Republic of Kenya

THE COUNTY GOVERNMENT OF SIAYA

DEPARTMENT OF WATER, SANITATION, ENVIRONMENT, NATURAL RESOURCES AND CLIMATE CHANGE

Siaya County Participatory Climate Risk Assessment (PCRA) Report, 2023

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Foreword

Siaya County is extremely susceptible to impacts of changing climate. Most livelihoods and economic activities in the County are reliant on climate sensitive sectors namely agriculture, fisheries, water, energy, trade and micro-processing. Dependence on these natural resources means that recurring droughts, floods and associated climate hazards as a result of climate change will continue to negatively impact livelihoods in the county.

This document presents the Climate Risk Profile for Siaya County, where climate variability has been accompanied by a significant increase in risks, as often reported in national news. In 2013, severe flooding caused the Nzoia rivers to break its banks, destroying fertile farmland and leaving more than 200 residents homeless. Amongst the hardest hit sub-counties were Alego Usonga and West Ugenya. Just three years later, in 2016, extreme flooding again led river banks to overflow, inundating cropland and washing away livestock and poultry of some 169 households. Efforts to address flooding and subsequent droughts have led the government to introduce drought tolerant maize varieties with appropriate sorghum breeds as alternative crops. International organizations have contributed to the efforts by providing inputs and introducing to farmers new climate smart technologies such as soil and water conservation management. The disastrous nature of extreme weather makes identification of impending climate risks urgent.

The County government of Siaya through the Department of Water, Sanitation, Environment Natural Resources and Climate Change is committed to implement the findings in this PCRA Report guided by Siaya County Climate Change Policy (2020) and Siaya County Climate Change Act (2021). Through these frameworks, we call upon all stakeholders to join hands in addressing the climate crisis.

H.E James Orengo, EGH

Governor,
County Government of Siaya

Acknowledgement

I take this opportunity to thank the PIU team for the FLLoCA program at the National treasury for the insights they provided during the inception of the program, the County Government of Siaya led by H. E. Governor James Orengo, EGH for building a capable team of officers drawn from various sectors to spear head the county level activities.

I would also like to appreciate the efforts and contributions of citizens of Siaya County from various wards and technical officers for their support during the mobilization, data collection, training and the final production phases of this report. I wish to thank the Chief Officer of the Department Mr. Walter Okelo for logistical and moral support.

From the directorate of environment, climate change and natural resources, the director, Mr. Gabriel Oduong and officers for tirelessly supporting the PCRA team. Finally, is it prudent to thank the 30 Ward climate change planning committee members elected from the wards who cooperated with the team during the entire PCRA exercise. This report would not be possible without their contribution, insight and knowledge of the geography and people of the wards. Without forgetting the PCRA Technical Working Group who played the vital role of piecing together the community contributions into a readable document. That they managed to undertake this exercise in competition with their other official engagements is commendable.

Hon. Angeline Oduor

Ag. CEC- Water, Sanitation, Environment, Natural Resources &Climate change
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Acronyms

AIDS	Acquired Immunodeficiency Syndrome
AMCEN	African Ministerial Conference on the Environment
CBD	Convention on Biological Diversity
CCA	Climate Change Adaptation
CCAP	Climate Change Action Plan
CCCF	County Climate Change Fund
CECM	County Executive Committee Member
CHIRPS	Climate Hazards Group Infra-Red Precipitation with Station data
CIDP	County Integrated Development Plan
CO	Chief Officer
CoG	Council of Governors
COP	Conference of the Parties
EAC	East Africa Community
ECDC	Early Childhood development Center
GCP	Gross County Product
GESIP	Green Economy Strategy and Implementation Plan
GHG	Green House Gases
HIV	Human Immunodeficiency Virus
IGAD	Intergovernmental Authority on development
IPCC	Intergovernmental Panel on Climate Change
IPCC	Inter-Governmental Panel on Climate Change
JOOUST	Jaramogi Oginga Odinga University of Science and Technology
KCSAS	Kenya Climate Smart Agriculture Strategy
KDHS	Kenya Demographic and Housing Survey
KMD	Kenya Meteorological Department
KNCCI	Kenya National Chamber of Commerce and Industry
LM	Lower Midlands
M&E	Monitoring and Evaluation
MAM	March-April-May

MCA	Member of County assembly
MTP	Medium Term Plan
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NDC	Nationally Determined Contributions
OND	October-November-December
PCRA	Participatory Climate Risk assessment
RCP	Representative Concentration Pathway
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change
VTC	Vocational Training Centres
WCCPC	Ward Climate Change Planning Committee
WMO	World Meteorological Organization

Tables and Figures

Definition of Terms

Weather refers to atmospheric conditions at a particular time in a particular location, including temperature, humidity, precipitation, cloudiness, wind, and visibility. Weather conditions do not happen in isolation; they have a ripple effect. The weather in one region will eventually affect the weather hundreds or thousands of kilometers away.

Climate is the average of weather patterns in a specific area over a longer period of time, usually 30 or more years, which represents the overall state of the climate system.

Climate change refers to the long-term changes in the Earth's climate that are warming the atmosphere, ocean and land. Climate change is affecting the balance of ecosystems that support life and biodiversity, and impacting health. It also causes more extreme weather events, such as more intense and/or frequent hurricanes, floods, heat waves, and droughts, and leads to sea level rise and coastal erosion as a result of ocean warming, melting of glaciers, ad loss of ice sheets.

Greenhouse gases are gases that trap heat in the atmosphere, causing global warming and climate change. The main greenhouse gases released by human activity are carbon dioxide, methane, and nitrous oxide, as well as fluorinated gases used for cooling and refrigeration.

Global warming is an increase in the Earth's average surface temperature that occurs when the concentration of greenhouse gases in the atmosphere increases. These gases absorb more solar radiation and trap more heat, thus causing the planet to get hotter. Burning fossil fuels, cutting down forests, and farming livestock are some human activities that release greenhouse gases and contribute to global warming.

Mitigation refers to any action taken by governments, businesses, and people to reduce, sequester, or prevent greenhouse gas emissions. Examples of mitigation include transitioning to renewable energy like wind and solar, investing in carbon free transportation, promoting sustainable agriculture and land use, planting forests to act as carbon sinks, and changing consumption practices and diet behaviors.

Adaptation refers to actions that help reduce vulnerability to the current or expected impacts of climate change. Examples of adaptation include planting crop varieties that are more resistant to drought or changing conditions, managing land to reduce wildfire risks, building stronger flood defenses,

relocating infrastructure from coastal areas affected by sea level rise, and developing insurance mechanisms specific to climate-related threats.

Resilience is the capacity of a community or environment to anticipate and manage dangerous climatic events and recover and transform after the ensuing shock, with minimal damage to societal wellbeing, economic activity, and the environment. Examples of increasing resilience in a community include long-term planning, early warning systems, training for new skills, diversifying the sources of household income, strengthening nature-based solutions, and building robust communal response and recovery capacities.

Climate finance refers to financial resources and instruments that are used to support action on climate change. Climate finance is critical to addressing climate change because of the large-scale investments that are needed to transition to a low-carbon global economy and to help societies build resilience and adapt to the impacts of climate change.

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

Vulnerability is the predisposition to be adversely affected. It encompasses sensitivity or susceptibility to harm, and lack of capacity to cope and adapt.

Risk is the possibility of something bad happening. Risk involves uncertainty about the effects/implications of an activity with respect to something that a person values, often focusing on negative, undesirable consequences

Disaster is a serious problem occurring over a short or long period of time that causes widespread human, material, economic or environmental loss which exceeds the ability of the affected community or society to cope using its own resources

Disaster Risk Reduction is systematic approach to identifying, assessing and reducing the risks of disaster. Aims to reduce socio-economic vulnerabilities to disaster and the environmental and other hazards that trigger them

Hazard is a potential source of harm. Substances, events, or circumstances can constitute hazards when their nature would allow them, even just theoretically, to cause damage to health, life, property, or any other interest of value

Executive Summary

Climate change is happening now and is projected to worsen in the future. Siaya County is extremely susceptible to impacts of a changing climate because most livelihoods are reliant on climate sensitive sectors including agriculture, fisheries and trade in agricultural products. Moreover, majority of county residents still rely on biomass to meet their energy needs. Social infrastructure is equally affected by floods, thereby affecting communities who are already underserved by health, water, schools, social halls and associated infrastructure.

Participatory Climate Risk Assessment (PCRA) is a mechanism for evaluating the risks and effects of climate change so that informed climate resilience actions that are sustainable can be designed. Experts from different fields acted as facilitators. PCRA is premised on the fact that when the local community is involved in a process they will own the results of the exercise. This will put them in a good position to assume responsibility for implementing the activities to increase their adaptation to effects and impacts of climate change.

Chapter one gives the back ground of highlighting the need and process leading up to the PCRA. Purpose of the PCRA and steps followed to come up with this report. Chapter two gives the County Climate Hazard Profile explaining the Current and Historical Climate Hazards and Trends, Exposure and vulnerability profiles of the county, Differentiated impacts of climate trends and risks and Spatial Distribution of Risks. Chapter three focuses National and downscaled climate change projections and County future climate scenarios.

Chapter four looks at the Analysis of Existing Resilience/Adaptation Strategies to Current and Future Climate Risks. In this chapter, Effectiveness of adaptation/resilience strategies to future climate risks is explained. Chapter five talks about the County Climate Strategic Adaptation Investment/Action Priorities. Chapter six concludes by looking at the conclusion of the PCRA exercise and what the community proposed as the way forward.

Walter Okelo
Chief Officer - Water, Sanitation, Environment, Natural Resources &Climate Change County Government of Siaya

1.0 Context of the Participatory Climate Risk Assessment

1.1 Background

1.1.1 Administration and Demography

In 2019, the population of the county was 993,183 consisting of 471,669 (47.5%) males and 521,496 (52.5%) females. This was projected to increase to 1,040,616 consisting of 525,833 males and 514,782 females in 2022. It is further projected to rise to 1,097,141 comprising 552,387 males and 544,755 females and 1,136,553 comprising 571,351 males and 565,202 females in 2025 and 2027 respectively.

Administratively, Siaya is divided into six sub-counties including Rarieda, Bondo, Alego-Usonga, Gem, Ugunja and Ugenya. These are further subdivided into 30 wards with various sub locations.

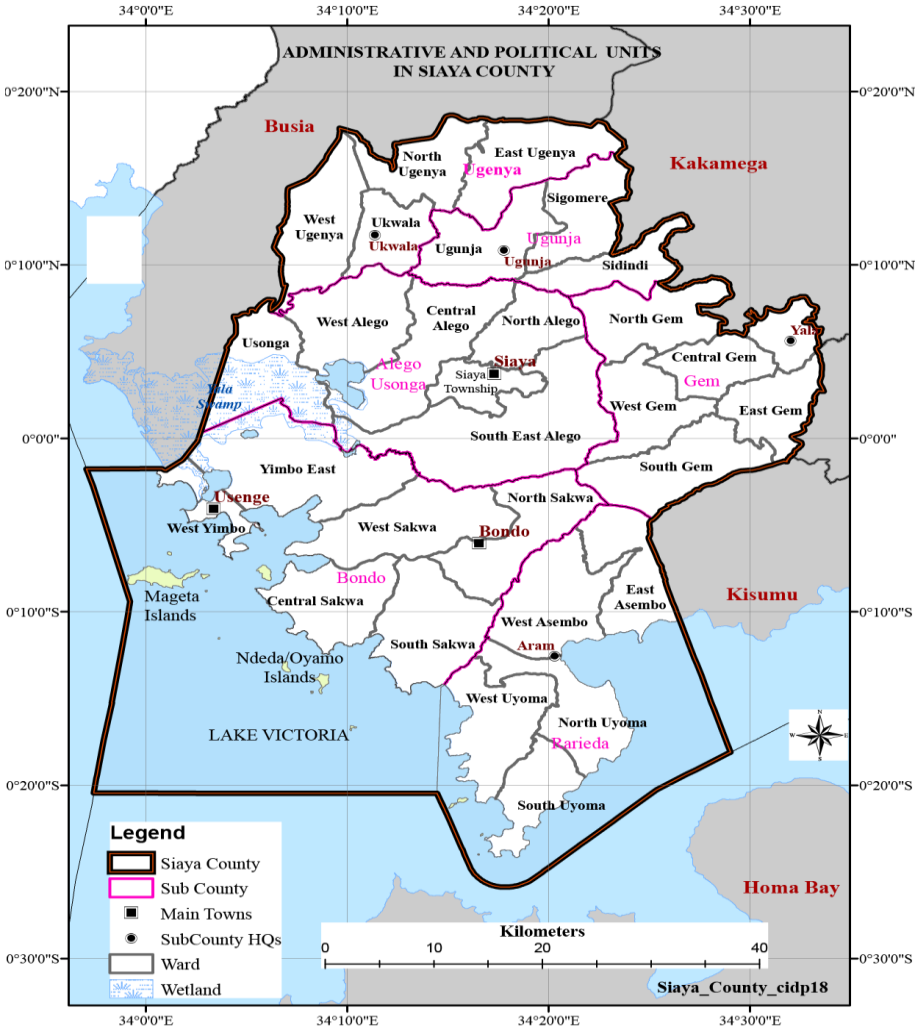

Figure 1 Administrative and Political Units

1.1.2 Geography

With a combined surface area of 3,535 km² (land 2,530 km²; water 1,005 km²), Siaya County borders Busia County to the North West, Vihiga and Kakamega Counties to the North East, Kisumu County to the South East and Homa Bay County across the Winam Gulf to the South.

The county's surface water resources include Lake Victoria, Lake Kanyaboli, Lake Sare, River Yala, River Nzoia and Yala Swamp. Major rivers include Nzoia and Yala, both which of drain through Yala Swamp and finally into Lake Victoria. Several tributaries, among them, Huiro, Uludhi, Wuoroya, Ugege, Seme Awach, Ndate, and Rawuo, feed the two rivers. The county also hosts several swamps, wetlands, dams and water pans that serve both domestic and commercial users.

The county is divided into three major geographic areas namely: Dissected Uplands, Moderate Lowlands and Lowlands such as Yala Swamp. These areas have different ecological characteristics of reliefs and soils, which influence their inherent land use patterns. The County's altitude rises from 1,140m on the shores of Lake Victoria to 1,400m above sea level on the North (Ugunja, Ugenya and parts of Gem). Major hills include Mbaga and Akara (Alego Usonga), Odiado (Ugenya), Regea, Rawalo and Nguge (Gem), Usenge, Ramogi hills, Got Abiero, Sirafuongo (Bondo) and Rambugu and Naya hills (Rarieda).

These geographic features inform diverse socio-economic livelihood activities in the county and its development plans. For instance, high altitude areas of Ugenya and Ugunja sub-counties and Gem (particularly Gem North) experience high rainfall, hence are suitable for intensive agriculture. The low altitude areas of Bondo, Rarieda, parts of Alego Usonga and Gem South experience low rainfall amounts and is thus suitable for drought resistant crops and fishing.

