COUNTY GOVERNMENT OF BUSIA

PARTICIPATORY CLIMATE RISK ASSESSMENT (PCRA)

MAY 2023

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COUNTY GOVERNMENT OF BUSIA

PARTICIPATORY CLIMATE RISK ASSESSMENT REPORT

MAY, 2023

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DEFINITION OF TERMS

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

Adaptive capacity: The ability of 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.

Climate change: A change in the climate system which is caused by significant changes in the concentration of greenhouse gases as a consequence of human activities and which is in addition to natural climate change that has been observed during a considerable period of time;

Geospatial Technology: The various modern tools and systems that help us to map the earth's surface, understand societies and interpret spatial patterns.

Global warming: Observed or projected gradual increase in global surface temperature. Itis one of the consequences of Climate Change.

Greenhouse gases: Gases 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: Preventing, reducing or slowing down the increase of atmospheric greenhouse gas concentrations by limiting current or future emissions and enhancing potential sinks for greenhouse gases;

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

BUWASCO:	Busia Water and Sewerage Services Company
CBO:	Community Bases Organization
CCCAP:	County Climate Change Action Plan
CGB:	County Government of Busia
CIDP:	County Integrated Development Plan
GESIP:	Green Economy Strategy and Implementation Plan
GIS:	Geographical Information Systems
ICBT:	Informal Cross Border Trade
KALRO:	Kenya Agricultural and Livestock Research Organization
KMD:	Kenya Meteorological Department
NAP:	National Adaptation Plan
NCCAP:	National Climate Change Action Plan
NCCRS:	National Climate Change Response Strategy
NCCRS:	National Climate Change Response Strategy
NDCs:	Nationally Determined Contributions
NEMA:	National Environmental Management Authority
PCRA:	Participatory Climate Risk Assessment
RCP	Representative Concentration Pathway
SDG	Sustainable Development Goals
TWG:	Technical Working Group
UNFCCC:	United Nations Framework Convention on Climate Change
WRUA:	Water Resources User Association

FOREWORD

The effects of climate change are manifested in Busia County through delayed onset of the rains, erratic rainfall patterns, prolonged dry spells and flooding. These affects livelihoods upon which many residents depend on such as Crop farming, Livestock production, Fishing, Trade and their associated value chains. Increase in population of disease vectors such as mosquitoes also presents a huge challenge on human health through diseases such as malaria. Impacts of climate change in the county are compounded by human activities such as sand and murram harvesting, poor waste management practices, degradation of water catchment areas and deforestation among others.

For the county to efficiently address the impacts of climate change, a coordinated approach anchored within a legal framework has to be embraced. In line with Kenya's Climate Change Act, 2016 and the National Climate Change Action Plan, 2018-2022, Busia County enacted the Busia Climate Change Act, 2021 which dedicates 2% of its development budget into a fund for climate change actions.

For participatory locally- led climate action, governance structures have been established at ward and county level. The Busia County Climate Change Steering Committee comprising of County Executive Committee Members from departments which are heavily impacted by climate change and other stakeholders, chaired by the Deputy governor is constituted to provide strategic leadership to county's climate response. In addition, Busia County Climate Change Planning Committee-a technical committee mainly comprising of county directors and chief officer from the climate change as well as Civil Society Organizations is established to plan and supervise implementation of climate change programs. Ward Climate Change Coordinating Committees in all the 35 wards are established and trained to facilitate community-centered climate action planning and implementation. All these structures are coordinated by the Directorate of Climate Change which coordinates implementation of the county's climate change programs.

This Participatory Climate Change Risk Assessment (PCRA) is an approach that enables communities to identify the climate change risks and hazards, their impacts and propose practical solutions for evidence-based county Climate Change Action Planning and implementation. The approach provides information regarding historical, current and future climatic scenarios and evaluates their implication to livelihood systems while examining the existing drivers of vulnerability.PCRA aims to inform the most effective sector-specific strategies to strengthen the community's resilience against the identified climate risks and hazards. This PCRA process is

supported by Financing Locally Led Climate Action (FLLoCA) Program and is one of the requirements for accessing County Climate Resilience Investment (CCRI) Grants. Based on the findings of the PCRA process, the County Government of Busia shall prioritize strengthening climate change governance framework, mainstreaming climate change across all sectors and strengthening capacity to monitor and report climate action at the county and ward levels. Furthermore, enhancing Climate Information Service and Early Warning Systems shall be prioritized to reduce the impacts of climate change shocks among the communities.

The County also prioritizes upscaling implementation of climate resilience projects with emphasis on restoration and rehabilitation of degraded ecosystems, strengthening livelihoods through climate smart agriculture, soil and water resources conservation, water provision and distribution, and promotion of green energy technologies. A Climate Change Action plan shall be developed, guided by this PCRA report to give specific guidance on the response to the identified climate impacts. Through collaborative and coordinated climate action, Busia County seeks to achieve Sustainable Development Goals, contribute towards attainment of Kenya's Vision 2030 and foster socio-economic development for improved livelihoods of residents of Busia.

H.E. Dr. Paul Nyongesa Otuoma,

Governor, County Government of Busia.

ACKNOWLEDGEMENT

The Busia County Participatory Climate Change Risk Assessment (PCRA) was carried out in May, 2023. The objective of PCRA is to guide the county to identify climate risks and hazards with their associated impacts within Busia County in order to inform the climate change action planning; integration of climate issues into the CIDP and the National Climate Change Action Plan.PCRA is also one of the conditions for accessing the Climate Resilience Investment Grant from the National Treasury's Financing Locally Led Climate Action (FLLoCA) Program.

The success of the PCRA process was enabled by the goodwill and guidance of the Governor, Busia County, H.E Dr. Paul Nyongesa Otuoma.The Chief Officer, Department of Water, Irrigation, Environment, Natural Resources and Climate Change, and the Busia County Directorate of Climate Change through the climate change secretariat. The National Treasury's FLLoCA Program Implementation Unit (PIU) also provided technical and substantive inputs to the development of the PCRA report.

I highly appreciate the PCRA Technical working group (TWG), which included representation from National Government Agencies such as NEMA and KMD, and County Departments of Water , Irrigation, Environment and Natural Resources, and Climate Change; Agriculture, Livestock and Fisheries; Disaster Management, Education, Public Administration and Gender, Finance, ICT and Economic Planning, Infrastructure and Energy, Lands, Housing and Urban Development, Health and Sanitation, all under the coordination of the Busia County Climate Change Directorate. Lastly, I acknowledge the contribution of communities for their active participation in the identification and prioritization of Climate Change issues in their wards which informed the preparation of this document.

H.E. Arthur Papa Odera, Deputy Governor/ CECM
Department of Water, Irrigation, Environment, Natural Resources and Climate Change.

THE EXECUTIVE SUMMARY

The general objective of PCRA is to guide the county to identify climate risks and hazards with their associated impacts within Busia County in order to inform the climate change action planning; integration of climate issues into the CIDP and the National Climate Change Action Plan. PCRA is also one of the conditions for accessing the Climate Resilience Investment Grant from the National Treasury's Financing Locally Led Climate Action, (FLLoCA). The PCRA report document entails climate risks, sources of vulnerability and the prioritized adaptation response actions.

The process of implementing the PCRA process involved: Formation and training of the Technical Working Group, stakeholder's analysis and mapping, community engagements at ward level, collection of historical, current and projected data of local climatic patterns, socio-economic conditions and vulnerability analysis, conducting county level workshop on climate change risk assessment as well as final writing of the PCRA report.

The assessment revealed that the residents of Busia County primarily depend on rain fed agriculture, and with the frequent changes in rainfall patterns, most households that depend on agriculture are exposed to the impacts of climate change. Furthermore, women are the most vulnerable to the effects of climate change. Impacts of climate change are compounded by unsustainable human activities including unsustainable sand harvesting and encroachment of fragile ecosystems.

The main climate hazards identified in the county are prolonged dry spells, unpredictable rainfall patterns, floods, emerging prevalence of pests and diseases, Environmental degradation (soil erosion, mudslides, gulleys, water catchment and riparian destruction) poor waste management practices and hailstones. Lightning and thunderstorms was also experienced in the county. The total annual rainfall trends showed a decrease of the precipitation in the past which will continue in the future (2020-2040) for the long rainy season while the short rainy season will receive enhanced rainfall for the same period. In both cases, projections show an increase of rainfall for the period 2041-2060.

The Impacts of climate change in the various sectors were identified and response actions prioritized. Adaptation strategies for water sector include prioritizing conservation and restoration of water catchment areas and wetlands, promotion of rain water harvesting, afforestation, Integrated water management sources and their catchment areas as well as investment in climate resilient water storage and reticulation infrastructure. Also, drilling, upgrading, equipping and solarization of boreholes in areas that cannot be served by piped schemes and water springs protection shall be prioritized to provide water for the community and the protection of sources of streams and rivers which shall help the community build resilience against the impacts of prolonged dry spells. Furthermore, rehabilitation of riparian areas through tree growing and bamboo planting to increase tree cover shall be promoted. Besides that, de-silting of dams shall be a priority in addressing the flooding menace within the affected wards such as Bunyala South, Central, North wards and in Teso South subcounty.

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

Prioritized response strategies for environmental conservation include: afforestation and reforestation, protection of fragile ecosystems, awareness raising and capacity building and storm water storage. County physical and spatial planning was proposed to be undertaken to guide settlements and land use for optimimal returns on land resources. Storm water control and conservation infrastructure was proposed as promotion of clean and renewable energy at both institutional and household level.

Strategies proposed for addressing climate related disaster risks include: development of Early Warning Systems and enhancing dissemination of weather/Climate Information using Geospatial technology (GIS and remote sensing technologies), strengthening disaster risk management planning and institutional framework, contingency planning and capacity building, strengthening response capacity, pest surveillance, strengthening extension services and resource mobilization as well as installation of lightening arrestors in strategic public institutions.

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CHAPTER 1:. CONTEXT OF THE PARTICIPATORY CLIMATE RISK ASSESSMENT (PCRA)

1.1 Background

Global projections indicate that climate change needs multi-stakeholder approach to combat the impacts associated with Climate Change. Climatic risks and hazards affect key socioeconomic livelihood systems that include but not limited to; water, environment, agriculture, energy, public health among others, endangering human health, through extreme weather events, forced displacement, increased hunger and poverty levels, poor nutrition thus affecting Sustainable Development Goals (SDG).

Climate change is becoming one of the most serious challenges to Kenya's achievement of its development goals as described under Vision 2030. Kenya is extremely susceptible to climate-related events, and projections indicate that the impacts are likely to affect the country even more in the future. In many areas, extreme events and variability of weather are now the norm: unpredictable rainfall patterns; some regions experience frequent droughts during the long rain season, others severe floods during the short rains. The arid and semi-arid areas are particularly hard hit by these climate hazards, thereby putting the lives of millions of households and their social and economic activities at risk.

A number of international treaties on Climate Change have been approved by the Kenyan Government such as, United Nations Convention on Climate Change (UNFCC), 1992; Kyoto Protocol, 1997; and the Paris Agreement, 2015. It is stipulated in the agreement to keep the increase in global average temperature below 2°C above pre-industrial levels while endeavoring to control temperatures within 1.5°C. This can be achieved through reducing the emission of greenhouse gases in the atmosphere and generating carbon sinks. Kenya has proposed mitigation strategies to reinforce countrywide climate change adaptation and mitigation measures. The efforts have been backed by several planning, governance and legislative documents such as Kenya Vision 2030, the National Climate Change Response Strategy (NCCRS) 2010, National

Climate Change Act 2016, and the Constitution of Kenya (CoK, 2010), that guide governance on climate change actions at both levels of Government.

Busia County has experienced tremendous climate change impacts across all major sectors and the livelihoods of the people. Residents in the County have observed that prolonged dry spell and flood events, that were rare in the 1940s to the 1990s, have become more frequent in the recent past

This is evident from flood occasions that have been witnessed in Bunyala, Teso North and Teso South sub-counties. Therefore, this has aggravated the efforts of the County to embrace participatory Climate Change mitigation and adaptation actions. This resulted in the formulation of a County Climate Change Act 2021 which outlines elaborate steps in addressing climate change within the county.

1.2 Policy Context

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

- **The United Nations Framework Convention on Climate Change (UNFCCC), 1992** which outlines parties' commitment to the convention. Parties should take climate change considerations into their environmental and socio-economic policies and actions.
- **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.
- **The Paris Agreement, 2015** that demands 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.
- **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), 2015-2030** 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.
- **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 Constitution of Kenya, 2010** which makes it a right for every Kenyan to reside in a clean and healthy environment.
- **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 propose appropriate strategies to build community resilience.
- **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.
- **Climate Change Act, 2016** that outlines structures that govern the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development in Kenya.
- **Busia County Climate Change Act, 2021** which outlines elaborate steps in addressing climate change in the county.

1.3 Purpose of the PCRA Report

Participatory Climate Risk Assessment (PCRA) is a tool of enhancing participation of Communities in the assessment of their respective climatic hazards/ risks, identifying their effects and adaptation/ mitigation strategies. The objectives of PCRA are to empower the communities to understand the climate risks they face and assess their ability to manage these risks as the basis for identifying and undertaking concrete climate actions that will be linked with community climate change action plans with existing ward level participatory planning.

The report was developed using multi-stakeholder approach and PCRA resilience participatory tools from the wards to the County level, which will inform the development of the Busia County

Climate Change Action Plan (BCCCAP, 2023-2027) in line with the County integrated Development Plan (CIDP, 2023-2027) and the National Climate Change Action Plan (NCCAP, 2023-2027), for seamless implementation of Climate Change Resilient Investment Projects.

1.4 Key steps in the County's PCRA process

Busia County Participatory Climate Risk Assessment report has been developed in accordance with the PCRA guidelines through the following key steps; -

1.4.1 Formation of PCRA Technical Working Group (TWG)

This was derived from different key sectors including Water, Environment, Forestry, Meteorology, NEMA, Agriculture, Public Works & Energy, Health, Finance & Planning, Irrigation, Social Services, Education, Disaster Management and Lands and Urban Development.

1.4.2 Training of Technical Working Group (TWG) on the PCRA process

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 coordinated by the Climate Change Secretariat.

Figure 1-1- Training of the TWG in Busia County

1.4.3 Stakeholder Mapping at all levels

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. Providers of scientific and statistical data such as the GIS team, the Meteorology, Social and County Planning Departments were also considered. The stakeholder analysis was conducted to categorize the stakeholders in terms of their interest and influence.

Figure 1-2- Stakeholder mapping in Busia County

1.4.4 Preparation for Community Engagement

The Climate Change Unit mobilized participants with the support of the directorate of public administration.Given the large geographic area of the county, the TWG adopted a process where the wards were engaged in clusters of 4-5 wards per venue per day, giving consideration to proximity to each other as well as common climate change challenges. Programs, engagement tools and other materials relevant to the community engagements were prepared in advance. These included the program and the community guiding questions.

1.4.5 Stakeholder Engagements at all Levels (Community & the Ward)

An average of 10-15 participants were mobilized from the wards in line with the mobilization criteria as per the PCRA guidelines. The participants mobilized consisted of different groups including the Ward Climate Change Coordinating Committees.

In the first session of the community meetings engagement, 4-5 wards clustered were jointly taken through an introduction session.The introduction session covered the significance of the PCRA process, overview of climate change trends followed by explanation of the process and its application in the county planning and development cycle. The participants were then segregated into their respective wards where members of the technical team were assigned roles to lead the entire process.

The community engagement meetings started by sketching climate hazards and community assets maps. Thereafter, the climate change risk assessment tools were 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's identified key climate change risks/hazards and priority response measures were captured.

Figure 1-3: Stakeholder engagement in PCRA process at Bukhayo Central ward, Nambale, Busia County

Figure 1-4-Stakeholder engagement in PCRA process in Ageng'a Nanguba ward, Samia in Busia County

Figure 1-5: Stakeholder engagement in PCRA process in Nambuku-Namboboto Ward, Samia in Busia County

1.4.6 Data Collection, Analysis and Preparation for the County Level Participatory Workshop

The data from the various Wards was summarized into reports and risk maps were developed by the GIS officers capturing the main hazards and prioritized response actions per ward and at the sub county level. This was followed by four hours meeting of technical committee to develop the workshop program and share responsibilities among team members as well as agree on the workshop execution strategy.

1.4.7 County Multi-stakeholders Level Workshop

The main objective was to validate the findings from the wards and have the multi-stakeholders incorporate their views into the Busia County PCRA process. The workshop was held in the fourth week of May, 2023 and had 100 participants who included the PCRA Technical working group, Ward Climate Change Coordinating Committee, County Climate Change Planning Committee, Climate Change Steering Committee, representatives of Civil Society Organizations implementing climate change actions, Academia, Development partners and Farmers representatives among others.

Figure 1-6- Busia County Multi-Stakeholders Level Workshop

During the workshop, the participants were introduced to the general overview of the county followed by the current and projected climate change scenarios.This presentation was followed by identification of climate change hazards, which were compared to the hazards that had been prioritized by the wards and followed by updating the hazard maps from the wards.The participants prioritized the hazards, response measures as well as drivers of climate change vulnerability. The discussion groups were constituted as per the PCRA guidelines.

1.4.8 Drafting final Busia County Participatory Climate Risk Assessment report

The TWG then developed a participatory climate risk assessment report by consolidating the data gathered throughout the participatory climate risk assessment process.

Figure1-7-TWG Drafting final PCRA report

CHAPTER 2:. BUSIA COUNTY CLIMATE HAZARD PROFILE

2.1 Current and Historical Climate Hazards and Trends

Busia County is fairly hot (21-23°C) and moist (760 to over 1,750 mm precipitation annually) throughout. There is a strong precipitation gradient with the northern areas receiving the most precipitation (> 1750 mm), and the southern areas closer to Lake Victoria receiving between 760 - 1,250 mm of precipitation. The temperature is fairly consistently warm through the year. Precipitation is also consistent throughout the year, although the first half of the year (January-June) receives a slightly greater amount of precipitation than in the second half of the year (July-December). Intense precipitation and heat stress are both hazards that contribute to agricultural risk in the county throughout the year, whereas dry spells are more an issue in the second wet season.

Historic analysis of weather in Busia County shows that both dry spells and extreme precipitation are hazards. Dry spells are on average longer during the second wet season varying between 35 and 65 consecutive days of moisture stress, whereas moisture stress is consistently less than 30 days during the first wet season. Extreme precipitation and flood risks are moderate to low in both seasons, with most years receiving between 10 and 25 mm of precipitation on the wettest day.

Climate has already been observed to change slightly in the county. Since 1981, the first wet season—the predominant rains of the year—have experienced a moderate (1.0ºC) increase in mean temperature and reduction in crop cycle. There was a tendency towards a slight increase in precipitation during this season. The second wet season experienced a slight increase in temperature (~ 0.5ºC), and a significant increase in precipitation of approximately 25%. This has resulted in an increased precipitation hazard contributing to flooding and erosion.

Looking to the future in the years of 2021-2065 (by the early 2040's), temperature is projected to increase by 0.2ºC, with the first wet season projected to experience even greater changes. And by this time, precipitation is projected to increase by 0.5 % in the first wet season, and 4% in the second wet season. Prolonged moisture stress is projected to occur in the first season of the year, whereas intense precipitation looks to change little in either season. Consecutive days of moisture stress is projected to almost double in the first wet season from

approximately25 days to around 40-45. In contrast, moisture stress in the second wet season is projected to decrease from over 60 consecutive days of moisture stress to 45-50 days. These projections of future climate change under the two climate scenarios—RCP 2.6 and RCP 8.5—show some small differences, but generally show the same future projections, suggesting climate change impacts will be fairly similar during this time frame no matter the greenhouse gas emissions that occur.

2.1.1 Rainfall

2.1.1.1 Annual Rainfall Cycle

The annual rainfall cycle over Busia County is shown in Figure 8. Two main distinct seasons (March to May and September/October to December) exist in Busia County. The highest rainfall amount is consistently received in Busia County from March to November. Since most of socio-economic activities in the County are rain dependent, information about the mean annual cycle of rainfall is important for various stakeholders in developing effective climate resilient strategies.

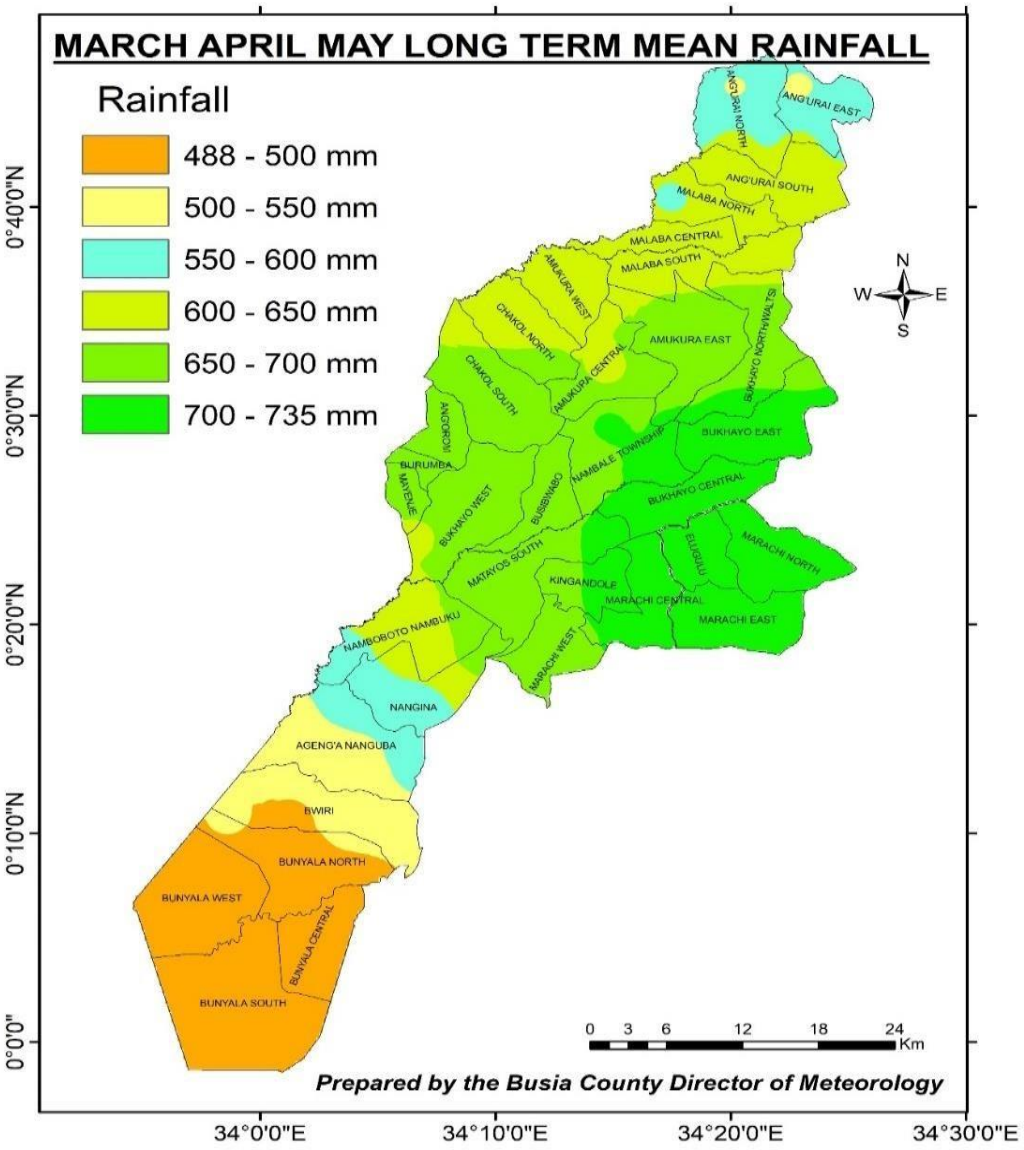

Figure 2-1: Busia County March, April, May Mean Rainfall Information Map

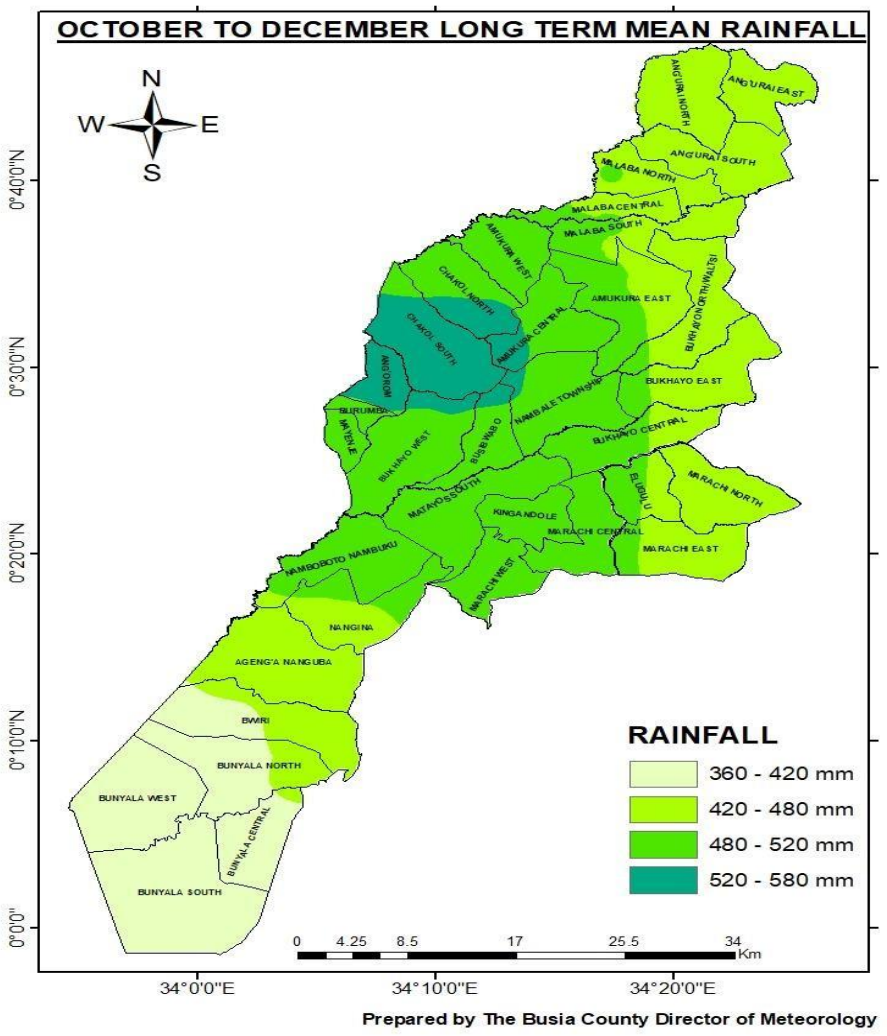

Figure 2-2-Busia County October to December Mean Rainfall Information Map

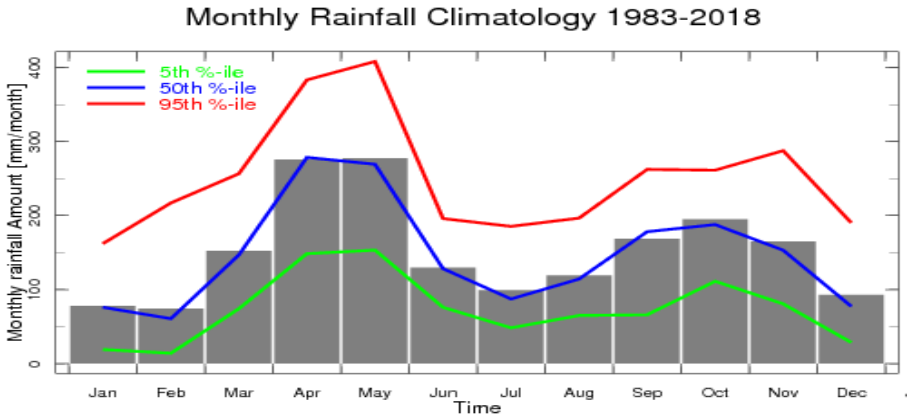

Figure 2-3-Busia County Monthly rainfall climatology

2.1.2 Temperature

2.1.2.1 Trend in Maximum and Minimum Temperature

Figure 11 shows the year-to-year variability and trend of maximum temperature over Busia County from 1981 to 2020. A positive trend is evident in Busia County. The highest maximum temperature recorded in Busia was in 2016. Globally, 2016 was recorded as the warmest year on record.

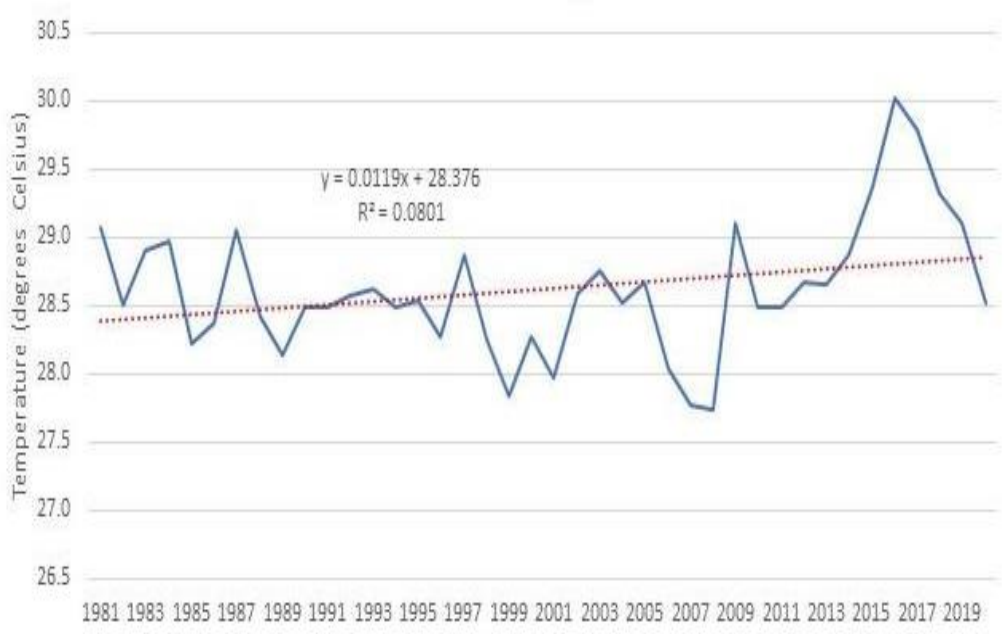

Figure 2-4-Trend of maximum temperature over Busia County in Kenya.

2.2 Exposure and Vulnerability Profiles of The County

Busia County is in the western part of Kenya lying between Latitudes of 0°27' to 38.7684° North and Longitudes of 34°6' to 41.2632° East. It is divided into **Seven** administrative sub-counties: Samia, Bunyala, Butula, Matayos, Nambale, Teso North, and Teso South and Thirty-five Wards. It borders Bungoma to the North, Kakamega to the East, and Siaya to the Southwest. The County has a tropical climate with an average temperature of 22 °C and an average rainfall of 1691 mm annually. It has an annual mean maximum temperature range of 26 °C to 30 °C and a mean minimum temperature range of 14 °C to 22 °C.

Busia County experiences a bimodal rainfall distribution with an extended rainy season in April–May and a short rainy season in October. The altitude varies from 1130 m on the shores

of Lake Victoria to approximately 1500 m in Funyula and the North Teso Hills (Musyimi *et. al, 2022)*. Busia is characterized by sandy loam soils with dark clay domination in the northern and central parts, making it agriculturally prosperous, with diverse food and cash crops, including rice, cotton, maize, Robusta coffee, sugarcane, and various horticultural crops.

