 7: Historical monthly mean temperature and precipitation (average of last 30 years) for Bungoma County

The total annual rainfall has remained stable since 1985 and is expected to decrease slightly until 2040. A slight increase is expected from 2041 to 2060 for the long rainy season. For the short rainy season, the trends show an increase since 1985 which will continue. The mean annual temperatures trends show an increase since 1985 for both seasons and these will continue in the future.

Precipitation and temperature fluctuations have led to increased incidents of climate change induced risks such as erratic rainfall and increased temperatures on existing resources, assets, livelihoods and diversified groups of people in the society.

The erratic and extreme weather conditions (precipitation and temperatures) have increased the intensity and frequency of climate changes threats/hazards. The main climate change threats/hazards in the county include; heavy storms, flush Floods, drought/dry spell, landslides, pests and diseases, hailstones, strong winds and lightning. The most prevalent hazards in the county are drought, floods, hailstones, storms, strong winds, pests and diseases.

The occurrence of climate change hazards differs in the county according to the agro-ecological zones with the upper part of Mt. Elgon sub-county experiencing landslides, floods, pests and diseases, drought, strong winds and hailstones. The lower part consists of eight sub-counties namely: Sirisia, Tongaren, Kimilili, Webuye east, Webuye west, Kabuchai, Kanduyi and Bumula. Most prevalent climate change threats/hazards in the county include; drought, floods, strong winds, pests and diseases with minimal frequency of landslides and mudslides.

Figure 8: Community Members Drawing a Hazard Map

2.2 Exposure and Vulnerability Profiles of the County

The intensity and frequency of climate change risks in the county such as increased temperatures and erratic rainfalls have induced climate change hazards. Climate change hazards occurring in the county include; heavy storms, flush Floods, drought/dry spell, landslides, pests and diseases, hailstones, strong winds and lightning. The county boasts of a variety of livelihoods/assets/resources that have been affected negatively by the climate change threats/hazards. The effects have been felt across the sectors such as agriculture, water, gender, energy and trade, health, environment and natural resources.

The induced effects of climate change hazards in the county include; soil erosion, loss of soil fertility, drying of crops, water shortage, wildfires, increased emergency of pests and diseases, market fluctuations, loss of income, pollution and outbreak of pests and diseases.

The community is highly susceptible to the impacts of Climate Change however, these hazards have affected diverse groups differently according to their level of vulnerability. The measure of vulnerability is dependent on severity, magnitude, extent and resilience mechanisms to adapt and mitigate the prevailing climate threats/hazards across the county.

Children and the elderly are most affected since they are malnourished due to inadequate food. Furthermore, there is increased truant children, who also walk long distances in search of water and firewood. Persons living with disability are sickly and also lack the strength to look for food and water. Women are affected highly by prolonged drought due to water scarcity and scarcity of food commodities for their households. Farmers are most affected by the hazards as they interfere with their agricultural activities in terms of delay in planting, pre- and post-harvest losses, crop failure due to unpredictable rainfall whose outcome is food insecurity and poverty.

Agriculture

High dependence of the county on rain-fed agriculture has led to low agricultural productivity due to unreliable weather patterns and effects of climate change. The area under food crops is 201,654.6 ha, while that under cash crops is 86,423.4 ha. Most of the agricultural activities are rain-fed, meaning that farmers only Plant during the rainy seasons. Dependency on rain-fed agriculture exposes families to instances of food insecurity because of unpredictable weather patterns. Women and children do not have equal rights to the men's access and management of the resources such as arable land used for agricultural activities hence more vulnerable.

Farmers are susceptible to climate change threats due to the sensitivity of crops to delays in the onset of rains, post-harvest losses, increased pests and diseases. Livestock keepers are vulnerable to climate change impacts during drought that results in pasture loss/fodder and water scarcity.

Trade and Energy

The Micro, Small and Medium Enterprises (MSMEs) are considered as sources of employment generation, economic growth, and social transformation. A significant proportion of the MSMEs are formal, while the majority fall within the informal economy based on their size, location, ownership, status of formality and economic activity. The sub-sector produces a significant share of total value added, and provides a large segment of the poor and middle-income populations with affordable goods and services. Seasonal variability in the agriculture sector affects traders coupled with market fluctuations in demand and supply of agricultural commodities during drought and flood periods.

Energy is one of the key factors of production with both the formal and the informal sectors being highly dependent. At 22%, nearly a quarter of residents in Bungoma County use electricity as their main source of lighting, while 36% use solar lighting. Firewood is employed as cooking fuel by 78%, while only 0.4% use electricity as a source of fuel for cooking (KNBS, 2019b). This in turn exacerbates destruction of forests, established farm forests and woodlots. women and youth spent more time and energy in search of these resources to meet their energy requirements.

Energy is one of the key factors of production with both the formal and the informal sectors being highly dependent on energy both for production or for consumption by the households. This sector has however been affected with climate change in terms of power generation transmission and consumption. Industries and households are all vulnerable with the variation in power leading to due to power rationing and increased cost of power leading to increased cost of production thus affecting the market prices of commodities affecting income generation.

Women are also highly affected in the household's since they rely on firewood and charcoal for cooking leading to increase in respiratory diseases, they also spend a lot of time and energy fetching firewood for cooking.

Transport and infrastructure

Transport Infrastructures such as roads have been affected by flash floods, rendering the roads impassable. This has affected the community's timely access to the markets. Small scale traders who are mostly women are affected where their commodities are destroyed and carried away from the open-air market they operate from. The children are unable to access schools and other essential amenities during the destruction of roads, bridges and culverts that control both storm water and

act as water ways. The elderly, PLWDs and the marginalized are disadvantaged in carrying out their socio-economic activities during infrastructure destruction by floods.

Health

Climate change induced impacts have affected the health sector. Drought for instance, has led to low agricultural yields among the farmers in the county. The effects of food scarcity/food insecurity have led to malnutrition making children, women and PLWD more susceptible to the effects. Flooding takes place across the County that has resulted in an emergency of pests and diseases both vector and waterborne diseases. Children, women and disadvantaged people in society are most vulnerable to the emerging diseases. Treatment of both waterborne and vector diseases by vulnerable groups is costly and expensive due to low-income levels.

Environment

Degraded environment from climate change hazards erodes the ability of communities to produce and maintain the same level of environmental resources and functions. The major degraded areas include; Mount Elgon, Hilltops; Chetambe hills and Sang'alo hills and Riparian areas along Rivers Nzoia, Malakisi, Kuywa, Sio and Khalaba.

These existing resources are impacted negatively during the drought period with reduction in water levels and wildfires in forested areas. Water scarcity affects women and children who travel long distances in search of water. During flooding, soil erosion occurs in forest, hills and on arable land leading to soil fertility loss and vegetation destruction that women and children depend on for farming activities.

Water

The County's water demand is currently at 58,220m3/day. This demand will surpass 220,027m3/day by the year 2050. The County has seven urban water schemes, twenty rural schemes. The urban water schemes collectively produce approximately 20,550m3/day. However, approximately 66% of the production is lost as Non-Revenue Water (NRW) hence only 7,000m3/day (12% of the demand) reaches the consumers. The boreholes and rural water schemes meet 11.8% (6,970m3/day) and 2% (1,164m3/day) of the residents' water demand respectively after correction for unaccounted for water. Therefore, only 25.8% of Bungoma County's residents (440,000 people) have access to safe drinking water. This is less than 69% of the global average

or 73% rate of access in Africa. It is also less than Kenya's national average water supply coverage of 57%.

During prolonged dry periods, the overall yields of water in these sources drastically reduces leading to time wastage and conflicts amongst the communities. During periods of excess rainfall, the overall quality of water in these sources declines due to pollution, with springs and dams being more affected.

Table 3: Vulnerability Matrix

Vulnerable Group	Livelihood or Economic Activities they Practice	Resources they Rely on	How they are Impacted by Climate Change
Women	• Farming • Small business • Nursery establishment • Waste recycle (mats, baskets, ornamentals, briquets) • construction of energy saving devices	Water, crops, animals, arable land, solid wastes, finances, inputs, machinery	• Water shortage -spend more time and walk long distances in search of water • Poor health and nutrition -increased cost of medication (respiratory , water borne diseases) • Food insecurity- result to malnutrition • More energy expenditure sourcing for wood fuel • Low incomes- affects social-economic status
Youth	• Crop farming • Small business • Nursery establishment • Livestock keeping • Waste recycle (building materials i.e., blocks) • Composting - biodegradable waste	Water, crops, land, capital, inputs, solid waste	• Water shortage -spend more time and walk long distances in search of water • Poor health-increased cost of medication(respiratory , water borne diseases) • Food insecurity- which may result to nutritional diseases • low incomes- affects social-economic status

PLWD	• Farming • Small business • Nursery establishment • Waste recycle (mats, baskets, ornamentals, briquets)	Water, crops, animals, solid wastes	• Poor health-increased cost of medication(respiratory , water borne diseases) • Food insecurity- which may result to nutritional diseases • Low incomes- affects social-economic status
Elderly	• crop Farming • Small business • livestock keeping	Water, crops, animals,	• Poor health-increased cost of medication(respiratory , water borne diseases) • Food insecurity- which may result to nutritional diseases • More energy expenditure sourcing for wood fuel • Low incomes- affects social-economic status
Minority groups	• Farming • Small business • Nursery establishment • Waste recycle (mats, baskets, ornamentals, briquets)	Water, crops, animals, solid wastes	• Water shortage -spend more time and walk long distances in search of water • Poor health-increased cost of medication(respiratory , water borne diseases) • Food insecurity- which may result to nutritional diseases • More energy expenditure sourcing for wood fuel • low incomes- affects social-economic status
Indigenous people	• Crop Farming • Small businesses • Livestock keeping	Farm inputs and Machinery, Finances, Technical expertise	• Loss of cultural identity • Poor Health & nutrition • Loss of livelihoods • Low incomes-Increased poverty levels
Children	• Schooling	Educational facilities, Finances	• Truancy • Inability to access education

2.2.1 Climatic Hazards and Social, Political and Economic Challenges

There exist other challenges facing the interested groups that have influenced the adaptation of the groups to the climatic condition. The Socio-economic challenges facing Bungoma County include-: poverty, unemployment, conflict in the community, family conflict, insecurity, pollution, covid 19, high population, poor waste management, increased teenage pregnancies and truancy, food safety and insecurity, poor governance and corruption among others. Politicians have interfered with protected areas rehabilitation from human encroachment and activities which have led to destruction of the natural resources in the County such as the Chetambe hills.

The non-climatic and climatic risks coexist, an example being the Covid 19 pandemic affected the livelihoods of the community. Similarly human conflict can lead to insecurity which affects the socio-economic activities and other sectors such as Agriculture, Environment and Health. These challenges make it more difficult for the community to adapt to climatic risks and hazards. Therefore, it is important that the Country's , County and other stakeholders' leadership is tailored to ensure that these challenges are minimized for effective implementation of the Climate Action Plan adaptive strategies.

Table 4: Response Matrix on Risks and Threats

Aspect	Challenge	Influence on Adaptive Strategy	Remedy
Social	High population	waste disposal, food security, pest and disease management	Good Governance, leadership, and urban planning
	Human animal Conflict	competition for resources affect food insecurity	Good Governance & leadership
	Weak governance	Implementation of strategies	Good Governance & leadership proactive civic education and public participation
	Insecurity	Food insecurity conflict	Good Governance & leadership
	Displacement of people	Loss of cultural identity	Good Governance & leadership

Economic	Low incomes	pest and disease management, food security, implementation of adaptation and mitigation strategies	Good Governance & leadership
	Corruption	Implementation of strategies	Good Governance & leadership
	Covid-19	Food insecurity Disease management	Health vaccination
Political	Political interference	Stakeholder engagement, Implementation of adaptation and mitigation strategies	Good Governance & leadership

2.3 Differentiated Impacts of Climate Trends and Risks

Climate change has affected a wide range of sectors in Bungoma County, these include agriculture (crops), livestock, forestry, energy, water, health and livelihoods. These hazards are impacting negatively and differently on various members of the Community especially elderly and people living with disability are disadvantaged to compete for scarce water in springs and other available sources of water due to drought, women are also vulnerable to drought as they walk long distances in search of water for domestic use. Expectant mothers, children and aged people have low immune systems thus making them more vulnerable to vector borne diseases such as malaria due to increased disease vector organisms such as mosquitoes.