1.1.3 Socio-economic characteristics

The County performs below the national average on most socio-economic indicators. It scores a Human Development Index of 0.46 which is below the national average of 0.56. Poverty is prevalent in the county and manifests itself in other socio-economic outcomes such as poor nutrition, health, and education as well as a lack of access to basic services. Unemployment is a major challenge in the county, especially among the youth. The majority of the population is employed in fishing and agricultural activities, with limited opportunities in commercial ventures and public service. As more young people enter the workforce due to rapid population change, the pressure on available

employment opportunities is expected to increase. High population density, HIV prevalence, water scarcity, falling food production combined with effects of climate change are increasing food insecurity, environmental degradation and poverty levels in the county. (Population Action international,2023)

The main economic activity is agriculture comprising of crop and livestock production as well as fishing. Crop and livestock production in the area is largely subsistence with a key focus on maize, beans, cassava, finger millet, sweet potatoes, bananas, tomatoes, sorghum, cattle, sheep, goats and chicken. The mean monthly food expenditure per adult accounted for 68.9 percent of household expenses, way above the national average of 54.3 percent. This is an indication of high poverty levels in the county because it is generally accepted that the poorer the household, the larger the share of its income spent on food.

The county mostly practices rain-fed agriculture. Consequently, dry spells often impact agricultural productivity, livelihoods and incomes, and rendering the county a net food importer. Climate extremes, such as flooding, are expected to increase in frequency and intensity leading to anaerobic soil conditions, plant stress, and reduced yields or even total crop failure. Climate change is already impacting inland fisheries production. Increasing temperatures and reduced wind velocities have weakened lake mixing, with a subsequent reduction in nutrient availability. Increasing water temperatures may force many aquatic species to relocate to colder areas of rivers and lakes as a coping strategy, thereby impacting fishing volumes.

Only 58 percent of county residents have access to improved water sources while the rest still rely on surface water sources. Waste management in the urban areas largely remains sub-optimal. The percentage of those who can read and write (basic literacy) is 79.75 percent while life expectancy is estimated to be 40 years—a staggering 16 years shorter than Kenya's average of 56.6 years. The major causes of morbidity and mortality include malaria (54 percent) respiratory tract infections (15 percent) and diarrheal diseases (4 percent). HIV/AIDS also contributes to morbidity and mortality.

Climate change is already affecting ecosystems and natural resources that support livestock production. These impacts include increased frequency of extreme weather events, such as, droughts and floods, productivity losses due to physiological stress occasioned by temperature increase and changes in water availability, and increased incidences of emerging diseases. Trade and manufacturing sectors are often indirectly affected by climate change, as they depend on climate sensitive sectors such as agriculture, transportation and energy. Reduced agricultural productivity occasioned by climate change may lead to reduced supply of raw materials for agro-processing or even trade.

1.1.4 Climate

Like the rest of Kenya, annual rainfall patterns in Siaya County is bi-modal, with the long rains falling between March and May (MAM) and the short rains between October and December (OND). Over the western part of the country including Siaya County however, a third rainy season is experienced between the months of June and August. Annual rainfall amounts range from 1000 – 2000 mm, with the southern parts of the county bordering Lake Victoria on the lower end of the spectrum with the northern parts on the upper end.

Consistent with other regions west of the Rift Valley, the county experiences high frequencies of thunderstorms, lightning and hailstorms. Strong winds are also experienced during, and often accompany, the rainy seasons. Temperatures range from a minimum of 15˚C to a maximum of 32˚C.

1.1.5 Agro-ecological zones

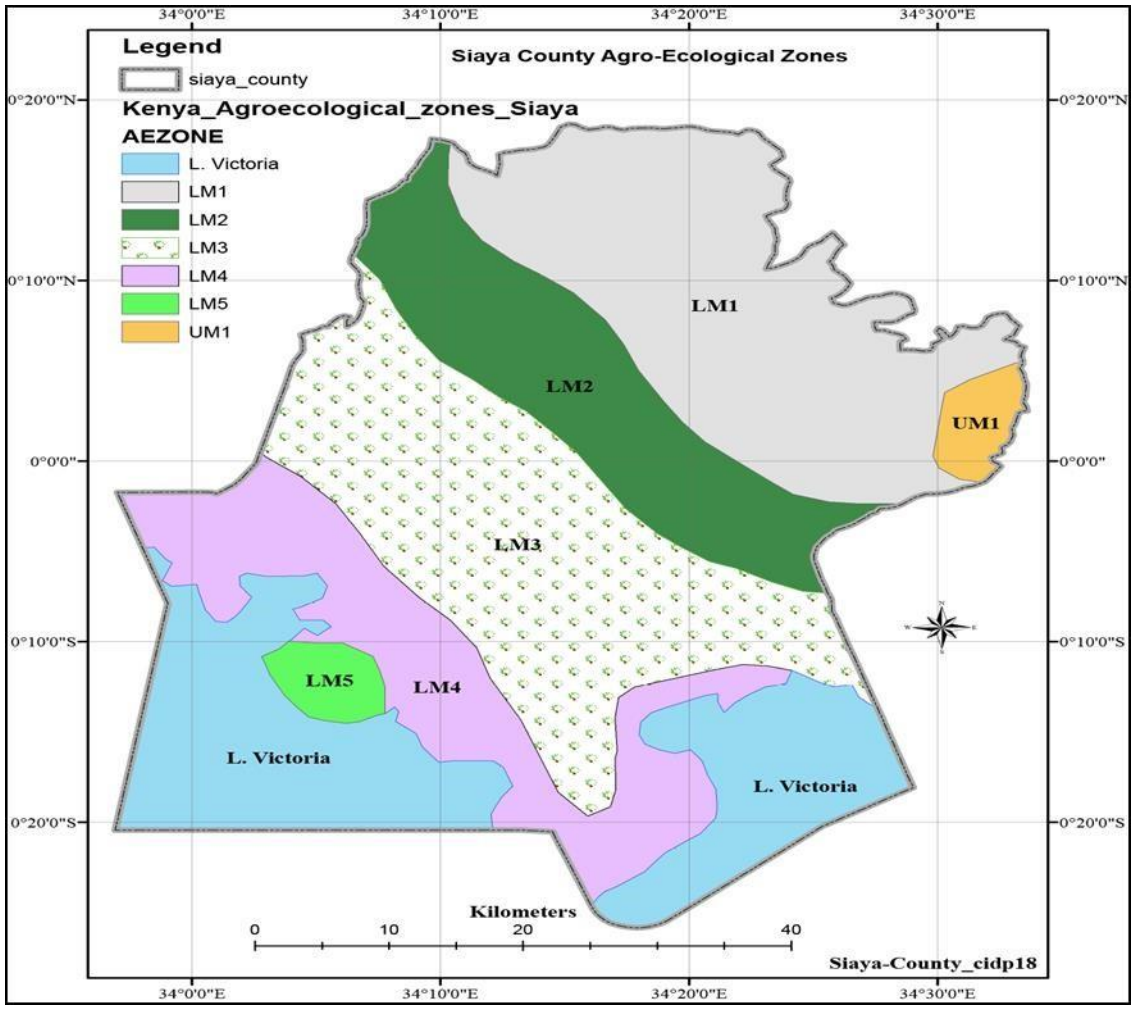

Figure 2 Agro-ecological zones

Siaya County falls under the "Lower Midlands" agro-ecological zone. Here, annual mean temperature ranges from 21^0 to 24^0C, with night temperatures falling as low as 14^0C. Siaya is further divided into 5 subzones based on weather patterns experienced.

Lower midland zone 1 (sub-zone LM1): This sub-zone is characterized by long cropping seasons due to cool temperatures, receiving 750-900 mm and 400-500 mm of rainfall in the first and second rainy seasons, respectively. Major crops grown during the long rains (March-April-May) include maize and beans intercrop, sorghum, cassava, groundnuts, cowpeas and sweet potatoes. During the short rains (October-November-December), however, maize and beans intercrop, cowpeas and sweet potatoes are prioritized. Fruit trees such as

bananas, pawpaw, passion fruit, mangoes and avocadoes also do well in the subzone. Masiro Katsieno in Ugenya sub-county, Sigomere and Mudhiero in Ugunja sub-county, Yala in Gem Sub County, falls under this sub-zone.

Lower midland zone 2 (sub-zone LM2): This sub-zone is characterized by long cropping seasons only that it receives slightly lower amounts of rainfall of 700-800 mm and 400-500 mm in the first and second rainy seasons, respectively. Maize and beans intercrop, sorghum, cassava, sweet potatoes and sole maize are the main crops grown in both seasons. Similar to LM1, fruit trees such as cooking bananas, pawpaw, passion fruit, mangoes and avocadoes are also do well in the subzone. Sega and Ukwala in Ugenya sub-county, Ugunja centre and Sidindi in Ugunja sub-county, Mutumbu and Wagai in Gem sub-county falls under this subzone.

Lower midland zone 3 (sub-zone LM3): Characterized by a medium cropping season and weak short rains, this subzone receives 480-600 mm and 300-400 mm of rainfall in the first and second rainy seasons, respectively. Cotton is the most suitable crop for the subzone, although its cultivation at present is quite limited owing to the near collapse of the industry. Maize and beans intercrop, sorghum, cassava, sole maize, groundnuts, sole beans and sweet potatoes are mainly grown in both seasons, while mangoes are the most common fruit trees. Boro, Siaya town and Uranga in Alego Usonga Sub-County, Rera in Gem sub-county falls under this sub-zone.

Lower midland zone 4 (sub-zone LM4): Characterized by a medium cropping season and weak (short) to very short rains, this sub-zone receives 350-450 mm and 200-300 mm of rainfall in the first and second rainy seasons, respectively. Maize and beans intercrop, sorghum, sole maize and groundnuts are mostly cultivated during the long rains), with maize and beans intercrop and sole maize again being cultivated during the short rains. Similar to LM3, mangoes are common in the subzone. An example of the subzone is Bondo Town, Mur Malanga and Nyangoma in Alego Usonga sub county, Asembo in Rarieda sub-county.

Lower midland zone 5 (sub-zone LM5): Characterized by a medium cropping season and weak (short) to very short rains, this sub-zone receives 300-400 mm and 200-300 mm of rainfall in the first and second rainy seasons, respectively. Maize and beans intercrop, sorghum, sole maize and groundnuts are mostly cultivated during the long rains), No maize is cultivated during the short rains. Similar to LM4, mangoes are common in the subzone. An example of the subzone is Usenge in Bondo Sub County, Mur Malanga and Madiany in Rarieda subcounty.

1.2 Policy Context

1.2.1 International Policy Context

The United Nations Framework Convention on Climate Change (UNFCCC) sets an overall framework for intergovernmental response to climate change, recognizing that the climate system can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The UNFCCC was adopted on May 9th, 1992 and opened for signatures at the United Nations Conference on Environment and Development (UNCED) the same year. Among others, the conference also adopted the Agenda 21, the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). It is a non-binding agreement. Currently, there are 197 state parties to the Convention, including Kenya.

Through its Conference of the Parties (COP), the UNFCCC provides a platform for state parties and other key stakeholders to take stock of the status of implementation of climate change actions as well as recommendations necessary to promote the effective implementation of the Convention. Decisions made and agreed to by Parties at the COP are binding to all the UNFCCC Party States, and therefore to sub-national governments under the Party States. This is the relevance of the Convention to Siaya County for Kenya is a Party to the Convention.

Intergovernmental Panel on Climate Change (IPCC): The UN Environment Programme and the World Meteorological Organization (WMO) jointly established the IPCC in 1989 to provide broad and balanced information about climate change. The IPCC fulfils this role by reviewing and assessing the most recent scientific, technical and socioeconomic information produced worldwide relevant to the understanding of climate change and translating this information into IPCC Assessment Reports and other periodic releases. IPCC's mandate to member states such as Kenya and its sub-national entities such as Siaya County Government enables provision of scientific, technical and other relevant information that informs climate change actions that entities should adopt. Such information includes projected temperature and rainfall changes and associated spatial and temporal socio-economic impacts.

The Paris Agreement: The Paris Agreement to the UNFCCC, just like the Kyoto Protocol is an instrument of the UNFCCC. The Convention is a consensual, nonbinding agreement that must be implemented by politically binding agreements such as the Kyoto Protocol, the Paris Agreement and others that will be agreed to, under the COPs. The Paris Agreement was adopted in Paris, France in 2015 in COP 21 and came into force on November 4th, 2016. To date, 187 Parties

of the 197 Parties to the UNFCCC have ratified the Agreement. Kenya ratified it on December 28th, 2016.

The Paris Agreement mandates all Parties to the UNFCCC to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. This is achieved primarily through the Nationally Determined Contributions (NDCs), which are country-specific and owned action plans detailing mitigation, adaptation and other related actions individual countries intend to undertake in order to combat climate change. NDCs are implemented at both national and sub-national levels, and many actions in Kenya's first NDC relate to a number of devolved functions of interest to Siaya County.

1.2.2 Regional Policy Context

African Ministerial Conference on Environment: The African Ministerial Conference on Environment (AMCEN) was established in December 1985, following a conference of African ministers of environment held in Cairo, Egypt. AMCEN is a platform that brings together African ministers for environment to deliberate on common environmental and sustainable development issues of the continent. AMCEN has increasingly played a key role in advancing Africa's common positions on climate change, particularly with respect to the COPs and is therefore of relevance to sub-national governments like Siaya. For instance, issues that inform the common positions that AMCEN advances at the COPs are discussed at both national and county levels. Kenya has particularly been active as well as played a key role in AMCEN given its role as the host of the United Nations Environment Programme (UNEP) that provides secretariat services for the platform.

The East African Community (EAC) Climate Change Policy (2010) guides Partner States on the preparation and implementation of collective measures to address climate change in the region. The African Union's Agenda 2063 commits to climate change action that priorities adaptation and calls on member countries to implement the Programme on Climate Action in Africa including a climate resilient agricultural development program. Moreover, AU's Agenda 2063 commits to building climate-resilient economies and communities.

The Intergovernmental Authority on Development (IGAD) has also prepared the **IGAD Drought Disaster Resilience and Sustainability (IDDRS) Strategy**. IGAD Member States, Kenya included, developed Country Programming Papers (CPPs) for the Ending Drought Emergencies (EDE) interventions to be undertaken at the national level, from which the County Governments can now draw on for their drought resilience initiatives.

1.2.3 National Policy Context

The Constitution of Kenya 2010 forms the foundation of the institutional and legal framework for climate change action. Article 10 sets out the National values such as sustainable development. Article 42 provides the right to a clean and healthy environment for every Kenyan. The constitution created 47 devolved County Governments which have a key delivery role in climate response. For instance, the Fourth Schedule to the Constitution mandates counties to intervene on climate-sensitive sectors such as water and sanitation, agriculture, forestry, public works, health, and tourism.

Kenya Vision 2030 and its Medium Term Plans: The Vision 2030 presents opportunities to identify climate-related actions and priorities through its implementation tools, the medium term plans (MTPs). The Fourth MTP (2023-2027) thus has a dedicated section on climate change, in addition to treating the same as a crosscutting theme in all sectors of the economy including governance and the rule of law. This is a key lesson for counties on how to mainstream climate change. The MTP IV identifies actions to address climate change, including implementation of the second National Climate Change Action Plan (NCCAP 2018-2022) and the Green Economy Strategy and Implementation Plan (GESIP 2016-2030) as well as mainstreaming of the Climate Change Act 2016 into sector policies, programs and projects formulation.