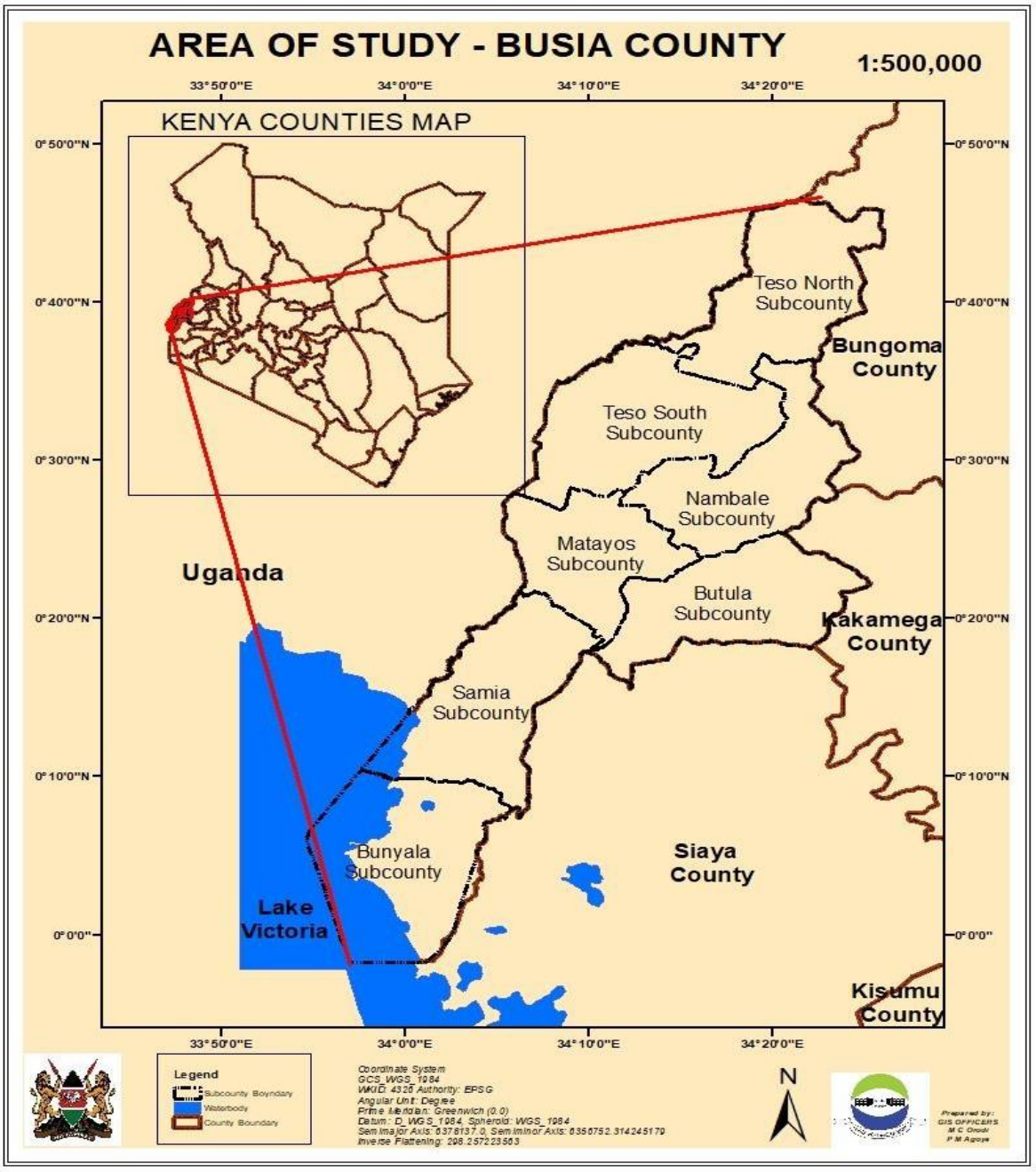

Figure 2-5- Position of Busia County in Kenya

Figure 2-6-Satellite Image of Busia County

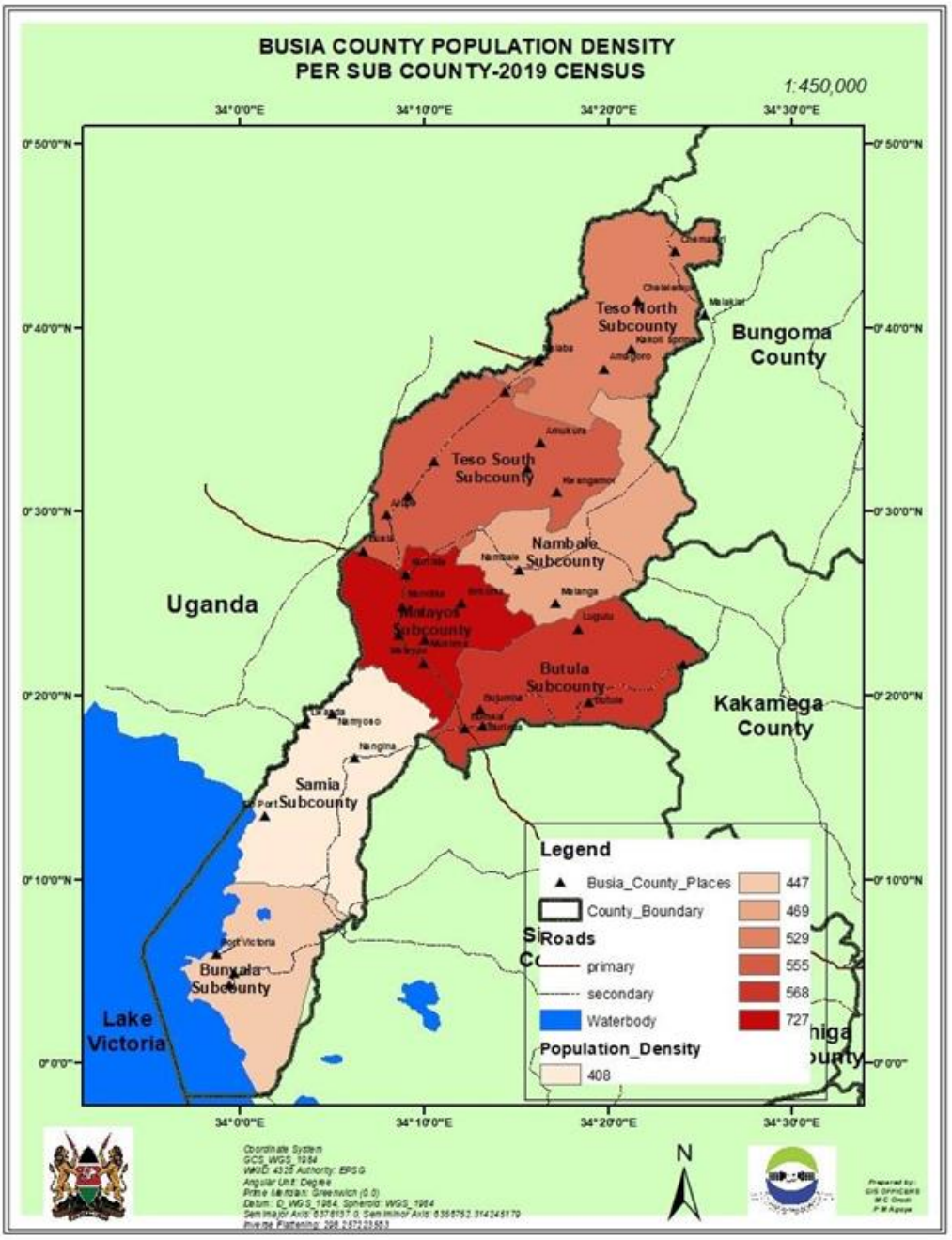

Figure 2-7: Population Density per Subcounty

Table 2.1: Population density of Busia County

Sub County	Total	Total Households	Area Sq. Km	Population per Sq. Km
BUNYALA	85977	19,039	192.2	**447**
MATAYOS	142408	33,160	196.0	**727**
BUTULA	140334	32,213	247.1	**568**
NAMBALE	111636	23,892	238.1	**469**

SAMIA	107176	23,884	262.4	**408**
TESO NORTH	138034	29,395	261.0	**529**
TESO SOUTH	**168116**	**36,569**	**302.9**	**555**

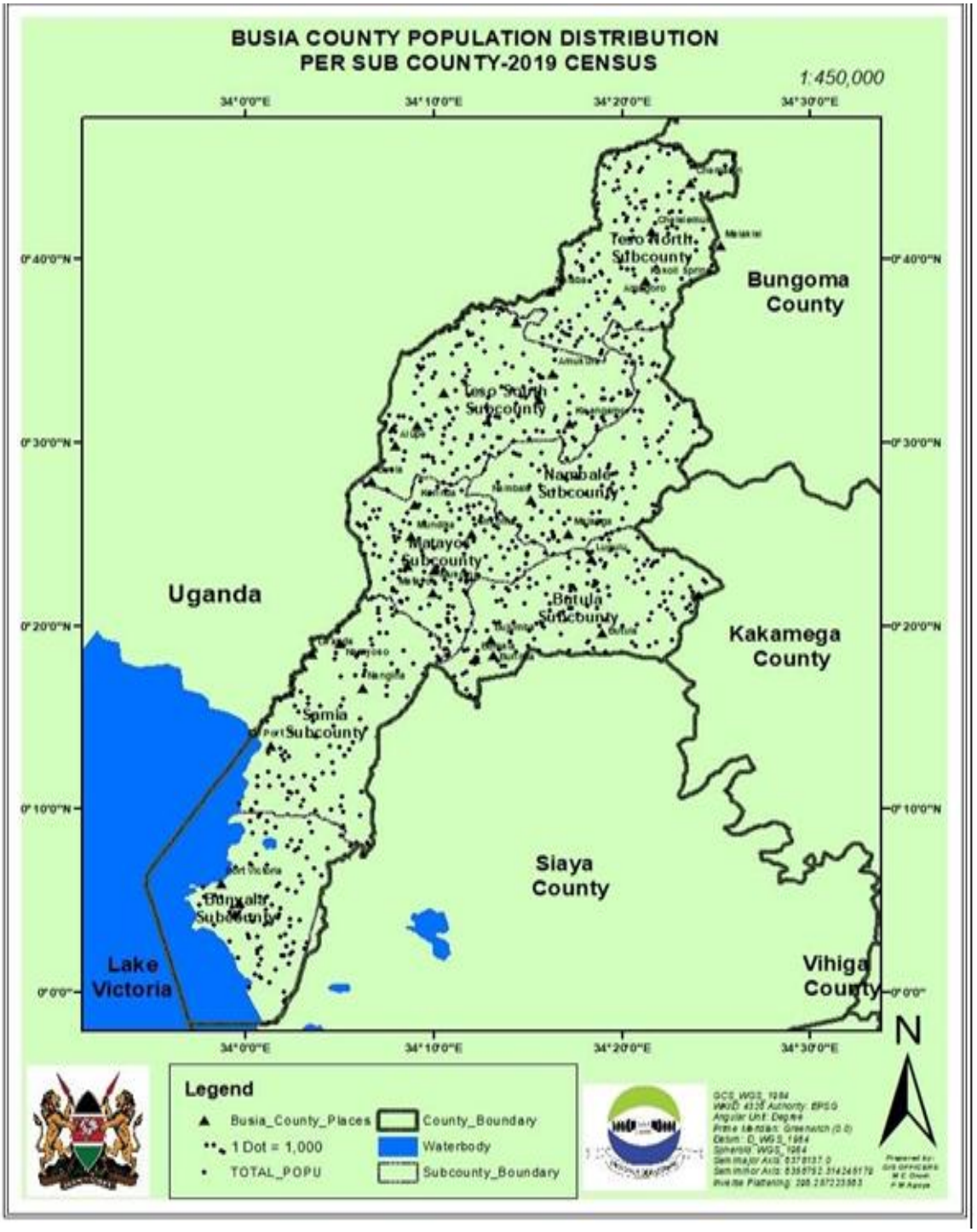

Figure 2-8: Population Distribution

The Natural Resources within the County include; Lake Victoria, Rivers Nzoia, Sio, Malakisi and Malaba, Port Victoria/Mumbaka forest, wetlands such as Sio-Siteko and Neela; hills such as Samia hills, Busia, Amukura, Chelelemuk, Kavirondo, Streams such as Lerekwe, Namaderema, Namuyala, Nang'eni, Kamsogon, among others, Sand, and other minerals. The physical resources include; Bunyala Irrigation Scheme, hospitals, factories, churches, schools and other educational institutions, roads, cattle dips and social halls; economical resources (financial institutions and markets) and human resources.

Flooding and prolonged dry spell which are as a result of climate change, impact on the agricultural sector resulting in food insecurity and increase in poverty levels. As a result, the community is encroaching on critical natural resources such as forests, riparian/wetland ecosystems for cultivation, grazing and wood fuel among other sectors. It must be highlighted that agriculture and blue economy are the leading economic activities and value chains to the county. Factories and long-distance trucks in the county are also sources of pollution (air, water and land) due to inability to manage their wastes properly. The high rate of urbanization coupled with the high population growth rate is increasing waste generation and given our inadequate and dilapidated infrastructure, pollution of our ecosystems is rampant resulting in water and air borne diseases.

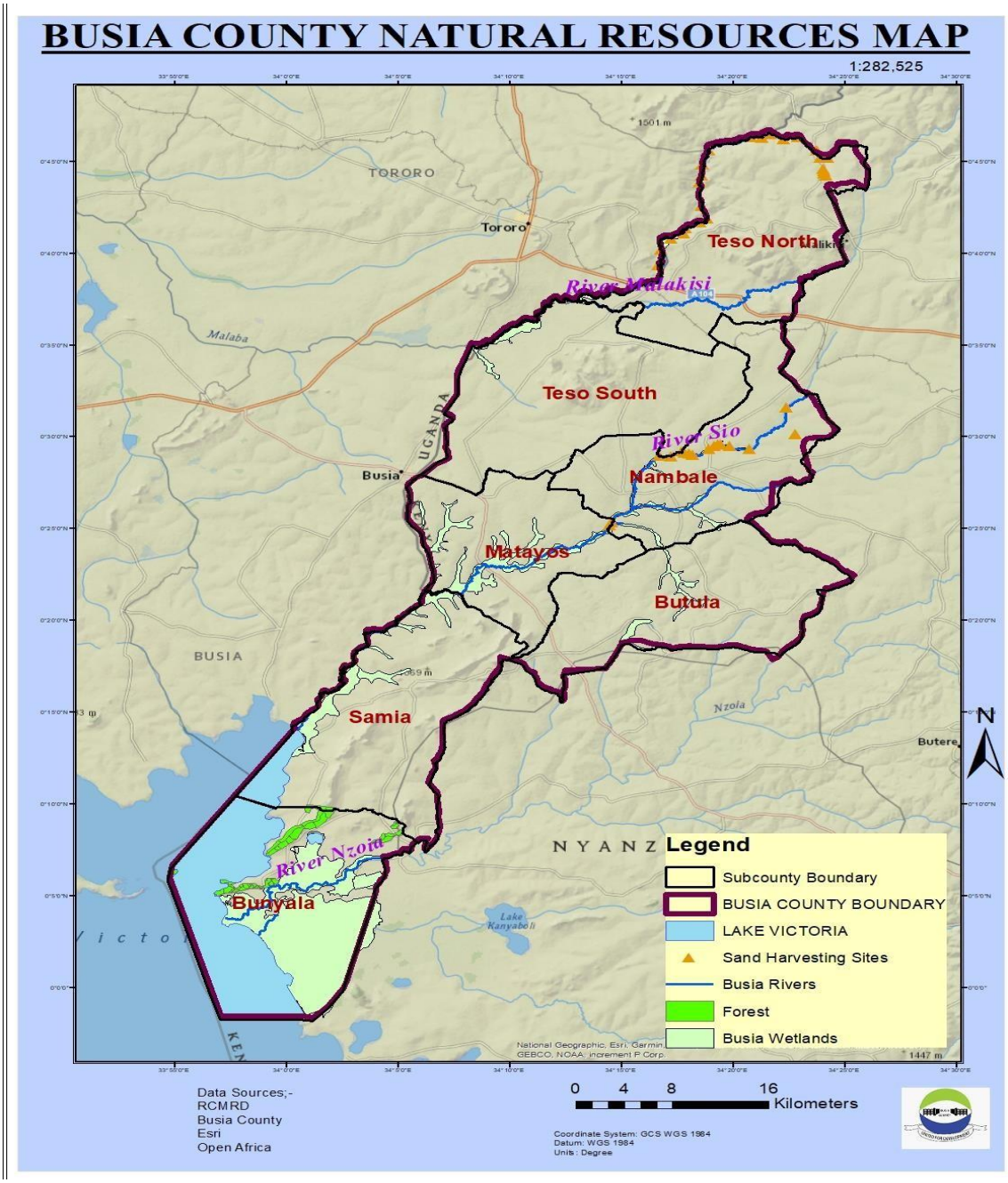

Figure 2-9-Natural Resources affected by climate change in Busia County

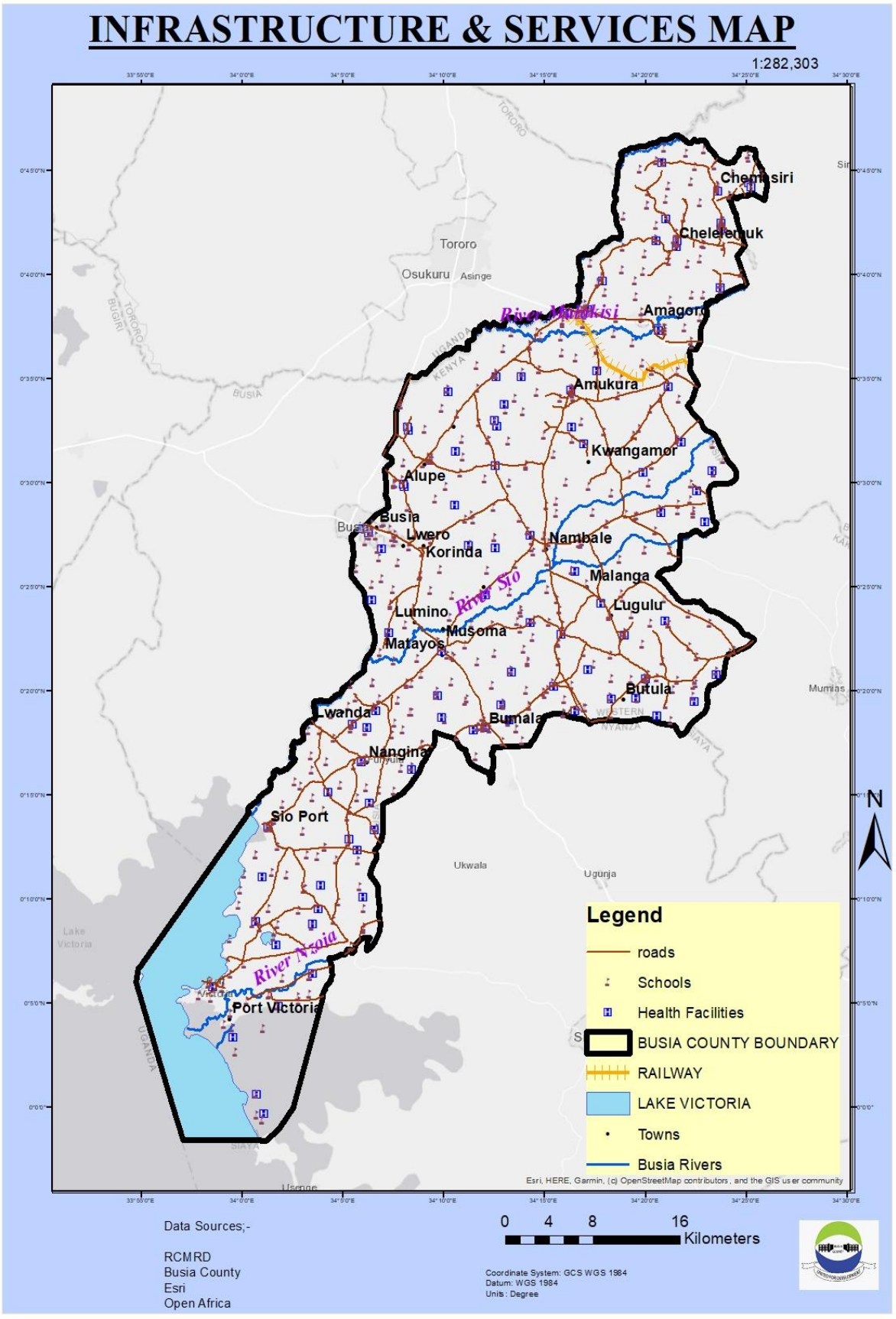

Figure 2-10-Infrastructure and Services affected by climate change in Busia County

The community is 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 magnitude, extent, severity, and resilience mechanisms to adapt and mitigate the prevailing climate hazards across the county.

- Women are affected highly by prolonged dry spell due to water scarcity and scarcity of food commodities for their households
- Persons living with disability are sickly and also lack the strength to look for food and water especially during flooding in Bunyala and Teso South Sub Counties.
- Children and the elderly are most affected since they are malnourished due to inadequate food. Furthermore, children have to skip school to walk long distances in search of water and firewood. Also, some skip school during flooding.

2.3 Differentiated impacts of climate trends and risks

Climate change has affected a wide range of sectors in Busia County; these include Agronomy, livestock, forestry, energy, water, health and livelihoods. These hazards are impacting negatively and differently on various members of the Community especially elderly, women, youth and persons with disability. Prolonged dry spells have directly impacted the agriculture sector by causing crop failure, loss of pasture, loss of water. Forestry sector has also been impacted by prolonged dry spell through reduced tree/forest cover and wild fires. The county also experiences increased pests and diseases as a result of prolonged dry spell and rising temperatures. Floods have especially in Bunyala Sub county have led to loss of lives; crops failure and poor harvest, outbreak of climate induced pests and diseases, contamination of water sources especially wells and springs, and infrastructural damage. Hails and thunderstorms on the other hand have led to crop and property damage. Poor waste management practices have led to emission of greenhouse gases and climate related diseases among others.

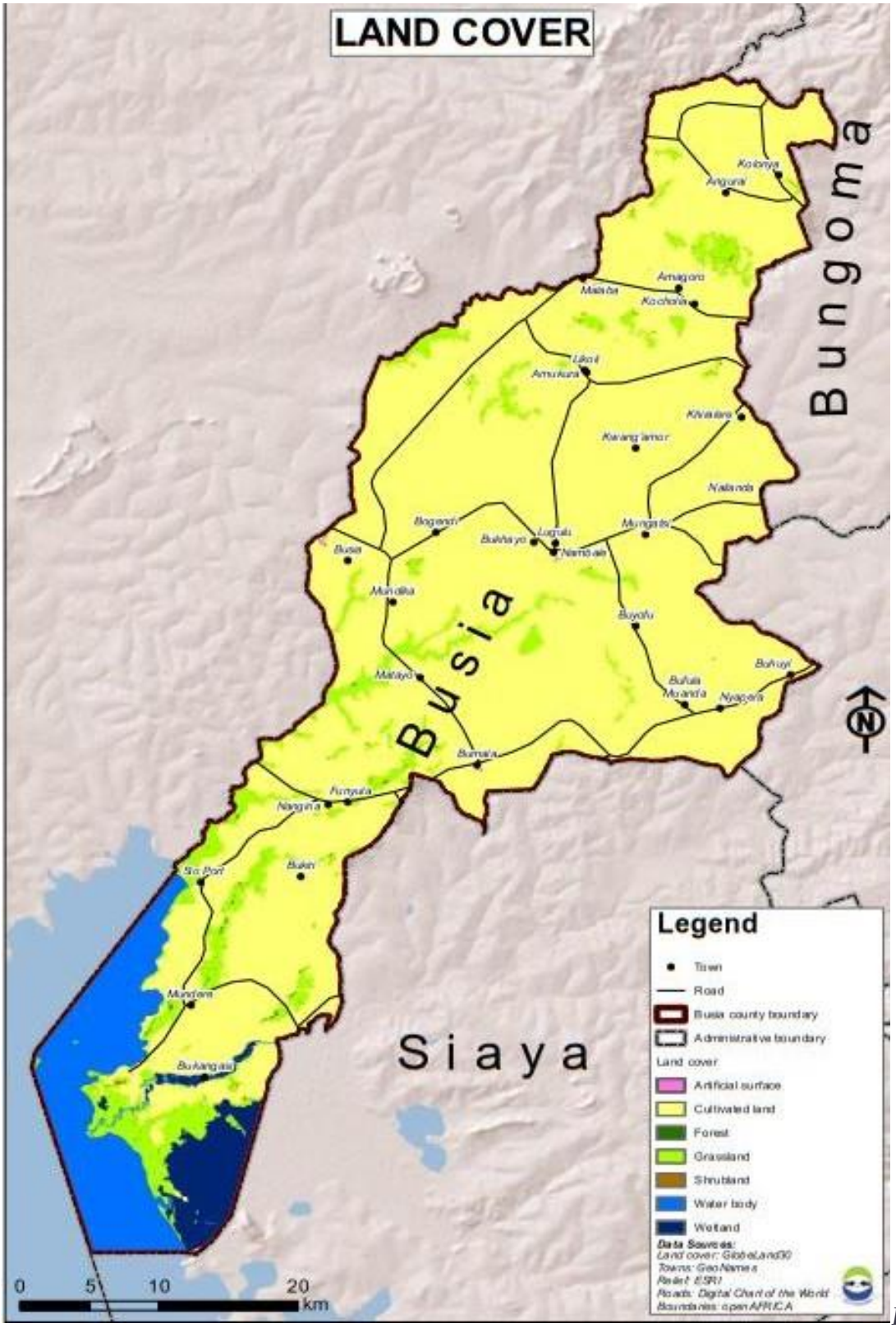

Figure 2-11-Distribution of Landcover Land Use in Busia County

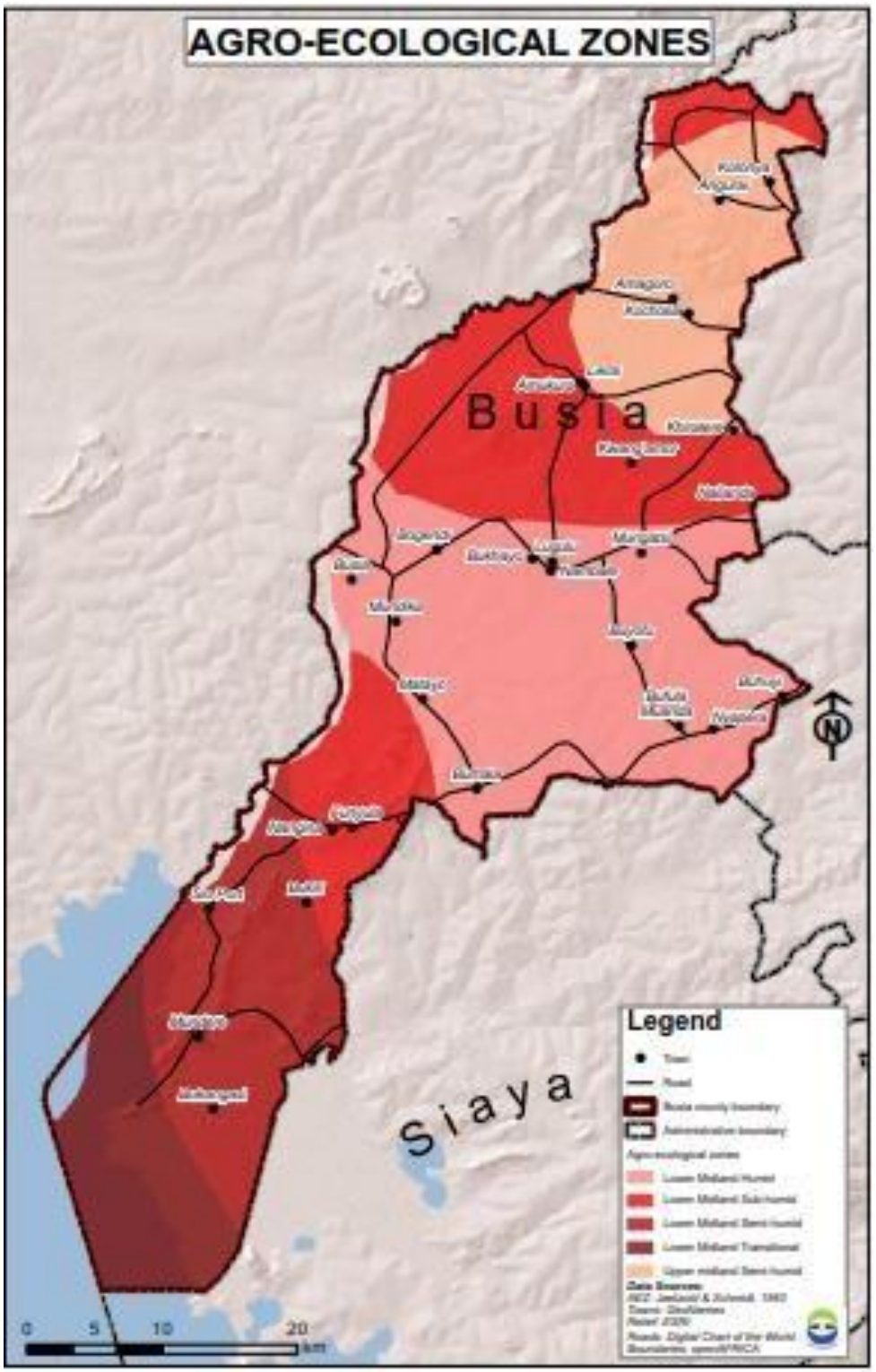

Figure 2-12- Distribution of Agro-ecological zones in Busia County

Floods have led to crop destruction, soil erosion and loss of agricultural land, affecting crop productivity. It has also been observed to affect livestock through the outbreak of bacterial, fungal and viral diseases ,destruction of grazing fields and pasture, and livestock shelters.

Further, it has affected human beings by causing deaths, displacement of homes, and destruction of infrastructure and spread of water- borne diseases.

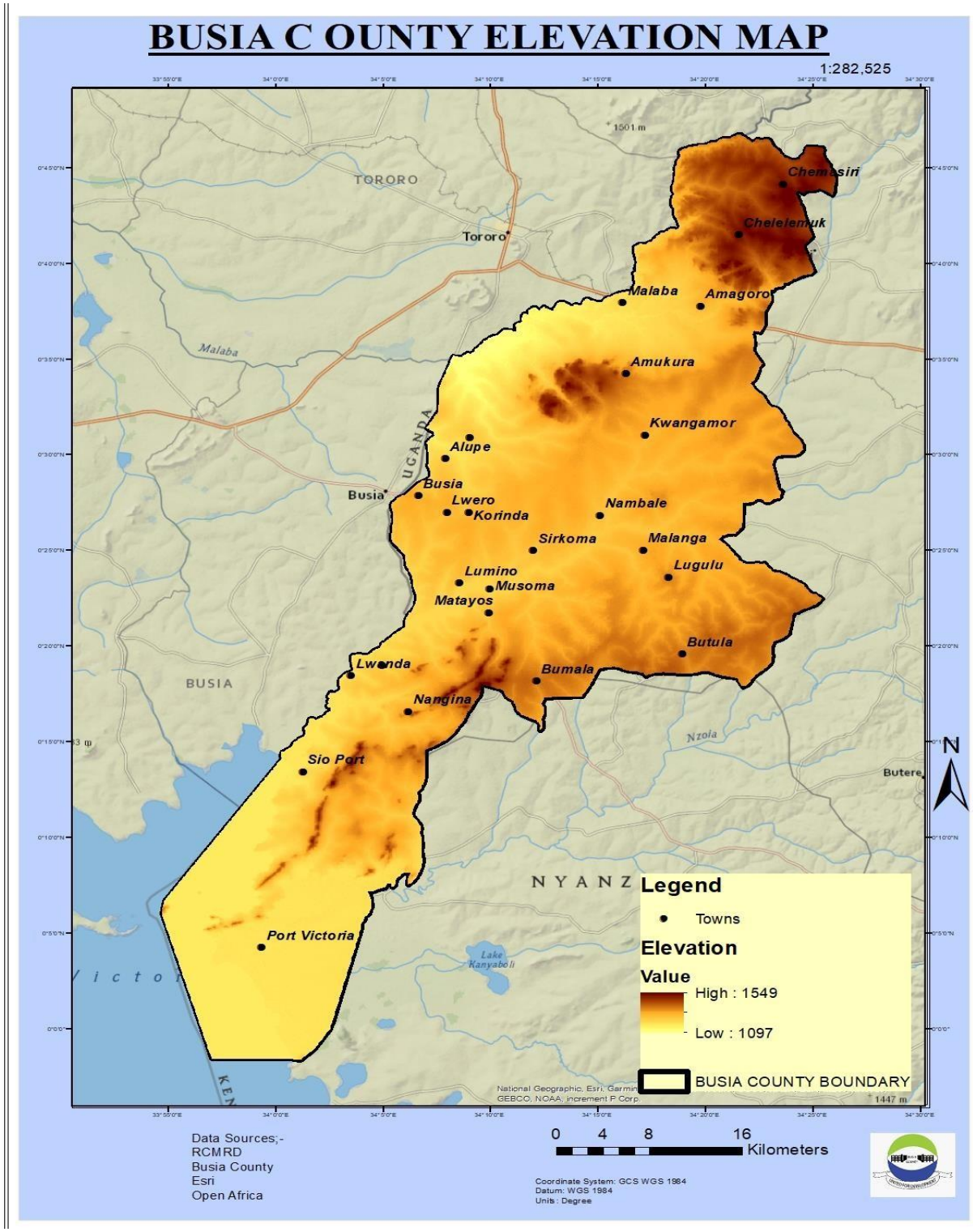

Figure 2-13- Busia County elevation profile that make Bunyala subcounty vulnerable to flooding

Forestry sector face various challenges related to human activities such as Charcoal burning, Brick burning, lumbering, settlement, among others which lead to deforestation within the county. In addition, encroachment of the wetlands like the Sio Siteko, and other riparian areas has led to loss of biodiversity and degradation of life support systems.