Drought has impacted the agriculture sector by causing crop failure, loss of pasture and fodder and also increased pests and diseases due to increased temperature. Forestry sector has also been directly impacted by drought through drying of forest cover and wildfires. The energy sector is also affected due to reduced water levels leading to low hydroelectric power generation and power rationing. In the water sector it has caused drying of water sources such as rivers resulting in human livestock conflict due to inadequate water.

The county also experiences increased pests and diseases as a result of prolonged drought and rising temperature. In the Agricultural sector(crops and livestock) it has caused crop failure, low crop yields, increased pests and vector borne diseases in livestock resulting in low production and death of livestock. Increased existence of vectors such as mosquitoes has resulted in the health sector recording high occurrences of malaria.

Floods have led to soil erosion and soil siltation consequently causing loss of productive agricultural land and loss of crop, aquaculture and livestock productivity. Flooding has been observed to directly affect livestock by encouraging outbreak of bacterial, fungal and viral diseases, destruction of grazing fields and pasture and holding areas and shelters, leading to unhygienic conditions in those areas. Flooding has also affected human beings by causing death, displacement of homes, and destruction of infrastructure and spread of water-borne diseases. In the energy sector it has caused destruction of electricity poles. In the water sector.it causes water pollution and breaking of water pipes.

Forestry and natural resources sector face various challenges related to human activities including uncontrolled cutting down of trees which leads to deforestation and siltation of dams; and encroachment of the wetlands and riparian areas leading to loss of biodiversity and degradation of life support systems.

Figure 9: Members of the Community analyzing occurrence of Hazards

Table 5: Differentiated Impacts

Risk	Hazard	Sector	Impacts	
			Direct	Indirect
Above normal rainfall	**Floods**	Agriculture; Crops	● Land degradation ● Crop destruction ● Soil erosion ● Landslides ● Increased post-harvest losses	● Loss of soil fertility ● Loss of biodiversity, ● Low income ● Market fluctuations ● Unemployment ● Human wildlife conflict ● Pollution ● Food insecurity
		Livestock	● Destruction of livestock, pasture and fodder ● Displacement of livestock and ● Increased livestock water borne diseases Destruction of livestock structures	● Loss of income ● Increased cost of production
		Water	● Siltation of water bodies ● Destruction of water infrastructure ● Destruction of drainage and sewerage system	● Increase in waterborne diseases, ● Increased cost of desilting, ● Water pollution
		Health	● Increase of vector borne pathogens ● Loss of life ● Destruction of drainage and sewerage system	● Malnutrition, ● Increase in diseases ● Increased cost of treatment of diseases and medication ● Displacement of human beings

		Environment & Natural resource	● destruction of vegetation cover ● destruction of riparian and water catchment areas	● Loss of biodiversity ● Land degradation
		Infrastructure	● Destruction of infrastructure system	● Increased costs of building infrastructures
		Energy	● Destruction of electricity grid ● Increased water levels for water sources ● Increased instances of Transmission failure due to lightning and storms	● Increased cost of power ● Loss of income due to power loss for SMEs and Industries ● Loss of employment ● Increased potential for hydroelectric power ● Increased cost of repairs of power transmission lines due to over ice loads, strong winds, lightning
Heavy rainfall	Landslides	Agriculture, Livestock, Forestry/Wildlife, Infrastructure	● Loss of pasture ● Displacement of People ● Loss of Livestock ● Loss of Life ● Destruction of property and infrastructure ● Loss of biodiversity	● Food insecurity leading to inflation ● Human-wildlife conflicts ● Conflicts over natural resources ● High cost of medication ● Loss of income/business ● Insecurity ● Impaired connectivity (transport and communication)

Depressed Rainfall	Drought/ dry spell	Agriculture	● Crop failure ● Soil biodiversity loss ● Early maturity of crops ● Extinction of variety of crops and introduction of new crops ● Increased evapo-transpiration ● Increased pest and disease ● Emergency of new pests and diseases and noxious weeds. ● Low yields	● Food insecurity ● Low income ● Human/animal conflict ● Diminished livestock feeds ● Introduction of new crop species ● Increased cost in crop, production ● invasive species of weeds and other crops ● Increased emergence of new pest and diseases ● Conflicts over scarce resources ● Food and nutrition insecurity ● Loss of income ● low production ● Emotional stress to local communities ● Financial insecurities ● Shift from agro-industry to means of livelihood
		Livestock	● Drying of pasture and fodder ● Increased cost of pedigree breeds ● Heat stress in livestock ● Increased cost of production ● Dehydration of livestock ● Migration of bees to cooler areas	● Diminished livestock feeds ● Introduction of new animal species ● Increased cost of animal, aquaculture production ● Increased emergence of new pest and diseases ● Conflicts over scarce resources
		Water	● Drying of water sources ● Increased pests and diseases ● Heat fatigue	● Water scarcity ● Increased workload for women in search of water ● Reduced water level and access to clean water

		Environment & Natural Resources	● Loss of animals (wildlife and domesticated) ● Loss of vegetation (plant life)	● Loss of biodiversity ● Increased Wind pollution and wind speed
		Health	● Increased pests and Diseases	● Increased cost of treatment and medication ● Malnutrition ● Heat fatigue
		Energy	● Reduction in renewable energy ● Increased decomposition of waste matter hence increase of energy production ● Increased solar energy	● Power rationing ● Increased potential for solar energy ● Increased usage of power for cooling (air conditioners in offices households and industries ,refrigeration ● Increased cost for pumping water
Increased temperature	Increased Pest, disease and noxious weeds	Agriculture	● Crop failure	● Food insecurity ● Loss of incomes ● Increased cost in crop ● New weed, disease, pest species
		Livestock	● Increased outbreak of pest and diseases	● Increased cost of production in livestock and fisheries ● low income ● death of livestock and fish ● reduced livestock productivity
		Health	● Loss of human life	● Malnutrition ● Heat fatigue
		Environment	● Loss of wildlife	● Loss of biodiversity
		Water	● Evapotranspiration ● Drying of water bodies water scarcity	● Increased cost of water supply

2.4 Spatial Distribution of Risks

The spatial distribution of the hazards across the various sub counties in Bungoma County is as follows;-

2.4.1 Bumula Sub County

Bumula Sub County is made up of seven administrative wards namely: Bumula, Khasoko, Siboti, South Bukusu, West Bukusu, Kimaeti, and Kabula. It borders Kanduyi sub county to the east, Kabuchai to the north, Sirisia to the west and Busia and Kakamega counties to the south.

Bumula sub-county has experienced changes in its climatic conditions. There has also been a change in the frequency and intensity of the said climate threats/hazards. Bumula ward currently experiences unreliable, unpredictable and less rainfall which has led to a decrease in the water levels. Further, the wards experience increased temperatures during the night. Specifically, Khasoko ward currently experiences drought from December to March. Some parts of Kimaeti ward experiences lightning that has led to loss of life and property while Hailstones have caused havoc to crops growing in the fields leaving the farmers with nothing to harvest and compromising their ability to recover from the adverse effects of the changing weather and climatic patterns.

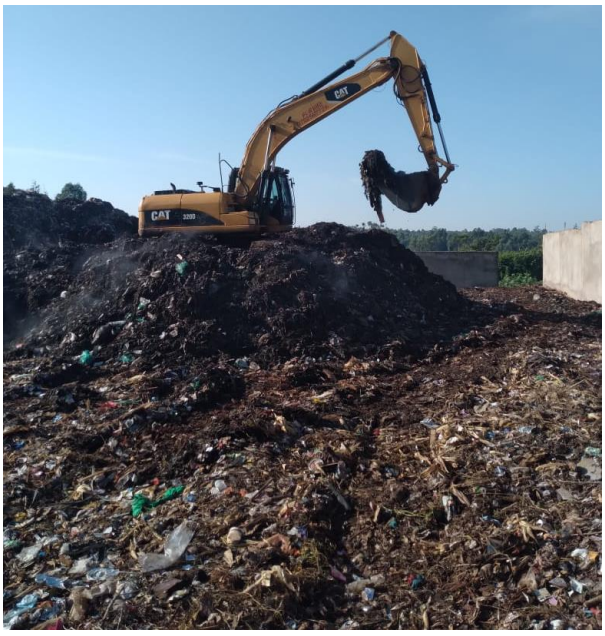

Figure 10: County Dumpsite in South Bukusu Ward

2.4.2 Kanduyi Sub County

Kanduyi Sub County comprises eight wards namely; Tuuti/Marakaru, Musikoma, Township, West Sang'alo, East Sang'alo, Bukembe West , Bukembe East, Khalaba. The hazards that are prevalent are drought, floods and pests and diseases. Drought has resulted in water shortage, crop failure, drying of pasture and fodder leading to malnutrition in both livestock and humans due to inadequate water, feeds and food respectively.

Floods have destroyed livestock structures, swept and killed livestock and also displaced people. There is also increased water and vector borne diseases such as bilharzia and malaria.

Increased occurrence of pests and diseases inhibits crop farming, increased cost of production of livestock and crops, reduced crop yields and low livestock production.

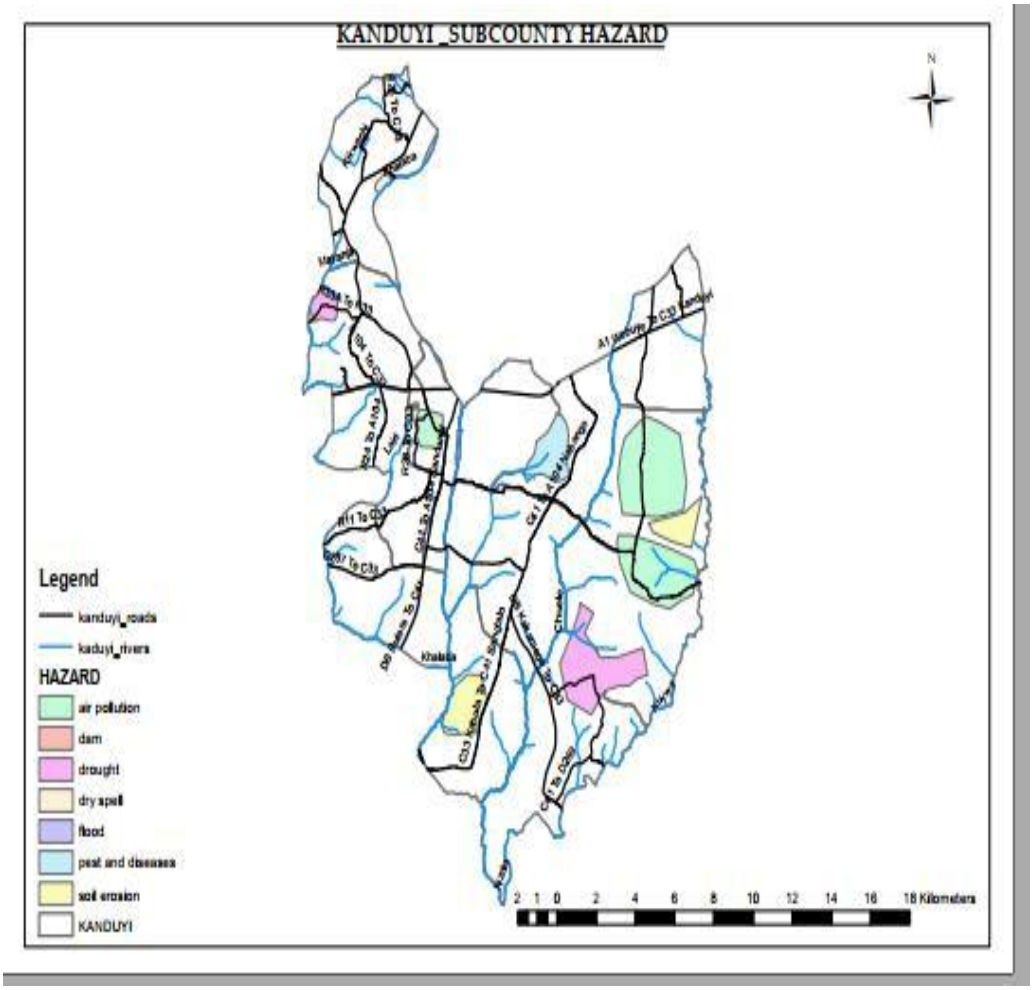

Figure 11: Kanduyi sub- County hazard Map

2.4.3 Kabuchai Sub County

Kabuchai Sub- County has four wards; Chwele/Kabuchai, West Nalondo, Mukuyuni, and Luuya/ Bwake. Kabuchai Sub-County community highlighted the following hazards as experienced in the locality; Drought, floods, pests and diseases, heavy rainfall and hailstones.