Green Economy Strategy and Implementation Plan 2016-2030: The Green Economy Strategy and Implementation Plan (GESIP) 2016-2030 aims at providing guidance to all development actors to adopt pathways with higher green growth, cleaner environment and higher productivity relative to the business as usual growth scenario. It will aid Kenya's transition to a low carbon development path through promotion of economic resilience and resource efficiency, sustainable management of natural resources, development of sustainable infrastructure and providing support for social inclusion. Similar to the other plans, policies and strategies for green growth/climate change response, GESIP recommends for mainstreaming of its proposed actions into development planning at both national and county levels, complemented by sound intergovernmental coordination for creating synergies.

Climate Smart Agriculture Strategy 2017-2026: The Climate Smart Agriculture Strategy (CSAS) 2017-2026 was developed to address the effects of climate change on the agricultural sector, taking cognizance of the importance of the sector to the country's economy. Agriculture being a devolved function, implementation of CSAS 2017-2026 largely rests with county governments. CSAS thus recommends that each county develops CSA policies, strategies and plans

to guide implementation or integrate County specific strategies into its County Integrated Development Plans (CIDPs) and other plans.

Public Finance Management (Climate Change Fund) Regulations, 2018: The Public Finance Management (Climate Change Fund) Regulations, 2018 aim at operationalizing the Climate Change Fund. The Regulations provide for the disbursement of the Fund's resources in the form of loans, grants or equity to eligible implementing agencies including county governments, as provided for in Section 25, for development of innovative actions that benefit climate change responses in Kenya.

The Climate Change Act (2016) provides the regulatory mechanisms to implement climate change resilience and low-carbon actions in both public and private sector development activities and has enshrined the National Climate Change Action Plan (NCCAP) – to be developed in 5-year cycles and aligned with the Medium Term Expenditure Plans (MTPs)—as its principal implementation instrument. It requires County governments to domesticate the Act. The National Adaptation Plan (2015-2030) aims to integrate climate change into national and county level development planning and budgeting, as well as enhance the resilience of vulnerable populations to climate shocks.

1.2.4 County Enabling Legal & Policy Framework

Siaya County Climate Change Policy (2020) is a major milestone in addressing county residents' vulnerability to climate change. The policy's overarching objective is to reduce vulnerability to the impacts of climate change by building adaptive capacity, enhancing climate change resilience and strengthening capacities for disaster risk reduction. The policy also provides a framework for mainstreaming climate change adaptation in county planning and budgeting cycle, promotes climate change awareness, mechanisms for mobilizing climate finance, and mainstreams gender in the county's climate change adaptation and mitigation efforts. The policy also creates a robust institutional framework for climate change response, recommends the adoption of specific legislation to better implement locally-led climate change response activities in Siaya County.

Siaya County Climate Change Act (2021) creates a Fund that will, among others, finance climate change programs in the county, mainstream climate response in the county planning and budgeting cycle, domesticate national climate change policies, support climate change awareness in the county, and create various institutions including community-level structures such as Ward Climate Change Planning Committees. The Act offers guidance on how to access additional finance for climate change interventions, including but not limited to the National Climate Change Fund and mechanisms to leverage Public Private Partnerships

(PPPs) as a vehicle for implementing low carbon climate resilient development activities in the county.

Siaya County Disaster Risk Reduction (DRR) Policy Framework is another instrument that demonstrates the county government's commitment towards addressing climate-related disasters. The goal of the DRR framework is to minimize the effects of potential disasters in the long run, thereby preserving lives, livelihoods and assets. Thus besides addressing the potential for immediate and accidental disasters, this policy focuses on DRR as the over-arching framework, for integration of risk reduction measures in the long term development plans of key sectors. It is intended to offer guidance by proposing relevant action points to be adopted in anchoring resilience in the long term development programming, besides responding to accidental disasters.

Siaya County Integrated Development Plan (CIDP; 2023-2027): Existing laws (County Government Act and Public Finance Management Act) allow county governments to spend only on priorities listed in the County Integrated Development Plan (CIDP), Annual Development Plan (ADP) and annual budget. The National Treasury has mandated counties to mainstream climate change in the third generation CIDPs, including indicators to track implementation. Therefore, the Siaya County Integrated Development Plan (CIDP; 2023-2027) provides a framework to prioritize, resource and implement climate priorities in the next 5 years. An overview of climate priorities in the CIDP is provided in the sections that follow.

Adaptation actions were a priority for Siaya County, consistent with the National Climate Change Action Plan 2018-2022 (NCCAP) for Kenya. Climate Smart Agriculture (CSA) priorities include, among others, expanding production of high value traditional crops, drought tolerant crops, improved livestock breeds, micro irrigation schemes, conservation agriculture and livelihoods diversification. The CIDP also includes actions that promote climate change mitigation. Many of these actions, such as increasing forest cover and agroforestry, also generate climate resilience benefits and can be considered adaptation actions. These include, among others, using solar power at the various water points and promoting the use of energy saving cook. Some of these priorities will require adoption of new county policies and legislation for better implementation including the formulation of Siaya County Climate Change (Rules and Regulations).

Siaya County Water and Sanitation Act 2018

Promotion of the use of renewable energy sources as a prime mover for public water supply schemes. This entails retrofitting bore holes with solar pumps and

hybridization of national power grid connections to water supply schemes with solar driven systems.

Siaya Youth Agri - business Strategy 2020 - 2024

The Strategy is designed to leverage on youth innovation, energy and techno savvy inclination, combined with multi sectoral players and development partner initiatives to create sustainable and gainful self-employment for the youth through engagement in agribusiness value chains.

Siaya County Agriculture Policy 2021

This policy seeks to stimulate agricultural production and productivity through targeted technical support, intensified investment, improved research and technology, extension services and capacity building to ensure development and sustainability of the sector. It proposes interventions that position crops, livestock and fisheries production as major economic activities in the county.

Siaya County Soil Management Policy 2021

This policy sets out the road map for overcoming challenges such as declining soil fertility, soil erosion, Climate change, land use, land tenure systems and deforestation which affect soil management in Siaya County. The policy commits the County Government of Siaya to various policy interventions.

Siaya County Fisheries and Aquaculture Act 2018

This Act provides for the sustainable utilization, management and development of Fisheries, Aquaculture and other Aquatic resources and for connected purposes.

1.3 Purpose of the PCRA report

The Participatory Climate Risks Assessment (PCRA) Report aims to inform the residents of Siaya and the county government on how to integrate climate change proof projects and programmes systematically into its community planning and development. This report is designed to be self-explanatory to the community members, Community-based organizations, municipalities and national government agencies. They may find this useful in assessing existing or planned development projects.

Specifically, the PCRA report is aimed at: -

- Raising communities' awareness,
- Enabling communities and the county government to assess their climate change and disaster risks
- Stakeholders to develop adaptation strategies (Non-governmental or community-based organizations.

This report will inform:

- Climate change and hazard analysis relevant to the context of the 30 wards
- Display Vulnerability assessment
- Come up with community led responses to the impacts of hazards and adaptation strategies
- The report will also highlight co-benefits of adaptation strategies to be implemented.
- And, finally Community adaptation planning

1.4 Key steps in the county's PCRA process

As described in the PCRA guidelines, the PCRA was implemented through 8 main steps. These are: Formation of the technical working group; training of the technical working group; mapping of stakeholders; preparation for community engagements; conducting participatory risk assessment at ward level;

preparation of ward level risk assessment reports; data analysis and preparation for county level multi-stakeholder workshop; multi-stakeholder climate change risk assessment workshop and final report writing as detailed in the section below.

Formation of the technical working group: The CECM in charge of climate change affairs officially launch the PCRA process during the technical working group training at White hotel. She emphasized the importance of the project in informing further actions to combat climate change and improved livelihoods.

Training of the technical working group: A technical Working Group was composed led by the directorate in charge of climate change affairs. This formed the PCRA team was consisting of county technical staff from Livestock production, Veterinary services, social development, public health, Civil society organization and the environment sectors. These were complemented by interns who not only played a critical role during the organization of activities but also learnt and gained experience. Prior to the PCRA exercise the team was taken through intensive training where the various data tools were shared and prospective roles clearly highlighted. Every team understood their responsibility and how to handle different scenarios anticipated in the field.

Preparation for community engagements: The sub county and ward administrators acted community mobilizers. This happened after they were taken to a training meeting to highlight their functions in the Siaya county climate change Act, 2021 and their vital role within the PCRA process. This involved training in stakeholder analysis and working relationship with the office of the MCA in the wards. The stakeholders were groups as follows: -

Stakeholder analysis: This process led to the categorization of stakeholders as shown below:

Table 1 Stakeholder analysis

High Influence, Low Interest	□ State Department of Youth and Gender □ KNCCI □ Research and Academic Institutions e.g., JOOUST □ Faith Based Organization's /Groups □ Media
High Influence, High Interest	□ Ministry of Interior – (Chief/Asst. Chief)

	□ Water Service Provider's /CBOs/ NGOs/CSOs □ Department of Agriculture (crop/ livestock/fisheries/veterinary) □ Department of health □ NEMA □ Research institution's □ Kenya Forest Service □ Kenya Meteorological Department □ National Drought Management Authority □ WCCPC □ Siaya Municipal Board □ Member of County Assembly (MCA)
Low Influence, High Interest	□ Farmer Groups □ Business community □ Hospitals □ Environmental ambassadors

Conducting the PCRA: The facilitators were to have note takers to capture the inputs from the community to handle enriching the document. The facilitators agreed to carry out probing to capture the relevant information. In a bid to have the exercise accessible to communities and other local actors, and specifically women, youth, ethnic minorities, people living with disabilities and other marginalized and vulnerable groups, meeting were done at ward level buildings. The public participation targeted a maximum of 100 people at public participation.

Public participation: To comply with the county government guidelines for public participation, the directorate of climate change was involved and ensured that all rightful categories were invited and that no ward was left behind. The ward administrators also made sure in their mobilization, all sub locations of the wards were captured. The representations was diverse and there was representation of women, men, youth and Persons with disability.

Figure 3 PCRA process ongoing in North Sakwa ward

Figure 4 PCRA process ongoing in Usonga ward

Data Analysis: The information was collected from the community at the ward level, it was analyzed by the technical working group to identify common hazards, historical & current climate patterns, and key issues related to climate risks in each ward in Siaya County. The data analysis phase involved synthesizing and interpreting the qualitative information obtained from the entire stakeholder engagement process at the ward, and county levels. The analysis assisted in understanding the specific climate-related risks and vulnerabilities that exist in all the wards around the county. This phase identified existing climate change

adaptation measures and their effectiveness in curbing the climate change menace.

Multi Stakeholder workshop: A multi stakeholder workshop was held at the county level in combination with the world environment day planning meeting. The main goal of the workshop was to bring together representatives from different stakeholder groups, including government officials, community-based organizations (CBOs), community members, NGOs, faith-based organizations (FBOs), civil society organizations (CSOs), and business people. The workshop served as a platform for sharing the findings of the ward engagements and fostering dialogue among stakeholders. It allowed for the validation of key hazards and risks, potential adaptation measures, and the prioritization of adaptation options. The meeting also helped in enriching the document and validating the most appropriate and effective adaptation strategies in Siaya County.

Drafting of Participatory Climate Risk Assessment Report: Drafting of this PCRA report was the final stage. Based on all community's' inputs and secondary data, this report was developed. It outlines the identified climate risks, their potential impacts, and recommended adaptation strategies as well as prioritized areas.

2.0 County Climate Hazard Profile

2.1 Historical and Current Climate Hazards and Trends

This chapter provides an analysis and comparison between the historical and the current climate hazards trends. Inclusion of scientific information and data collected during the community engagements is captured here.

Historical Climate Hazards

Siaya County has two peaks in rainfall which occur in April and November on average (figure 1). The April peak is larger, with around 220mm received at that time, and in November the county receives about 140mm on average. A drier period occurs in January and February with around 60mm per month on average. A second drier period also occurs in July where approximately 70mm of rainfall occurs on average. Figure 1 shows an average of all the rainfall occurring across the county and is an average across a thirty-year period, from 1983-2013. The figure 1 is also based on monthly averages so it is not detailed enough to assess onset or cessation of rainfall at a daily scale. The assumptions of the study stipulate that locally measured point rainfall figures may differ from the findings compared to dataset, CHIRPS, captured from satellite and rain gauge data used to estimate the findings this study.

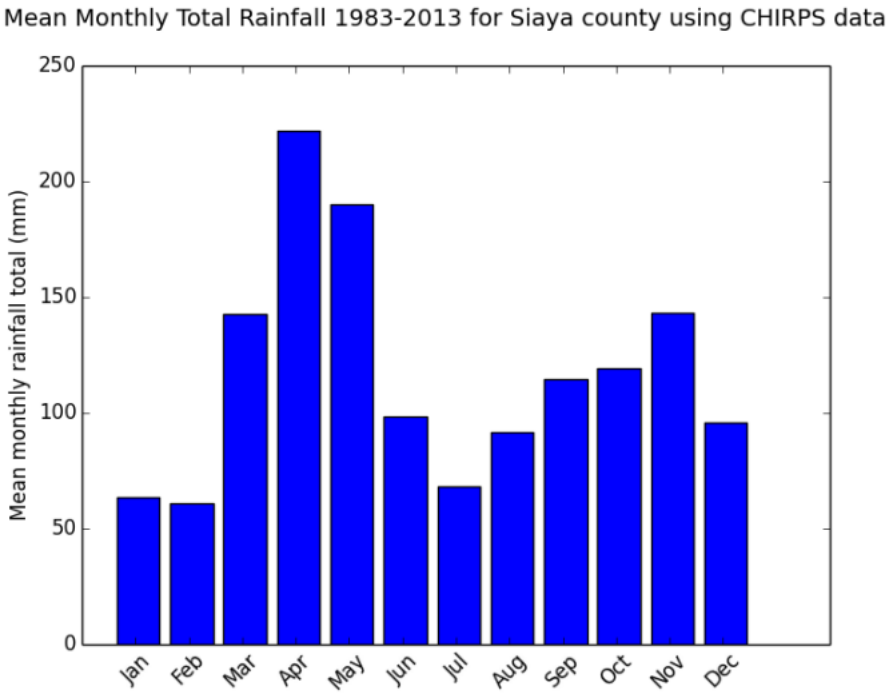

Figure 5 Map of rainfall distribution across Siaya county

The above displayed map of rainfall distribution across Siaya County, averaged cross four three-month periods. The dry period in January and February can be clearly seen. The June, July and August map (JJA) which contains another drier period is also evident. The wetter period around April (present in the MAM map) is also displayed. A trend across the county appears to exist with drier conditions typically present in the south and west through the year, with wetter conditions in the north and east.