2.4 Spatial Distribution of Risks

All the thirty-five wards within Busia County have been affected by the effects of Climate Change. However, spatial distribution of the County hazards across the various wards and sub counties is as shown in the map below; -

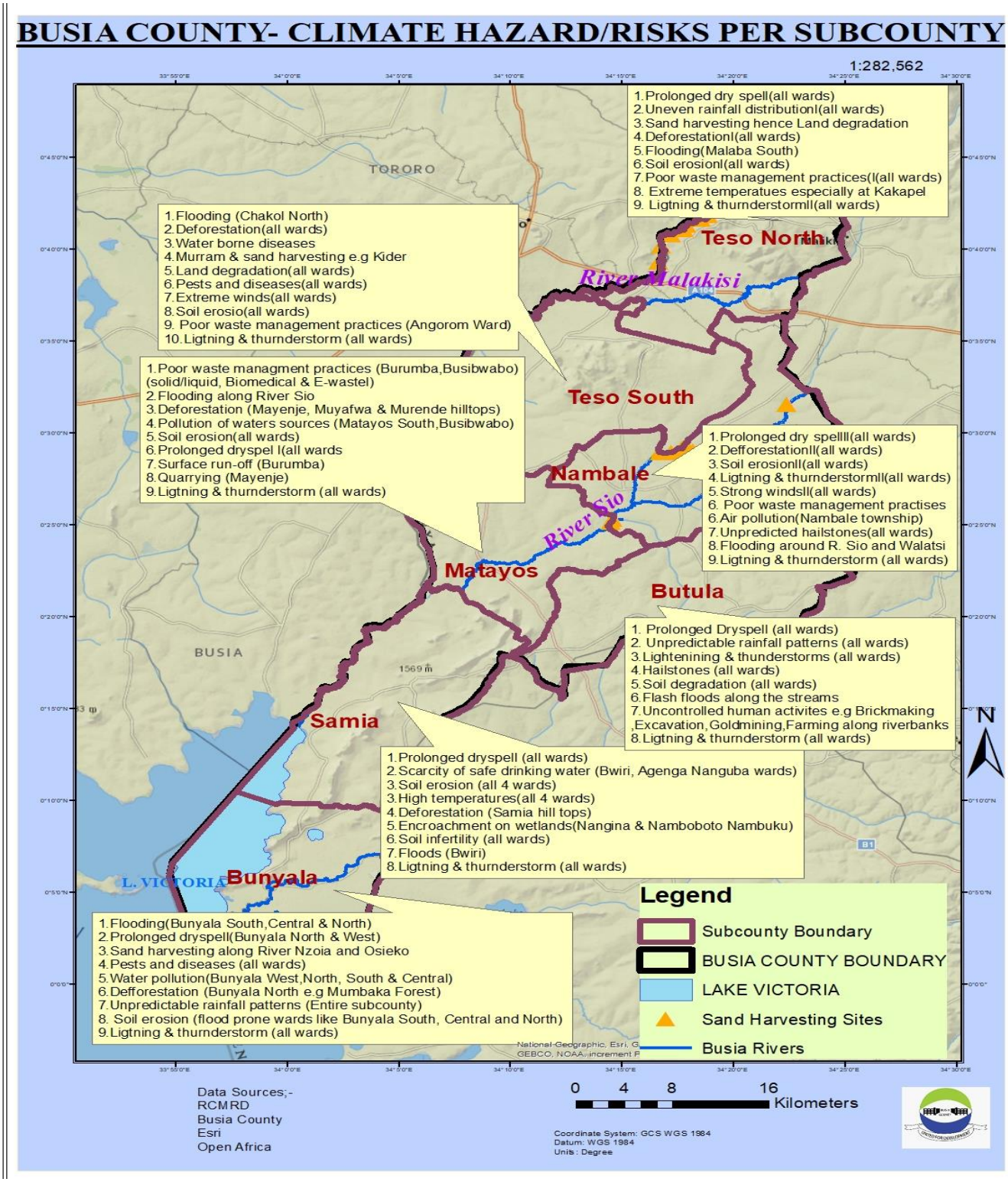

Figure 2-14-Busia County Climate/Hazard Risks per subcounty Identified at ward levels

CHAPTER 3:. FUTURE CLIMATE SCENARIOS FOR THE COUNTY

3.1 National and downscaled climate change projections

The climate conditions in Kenya are changing as proven by variations in temperature and precipitation. Temperatures are projected to continue rising by 1.7°C by 2050s and 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 end of 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.

3.2 County future climate scenarios

3.2.1 Future Rainfall and Temperature Scenarios

3.2.1.1 Inter-annual Variability in Projected Rainfall Anomalies

Year-to-year long-term rainfall signal (projected time series) analysis over Busia County is based on multi-model ensemble simulations under each RCP for the historical period (1951-

2020) and future period (2021-2100). The use of multi-model ensemble helps to explore uncertainties across the RCM ensembles. The results show that under;

1. RCP2.6 (green lines): the models used exhibit minimal rainfall variability across the future period compared to the historical period. Inter-model differences are however notable. The projected anomalies range from about –1.8 mm to about 2.0 mm standard deviation of the mean. The variability is nearly symmetrical across the years.

2. RCP4.5 (blue lines): models project a likelihood of higher rainfall in future periods with higher inter-annual variability. High positive rainfall anomalies (high blue peaks) are remarkable with limited occurrences of high negative rainfall anomalies (low blue peaks) across the future period. The anomalies range from about –4.2 mm to about 4.5 mm deviation from mean. There is a fairly significant inter-model variability.

3. RCP8.5 (red lines): rainfall is projected to be higher than the average rainfall with more positive anomalies and few years indicates negative rainfall anomalies. Towards the end of the century, one model shows a consistent decline in rainfall with anomalies up to – 4.5 mm deviations from the mean.

There is high uncertainty particularly over Busia County where rainfall is driven by mesoscale processes and systems as opposed to regions whose rainfall is driven by large- scale systems. Additional information based on further downscaling is needed. Future rainfall variability may expose Busia to danger of flooding and drought events that may affect agriculture, settlement and infrastructure including transport.

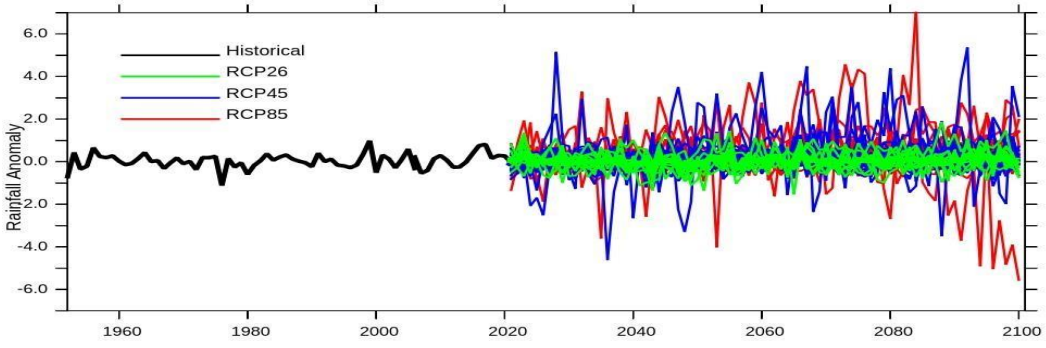

Figure 3-1-Busia County Inter-Annual Variability in Projected Rainfall Anomalies

Projected changes in the length of the rainfall season during MAM rainfall season show that models project scenarios with a longer future length of season over Busia County.

3.2.1.2 Inter-annual Variability in Projected Temperature Anomalies

Year-to-year long-term temperature signals (projected time series) over Busia County is based on multi-model ensemble simulations under each RCP for the historical period (1951-2020) and future period (2021-2100). The results show that under;

1. Historically (black line): models show that the temperature has increased by slightly under 1^{O}C since 1950s over the Lake Victoria Busia County. Notably, the warming has been faster in the recent 10-15 years.

2. RCP2.6 (green lines): the models used exhibit minimal increase in temperature across the near future period (2020-2050) and a decrease in temperature, thereafter towards the end of the century. Despite inter-model differences the projected temperature change over Busia County remains well below 2 ^{O}C.

3. RCP4.5 (blue lines): models project a likelihood of low but consistent increase in temperature in future periods with higher inter-annual variability compared to RCP2.6. The inter-model variability is larger in the far future and towards the end of the Century. A temperature increase of about 1.5-3 ^{O}C is expected in the Lake Victoria Busia County under this scenario.

4. RCP8.5 (red lines): higher temperature changes of up to 4.5 - 6 ^{O}C are projected across the Lake Victoria Busia County. The increase in temperature under this scenario is faster than that projected under RCP4.5 especially between 2050-2100.

Expected temperature increase in the County is likely to increase evapotranspiration in the lake and the surrounding. It is also expected that extreme heat may lead to heatwaves that may affect life comfort and other activities.

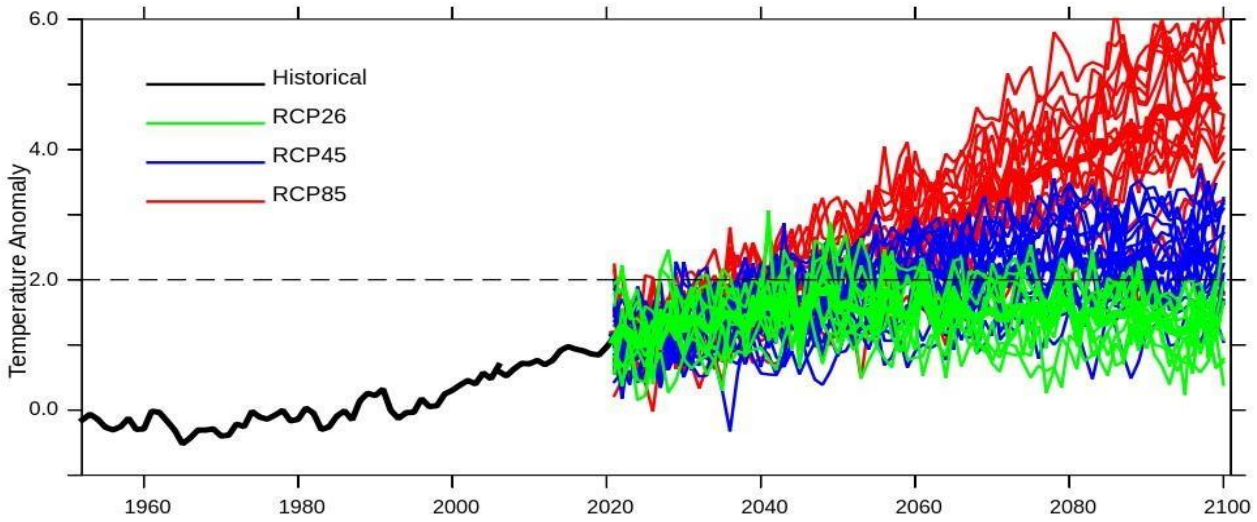

Figure 3-2-Time series of temperature anomalies averaged over the Lake Victoria Busia County for different scenarios for the period 1951-2100 with respect to 1971-2000 base period.

3.2.2 Projected Rainfall and Temperature Changes Over the Project Sites

In addition to spatial and temporal analyses over Busia County, detailed analysis for County has been undertaken. This section presents statistics on the projected changes in rainfall/precipitation (%) and temperature (^{O}C) for Busia County. The changes have been computed by subtracting future (2030s, 2050s and 2080s) rainfall and temperature model values from the historical model values using 1971-2000 as the baseline/historical period.

Busia County results for RCP 2.6 in Table 15 show a likely future increase in annual and seasonal (MAM, JJAS, OND and DJF) rainfall across the three (3) future periods (2030s, 2050s, and 2080s) except for rainfall decrease projected during MAM (2050s) and JJAS (2050s) seasons. Over this site, models project an increase in temperature across all seasons. For RCP2.6, the temperature peaks in the mid Century (2050s) and then declines towards the end of the Century (2080s). This is due to mitigation benefits expected under this scenario as Parties implement their actions towards reducing global warming. The projected temperature increases under RCP2.6 is in the range 1.0 - 1.77 ^{O}C with respect to historical/baseline temperature values over the site. On the other hand, rainfall is projected to decrease up to about 5.02% in 2050s during JJAS with the projected increase of about 61.06% (2080s), 54.95% (2030s) and 53.22 (2050s) during DJF and an increase of 27.42%, 28.29% and 30.65% projected for 2030s, 2050s and 2080s respectively during OND season.

Under RCP4.5, projections show a likely general increase in annual rainfall with a decrease during MAM season 0.6% (2030s), 3.75% (2050s) and 5.85% (2080s). JJAS, OND and DJF are expected to record an increase in rainfall except for the expected decrease in rainfall (1.91%) during JJAS (2080s). The temperature increase under RCP4.5 is comparable to the temperature increase projected under RCP2.6.

For RCP8.5, results further show noticeable rainfall decreases during MAM season

(8.58%, 7.25% and 8.8%) for the future periods 2030s, 2050s and 2080s respectively.

JJAS is expected to experience an increase (0.89%) during the 2030s and a decrease in rainfall of about 4.95% (2050s) and 25.35% (2080s). Rainfall increase is further projected for the OND season (18.22%, 26.26% and 53.19%) for the future periods 2030s, 2050s and 2080s respectively with reference to the baseline/historical values (1971-2000). The DJF season on the other hand is projected to experience a decrease in rainfall during the 2030s (3.36%) and increase during

2050s (31.26%) and 2080s (33.17%). Temperature increase projected for RCP8.5 range from 0.84 - 4.72 ºC.

CHAPTER 4:. ANALYSIS OF EXISTING RESILIENCE/ADAPTATION STRATEGIES TO CURRENT AND FUTURE CLIMATE RISKS

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

The agriculture sector in Busia County has witnessed declining productivity leading to food insecurity that is affecting the most vulnerable in the society who include women, youth and PLWDs. The county has embraced various preventive measures to curtail the effects associated with the above menace through use of pesticides and herbicides, planting of cover crops planting of drought resistant crops, use of both manure and fertilizers to increase soil fertility. Riparian land encroachment and Soil erosion is rampant. To address the above challenges, there is need to step up various measures such as construction of cut off drains/trenches, strip farming/planting of bamboo and Napier grass along riparian areas to prevent flooding. In addition, adoption of smallholder irrigation systems, Construction of livestock shades (zero grazing), cross-breeding, and use of commercial feeds are other strategies within the sector.

It has been predominantly observed that depending on rain fed agriculture has not only left farmers counting losses, but has discouraged some of them particularly the youth to engage in meaningful agricultural production. This has left most residents with no option other than depending on food imported from the neighboring Uganda. It is estimated that 40% of the imports are agricultural commodities according to a study on Informal Cross Border Trade (ICBT) along Kenya Uganda border. (Nkoroi, 2001). There is urgent need to improve access to adequate nutrition among women and children by investing in priority sectors affected by climate change, improving child protection outcomes and expanding access to information.

The water sector in Busia County is also greatly affected by climate change as the county is classified as a water scarce. In this era of climate change and its evident effects on rainfall patterns, the county continues to experience a decline in water availability despite the increasing water demand due to population increase. Climate change effects on boreholes are not immediate however for shallow wells and spring that constitute a total of 54.85% of the county water sources, decline in yields is a rather common occurrence attributed to prolonged dry spells experienced in the county. Additionally, water harvesting and storage infrastructure are limited in the county.

Reduced water quality due to contamination of sources resulting from flooding and proliferation of harmful algae bloom resulting from increased temperature poses a threat to sustainability in provision of clean and safe water as the cost of water quality improvement to potable standards is high. Random sampling of water from shallow wells in flood prone areas in Bunyala Sub-county has shown prevalence of e-coli contamination.

Extreme weather events such as floods that are now more frequently and intensely experienced, have resulted in destruction of water infrastructure such as pipelines and water treatment facilities interrupting water supply.

Heightened climate change concerns have therefore necessitated the need to put in place adaptation strategies to enhance resilience in the county water sector to enhance water availability and quality. Increased investments to water harvesting and storage facilities, promotion of water conservation strategies, construction of climate resilient water infrastructure and development of policies that prioritize sustainable management of water resource have been identified as key strategies to enhance climate resilience.

Current strategies for all the wards across the county include:

Table 4.1: Strategies per Ward

Hazard/Risk	Impact	Response
Floods	Structural damage to buildings, roads, rails, communication lines, and land in general causing massive erosion resulting in wide gullies that cannot be cultivated anymore. Deaths of people and animals from drowning and injuries from displaced boulders, falling buildings, trees and others. Outbreak of diseases like malaria, cholera, dysentery etc due to presence of mosquitoes and contamination of water sources by the floodwaters. Contamination of wells and Ground water which is the major source of drinking water by most rural communities Loss of harvests and crops in farms, loss of food stocks, supplies and produce from farms.	Moving to high grounds Maintenance of the existing dykes on River Nzoia Improving drainage in agricultural farmlands Planting of water tolerant crops Opening of water channels in Ndekwe, Sidokho,Nandekhein Bunyala South ward Opening of river channels in Yala swamp particularly Lugos, Mulanya/Bulwani
Prolonged Dry Spell	Disrupt farming	Adoption of irrigation
	Crop/ animals diseases	Plant environmentally friendly crops
	Water resources dry up Causes wilting of crops thus affecting yield	Plant drought resistant crops Plant of early maturing crops

Hazard/Risk	Impact	Response
		Construction of water reservoirs such as dams, water pans Rain water harvesting Establishment of early warning systems
Pests and Diseases	Crop Failure Decreased livestock production Prevalence of human diseases Communicable diseases	Planting diseases/ pest tolerant crops e.g. sorghum, millet,cassava, sweat potatoes, cow peas
Soil degradation	Poor harvest	Acquisition of soil testing equipment
	Poor nutrition	
	Low food quality	Use of organic farm in puts eg organic fertilizer, seeds Establishment of seedbanks in the community
Hailstones	Crop damage Property damage	Planting of tuber crops Planting more trees Use of indigenous knowledge Early Warning Systems

Hazard/Risk	Impact	Response
Lightening and thunderstorms	Loss of life Loss of property	Installation of lightning arrestors Sensitization and awareness
Poor waste management practices	Health risks Emission of the Greenhouse gases Environmental pollution	Encourage wastes recycling Sanitization of proper waste management Produce farm manure from organic wastes
Noxious weeds	Declined tree/ forest cover Declined agricultural productivity	Adoption of integrated control practices
Deforestation	Soil erosion Reduced forest cover Destruction of the biodiversity of the natural ecosystem	Tree planting in the affected areas

4.2 Effectiveness of adaptation/resilience strategies to future climate risk

Impacts of Climate Change are getting more severe as predicted by 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: -

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

- Busia 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.

- 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)

- 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.

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: -

- Women are able to access adequate food, water, energy (lighting and Cooking) and opportunities to better their lives and their households.

- The youth are able to access opportunities for employment and contribute towards development of the County.
- The PLWD are able to access opportunities to better their lives and engage in meaningful livelihood activities to meet their basic needs.
- Children have access to basic needs for proper growth.
- The Elderly are weak and vulnerable to climate change effects hence need to be prioritized in the mitigation strategies.

Risk/Hazard	Livelihood/ Economic System	Climate Resilience Strategies	Stakeholder Group Applying the Strategy	Gender and Social Inclusion Information
1. Floods	Agriculture	Soil conservation practices (gabions, terraces) Enforcement of relevant Legislations on land, agriculture, Water Construction of dykes	KMD, Disaster Management, CBOs, Livestock Research Organization (KALRO), Individual farmers, Department of Agriculture KFS, NEMA, Water Resources Authority (WRA), Kenya Red Cross, USAID.	Capacity building and sensitization of Women, PLWD, youth, widows, widowers Priority given to the youth, PLWD, women groups during sensitization exercises
	Water	Water harvesting (Construction of dams) Distribution of Chlorine and other water treatment chemicals	Department of Water Irrigation, Environment, Natural Resources and Climate Change, BUWASCO, CBOs, KMD, Department of Health and Sanitation, Services, WKWP(USAID), NEMA, WRA,	Inclusion of with the vulnerable PLWD, Women, Children, Youth given priority

	Natural Resources/Environment	Rehabilitation of Degraded landscapes (Forests, Hills, Dams, Rivers) Preservation and Protection of all wetlands	CBOs, Water Resources Users Associations (WRUAs), Department of Water, Irrigation, Environment, Natural resources and Climate Change NEMA,	Engagement of PLWD, Women and Youth Groups to undertake the rehabilitation exercises.
	Energy	Promotion of energy efficient Cooking Stoves In institutions and Households	Department of Energy, CBOs, Households, Institutions, Departments Of Education, Environment, Financial institutions (KWFT), Natural Resources and Climate Change	Demonstrations and subsidies Targeted to PLWD, Women, Youth

	Health	Increased surveillance of water-borne diseases Distribution of Mosquito nets	CBOs, KMD Health and Sanitation Services, Community Health Volunteers (CHVs),	Areas with the vulnerable PLWD, Women, Children, Youth given priority
	Infrastructure	Construction of proper Drainages on infrastructure	KMD, NEMA, Department of Roads and Infrastructure	Infrastructure done With consideration to PLWD
		Adherence to the building codes	National Construction Authority (NCA), NEMA, Departments of Roads, Infrastructure, Public Works, Lands, Physical Planning, Public Health	Infrastructure development With consideration to PLWD
		Climate Proofed Infrastructure	NCA, NEMA, Department of Roads, Public Works and Infrastructure	Infrastructure done with consideration to PLWD

2. Prolonged Dry Spell	Agriculture and Livestock	Dry Planting	CBOs, One Acre Fund, Seed Companies, Individual farmers, Department of Agriculture, KMD,	Farm inputs subsidies to Women, PLWD, youth, widows, widowers and other vulnerable persons within the community
		Use of certified Seeds	KMD, CBOs, One Acre Fund, Kenya Seed Co, Individual farmers, Agriculture	Farm inputs subsidies to Women, PLWD, youth, widows, widowers and other vulnerable persons within the community
		Promotion of early maturing/drought resistant varieties of seeds	CBOs, One Acre Fund, Kenya Seed, Individual farmers, Department of Agriculture	Farm inputs subsidies to Women, PLWD, youth,

		Irrigation	CBOs, WRA, NEMA, Departments of Agriculture, Livestock, Irrigation, Water	widows, widowers and other vulnerable persons within the community
		Mixed Cropping/Cover Cropping/Mulching Crop rotation/Crop Diversification	CBOs, One Acre Fund, Kenya Agriculture and Livestock Research Organization (KALRO), Individual farmers, Department of Agriculture KMD CBOs, One AcreFund,Individualfarmers, Department of Agriculture	Sensitization and Demonstrations targeting Women, PLWD, youth, widows, widowers Farm inputs subsidies to Women, PLWD, youth, widows, widowers and other vulnerable persons within the community

		Composting/Use of Manure, Promotion of Silage/Hay, De-Stocking/Reducing number of livestock, Zero grazing, Reduced/Minimum tillage	CBOs, Individual farmers, Department of Livestock KMD, CBOs, Individual farmers, Department of Livestock, KALRO, Ripple Effect, NGOs, Individual farmers, Department of Livestock, NGOs, Individual farmers, Department of Agriculture	Demonstrations targeting Women, PLWD, youth, widows, widowers' groups given priority
	Water	Water harvesting/Storage (roof catchment)	CBOs, Individual households, Institutions, Department of Water	Focus on PLWD, Women, youth and widows Demonstrations targeted at groups/individuals with PLWD, Women, Youth
		Investing in piped schemes	Department of Water, WRA, NEMA, Water Service Providers BUWASCO).	

		Exploitation of aquifers Through drilling and equipping boreholes	WRA, NEMA, Department of Water	
		Construction and Protection Of Water Springs	WRUAs, Department of Water, CBOs,	Vulnerable Groups of Women, PLWD, Youth given opportunities
	Natural Resources/Environment	Afforestation of water catchments (Hills, dams, rivers, springs)	CBOs, WRUAs, Department of Water, Irrigation, Environment, Natural Resources and Climate Change	PLWD, Women and Youth Groups engaged to supply and grow the trees
		Waste Recycling and Composting	CBOs, NEMA, lands, Directorate of Environment, municipality	Priority given to groups with PLWD, Women, youth groups to undertake the recycling and composting
		Promotion of Urban Forestry	CBOs, KFS, community Forest Associations Department of Agriculture, Environment and Natural Resources, Individual farmers,	Focus on PLWD, Women, youth and widows

		Promotion of Urban Forestry	CBOs, Kenya Forest Service (KFS), Department of Physical Planning, Department of Roads, Directorate of Environment and Natural Resources, Individual farmers,	Priority given to the youth, PLWD, women groups to supply necessary tree seedlings and undertake the landscaping
		School/Institutional Greening	CBOs, Kenya Forest Service (KFS), Department of Education, Directorate of Environment and Natural Resources, Individual	Priority given to institutions of PLWD, youth, women
	Energy	Promotion of biogas	CBOs, NGOs, Individual farmers, Department of Livestock and Energy	Women, PLWD, youth, widows, widowers groups given priority in demonstrations and subsidies
		Promotionof Solar energy	CBOs, NGOs, institutions, households, Department of Energy	Women, PLWD, youth, widows, widowers groups given priority in demonstrations and subsidies
			CBOs, KALRO, NGOs,	

3. Pests and Diseases	Agriculture	Increased surveillance of Climate induced Pests and diseases and Vaccination of livestock	Individual farmers, department of Agriculture and Livestock	Information cascaded to Women, PLWD, youth, widows, widower groups
		Mixed Cropping/Cover Cropping/Mulching	CBOs, One Acre Fund, Kenya Agriculture and Livestock Research Organization (KALRO), Individual farmers, Department of Agriculture	Sensitization
	Health	Immunization	Department of Health, CHVs,	Priority given to PLWD, Women, Children, Youth, Elderly
		Increased Surveillance of climatic related diseases	KMD, Department of Health,	Information cascaded down to
		Pest Control	CHVs, Individual Households,	
	Environment/Natural Resources	Afforestation and Reforestation	WRUAs, Community Forest Associations (CFAs), KFS, Directorate of Environment/Natural	PLWD, Women and Youth Groups engaged to supply and grow the trees

4**. Inadequate skills and knowledge on climate change matters**	All Sectors of the Economy and Livelihood Systems	Community trainings/sensitizations on the impacts of Climate Change across all sectors/livelihoods Regular Climate Risk Vulnerability assessments across all	Ward Climate Change Planning Committees, Community Based Organizations (CBOs), Non-Governmental Organizations (NGOs), Private Sector, Semi-Autonomous Government Agencies (SAGAs) County Government of Busia	Focus on the most vulnerable in the Community-Women, Persons Living with Disability (PLWD), Youth, Children, Elderly, Sick, Widows and Widowers, Poor, Focus on the most vulnerable in climate change matters

CHAPTER 5:. BUSIA COUNTY CLIMATE STRATEGIC ADAPTATION INVESTMENT/ACTION PRIORITIES

5.1 Overview of Strategic Investments

The County Participatory Climate Risk Assessment identified seven key hazards/risks 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 Busia County Climate Change Strategic Adaptation and Investment Priorities

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

- In the Water Sector, areas that cannot be served by piped schemes, drilling of boreholes 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. Furthermore, water harvesting through construction of dams and construction of roof-catchments shall be promoted for adapting to prolonged dry spell risk. Water springs protection shall be prioritized to provide water for the community and the protection of sources of streams and rivers which shall help the community build resilience against the impacts of prolonged dry spells. Rehabilitation of riparian areas through tree growing and bamboo planting to increase tree cover. Also, de-silting of dams shall be a priority in addressing the flooding menace within the affected wards such as Bunyala South, Central, North and in Teso South.

- The Environment and Natural Resources Sector shall prioritize increasing the County forest/tree cover through promoting farm forestry, rehabilitation of degraded landscapes in Teso South, Bunyala, and Butula Sub-counties. Promotion of reaforestation through school/institutional greening programmes and promotion of Nature Based Enterprises as adaptation strategies to the impacts of dryspell

will be a priority. Furthermore, investments in Waste management infrastructure (Both liquid and Solid) such as rehabilitation of the sewerage system, development of sanitary landfills and installation of solid waste receptacles shall be prioritized for the urban areas of Busia town, Malaba, Nambale, Funyula, Bumala and Port-Victoria

- In the agronomy and Livestock sectors; Climate Smart Agriculture 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.

- 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 Energy sector shall promote Energy saving devices such as Improved Cooking Stoves and jikos and use of alternative renewable/green energy such as Solar, Biogas as adaptations to the impacts of deafforestation.

Table 5.1: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.

Risk/Hazard	**Priority Areas of Investment**		
1. Prolonged dry spell	Agriculture and Livestock	Adoption of Climate Smart Agriculture Practices i.e Apiculture, Agroforestry, aquaculture	For affected wards
		Promotion of drought tolerant crops	For affected wards
		Promotion of early maturing/ drought escaping crops.	For affected wards
		Crops and disease surveillance	For affected wards
		Promotion of crop and livestock insurance	For affected wards
		Adoption of irrigated agriculture	For affected wards
		Promotion of soil and water conservation measures	For affected wards
		Creation of awareness on conservation Agriculture	For affected wards
	Water and Irrigation	Borehole Drilling, Equipping and solarisation	For affected wards
		Springs rehabilitation and Protection	For affected wards
		Roof catchment Water harvesting	For affected wards
		Rehabilitation of water supply schemes	All affected wards
		Rehabilitation of dams and water pans	For affected wards
		Rehabilitation of irrigation schemes	For affected wards
	Environment/Natural Resources	Increasing County Forest/Tree Cover	All hills, rivers, planting of bamboo

Risk/Hazard	Priority Areas of Investment		
	Livelihoods		along the riveras and wetlands, School Greening programs, Degraded Landscapes, Farms
		Promotion of Nature Based Enterprises	In the affected wards
		Integrated waste management	For affected wards
		Spring protection	For affected wards
		Establishment of tree nurseries	All the 35 Wards
		Promotion of bamboo	In the affected wards
		Integrated watershed and catchment protection	For affected wards
	Energy	Promotion of renewable energy Sources	Affected public institutions
		Promotion of energy efficient devices	For affected wards
	Health	Climate related Disease Surveillance or Monitoring	In the affected wards
		Capacity building	In the affected wards
2. Floods	Environment/Natural Resources	Promotion of bamboo	In the affected wards
	Water and Irrigation	Construction of water pans and water dams	In the affected wards

Risk/Hazard	Priority Areas of Investment		
		Rehabilitation of Riparian areas	In the affected wards
		De-silting of rivers and dams	All dams within the 35 Wards
	Health	Surveillance of water and vector borne diseases	Areas with prevalence of floods within the 35 Wards
3. Increase prevalence of Pests and Diseases	Agriculture	Integrated Pest Management Practices	In the affected wards
4. Unpredictable rainfall patterns	Agriculture	Planting of drought tolerant crops Water harvesting Soil and water conservation	In the affected wards
5. Land degradation due to sand harvesting	Environment/Natural Resources	Capacity building on proper sand harvesting methods to control the activity Site restoration/ rehabilitation Quarry reclamation	Four sub counties
6. Deforestation	Environment/Natural Resources	Afforestation and reforestation programs Bamboo planting along the rivers Riparian areas restoration	All the 35 Wards

Risk/Hazard	Priority Areas of Investment		
		Wetland management capacity building	
7. Poor Waste Management practices	Lands, Environment/Natural Resources	Integrated Waste Management Practices Conversion of organic waste into organic mature and poultry fish feeds using black soldier farming.	All major towns within affected wards
8. Lightning and thunderstorms	Disaster management	Installation of lightning arrestors	All the affected wards
9. Mudslides and soil erosion	Environment/Natural Resources	Landscape conservation and management	All affected wards

CHAPTER 6:. CONCLUSION AND RECOMMENDATIONS

The Participatory Climate Risk Assessment (PCRA) Report has been developed with the sole objective of having a community led-risk identification and Action planning to inform decisions of policy makers and guide community prioritization of climate change strategies. This report shall form the foundation of the County Climate Change Action Plan 2023 -2027 which shall then inform the National Climate Change Action Plan to ensure the Country meets its Nationally Determined Contributions as per the various treaties approved.