The Sub-County had in recent years experienced extreme high temperatures and drought in the months of January, February, March as well as December as compared to the previous years where the temperatures were moderate in the similar months. The floods tend to occur during intense rainfall periods in the months of April and May as well as September and October. The pests and diseases on the other hand were noted to be more frequent during the rainy season in the months of April, May and June.

It was noted that Luuya Bwake experienced medium hailstones and fog in the months of April, May and June. In addition, low impact landslides were experienced in the sub-county mostly in the months of April and May. The strong winds were experienced during the dry spells in the months of January-February and November- December.

Chwele Kabuchai Ward faces dry spells mostly around Musese area, pests and diseases in Chwele location, and flooding in the quarries in Sikulu that has led to loss of lives. In Mukuyuni Ward, soil erosion has led to gullies alongside Chebusitati River, endangering the lives of livestock and people. Flash floods along River Kuywa and Kibisi endangers lives of people and destroys buildings. The ward has also experienced dry spells in Sichei and Sikulu localities leading to food shortages. In West Nalondo, Namosi location has brick making as their economic activity which creates valleys and increasing vulnerability of the area. Further, the encroachment in the Luucho and Kabuchai Hills has led to landslides and soil erosion.

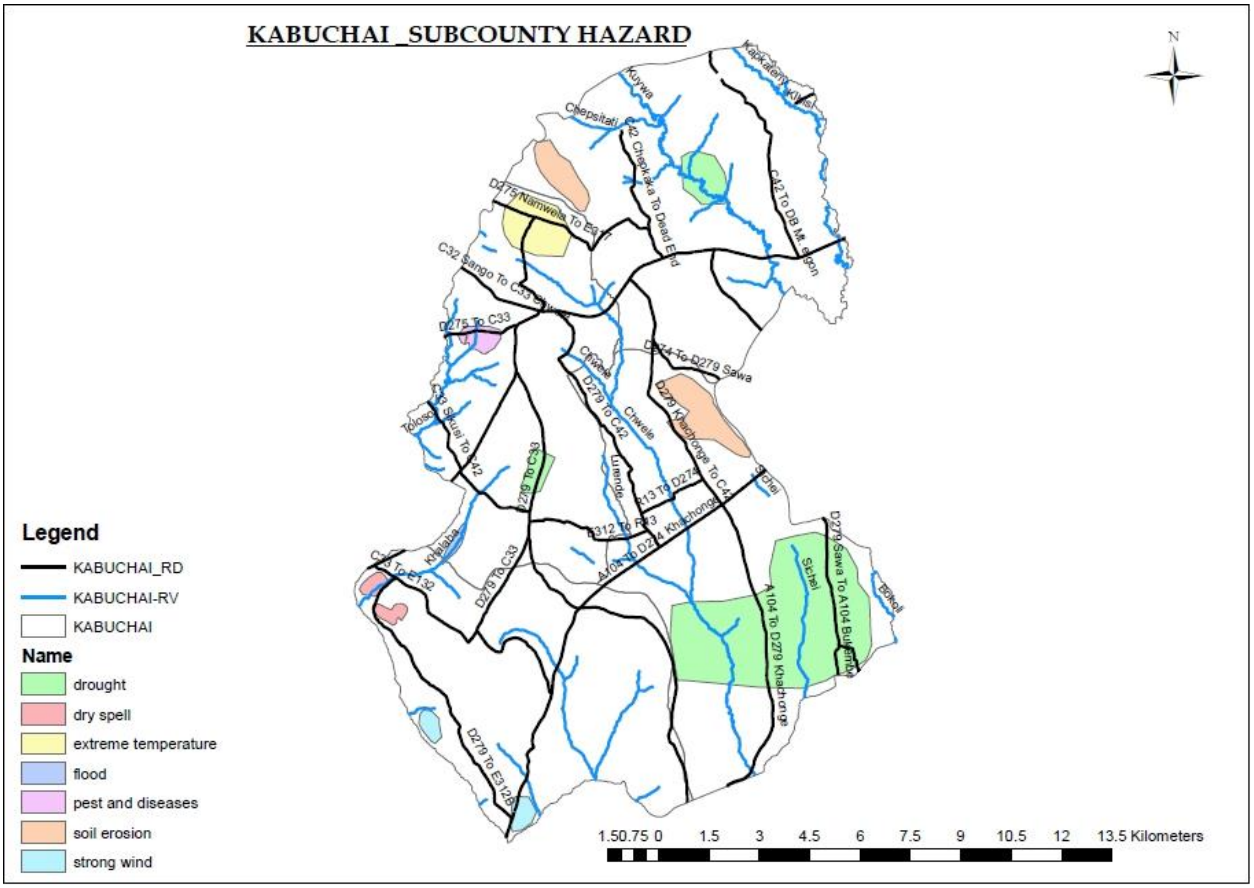

Figure 12: Kabuchai sub- County hazard Map

Figure 13: Urban Flooding in Township Ward

2.4.4 Tongaren Sub County

Tongaren Sub County is made up of six wards namely; Mbakalo, Naitiri/Kabuyefwe, Milima, Ndalu/Tabani, Tongaren, Soysambu/Mituwa. All the wards are at risk of the impacts of Climate Change given their reliance on agriculture and natural resources. It must be emphasized that crop failure that results in food insecurity and general poverty is forcing the community to encroach on riparian land (including rivers and dams) and hills for cultivation further exacerbating the impacts of climate change in the Sub County.

Tongaren/Kiminini ward is experiencing longer dry spells/drought which is affecting agricultural productivity resulting in crop failure. Ndalu/Tabani ward is equally experiencing extreme temperatures and longer drought/dry spells that are causing low agricultural productivity leading to the community encroaching fragile areas such as dams (Sinoko, Mapera, Muliro-obae) leading to their siltation. Mbakalo Ward is similarly affected by drought/dry spells affecting agricultural productivity and the residents turn to activities like sand harvesting which reduces water quality and quantity. Milima Ward is experiencing drought/dry spells directly affecting agricultural productivity that indirectly impacts on food security and raw materials for the sugar factory within the ward.

Flooding is accompanied by increased instances of water borne diseases due to water contamination. Flooding is common in areas close to Rivers Kiminini and Nzoia. Floods in Mbakalo ward are also common as a result of encroachment on dams (Keyani, Matisi, Lutukai) and markets affecting commercial/trading activities resulting in destruction of infrastructure and outbreak of diseases.

Increasing temperatures as a result of climate change is increasing incidences of pests and diseases across the ward further affecting all sectors of the economy. Naitiri/Kabuyefwe is experiencing increased temperatures that affect agricultural productivity and drying up of water sources (Dthokia, Opicho wells) leading to the community encroaching fragile areas such as dams (Nyakuri, Wepukhulu) leading to their siltation therefore reducing water levels.

Figure 14: Stress and shock by dry spell on maize in Mbakalo, Tongaren sub-county

2.4.5 Sirisia Sub County

The sub county comprises 3 wards namely; Namwela, Malakisi/South Kulisiru and Lwandanyi. Drought has affected the following areas within the sub-county; Mutonyi, Toloso and Kolani areas in Namwela ward; Bukokholo dam and Butonge dam in Malakisi/ S. Kulisiru ward and Mayekwe, Wamono and Chebukuyi areas in Lwandanyi ward.

Flush floods have led to soil erosion and soil siltation consequently causing loss of productive agricultural land and loss of crop productivity. Flooding has been observed to directly affect livestock by encouraging outbreak of fungal diseases in livestock, destruction of livestock grazing fields and pasture and livestock holding areas and shelters, leading to unhygienic conditions in those spaces. Flooding has also affected human beings by causing death, displacement of homes, and destruction of infrastructure and spread of air-borne diseases. The areas affected by floods within the sub-county include Menu and Central Namwela in Namwela ward.

Environment and natural resources sector face various challenges related to human activities including uncontrolled cutting down of trees which leads to deforestation and siltation of dams and encroachment of the wetlands and riparian areas leading to loss of biodiversity and degradation of life support systems. In Malakisi/South Kulisiru ward the affected areas include forests in Sirisia

which have suffered deforestation and rivers in Ndakaru which have been encroached. In Lwandanyi ward, Kapkara, Machakha and Malakisi are the most affected by deforestation which has been caused by uncontrolled cutting down of trees for growing tobacco. Kapkara Dam has suffered siltation which has been caused by cutting down trees thus increasing surface run-off

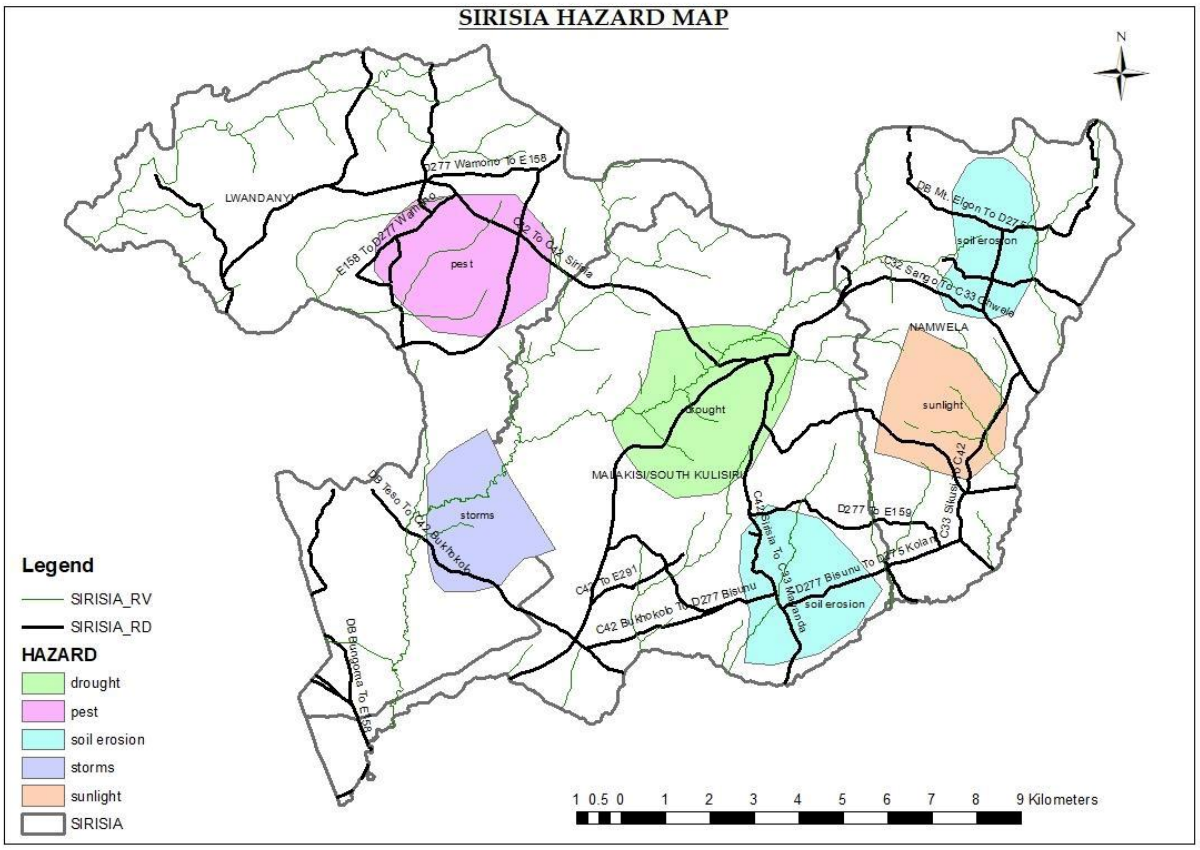

Figure 15: Sirisia sub- County hazard Map

Figure 16: Soil Erosion at Namwela in Sirisia sub-county

2.4.6 Mt. Elgon Sub County

The sub county has 6 wards namely; Cheptais, Chesikaki, Chepyuk, Kapkateny, Kaptama and Elgon Drought has impacted the agriculture sector by causing crop failure, water scarcity and drying of pasture and fodder. The existence of this drought has affected the following areas within the wards in Mt Elgon sub county: Chepkitale, Chemoge, Kaptama Kabonyo, Kaborom, Chesiyo, Kapkanai, Kapchepku, Cheseker, Cheromis, Kamtiong, Bugaa, and Namorio.