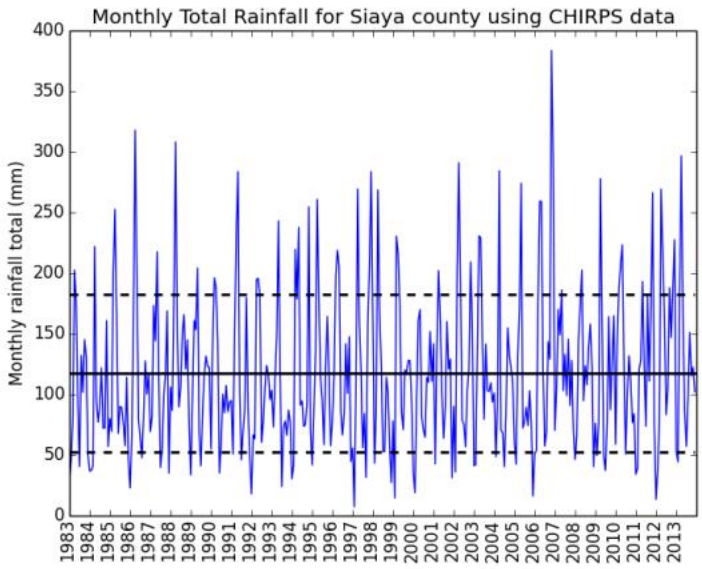

Figure 6 Monthly rainfall for Siaya County

Line graph showing the variation in monthly totals of rainfall over Siaya county from 1983 to 2013 (blue line). The average monthly total rainfall for the whole period (solid black line) and the standard deviation (dashed line) are displayed. The standard deviation shows the amount of variation in the data.

Temperature

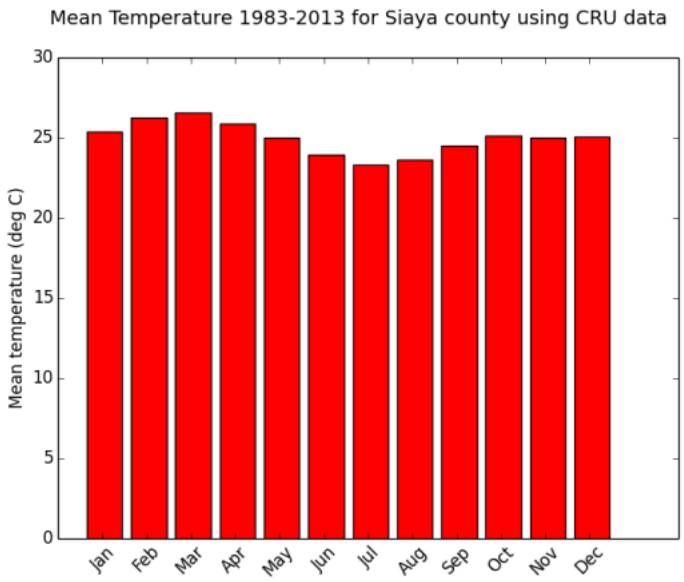

Figure 7 Mean temperature for Siaya County

The Bar graph above is showing the average temperature in Siaya County for each month calculated over the period from January 1983 to December 2013.

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Current Climate Hazards of Siaya County

The county is fairly hot (21-25 °C) and moist (1000-1750 mm precipitation annually). There is a strong precipitation gradient with the northern areas receiving more than 1750 mm, and the southern areas closer to Lake Victoria receiving 1000-1250 mm of precipitation. Both temperature and rainfall are high during most part of the year, although the first wet season (January-June) receives higher and more consistent precipitation than the second season (July-December). Intense precipitation and heat stress are both hazards that contribute to agricultural risk in the County throughout the year, Dry spells are on average longer during the second wet season, with consistently close to 60 consecutive days of moisture stress. While in the first season moisture stress occurs for fewer than 30 days. Extreme precipitation and flood risks are moderate to low

in both seasons, with most years receiving 10-25 mm of precipitation on the wettest day. This pattern dictates the kind of agricultural activities that can be undertaken in the region.

Community members on during the climate risk assessment

The community members from the ward stated that there have bouts of severe droughts in the last ten years. During the same period, cases of severe flooding in several sections of the county around the lake have been reported namely: Usonga ward, Yimbo and Sakwa wards.

The ward contributions from community identified unpredictable onset of rainfall and durations of the dry season as the major current hazard. This mainly affects agricultural sectors and causes stress in availability of water to households. Cases of some boreholes drying up has been identified. The current repeating patterns of floods and droughts in the county was cited to be one of the main reasons for economic and social stress. In the agricultural sector, crops, fisheries and livestock sectors were said to be severely affected by unpredictable rainfall.

In the scientific data delivered above, the short rains period was characterized by unpredictable rainfall when looking data of 1983 to 2013. The wards located in Bondo and Rarieda sub counties informed the assessment that they severely affected and there coping mechanisms was becoming limited. This necessitates the need for significant disaster risk investment.

The overreliance on rain fed agriculture highlighted during the ward engagement displayed the high level of vulnerability. Some of the consequences were listed in big numbers such as;-

- Low harvest for the ultra-poor households without any member employed
- The increased vulnerability to child and women headed families
- The need for multiple farm inputs after unpredictable rain cause failure in germination.

The community members also identified increase in groundwater levels in boreholes and wells, springs therefore necessitating other interventions of water supply. This was strongly suggested in North Alego and parts of Ugenya sub county. This is prone in dry parts of Alego Usonga and Ugenya sub counties.

Multiple hazards listed above were based on history and the current situation in sub counties as tabulated below: -

Table 2 current and Historic hazards/Risks experienced mentioned in the ward public participations.

S/NO.	Hazards /Risks	Specific Areas mainly affected	Cause
1.	Flooding	Alego Usonga, Bondo and Rarieda sub county	Lake victioria River Nzoia
2.	Soil erosion	Entire county	Rainfall
3.	Loss of biodiversity eg fish	Alego Usonga, Bondo and Rarieda sub county	Warming of the lake Overdependence of fish (wrong fishing nets)
4.	Drought (year)	Entire county	Prolonged dry seasons
5.	Pest & diseases eg army worm & dodder plant	Entire county	Seasons

6.	High temperatures	Entire county	Prolonged dry seasons
7.	Unpredictability of rainfall frequencies intensified	Entire county	Weather unpredictability

2.2 Exposure and vulnerability profiles of the county

Siaya County Vulnerability Indicators

To understand vulnerability further, the technical working group identified indicators to inform vulnerability within the county. The indicators also important because they will inform planning and decision making. To understand these indicators deeper, research was conducted and engagement dome with the community to portray the reality when it comes to climate change impacts. The indicators identified are: -

1. **Human Development Index**

The Human Development Index (HDI) which is a composite measure of development that combines indicators of life expectancy, educational attainment and income. The County performs below the national average on most socio-economic indicators, it scores a 0.46 which is below the national average of 0.56 on Human Development Index. Poverty is prevalent in the county and manifests itself in other socio-economic outcomes such as poor nutrition, health, and education, as well as a lack of access to basic services. Unemployment is a major challenge in the county, especially among the youth. The majority of the population is employed in fishing and agricultural activities, with limited opportunities in commercial ventures and public service.

From the ward engagements, the identification of poverty within the wards was characterized by unemployment within households which reduced their capacity to fulfill the basic needs. The vulnerable in this context are the children who might end up not attaining their life expectancy. The community engagements acknowledged the missing link between education and employment for their youths. The climate change impacts were exacerbating to the already unpleasant statistics for Siaya County.

Table 3 Poverty indicators situation in Siaya County

POVERTY INDICATORS		**SIAYA**	**KENYA**
Monetary Poverty Rate (%)		33.1	35.7
Multidimensional Poverty Rate (%)		68.8	53.0
Multidimensional Poverty Rate by Age Group (%)	Children (under 18 years)	65.2	52.5
	Youth (18-34 years)	70.1	48.8
	Adults (35-59 years)	82.9	60.8
	Elderly (60+ years)	62.7	55.7

2. Food and Nutrition security

According to FAO (2010), food and nutrition security refers to a situation where all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. About 34% of Siaya population is food poor (CIDP, 2018) with disparities across the sub counties (Opiyo et al 2015). The situation is aggravated with the county food produce only lasting nine months in a year.

During periods of drought, torrential rains and floods, the number of people in dire need of food aid substantially increases in the County.

The community engagement highlighted malnutrition is a big public health problem in Siaya. Some of the cause of malnutrition suggested were inadequate food intake, disease, poor maternal/childcare practices and household food insecurity and in line with Siaya County Nutrition Action Plan, 2018. Climate change related household food and nutrition insecurity exposes families to disease risks, interferes with growth and development of children and limits work performance.

It was clear that within the wards, climate change related household food and nutrition insecurity be considered as a vital issue in the planning and budgeting documents to increase food availability, access, utilization and stability. Diversification of food production techniques were suggested as one way to increase productivity and reduce loss of life.

Table 4 Siaya County Nutritional status

N0.	Indicator	Kenya-National	County- Siaya	Data Source
Height for height	-3SD severe stunting	4.2%	5.3%	KDHS, 2022
	-2SD Moderate stunting	17.5%	19.2%	
Weight-for-height	-3SD severe underweight	0.6%	1.1%	

	-2SD moderate underweight	4.9%	1.7%	
Weight -for-age	-3SD severe wasting	1.8%	2.1%	
	-2SD	10.1%	7.0%	
Women House ownership	Alone	4.5	4.4	
	jointly	28.2	47.4	
	% who do not own a house	67.2	48.2	

3. Agro-Ecological Zones

Siaya County has multiple agro ecological zones mainly: - Lower Midland Zones (LM) ranging from LM1 to LM5 with pockets of Upper Midland Zones which have a high agricultural potential. These are based on the climatic conditions of the areas. As a result of climate change, the different.

The community engagement provided a vivid picture of the current status as altered and has properties of unpredictable weather patterns increasing the occurrence of climate change hazards affecting livelihoods.

In the discussions, animals were also described as victims of these climate hazards such as the endangered Sitatunga antelopes located in the Yala swamp. They

suffer as result of reduced water levels while increased water levels have also destroyed the dyke at Kanyaboli Lake making water levels fatally low.

The Agro-Ecological Zones are explained in the table 4 below: -

Table 5 Agro-Ecological Zones in Siaya County.

Agro-Ecological Zones (AEZ)	**Altitude (m)**	**Annual Mean Temperatures**	**Annual Average Rainfall**	**60% Reliability of rainfall (mm**	
				Long rains	Short rains
Lower Midlands (LM1)	1300- 1500	21.8- 20.9^0 C	1500- 1900 mm		
Lower Midlands (LM2)	1337- 1457	22.3- 21.5^0 C	1400- 1600 mm		
Lower Midlands (LM3)	1160- 1350	22.7- 20.0^0 C	1020- 1390 mm	250-350	250-350
Lower Midlands (LM4)	1160- 1280	22.7- 22.3^0 C	890- 1020 mm	220-350	250-350
Lower Midlands (LM5)	790-1220	24.0- 21.6^0 C	650- 750 mm	180-300	200-300

The community level engagements confirmed that the Lower Midlands (LM 1-3) are sub-humid and humid zones with reliable precipitation. Areas under LM5 are found in the lower parts of the County around the shores of Lake Victoria. Both LM4 and LM5 are semi-humid, semi-dry lower midland zones classified as marginal cotton and livestock and millet zones respectively.

4. Communicable Diseases

Reduction in mortality arising from communicable diseases as a result of a decline in HIV Prevalence from 17.6% to 14.7% (NACC Estimates 2021) and improved TB cure rate from 83% in 2019 to 87% in 2022 (Tibu,2022). Improvement in management of non-communicable diseases (NCDs) through improved screening of non-communicable diseases including hypertension, cervical cancer, diabetes and mental health. Additional training of health care workers on NCDs supported by Non-Communicable Diseases Alliance of Kenya (NCDAK) through MOYO AFYA PROJECT. Training of health care workers on mental and conducting of mental health outreaches by the County Psychiatrist.

Reduction in the prevalence of malaria from 38% in 2018 to 19% (malaria indicator survey 2020). This reduction could be attributed to strengthening of malaria case management, LLIN distribution to pregnant mothers and children under one and community engagement in testing of suspected cases and treating the confirmed cases while at the same time referred the complicated cases (Draft Siaya county integrated development plan 2023-2027)

In cognizant of these worrying statistics of Siaya County, the negative impacts of climate change highlighted from the wards can only make the socio economic situation worse because of the vulnerable groups already burdened by diseases.

5. Women

Climate change is as a result of global warming. In Siaya County, it is currently causing environmental concern. Forests and trees play a vital role in mitigating climate change by sequestrating carbon dioxide which is a greenhouse gas. Climate change and deforestation is had to detach because trees provide environmental, social and economic benefits. Siaya county has a tree cover of about 0.23% according to the National Resources Assessment (2021) carried by the Kenya forest service. This alters a micro climate of an area.

Women are restricted by socio cultural reason to practice in tree growing initiatives because of land ownership barriers. In this situation, women suffer the most because of the cultural roles of women to look for firewood, and rely mostly in agriculture in better parts of Siaya County (Oloo, 2015).

As discussed in the community engagements, women in various wards complained on the hindrance by cultural practices in contributing to improve the output of their farms through agro forestry and have alternative income generating actives from the forestry value chain. This made them very vulnerable and with little power to become resilient to effects of climate change.

6. Youth and children

Siaya County has a fertility rate of 4.2 children per woman. Fifty-five percent of the married women in the county are using contraceptives. Seventy percent of all births in the county are delivered by a skilled health worker and 78 percent of the children 12-23 months are fully vaccinated. However, the County has a very HIV prevalence rate of 23.7 percent. In regard to education, the primary school net enrolment rate is 96 percent. This means that about 4 percent of the primary school age children are out of school in the county.

However, the secondary school net enrolment rate is much lower (63 percent) than the primary school net enrolment rate. It is estimated that 9,384 primary school age and 32,000 secondary school age children are out of school in the county. The Human Development Index (HDI) which is a composite index that measures the levels of literacy, health and economic well-being is 0.445 which is lower than the national average of 0.520. Young people in the county are faced various health challenges. The mains challenges are STIs, HIV and AIDs, teenage pregnancy and SGBV. These issues are caused mostly by lack of jobs, poverty, peer pressure, and lack of guidance from the parents. The county government together with other stakeholders should increase investments in education,

health and infrastructure and to set up efforts to reduce the HIV prevalence in the county (NCPD, 2017)

The community public participation highlighted unpredictable rainfall patterns and prolonged droughts due to climate changes that cause water scarcity. If access to clean water continues to become a challenge then incidences of water-washed diseases such as soil transmitted helminthes infections may rise, hence, leading to poor learning outcomes. Flooding, poor waste management and other climate-driven effects contribute to the rise in vector-borne diseases such as malaria making the youth, children and expectant mothers at risk.