Therefore, from the PCRA exercise, we recommend;

i. A climate change action plan 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 common climate risks as identified including erratic rainfall patterns, prolonged dry spells, floods, soil erosion, reduced soil fertility, environmental degradation, and increased incidence of pests and diseases.
ii. Climate change stakeholders in the County rally around the action plan and support the county government in implementing the priority actions identified in the plan which should be updated on regular basis to keep the document alive.
iii. Capacity building of the County Climate Change Coordination Unit. i.e. County Climate Change Steering Committee, County Climate change Planning Committee and the Wards based Climate Change Coordinating Committees.
iv. In addition, County Assembly committees in charge of climate change and County legislations should also be capacity built on climate change issues.

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ANNEXES

Annex 1 : Ward Based PCRA Findings & Proposed Climate Resilient Projects

1. BUNYALA SUBCOUNTY

i. Bunyala West ward

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BUNYALA WEST WARD					
No.	**RISKS/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Floods	• Death of people and animals • Destruction of property • Displacement of families, business sites and animals • Water borne diseases like cholera, bilharzia, etc. • Food insecurity	• Excessive migration of people • Increased food insecurity	• Food insecurity • Displacement of families • Increase in diseases particularly the water borne diseases	• Moving to high grounds • Maintenance of the existing dykes on River Nzoia • Provision of mosquito nets • Improving drainage in agricultural farmlands • Planting of water tolerant crops • Provision of mobile toilets • Opening of water channels in Ndekwe, Sidokho, Nandekhe in Bunyala South ward • Opening of river channels in Yala swamp particularly Lugos, Mulnya/Bulwani

				• Death of people • Destruction of social infrastructure • Destruction of property	
2.	Prolonged dry spell	• Food insecurity • Death of animals • Drying of shallow wells		• Food insecurity • Death of animals • Drying of shallow wells	• Tree planting • Planting of drought resistant crops like cassava
3.	Pests and diseases	• Loss of animals particularly cattle, sheep • Destructions of crops • Death of humans	• Increased pest population	• death of people and animals • destruction of crops	• use of pesticides • provision of mosquito treated nets • having crash pens in each sub location • planting pest and disease tolerant crops •

		• Increase in poverty levels due to high medical expenditures		• increased poverty levels • loss of income	
4.	Hailstorms and strong winds	• Destruction of crops particularly rice, bananas, beans etc.	• Probability of occurrence unknown	• Heavy losses by farmers • Food insecurity	• Planting of trees to act as wind breakers
5.	Lightning strikes	• Destruction of property • Death of people and animals	•	• Destruction of property • Death of people and animals	• Installation of lightening arrestors • Communities sensitization on lightening strikes

Bunyala West Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Establishment of Nature based enterprises-Bee keeping
iii. Promotion of Fish cage farming
iv. Horticulture farming

v. Promotion of modern waste recycling technologies
vi. Promotion of plastic waste recycling plant
vii. Water bottling promotion
viii. Establishment of hydrants at Port Victoria town
ix. Opening of the channels
x. Pipeline extension for port Victoria supply and repair of rising main
xi. Eradication of invasive weeds- dodder and striga weeds.
xii. Portable PH meters
xiii. Grain moisture meters

ii. BUNYALA SOUTH WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT BUNYALA SOUTH WARD					
No.	**RISKS/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Floods	• Displacement of families • Destruction of crops/property • Death of people and livestock • Damage to road networks • Disruption of learning • Disease outbreaks • Poor sanitation • Destabilizes the economy	• More health risks • Loss of species • Rise in lake levels • More severe storms	• Less population in the area • High cost of living • Shock, trauma/depression • Inaccessibility hence poor development in the area • High cases of school dropout/ early pregnancies • Spread of HIV/Aids • Low living standards • Divorced and separation • Migration of people	• moving to higher grounds • opening of water channels • strengthening of dykes • improved sanitation facilities • stop people from cultivating along the dykes • planting of water resistant crops • planting of early maturing crops • establishment of early warning systems • deployment of resue teams • tree planting in Samia hills • river trimming

				• High poverty levels • Malnutrition	
2.	Prolonged dryspell	• Disrupt farming • Crop/ animals diseases • Death of animals • Water resources dry up	• Loss of species	• Food insecurity • High food prices • Low living standards • Malnutrition	• Plant environmental friendly crops • Plant drought resistant crops • Plant early maturing crops • Construction of water reservoirs such as dams, water pans • Rain water harvesting • Establishment of early warning systems
3.	Disease outbreak	• Death of people and animals • Respiratory and heart diseases	• Increase illness • Increased mortality rate	• High cost of living • Low population • High medical bills • Depression/ trauma	• Water treatment • Improved hygiene • Enhanced accessibility to health facilities

			• Poor growth and development		• Sensitization of the community on disease prevention
4.	Water pollution	• Increase diseases • Death of fish • Reduction of fish		• High cost of living • Poverty • Theft • Poor fishing methods	• Water purification • Plant more trees
5.	Human/wildlife conflict	• Death of people/livestock • Destruction of crops/property • Instils fear in the surrounding community • Discourages farming	• Not enough food • More health risks • Increased conflicts • Increased poaching •	• Heightened conflicts • Food insecurity • Leads to migration • Hinders movement of people • Loss of some animal species	• Avoid encrotchment into animal habitats • Community Sensitization on human/wildlife conflicts

Bunyala South Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Opening of drainage canals
iii. Purchase and operationalization of a Rescue boat

iv. Creation of water ways
v. Water pipeline extension in Mahoma.
vi. Pipeline extension of Rukala water project.
vii. Roof catchment water harvesting and storage enhancement at Bulwani, Osieko, Rukala and Khajula dispensaries.
viii. Solarisation of Bulwani, Osieko, Rukala and Khajula dispensaries.
ix. Enhancement of Solid Waste management-medical waste management at Rukala dispensary.
x. Land reclamation of water logged areas in Osieko.
xi. Eradication of invasive weeds- dodder and striga weeds.
xii. Portable PH meters
xiii. Grain moisture meters

iii. BUNYALA CENTRAL

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BUNYALA CENTRAL WARD				
RISKS/HAZARDS	EFFECT TO THE COMMUNITY	FUTURE TRENDS	ANTICIPATED IMPACTS	ADAPTATION/MITIGATION PRACTICES
Floods	Death of people and animals Destruction of property Displacement of families, business sites and animals Water borne diseases like cholera, bilharzia, etc. Food insecurity	Excessive migration of people Increased food insecurity	Food insecurity Displacement of families Increase in diseases particularly the water borne diseases Death of people Destruction of social infrastructure Destruction of property	Moving to high grounds Maintenance of the existing dykes on River Nzoia Provision of mosquito nets Improving drainage in agricultural farmlands Planting of water tolerant crops Provision of mobile toilets Opening of water channels in Ndekwe, Sidokho, Nandekhe in Bunyala South ward Opening of river channels in Yala swamp particularly Lugos, Mulnya/Bulwani

Prolonged dryspell	Food insecurity Death of animals Drying of shallow wells		Food insecurity Death of animals Drying of shallow wells	Tree planting Planting of drought resistant crops like cassava
Pests and diseases	Loss of animals particularly cattle, sheep Destructions of crops Death of humans Increase in poverty levels due to high medical expenditures	Increased pest population	death of people and animals destruction of crops increased poverty levels loss of income	use of pesticides provision of mosquito treated nets having crash pens in each sub location planting pest and disease tolerant crops
Hailstorms and strong winds	Destruction of crops particularly	Probability of occurrence unknown	Heavy losses by farmers Food insecurity	Planting of trees to act as wind breakers

	rice, bananas, beans etc.			
Lightening strikes	Destruction of property Death of people and animals		Destruction of property Death of people and animals	Installation of lightening arrestors Communities sensitization on lightening strikes

Bunyala Central Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Installation of Solar driers for rice
iii. Solarization and Pipeline extension of Siamungu water project
iv. St Anne's Girls school, solarization and pipeline extension
v. Promotion of cottage industry e.g basketry
vi. Solarisation of Mukhobola health centre and pipeline extension to serve; Busagwa health centre, Busagwa TVET and Busagwa dispensary.
vii. Eradication of invasive weeds- dodder and striga weeds.
viii. Portable PH meters
ix. Grain moisture meters

iv. BUNYALA NORTH WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BUNYALA NORTH WARD					
No.	**RISKS/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Floods	• Destruction of farmlands • Destruction of property • Destruction of infrastructure i.e. schools, roads, bridges etc. • Outbreak of diseases • Displacement of the population • Loss of food security • Death of people and livestock • Water pollution • Soil erosion • Early pregnancy and marriage • Increased pressure on the available resources e.g. drugs, food • Leads to insecurity • Diversion of resources allocated for other development programs	• Cause permanent displacement of people • Increased levels of water in Lake Victoria. • Change of anticipated rain patterns • Increased flush floods	• Lead to famine • Destruction of schools, hospitals • Increase in school dropouts • Increase in death tolls • Increased pressure in social facilities e.g. schools, hospitals • Insecurity	• Construction of dykes • Construction of water canals • Planting of water resistance crops like sorghum, yams • Drumming on the dykes as an early action plan • Harvesting rain water • Sensitization on early warning through local radio station (Bulala FM), public barazas

2.	Disease outbreak	• Outbreak of diseases e.g. cholera, malaria, typhoid, bilharzia • Death • Poverty in families	• Severe disease outbreaks • High mortality rates •	• Low household income • Diversion of resources hence poor development	• Sensitization of population on disease prevention mechanisms • Empowerment of community health volunteers • Development of a health database • Supply of mosquito nets
3.	Prolonged dryspell	• Immaturity of food crops • Water shortage • Early marriages and early pregnancies • Famine • Malnutrition	• Famine/hunger • Poverty • Insecurity •	• Death	• Tree planting • Planting of fast maturing crops • Planting of drought resistant crops • Rain water harvesting and storage • Construction of water reservoirs • Traditional copying mechanisms e.g. cooking rikhubi, drying and storing for the future.
4.	Deforestation	• Soil erosion • Low rainfall	• Floods • Open gullies • Extinction of wildlife • Loss of indigenous species	• Low production of crops as a result of low soil fertility • Human animal conflict • Prolonged dry spell	• Afforestation and reforestation • Agroforestation

				• Increased greenhouse gas emission	
5.	Pollution of water bodies	• Outbreak of water borne diseases • Unsafe drinking water • Death • Collapse of aquatic ecosystem	• Blue economy will be affected	• Loss of lives • Outbreak of water borne diseases • Migration of aquatic wildlife	• Sensitization of the community on the adverse effects of pollutions

Bunyala North Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Establishment of Nature based enterprises-Bee keeping and poultry.
iii. Construction of Namonye water pan for irrigation, animal water and flood control.
iv. Rooftop rain water harvesting at Ruganwa,Siakula,Budebu and Sifugwe
v. Solarization, Pipeline extension and rehabilitation of Sisenye water supply-improvement of storage tanks
vi. Establishment of fruit parks around water pans.
vii. Promotion of cash crop farming

viii. Installation of solar driers for the paddy rice in Rwambwa-Mudembi irrigation scheme.

ix. Solarization for Bulala FM community Radio station and Budalangi dispensary.

x. Rooftop rain water harvesting at Budalangi primary,Mudembi,Sibuka, Mundere,Namalo primary

xi. Schools and health facilities roof catchment water harvesting

xii. Opening of canals to ease drainage- cash transfers.

xiii. Promotion of modern waste recycling technologies

xiv. Eradication of invasive weeds- dodder and striga weeds.

xv. Portable PH meters

xvi. Grain moisture meters

2. SAMIA SUBCOUNTY

i. BWIRI WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BWIRI WARD					
No.	**Risk/Hazard**	**Effects to the Community**	**Future Trends**	**Anticipated Impacts**	**Mitigation/Adaptation**
1	prolonged dry spells	• High crop failure • Low yields • Food & nutrition insecurity • Pests & diseases outbreaks • Drying of water sources • Hunger • inadequate pasture • Poverty • reduced • livelihoods • Drying off/destruction of vegetation • Scarcity of water	• desertification	• deaths • desertification	• Irrigation • construction of water harvesting and storage facilities (dams, water pans) • Afforestation of hilltops • Agroforestry • growing of drought resistant and early maturing crop varieties, • Early/timely planting • organic farming • Conservation agriculture • Double digging • Poultry production • Early warning systems

2	Scarcity of clean safe water	• Poor sanitation • wilting/withering of crops • outbreak of diseases and pests (human/livestock)	• Low human productivity • Low land productivity	• Low productivity of human capital • Deaths	• construction of dams , water pans and protection of water springs
3	Floods	• contamination water points • submergence of sanitation facilities • outbreak of water born and water related diseases • Destruction of landing beaches • destruction of crops/vegetation • Human and animal conflicts	• Development of swamps • Closing down of beaches • Reduced land/ crop productivity • Low productivity of human capital	• Reduced livelihoods • Food & nutrition insecurity • Hunger • Poverty • Deaths • Homelessness • increase in vulnerable population e.g OVC	• construction dykes • river training • river dredging • construction of drainage systems • growing of water loving trees • construction of dams, water pans • growing of paddy rice

		• displacement of people due to destruction of human settlement • reduced grazing fields/grounds • deaths due to drowning • hunger • Food and nutrition insecurity • destruction of road infrastructure, power lines • interference of learning in schools		• inaccessibility of affected areas • high illiteracy levels`` • Closure of social amenities schools, health facilities	
4	soil erosion	• Low land productivity due to Loss of soil fertility • destruction of crops • Destruction of road infrastructure • Siltation of dams, rivers, • food and nutrition insecurity	• Development of gulley • desertification • Land slides	• Hunger • Poverty • Inaccessibility	• construction of terraces along contours • Cover cropping • construction of gabions, • crop rotation • cutoff drains • Afforestation of hill tops, and erosion prone areas • conservation Agriculture

					• Contour planting • surface runoff water harvesting techniques such as sand/earth dams

Bwiri Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Solarisation and pipeline extension of Busijo water supply.
iii. Rehabilitation of water pans- Matabi, Namasango for irrigation and livestock watering.
iv. Establishment of fruit parks around dams and water pans.
v. Fruit parks around the dams and water pans
vi. Establishment of Nature based enterprises-Bee keeping.
vii. Establishment of Poultry farming.
viii. Eradication of invasive weeds- dodder and striga weeds.
ix. Portable PH meters
x. Grain moisture meters

ii. AGENG'A NANGUBA WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR AGENG'A NANGUBA WARD					
No.	**RISK HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTION/MITIGATION PRACTICES**
1	Floods	• Outbreak of diseases i.e cholera,bilhazia		• Death • Displacement of persons/schools • Destruction of property • Loss of grazing lands • Disruption of transport • Leads to livestock diseases	• Constructions of dykes and terraces • water pans • Vaccination of livestock • Protection of springs
2	Prolonged dryspell	• Lack of food/crops • Outbreak of livestock diseases		• Hunger • Death of livestock	• Irrigation waterpan • Planting drought resistance plants/crops • Planting early maturing plants/crops • Harvesting rain water • Drilling solar powered boreholes/shallow wells • Make hay • Construction of crushpen /cattle dips • Incentify extension services • Construction of an animal laboratory

3	Pests and diseases	• Low productivity		• Food insecurity	• Early spraying(chemicals) • Biological means • Crop rotation • Research on control of termites and moles
4	Soil infertility	• Low productivity • crop poisoning i.e cassava		• Food insecurity • Death	• Soil sampling and testing • Use of organic manure • Use of lime • Soil sampling/testing
5	Soil erosion	• Low productivity		• Food productivity	• Construction of gabions, terraces e.t.c • Planting trees • Avoid burning of vegetation. • Planting of cover crops • Adopt TIMPS i.e minimum tillage contour farming.
6	Deforestation	• Soil erosion • reduces aesthetic value		• Drought • Pollution	• Reafforestation • Alternative sources of energy i.e green energy • Enforcement of law

		• Loss of bio diversity			• Alternative sources of livelihood i.e Agroforestry, bee keeping • Fruit trees • Sensitization
7	Destruction of natural environment	• Soil erosion • Flooding • Water pollution • Loss of biodervisity		• Water pollution • Wildlife/human conflict	• Enforcement of the law • Sensitization • Soil conservation measure

Ageng'a/ Nanguba Ward Proposed Climate Resilient Projects

1. Establishment of Tree nurseries and afforestation programs (including fruit trees).
2. Establishment of Soil conservation measures around Agenga hills
3. Augmentation and solarization of Munana water supply/ increase rise main
4. Pipeline extension for Ojibo water project
5. Establishment of Matinga irrigation scheme.
6. Drilling and solarising of borehole in Bujwanga area.
7. Bee keeping/ goat keeping
8. Roof top rain water harvesting at Bunandi, Bumulimba, Muramba, Nabutuki
9. Human waste to energy conversion biogas project at Sigalame Boys high school
10. Construction of Water pan around Samia Girls

11. Installation of Lightening arrestor at Ageng'a dispensary
12. Construction of storm water drainage systems and stage improvement at along Muramba-Bukiri Road
13. Water provision at Agenga health centre
14. Eradication of invasive weeds- dodder and striga weeds.
15. Portable PH meters
16. Grain moisture meters

iii. NANGINA WARD

1. PARTICIPATORY CLIMATE RISK ASSESSMENT FOR NANGINA WARD					
No	**RISK/HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**MITIGATION/ADAPTATION MEASURES**
1	Prolonged dry spell	• Crop failure • shortage of water • Shortage of food • Drying of springs • Human stunted growth & malnutrition	• Likelihood of semiarid conditions • Drying of trees and forests	• Famine • Increased mortality rates	• Plant drought resistant crops • Adoption of early maturing crops • Tree planting on Hills • Adopt Irrigation Agriculture • Protect springs and wetlands • Promotion of silage making and hay baling • Practice zero grazing
2	Soil Erosion	• Poor crop production	• Scarcity of food	• Water pollution • deforestation	• Terracing and Gabions • Planting of cover crops

		• Silting of rivers and springs • Loss of soil fertility • Emergence of Gullies and valleys • Crop lodging	• Destruction of Ecosystem • Abandonment of farming • Displacement of people	• Hunger	• Afforestation/ Agroforestry • Desilting of rivers and springs
3	Change of rainfall patterns	• Withering of crops/ crop failure • Floods • Poor harvests • Outbreak of pests & Diseases	• Erratic rainfall/poor rainfall distribution	• Famine	• Adopt alternative water harvesting technologies • Practice conservation agriculture • Practice zero grazing • Adopt Aquaculture • Introduction small livestock enterprises
4	Floods	• Crop damage • Increased Human and animal disease outbreaks	• Reduced agricultural land • Loss of soil Fertility	• Deaths and Diseases • Hunger	• Afforestation • Community sensitization on environmental conservation • Land terracing and Gabions

		• Displacements and destruction of settlements • Soil Erosion • increased cases of Malaria			
5	High Temperatures	• Outbreak of diseases in plants and Animals • Crop failure • Pests outbreaks in plants • Drying of trees	• Increased mortality rates and Hunger	• Chronic illnesses and poor human health • Famine	• Tree planting • Adoption of drought tolerant crops
6	Windy Storms	• Destruction of property i.e houses, schools Etc.	• Can evolve into cyclones	• Deaths • Displacement of Humans and animals	• Tree planting • Proper architectural designs for human settlement
7	Scarcity of safe drinking water	• Increased water borne diseases	• Increased mortality	• Reduced animal production • Poor human Health	• Drilling of boreholes • Adopt safe drinking water harvesting methods

					• Treatment of water plants • Community Sensitization
8	Encroachment on Wetlands	• Destruction of ecosystem • soil Erosion • Silting of Rivers • Water pollution • Increased cases of water borne diseases	• Extinction of flora and fauna • Increase in animal Human conflict	• Reduced water volumes in streams and Rivers	• Mapping and protection of wetlands • Community sensitization
9	Pests and Diseases in crops and Livestock	• Low food production • Intensive use of pesticides leading to environmental pollution	• Pests and disease resistance to pest control products • High budgets for control of pests	• Reduced life expectancy as a result of increased use of pesticides	• Adopt disease resistant varieties • Practice crop rotation and intercropping • Keeping of improved livestock breeds • Increased budgets of research • Community trainings on pests and diseases control

Nangina Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Drilling of boreholes in Bukhulungu D, Bwangangi, Malaya, Sirekeresi and Bulori.
iii. Soil erosion control in Kabwodo, Bukhulungu and Bwangangi
iv. Establishment of Irrigation scheme in Munana and Luchululo
v. Alternative livelihoodsstream bee keeping, pig rearing, poultry farming Pig rearing
vi. Construction of water pans
vii. Solarization of Nangina dispensary
viii. Promotion of modern waste recycling technologies
ix. Establishment of hydrants
x. Rehabilitation of Alema Water supply (repairs and maintenance)
xi. Eradication of invasive weeds- dodder and striga weeds.
xii. Portable PH meters
xiii. Grain moisture meters

iv. NAMBUKU/ NAMBOBOTO WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR NAMBUKU/ NAMBOBOTO WARD					
No.	**RISKS/HAZARDS**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION.PRACTICES**
1	**(A)**Diseases e.g. malaria	• Reduce financial economical productivity.	• Causes death • Reduced economic development • Destruction of properties • reduced population.	• Increase in: • Poverty • Premature birth	• Use of mosquitoe nets • Drainage of stagnant water • Bow hole clearing • Early treatment. • Spraying/applying repellant.
	(B) Soil Erosion.	• Reduced crop productivity • Increase siltation in water sources and blockage	• Destruction of properties.	• Barren land • Impassable roads	• Construction of gabions and terracing. • Good farming method e.g. couture farming, cover cropping. • Tree growing.

		of drainage system.			
2	**(A)** Prolonged Dry Spell.	• Water scarcity • Crop failure	• Drought	• Reduced livestock/crop production.	• Drilling of borehole • Water harvesting • Protection of existing water sources(springs) • Planting of trees water streams.
	(B) Flash Floods.	• Crop damage • Temporary displacement	• Loss of property • Deaths.	• Destroyed infrastructure.	• Improved drainage system. • Tree growing.
	(C) Deforestion.	• Shortage of rain.	• Drought • Diseases	• Lowcrop production • Increased corosion.	• Early awareness. • Reafforestation. • Introduction of other economic activities.
3	**(A)**Drought.	• Malnutrition.	• Death(Human)		• Early maturity crops.

	(B) Human/Wildlife Conflict	• Low crop/animal production.	• Loss of property (livestock/crops).	• Hunger and starvation.	• Growing of drought resistant crops. • Irrigation. • Improved farming methods. • Application of the law. • Separation between human and wildlife.
			• Increases poaching.		
	(C) Floods.	• Crop destruction. • Loss of life. • Spread of diseases.	• Death. • Property distraction.	• Decreases inhuman/Wildlife Population.	• Early medication. • Dike construction. • Early medication. • Awareness/warning
				•	
				• Spread of diseases.	
		• Displacement. • Crop damage.		• Property destruction.	

Namboboto/ Nambuku Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Establishment of Soil conservation measures.
iii. Protection of natural water streams-namundiri,
iv. Establishment of Fruit park around Namboboto dam
v. Development of Namboboto dam for irrigation and domestic water usage.
vi. Catchment protection of Ludacho stream
vii. Water harvesting in health facilities.
viii. Installation of Solarised cold storage at Bukani aquapark
ix. Eradication of invasive weeds- dodder and striga weeds.
x. Portable PH meters
xi. Grain moisture meters

2. BUTULA SUBCOUNTY

i. MARACHI WEST WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MARACHI WEST WARD					
No.	**RISK/HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Prolonged Dryspell	• Late planting • Lack of animal feeds • Soil erosion • Communicable diseases	• Likely to reoccur	• Food insecurity • Malnutrition • Death • Social hazards like theft • Separation of families • Drying up of steams eg Obwogo in Bujumba sublocation	• Afforestation and reafforestation • Planting drought tolerant crops • Adoption of irrigation • Reclaiming of wetlands • Construction of water reservoirs • Good agronomic practice(community sensitization) • Employment of more extension staff.
2.	Flash floods	• Soil erosion • Impassable roads • Pests and diseases • Destruction of crops and structures • Interference with normal education	• Likely to reoccur	• Displacement of people • Destruction of critical infrastructure (Ogongo bridge)	• Construction of dykes • Afforestation and reafforestation • Construction of terraces and gabions • Awareness creation • Reclamation of wetlands.

		schedules for pupils and students			
3.	thunderstorms	• Death • Destruction of property	• Likely to occur frequently	• Death • poverty	• Installation of lightening arrestors • Awareness creation
4.	Unpredictable rainfall patterns	• Late planting	• Likely to re-occur	• Food insecurity	• Irrigation • Afforestation • Awareness creation • Weather advisory (engaging meteorology) • Training on early warning
5.	Strong winds	• Deforestation • Soil erosion • Destruction of crops • Destruction of critical infrastructure eg communication masts and powerlines	• Likely to re-occur	• Insecurity • Displacement of people • Poverty • Cuts communication	• Afforestation • Community sensitization • Increase allocation of disaster management funds
6.	Soil degradation	• Poor harvest • High cost of production	• Likely to re-occur	• Hunger • Malnutrition • Poverty	• Employ agricultural extension officers • Treatment of soil • Conducting frequent soil testing

7.	Striga weeds infestation	• Low yields • High expenditure on farm inputs	• Likely to re-occur	• Malnutrition • Poverty • Hunger • Food insecurity •	• Employ agricultural extension officers • Planting cover crops • Training farmers • Agroforestry •
8.	Human activites • Brick making • Excavation • Goldmining • Farming along riverbanks	• STIs • School dropouts • Increased cases of early pregnamcies	• Likely to re-occur	• Displacement • Diseases • Insecurity • Poverty • Food insecurity	• Community sensitization • Good agronomic practices • Afforestation •

Marachi West Ward Climate Resilience Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Enhancement of Bujumba Burinda water supply.
iii. Establishment of Apiary as an alternative source of livelihood.
iv. Eradication of invasive weeds- dodder and striga weeds.
v. Promotion of modern waste recycling technologies

vi. Bukhalalire spring hybridisation

vii. Establishment of two hydrants at Bumala town

viii. Portable PH meters

ix. Grain moisture meters

ii. KINGANDOLE WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR KINGANDOLE WARD					
No.	**RISK/HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Human activities (gold mining)	• Borrow pits • Abandoned mines • School drop outs	• Increasing	• Cause death • Hiding places for thugs •	• Community compensation/ resettlement • Organised and sustainable mining •
2.	Drought/ prolonged dryspell	• Food insecurity • Inadequate livestock feeds	• Malnutrition	• Hunger • Death of livestock •	• Irrigation • Use of indigenous crops • Afforestation • Establishment and improvement of livestock feeds
3.	Floods/ flash floods	• Destruction of crops • Destruction of property • Human displacement • Impassable roads	• Hunger • Poverty	• Poor harvest • Pests and diseases • Death • Affects transportation	• Cover crops • Afforestation • Construction of dams • Water harvesting • Improved drainage • Improved roads

4.	Soil erosion	• Impassable roads and river crossing • Loss of soil fertility • Pollution of water	• Likely to re-occur • increasing	• Poor roads • Low yield • Diseases	• Planting of cover crops • Afforestation • Soil and water conservation measures
5.	Pests and diseases	• Low yield • High cost of production • Low production due to diseases	• Increasing	• Famine • Poverty • Deaths	• Use of pesticides and herbicides • Use of modern farming technology • Improvement of health facilities • Availability of drugs • Improvement of extension services
6.	De-afforestation	• Drought • Soil erosion •	• Increasing	• Drought • Loss of soil fertility	• Government and community to plant trees.
7.	Strong winds	• Destruction of property	• Likely to increase	• Destruction of properties and crops	• Afforestation • Planting trees eg bamboos along river banks
8.	Thunder storm	• Death • Stress and depression	• Likely to increase	• Death • Destruction of property • Food insecurity	• Installation of lightning arrestors • Awareness creation

Kingandole Ward Climate Resilience Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Existing borehole at Bumutiru A. C. Primary water project needs an overhead tank, solar pump and piping to the community and water kiosk.
iii. Pipeline extension at Nyalwanda dispensary and provision of community water kiosks.
iv. Solarisation of Kingandole Secondary borehole.
v. Installation of Solar driers for irrigation farmers at Bumwaya dam
vi. Solarization of Khunyangu subcounty hospital
vii. Installation of Solar hatcheries.
viii. Eradication of invasive weeds- dodder and striga weeds.
ix. Portable PH meters
x. Grain moisture meters

iii. MARACHI CENTRAL WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MARACHI CENTRAL WARD					
No.	**RISK/HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Flash floods	• Crop destruction/ damages • Displacement of families • Water logging • Spread of water borne diseases • Poor crop harvest • Water pollution • Soil degradation • Food insecurity • Poor hygiene • Loss of income	• Can lead to prolonged drought in the next season which causes famine in the community.	• Poverty of household levels increases • Malnutrition among children below the age of 5 years • Anti-social behaviour • Poor living standards among families	• Planting of trees to prevent soil degradation •

2.	Prolonged dry spell	• Crop destruction • Food insecurity • Poor harvest • Fire out breaks • Loss of income • Loss of livestock • Increased heatwave • Malnutrition • Loss of lives • Increased rate of school dropout • Water scarcity • Family breakup	• Anticipated to keep recurring • Food insecurity • High inflation rate • •	• Increased poverty level • High inflation rate • Malnutrition among children • Increased criminal activities • Loss of human lives and anmals • High school dropout rates • Increase of Early teenage pregnancies • Increased rate of family breakups • increased rate of diseases and health conditions	• planting drought tolerant crops eg cassavas • create awareness on tree planting • Reclamation of wetlands eg planting of papyrus reeds • Maintenance of riparian land • Adoption of irrigation • Water harvesting tanks and reservoirs • Employment of more extension officers to train farmers on good agricultural practices • Sensitization and awareness creation on new climate trends by the meteorological department • Establishment of conservation of animal and human food for future use • Cereal bank establishment.