Flush floods have led to soil erosion, destruction of crops and breaking of rivers banks and loss of soil fertility. Floods have also affected livestock by encouraging outbreak of diseases and in extreme cases have caused death, displacement of people, destruction of property and spread of waterborne diseases. The areas affected by floods include Chepkitale, Chemoge Kongit, Nalondo, Kaberwo, Cheptais, Kapsosoi, Walanga and Wasio. Heavy rainfall has resulted in massive landslides in some parts of Chesikaki ward.

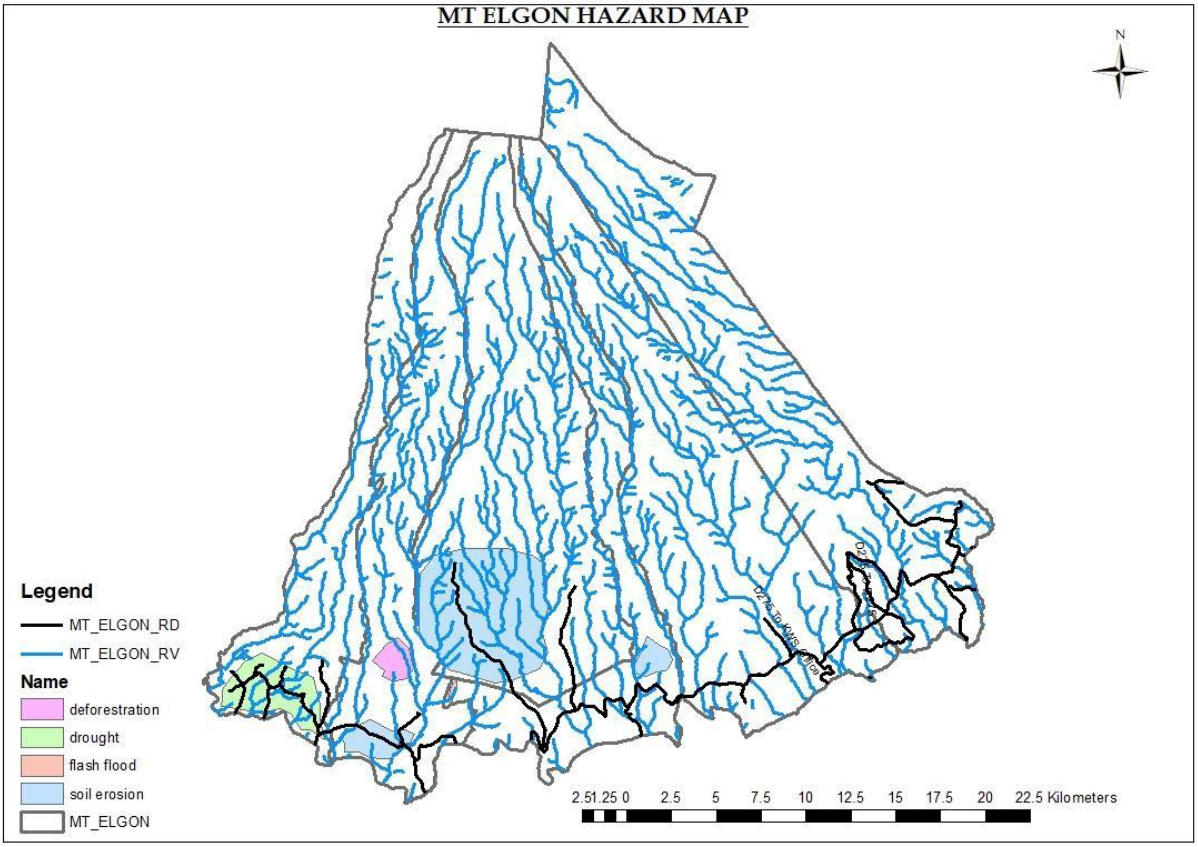

Figure 17: Mt. Elgon sub- County hazard Map

Figure 18: The pictures above show landslides occurrence and a dead goat swept by flash floods in Tuikut and Kaptoboi area respectively, Chesikaki ward in Mt. Elgon sub-county

Environment and natural resources sector face various challenges related to human activities including cutting of trees for charcoal burning hence reducing forest cover as a result ,the sub county experiences less rainfall and deforestation. The most affected areas are the ones bordering mt. Elgon Forest.

2.4.7 Webuye East Sub County

Webuye East sub county comprises three wards namely; Mihuu, Maraka and Ndivisi. The main threats/hazards facing Webuye East sub-county include; Floods, Drought, landslides, pests and diseases, hailstones, strong winds, thunder and lightning. Out of the mentioned hazards above, the most prevalent hazards for the three wards are strong winds, drought, increase in pests and diseases and flush floods.

Floods have led to destruction of property, crop destruction, water-borne diseases, destruction of infrastructure, land degradation, loss of livestock, soil erosion and loss of lives. The main areas affected by floods include; Lufwindri, Muchi, Nabuyole, Khamoto, River Kibisi and Wabukhonyi. Water scarcity, loss of pasture and crop failure are among the main effects of drought within the sub county with Muchi, Lukhoba, Nzoia PEFA, Magemo dam, Sinoko, Nakuselwa, Namarambi and Ndivisi being the most affected areas.

Strong winds experienced in Mihuu Ward have led to falling of trees, soil erosion and destruction of property. The most affected areas are Chetambe Hills and rivers within the Ward. An increase in pests and diseases has led to low production of milk, loss of livestock, low crop yields and sickness in people leading to weakened human resources. Nang'eni, Lukhoba, Misemwa, Sitabicha, Marinda, Lutacho and Malomonye are the most affected areas.

2.4.8 Webuye West Sub County

Webuye West Sub County has 4 wards namely; Misikhu, Matulo, Bokoli and Sitikho. The main climatic hazards in the sub county include: drought, floods, pests and diseases. Prolonged drought has adversely affected livelihoods, crop farming, livestock keeping, drying of vegetation cover and drying of water sources. Machakha, Bokoli, Sirwa, Matisi and Namatondoi areas have been most affected by drought.

Floods on the other hand have led to soil erosion, displacement of people, destruction of crops and destruction of power lines. The impacts of floods have been felt in Malaha upper, Matulo lower, Matulo upper, along Kuywa river, along Sichei river, along Miendo river and swampy areas (Namatondoi and Lukuku).

Increased Pests and Diseases have also been witnessed in the sub county and has resulted to crops destruction, crop failure due to bacterial wilt, low crop yield, low production in livestock and death of livestock leading to loss of income. The most affected areas include; Sikimbilo, Bokoli and Milani.

Figure 19: Pests infestation on maize plantation at Sikimbilo in Webuye west sub-county

2.4.9 Kimilili Sub County

Kimilili sub-county has four (4) wards namely; Kimilili, Maeni, Kibingei and Kamukuywa. Climate change risks in the sub-county are spread across the four wards. Climate Risks severity, magnitude and extent vary in the sub county in relation to resources/assets/livelihoods available as follows; drought has led to reduced rainfall received during long rain season leading to drying up of crops, pastures and fodder, drying up of water sources e.g., springs. This situation has led to encroachment of water catchment areas and riparian land, the most affected areas include; Kimilili

ward-Khamulati, Matili springs, Pasi palm, Sitabicha, Maburu, Sango River, Misikhu river and Matili river. Kamukuywa ward, Masinde and Musembe springs, Kamukuywa and Sosio rivers. Kibingei ward - Kibingei, Khwiroro, Daraja Mungu, Kamusinga, Namakhele and Miruri. Drought also affects the entire ward of Maeni.

Increased incidences of pest and diseases as a result of increased temperature has affected all the 4 wards leading to crop failure, increased animal vector diseases, death of livestock, human vector borne diseases such as malaria spread by mosquitoes, there is also reduced livestock products and low crop yield.

Unpredictable heavy rainfall has increased which leads to destruction of infrastructure, displacement of livestock and people, loss of livestock and human life and flooding in farms. The most affected areas are along Sitabicha, Matili and Misikhu rivers, Kibunde, Kitayi, Siuna, Daraja Mungu and Lutonyi.

Figure 20: Developed gullies at Kamtyong area in Kimilili Sub-County

Chapter Three

3. Future Climate Scenarios for the County

3.1 National and Downscaled Climate Change Projections

The Kenyan climate is changing as proven by changes in temperature and precipitation. 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. 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 (RCP 8.5), average temperatures are expected to increase rapidly by mid-century. Increased heat and extreme heat conditions will result in significant implications for human and animal health, agriculture and ecosystems. The mean annual temperatures trends show an increase since 1985 for both seasons and these will continue in the future.

Rainfall or Precipitation is projected to remain highly variable and uncertain. However, average rainfall is expected to increase by mid-century, particularly during the 'short rains', which occur between October and December. 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. Annual average precipitation is expected to increase slightly by the end of the century under a high emissions scenario.

Similarly, these National Climatic Changes are reflected in regional climatic changes such as that of the Lake Victoria Basin of which Bungoma is part of. The overall climate of the region is becoming hotter and drier from recent observations (1981 -2010). The annual precipitation trends for the region are declining indicating a 40 -50 % variation in a 10-year cycle of dry and wet periods from the 1930s.

3.2 County Future Climate Scenarios

Bungoma County has experienced monthly temperatures of 15-29°C. The long rainy season, which runs between February and June, is wetter than the second rainy season, experienced between late July and December. A dry season (characterized by fewer than 80 mm rainfall) is experienced from December to February. April and May receive the highest rainfall (more than 200 mm per month). The annual average precipitation in the county is 1100-1700 mm. Most of Bungoma County receives an annual average precipitation of more than 1400 mm. The annual average temperature range for Bungoma is between 10-25°C, although elevation affects temperatures and most of the land area experiences an annual average temperature of more than 20°C.

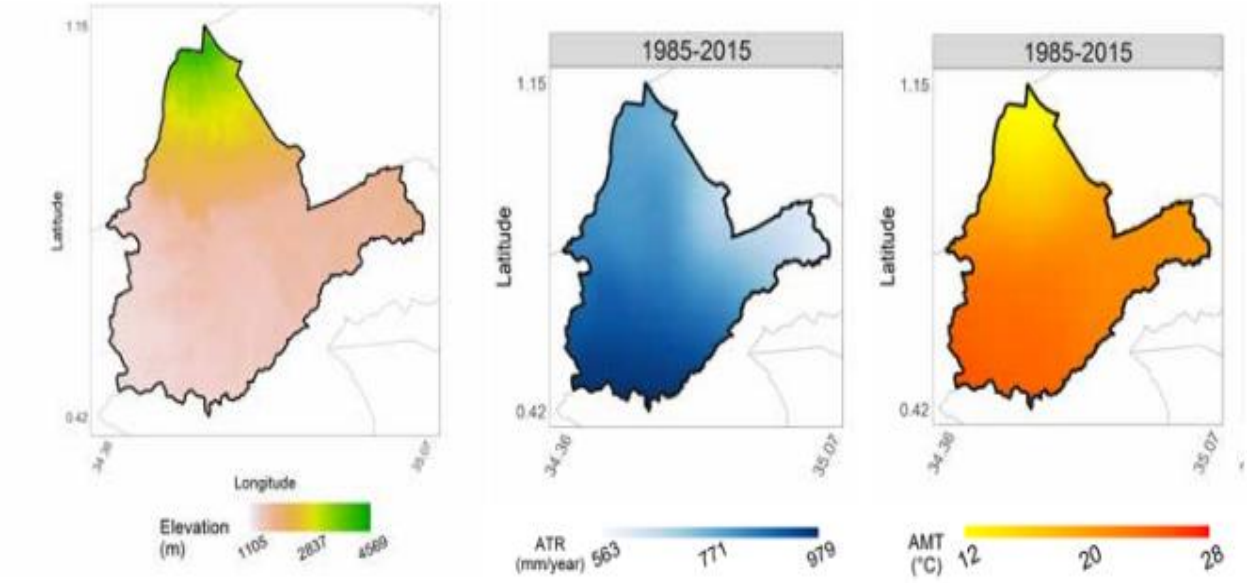

Figure 21: Elevation (left), historical annual mean precipitation in mm (center), and historical annual mean temperature in °C (right) for Bungoma County for the long rainy season