2.3 Differentiated impacts of climate hazards / risks

Over the decades, Siaya County, like most other parts of Kenya has faced some measure of vulnerability to climate risks. Communities are predisposed to climate disasters by a combination of factors such as poverty, age, gender and settlement patterns especially in areas prone to perennial flooding. Vulnerable groups are mostly affected by climate change. These include:

Women: Climate change impacts affects women and men differently, and in Siaya, the disproportionate engagement of women to exploit agriculture and natural resources makes them highly susceptible to climate change and climate variability. Climate change is thus likely to worsen existing gender inequalities such as income disparities, labour engagement and market access between men and women. Women in Siaya seldom control land from which other livelihoods depend. Widows and women-headed households are particularly vulnerable to disenfranchisement for they own land through their spouses. Gender roles also ensure that the responsibility of fetching water, firewood, cooking and associated tasks rest on women. As climate change contributes to the scarcity of the said resources, it is women and girls who suffer the most.

Youth: Youth represent a crossover between the present and future generations, yet they are seldom involved in climate change response strategies. Climate change is already contributing to increased youth unemployment in sensitive sectors such as agriculture, manufacturing and tourism. Limited economic opportunities will likely result in youths dropping out of school, turning to crime, rural-urban migration and poor performance in school. Being a largely agriculture-based economy, Siaya County no longer generates adequate or even appropriate jobs of interest to the youth. Severe environmental degradation also threatens intergenerational equity.

Elders: Climate change risks such as droughts and floods tend to increase elder's vulnerabilities: appropriate foods may be unavailable, their mobility might be reduced and their dependence on others may increase. Droughts also negatively affect the traditional roles of older people, and perhaps more specifically their social position, as communities and power and support structures are dismantled, leaving older people with less influence and power. These challenges are already manifesting in Siaya County.

Children: Children are among the most vulnerable to the climate risk hazard such as drought and floods. Families have been driven to an increased reliance on negative coping mechanisms and strategies, which indirectly or directly affects children. When families are faced with difficult decisions in order to survive, they may be forced to leave their children, including at streets/relatives, so they can search for work or food, reduce the mouths they need to feed by engaging their children in forced marriage or labor. Negative coping mechanisms and strategies involving children have long-term repercussions, especially as children often do not have the same agency as adults, making them vulnerable to the decisions taken by their caregivers. Malnutrition has been also recorded among children in some pockets of the county especially during extended drought.

Persons with Disability (PWDs): Person living with disability and terminally sick people are affected by floods and drought owing to limitations regarding their mobility. People with terminal illness often exposed to lack of medication and this in long run might cause death.

2.4 Spatial distribution of risks

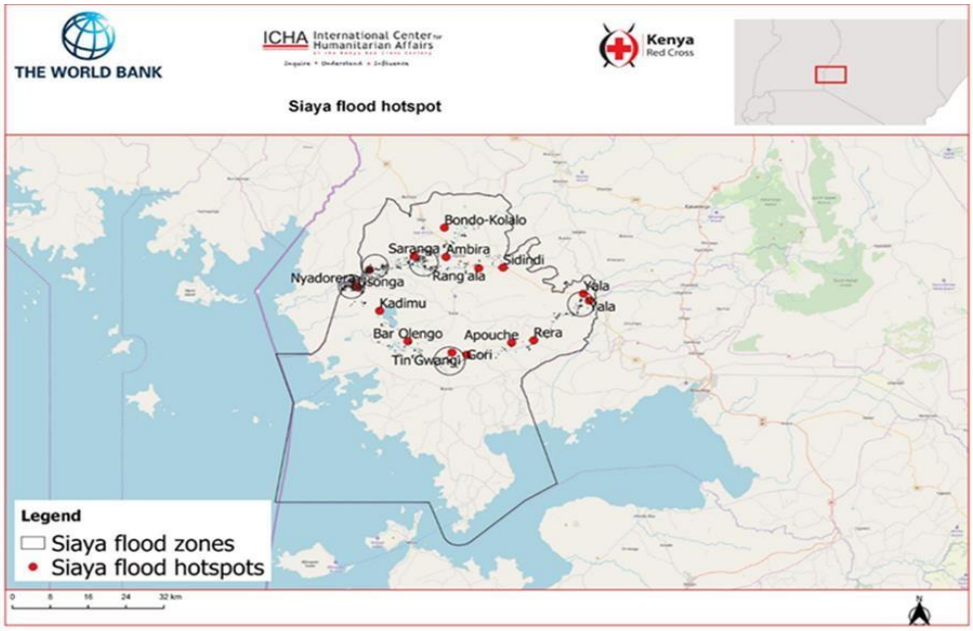

Figure 8 Flood hotspots in Siaya County

2.4.1 Risk Profile

CONSOLIDATED IN RISKS AND HAZARDS
ALEGO USONGA SUB COUNTY
CENTRAL ALEGO

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Deforestation, desertification, and excessive tree cutting	Got Akara (Obambo, Kandenje, Kalenjuok) Got Aduwa	• Revamping tree nurseries in all the sub locations • Tree growing and nurturing to maturity • Rehabilitation of the derelict Got Aduwa area and development of nature trail in the area for economic activity • Reintroduction of 4K club to in all primary schools to inculcate the culture of environmental awareness to children at a tender age.
	Soil degradation, flooding (sanitation and health issues)	Lake Kanyaboli Ndaye Obambo Kandenje Got Aduwa Ndere dispensary	• Installation of dams and water pans with sufficient canals channeling water to the same • Construction of terraces in farms in flood prone areas • Building of gabions and scotches to reduce soil erosion • Unclogging of storm water drainage ways in time to reduce overflows to the roads • Desilting of existing dams • Installation of rainwater harvesting systems in schools, health facilities, and homes to ensure adequate collection of water. This will help reduce cases of excessive storm water run offs
	Brick making (soil erosion, wood fuel extraction, and land degradation)	Across the ward Ouru/Segere area Nyasanga	• Strengthening policy implementation and law enforcement to reduce overexploitation of land and soil resources • Empowering communities with alternative economic activities to reduce overindulgence in break making which has direct impact on forest/tree cover

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
			• Creating awareness on the need for environmental conservation through forums such as schools, chief's barazas, meetings, and open days. • Rehabilitant derelict land through planting of crops such as bananas and sisal
	Artisanal mining (gold mining, soil harvesting for brick making, and ceramics)	Got Aduwa Kakumu Kombe	• Institutional strengthening for law enforcement • Good will from government officers to enforce law especially on the issue of Got Aduwa

NORTH ALEGO

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Agriculture, Soil, Livestock, Irrigation, and Crop Development	Unpredictable rainfall patters	Throughout North Alego	• Tree growing and nurturing to maturity
	Reduced soil pH and soil fertility	Throughout North Alego	• Tree planting • Increased awareness on soil conversation such as farmer field days to sensitize farmers and local community members on the importance of soil conservation • Protection of riparian land to reduce soil erosion
	Soil erosion	Lowlands of North Alego, various roads, and paths	• Building of gabions in high speed storm water flows • Building scotches in low speed storm water flows • Sensitizing farmers and livestock keepers on the importance of zero grazing to reduce movement of animals that act as agents of soil erosion

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
			• Constructing water troughs for animal watering in different parts of the ward to reduce the congested movement of animals to water pans and dams • Terracing of farms and planting of napier grass and vativa grass in homefarms • Embracing planting of cover crops that helps control storm water flows • Practicing improved/conservation agriculture which embraces good practices such as agroforestry, ploughing along the contours
	Poor seed choices	Throughout North Alego	• Government to employ ward agriculture extension officers to sensitize communities in seed choices • The project should procure the identified seeds in time to ensure local communities have access to the right seeds
Water and Sanitation	Inadequate household water	Throughout North Alego	• Solarization of the existing boreholes to reduce reliance on diesel driven generators or electricity for pumping • Provision of storage tanks in community facilities such as schools, hospitals, and churches to harvest rainwater for community use
Infrastructure	Soil erosion (Storm water damaging roads)	Throughout North Alego	• Building of gabions in high speed storm water flows • Building scotches in low speed storm water flows • Routine maintenance of roads and other infrastructure such as culverts to direct storm water to pans and dams

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
	Deforestation (excessing fuel wood extraction for energy)	Throughout North Alego	• Identification of alternative sources of livelihoods to reduce overreliance on brick making as a source of livelihoods for example introduction of fish farming in the dams • Provision of energy saving *jikos* to local community members to reduce wood fuel consumption per household
Education	Poor water quality Absenteeism due to illnesses among children Low nutrition	Throughout North Alego	• Provision on rainwater harvesting systems for schools and treatment of the water in schools to improve its quality • Reviving 4K Club to improve children engagement on environmental issues at a tender age
Public Health	Flooding {mosquito breeding grounds)	Lowlands of North Alego	• Bush clearing • Clearing stagnant water near houses • Terracing of farms to reduce impact of flooding on crops

SOUTH EAST ALEGO

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought and drying of seasonal streams leading to water shortage and inadequate water supply	Bugo, Yawo Lwanda, Ongala, Ranyadha, Ongoro, Ang'ech, Mbeji, Wadh	• Encouraging rainwater harvesting by providing water tanks to households and institutions • Desilting of water pans, streams, dams • Construction and Repair of springs collection structure and boreholes • Extension of water pipelines to communities • Controlling human activities along the shores of the streams • Massive tree planting
	Deforestation for brick making as alternative source of livelihood	Throughout South East Alego	• Planting of trees along riverbanks, institutions and schools • Introduction of 4K clubs in schools to manage tress planted in schools. • Starting community tree nurseries to ensure supply of trees to the communities for planting during rainy seasons. • Promoting and providing alternative source of livelihood to the youths
	Destruction of properties and injuries especially to children by strong wind (*kalausi*) which blows off roofs and even uproot huge trees		• Planting of strong indigenous trees to act as barriers to strong wind. • Ensuring building of strong and quality houses especially schools
	Floods leading to outbreak of diseases e.g cholera,	Mur Malanga market	• Bush clearing to destroy breeding places for mosquitoes.

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
	malaria, bilharzia, amoeba, pneumonia & anthrax and skin diseases in livestock	Bar Olengo market Nyang'oma market	• Provide proper drainage system to reduce stagnant water. • Vaccination of animals against such diseases • Treatment of water for human consumption • Creating awareness to the communities on water pollution, sanitation and management
	Storm Water Drainage affecting / flooding markets	Mur Malanga market Bar Olengo market Nyang'oma market	• Improve drainage system within the affected markets. • Murraming and levelling of the affected markets
Food security and agriculture	Soil erosion/Loss of fertility ie farms washed by flood waters	Bar Olengo	• Building gabions and terraces to reduce on soil erosion. • Promotion of soil and water conservation agriculture through zero tillage, mulching and crop rotation
	Human animal conflicts - hippos, crocodile, antelope	Bar Olengo	• Protection of riparian areas • Digging trenches to control hippos • Sensitizing community members to avoid animal territories
Infrastructure and roads	Interference with learning - Schools inaccessible when bridges are washed away by flood waters.	Ambururu, Una, Alwala, Aorakite, Yao Lwanda, Nyamboi	• Construction, repair and maintenance of the affected bridges

SIAYA TOWNSHIP

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Flooding (leading to Poor soil quality Soil erosion Siltation of dams Outbreak of health problems Water pollution.)	Ufinya dam	• Expansion and disiting of dams e.g Ufinya dama
	Drought (Drying of water sources Increased heat stress Death of livestock Low agricultural yields Reduced water level in the rivers Increased cutting down of tree and burning of charcoal)	Entire Siaya Township Ward	• Expansion of the existing dams to hold more water to be used during dry seasons • Improving the drainage system of the ward to be able to channel water into the dams • Encouraging farmers to practice agroforestry and conservation agriculture to help improve the agricultural yield while conserving the environment • Rain water harvesting to avail water for use during the dry season

UGENYA SUBCOUNTY

WEST UGENYA

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought	Entire West Ugenya	• Massive tree planting • Distribution of water tanks to members of the community to harvest water • Distribution of drought resistant crop seeds to famers for example sorghum
	Flooding	Sifuyo Mlango Many parts of Ugenya	• Planting of trees (bamboo) around Sifuyo area • Desilting of Mlango Dam • Establishing of indigenous tree nursery in one of the schools in West Ugenya to provide seedlings to the community. • Sensitizing members of the community living in flooding areas to move to higher grounds during rainy seasons • Distribution of mosquito nets and other water borne disease drugs to hospitals in West Ugenya
	Charcoal burning and deforestation	Entire West Ugenya Ward	• Regulating charcoal burning implementing cut one plant two policy • Planting of indigenous trees • Encouraging conservation agriculture among community members

UGUNJA SUBCOUNTY

UGUNJA WARD

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Flooding	Ugunja town Ambira area	• Establish a tree nursery in Ambira primary school to provide the community with tree seedlings • Planting of trees in schools and public institutions such as hospitals

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
			• Building of toilets in Ugunja to prevent spread of cholera during rainy seasons • Provision of medicine for water borne diseases to medical facilities to curb spread of water borne diseases
	Deforestation, soil erosion, land degradation, and charcoal burning	Ambira area Nguya area Raduodi area	• Planting of trees in Ambira primary Nguya primary and Raduodi primary • Sensitizing the community on effects of defforestration and encouraging them to plant trees on their farms • Promoting use of energy saving jikos to act as an alternative to use of fire wood • Educating farmers on smart ways of farming such as use of cover crops and minimal soil disturbance to reduce soil loss
	Drought	Entire Ugunja ward	• Distribution of water tanks to schools and the community to harvest water during rainy seasons • Providing of drought resistant crop seeds to farmers to enhance food security such as cassava, millet and sorghum • Protection of local water springs

SIGOMERE WARD

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Flooding		• Maintenance of existing drainage systems • Building of gabions and terraces to control soil erosion •
	Soil erosion and soil degradation from mining		• Planting cover crops • Planting of indigenous trees

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
	Deforestation and charcoal burning		• Afforestation and tree growing in public institutions such as hospitals, chief's camps, and police lines, and schools. • Regulation of charcoal burning
	Drought		• Tree planting • Building of dams • Protection of local water springs

SIDINDI WARD

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Soil erosion and soil degradation	Ndhene Maungo Midhine Kaloo Kagutu Mauongo	• Construction of culverts to direct water • Provision of fallow seeds to improve soil stability • Planting of indigenous trees
	Deforestation and charcoal burning		• Provision of seedlings for afforestation
	Drought	Entire ward	• Provision of water storage systems in schools
Public Health	Bedbugs and mosquito menace	Entire ward	• Fumigation and spraying of mosquitoes • Disinfection of stagnant waters • Clearing of bushes around homesteads
Agriculture and food security	Poor seed choices	Entire ward	• Provision of affordable seeds and fertilizers •
	Post harvest losses such as weevils (osama)	Entire ward	• Provision of storage facilities
	Poor soil pH and fertility levels	Entire ward	• Soil testing for right crop choices

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
			• Provision of extension officers to help in identifying best seeds for the soil types
	Food wastage	Entire ward	• Education on good and proper use of food like "Do not waste" slogan