3.	Lighting and thunderstorm	• Death of human and animals • Property damage eg schools and homes • Loss of electricity supply	• Likely to keep on recuuring especially during the rainy seasons • Increased lighting on the lightning orbit	• Increased property damage • Loss of human and animal lives • Loss of income by business people due to lack of electricity	• Installation of lighting arrestors in schools, markets places, town centres and churches. • Creation of awareness and community sensitization. • Adoption of solar technologies.
4.	Strong winds	• Loss of lives • Property damage • Crop damage • Loss of income • Food scarcity • Logging- damage of trees • Family displacement • homelessness	• Likely to keep on recurring • Increased destruction of property • Increased family displacement	• Increased poor livelihoods • Increased food scarcity	• Planting of indigenous tree species • Installation of wind socks in public places • Installation of meteorological equipment • Resettlement of affected families to areas that are less prone • Practice of good agronomic practices to avoid crop damage eg use of greenhouses

5.	Soil degradation/ exhaustion	• Loss of soil fertility • Poor harvest • Poor income • Poor nutrition	• Likely to keep on recurring due to continuous use of inorganic farm inputs	• Increased poor harvest • Increased poor nutrition • Low food quality	• Acquisition of soil testing equipment • Use of organic farm inputs eg organic fertilizer, seeds • Establishment of seedbanks in the community • Employment of more extension officers.
6.	hailstones	• Crop damage • Property damage	• It is unpredictable • Likely to keep on recurring during the rainy season	• Low crop production	• Planting of cover crops • Planting more trees • Construction of houses with stronger gauge iron sheet roof • Construction of animal sheds which are weather proof. • Use of traditional gadgets • Employment of more extension officers

Marachi Central Ward

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Catchment protection on the upstream side of Lerekwe stream
iii. Establishment of Apiary as alternative source of livelihood
iv. Installation of lightening arrestors in all some public institutions.
v. Construction of storm water drainage systems and stage improvement at along Murumba-Simuli and Busiada-Obiero-Ochicho roads.
vi. Promotion of cottage industry (Marachi sofas, bamboo products etc)
vii. Rehabilitation of Neela irrigation scheme.
viii. Eradication of invasive weeds- dodder and striga weeds.
ix. Portable PH meters
x. Grain moisture meters

iv. **MARACHI NORTH WARD**

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MARACHI NORTH WARD					
No.	**RISK/HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Prolonged dry spell	• Poor harvest • Water shortage • Increase in insecurity(theft) • Increased causes of man-caused fire • Lack of feeds and water for livestock	• Likely to reoccur severely	• food insecurity (hunger) • Diseases as a result of dirty water • Inaccessibility to clean and safe water	• Irrigation • Planting drought tolerant crops • Planting early maturing crops • Afforestation and re-afforestation • Roof catchment water harvesting for domestic use • Conservation of fodder feeds • Replacement of eucalyptus with indigenous trees •
2.	Flash floods	• Destruction of crops and •	• Likely to reoccur severely •	• Internally displaced persons • Pests and diseases • Food insecurity • Malnutrition	• Reclamation of destroyed ecosystems • Planting of bamboos and indigenous tress along the river banks, Akanyo, Khabudinga.

					• Construction of cut-off drains • Widening of the streams • Construction of storm water drainage
3.	Strong winds	• destruction of homes, crops and property • destruction of roads/ communication network	• It is likely to reoccur •	• Displacement of persons • Food insecurity • Leads to diseases	• Afforestation and re-afforestation • Planting of cover crops
4.	Hailstones and thunderstorm	• Destruction of homes, livestock and crops • Loss of lives	• It is likely to reoccur •	• Displacement f persons • Food shortage • Diseases	• Installation of lightning arrestors in prone areas and public institutions • Planting of tolerant crops • Establishment of early warning systems • Establishment of greenhouse planting • Construction of livestock structures
5.	Air pollution	• Increase in airborne diseases • Extreme heat conditions	• It is likely to re-occur	• Results to diseases	• Planting of trees • Use of renewable energy • Use of electric cars/ machines

Marachi North Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Construction of flood control structures at Siunga aquapark- dyking and cut off drains
iii. Installation of Solarised cold room for Siunga Aquarpark
iv. Installation of lighting arrestors at Tingolo primary school.
v. Installation of lightning arrestors at Butula boys' high school.
vi. Installation of biodigester at Butula boys' high school.
vii. Eradication of invasive weeds- dodder and striga weeds.
viii. Portable PH meters
ix. Grain moisture meters

v. ELUGULU WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR ELUGULU WARD					
No.	**RISK/HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Prolonged dry spell	• Causes late planting • Shortage of food • Shortage of animal feeds • Poor harvest	• It occurs periodically	• Food insecurity • Malnutrition • High cost of food	• Planting of trees to prevent soil degradation

				• Increased crime e.g theft	
2.	Flash floods	• Destruction of crops and property • Displacement of people • Soil erosion e.g. (gulley erosion) • Causes diseases • Causes death of human beings and animals • Destruction of roads and road networks	• Occurs periodically	• Food insecurity • High cost of food • Malnutrition • Family conflicts • Poor performance especially to school going children • Problem in movement from one place to another	• Construction of dams • Construction of terraces • Planting of cover crops • Construction of health facilities and employ more health workers • Provide tanks for water harvesting • Provide mosquito nets
3.	Strong winds	• Destruction of crops, structures and trees • Causes soil erosion	• It occurs periodically	• Food insecurity • Blackout • Malnutrition	• Re-afforestation • Planting of indigenous trees • Planting cover crops

		• Disconnection of electricity lines and poles		• Reduced services due to lack of power	• Installation of solar panels • Installation of green houses
4.	Hailstones	• Destruction of crops • Causes death of crops and birds • Causes soil erosion • Destruction of structures • Causes diseases e.g. pneumonia	• It occurs periodically	• Poverty • Loss of yield • Soil degradation	• Employ traditional practices • Planting cover crops • Improve health centres • Empower community health workers • Establish soil conservation measures-installatin of organic input banks
5.	Lightning and thunderstorm	• Causes death of animals and human beings • Destroy plants • Destroy structures • Disconnects electricity	• It occurs periodically	• Fear • Reduced services due to lack of power • Poverty	• Installation of lightning arrestors • Creating awareness e.g. not walking barefooted in water, standing under trees when it is raining.

Elugulu Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Spring protection of Lugulu spring at water reticulation
iii. Drilling and equiping a borehole and supply of water at Esibembe Girls Secondary
iv. Nature based enterprises- bee keeping
v. Construction of Lugose and Rerekwe streams box culverts
vi. Drilling and supply of water at Esibembe Girls Secondary, Namusala and Bulemia.
vii. Eradication of invasive weeds- dodder and striga weeds.
viii. Solarization , construction of water tank and water point at Sikura primary school
ix. Solarization , construction of water tank and water point at Bulwani prmary school
x. Solarization of Namusala dam.
xi. Portable PH meters
xii. Grain moisture meter

vi. MARACHI EAST WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MARACHI EAST WARD					
No.	**RISK/HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Lightning and thunderstorm	• Loss of lives and property	• likely to reoccur	• displacement of families	• Installation of lightning arrestors •

		•		• loss of lives and property	
2.	Strong winds	• Crop destruction	• Likely to reoccur	• De-afforestation • Lodging of trees • Loss of lives and property	• Afforestation/ reafforestation • Plant cover crops
3.	Hailstones	• Loss of lives and property • Stunted growth to crops • Poor harvest •	• It is likely to reoccur •	• Food insecurity • Malnutrition	• Use of traditional experts • Introduction of traditional gadgets • Introduction of early maturing crops • Construction of greenhouses
4.	Floods/ flash floods	• Siltation • Soil erosion • Pests and diseases • Destruction of infrastructure • Destruction of crops	• Re-occurrence •	• Displacement • Pests and diseases • Drying up of water sources • Food insecurity	• Construction of dams • Construction of dykes • Practice good agronomic methods • Terraces construction • Drainage canals •
5.	Drought/ prolonged dry spell	• Poor harvest • Malnutrition	• It is likely to re-occur	• Food insecurity • Malnutrition	• Introduction of irrigation • Afforestation/ re-afforestation (indigenous trees)

		• Loss of lives and property		• Causes school dropping out	• Drought tolerant crops • Earlt maturing crops • Rehabilitation of existing dams • Drilling of boreholes • Soil and water conservation measures • Rain water harvesting • Construction of food store (human and livestock) • Livestock structures
6.	Unpredictable rainfall patterns	• Poor harvest	• Likely to reoccur	• Food insecurity	• Introduction of irrigation

Marachi East Ward Climate Resilience Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Water provision at the Buduma Dairy Park in Bamala B
iii. Fodder establishment and conservation at Buduma Dairy Park in Bamala B
iv. Biogas demo centre at the dairy park at Buduma Dairy Park in Bamala B
v. Installation of lightening arrestors to prone areas eg Buhuyi primary and secondary school and Bumala B health centre
vi. Desiltattion and catchment protection of Buduma dam (Bumala B) for irrigation

vii. Spring protection/afforestation Growing bamboos.

viii. Eradication of invasive weeds- dodder and striga weeds.

ix. Portable PH meters

x. Grain moisture meters

3. **MATAYOS SUB COUNTY**

i. BUKHAYO WEST WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BUKHAYO WEST WARD					
NO	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1.	Solid/liquid waste	• Outbreak of diseases • Pollution of the environment	• Building of latrines	• Unconducive environment • Death • Reduction of productive working space • Reduction in labour	• Regular collection of waste • Establishment of dumping sites • Installation of incinerators • Establishment/improvement of drainage/sewerage systems
2.	Planting of eucalyptus trees in water catchment areas	• Low water table • Soil infertility and acidity	• Unproductive land • Food insecurity • Plant indigenous trees	• Low crop yields • Raised hard pan	• Encourage planting of bamboo, indigenous fruit trees

3.	Deforestation	• Soil erosion • Poor soil fertility • Poor soil pH • Flooding	• Afforestation	• Reduced rainfall • Increased temperatures • Lack of wind breakers	• Afforestation • Discouragement of logging • Encourage use of biogas for cooking
4.	Flooding	• Soil erosion • Poor yields	• Building of gabions • Afforestation	• Diseases like cholera • Migration • Death	• Construction of dams • Construction of dykes • Afforestation • Improvement of drainage systems

Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Establishment of Nature based enterprises-Bee keeping, aqua park.
iii. Solarization of Mayenje and mabale community borehole
iv. Equiping and solarizing of Bugengi dip borehole
v. Rehabilitation of Mayenje Drainage Scheme
vi. Eradication of invasive weeds- dodder and striga weeds.
vii. Portable PH meters
viii. Grain moisture meters

ii. BUSIBWABO WARD

PARTICIPATORY LIMATE RISK ASSESSMENT FOR BUSIBWABO WARD					
NO	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1.	Stone /Murram mining	• Increased breeding sites for mosquitoes • Drowning of animals and people	• Risk of animal and human lives	• Health hazard • Reduced agricultural land • Security threat	• Construction of water pans and/ fish ponds in those areas • Land reclamation e.g by afforestation

2.	Deforestation	• Shortage of rains • Changing rain patterns	• Desertification • Reduced food production	• Increased poverty	• Planting of environment friendly trees • Establish tree nurseries • Training the general pollution on effects of deforestation
3.	Industrial pollution	• Air pollution • Water pollution	• Health hazards to human, animal and aquatic life	• Loss of life	• Compelling factories to comply with applicable environmental laws
4.	Thunderstorms and lightning	• Loss of life • Loss of property	• Destruction of property • Destruction of life	• Reduced local/foreign investors	• Installation of lightning arrestors

Busibwabo Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Establishment of Nature based enterprises-Bee keeping.
iii. Establishment of Poultry farming.
iv. Solarization and pipeline extension of Nasewa and Nasira water projects.
v. Establishment of Fish ponds.
vi. Eradication of invasive weeds- dodder and striga weeds.
vii. Portable PH meters
viii. Grain moisture meters

iii. MATAYOS SOUTH WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MATAYOS SOUTH WARD					
NO	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1.	Deforestation of Nang'oma, Nambere, Murende and Muyafwa Hills	• Gulley erosion • Storms • Reduced forest cover • Destruction of the biodiversity of the natural ecosystem	• Prolonged dry spell • Human-animal conflict • Storm accidents	• Food insecurity • Destruction of water sources • Loss of lives and property • Extinction of wild life	• Tree planting in the affected areas
2	Quarring (Stone/Gravel harvesting at Nang'oma, Nambere, Mutafwa and Murende Hills)	• Water clogging • Deep gulleys • Accelerated surface runoff	• Breeding sites for mosquitoes that causes malaria • Increased accidents leading to loss of lives • Landslide	• Land degradation • High mobility and mortality rate • Loss of productive land • Loss of water sources	• Rehabilitate the sites

3	Soil acidity	• Low yield • Contaminated animal feeds and crop products	• Malnutrition, hunger, and increased mortality rate	• Unsafe and unhealthy food (food poisoning)	• Application of lime • Use of Organic manure • Use of safe storage method • Conservation agriculture method
4	Pollution of water sources and encroachment (Masinde spring Lung'a)	• Unsafe water for human use • Scarcity of resources • Human conflict • Waterborne diseases	• Resource based conflicts	• Water scarcity • Loss of water sources • Protracted conflicts • Waterborne disease	• Protection of water sources • Land reclamation
5	Flooding along River Sio	• Destruction of crops • Displacement of people • Soil erosion • Destruction of property and infrastructure	• Reduced farmland • Destruction of riverbanks • Increased soil erosion • Migration of the population	• Low food production • High level of poverty • Poor infrastructure	• Construction of dams and dykes • Installation of detection sensors • Planting of indigenous trees e.g sassy trees
6	Sand harvesting	• Death/loss of lives • Landslides • Destruction of road networks by heavy sand trucks	• Poor infrastructure • Encroachment into other people's lands hence human conflicts	• Death • Change of river course • landslides	• River bank protection i.e planting of bamboo • Enforcement of law on sand harvesting

			• Death		
7.	Soil erosion	• Destruction of farmland • Pollution of water sources i.e springs • Silting of water points • Clogging of culverts, brides and drainage channels	• Increased soil erosion	• Poor soil fertility • Poor transport and communication networks • Prevalence of waterborne diseases	• Afforestation • Soil conservation e.g construction of gabbions, stone pitching, surface runoff

Matayos South Ward

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Establishment of Nature based enterprises-Bee keeping.
iii. Establishment of Poultry farming.
iv. Solar hatcheries
v. Rehabilitation of Fish ponds and establishment of new ones.
vi. Protection of River Sio banks by planting of bamboos
vii. Eradication of invasive weeds- dodder and striga weeds.
viii. Portable PH meters
ix. Grain moisture meters

iv. MAYENJE WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MAYENJE WARD					
NO	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1.	Deforestation	• Reduced food production • Soil erosion • Greenhouse gas	• Afforestation • Reforestation	• Increase in greenhouse gases • Soil erosion	• Recycling papers • Use of less paper • Use of modern technologies e.g use of soft copies
2.	Quarrying	• Reduction of Agricultural land	• Controlled quarrying • Drowning of animals • Pollution • Breeding place for mosquitoes	• Drowning • Pollution • Breeding place for mosquitoes	• Refilling of pits • Allocate specific sites for quarrying
3.	Prolonged dryspell	• Food shortage • Inflation of food prices	• Increase in crime • Premature harvests	• Planting drought resistant crops	• Construction of green houses • Fish farming • Construct a market
4.	Brick making	• Deforestation	• Alternative production method	• Soil erosion • Unfilled pits	• Animal husbandry • Afforestation

5.	Interference with water catchment areas	•	• Rehabilitation of springs	• Ecosystem interference	• Protection of springs by planting trees • Install solar power boreholes

Mayenje Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Establishment of Nature based enterprises-Bee keeping.
iii. Establishment of Poultry farming.
iv. Solar hatcheries
v. Rehabilitation of Fish ponds and establishment of new ones.
vi. Protection of River Sio banks by planting of bamboos
vii. Eradication of invasive weeds- dodder and striga weeds.
viii. Portable PH meters
ix. Grain moisture meters

v. BURUMBA WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BURUMBA WARD					
NO	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1.	Poor Waste Management Practises	• Health risks • Emission of the Greenhouse gases • Environmental pollution	• Separation of the organic wastes • Recycling of wastes • Re use and Reduce principle	• Environmental pollution • Increased Greenhouse gases	• Encourage wastes recycling • Sanitization of proper waste management • Produce farm manure from organic wastes
1	Surface Runoff	• Destruction of property • Water sources contamination • Destruction of road networks • Loss of lives	• Building of drain works • Storm water harvesting • Building roads with bitumen and good drainage systems	• Increased poverty levels • Soil erosions • Poor transport network	• Improving on the drainage system through storm pitching
2	Uncontrolled DVT	• Poor sanitation • Building on the riparian land • Deforestation	• Reduction of GI • Conserving the ecosystem	• Extinction of ecosystem • Loss of lives /deaths	• Expansion of the sewerage networks • Proper law enforcement • Protect the riparian lands

			• Encourage use of steel in construction i.e roofing	• Reduction of carbon circulation	• Planting of the indigenous trees • Implementation of the 10% tree cover

Burumba Ward

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Enhancement of Solid waste management.
iii. Establishment of kitchen garden demonstration at ATC and public institutions.
iv. Operationalization of biodigesters-Biogas demonstration at ATC
v. Establishment of solar driers at Busia ATC
vi. Upscaling of solar powered micro irrigation scheme at Busia ATC
vii. Establishment of backyard fish pond at Busia ATC
viii. Creation of green spaces and establishment of green gardens within Busia Municipality.
ix. Solarization of Burumba hospital
x. Solarization of Busia County Referral Hospital.
xi. Development of Incinerator at Busia County Referral Hospital.
xii. Eradication of invasive weeds- dodder and striga weeds.
xiii. Portable PH meters
xiv. Grain moisture meters

3. NAMBALE SUBCOUNTY

i. BUKHAYO CENTRAL

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BUKHAYO CENTRAL WARD					
No.	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1.	Floods • Musoma • Lelekite • Malanga • esideni	• Total destruction of foodstuff, human life and livestock • Destruction of road infrastructure • Causes soil erosion	More occurrence. Increase in intensity and frequency is expected in future	• Food insecurity • Water borne diseases will increase • Displacement of people	• Law enforcement to protect the environment • Construction of check dams • Construction of water pans • Building of gabions to prevent soil erosion • Planting of bamboo trees • Afforestation
2.	Prolonged Dry Spell • Affects the entire ward	• Lack of water for both human and livestock • Lack of food for both human and livestock • Affects food production • Leads to severe levels of poverty	Increase in intensity and frequency is expected in future	• Food insecurity	• Have in place functional irrigation infrastructure • Encourage rain water harvesting • Implement soil water conservation measures e.g. mulching, growing cover crops • Going for drought tolerant crops/fast maturing crops like sweet potatoes.

					• Water of water reservoir • Awareness creation on interpretation of climate information to increase understanding, access and utilization of seasonal, monthly and weekly forecasts
3.	Thunder and Lightning • Affecting the entire ward	• Destruction of both human and livestock • Loss of lives, property and livelihoods	Increase in intensity and frequency is expected in future	• Loss of lives, property and livelihoods • Trauma	• Subsidized lightning arrestors installation • Awareness creation by KMD on what lightning is, its cause as well as source and how to stay safe from lightning • Demystifying myths surrounding lightning strikes in communities • Training end users on interpretation of climate information
4.	Hailstorm • More frequent in April, May and September,	• Destruction of crops and livestock	Increase in intensity and frequency is expected in future	• Low food yield • Loss of lives and property	• Early warning systems development: use of climate information especially seasonal forecasts and related updates • Awareness creation on how to stay safe from strong wing by KMD

	October and November across the ward				• Growing tuber crops like sweat potatoes and cassava
5.	Strong winds • Affecting the entire ward	• break twigs and branches off trees, • blow roofs off houses • flatten crops/ damage agricultural crops • uproot trees causing them to fall over. If trees fall onto buildings or roads, they may cause damage to property, injury to people and loss of life. • Cause soil erosion (wind erosion] • carry dust from one area to another	Increase in intensity and frequency is expected in future	• break twigs and branches off trees, • blow roofs off houses • flatten crops/ damage agricultural crops • uproot trees causing them to fall over. If trees fall onto buildings or roads, they may cause damage to property, injury to people and loss of life. • Cause soil erosion • Loss of lives and property	• Plant trees to act as wind breakers • Encourage farmers to practice agroforestry • Early warning systems enhancement: use of climate information especially seasonal forecasts and related updates • Awareness creation on how to stay safe from strong wing by KMD • Proper anchorage of roofing elements is key. • Buildings should have stable foundations.

		• School pupils have been injured when roofs get blown off			
6.	Sand harvesting and brick making	• Environment destruction •	More occurrence	• Environment degradation • Quarries develop • Mosquito breeding grounds	• Afforestation and reafforestation • Awareness creation • Use of alternative building materials other than bricks
7.	Deforestation	• Interfere with rain patterns • Interfere with the rain amounts •	More rampant deforestation	• Shortage of rain water • Desertification	• Afforestation and reafforestation programs • Awareness creation
8.	Planting of Blue gum Trees	• Lower water tables		• Low water levels	• Avoid planting • Plant other environmentally friendly trees

Bukhayo Central Ward Climate Resilience Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Installation of lightning arrestors in most prone areas like Esidende East and Malanga.
iii. Development and reticulation of Mabunge primary borehole
iv. Solarization of Sidende dispensary
v. Eradication of invasive weeds- dodder and striga weeds.
vi. Portable PH meters
vii. Grain moisture meters

ii. BUKHAYO EAST

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BUKHAYO EAST WARD					
NO	**RISK / HAZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1	Floods / Heavy Rains	• Death • Water borne diseases • Inaccessibility to other areas • Soil erosion • Crop damage and failure	Increase of the flood intensity and frequency	• Displacement of people • Low crop yield • Poor transport network	• Afforestation • Protection of river banks by planting indigenous trees • Construction of gabions, terraces

					• Planting of cover crops and agroforestry • Discouragement of human activities in riparian land • Use of climate information especially seasonal forecasts
2	Hailstones	• Cop damage / low crop yield • Death to livestock	Increase of the Hail stones intensity and frequency	• Low yield • More livestock deaths	• Intercropping • Insurance cover • Keeping livestock in sheds • Use of Green houses and screen nets • Use of weather and climate information such as seasonal, monthly and week forecasts • Traditional interventions e.g., throwing empty soda bottles into the rain
3	Lightning and thunderstorms	• Death • Loss of lives and property • Trauma of lightning	Increase frequency and intensity	• Increase loss of life and property • Increase trauma	• Installation of lightning arrestors • Psychological support to the traumatized

					• Awareness creation by county experts in the field like meteorologists and disaster management personnel
4	Prolonged Dry Spell	• Poor crop yield • Food shortage • Social illness e.g. theft • High mortality rate • Low fertility	Increase frequency and intensity	• Famine and drought • High mortality rate • Increased social illness	• Afforestation • Shifting to irrigation • Rain harvesting • Preservation of water catchment areas and sources • Planting early maturing crops
5	Strong winds	• break twigs and branches off trees, • blow roofs off houses • flatten crops/ damage agricultural crops • uproot trees causing them to fall over. If trees fall onto buildings or roads, they may cause damage to property, injury to people and loss of life.	Increased frequency and intensity	• Breaking tree branches, twigs and damage leaves off trees, • Blowing roofs off houses • Flattening crops/ damage agricultural crops • Uproot trees causing them to fall over. If such trees fall onto buildings or roads, they are likely to cause damage to property,	• Plant trees to act as wind breakers especially to the East of farms and homes • Encourage farmers to practice agroforestry • Early warning systems enhancement: use of climate information especially seasonal forecasts and related updates

		• Cause soil erosion via wind erosion • Carry dust from one area to another • School pupils have been injured when roofs get blown off		injury to people and loss of life. • Wind erosion cause soil erosion. • Wind carry dust from one area to another • School pupils and residents are likely to get injured when roofs get blown off	• Awareness creation on how to stay safe from strong wing by KMD • Proper anchorage of roofing elements is key. • Buildings should have stable foundations.
6	Poor Solid Waste management	• Prevalence of vector diseases • Affecting soil PH • Affects soil living organism • Untidy environment	Increased severity and effects if there is no interventions	• Increased mortality rate • Low crop yield • Increased vector borne diseases	• Recycling of all nondegradable material • Increase dumpsites • Incineration
7	Air pollution (Use of Firewood for Cooking)	• Release of GHGs into the atmosphere especially $co_{2.}$ • Corrosion of iron • Tampers with rain pattern • Acid rain • Airborne diseases and death	Increase the effects if there is no intervention	• Increase diseases and deaths	• Use energy saving Jikos • Use of solar power • Use of biogas systems.

8	Quarry and Sand Harvesting	• Danger to human settlement • Breeding ground for vector diseases • Reduces land for agriculture and settlement • Encourages soil erosion and flooding • Loss of valuable trees and animal species	Increase the effect of no intervention	• Increase cases of death through drowning	• Encourage refilling of the quarry sites

Bukhayo East Ward Climate Resilience Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Reticulation and storage improvement of Ekisumo borehole
iii. Pipeline extension of Mungatsi TVET borehole to serve the institution as well as surrounding community.
iv. Installation of Energy saving Jikos/ Biogas in public institutions.
v. Solarization , reticulation and storage improvement of Elwanikha Girls secondary school borehole.
vi. Solarization of borehole and storage tanks at Mudembu dispensary
vii. Eradication of invasive weeds- dodder and striga weeds.
viii. Portable PH meters
ix. Grain moisture meters

iii. NAMBALE TOWNSHIP WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR NAMBALE TOWNSHIP WARD					
NO	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1	Prolonged Dry Spells	• Crop failure • Late planting • Low crop and animal production • Lack of pasture • Water contamination due low water tables	Prolonged dry spell expected to be more severe	• Shift in farming calendar • Shortened rain season • Low water table • Livelihoods become risky to undertake	• Afforestation and reafforestation • Diversification of farming activities • Practice functional irrigation • Water harvesting • Practice conservation agriculture • Planting drought resistance crops
2	Floods	• Stunted growth of plants • Water borne diseases • Displacement • Poor sanitation	Possibility of severe flooding	• Low / poor harvest • Poor health • Loss of lives • High cost of living	• Digging of drainage systems • Use of mosquito nets • Moving to high areas • Avoid digging along the river / riparian land • Roof water harvesting
3	Lightning	• Destruction of lives and property • Loss of lives	Increased lightning instances	• Increased loss of lives and property	• Installation of lightning arrestors • Awareness creation • Mapping out lightning prone areas

					• Planting of Nandi flame trees • Use of weather forecast
4	Heavy Rains	• Damage of property • Soil erosion • Land slides • Low crop production • Increase in malaria	Increased heavy rainfall	• Collapse of houses • Loss of lives • Unsightly galleys • Low production • Displacement	• Awareness creation • Planting cover crops and tress • Construction of gabions • Improving drainage systems • Practicing proper farming methods • Improve sanitation • Roof and land water harvesting
5	Hailstones	• Destruction of crops • Poor harvest • Low income • Scarcity of food • High cost of living	Increased occurrence of hailstones	• Poor harvest • High demand of crop produce • High cost of living	• Agroforestry • Planting tuber crops • Use of shed nets • Traditional interventions • Awareness creation • Training residents on interpretation and use of weather forecasts
6	Pollution (cooking using firewood, charcoal burning, rearing of many herds of local	• Water borne diseases • Odor in the environment • Low / acidic rainfall	Increased pollution as a result of population increase	• Unsightly garage • Loss of lives • Low production • Hard water	• Proper disposal methods • Avoid dumping into rivers • Awareness creation

	cattle (methane release) use of chemical weeding)	• Stroke, lung cancer, obstruction of chest • Death of aquatic life		• Emission of greenhouse gases	• Road unworthy vehicles should not be allowed to run • Rearing of fewer exotic breeds that have high milk yields • Recycling of waste • Use of clean energy sources • Encourage homes and school to set up biogas systems for cooking to reduce reliance on firewood
7	Pests and Diseases`	• Low crop production • Crop destruction • poor livestock health	Possibility of continuity	• high livestock mortality rate • low harvest	• Applying acaricides on animals • Spraying of crops with recommended pesticides • Creation of awareness • Practice zero grazing to curb diseases • Use of certified seeds • Training of farmers
8	Strong Winds	• Destruction of property	Continuity of strong winds	• Increase loss of property	• Planting of trees • Awareness creation

Nambale Township Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Construction of storm water drainage systems and stage improvement at Nambale Township.
iii. Riparian land conservation
iv. Promotion modern recycling technologies
v. Pipeline extension for Okatekok borehole
vi. Solarization of Nambale market borehole to serve market as well as proposed livestock market
vii. Solarization of Kajoro primary school borehole
viii. Rehabilitation of Siekunya drainage scheme at Siekunya
ix. Establishment of hydrants
x. Installation of lightning arrestor at Kisoko
xi. Solarization of the Nambale subcounty hospital
xii. Enhancement of water storage at Nambale Subcounty hospital.
xiii. Eradication of invasive weeds- dodder and striga weeds.
xiv. Portable PH meters
xv. Grain moisture meters

iv. BUKHAYO NORTH/ WALATSI WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR BUKHAYO NORTH/ WALATSI WARD					
NO	**RISK / HARZARD**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACT**	**ADAPTATION / MITIGATION PRACTICES**
1	Prolonged Dry Spell	• Causes wilting of crops thus affecting yield • Rivers, Shallow wells, springs and boreholes dry up • Fire outbreak (Bush fires) • Soil Erosion • Communicable diseases • Interfere with domestic activity	Expected increase in Prolonged Dry Spell	• Starvation and malnutrition • Death in human being, animal, insects and small living organism • Affects vegetation and environment thus causing air pollution • Air borne diseases will increase	• Practicing Agroforestry • Planting drought tolerant crops e.g. sorghum, millet, cassava, sweat potatoes, cow peas • Avoid plating high water consumption trees • Construction of water dams • Encourage water harvesting
2	Heavy Rains	• Flooding • Water borne diseases • Sevier soil erosion • Destruction of properties and livelihoods	Expected increase in Prolonged Heavy Rains	• Food insecurity • Poor transport and communication network • Destruction of property • Loss of life	• By practicing conservation agriculture • Afforestation • Dyke construction • Construction of sustainable drainage system

		• Destruction to critical facilities e.g. water lines, electricity supply			• Construction of water storage facilities • Tree planting • Unclogging of culverts/improvement of drainage system • Investing in early warning system (Both modern and traditional)
3	Thunder and Lightning	• Loss of life • Loss of property	Expected Increase of Thunder and Lightening	• Reduced human, animal and plant population	• Building of lightning arrestors • Sensitization and awareness creation of citizens on how to stay safe on lightning strikes
4	Unpredictable hail stones	• Causes death to animal and humans • Causes destruction on plants	Expected increase in hail stones	• Reduced production	• Construction of green houses and screen /shade nets • Planting tuber crops • Investing in early warning systems • Investing in traditional interventions.

Bukhayo North/ Walatsi Ward

i. Establishment of Tree nurseries and afforestation programs (including fruit trees)
ii. Installation of Lightning arrestors at Musokoto village
iii. Installation of Solar driers at Walatsti stream to support small holder irrigation farmers.
iv. Installation of energy saving jikos in public schools
v. Planting of bamboos in the water resources
vi. Eradication of invasive weeds- dodder and striga weeds.
vii. Portable PH meters
viii. Grain moisture meters

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR AMUKURA CENTRAL WARD					
No.	**RISK/HAZARDS**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICEES**
1	Hailstones (across the ward)	• Loss of property e.g. crops and animals • loose of life to both livestock and people • causes injuries to people, animals and crops • mudslides	• food insecurity • death • soil erosion	• increased hunger • decrease in population • affects weather pattern	• adopting crop insurance • life assurance
2	Human activities cultivating along river banks eg edoket kemong`kotilia kadai chakol kakoleit (prolonged dry spell)	• drying of water sources • soil erosion • water contamination • water scarcity	• drought • waterborne diseases • soil infertility	• food insecurities • poverty • death • water salinity	• Planting of indigenous trees • establishment and restoration of riparian buffers • Revise land use plans • adaptation of ground water management • desalinization

3	strong winds (entire ward)	• storms • loss of property • forced displacement • loss of life	• severe loss of property and life • floods • air pollution • air borne diseases • changes in rainfall pattern	• poverty • change in precipitation • extreme weather • pressures on mental health • death e.g. people and animals	• integration of climate change • planting of trees e.g. canopy trees
4	Pests and diseases (entire ward)	• loss of life(crops, livestock) • Disease outbreak e.g. malaria, typhoid	• Formation of ozone layer • famine • destruction of soil layer	• increased mortality rate • global warming • emission of green gases	• Reafforestation • avoid charcoal burning • improved farming practices
5	De-afforestation	• High level of CO2 • Drought • soil erosion	• Famine • Soil layer destruction.	• Increased mortality rate, global warming and emission of green gases.	• reafforestation • improved farming practices • Avoid charcoal burning and use.