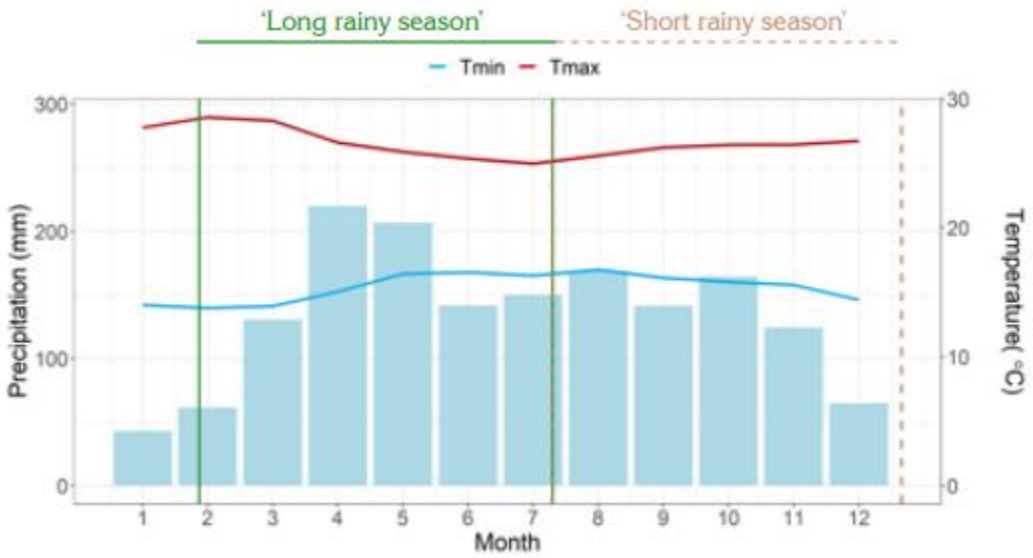

Figure 22: Historical monthly mean temperature and precipitation (average of last 30 years) for Bungoma County. Bars represent total monthly precipitation and lines represent maximum (red line) and minimum (blue line) monthly mean temperatures**.**

Temperature

Future climate projections in Bungoma County indicate that the number of days recording more than 35^{o}C will increase dramatically in the southern regions (Mainly covering Bumula and Kanduyi sub-counties) during the long rains season, suggesting extreme heat events that could last up to 3 weeks. In the second rainy season, it is projected that there will be an increase of about 6 days with temperatures above 35 degrees annually in the southern regions (Mainly covering Bumula and Kanduyi sub-counties).

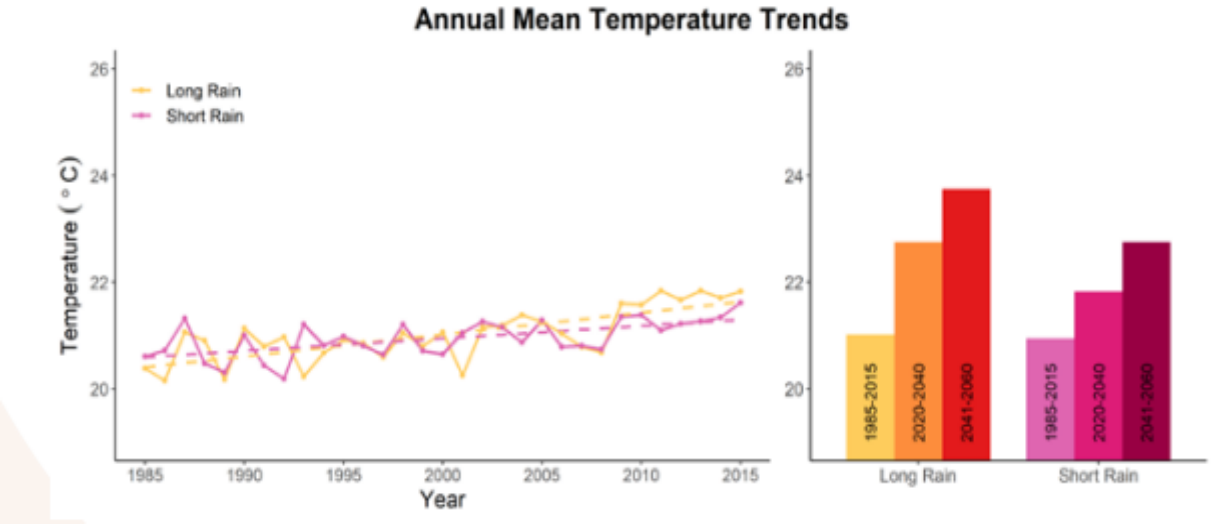

Figure 23: Annual mean temperature trends for the long rainy and short rainy seasons in the past (1985-2015) and in the future (2020-2040 and 2041-2060)

Rainfall/Precipitation

The total annual rainfall in Bungoma County has remained stable since 1985 and is expected to decrease slightly until 2040. A slight increase is expected from 2041 to 2060 for the long rainy season. For the short rainy season, the trends show an increase since 1985 which will continue.

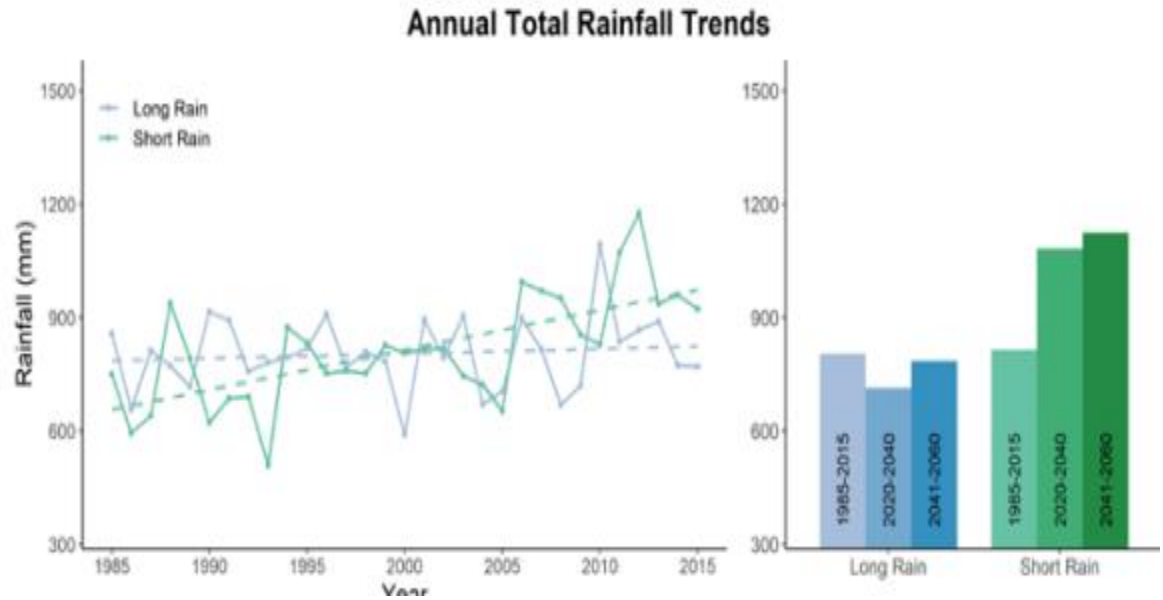

Figure 24: Annual total rainfall trends for the long rainy and short rainy seasons in the past (1985-2015) and in the future (2020- 2040 and 2041-2060)

The future climatic projections indicate temperatures rising with declining rainfall. This shall have an impact on the agriculture, energy and water sectors and therefore general livelihoods. Therefore, appropriate strategies must be put in place to ensure the community builds resilience to the impacts of Climate Change. The sectors must put in place the strategies to ensure the most vulnerable in the society (Women, Persons Living with Disability, Youth, Elderly,) are sheltered from the adverse impacts.

Chapter Four

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

4.0 Introduction

The adverse effects of climate change have been felt in various sectors across the County including; Agriculture, Health, Water, Environment, Energy, Transport and Infrastructure. The County Government of Bungoma has enacted various legislations including Climate Change Policy, Climate Change Fund Act, Climate Change Finance Policy, Climate Change Environment and Social Safeguards Policy *inter alia* to ensure the community is cushioned from the adverse effect of climate change. The County Government of Bungoma is working with other stakeholders such as the CSOs, FBOs, CBOs, and NGOs to come up with resilience actions to mitigate the climatic hazards. Some of the adaptation strategies developed are effective while others require support and innovation to make them more effective in order to impact the livelihoods of the people. This section analyzes the existing resilience strategies and their effectiveness to the current and future climatic risks while putting in consideration the vulnerable groups; youth, women, elderly, marginalized, minority and the PLWDs.

4.1 Overview of Existing Adaptation Strategies and their Effectiveness to Current Climate Risks

The analysis of data from the 45 Wards presented at least four hazards as the most prevalent; dry spells/drought, flush floods, pests & diseases and landslides. There are various strategies being implemented across the various Wards in the County to mitigate and adapt to the impacts of climate change across various sectors as follows;-

4.1.1 Agriculture

The agriculture sector has witnessed reduced productivity resulting in food insecurity that is affecting the most vulnerable in the society. The vulnerable groups have embraced integrated pest management on crops and livestock due to increase of pests and diseases, planting of drought resistant crops, conservation agriculture (crop rotation, soil cover and minimum tillage), use of both farm manure and fertilizers to increase soil fertility. Encroachment accompanied by Soil erosion is rampant, therefore, the community is undertaking use of soil conservation structure (terracing, cultivation along the contour, building gabion) and avoidance of cultivation along riparian areas to prevent instances of floods. In addition, construction of cut off drains/trenches,

strip farming/planting of Napier along riparian areas to prevent flooding and small irrigation systems are other strategies within the sector. Construction of livestock shades (zero grazing), cross-breeding, use of commercial feeds and other alternatives such as hay, silage and sugarcane stalks or destocking during dry spells/drought are strategies being implemented in the County.

4.1.2 Health

The health of the vulnerable people in Bungoma County is compromised given the low crop productivity, and loss of livelihoods as a result of climate change. The practice of sourcing for food from other areas such as Mt. Elgon and other parts of the Country continues during dry spells as communities seek to provide food for the interest group such as Children, elderly, PLWD whose immunity may be low leading to malnutrition and other diseases which is a burden to the health sector. Draining stagnant water, use of treated nets to prevent Malaria and other vector-borne diseases, water treatment and in worse-case scenarios migration to other safer places are commonly employed during floods.

4.1.3 Environment and Natural Resources

Tree planting/afforestation is one of the strategies being implemented though on a small scale along riparian areas, hilly and mountainous areas such as Mt. Elgon to prevent soil erosion during events of floods and landslides but also aimed at increasing the County tree cover. Cases of fire outbreaks are common during drought/dry spells given the fact that farmers have embraced cultivation of sugarcane. Strategies used include; fire extinguishers and using branches or soil to put off the fire.

4.1.4 Water

Water challenges like scarcity and pollution have been worsened by climate change. Most of the water sources, for example the dams have undergone siltation and pollution. The riparian lands have also been encroached and deforested. The community has embraced digging shallow wells, water harvesting using roof catchments, buying water from private vendors and in the worst-case scenario walking long distances to fetch water.

4.1.5 Transport & Infrastructure

Transport Infrastructure such as roads have been affected by flash floods, rendering the roads impassable. This has affected the community's timely access to the markets for the small traders,

the children are unable to access schools and other essential amenities, the elderly, PLWDs and the marginalized are disadvantaged in carrying out their socio-economic activities.

The strategies above range from less effective and less sustainable such as putting out fire using soil to more effective and sustainable approaches such as afforestation. However, some strategies are traditional and localized in particular areas of the wards. Therefore, the community requires capacity building and awareness on Climate Change and its impacts across various sectors and promotion of effective and sustainable strategies for adaptation to climate change to build resilience. However, to build community resilience there is a need for increased stakeholder engagement to mobilize resources to effectively implement adaptation strategies.

4.1.6 Trade Energy and Industrialization

Trade is one of the key sectors highly dependent on energy as a factor of production for the MSMEs sectors, cottage industries and industries. Climate change has affected the energy sector both in terms of generation, transmission and usage of power. Climate change has greatly affected power since the County is highly dependent on solar and hydro power. With the variation of rains both in intensity and frequency the energy sector has been greatly affected since this led to power rationing and increased cost of production.