BONDO SUBCOUNTY

EAST YIMBO

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought	Entire East Yimbo	• Massive tree planting • Provision of drought resistant crop seeds to farmers • Protection of local water springs • Planting of trees along riverbanks, institutions and schools
	Flooding	Nyamonye Usigu	• Construction of pit latrine in Nyamonye Market • Initiating tree planting in flood prone areas • Maintenance of drainage systems to direct water • Planting of bamboo trees along the mouth of River Yala • Promotion of soil and water conservation agriculture through zero tillage, mulching and crop rotation.
	Strong winds		• Tree planting • Establishing indigenous tree nursery

WEST YIMBO

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Flooding	Got Agulu sub location	• Planting of bamboo around the lake • Construction of drainage canals • Construction of dykes to redirect R Yala waters
	Drought		• Tree planting and agroforestry in private farms

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
			• Establishing indigenous tree nursery • Planting drought resistant crops like cassava
	Reduced fish populations due to lake pollution		• Preservation of riparian lands and protection of the lake waters
	Soil degradation from stone harvesting		• Enhancement of law enforcement

WEST SAKWA

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Flooding	Kapiyo Maranda	• Initiating tree planting in flood prone areas • Maintenance of drainage systems to direct water
	Strong winds		• Tree planting • Establishing indigenous tree nursery

NORTH SAKWA

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought		• Massive tree planting • Provision of drought resistant crop seeds to farmers • Protection of local water springs
	Flooding and silting	Majiwa area	• Construction of dykes and check dams • Conserving riparian lands • Planting trees along the streams • Desilting and unclogging of culverts
	Pollution from mining (leeching and dumping sites)	Ndira area	• All mining sites should be fenced • Criminalize the use of red mercury •

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
	Strong winds	Okola primary school	• Tree planting • Establishing indigenous tree nursery

SOUTH SAKWA

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought		• Massive tree planting • Provision of drought resistant crop seeds to farmers • Protection of local water springs
	Flooding and silting	Destruction of properties; houses, roads, bridges, schools and loss of lives in Gombe and Migwena areas	• Desilting of dams • Conserving riparian lands • Planting trees along the streams
	Pollution from waster		•
	Soil degradation	Abimbo	• Rehabilitation of degraded lands • Control of mining
	Extinction of indigenous species		•

RARIEDA

NORTH UYOMA

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought		• Planting of tree in schools, churches, dispensaries, and public lands

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
			• Initiating agroforestry among farmers • Provision of drought resistant crop seeds to farmers • Protection of local water springs
	Lake Pollution		• Planting vatiza grass • Planting of bamboo in riparian areas around the lake
	Soil erosion		• Sensitize farmers to engage in counter ploughing • Planting cover crops • Construction of check dams
Food security and livelihoods	Reduction in cotton farming		• Provision of coton seeds • Sensitization and capacity building of farmers on new cotton farming techniques • Revamping Madiany Cotton Ginery

WEST UYOMA

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought and unreliable rainfall patterns		• Planting of 500 tree seedlings in all primary schools, churches, dispensaries, and public lands • Initiating agroforestry among farmers • Provision of drought resistant crop seeds to farmers • Protection of local water springs
	Drying up and shrinking of water bodies	River Mawira	• Planting vatiza grass • Planting of bamboo in riparian areas around the lake
	Soil erosion		• Sensitize farmers to engage in counter ploughing • Planting cover crops • Construction of gabions

SOUTH UYOMA

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought and drying up of rivers		• Planting of tree in schools, churches, dispensaries, and public lands • Rainwater harvesting and storage • Construction of large dams to serve the community during droughts
	Flooding	Abururu Ndigwa Majenga Rd Ranyala Madundu Rd Otieno SIbuor Nyamanga Rd KaminOningo Beach Koguta Juction Wikwang Rd Lieta Mumbo Rd Lweya Kobonde Madiany Rd Ndigwa Buru Rd Otumba rd Kobel Aora Korwa Rd Wio Mino Rd, Chamakwaro Kolilo Rd,	• Massive tree planting • Building of gabions and dykes • Construction of drainage and culverts in • Planting grass and cover crops • Construction of gabions

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
		Kawater Kadiala Beach Rd Rahongo Kadiala Beach Rd	
	Strong winds	Mumbo Ranyala	• Planting trees
	Human wildlife conflict		• Demarcation and protection of riparian land • Planting more tree to improve forest cover to protect farms from monkeys

EAST ASEMBO

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Drought and drying up of rivers	Kianja, Nyandiwa, Pap Otere, and Kakonya	• Planting of tree in schools, churches, dispensaries, and public lands • Conserving wetlands such as Pap Otere, Osago, AoroBay, and Nyandiwa
	Soil and river erosion		• Contour ploughing • Planting grass and cover crops • Construction of gabions
Food security and agriculture	Crop/human and livestock diseases		• Planting drought resistant crops • Enhance of fruit farming such as mangoes to provide raw materials for the Ndori Mango Factory • Practicing irrigation farming
	Human wildlife conflict		• Demarcation and protection of riparian land • Planting more tree to improve forest cover to protect farms from monkeys

GEM SUBCOUNTY
NORTH GEM

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Prolonged drought and unreliable rainfall patterns	Barkotako area	• Construction of dam at Barkotako • Planting of indigenous trees such as bishop • Provision of drought resistant crop seeds to farmers • Protection of local water springs
	Floods	BaoMoja Kisendo Rd BoaMoja Mundoware Rd Barkotako	• Building of gabions • Improve drainage system
	Strong winds, hailstones, and lightning	Nyambeda areas	• Lightning arrestor at Nyambeda Primary School • Planting of trees to act as wind breakers
	Soil erosion	BaoMoja Kisendo Rd BoaMoja Mundoware Rd Barkotako	• Sensitize farmers to engage in counter ploughing • Planting cover crops • Construction of gabions

WEST GEM

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Prolonged drought and unreliable rainfall patterns	Entire West Gem Komuok area Ujwang'a area	• Revival of water projects Komuok, Ujwang'a, Nyapiedho, and Dienya areas • Solarization of Wanjogi Primary water project • Planting of indigenous trees such as bishop • Provision of drought resistant crop seeds to farmers • Protection of local water springs

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
		Nyapiedho Dienya Wangoji	
	Floods	Komito and Ochuoga streams	• Building of gabions • Improve drainage system • Provision of water harvesting systems in all public schools
	Deforestation	Entire West Gem	• Planting of indigenous trees like *ober, ng'ou, and siala.* • Procurement of energy saving jikos for communities to reduce reliance on wood fuel as a source of energy • Alternative sources of livelihoods such as upscaling of handcraft industry in making energy saving *jikos* • Adopting alternative sources of energy such as biogas
	Soil erosion	Degradation of Komito and Ochuoga streams	• Improving drainage systems to channel storm water to designated dams/pans • Control sand harvesting

EAST GEM

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Floods	River Dhene River Awach Uranga	• Building of gabions • Improve drainage system
	Soil erosion	Ramula Onyoso	• Sensitize farmers to engage in counter ploughing • Planting cover crops • Construction of gabions

YALA TOWNSHIP

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Floods and gulleys	Ulumbi Bar Sauri Luero	• Building of gabions • Improve drainage system
	Soil erosion	Nyamninia	• Sensitize farmers to engage in counter ploughing • Planting cover crops • Construction of gabions

SOUTH GEM

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Agriculture	Increase in destructive weeds	Entire ward	• Provision of pesticides for effective weed control
	Human wildlife conflict (increase in farm attacks by monkeys)	Uthuthu Oboke Uthanya Areas along R Yala	• Liaising with KWS for effective wildlife control • Compensation of farmers for farm loses arising from wildlife attacks
Environment and Water	Deforestation	Entire ward	• Planting of trees
	Soil erosion and flooding	Ongoro	• Sensitize farmers to engage in counter ploughing • Planting cover crops • Construction of gabions

CENTRAL GEM

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
Environment and Water	Floods and gulleys	Siriwo Luri Nyandiwa	• Building of gabions • Improve drainage system

Sector	Risk/Hazard	Hotspots	Suggested mitigation measures
		Farms around River Yala	
Public Health and Sanitation	Floods filling pit latrine and shallow wells thus contaminating water around	Rawalo	• Exhausting pit latrines • Protecting and enhancing shallow wells through installation water treatment systems at the tap levels

Table 6 Summary of county risk profile

Disease outbreaks: By far, HIV/AIDS is perceived to be the most dominant hazard in Siaya County. Indeed, going by the results of the Kenya National Aids Indicator Survey of 2022, Siaya stands out as a county with the third highest rate of HIV/AIDS prevalence rate nationally at 15.3%. While focus remains on HIV/AIDS, malaria is the lead problem, being an endemic disease in the county. At 46% prevalence rate, malaria is the most prevalent health problem in the county. Malaria spread is increasingly linked to frequent floods that provide conducive breeding grounds for mosquitoes. Disease outbreaks were reported across all the sub counties.

Drought: Recurrent droughts are a common phenomenon in sections of Siaya County, with the frequency of drought cycles varying in different parts of the county. In Bondo and Rarieda Sub-Counties, drought was regarded by respondents as the worst hazard. Apart from other factors related to climate change, the effects of droughts are becoming increasingly pronounced owing to population pressure, land use change and poor land management practices.

Floods: Flood related losses along river Nzoia basin (mostly in the Budalangi plains and Siaya County's Nyadorera and Sifuyo areas) are estimated at US$ 4.8 million annually. Vulnerability is determined by poverty with the poor being forced to settle in risky floodplains to eke a living from agriculture, livestock rearing and fisheries. Flood impact is dependent on the nature of livelihood and wealth group in the community. For example, agricultural production gets reduced to 50% every three years in Budalangi and the affected parts of Siaya County owing to floods.

Figure 9 Floods in Alego Usonga Sub County (courtesy of Kenya Red Cross)

Severe winds/hail storms: Due to global climate changes, recent climatic variations around the world have been highly unpredictable. Similarly, Siaya County also experiences extreme variations in its climate and weather patterns. Although the county has not experienced large scale destructions due to windstorms or hailstorms, some pockets of the sub counties have been affected from time to time by both. All sub counties have reported damage from severe winds.

3.0 Future Climate Scenarios for the county

3.1 National and downscaled climate change projections

The climate mechanisms that are important for rainfall in East Africa are not thoroughly understood and it is also not known how well climate models represent these processes. Therefore, detailed rainfall projections at the county level are not provided as these may indicate a level of detail that is misleading. The results are therefore, provided at the country level where signals from the models can be interpreted more broadly and provide messages which are more robust. For each of the four three-month periods, the models included within CMIP5 were assessed to determine which showed the driest, the mean and the wettest projection for Kenya as a whole. These results are shown at figure 2 below. It should be noted that the models run at different horizontal resolutions and define their model grids differently over the globe, this results in different patterns of grid boxes in these results. Broadly across all four periods, the models show a range of results from drier to little change to wetter projections. For the Lake Victoria Basin within Kenya the most uncertain period is the short rains within the September to November (SON) period. The spread in these results is approximately a decrease of 80mm per month to an increase of 60mm per month. The long rains during the March-May period (MAM) show a slight decrease of around 20mm per month to an increase of 30 mm per month.

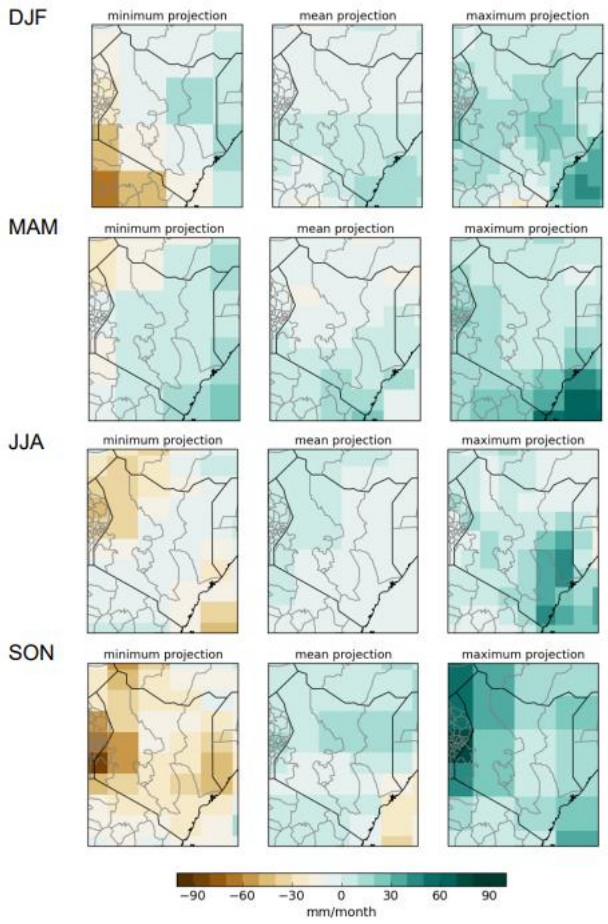

Figure 10 Maps showing future rainfall change for Kenya

The above showed maps show future rainfall change for Kenya from the CMIP5 models for the four three-month periods. These show the change between 1983-2013 and 2020-2050. For each season the model showing the minimum amount, the mean amount and the maximum amount of rainfall for Kenya on average are displayed. This very relevant for Siaya county to adjust in preparing for the impacts of climate change.

3.2 County future climate scenarios

Siaya County depends mainly on rain-fed agriculture to support its crop and livestock production. Smallholder farmers in Siaya are increasingly challenged by the uncertainty and variability of weather caused by climate change at seasonal scale. Since most crops are rain-fed, yields depend on water availability from

rainfall. However, the length, intensity and distribution of rainfall over the rainy seasons are becoming increasingly unpredictable. Besides, the use of irrigation facilities remains limited due to poor extension services, mismanagement of irrigation schemes, inadequate financing and poor irrigation infrastructure.

Most of the wards in the county experience two rainfall maxima which is observed in March-April-May (MAM) and October-November-December (OND) as per the historical calendar developed during the county Participatory Climate Risk Assessment (PCRA) process. The PCRA process further developed the seasonal scale rainfall projections for the two RCPs 4.5 and 8.5 to determine the seasonal rainfall change. RCPs 4.5 refers to projections under business as usual emissions while RCPs 8.5 refers to projections under enhanced emissions. Generally, the northern and central parts are likely to experience reduction in rainfall amounts while the southern parts are projected to experience increase in rainfall amounts. Under the RCP8.5 the entire Siaya County is projected to experience reduction in rainfall amounts.