Amukura Central Ward Climate Resilient Projects

i. Afforestation along the streams (restoration of riparian land) namely; Odoket Kemong, simbachai, Kasorian, Kaliwa, Obekai Obekai, Emwangat,Akites, Kakoleit Apokor, Akobwait Aparikoit,Apatit ,Kongurapus, Kongurapus and tree nursery establishment
ii. Pipeline extension and repair of boreholes
iii. Protection of all spring/wells within the ward
iv. Storm Water Management
v. Establishment of proper drainage system for heavily affected by runaway water.
vi. Trainings on agricultural practices, land use and support farmers on proper use of pesticides
vii. Construction of Kalachamong box culvert that was washed by floods
viii. Alternative sources of livelihood e.g bee keeping, value addition on cassava varieties
ix. Capacity building to create awareness on importance of conserving the environment and climate change matters in all the public schools and public barazas in the entire ward.
x. Soil conservation Measures programs
xi. Eradication of invasive weeds- dodder and striga weeds.
xii. Portable PH meters
xiii. Grain moisture meters

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR AMUKURA EAST WARD					
No.	**RISKS/HAZARDS**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION AND MITIGATION PRACTICES**
1	Murram Harvesting kidera kodedema kachilameri kwangamor	• causes death • diseases e.g. malaria,bilhazia • brings erosion • displacement leading to poverty • land degradation	• population reduction • lack of education • inadequate food production	• leads to land lesness • loss of fertility • leads to conflicts among family members	• backfilling • irrigation activity • afforestation • planting of food crops e.g. bananas
2	Dry spell E.g. change in weather patterns	• Leads to food shortage • forced ruralurban migration • domestic conflict • poor health	• malnutrition/diseases • separation/divorce • depression	• leads to diseases and sickness • leads to loss of life • low education standards	• plant drought resistant crops • irrigation practices • start low income • generate activities
3	Sand Harvesting e.g.agong kabosokipi	• child labour • truancy	• rampant school dropout	• Landlessness for agric activity	• backfilling • irrigation practices

	akobwait	• causes gulley erosion • alcoholism/drug abuse • floods • erosion	• Child abuse • Land destruction • Disputes • Destruction of residential areas • increased number of I.D.Ps • Shortage for land cultivation	• leads to low food production • broken marriages • leads to mental illness and deaths • leads to poor health and nutrition	• planting plants like bamboo
4	Deforestation cutting of tress across the ward	• soil erosion • Affects weather pattern • Loss of water • Decreased biodiversity • Habitat loss • Conflicts	• Drought/famine • Long distance in search of water • domestic conflicts	• leads to poor health • Insecurity • Leads to child abuse	• planting of more trees • avoid destruction of indigenous tresss • capacity building on nursery • establishment

ii. AMUKURA EAST WARD

Amukura East Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including bamboo and fruit trees)
ii. Roof catchment water harvesting in hospitals and selected public institutions
iii. Development, solarization and pipeline extension of Amukura-Kwangamor high yielding borehole.
iv. Soil conservation/ soil erosion control structures like the gabions and terraces on the slopes of Amukura Hills.
v. Solarization of Amukura health centre.
vi. Fodder establishment and conservation.
vii. Establishment of small stocks e.g. poultry and dairy goats
viii. Catchment protection of water resources.
ix. Eradication of invasive weeds- dodder and striga weeds.
x. Portable PH meters
xi. Grain moisture meters

AMUKURA WEST

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR AMUKURA WEST WARD					
No.	**RISKS/HAZARDS**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICE**
1	Sand harvesting and mining in Odioi,akoret,aburi, Machakusi,okwata	• Environmental degradation • School dropouts • Destruction of road infrusctuture • loss of lives • food shortage • alcoholism • Reduced life expectancy	• gulleys	• Soil erosion • Loss of soil fertility • Poor housing • Illiteracy • Increased mortality rates • poverty • criminal activities	• Afforestation • Legislation on sustainable use of natural resources • construction of gabions in affected areas • public awareness ad sensitization • established and funded climate change Committee
2	Deforestation in aderema hills,akatagoret,Odioi,osuret	• Loss of forest cover at the hilltops • Reduction in the water table • draught	• Global warming	• drought • extreme temperature • sickness • death	• Afforestation • Public awareness/sensitization • implementation on legal farm • conservation of wildlife system

		• loss of natural streams, wells and springs		• hunger • wildlife human conflict	
3	Brick making and baking in akatagoret,Parater.Machakus, Lukolis	• Land degradation • Promotes deforestation • Increased temperature • School dropouts • Loss of lives • Alcoholism and drug abuse	• famine	• loss of land • increased food insecurity • Loss of lives • Reduced quality of life • Family conflict	• public participation and sensation • Provision of employment opportunities • legislation on brick making • establishment of community empowerment centres
4	Flooding in Paratere, Akapijan	• Outbreak of malaria • death • Premature delivery • poverty • loss of food crops, livestock • destruction of infrastructure		• loss of lives • Loss of households income • Hunger • Displacement • High mobility	• Support CHW by providing adequate equipment. • Relief/subsidized foods/farm input • provision of houses and shelter for the displaced • Public participating and awareness • Provision of long-lasting nest

				• Outbreak of water borne diseases	
5	Quarrying in Aderema hills,Akatagoroit Osurest,lukolis	• Loss of lives • Family conflicts • illiteracy • landslides • road distruction • wildlife human conflict	•	• soil erosion • loss of land • wildlife/human conflict • death • family conflict	• afforestation in affected areas • public participation • legal frammic in place • creation of job opportunities

Amukura West Ward Climate Resilient Projects

i. Construction of gabions and planting of indigenous and bamboo trees in the gulleys at Alikito/Odioi, Nyalakot, Aburi and Akatagoroit.
ii. Construction of a bridge connecting Odioi and Osuret Sublocation at Alikito.
iii. Afforestation of Odioi, Osuret, Aburi, and Aderema hills.
iv. Construction of dykes along river Komiriai at Akiriamas, Okook, Parater areas.
v. Scaling up collection sump of water at Odioi/Osia springs and erection of high tanks at the foot of Odioi hills and water pipeline extension to Akoreet Primary School, Fr Okodoi Secondary School, Lukolis Market, Aburi, Osuret, Okook market and Machakusi.
vi. Establishment of water reservoir at Amoni springs “Aderema” and solar pumping of Morukewasu and Aderema Village.

vii. Construction of storm water management facilities of Lukolis, Akapiyan, Parater, Totokakile, Okook, Osuret and Akatagoroit village.
viii. Protection of riparian ecosystems.
ix. Improvement of roads network to low volume seal and carriage in Lukolis
x. Establishment of indigenous tree nurseries at Alikito and Aburi valley site to provide alternative employment opportunities.
xi. Enactment of legislation to guide exploitations of the natural resources including sand harvesting, brick making and stone mining in all affected areas of the ward.
xii. Soil conservation Measures programs
xiii. Eradication of invasive weeds- dodder and striga weeds.
xiv. Portable PH meters
xv. Grain moisture meters

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR CHAKOL NORTH WARD					
No.	**RISK**	**EFFECTS**	**TRENDS**	**IMPACTS**	**ADAPTATION/MITIGATION**
1	Prolonged dry spell	• lack of water • shortage of food • loose of livestock • outbreak of diseases (water borne)	• Desert	• Death of livestock • loose of life. • income reduction. • maturation in children	• tree planting • planting of short season crops eg beans • planting of drought resistance crops.
2	Unsustainable sand harvesting. Aubrie, Apegei, Okiporo, Akitesi, Aciit, Akisim, Abai, Acurut	• loose of life • diseases e.g. malaria • reduce farming land • loose of income • soil erosion • distraction of water sources	• landslide	• Death • Poverty • malnutrition • reduced soil fertility • water born diseases	• planting of bamboo tree • planting of cover crops • planting of local trees • building gabions • law enforcement on sand harvesting • empowering community • sensitization and training
3	Floods Goria, Acurut, Aburi, Ochileta, Osipat Apegei	• displacement • Death • Outbreak of diseases • crop damage	• No settlement	• Poverty • loose of life • school dropouts	• planting of bamboo • protect river banks and water sources • avoid flooded areas

		• Distraction of infrastructure • lack of income		• lack of transportation	• Drilling of water • constriction of health facilities
4	Prevalence of Pests and diseases e.g. –Goria, Atem, Japel, Karisa	• loose of livestock. • crop damage • death	• population decrease	• poverty • food shortage • low income • low population • school dropouts	• vaccination • building of cattle dips • training • sensations • construction of health facilities • construction of a research centre
5	Soil erosion Osipata, aburi, Akilesit Omoloi, Okiporo, Osasame, goria,akitesi Ojapel, abai, aten	• distraction of infrastructure • soil infertility • crop distraction • gullies	• gallies	• school dropouts • hunger • shortage of food • diseases	• afforestation • plant cover crops • building of gabions • construction of drainage in roads • training

Chakol North Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees)
ii. Roof top water harvesting for Morukarisa Dispensary and enhancement of water storage for Morukarisa dispensary
iii. Pipeline extension for Ngelechom dispensary

iv. Soil conservation measures and bamboo planting at Akatagroit

v. Eradication of invasive weeds- dodder and striga weeds.

vi. Portable PH meters

vii. Grain moisture meters

v. CHAKOL SOUTH WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR CHAKOL SOUTH WARD					
No.	**RISKS/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATON/MITIGATION PRACTICS**
1	Floods In areas of Asiriam,Okiludin,Obucuum, Amase,Kaujo,Ongaroi,Pasama, Omiriai,Otimong,Adukumut,Okame stream,Osia river,Angololo,Emasa river and kawanga stream	• Displacement • Diseases outbreak • Hunger/food insecurities • poverty • soil erosion • River siltation • school dropouts	•	• Deaths • High level of poverty • Loss of households income • Increased school dropouts	• plant bamboo and natural trees along river/streams and flooding areas • No cultivation along river /stream banks • provide civic education to the community members on how to conserve environment • Discourage eucalypti plantation along river /streams banks but plant them in flooding areas. • Encourage cover crops to reduce soil erosion

2	Prolonged Dryspell	• Hunger/food insecurities • Malnutrition • Skin diseases • Poverty • inadequate pastures	• Social conflicts	• Death of animals • food insecurities • school dropouts • insecurity issues • low water table • reduced household income	• afforestation • drought resistant crops • confirmed civic education • deepen shallow water wells • encourage good practices like mulching • protect water grounds
3	Air Pollution Oleptio sugar factory & Busia sugar factory.	• Environmental pollution • Respiratory diseases • Iron sheets corrosion. • Water pollution • Aquatic deaths	• Reduced crop production and reduced pollination in crops	• Hunger • Disease outbreak • Deaths • Loss of household income.	• Enhance afforestation • enactment of environmental/climate control policies • community sensitization • policies control factories environmental pollution.

		• Reduced sunlight.			
4	Deforestation	• Change in weather pattern. • drought • Air pollution • desertification and soil erosion in Angololo,Okame, Chakol, Kawaga and Amaase Rivers. • Human-wildlife conflict. • low water table across the ward.	• Release of carbon iv oxide and methane and other green house gases.	• soil erosion • reduction of indigenous trees. • increased flooding. • increased green house gases. • loss of household income. • drought and hunger. • malnutrition.	• Afforestation and reafforestation. • good agronomy practices. • Sensitization of the communities. • enactment of policies.
5	Poor solid waste management.	• human and animal diseases • flooding.	• Poor sanitation and	• Loss of household income.	• Reuse plastics • creation of dumping sites in all market and shopping centres & homesteads.

		• blocking of drainage systems & water ways. • breeding areas for pests and insects. • Reduced soil aeration e.g Adungosi and kemodo. • water pollution.	disease outbreak.	• reduced agricultural production. • death • outbreak of animal and human diseases.	• timely/ regular garbage collection. • community sensitization. • enact policies to control plastic pollution.
6	Poor agronomy practices	• river siltation • soil erosion • soil infertility • acidity of rivers • death of aquatic animals • reduced crop production.	• Food insecurity and high poverty levels.	• food insecurity & poverty and GVB. • Loss of household income. • malnutrition • death in aquatic, animals and	• Empowerment of agriculture and livestock technical personnel. • enactment of policies. • community sensitization of GAPs • reduce use of chemical fertilizers. • adoption of organic farming. • facilitate extension officers.

				human beings.	

Chakol South Ward Proposed Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees)
ii. Installation Solar driers for the rice at Asinge rice mill
i. Solarisation of Okerebwa fish hatchery
ii. Solarization of Asiriam poultry park incubators
iii. Rehabilitation and development of Olepito borehole
iv. Construction of climate smart box culvert on Asiriam to Alupe
v. Construction of storm water drainage systems and stage improvement at Asinge- Obuchune
vi. Ochude and Amongra Dispensary-alternative source of water for development-
vii. Roof top catchment water harvesting at Amongura Secondary school.
viii. Energy saving jikos in public institutions
ix. Eradication of invasive weeds- dodder and striga weeds.
x. Portable PH meters
xi. Grain moisture meters

vi. ANGOROM WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR ANGOROM WARD					
`	**RISK/HAZARDS**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1	Water borne diseases e.g. Typhoid	• Frequent sickness	• increased continues diseases	• Death and poverty	• Provision of clean and safe water i.e. piped water, ward water. • provision of water treatment measures. • Sensitize the community members on proper water usage.
2	Drying up of water sources i.e. spring shallow wells and rivers.	• Limited water supply	• scarcity of water supply	• conflicts • Dehydration	• Afforestation ie bamboo • Proper protection of water points eg springs
3	Floods	• Displacement • Loss of poverty	• Poverty	• Death	• contraction of proper drainage system eg culverts
4	Soil erosion along the roads and river banks	• Destruction of repairing land	• floods	• Decrease of productivity	• Sensitization of the community on proper farming practices on riparian

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR ANGOROM WARD					
5	Air pollution	• Outbreak(increased)diseases		• Death	• planting of tress. • Constructing of the recycling facilities
6	Prolonged dryspell	• Decrease in production of farm output	• Multination	• Death	• Tree planting • Community Sensitization on post control
7	Increased pest invasion				
9	Malnutrition	• Diseases	• Death	• Death	• Sensitization on proper feeding methods

Angorom Ward Climate Resilient Projects

i. Harnessing, storage and supply of Aget water spring and piping water from existing water sources to homes.
ii. Protection of all water springs in entire ward
iii. Restoration of riparian land along Okame and Alupe River
iv. Repair and maintenance of all roads in the entire ward with proper drainage system.
v. Water Management facility at Alupe dumpsite
vi. Construction of Opakasi and Makelele bridge
vii. Construction of drainage system and installation of culvert along river Amoni

7. TESO NORTH SUB COUNTY

i. ANGURAI SOUTH WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR ANGURAI SOUTH WARD					
	RISKS/HAZARDS	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICSE**
1.	Prolonged dry spell season across the ward	• crop failure • disease • water shortage • shortage of pesticide	• We expect some increase in the frequency of occurrence	• Severe loss of life & property in the future	• Planting of specific trees specially enviro, • Promote the benefit of agroforestry
2.	Extreme temperatures at kakapel	• pests & diseases reduction	• Because of increase in human activities	• Eruption of varies due to over flooding and erosion	• Reduced to avoid hazardous human activity e.g charcoal burning, brick baking and sand harvesting
3.	Uneven rainfall distribution	• Destruction of property • Loss of life		• Destruction of property	

5 6. 7.	Pests and Diseases Army worm's, locusts Floods specific areas mwari, koseny (Aswata stream) obatai Strong wind at aboloi, ketebat, akichelest, kakapel Lightening at Rwatana, Aedomoru, Kakapel Aboloi, Ketebat	• Loss of animals & life • Destruction of environment • Soil degradation • water logging • loses of livelihood • Conflict	• Infrastructure • Roads • Houses • Water Lines • Power Lines • Increase in Soil Erosion • Destruction of social amenities i.e. schools, churches etc.	• Abrupt changes changing clouds • Larger changes in precipitation • Pattern trains • Patterns • Changes in • Risk to aquatic life	• Use of integrated pest & diseases management. • Embrace/ promote organic farming • Promote use of renewable energy e.g solar energy biogas • Promote use of improved jikos. • Adaptable farming technique e.g short season planting • Implement the laws and regulation on eucalyptus • Regulate sand mining. • Carry out civic education on the risk/hazard of climate change by public health NGAO county • Initiate action and enforce policies • Public health NGAO • County government administration • Directorate climate change • Conservation of environment • Construction of dam, water pond.

Angurai South Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs
ii. Fodder establishment and conservation
iii. Vaccination against tsetse flies
iv. Water harvesting
v. Pipeline extension
vi. Rehabilitation of degraded sites, Construction of Gabion blocks and Check Dams and Planting of trees and bamboo and establishment of tree nursery beds, one in each village unit.
vii. Erection of lightening arresters and planting of Nandi flame trees within the areas affected like Katakwa, Aboloi, Rwatama, Akolong, Aedomuru and Aboloi , Komolo area, Kakapel A, Akichelesit, Kekalet and Kang'elemuge.
viii. Capacity building to create awareness on importance of conserving the environment and climate change matters in all the public schools and public barazas in the entire ward.
ix. Eradication of invasive weeds- dodder and striga weeds.
x. Portable PH meters
xi. Grain moisture meters

ii. ANGURAI EAST WARD

1. PARTICIPATORY CLIMATE RISK ASSESSMENT FOR ANGURAI EAST WARD					
No.	**RISK/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Deforestation	• Low Rainfall • Soil Erosion • Scarcity Wood Fuel • Inadequate Timber for Building • Loss of Soil Fertility	• Prolonged drought • Increase gulley and wind erosion • More timber prices • Low production for food stuff	• Lack of food security. • Leads to continues use of fertilizer hence increase in acidity in soil • Variation is season due to prolonged drought • Water scarcity	• Sensitization the community on mass tree planting. • Make gabions and terraces • Engage the service of field extension officers • adaptation

2.	Encroachment of water catchment areas	• Water scarcity (omulame walls) • Scarcity of water for livestock	• Prolong drought and hunger	• Low food/ livestock production • Poverty index will increase • Extension of water source(Agnes Walls,Akibui Dam And Ataba Oburi River)	• Penalize water encroachment individuals • Burning human activities around water catchment e.g farming, lumbering of timber etc.
3.	Ignorance on environmental activities	• Destruction of echo system e.g cutting of trees burning of charcoal • Encroachment of water source	• More destruction of environment leading to global warming	• High levels of poverty • High soil erosion • deforestation	• Engage NEMA for prevention of environment destruction and community empowerment(knowledge)

4.	Uncontrolled garbage disposal	• Emergency of communicable disease such as cholera, typhoid • Soil erosion	• air pollution • soil pollution	• increase deaths • unconducive environment. • Overstretched medical facilities • Interference of business activities • Low investment turn up due to dirty environment.	• Controlled garbage disposal programme e.g use of providing damp site and garbage collection equipment's and machines
5.	lightining	• Leads to death • Destruction of property e.g chamasiri location	• Increase death • Increase poverty • Destruction of infrastructure.	• Poverty, death, destruction of economic activities	• Installation of lightening arrestors.

Angurai East Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs
ii. Water drilling/ rain water harvesting
iii. Installation of lightning arrestors at Chemasiri
iv. Rehabilitation of dams i.e Kolanya and Akibui
v. Soil conservation programs
vi. Eradication of invasive weeds- dodder and striga weeds.
vii. Portable PH meters
viii. Grain moisture meters

iii. ANGURAI NORTH WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR ANGURAI NORTH WARD					
No.	**RISK/HAZARDS**	**EFFECTS TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1	Deforestation	• Fluctuations in rain patterns. • Soil erosion. • Increased in temperature.	• Continued/increased erosions. • Increased temperature.	• High demand of energy. • Low crop yields.	• Alternative source of energy. • Afforestation. • Agroforestry • Community sensitisation.

		• Less income.	• Increased land infertility. • Increased poverty.	• Community conflicts. • Displacement of persons. • Hunger/poverty. • Poverty	• Introduction of an alternative source of energy. • Introduction of other income generated activity apiculture.
2	Prolonged dry spell	• Increased in temperature. • Land infertility. • Low food production. • Poverty. • Malnutrition. • School dropout. • High cost of living.	• Increased land infertility. • Hunger/famine. • Incapacitation. • Increased malnutrition.	• Increased cases of crime e.g., GBV. • Cases of death. • Friendly conflicts. •	• Afforestation. • Economic empowerment. • Local leaders.
3	Land degradation	• Land infertility. • Low productivity. • High cost of living.	• Increased land infertility. • Increased high cost of living.	• Poverty. • Famine. • Diseases. • Deaths.	• Use of fertilizers. • Good agricultural practices. • Community sensitisation. • Alternative sources of income. • Crop rotation.

					• Planting cover crops.
4	Unpredictable rainfall patterns	• Crop failure • Rise in temperatures	• Low crop productivity • Death in animals. • Malnutrition. • Increased friendly conflicts. • Water borne diseases.	• Anticipated cases of crime. • Famine.	• Sensitisation. • Aid from government e.g., world vision, world bank.
5	Flash floods	• Destruction of crops and property. • Flooding. • Erosion.	• Hunger. • Water borne diseases e.g., cholera& typhoid. • Increased mosquitoes causing Malaria • Displacement of families.	• Deaths of animals and people. • Separation of families.	• Water control measures. • Afforestation.
6	Lightning	• Fear among community members.	• Increased fear. • Increased deaths.	• Deaths. • Displacement of families.	• Lightening arrestors • Community sensitised. • Government intervention.

		• Deaths in community.			•

Angurai North Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs
ii. Soil conservation programs
iii. Establishment of resilient climate change infrastructure like box culverts etc
iv. Lightning arrestors at Bishop Sulumeti Girls
v. Rehabilitation of boreholes
vi. Check off dams establishment on roads
vii. Alternative sources of livelihood e.g beekeeping
viii. Eradication of invasive weeds- dodder and striga weeds.
ix. Portable PH meters
x. Grain moisture meters

iv. MALABA SOUTH WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MALABA SOUTH WARD					
No.	**RISKS/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Floods	• Displacement of persons. • Loss of property • Crops damages. • Soil erosion • Water borne diseases. • Roads destruction.	• People will be homeless. • High poverty level. • Hunger. • Deaths. • Breakdown in community caution. • Poor farming methods.	• Poverty. • Loss of farm land. • Deaths. • Poor nutrition. • School dropout. • Breakdown in communication. • Poor farming methods.	• Improvement in drainage system. • Purchase of land to construction • Box culverts • Water dams. • Planting of trees i.e. bamboo. • Provision of tree seedlings. • Construction of modern toilets. • Early warning systems. • Health improvement, medication; mosquito nets
2.	Prolonged Dry spell	• Lack of water for domestic use and animals. • Delay in planting.	• Low yield crops. • Factuality rain falls. • Early child pregnancy.	• Famine • crop failure • Drought. • School drop outs.	• Increase forest cover (Agroforestry). • Water harvesting during rainy seasons. • Drilling of boreholes. • Irrigation

		• Crop failure.	• Counterfeit increased.	• High cost of living.	
3.	4. Sand/Ballast harvesting	• Child labor. • Death. • Soil erosion • Breaking of river banks. • Reduced productive land	• Conflicts. • Loss of land • Displacement • Change of river course.	• Increased deaths. • Low yields • Poverty • School drop out • Substances abuse • Family breakages. • Increase of crime(theft).	• Enforcement of environmental laws / policies. • Land reclamation. • Protecting the affected areas (fencing). • Afforestation. • Awareness creation and
5.	Lightning strikes	• Deaths • Trauma • Myths	• Loss of property. • Increased deaths. • Conflicts.	• Increased deaths • Conflicts	• Installation of arrestors in all public institutions. • Awareness creation.
6.	Deforestation	• Soil erosion	• Change of rain patterns. • Prolonged dry spell drought		• Creation of trauma centres for gc • Planting of trees • Community sensitization • Policy formulation • Alternative fuel use i.e. gas, modern jikos

7.	Soil Erosion	• Low crop production			• Terracing • Gabions construction • Planting of trees i.e. bamboo
8.	Poor Waste management practices Kochoiya complex, opare	• Pollution • Sanitation • Water borne diseases	• Water borne diseases will be on the rise. • Deaths	• More deaths	• Construction of sewerage system. • Purchase of land for dump site. • Adaptation of system for opare primary school

Malaba South Ward Climate Resilient Projects

a) Drainage box culverts ward wide

i. Kalalaran to free Pentecost
ii. Toto kakile – katanyu
iii. Opare – onyunyur
iv. Okadukudukut to Akulony
v. Gara –ogiroi
vi. Osopotoit-kamolo
vii. Ouka moja – kocholya catholic church
viii. Kokare – kocholya
ix. Kocholya – kapina

x. Kocholya stream opedur

b) River training

i. Stream Gara to kamolo

ii. Stream Osopotoit to opare

iii. stream Nauria to akapijan

iv. Onyunyuri to Toto Kakile

c) Construction of Water Pans

i. Stream Onyunyur to Toto kakile

ii. Stream Kamolo to gara

iii. Stream Katanyu to toto kakile

I. Prolonged Dry Spell

a) Water harvesting in some public institutions

b) Drilling of boreholes in Kocholya, Koteko, Kengatung, Kokare, Okadukukudukut, Aguor, Toto kakile, Okaraia, Kaliwa , Ogiroi and Atoto

c) Increase of forest cover (bamboos to be planted along the rivers)

II. Lightning and Thunderstorms

Installation of arrestors at Aedomuru and selected.

III. Poor Waste Management

a) Sewer system to be constructed in Kocholya township

b) Construction of modern toilets at Opare primary school

IV. Soil Erosion

Construction of gabions at Duka moja, Kocholya, Kengatung,Koteko, and along river Malakisi river bank.

V. Sand and Ballast Harvesting

a) Land reclamation in affected areas like Opare , kadaudau, koboso kipi stream, duka moja and along river malakisi.

VI. Deforestation

a) Establishment of Tree nurseries and afforestation programs

Planting trees in affected areas; Kocholya hills and all public institutions.

VII. Solar back up at Kocholya sub county hospital

VIII. Eradication of invasive weeds- dodder and striga weeds.

IX. Portable PH meters

X. Grain moisture meters

v. MALABA CENTRAL WARD

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MALABA CENTRAL WARD					
No.	**RISK/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Floods	• Community animal displacement • Crop damage • Deaths	• Increased human/animal displacement. • Persistent famine.	• Increased number of deaths.	• Construction of dykes along River Malaksi and Komiriai. • Planting of bamboos and water friendly trees along River Malakisi and Komiriai.

		• Diseases • Hunger.	• Low harvest	• Increased animal/human displacement	• Drenching of River Malaksi. • Reduction of sand harvesting along River Malakisi and Komiriai
2.	Prolonged Dry Spell	• Low harvest. • Reduced water volumes in River Malakisi and shallow wells within malaba central. • Reduced animal feeds. • Increased child labor. • Poverty	• Over dependency on relief supplies. • Drying up of River Malakisi. • Affects aqua life.	• Malnutrition • Poverty Increase. • Land degradation.	• Adoption of irrigation. • Poverty increase. • Land degradation.

3.	Riparian Land Degradation	• Silting of River Malakisi and Kajei stream. • Flooding of River Malakisi. • Displacement of humans and animals. • Crop damage	• Persistent flooding. • Raised river bases. • Massive replacement of people and animals. • Abandonment of land. • Increased poverty levels.	• Poverty • Population • Spread of diseases. • Poor hygiene. • Conflicts (internal). • Scarcity of resources. • Poor settlement.	• Maintain 60 meters away from river/riparian land. • Planting of trees. • Discouraging cultivation and other activities along the riparian land. • Civil education on need to reserve riparian land.
4.	Solid Waste	• Air/water/soil pollution • Air borne diseases e.g. cholera and typhoid. • Affects trade. • Death	• Chronic health diseases e.g. malaria, T.B, typhoid • Affects revenue collection.	• High cost of living • High death rates • Poverty • Loss of income • Causes health hazards to human scavengers.	• Civic education on waste disposal and management. • Effect action plan on solid waste management within Malaba.

			• Causes migration. • Negative impact on agriculture.		

Malaba Central Ward Climate Resilient Projects

i. Establishment of Tree nurseries and afforestation programs (including fruit trees).
ii. Investment on solid waste management
iii. Flood mitigation measures
iv. Water harvesting in schools and markets
v. Hydrant establishment at Malaba town
vi. Stabilize the banks through planting of bamboos and dykes establishment
vii. Eradication of invasive weeds- dodder and striga weeds.
viii. Portable PH meters
ix. Grain moisture meters.