Although a number of households use firewood and charcoal as the dominant source of energy for cooking, this has a negative impact on the environment, water and health sectors. The environment is affected mainly due to deforestation of the forests for charcoal burning leading to degradation of the forests. The water sector on the other hand is negatively impacted since the loss of forest cover leads to drying of the water sources such as rivers and streams. The health sector is equally impacted because prolonged use of firewood and charcoal for cooking leads to respiratory diseases especially in women.

There is therefore concerted effort both in the short term and long term to mitigate on the climate change risk in the energy sector through conservation of the environment through afforestation, reforestation and agroforestry, protection of riparian land, adoption of other alternative energy sources such as solar, crops residue ,and energy efficient cooking stoves.

Table 6: Past and Current Adaptive Options, Actions and Practices Across Various Sectors

Hazard	Sector	Impact	Past and current adaptive options, actions and practices
Floods	Agriculture (Crops)	Soil erosion Crop failure loss of soil fertility	● Construction of soil conservation structures ● Conservation agriculture (Crop rotation, minimum tillage, soil cover) ● Agroforestry and crop diversification Good agronomic practices ● Crop insurance ● Early warning systems ● Breeding of tolerant and resistant varieties to water logging ● Knowledge and skill enhancement ● Invest in post-harvest loss management ● protection of riparian lands and hills areas ● Regenerative Agriculture and agroforestry/carbon credit ● Customization of national policies ● Good agronomic practices

			● Opening of drains, ditches to drain excess water ● Agriculture mechanization ● Planting early maturing crop varieties ● shift cultivation and crop diversification ● Availability of Disaster management fund
	Livestock	Destruction of pasture and fodder	● Use of alternative feeds such as bananas and sugarcane stalks, silage and hay, formulated feeds ● construction of soil conservation structures ● agroforestry
		Loss and displacement of livestock and aquaculture	● Construction of raised livestock structures ● rehabilitation of ponds. ● moving livestock to safer areas ● Integrated poultry aquaculture farming
		Emergence of pests and diseases	● Moving livestock to safer areas ● vaccination

	Environment & Natural Resources	Destruction of vegetation, crops and structures	● Avoid cultivation along river banks ● Construct cut off drains/ridges ● Strip farming/Napier grass ● Cover crops/mulching ● Advanced reinforcement of infrastructure.
		Displacement of people Human wildlife conflict	● Use of early warning systems. ● Vacation to safety grounds e.g., schools, chief camps. ● Agroforestry ● Early warning system
		Loss of biodiversity	● Use of gene and seed banks ● Use of hybrid seeds and genes
		Pollution of water ways	● Planting of Napier and bamboo grass species to filter water ways. ● Avoid cultivation along riparian land. ● Sustainable Waste Management (Reduce, Re-use and Re-cycle) and disposal

			● Use of incinerators ● Fumigation of collection sites ● Solid waste segregation and massive composting
	Energy	Destruction of power infrastructure. Loss of power affecting industries. Increased water levels potential for power generation.	● Construction of water reservoirs ● Terraces and gabions ● Building of climate proof infrastructures. ● Alternative source of energy. ● construction of more dams. ● Afforestation, Agroforestry and reforestation ● Use of renewable energy sources, solar panels, biogas, green lights. ● Small scale hydroelectric generation ● Establishment of windmills
	Health	Outbreak of waterborne diseases	● Water treatment ● Drain stagnant water ● Vaccination of both human and livestock ● Use of herbal medicines

			● Boiling of water ● Sustainable waste management (Reuse, Reduce and Recycle) ● Proper sanitation [use of pit latrines] ● Use of mosquito's nets ● Drainage of stagnant water ● Massive Spraying programs ● Provision of free medication in schools ● Use of vaccination ● Unblocking of the drainage and sewerage systems.
	Infrastructure	Destruction of infrastructure system (Roads and Buildings)	● construction of climate proof infrastructure ● Avoid construction of structures in riparian lands
	Water	Siltation Water pollution Destruction of water Infrastructures	● Spring protection ● desalination of dams ● Water treatment ● Rehabilitation of water infrastructure ● Customization of national policies

Drought/ Dry Spell	Agriculture	Crop failure	● Soil conservation practices ● Conservation agriculture (Crop rotation, minimum tillage, soil cover) ● Agroforestry and crop diversification ● Manures and composting ● Good agronomic practices ● Crop insurance ● Early warning systems ● Breeding of tolerant and resistant varieties to drought ● Knowledge and skill enhancement ● Invest in post-harvest loss management ● Regenerative Agriculture and agroforestry/carbon credit ● Irrigation ● Early maturing varieties ● Hydroponics
	Livestock	Lack of pasture	● Giving part of your stock to relatives and friends to take care as part of spreading the risk

			● Sharing of farm products in exchange of grazing fields ● use of crop residues such as maize stalks, Banana stems and sugarcane ● Grazing of livestock on community/public lands ● moving livestock to other areas in search of pasture and fodder ● hydroponic technology to grow pastures ● establishment of drought resistant pasture and fodder ● preference to small ruminant animals. ● Irrigation ● intensive feed production ● Agroforestry (caliadria, sesbania, desmoniam and graviallia). ● plantation of high yield fodder crops (Napier, black carrier, bracharia) ● destocking ● establishment of pasture and fodder banks

			● Preserving of fodder ● zero grazing ● silage and hay making ● Pests and disease surveillance ● Enforcement Transboundary Crop, livestock movement ● Use of ITK ● Quarantine and isolation ● Pest free zoning
		Increased cost of pedigree breeds	● cross breeds
	Water	Drying up of water sources water shortage	● Walking long distance to get water from other places ● Buying water from private vendors ● Protection water springs and water catchment areas ● Gravity water supply. ● Roof and underground water harvesting and storage infrastructure ● Drilling and upgrading of existing Boreholes. ● Desalination of dams ● Water treatment

			● Rehabilitation of water infrastructure ● Water purification and treatment; boiling water etc. ● Institute water conservation ● Digging of Shallow wells
	Environment & Natural Resources	Fire outbreak	● Digging of trenches ● Fire extinguishers ● Using branches, soil ● Tolerant varieties ● In Situ water conservation ● Irrigation ● Capacity building on fire fighting ● Enforcement of grass fire ACT.
		Loss of biodiversity extinction	● Reserve natural habitats for endangered species (botanical gardens) ● Establishment of tree nurseries. ● Establishment of gene banks. ● Capacity building on indigenous knowledge and preservation.

			● Establishment of environment clubs in schools
		Decreased forest cover	● Planting of trees on the farm ● Planting of trees in institutions
	Energy	-Reduced hydropower generation of power -Reduced biogas generation - Increased potential to produce solar energy	● Use of alternative sources of lighting e.g., candles, solar lamps, kerosene lamps etc. ● Use of alternative sources of fuel e.g., firewood, kerosene etc. ● Planting of high calorific value tree to produce heat energy ● promotion use of energy saving machines and electronics
	Health	Loss of human life	● Use of mosquito's nets ● Massive Spraying programs ● Provision of free medication in schools ● Use of vaccination
	Infrastructure	Destruction of infrastructure system (roads, buildings)	● Climate proof infrastructure

			● Avoid construction of infrastructure in riparian lands
Pests and Diseases	Agriculture	Crop Failure	● Integrated Pest Management plan ● Soil conservation practices ● Conservation agriculture (Crop rotation, minimum tillage, soil cover) ● Agroforestry and crop diversification ● Good agronomic practices ● Crop insurance ● Early warning systems ● Breeding of tolerant and resistant varieties ● Knowledge and skill enhancement ● Invest in post-harvest loss management ● Early maturing varieties ● Enforcement Transboundary Crop movement ● Quarantine and isolation ● Pest free zoning ● Use of ITK

			● Risk Management Fund
	Livestock	Loss of Pasture	● Migration to look for fresh pasture ● Planting fodder crops ● Zero grazing ● Use of hydroponics ● Silage/ hay making ● Destocking
		Loss of Livestock	● Vaccination ● Spraying of livestock ● Use of indigenous medicine ● Rearing pest/disease resistant animals (zebu) ● Curling ● Use of acaricide ● Cross breeding and use of pedigree animals
	Health	Prevalence of medical diseases	● Seek medical treatment
	Environment & Natural Resources	Loss of vegetation	● Cutting and burning
		Loss of biodiversity	● Cultural belief for sacred areas ● Improvement of new species pest resistant plants (Kanunga) ● Arial spraying (invasion of locust)

Landslides	Agriculture	Soil Erosion	● Avoidance of cultivation and settlement on hilly and mountainous areas. ● Afforestation on hills and mountainous areas. ● Shifting cultivation ● Enforcement of laws
		Crop failure	● Tree planting ● Early planting
	Livestock	Loss of Livestock	● Migration to safer grounds ● Resentment from landslide prone areas
	Infrastructure	Destruction of property	● Migration to safer grounds ● Resentment from landslide prone areas. ● Early warnings

The existing adaptive strategies range from low effective to high effective. The gaps identified have been captured in the future adaptive strategies in section 4.2.

4.2 Effectiveness of Adaptation/Resilience Strategies to Future Climate Risks

Climate Change impacts are expected to be more severe given the County projections of temperature and precipitation from Kenya Meteorological Department. Therefore, given the number of strategies being employed across the various sectors to combat climate change, the following should be enhanced to build resilience:-

i. Capacity building and Community sensitization at all levels from the village unit to the County level on causes, impacts and strategies of mitigation and adaptation on Climate Change.

ii. County Climate Change information systems should be put in place in order to ensure early warning systems for climate hazards. Once hazards are detected, the information should be

shared to various stakeholders and vulnerable members of the Community such as Women, Youth, Persons Living with Disability, marginalized and minorities. This shall ensure proper strategies are put in place across various sectors of the economy to cushion residents against the anticipated hazards.

iii. County climate change vulnerability assessments across the various sectors of the economy must be undertaken to identify key climatic risks and hazards and develop appropriate strategies to combat the hazards. Furthermore, vulnerability assessments of the sectors shall ensure mainstreaming of Climate Change in the County Integrated Development Plan (CIDP)

iv. Partnerships and stakeholder engagements should be encouraged due to climate change being a global phenomenon and the need to work together towards building global resilience. Furthermore, the partnerships and stakeholder engagements are a sure method of mobilizing resources (technical and financial) that are needed for Climate Change Mitigation and Adaptation.

The basic human rights of food, clothing and shelter are threatened by climate change. The situation increases with vulnerability due to poverty, disability, lack of opportunities, gender issues and discrimination. Therefore, all proposed climate change strategies across the various sectors must focus or give priority to ensuring the following is achieved for the vulnerable:-

a) Women are able to access adequate food, water, energy (lighting and Cooking) and opportunities to better their lives and their households
b) The youth are able to access opportunities for employment and contribute towards development of the County
c) The PLWD are able to access opportunities to better their lives and engage in meaningful livelihood activities to meet their basic needs
d) Children have access to all they require for proper growth and education to be the leaders of the future
e) The Elderly are weak and cannot meet their basic needs and therefore require assistance to be able to live normal lives

Table 7: New Climate Risk Management, Mitigation and Adaptation Strategies for Current and Future Scenarios

Hazards	Impacts	Proposed climate action (mitigation and adaptation) priorities for current and future climate impacts	Who/Actors	Location/Where	Gender & Social Inclusion
FLOODS					
Agriculture	· Soil fertility loss · Soil erosion · Crop loss	· Manures and composting · Construction of soil conservation structures · Conservation agriculture (Crop rotation, minimum tillage, soil cover) · Agroforestry and crop diversification · Good agronomic practices · Crop insurance · Early warning systems · Breeding of tolerant and resistant varieties to water logging · Knowledge and skill enhancement · Invest in post-harvest loss management · Regenerative Agriculture and agroforestry/carbon credit · Customization of national policies · Agriculture mechanization · Planting early maturing crop varieties · Shift cultivation and crop diversification	· NGO's · CBO · NARIGP · County Government of Bungoma · Department of (Livestock, Agriculture, Irrigation Forestry, Meteorological, Environment, Water), · Regulatory bodies (NEMA, KEPHIS, KALRO, · KEBS) · Development partners (USAIDD, GIZ, UNDP) · FBO · WRUA · CFA · Private sector · Seed companies · Learning institutions (universities, schools, collages) · WCCPC	Kaptama, Chemwonge, Chepkitale, Kaborom, Kongit, Kaboywo Entire Elgon ward, Entire Chepyuk ward, Entire Chesikaki, Entire Cheptais ward, Malaha upper Daraja Mungu, Siuna, Kitayi, Kibunde Matulo upper & lower, Entire Sitikho West Sangalo entire ward, Siaka, lake basin. East Sangalo ward along all river banks, around water springs/hill/rock/institutions places Bukembe West, along river banks, Nalutiri, Tobolia Bukembe East ward all river banks, a long roads and public facilities	Sensitization and Demonstrations of the proposed strategies targeting Women, PLWD, youth, widows, widowers