ANNUAL MEAN RAINFALL PROJECTION

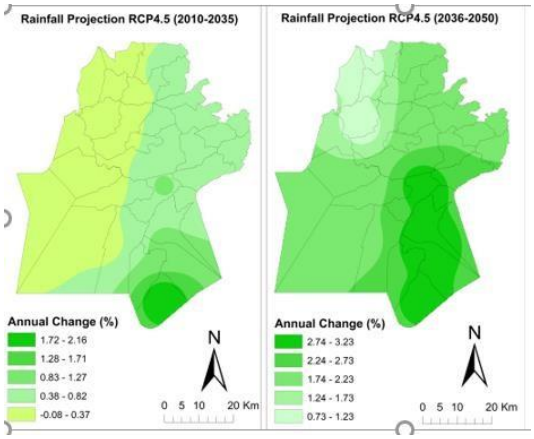

Figure 11 Annual mean rainfall projection RCP4.5

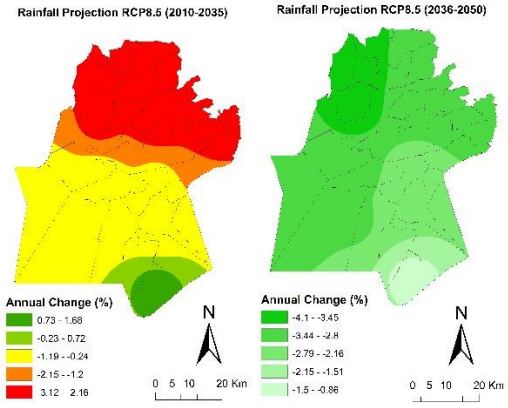

Figure 12 Annual mean rainfall projection RCP8.5

MAM MEAN RAINFALL PROJECTION

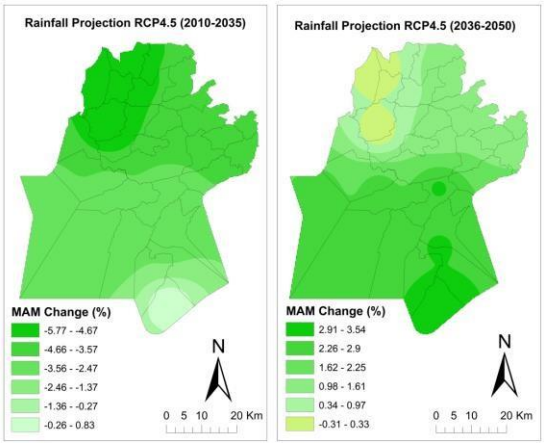

Figure 13 MAM mean projection RCP4.5

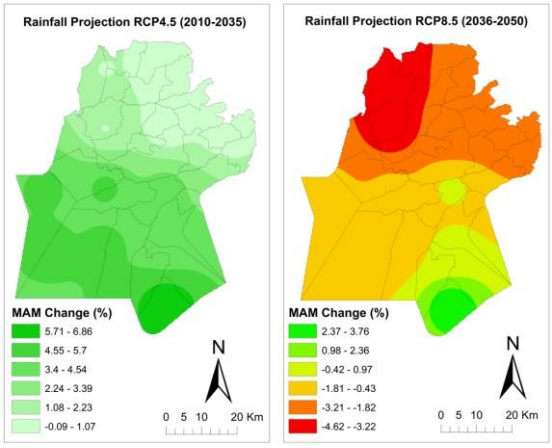

Figure 14 MAM mean projection RCP8.5

OND MEAN RAINFALL PROJECTION

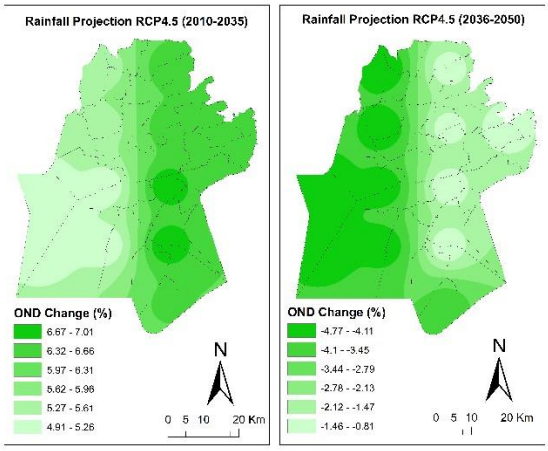

Figure 15 OND mean projection RCP4.5

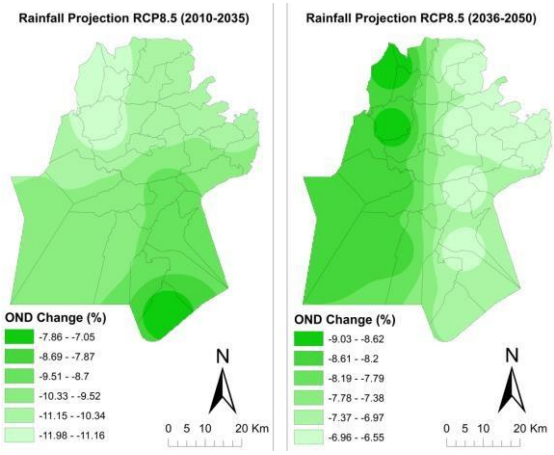

Figure 16 MAM mean projection RCP8.5

Both hot and cold temperature extremes can place many demands on vulnerable members of the society. While seasonal changes in temperature are normal and indeed important for a number of societal sectors (e.g. tourism and farming), extreme heat or cold can have serious negative impacts. Importantly, what is 'normal' for one ward in the county may be extreme for another ward that is less adapted to such conditions. The minimum and maximum projections depict warmer nights and hot day temperature Climate change is expected to have a significant influence on the ecology and distribution of tropical ecosystems, even though the magnitude, rate and direction of these changes are uncertain. With rising temperatures and increased frequency and intensity of droughts, wetlands and riverine systems are increasingly at risk of being converted to other ecosystems, with plant populations being succeeded and animals losing habitats. Increased temperatures and droughts also affect succession in forest systems while concurrently increasing the risk of invasive species all of which affect ecosystems. In addition to these climate drivers, low agricultural production and population growth might motivate further

agricultural expansion resulting in increased deforestation, land degradation and forest fires, all of which will impact on animal and plant biodiversity in siaya

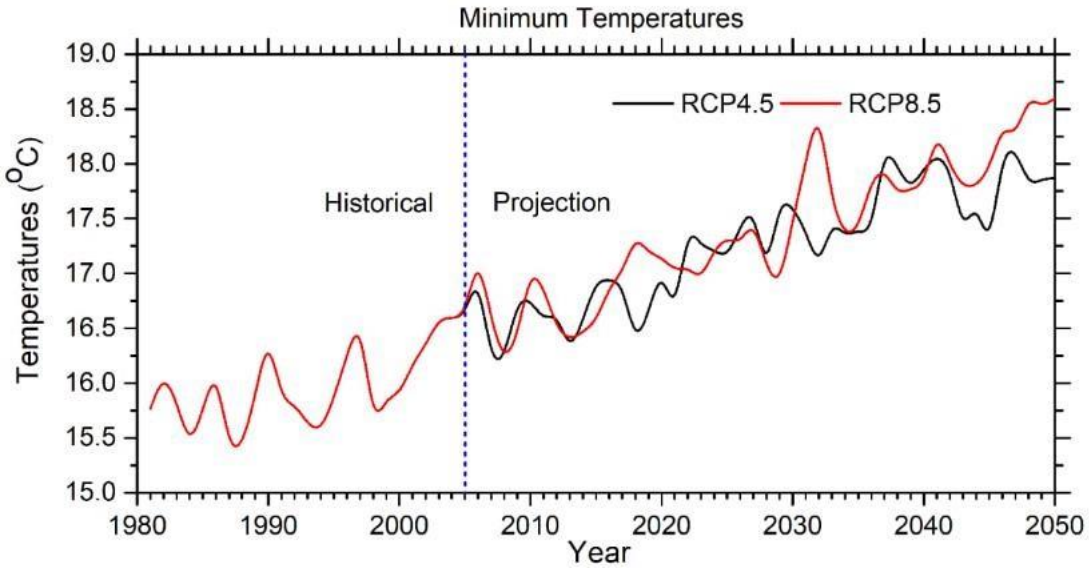

Figure 17 Historical and projected minimum temperatures

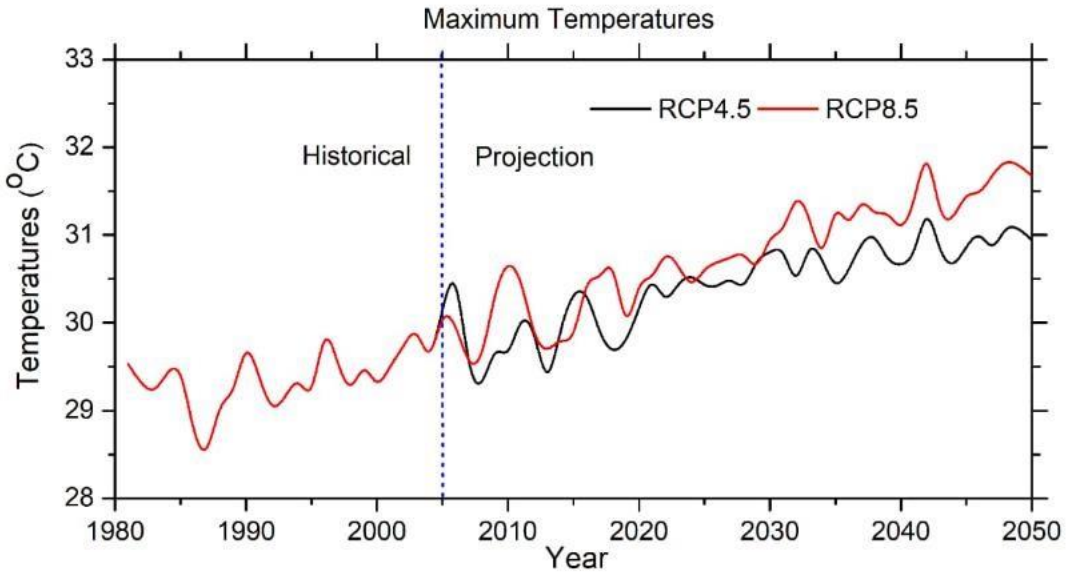

Figure 18 Historical and projected maximum temperatures

4.0 Analysis of Existing Adaptation Strategies to Current and Future Climate Risks

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

Recurring Droughts: Drought is one of the major hazards in Siaya County and therefore the choice of the right adaptation strategy and its effectiveness is extremely important. Adaptation strategies proposed during the PCRA include, among others, investing in water harvesting and ground water structures, investing in climate smart agriculture and diversification of livelihoods.

Effectiveness of adaptation strategies: Investing in water harvesting and ground water structures has been working well in the drought emergency hotspots within the County. In areas where these interventions have been implemented, return trekking distances to water sources has reduced and waiting time at water sources has also reduced. Water consumption per household per day has increased and the cost of water for a 20 litre jerry can has reduced. While this strategy has been effective, the scope of this work needs to be up-scaled to cover more household and institutions in in the event of worsening drought. However, there is need to strengthen the local water management structures.

Livestock and human diseases: Livestock and human diseases affect large population of both the people their livestock in the County. Adaptation strategies proposed during the PCRA include, among others, control of livestock movement, promotion of participatory rangeland management, mass vaccination of livestock and equipping of health centers with drugs.

Effectiveness of adaptation strategies: Control of livestock movement limits transmission of livestock and human diseases. Sustainable natural resource management and fodder bulking provide mechanisms for managing drought. Through vaccination, immunity of both livestock and young children would be strengthened and deaths reduced. The provision of treated mosquito nets, adequate sanitation facilities and access to clean water include other preventative mechanisms. That said, more resources will be needed to effectively deal with a surge in climate-related disease outbreaks in the future.

Floods: In addition to other hazards, we also have major flood hotspots in the County. Adaptation strategies proposed during the PCRA include, among others, timely early warning disseminations, proper land management, evacuation, flood mitigation mechanisms, humanitarian response with both food and non-food items, provision of house hold water treatment chemicals, Maintenance of existing water facilities, adoption of ecosystems based adaptation technologies

such as planting of vertiver grass and bamboo to stabilize the soils against erosion ,woodlot establishment as a form of land restoration , promotion of agroforestry and capacity building of affected communities.

Effectiveness of adaptation strategies: Through use of early warning bulletins and advisories provided by Kenya Meteorological Department to those who are living within flood prone areas, lives and livelihood have been saved. Continuous capacity building of the local communities to cope with hazards such as floods have increased chances of resilience and building their adaptive capacities during emergencies.

4.2 Effectiveness of adaptation/resilience strategies to future climate risks

Prolonged dry spell leading to drought: The likely future hazard scenario is that we will have increased frequency and duration of long dry spells that may lead to severe drought conditions with increased acute water shortages and increased food and nutritional insecurity. The choice of our adaptation strategies involving rain water harvesting and ground water structures have to be improved to cope with the extreme and potential disastrous future emergencies. Our coordination mechanism involving both the National and County Government as well as partners and communities have to be strengthened further to save lives and livelihood. Adaptation strategies that have worked well now could be up-scaled and utilized in the likely future hazard scenarios as more as we invest also into more research on emerging technologies for improved water, food security and other livelihood options.

Increase in vector borne livestock and human diseases: Human and livestock diseases expected to increase with increase in temperature as projected by 2050 emission scenarios. Adaptation strategies will include, among others, improvement in the current adaptation strategies involving establishment of livestock laboratory and veterinary services, promotion of participatory rangeland management, mass vaccination of livestock, equipping of health center with drugs will have to be done along with new medical researches on human and livestock diseases.

Torrential rainfall leading to floods: Unpredictable and increased torrential rains with high intensity expected to worsen hence affecting lives and livelihoods of communities. Adaptation strategies will include, among others, improvement in the timely early warning disseminations, proper land management, capacity building of communities need to be adequately supported and strengthened. Improvement in climate science and hazard predictions needs to be explored. Collaboration with other regional bodies working on climate related matters needs be strengthened to increase our coping mechanism to rapidly likelihood of future climatic scenarios, pegging and marking of riparian zones, Riparian

afforestation and conservation, dyke construction, promotion of nature based enterprises, promote construction of large scale construction structures such as water pans and small holder on farm water ponds to harvest surface runoff from road drainages. This would contribute to the control of gulley erosion.

5.0 County Climate Strategic Adaptation investment/Action Priorities

5.1Climate Hazards in the County

Crop Farming: Rain-fed agriculture is common in the county. Consequently, dry spells often impact agricultural productivity, livelihoods and incomes, and rendering the county a net food importer. Changes in temperature regimes and precipitation patterns have led to the shifting of agro-ecological zones thereby changing the geographical suitability of specific crops as well as changes in cropping seasons. This has resulted in reduced production per unit area and increased post-harvest losses. The changes have also contributed to an increase in the incidences of crop pests and diseases as well as emergence of new ones. Climate extremes, such as flooding, are expected to increase in frequency and intensity leading to anaerobic soil conditions, plant stress, and reduced yields or even total crop failure. Women are the most vulnerable and are hardest hit by these climate change impacts on agriculture given their disproportionately larger role in the sector across rural Kenya in general and Siaya County in particular.

Fisheries: Climate change is already impacting inland fisheries production. Increasing temperatures and reduced wind velocities have weakened lake mixing, with a subsequent reduction in nutrient availability for fish. Fishermen are already reporting reduced catch. Climate change is also predicted to lead to fluctuations of river volumes and lake levels by altering hydrological regimes. Such fluctuations affect the functionality of wetlands (such as the Yala Swamp and Lake Kanyaboli), altering the breeding ecology of both permanent and anadromous fish species. As populations grow and pressure to increase food supply increases, climate will reinforce existing challenges, among others, overexploitation of fisheries resources.