PARTICIPATORY CLIMATE RISK ASSESSMENT FOR MALABA NORTH WARD					
No	**RISKS/HAZARDS**	**EFFECT TO THE COMMUNITY**	**FUTURE TRENDS**	**ANTICIPATED IMPACTS**	**ADAPTATION/MITIGATION PRACTICES**
1.	Land Degradation and Deforestation	• Poor agricultural practises • Lose of indigenous trees • Degradation of the soil • Food Insecurity • Increased poverty • Malnutrition • Lack of access to clean drinking safe water e.g.		• Increased poverty • Extinction of indigenous trees • Loss of water catchment areas • Soil erosion • Low harvests/poor roads • Reduced soil fertility • Increased hunger • Increased diseases • Increased waterborne diseases • Loss of habitat for wildlife and human	• Practicing modern farming activities e.g. greenhouses • Practicing Agro forestry • Afforestation and reafforestation e.g. Agong'et, Kokoli hills, along river malakisi and Komiria, kaja Stream • Sensitizing the community on climate change • Encourage use of soil erosion control measures e.g., building of gabions • Enforce sand harvesting and tree planning measures • Encourage use of alternative fuel e.g., Biomass, biogas, solar energy to reduce on deforestation • Establishment of tree nurseries and
2.	Sand Harvesting				

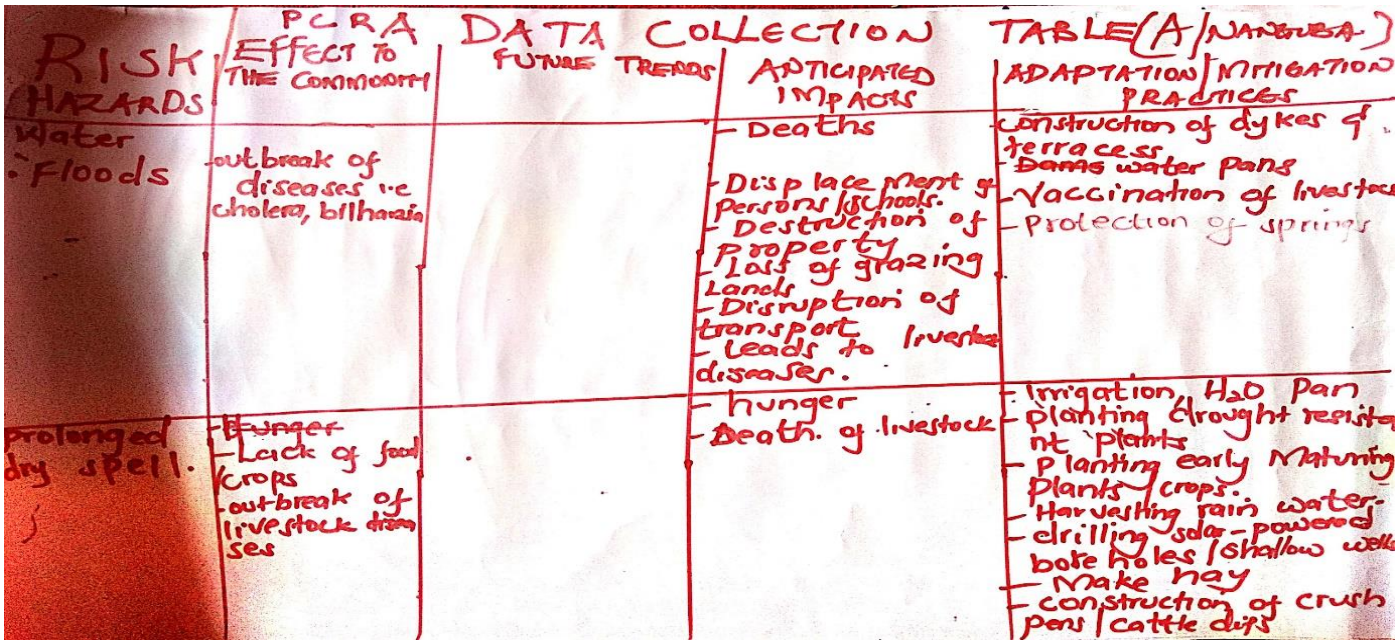
		Kokadi Amagoro • Imbalance in the ecosystem • Air pollution		• Results into respiratory diseases • Results into droughts and heavy rains that are unpredictable	ornamental and flower nurseries • Encourage organic farming to reduce use of chemicals • Preservation of indigenous springs e.g., Abwani and Kokoli and others within the ward
3.	Charcoal Burning and Logging	• Carbon emission			
4.	Increase in pests and diseases			• Area becomes prone to diseases e.g. malaria increasing deaths	• Establish alternative drought resist and crops e.g. Cassava, sorghum, potatoes and green grams

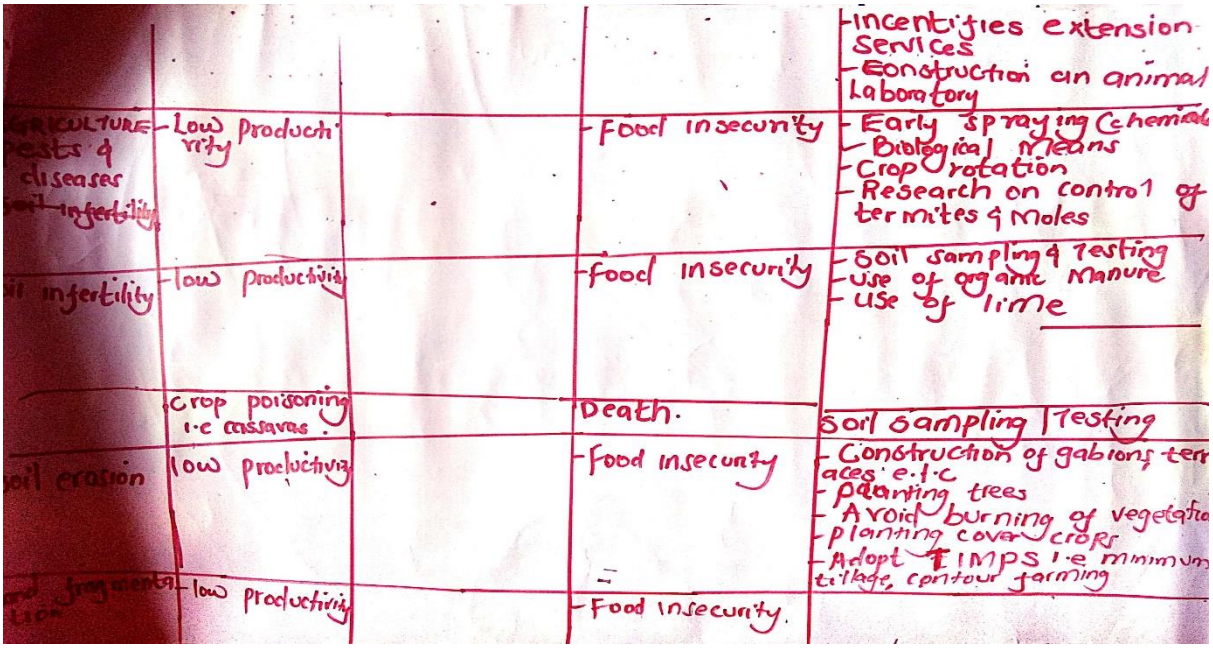
Malaba North Ward Climate Resilient Projects

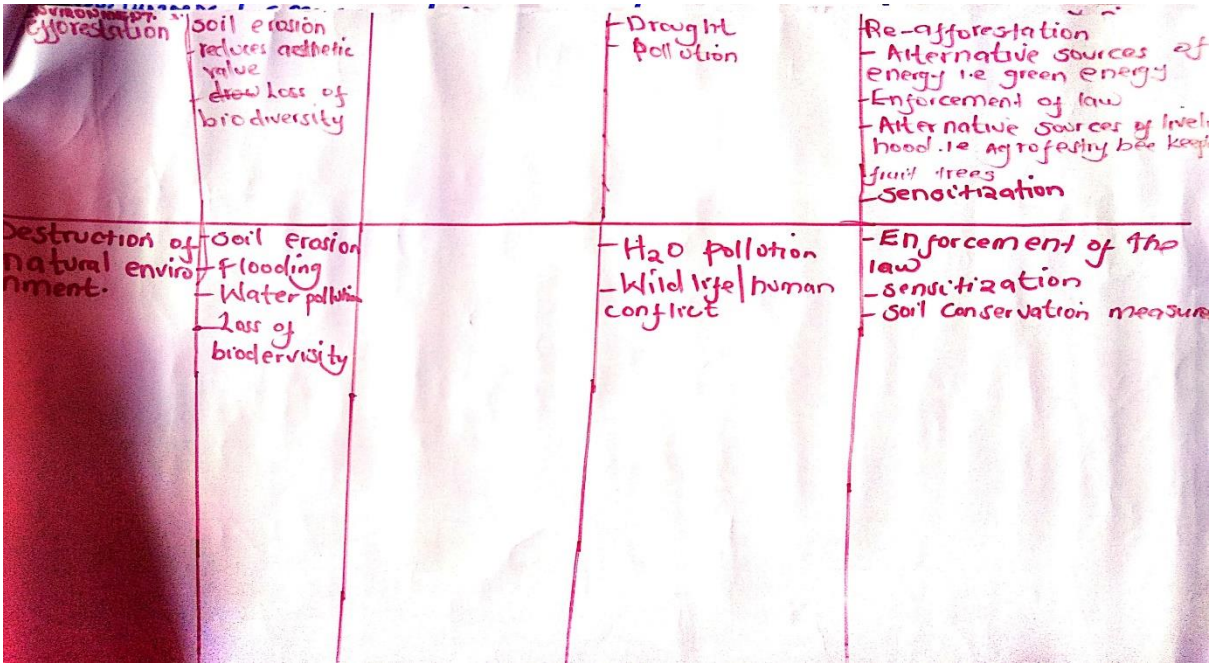
i. Pipeline extension (Bishop Kitui water Kamuriai, Agonget water project Kamurai, Osere Chiefs Office water Kamuriai Milele and Kakinei water project Okuleu)
ii. Soil conservation measures
iii. Bee keeping project in Kamuriai
iv. Establishment of Tree nurseries and afforestation programs
v. Construction of climate proof box culvert/small span bridges
vi. Eradication of invasive weeds- dodder and striga weeds.
vii. Portable PH meters
viii. Grain moisture meters

Annex 2: PCRA Ward Data Collection Tools

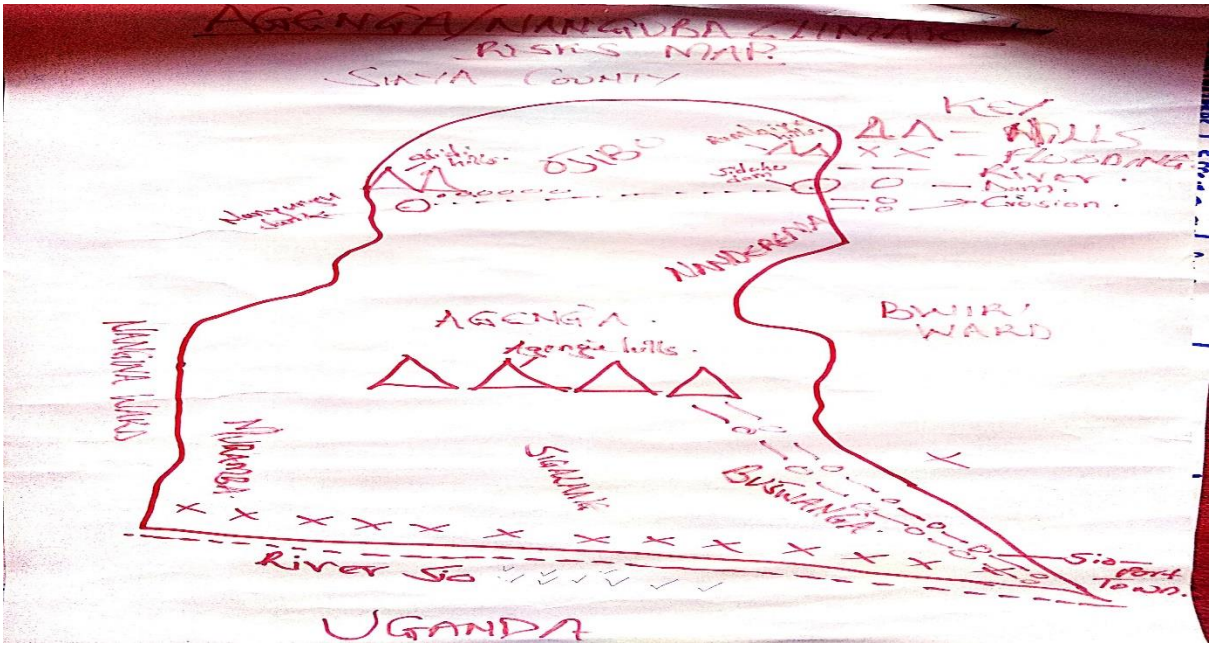
1. AGENG'A NANGUBA WARD PCRA FIELD DATA



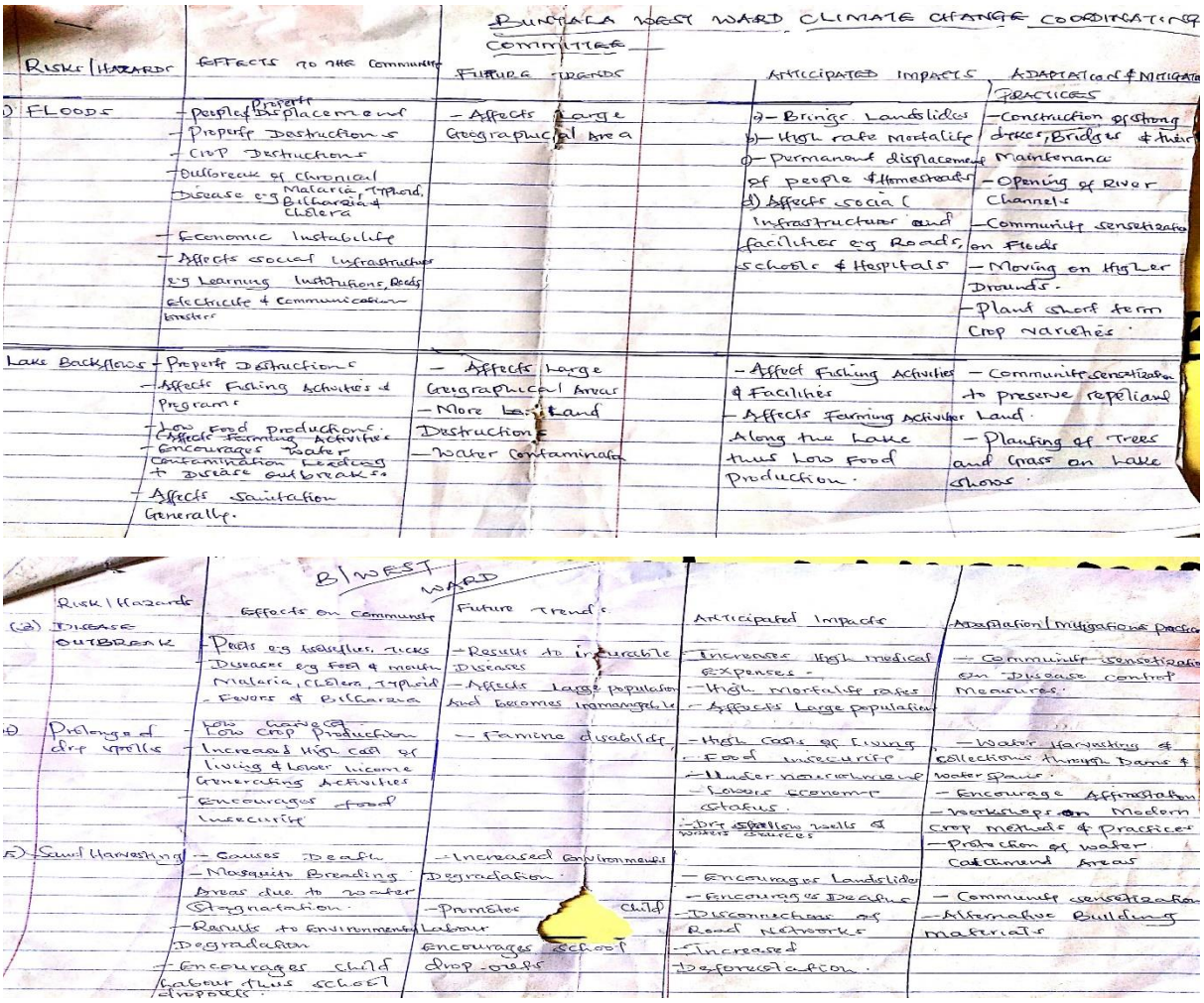




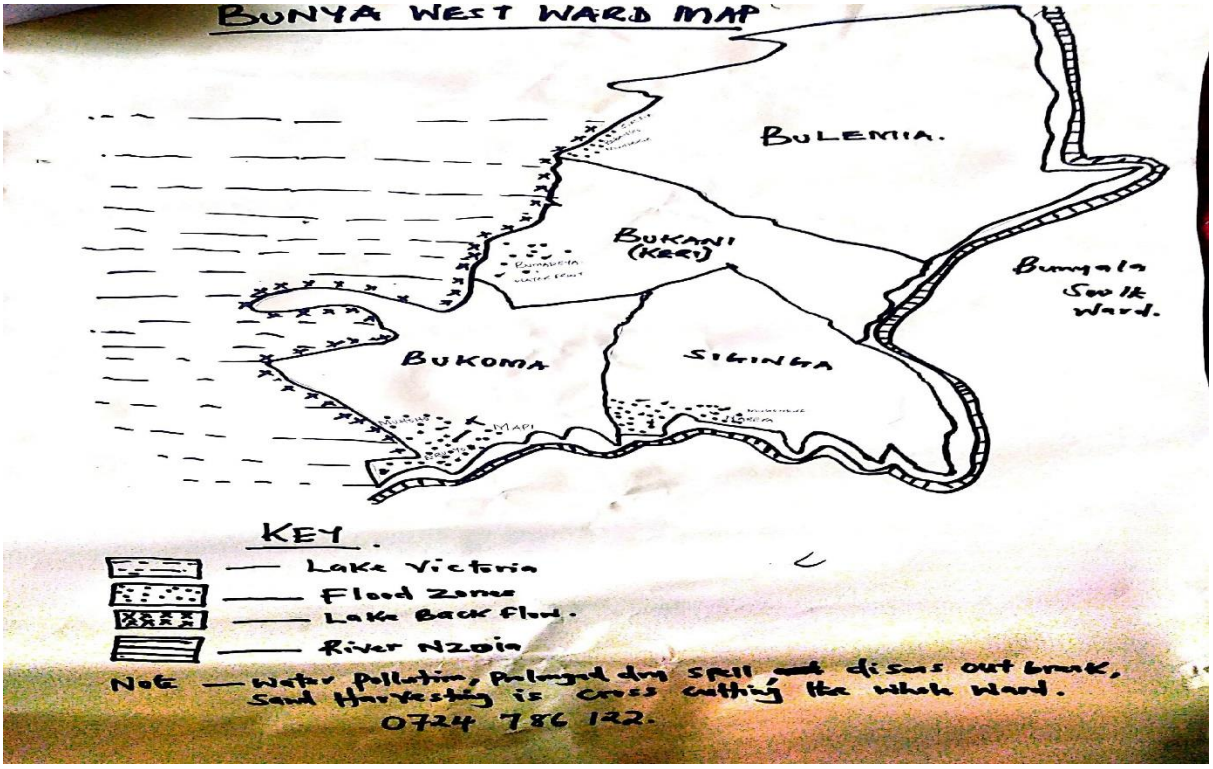
Ageng'a Nanguba Hazard Map



2. Bunyala West ward PCRA field data

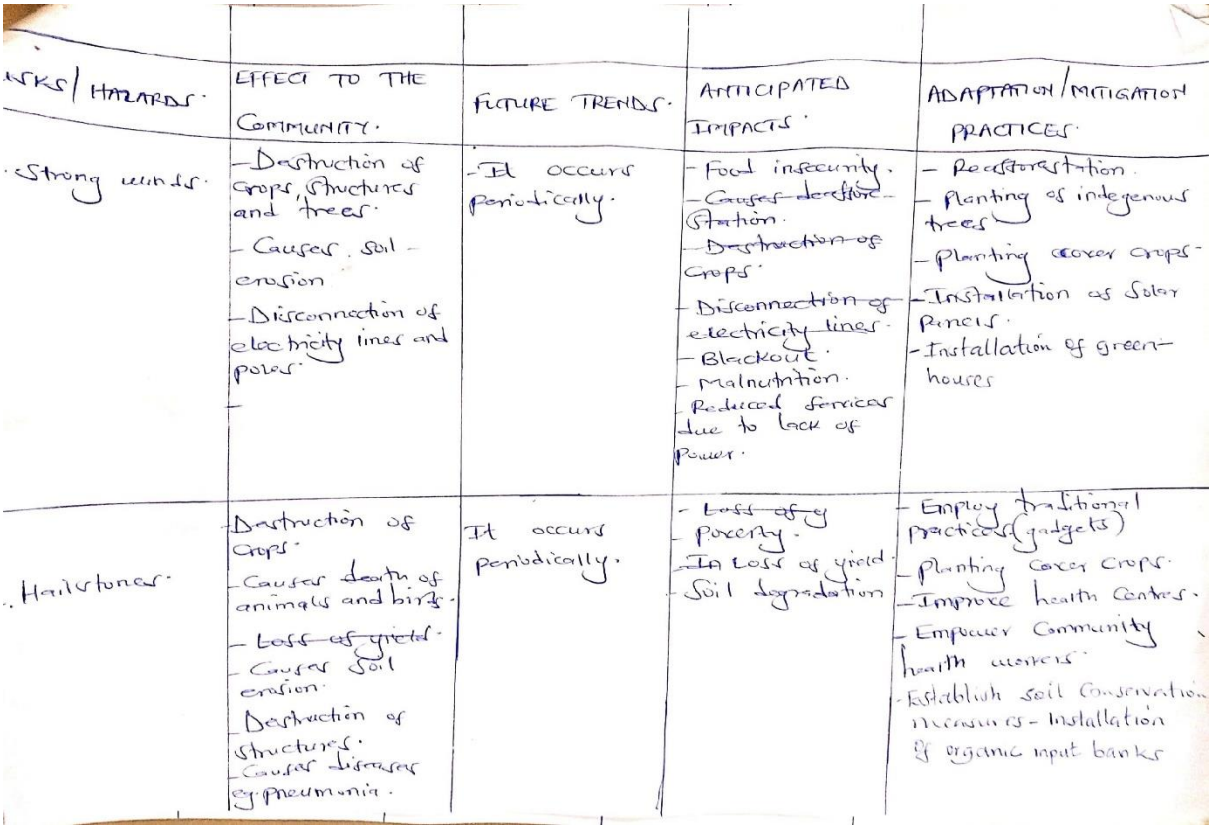


Bunyala West Ward Hazard Map

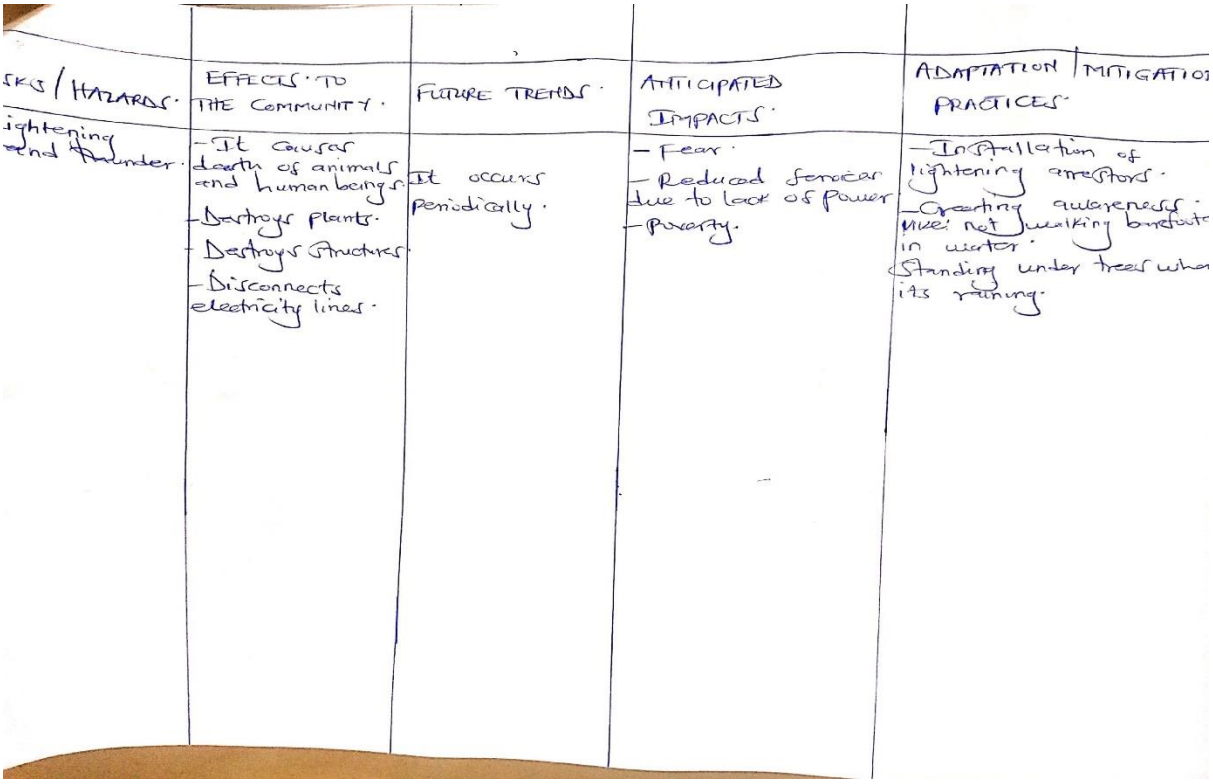


3. ELUGULU WARD PCRA FIELD DATA

		ELUGULU	WARD.	
SKS / HAZARDS.	EFFECT TO THE COMMUNITY.	FUTURE TRENDS.	ANTICIPATED IMPACTS.	ADAPTATION / MITIGATION PRACTICES.
rolonged dry - pell.	- It causes late planting. - Shortage of food. - Shortage of animal feeds. - Poor harvest.	- It is likely to - It occurs periodically.	- Food insecurity. - Malnutrition. - High costs of food. - Family disputes. - Increased crimes eg. theft.	- Irrigation. - Planting drought resistant crops. - Planting early maturing crops. - Afforestation and Reforestation. - Conservation of fodder seeds. - Replacement of trees. eucalyptus with indigenous.
Flash floods.	- Destruction of crops and property. - Displacement of People. - Soil erosion eg. (gulley erosion) - Causes diseases - Causes death of animals & human beings. - Destruction of roads and road networks.	- Occurs Periodically.	- Food insecurity. - High cost of food. - Malnutrition. - Family conflicts. - Poor performance especially to School going children. - Problem in movement from one Place to another.	- Construction of dams. - Construction of terraces. - Planting of Cover crops. - Construction of health facilities and employ more health workers. - Provide tanks for water harvesting. - Provide mosquito nets.

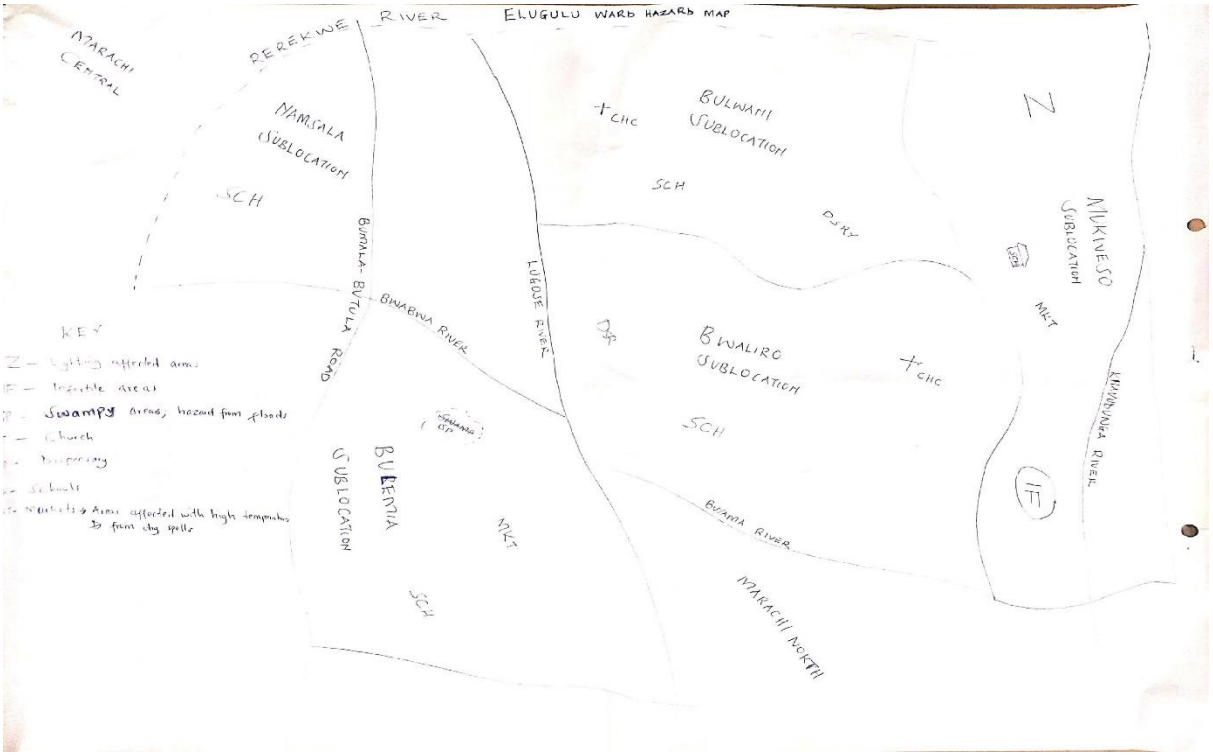


NKS/ HAZARDS	EFFECT TO THE COMMUNITY	FUTURE TRENDS	ANTICIPATED IMPACTS	ADAPTATION/MITIGATION PRACTICES
Strong winds	-Destruction of crops, structures and trees. - Causes soil erosion -Disconnection of electricity lines and poles.	-It occurs periodically.	- Food insecurity. - Causes deforestation. -Destruction of crops. - Disconnection of electricity lines. - Blackout. - Malnutrition. - Reduced services due to lack of power.	- Reafforestation. - Planting of indegenous trees - Planting cover crops. - Installation of Solar Panels. - Installation of green-houses
Hailstones.	-Destruction of crops. - Causes death of animals and birds. - Loss of yield. - Causes soil erosion. - Destruction of structures. - Causes diseases eg pneumonia.	It occurs periodically.	- Loss of income - Poverty. - Loss of yield. - Soil degradation	- Employ traditional practices (gadgets) - Planting cover crops. - Improve health Centers. - Empower Community health workers. - Establish soil Conservation measures - Installation of organic input banks

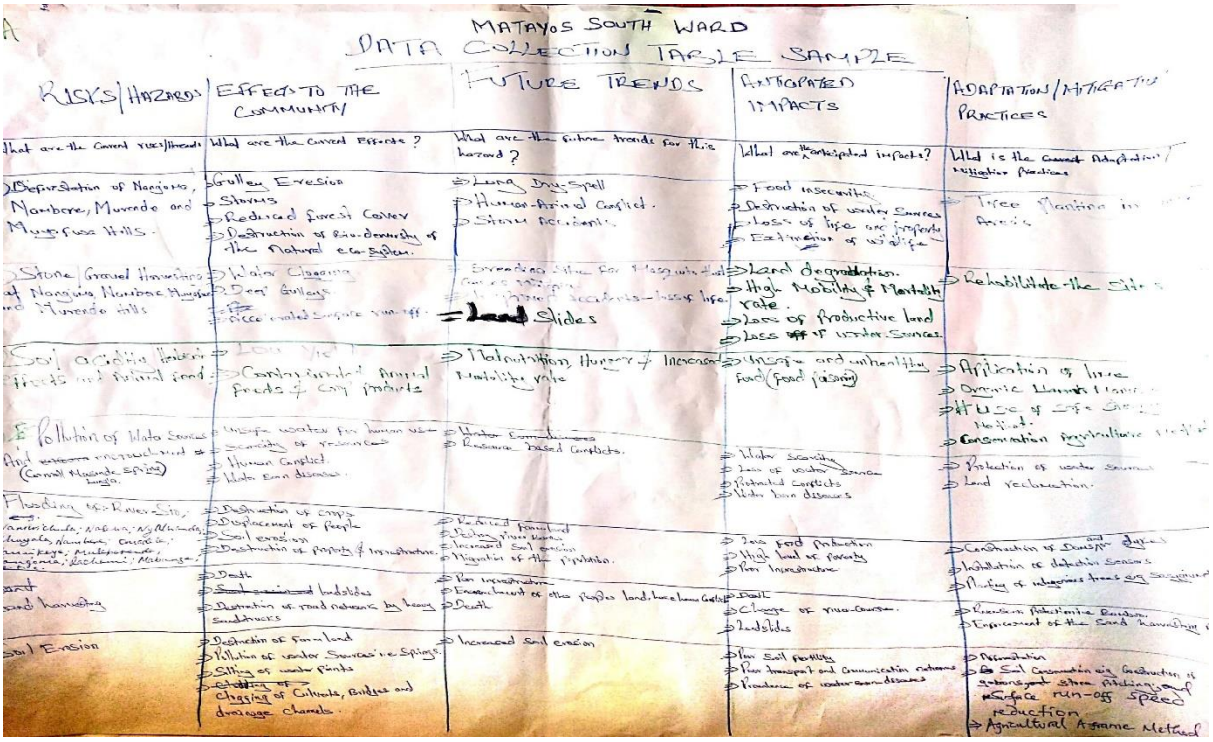


SKS / HAZARDS	EFFECTS TO THE COMMUNITY	FUTURE TRENDS	ANTICIPATED IMPACTS	ADAPTATION / MITIGATIO PRACTICES
ightening and Thunder	-It causes death of animals and human beings. -Destroys plants. - Destroys Structures. - Disconnects electricity lines.	It occurs periodically.	- Fear. - Reduced services due to lack of power - Poverty.	-Installation of lightening arrestors. -Creating awareness. like: not walking barefoot in water. Standing under trees when its raining.