		· Practice of smart agriculture		Kibingei, River Misikhu, Sango, River Sitabichi Entire Kamukuywa ward Kuywa River, Bokoli River, Sichei River, Miendo River, Swampy areas (Namatondoi and Lukuku) Entire Township ward Bumula ward; along river banks, Nandingwa, Mayanja, Khayo, Nasiana Khasoko ward; along river banks, River Sio, Namatotoa, Nasianda, Namsasi, Khayo Kimaeti ward; Bitoto, Khasoko, Myanja, Kimwanga, Kitingia Tabala Namwela ward; Menu, Central Namwela Lwandanyi ward; Boiki, Wamono, Nasala, Tulienge, Mufungu, Kibindoi Mihuu ward; Entire ward	

				Maraka Ward; Lufwindiri, Muchi, Nabuyole, Khamoto Ndivisi ward; Magemo Dam, River Kibisi, Wabukhonyi Malakisi ward Sirisia, Tunyo, Butonge, Lukale Siboti ward; lower Siboti, Musole, Nsimbo, Kisiwai South Bukusu; entire ward West Bukusu; Lwacha, Kisoyi, Tunya, Nyangali, Machwele Kabula ward; entire ward Misikhu ward along river banks/ upper hills Sikhendu, Nameme, Nasusi, Kamasielo, along rivers and catchment areas West Nalondo ward; all river banks, all feeder streets, institutions Chwele Kabuchai ward; Makhonge dam, Chwele dam, schools, Hospital rivers & streets,	

				Chwele slaughter houses Luuya ward; all river bank	
	· Loss of livestock & aquaculture · Displacement of livestock	· Use of adaptive/tolerant breeds · Construction of raised livestock structures · Moving livestock to safer areas · Rehabilitation of ponds. · Use of formulated feeds, hay, silage, formulated feeds · Integrated poultry and aquaculture farming · Tolerant pasture varieties · Customization of national policies · Disaster management fund	· ICIPE · KEFRI · ILRI · CBOs · NGOs · WCCPC. · MOA · Department of Livestock · Agro-dealers · Co-operatives · WARMA		Sensitization and Demonstrations of the proposed strategies targeting Women, PLWD, youth, widows, widowers
	Emergence of Pests & Diseases	· Vaccination · Use of adaptive/tolerant breeds			Extension services and vaccination targeting Women, PLWD, youth, widows, widowers and the marginalized as a priority
Water	· Siltation	· Spring protection · Desalination of dams · Water treatment · Customization of national policies	· WRUA, · Department of Water · WRMA · NEMA · KFS · Water service regulatory board · NZOWASCO · Development partner (KOICA-		Engage the vulnerable group in public participation of the customized policies as well as the development al plans of desalination

			Kenya, USAID-western Kenya, GIZ, USAIDD) · CBOs · WASREB		and protection of the springs.
	· Destruction of water Infrastructures	· Rehabilitation of water infrastructure			PLWD, Women and Youth Groups engaged to undertake the rehabilitation exercises
Environment and Natural resources	· Land degradation · Loss of bio-diversity · Loss of vegetation · Pollution · Human wild life conflict · Pollution	· Afforestation · Agroforestry · Enforcement of existing laws on Environment Conservation · Early warning information · Riparian land protection · Sustainable Waste Management (Re-use, Re-cycle and Reduce) and disposal · Use of incinerators · Fumigation of collection sites · Waste segregation and massive composting · Customization of national policies	· WRUA, · Department of Water · WRMA, USAID-western Kenya · NZOWASCO · KOICA-Kenya · CBOs · WASREB · KFS · KMD · NEMA · KWS · Private sector, Development partners, · NGO's · Civil society organizations		
Infrastructure	Destruction of infrastructure system (roads, buildings)	· Climate proof infrastructure · Avoid construction of infrastructure in riparian lands	· Department of Public works · Development partners · KENHA · KERRA · REA · NGO's · CBOs · CSOs · KURA		Sensitization the community on protection of the riparian land Infrastructure done with consideration to PLWD

Health	Water and vector borne diseases Human and animal death Destruction of Drainage and sewerage system	· Use of mosquito's nets · Drainage of stagnant water · Massive Spraying programs · Provision of free medication in schools · Use of vaccination · Unblocking of the drainage and sewerage systems.	· Department of Health · Red Cross · NGOs · Development Partners (AMREF, GIZ,USAIDD, SIDA) · CBOs · CSOs		Sensitization targeting Women, PLWD, youth, widows, widowers and the marginalized on the use of mosquito nets, provision of vaccinations and drainage of stagnant water to assist protect from pests and diseases
Energy	· Destruction of electricity grid system and powerlines · Loss of power affecting industries. · Increased water levels potential for power generation.	· Use of renewable energy sources, solar panels, biogas, green lights. · Small scale hydroelectric generation · Establishment of wind mills · Building of climate proof infrastructures	· Department of Trade and Energy · CBOs · CSOs · NGOs, Development partners (GIZ, USAIDD)		Sensitize PLWDs, Women and Youth Groups sensitized on use of renewable energy
DROUGHT					
Agriculture	· Crop failure	· Manures and composting · Soil conservation practices. Mulching · Use of certified seeds · Conservation agriculture (Crop rotation, minimum tillage, soil cover)	· Seed Companies · KALRO · MOA · CBOs · NGOs · KEVIS · WCCPC	Cheptais ward; entire ward Chesikaki ward; entire ward Elgon ward; entire ward Kaptama ward; Kaptama, Chemwonge, Chepkitale,	Sensitize women, PLWD, youth, widows, widowers and other vulnerable persons within the community

		· Agroforestry and crop diversification · Manures and composting · Good agronomic practices · Crop insurance · Early warning systems · Breeding of tolerant and resistant varieties to drought · Knowledge and skill enhancement · Invest in post-harvest loss management · Regenerative Agriculture and agroforestry/carbon credit · Irrigation · Early maturing varieties		Kaborom, Kongit, Kobonywo Kapkateny ward; entire ward Chepyuk ward; entire ward Matulo ward; entire ward Sitikho ward; entire ward, Bokoli ward; Machakha, Bokoli, Sirwa, Matisi, Namototo Misikhu ward; Misikhu Disp', Makhonge pri. sch, Sirisia mkt, Kituni Disp' Kamukuywa ward; entire ward Kibingei ward; Kibingei, Khwiroro, Daraja Mungu, Lutonyi, Miruri, Kibunde, Kitayi, Siuni Kimilili ward; Khamulati, Matili spring, Pasipalm, Sitambichi, Maburu Maeni ward; churches, schools, entire ward Tuuti/Marakaru ward; Kakichuma, Bukusu, Mayanja, Namawanga, Mungeti, Muchele, Motongi, Sazuri, Muliki Township ward; upper & lower township. East Sangalo ward; Locally identified	on the proposed resilient strategies.

				farmers, River sources Musikoma ward; entire ward Bukembe East; River banks, public institutions, social places, Private demonstration farms West Sangalo ward; Dispensaries, Schools, Markets, River banks, Halls Khalaba ward; Khalaba, Namuyemba, entire ward Bukembe west; entire ward- schools, markets, dispensaries Bumula ward; entire ward Khasoko ward; entire ward, Khalela-A, Maraba pri, Khayosi, Namsasi-B, Institutions Siboti ward; Siboti, Murumba, Nangili, Kisawai, Masielo, Manani, Mukwa, Kikwechi, Nasimbo, Namanje South Bukusu ward; entire ward, West Bukusu ward; entire ward Kabula ward; entire ward; Wanyiri, Malinda Namwela ward; entire ward Lwandanyi ward; Machakha, Kabkara, Wamono, Chebukui,	

				Mayakwe, Tamlega, Sitabachi, Mufungu, Mwalie, Nasala, Kabendo, Kibindoi, Namubila, Khabukoya, Kamnyongole Malakisi ward; Namangofula, Kibeu, Chongoi, Yabek, Musieba, Sirisia, Vishnu, Ndakaru, Butonge Tembelela Ndivisi ward; Magemo Dam, sinoko, Nakuselwa, Namarambi, Ndivisi Maraka ward; Muchi pri, Lufwindiri, Khamoto, Kakhoba Nzoia PEFA Mihuu ward; Chetambe hills, rivers	
	Loss of Livestock and aquaculture Loss of pasture	· Use of adaptive/tolerant breeds · Use of formulated feeds, hay, silage, Hydroponics · Integrated poultry aquaculture farming · Tolerant pasture varieties · Destocking · Zero stocking · Plantation of high yield fodder crops (Napier, black carrier, brachia)	· ICIPE · KEFRI · ILRI · CBOs · NGOs · WCCPC. · MOA · Department of Livestock · Agro-dealers · Co-operatives		
Environment and Natural	· Land degradation · Loss of bio-diversity · Pollution	· Afforestation · Enforcement of existing laws · Early warning information	· WRUA · Department of Water · WRMA		Engage the vulnerable groups in afforestation activities.

resources	· Human wild life conflict	· Riparian land conservation and protection · Sustainable Waste Management (Re-use, Re-cycle and Reduce) and disposal · Use of incinerators · Fumigation of collection sites · Waste segregation and massive composting · Disaster risk fund	· USAID-western Kenya · NZOWASCO · KOICA-Kenya · CBOs · WASREB (Water services regulatory Board) · KFS · KMD · NEMA · KWS · Private sector · Development partners · NGO's · Civil society organizations		Give early warning signs to the vulnerable groups before onset of dry spell
	· Wild fire	· Install fire extinguishers · Capacity building on fire fighting · Enforcement of grass fire ACT			
Water	· Water pollution · Drying of water sources · Water shortage	· Spring protection · Drilling and upgrading of existing Boreholes. · Water treatment · Roof water harvesting in schools, institutions · Rehabilitation of water infrastructure	· CBOs · NGOs · WCCPC. · MOA · Department of Water · WARMA · WRUA		Treatment of water sources, rehabilitation of water structures , drilling of water boreholes to ease access to clean water by the vulnerable groups
Infrastructure	· Destruction of infrastructure system (roads, buildings)	· Climate proof infrastructure · Avoid construction of infrastructure in riparian lands	· Department of Public works · Development partners · KENHA · KERRA · REA · NGO's, · CBOs,		Consider PLWDs in construction of the climate proof infrastructure .

			· CSOs		
Health	· Pest and Diseases outbreaks · Human and animal death	· Use of mosquito's nets · Massive Spraying programs · Provision of free medication in schools · Use of vaccination · Unblocking of the drainage and sewerage systems.	· Department of Health · Red Cross · NGOs · Development Partners (AMREF, GIZ,USAIDD, SIDA) · CBOs · CSOs		Distribute mosquito nets to the vulnerable groups Provide vaccination priority given to children, elderly, PLWDs, and women.
Energy	· Destruction of electricity grids- Reduced hydropower generation of power · Reduced biogas generation · Increased potential to produce solar energy	· Use of alternative sources of lighting e.g., candles, solar lamps, kerosene lamps etc. · Planting of high calorific value tree to produce heat energy · Promotion use of energy saving machines and electronics	· KETRACO · KFS · WCCPC · Department of Trade · KENGEN · RURAL Electrification · IBRA		Sensitize the vulnerable group on use of alternative source of energy such as solar and panting of high calorific value tree to produce heat
PEST, DISEASE AND NOXIOUS WEEDS					
Agriculture	· Crop failure · Loss Livestock · Loss of aquaculture	· Integrated Pest Management plan · Soil conservation practices · Conservation agriculture (Crop rotation, minimum tillage, soil cover) · Agroforestry and crop diversification · Good agronomic practices · Crop insurance · Early warning systems	· NGO's · CBO · NARIGP · County government of Bungoma · Department of Livestock, agriculture, irrigation forestry, meteorological, environment, water, · Regulatory bodies (NEMA, KEPHIS, KALRO, KEBS)	Cheptais ward; entire ward Chesikaki ward; entire ward Elgon ward; entire ward Kaptama ward; Kaptama, Chemwonge, Chepkitale, Kaborom, Kongit, Kabonywo	Sensitize the vulnerable group on climate smart agricultural practice, crop insurance and IPM to assist them mitigate the impacts of pests and diseases.