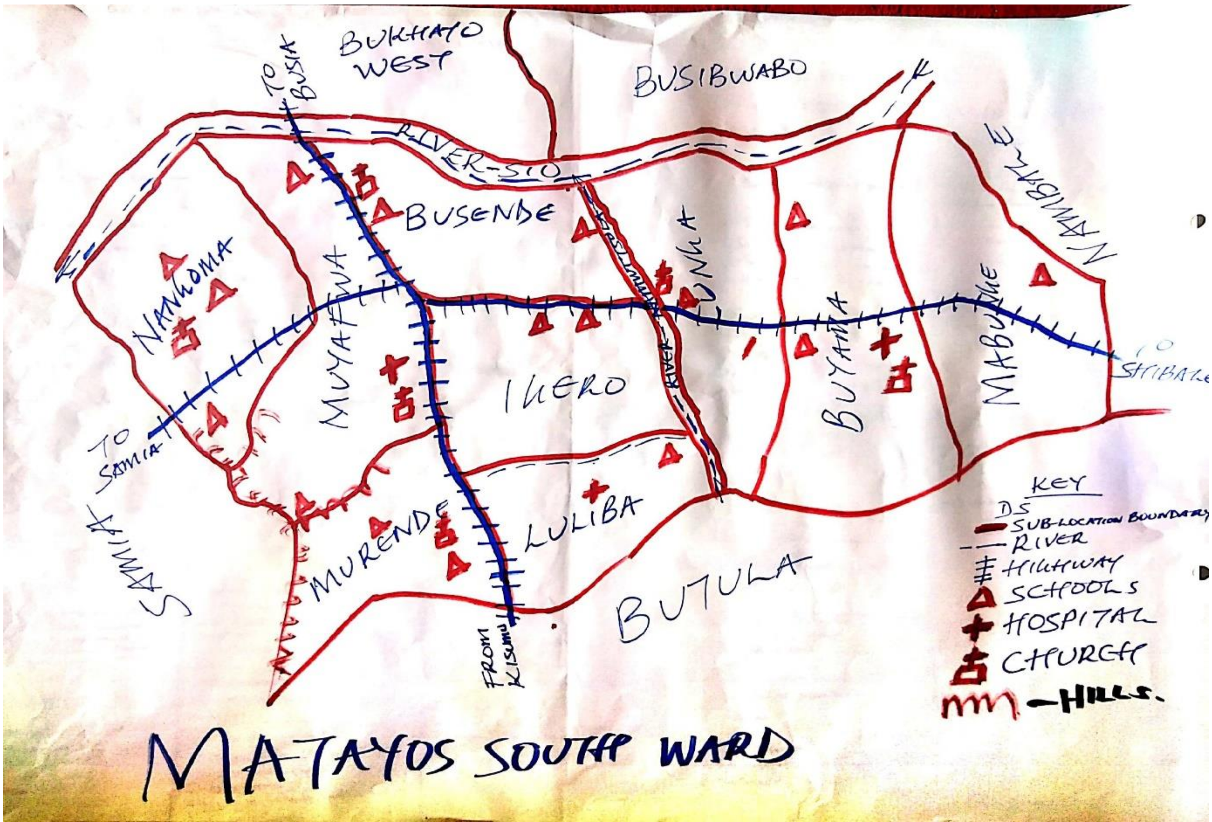
ELUGULU WARD HAZARD MAP



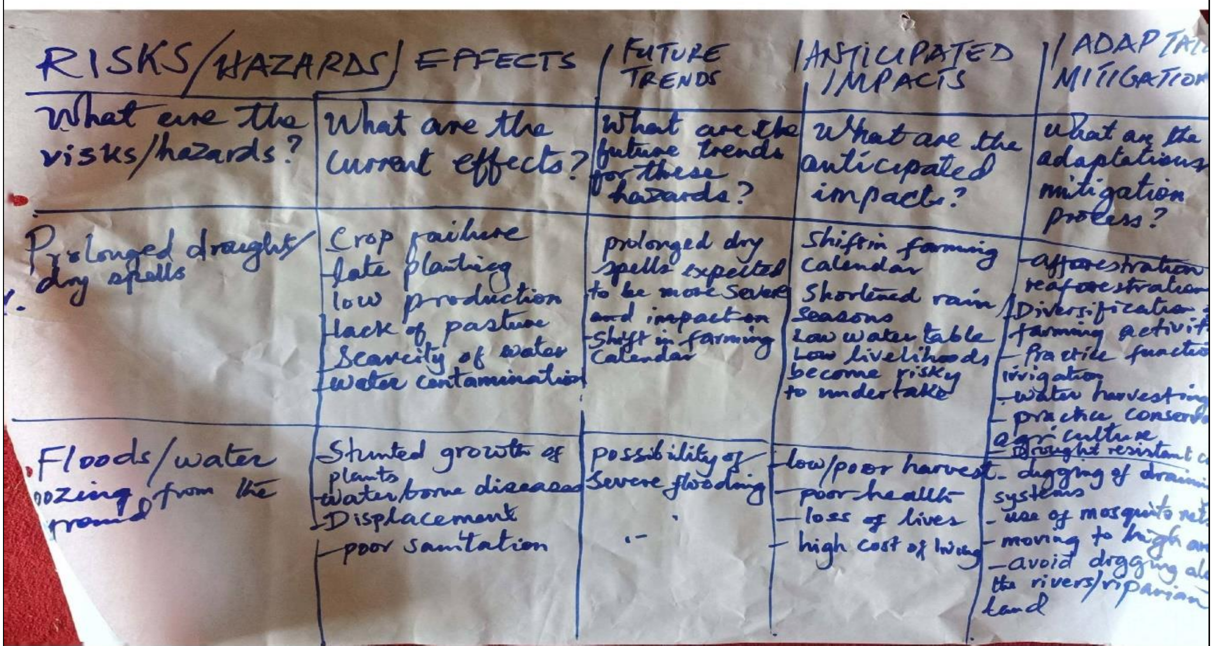
4. MATAYOS SOUTH WARD PCRA FIELD DATA



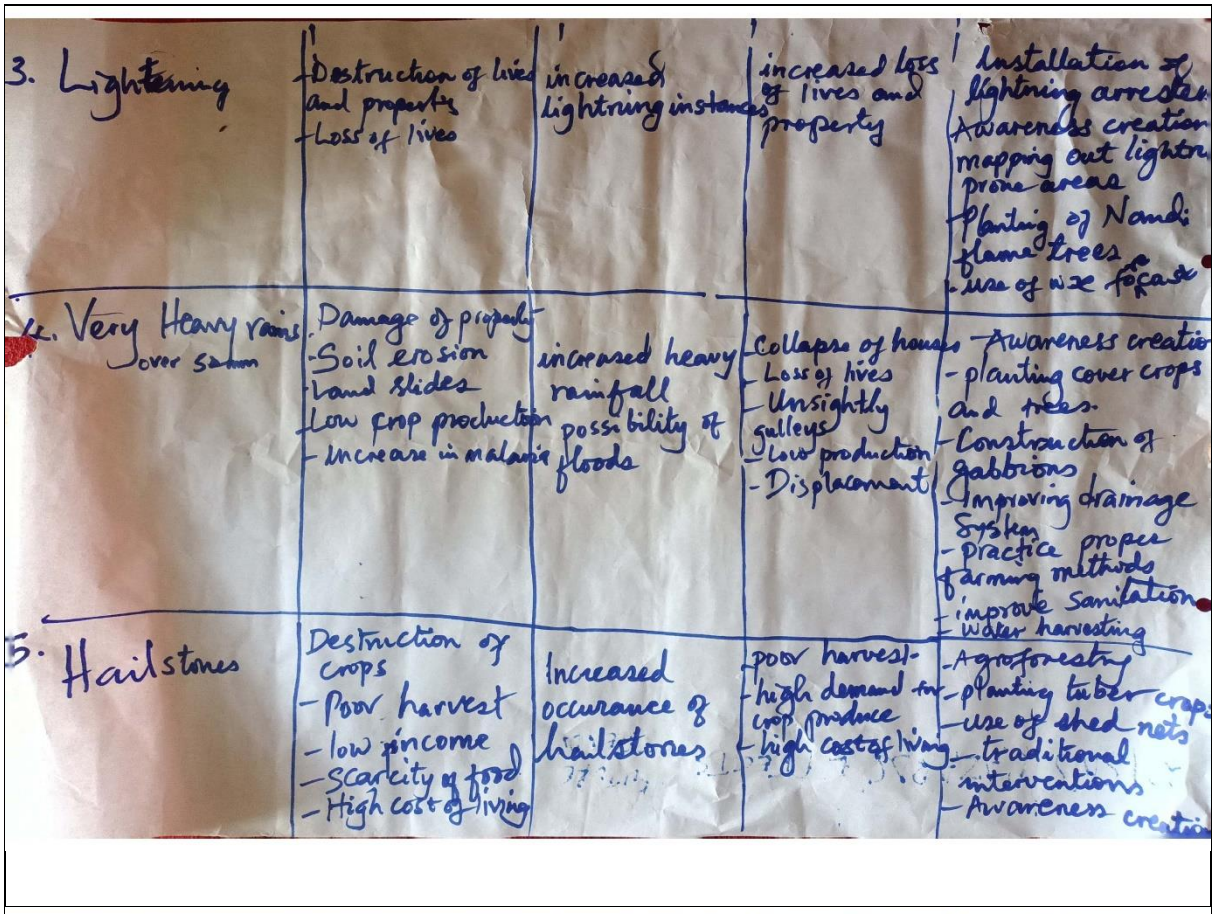
MATAOS SOUTH WARD HAZARD MAP



5. NAMBALE TOWNSHIP WARD PCRA FIELD DATA

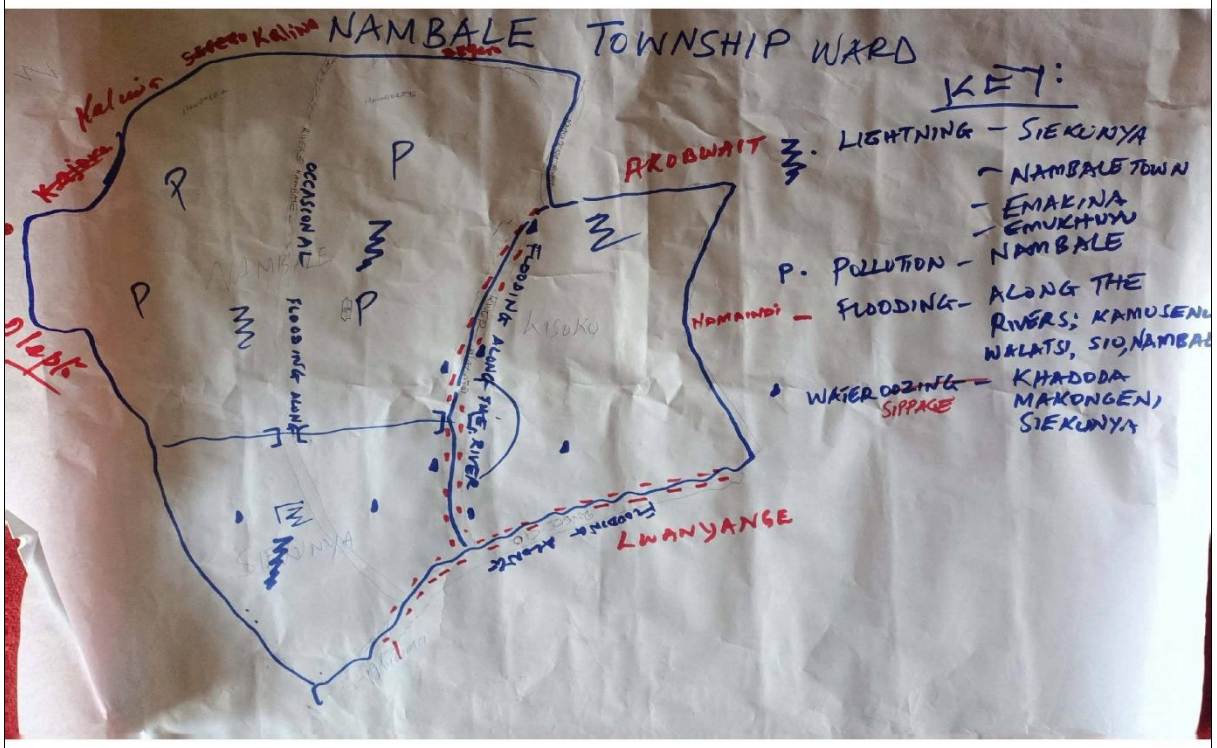


RISKS/HAZARDS	EFFECTS	FUTURE TRENDS	ANTICIPATED IMPACTS	ADAPTATION/ MITIGATION
What are the risks/hazards?	What are the current effects?	What are the future trends for these hazards?	What are the anticipated impacts?	What are the adaptations mitigation process?
Prolonged draught/ dry spells	Crop failure - late planting low production - lack of pasture - Scarcity of water - water contamination	prolonged dry spells expected to be more severe and impact on - Shift in farming calendar	Shift in farming calendar Shortened rain seasons Low water table Low livelihoods become risky to undertake	- afforestration reafforestration - Diversification of farming activit... - Practice function... irrigation - water harvesting - practice conserv... agriculture - drought resistant c...
Floods/water oozing from the ground	Stunted growth of plants - water borne diseases - Displacement - poor sanitation	possibility of severe flooding	- low/poor harvest - poor health - loss of lives - high cost of living	- digging of drain... systems - use of mosquito net... - moving to high ar... - avoid digging al... the rivers/riparian land



3. Lightening	Destruction of lives and properties Loss of lives	increased lightning instances	increased loss of lives and property	Installation of lightning arresters Awareness creation mapping out lightning prone areas Planting of Nandi flame trees use of wire fences
4. Very Heavy rains over 50mm	Damage of property -Soil erosion -Land slides -Low crop production -Increase in malaria	increased heavy rainfall possibility of floods	-Collapse of houses -Loss of lives -Unsightly gulleys -Low production -Displacement	-Awareness creation -planting cover crops and trees. -Construction of gabbions -Improving drainage system -practice proper farming methods -improve sanitation -Water harvesting
5. Hailstones	Destruction of crops -Poor harvest -low income -Scarcity of food -High cost of living	Increased occurance of hailstones	-poor harvest -high demand for crop produce -high cost of living	-Agroforestry -planting tuber crops -use of shed nets -traditional interventions -Awareness creation
6 Pollution	-water borne diseases -odour in the environment -low/acidic rainfall -Stroke/lung cancer obstruction of chest -death of marine life	~~Lots~~ increased pollution as a result of pop increase	-Unsightly garbage -loss of lives -Low production -Hard water -Emission of Green house gases	-Proper disposal methods. -Avoid dumping into rivers -Awareness creation -Road unworthy vehicles should not be allowed to run. -Recycling of waste -Use of clean energy sources (solar electricity)
7. Pests and Diseases	-low crop production -crop destruction -poor livestock health	possibility of continuinity	-High livestock mortality rates. -Low harvest	-apply acaricides on animals. -Spraying of crops with recommended pesticides. -creation of awareness. -Practice zero-grazing to curb diseases. -Use of certified seeds. -Training of farmers
8. Strong winds	-Destruction of property (Trees houses)	Continuinity of strong winds.	-Increased loss of property.	-planting of trees -creation of awareness

NAMBALE TOWNSHIP WARD HAZARD MAP

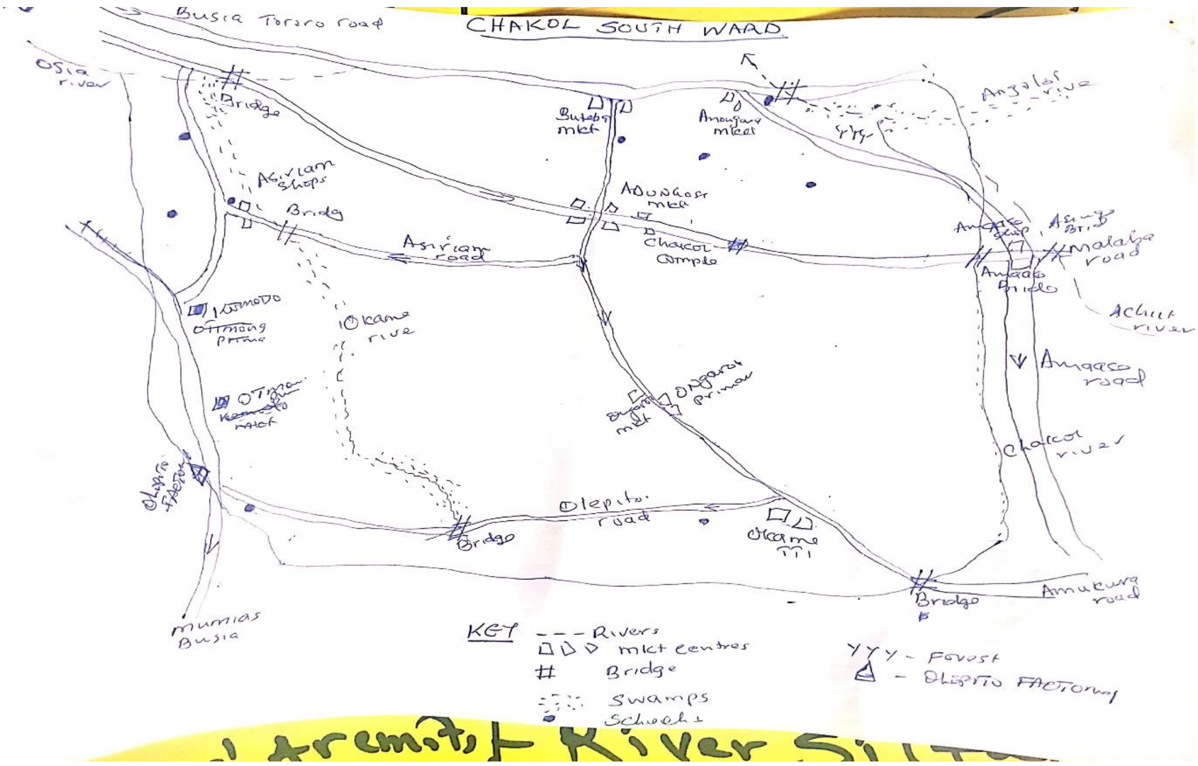


6. CHAKOL SOUTH WARD PCRA FIELD DATA

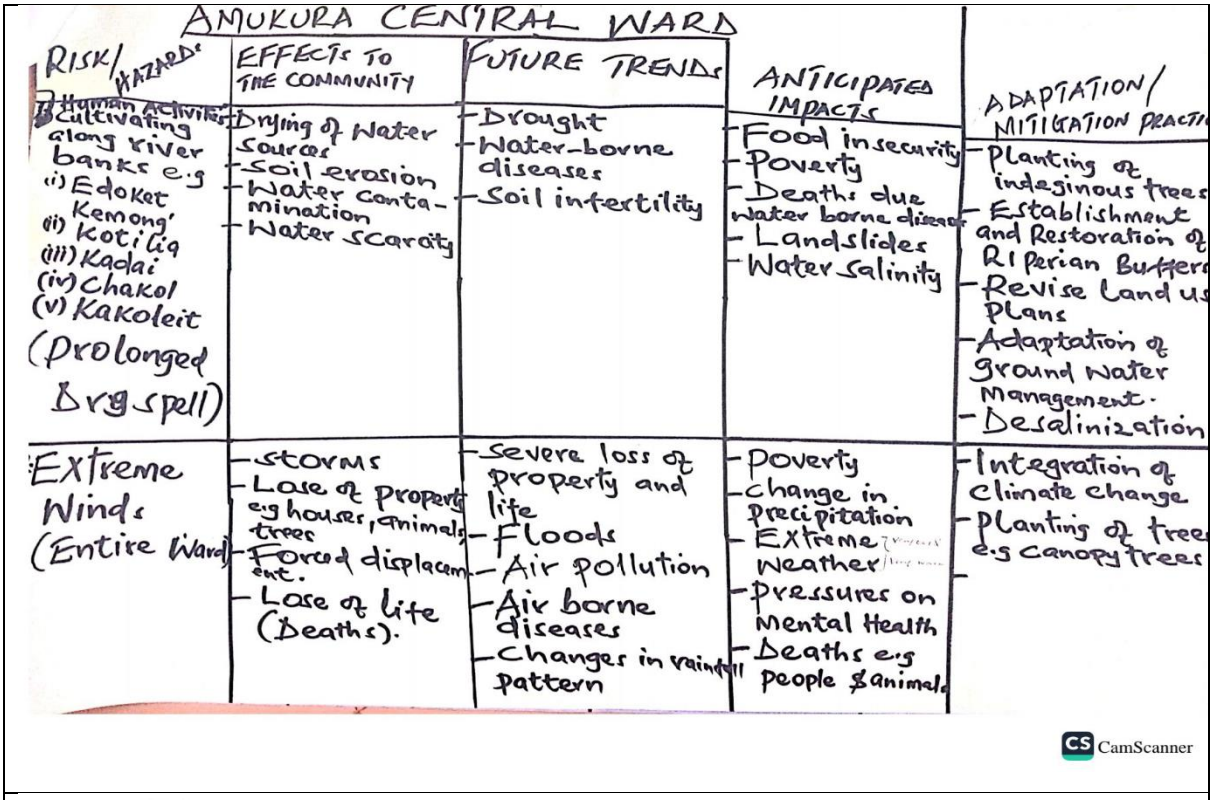
HAZARDS	EFFECT TO THE COMMUNITY	FUTURE TRENDS	ANTICIPATED IMPACTS	ADAPTATION/MITIGATION PRACTICES
1) FLOODS In areas of Asiriam, Okiluba, Obucmun, Amaase Kawjo, Ong'aroi, Pasame, Omiria'i, Otimong' Aremit, Palama, Adukumut, OKame stream, Osia River, Angololo river Amaase River and Kawaga Stream.	- Displacement. - Diseases Outbreak - Hunger/Food Insecurity - Poverty - Infrastructure Destruction eg Roads, Power Lines. - Soil erosion - River Siltation - School Dropouts		- Continued Deaths - High Level poverty Levels. - Loss of household income. - Increased school dropouts. - Displacements	- Plant Bamboo and Natural trees along Rivers/Streams and flooding areas. - No cultivation along River/Stream banks. 6 metres - 30 metres. - Provide Civic education to the Community members on how to conserve environment - Discourage Eucalyptus plantation along River/Stream Banks but plant them in flooding areas - Encourage cover crops to reduce soil erosion.
2) Drought.	- Hunger/Food Insecurity - Malnutrition - Skin Diseases/sunburns. - Poverty. - Inadequate pastures/water.	Social Conflicts.	- Death of Animals and human beings - Food Insecurity - School dropouts - Insecurity issues and theft. - Low water table. - Reduced hh income.	- Afforestation. - Drought Resistant crops eg sorghum, millet, Cassava - Continued Civic education - Deepen shallow water wells - Conserve rain water in underground tanks and dams. - Encourage good agronomy practices like mulching - Protect water sources.

HAZARD	EFFECTS TO COMMUNITY.	FUTURE TRENDS	ANTI IMP
3. AIR POLLUTION. Sugar: - olepito factory - Busia Allied Sugar factory.	- Environmental polution - Acid rain - Affects human health- Respiratory diseases. - Corrosion of iron sheets - Water polution e.g olepi to Sugar factory. - Aquatic deaths. - Reduced sunlight.	Reduced crop production e.g Fruits - Reduced pollination in crops.	- Hung - Dise e.g ast diseas - Dea - Loss incor
4. De-Aforestation.	- Change in weather pattern - Drought - Air pollution - Desertification and soil erosion in Angololo, Okame Chakol, Kawaga, and Amagoro Rivers. - Human-wild life conflict - Low water table across the ward.	- Release of Carbon (IV) oxide, methane and other green house gases.	- Soi - Red indige - Incr - Incr house - Loss incom - Dro - Mal
5. Increased Local Garbage Dumping.	- Human & animal diseases - causes flooding - Blockage of drainage systems & water ways - Breeding areas for pests and insects - Reduced soil aeration Adungosi, [illegible] pollution.	- poor Sanitation - Diseases outbreak.	- Loss inco - Re tura - Ou incr dis - De

CHAKOL SOUTH WARD HAZARD MAP



7. AMUKURA CENTRAL WARD PCRA FIELD DATA



AMUKURA CENTRAL WARD

RISK/ HAZARDS	EFFECTS TO THE COMMUNITY	FUTURE TRENDS	ANTICIPATED IMPACTS	ADAPTATION/ MITIGATION PRACTI
1) Human activities - Cultivating along river banks e.g (i) Edoket Kemong' (ii) Kotilia (iii) Kadai (iv) Chakol (v) Kakoleit (Prolonged Dry spell)	- Drying of Water sources - Soil erosion - Water contamination - Water scarcity	- Drought - Water-borne diseases - Soil infertility	- Food insecurity - Poverty - Deaths due water borne diseases - Landslides - Water salinity	- Planting of indeginous trees - Establishment and Restoration of Riperian Buffers - Revise Land us Plans - Adaptation of Ground Water Management. - Desalinization
Extreme Winds (Entire Ward)	- storms - Lose of property e.g houses, animals, trees - Forced displacement. - Lose of life (Deaths).	- Severe loss of property and life - Floods - Air pollution - Air borne diseases - Changes in rainfall pattern	- Poverty - Change in Precipitation - Extreme Weather - Pressures on Mental Health - Deaths e.g people & animals	- Integration of Climate change - Planting of trees e.g canopy trees

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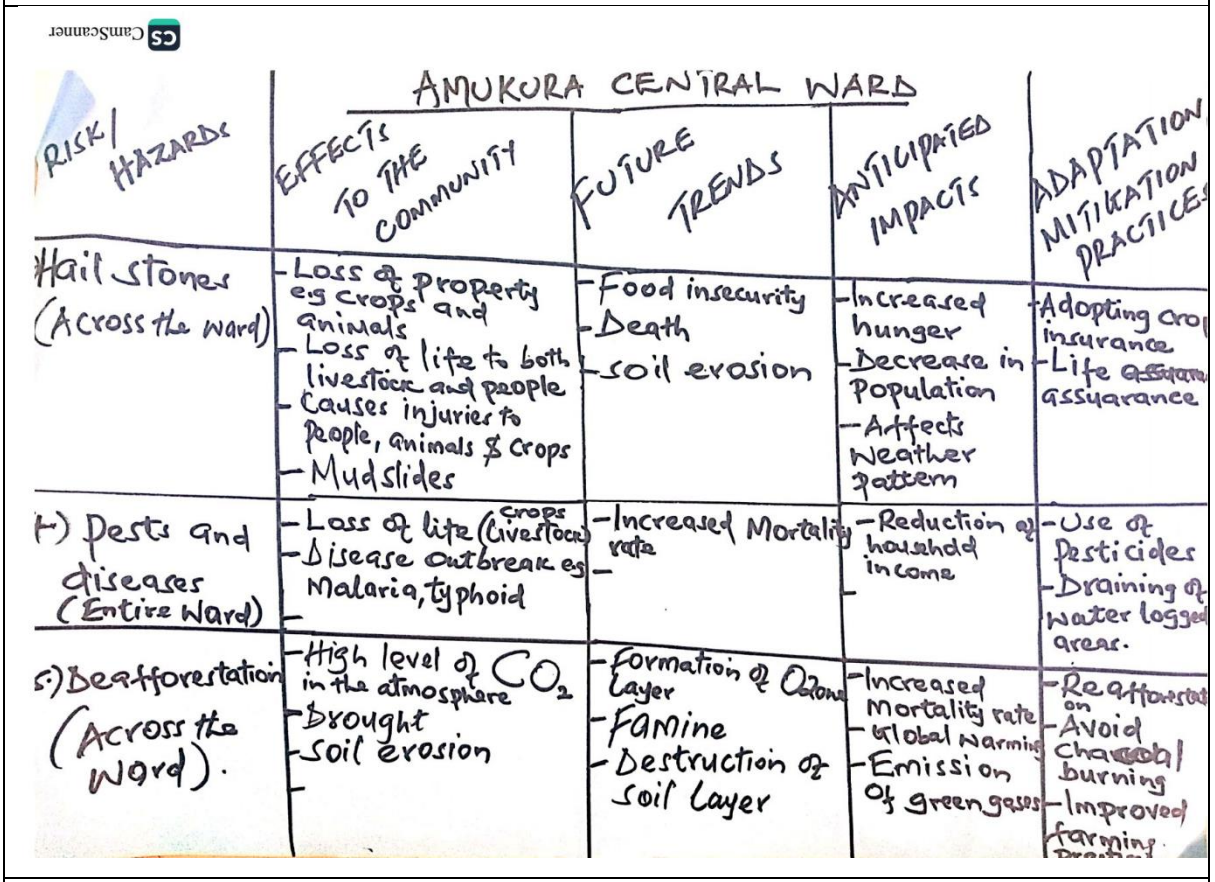

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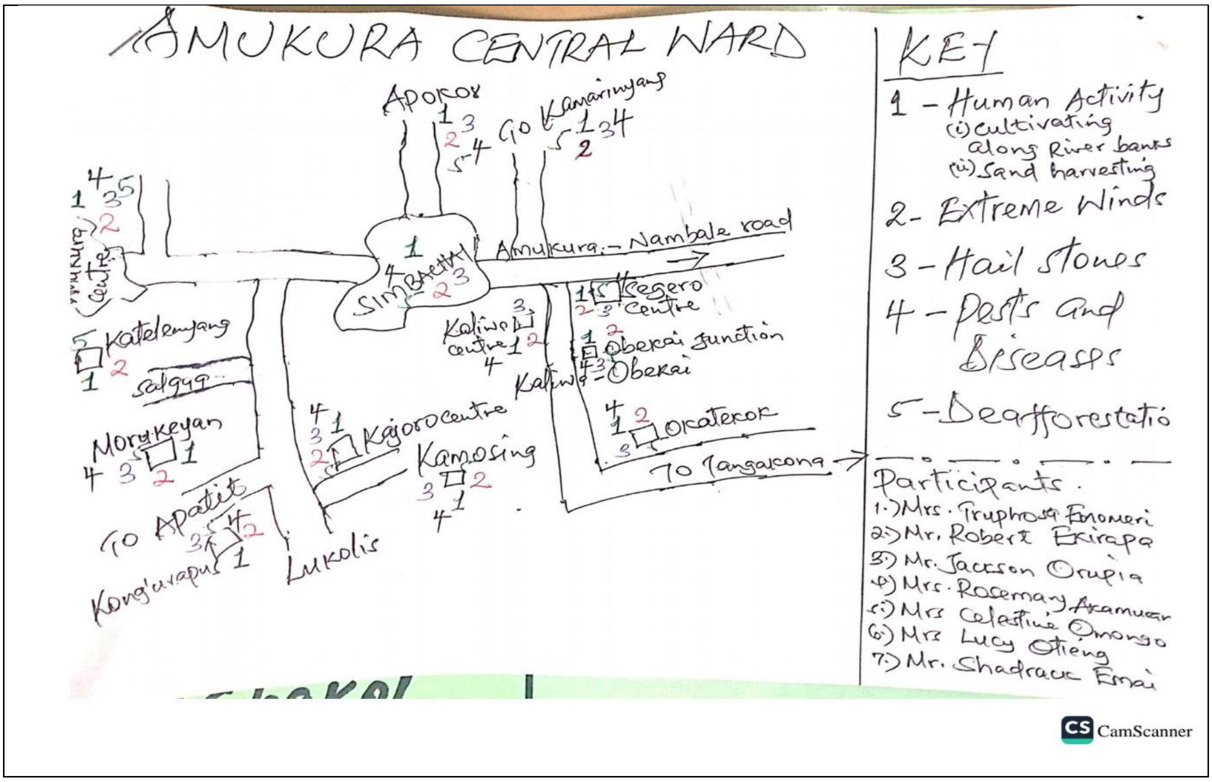
AMUKURA CENTRAL WARD

RISK/ HAZARDS	EFFECTS TO THE COMMUNITY	FUTURE TRENDS	ANTICIPATED IMPACTS	ADAPTATION MITIGATION PRACTICES
3) Hail stones (Across the ward)	- Loss of Property e.g crops and animals - Loss of life to both livestock and people - Causes injuries to people, animals & crops - Mudslides	- Food insecurity - Death - soil erosion	- Increased hunger - Decrease in Population - Affects Weather pattern	- Adopting crop insurance - Life assurance
4) Pests and diseases (Entire Ward)	- Loss of life (crops (Livestock) - Disease outbreak eg Malaria, typhoid	- Increased Mortality rate	- Reduction of household income	- Use of Pesticides - Draining of water logged areas.
5) Deafforestation (Across the Ward).	- High level of CO_2 in the atmosphere - Drought - Soil erosion	- Formation of Ozone Layer - Famine - Destruction of soil Layer	- Increased Mortality rate - Global Warming - Emission of green gases	- Reafforestation - Avoid Charcoal burning - Improved farming



AMUKURA CENTRAL WARD
APOKOR
GO Kamarinyang
Amukura - Nambale road
SIMBA
Katelenyang
MoruKeyan
Kajoro centre
Kamosing
Kaliwo centre
Kaliwo
Kegero Centre
Obekai Junction
Obekai
Okaterok
To Tangakona
To Apatit
Kong'uvapus
Lukolis
KEY
1 - Human Activity
(i) cultivating along River banks
(ii) Sand harvesting
2 - Extreme Winds
3 - Hail stones
4 - Pests and Diseases
5 - Deafforestatio
Participants.
1.) Mrs. Truphosa Emomeri
2.) Mr. Robert Ekirapa
3.) Mr. Jackson Orupia
4.) Mrs. Rosemary Akamuar
5.) Mrs Celestine Omongo
6.) Mrs Lucy Otieng
7.) Mr. Shadrack Emai
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