		· Breeding of tolerant and resistant varieties · Knowledge and skill enhancement · Invest in post-harvest loss management · Irrigation · Early maturing varieties · Enforcement Transboundary Crop movement · Quarantine and isolation · Pest free zoning · Use of ITK · Risk Management Fund	· Development partners (USAIDD, GIZ, UNDP) · FBO · WRUA, CFA · Private sector · Seed companies · Learning institution (universities, schools, collages)	Kapkateny ward; entire ward Chepyuk ward; entire ward Matulo ward; entire ward Sitikho ward; entire ward Bokoli ward; Sikimbilo, Bokoli, Maloho, Milani village Misikhu ward; entire ward Kamukuywa ward; entire ward Kibingei ward; entire ward Kimilili ward; Punda village, Chelekei, Ngoli village. Sitambachi Maeni ward; entire ward Tuuti/Marakaru ward; Bukusu, Marakaru, Kikwechi, Namawanga, Namikelo Musikoma ward ; entire ward Bukembe East; farms, public institutions, markets, water catchment areas, open sewer	

				West Sangalo ward; entire ward Bukembe west; entire ward Bumula ward; Nandingwa, Bumula, Mabusi, Nasianda, Lunao, cattle Dip Khasoko ward; entire ward Kimaeti ward; entire ward Siboti ward; Manani, Kisawai, Masimbo, Masielo, Siboti Malakisi ward; Sirisia, Bukokholo, Ndakaru, Mwanda, Bisunu, Butonge Ndivisi ward; Misemwa, Sitabicha, Marinda, Lutachi, Malomonye Maraka ward; Nang'eni, Lufwindiri, Lukhoba Mihuu Ward; entire ward	
	· Loss of Livestock and aquaculture	· Use of adaptive/tolerant breeds · Construction of animal structures and rehabilitation of ponds.	· ICIPE · KEFRI · ILRI · CBOs · NGOs · WCCPC. · MOA		

		· Use of formulated feeds, hay, silage · Integrated poultry aquaculture farming · Tolerant pasture varieties · Gene bank · Customization of national policies · Pests and disease surveillance · Enforcement Transboundary Crop movement · Use of ITK · Quarantine and isolation · Pest free zoning	· Department of Livestock · Agro-dealers		
Health	· Loss of human life	· Use of mosquito's nets · Massive Spraying programs · Provision of free medication in schools · Use of vaccination	· Department of Health · Red Cross · NGOs · Development Partners (AMREF, GIZ,USAIDD, SIDA) · CBOs · CSOs		
Environment and natural resource	· Loss of bio-diversity · Human wild life conflict · Pollution	· Afforestation · Early warning information · Sustainable Waste Management (Re-use, Re-cycle and Reduce) and disposal · Use of incinerators · Fumigation of collection sites · Waste segregation and massive composting · Customization of national policies	· WRUA · Department of Water · WRMA, · USAIDD -western Kenya · NZOWASCO · KOICA-Kenya · CBOs · WASREB · KFS · KMD · NEMA · KWS · Private sector, · Development partners · NGO's		Sensitize the vulnerable groups on sustainable waste management and waste segregation. Fumigate pest prone areas to prevent the children, elderly, women, youth, marginalized and PLWDs from the

			· Civil society organizations		impacts of pests and diseases.
Water	· Water pollution	· Water treatment · Roof water harvesting in schools, institutions · Protection and management of water sources	· CBOs · NGOs · WCCPC · MOA · Department of Water · WARMA · WRUA		

Chapter Five

5. Bungoma County Climate Strategic Adaptation Investment/Action Priorities

5.1. Overview of Strategic Investments

The County Participatory Climate Risk Assessment identified four key hazards that strategic actions must be put in place to address the impacts emanating from the hazards. The strategic investments must be tailored to the key sectors and livelihood assets that are most vulnerable.

5.2. County Climate Change Strategic Adaptation and Investment Priorities

Bungoma County proposes the following strategic adaptation and Investment priorities as per the deliberations of the Ward stakeholders:-

i. In the agronomy and Livestock sectors; CSA Practices that include agroforestry, conservation tillage, cultivation of drought-tolerant crops; Soil Conservation Practices such as crop rotation, reduced tillage, cover cropping shall also be promoted as adaptation strategies for drought/dry spells. An integrated Pest management approach shall be the strategy promoted to deal with pests and diseases within the sector.

ii. In the Water Sector, Water harvesting through construction of dams, construction of roof-catchments shall be promoted for adapting to the drought/dry spells. Furthermore, these dams that as proposed by the County Water Master Plan shall be in the upper regions of Mt. Elgon and Tongaren Sub Counties shall supply water to the lower regions of Kabuchai, Webuye East and West, Kanduyi, Bumula through gravity which shall be sustainable and environmentally friendly. Furthermore, areas that cannot be served by piped schemes, water drilling shall be prioritized in public institutions and once the borehole depth and capacity has been ascertained, borehole upgrading and equipping shall be done using solar as the main energy source and a small piped scheme developed for surrounding community households. Water springs protection shall be prioritized not only to provide water for the community but also to protect sources of streams and rivers which shall help the community build resilience against the impacts of drought/dry spells. Rehabilitation of riparian areas through increasing their overall tree cover in addition to desilting of dams shall be a priority in addressing the flooding menace across the 45 Wards.

iii. The environment and Natural Resources Sector shall prioritize increasing the County Forest/tree cover through promoting farm forestry, rehabilitation of degraded landscapes such Mt. Elgon, rivers, hills through reforestation; school/institutional greening and promotion of Nature Based Enterprises as adaptation strategies to the impacts of drought. Furthermore, investments in Waste management infrastructure (Both liquid and Solid) such as rehabilitation of the sewerage system, development of sanitary landfills, upscale of waste recycling and composting and installation of solid waste receptacles shall be prioritized for the urban areas of Bungoma, Kimilili, Webuye and Chwele.

iv. The Energy sector shall promote Energy saving devices such as Improved Cooking Stoves; use of alternative renewable/green energy such as Solar, Biogas as adaptations to the impacts of drought and floods.

v. The health sector shall undertake increased surveillance of climate related diseases and immunization of the Community as an adaptation to the impacts of Climate Change.

The summary of some of the specific investment priorities as identified by the various wards and sub counties is as indicated in the action matrix tables.

Table 8: Priority Areas of Investment

Risk/Hazard	Priority Areas of Investment	
Drought/ Dry Spell	Agriculture (Crops)	• CSA Practices • Soil Conservation Practices • Agriculture Mechanization • Irrigation • Crop insurance • Early warning systems • Strengthen extension services • Livelihood diversification
	Livestock	• Growing of drought resistant pasture and fodder varieties, • Feed planning, feed conservation(hay and silage making) and on farm feed formulation • Livelihood diversification such as apiculture and aquaculture • Genetic improvement for drought resistant breeds
	Energy	• Promotion of renewable energy Sources (solar and biogas production) • Promotion of energy efficient devices

	Health	• Immunization • Climate related Disease Surveillance and Monitoring
	Environment/ Natural Resources	• Increasing County Forest/Tree Cover • Sustainable Waste Management (Reduce, Reuse and Recycle), Solid Waste Segregation, Composting and Disposal
	Water	• Protection and management of water sources • Water treatment • Spring protection • Drilling and upgrading of existing Boreholes. • Desalinations of dams • Rehabilitation of water infrastructure
	Livelihoods	• Promotion of Nature Based Enterprises e.g., apiculture
Floods	Environment/ Natural Resources	• Increasing the County Forest/Tree Cover • Conservation of riparian land • Early warning systems
	Health	• Surveillance of water and vector borne diseases • Immunization
	Trade & Energy	• Promotion of energy efficient systems • Master planning requirements
	Infrastructure	• Construction of proper drainages on infrastructure • Physical planning requirements • Insurance of houses
	Agriculture (crops)	• Agroforestry • Terracing • Conservation of riparian land • Contour farming • Cover cropping • Crop insurance
	Livestock	• Construction of modern livestock structures • Agroforestry • Improved drainage systems • Terracing • Livestock insurance
Pests and Diseases	Agriculture	• Integrated Pest Management • Planting pest and disease resistant crops and trees • Increased vector borne disease surveillance and monitoring. • Crop insurance
	Health	
	Environment/ Natural Resources	
	Livestock	• Rearing pest and disease resistant breeds • Disease surveillance

		• Biodiversity • Disease control and management • Livestock insurance
Landslides	Environment/ Natural Resources	• Increasing County Tree/Forest Cover • Agroforestry • Conservation of riparian land • Contour farming along sloped areas

Chapter Six

6. Conclusion and Recommendation

6.1. Conclusion

Climate change affects all the key sectors of our county with Agriculture being the most affected since its highly dependent on rain fed agriculture, small scale trade and services, artisanal mining of sand and gold as well as exploitation of natural resources such as forests and rivers. As a result, the economy is highly exposed to climatic hazards including prolonged dry spells, erratic rainfall patterns, floods in low lying areas and emerging pests and diseases. These hazards coupled with human activities such as deforestation, unsustainable sand harvesting, encroachment of riparian zones and destruction of catchment areas further compounds the impacts on people and the environment.

Various actors including national and county government, local communities and CSOs are already implementing a number of climate change response actions even though the efforts are largely disjointed and currently not achieving much in terms of resilience building. Based on the consultation with diverse actors within the county ranging from the affected communities, county government officials, research and higher learning, CSOs, private sector representatives and learnings from these experiences, several adaptation strategies have been proposed in chapter 5 to address these challenges going forward.

These include protection of catchment areas, promotion of CSA, capacity building, strengthening early warning systems and strengthening disaster management institutional framework. These have to be done in a more coordinated manner while paying attention to the changing climate through use of climate information in prioritizing and designing the interventions.

Sustainable Land Management practices such as terracing and construction of gabions; catchment conservation; reforestation and afforestation; and conservation of communal forest were found to be highly effective. Other effective strategies for climate resilience include adoption of CSA specifically early maturing and drought tolerant crops and capacity building of the community members on soil conservation.

On the other hand, livelihood diversification, adoption of modern farming techniques, use of appropriate certified seeds, strengthening early warning systems and access and use of Climate

Information Services (CIS) through enhanced working relationships with the Kenya Meteorological Department(KMD) should be embraced to strengthen resilience against prolonged dry seasons.

6.2. Recommendation

From our engagements with the various stakeholders the PCRA report recommends that:

1. A Climate Change Action Plan will be developed to provide an implementation framework for the proposed adaptation strategies over the next 5 years. The action plan should focus on addressing the most prevalent climate hazards as identified in above; flush floods, prolonged dry spells/drought, increased pests and diseases and landslides. As guided in chapter 5, the proposed actions should address the most vulnerable thematic areas which include: Agriculture, Water, Energy, Health, Environment & Natural Resources.
2. All stakeholders and the various actors as proposed in chapter 4 above should support the County Government in implementing the priority actions identified which should be updated on regular basis to keep the document alive.
3. Climate action implementation should take cognizance of the fact that some actions are more effective in addressing the climate hazards than others.
4. Capacity building of key players in the implementation of climate action should be undertaken, these include: the County Climate Change Unit, the County Climate Change Planning Committee, the Steering Committee, the Ward Climate Change Planning Committee among others in order to facilitate mainstreaming of climate action across the sectors. This should be accompanied by increased capacity to track and monitor climate finances across various sectors in the county.

References

1. *Bungoma County Integrated Development Plan 2023 -2027*
2. *The Bungoma County Climate Change Finance Policy (2020)*
3. *The Bungoma County Climate Change Policy (2020)*
4. *The Bungoma County Climate Change Fund Act, 2022*
5. *The Bungoma County Environmental and Social Safeguard Policy (2019)*
6. *Climate Risk Profile: Kenya (2021): The World Bank Group.*
7. *Republic of Kenya, (2018), National Climate Change Action Plan (Kenya) 2018-2022.*
8. *Republic of Kenya, (2016): National Climate Change Adaptation Plan 2015 -2030*
9. *The Climate Change Act, 2019(No. 11 of 2016)*
10. *Kenya Meteorological Department forecasts*

Annexes

Pictorials from the Ward PCRA Engagements

Pictorials from County Stakeholder Engagements