Trade and Manufacturing: Trade in agricultural products dominates the sector, taking place in more than 220 markets across the county. The trade and manufacturing sectors are often indirectly affected by climate change, as they depend on climate sensitive sectors such as agriculture, transportation and energy. Reduced agricultural productivity occasioned by climate change may leads to reduced supply of raw materials for agro-processing or even trade. On the other hand, destruction of transport infrastructure by floods often limits movement of people, goods and services, thus hindering trade and manufacturing.

Water and Sanitation: Being a largely rural county, only 58 percent of county residents have access to improved water sources while the rest still rely on surface water sources. Access to water is generally a challenge as people have to walk long distances in search of it, with the southern part of the county (Rarieda and Bondo) being the most water scarce. Frequent droughts are making a bad situation worse. Floods, on the other hand, combined with siltation, often lead to pollution of surface water sources, thereby hindering availability of clean water and increasing the cost of water treatment. Over 82 percent of the population have access to pit latrines, while only 5 percent have access to sewerage system. The remaining 13 percent still use open defecation. The main impact of climate change on sanitation systems is damage to associated infrastructure by floods and contamination of potable water sources with human waste, with cascading impact on public health.

Natural Resource Management: Siaya County's forest cover stands at 0.42 percent against a national average of about 7 percent. The county's low forest cover means it cannot meet its demand (forest and non-forest products) through domestic production and, therefore, relies on imports. The main threat to the county's natural resources is the unsustainable extraction of forest products to meet the escalating energy demand of its growing population. For instance, firewood accounts for 82.5 percent of household energy demands followed by charcoal at 13.6 percent. Climate change is already exacerbating these challenges. Siaya is home to Yala Swamp, a critical ecosystem for various species of birds, fish and other mammals such as the Sitatunga (*Tragelaphus spekei*), which are unique to this wetland. Regrettably, the Yala Swamp ecosystem has undergone drastic ecological changes over the last decades. Most notable has been the decline in the populations of many endemic cichlid fishes. Climate change poses a new challenge as it is exacerbating existing pressures.

Infrastructure: Climate change is already impacting infrastructure development in the county. High temperatures lead to softening and expansion of tarmac roads and, in turn, create rutting and potholes. Climate change is also projected to increase the intensity of flooding, which could destroy critical infrastructure or even render most roads impassable. In Siaya County, low-lying and flood prone areas such as the Yala Swamp are particularly at greater risk. Taken together, these may increase the cost of developing and maintaining infrastructure in the county.

Human Health: Climate change is most likely contributing to an increase in vector borne diseases. Changes in temperature and precipitation increases the geographic range of diseases spread by vectors. While malaria is endemic in lowlands such as the southern and central parts of Siaya County, it may pose greater challenges in the wetter and higher altitude parts of the county that

border Kakamega and Vihiga counties. On the other hand, increased frequency of floods may result in environmentally-related diseases such as typhoid, amoeba, cholera, and bilharzia while also displacing populations or even causing deaths. Internal displacement owing to the heavy rains experienced in 2023 overburden public health systems and heighten the risk of disease outbreaks.

Education: Climate change's main impact on the education sector is as a result of the sector's linkages with agriculture, food security and household incomes in agriculturally dependent communities like Siaya. In such places, food insecure (hungry) children often miss school, as they and their families resort to seeking opportunities to get food. Further, reduced agricultural productivity and household incomes that is increasingly linked to climate change and climate variability implies that many rural households are increasingly unable to afford fees for their secondary school-going children.

5.2 Priority areas of investment

5.2.1 Water and Sanitation

- Protect and conserve (gazettement) water catchment areas/watersheds, rivers banks, spring/water ways and potential flood plains from degradation and contamination;
- Capacity build water resource user associations / WRUAs on water harvesting, storage, conservation measures, maintenance and operations;
- Increase access to safe water and sanitation facilities to limit outbreaks of water borne diseases;
- Construct water harvesting infrastructure
- Protection of water pans, dams and water springs
- Solarization of boreholes and water supply schemes
- Development support to SIBO and community water supply schemes
- Development of Siaya County Water Policy and master plan
- Develop child friendly ablution blocks in market centers

5.2.2 Agriculture and Food Security

- Promotion of community based adaptation strategies and knowledge, like indigenous seed bulking of drought tolerant traditional food crops like

cassava, sorghum millet, African leafy vegetables with greater adaptations to extreme temperatures and rainfall events;

- Provision of technical assistance and increase access to finance to expand area under high value traditional drought tolerant crops (DTC) and drought escaping crops;

- Promoting Climate Smart Agriculture (CSA) to increase rainwater infiltration, reduced floods, reduced soil erosion, improve soil quality, fast growing perennial tree/food crops; sack gardens, shade nets, sustainable green houses, Zai Pits; and

- Supporting weather index-based crop insurance to cushion farmers against crop failure due to adverse weather conditions.

Promotion of flood based farming systems e.g. use of water reservoirs for micro irrigation projects for crop production; on farm small water harvesting techniques

Strengthening of agricultural extension services and mainstreaming climate change information and technologies into the farming system;

- Promote climate change resilience practices in the value chains
- Develop policies, strategies, bills regulations and plans (county livestock feed strategy; livestock subsector strategy; disease contingency plan; food safety policy; mechanization policy, fish cages policy, Lake Kanyaboli fisheries management plan)
- Control pests and diseases affecting crops, animal and fisheries
- Promote apiculture (beekeeping equipment,)
- Promote poultry development Strengthen legal and operational framework

5.2.3 Fisheries

- Strengthening of fish value chain to create formal and informal job creation.
- Supporting livelihood diversification strategies
- Strengthening capacity of Beach Management Units (BMUs) to carry out fisheries monitoring, control and surveillances in collaboration with the national government
- Identify and protect fish breeding sites to minimize unsustainable fishing practices and habitat destruction in collaboration with the national government;
- Strengthen community participation in fisheries resources management and value addition.

5.2.4 Forestry and Land Use

- Identify and assess pockets of degraded forest areas in county for rehabilitation;

Draw and implement a comprehensive afforestation plan during wet seasons at all governance levels in the county, with an emphasis on indigenous tree species;

Promote greening program in schools;

- Strengthen early warning systems in reduction of fire outbreaks (fire towers, fire drills).
- Support communities of interest to gazette fragile ecosystems like springs, forest buffer zones, riverine, watersheds etc.
- Support new enterprises suitable for the environment including bee keeping, domestication of plant medicinal plants, tree crops and forages of economic value
- Support alternative livelihood opportunities to charcoal/firewood as a source of income;
- Promote alternative building materials such as soil bricks.
- Tree nurseries establishment
- Establishment of woodlots &Hilltops Afforestation
- Creation of urban green spaces
- Gazettement of community forests
- Purchase and distribution of tree seedlings
- Awareness creation on environment and climate change.
- Surveillance and management of invasive species
- Development of Forestry Investment Strategy
- Establishment of community tree learning sites and Community Trainings on tree nursery establishment and management
- Development of Siaya County State of Environment Report
- Observation of environmental calendar days
- Planting of trees along major roads in urban areas within the County.

- Rehabilitate degraded areas

  Protecting environmental sensitive areas such as Yala swamp

  Mapping of available natural resources

  Develop Siaya County Spatial Plan

5.2.5 Social Infrastructure

- Strengthening disaster preparedness through improved public health systems (including personnel, infrastructure, medicine and equipment);
- Support spatial planning in urban centers and areas prone to disasters;
- Improve access to clean water and sanitary facilities to limit outbreaks of water borne dis-eases and awareness promotion on better hygiene;
- Formation and strengthening of resident / committees Units that can respond to emergencies and involving them in key decision making;
- Develop disaster response plans based periodic assessments and surveillance reports
- Formulate County Climate-Proofing Strategy to enhance compliance when designing and developing county infrastructure projects
- Climate proof projects through environment and social impacts assessment tools

5.2.6 Energy

- Implement installation of solar (hybrid systems), for water pumping – diesel generators;
- Enhance solar electrification program to meet public institutions and rural households' energy demand;
- Promotion of energy efficient cook stoves to reduce demand on biomass energy as well as to reduce greenhouse gas emission for households in rural areas and linkages to carbon financing/credit including awareness on improved cooking practices;

- Installation of improved institutional cook stoves to reduce GHG emissions to take advantage of carbon markets;
- Develop green energy (wind and solar) through public private partnership (PPPs);

Investments in renewable biomass energy bio-fuels (briquettes, bio-gas);

Lobby the national government to promote the use of Liquefied Petroleum Gas (LPG) for cooking, florescent light bulbs used by households through subsidies and or tax waivers;

- Support enactment policies/bills that support natural resources conservation measures.
- Formation of climate change planning committees' structures;
- Formulation regulations to support the Siaya County Climate Change Act, 2021
- Establishment of model Siaya County Climate Change Centres
- Climate change education and awareness creation materials
- Climate change education and awareness creation materials

5.2.7 Health

- Promotion of vaccination and immunization campaigns against diseases aggravated by climate change and climate variability.
- Periodic monitoring and evaluation of the quality of promotive and preventive, curative, palliative and rehabilitative services
- Construction and rehabilitation of climate-proofed health infrastructure
- Provide adequate commodities
- Formulate and implement policies, plans and laws that strengthen the link between climate change and halth
- Nutrition supplement and commodities procured
- Strengthen public health emergency response
- Proportion of targeted pregnant women provided with LLITNs

5.2.8 Education

- Formulate and implement policies/bills, regulations and guidelines

- Operationalize the existing child rescue centre to act as a safety net (child rescue centre)

  Provide bursary to needy to students

  Roll out school feeding programme

- Develop and operationalize VTCs
- Provide capitation to learners in ECDC and VTCs

6.0 Conclusion

The Communities in Siaya County identified inadequate knowledge in climate risks and their vulnerability modeling current and historical situations. They identified the most pressing needs such as inadequate capital to establish and sustain farming practices, human and livestock diseases, Inadequate feeds and water for livestock and human consumption, inadequate market information, inadequate extension resource personnel and poor infrastructure. This report, therefore, calls for interventions tailored to address the community challenges occasioned by a changing climate.

Sustainable approaches proposed by the community include capacity building on areas of their livelihoods impacted by climate change is necessary to curb a projected climate disaster. A Community Action Plan developed by the community will become a significant tool for use not only by FLLoCA but also by other development partners. The community demonstrated willingness to support the projects going forward and requested for regular engagements with Ward Climate Change Planning Committees (WCCPCs) and feedback.

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Annex 1: List of participants of technical working group members

Work Area Allocation				
Alego Usonga				
1	Siaya Township	Dominic Arodi	713817279	KMD
2	North Alego	Hillary Omondi	791694302	Siaya Muungano
3	Central Alego	Immaculate Ochieng'	720990182	Gender
4	West Alego	Joseph Abuje	722108600	Public Health
5	South-East Alego	Eric Omuombo	727716098	Communications
6	Usonga	Diana Awuor	726714513	Environment
Ugunja				
7	Sidindi	Rodgers Otieno	0710 204 014	Tourism
8	Sigomre	George Okello	0722 492 099	Governance
9	Ugunja	Kelly Wafula	725772133	Agriculture
Ugenya				
10	North Ugenya	Maurice Otieno	729422149	Agriculture
11	East Ugenya	George Saitoti	717303509	Agriculture
12	West Ugenya	Pascal Omondi	0708 767 070	Public Health
13	Ukwala	Ben Ouma	0720 972 776	Agriculture
Gem				
14	Yala Township	Jared Abayo	0722 717 657	Governance
15	Central Gem	Kevin Owira	707440227	Finance
16	North Gem	Marylin Otwoma	0795 206 350	Public Health
17	West Gem	Charles Ngige	790287575	Agriculture
18	South Gem	Kevin Otieno	0797 623 941	Public Health
19	East Gem	Collins Ouko	0791 571 844	Public Health
Bondo				
20	North Sakwa	Moses Otieno	721651058	Finance

21	West Sakwa	Sophie Odhiambo	720925025	Agriculture
22	Central Sakwa	Jackson Achuti	742334761	Agriculture
23	South Sakwa	Millicent Otieno	717703551	Agriculture
24	East Yimbo	Evans Onyango	707776144	Public Health
25	West Yimbo	Mercelline Amuga	723941108	Environment
Rarieda				
26	East Asembo	Henry Dundo	0714 279 820	Livestock
27	West Asembo	Abraham Oluoch	0708 713 330	Finance
28	West Uyoma	Walter Aol	0719 563 641	Public Health
29	North Uyoma	John Awalo	0720 342 035	Agriculture
30	South Uyoma	Bernard Ogeta	0729 644 364	Finance

Table: Sample List of PCRA Participants from East Gem Ward

SAMPLE LIST OF PCRA PARTICIPANTS FROM EAST GEM WARD								
S/No.	**Name**	**ID**	**Mobile number**	**Gender**		**People living with disability**		**Age**
				Male	Female	Yes	No	
1.	ESTHER AMOLO	20606137	0725781173		□		□	45
2.	COLLINS OUKO	29343893	0791571844	□			□	31
3.	MICHAEL ATIENO		0724944244	□			□	52
4.	COLLINS OKELO	7814350	0723105788	□		□		55
5.	ZJULIA ARWA ODHIAMBO	0642818	0720245749		□	□		70
6.	WASHINGTONE ONYANGO	25272983	0718275929	□			□	35
7.	ISAAC ONJALA	24632287	0718089637	□			□	35
8.	ISAAC KEVIN OKOTH	24845731	0768290096	□			□	35
9.	DANIEL ONYANGO	6480943	0722846109	□			□	70
10.	JOAN AMIMO	8135610	0710797408	□			□	66
11.	CHRISTINE OTIENO	41778649	0110466304		□		□	18
12.	ROSEMAY ACHIENG	30852254	0742873490		□		□	32
13.	CHRISTINE AKINYI	24914971	0716679097		□		□	35
14.	J JANE ANYANGO ODHIER	8254469	0717610648		□	□		55

15.	DORINE ADHIAMBO OKUMU	26970339	0717027096		□		□	39
16.	GEORGE OMONDI	26252736	0113907516	□			□	35
17.	MAWINDA ATIENO LENCER	36827531	0717694450		□		□	24
18.	JOSEPH OTIENO OBONYO	24843774	0729690428	□			□	39
19.	SSTEPHEN ODHIAMBO TOGENGA	29592482	0713880412	□			□	31
20.	JACOB ADEDE	13664770	0706339739	□			□	52
21.	ARANGA EMMANUEL	40505341	0112776441	□			□	21
22.	OCHIENG' VICTOR ONYANGO	39439671	0778654006	□			□	20
23.	POLYCARP OMONDI	29366192	0718700469	□			□	31
24.	YROBERT OTIENO Y	31241615	0717170622	□			□	28
25.	BENARD ODONGO	25780224	0758835457	□			□	31
26.	GABRIEL OTIENO	29078566	0115510585	□			□	31
27.	BARACK OCEAGO	21791089	0718022800	□			□	49
28.	HESBON NYAKOMBO	26103262	0700657553	□			□	35
29.	EDWIN OGINGA	32945605	0791484043	□			□	29
30.	SELINE OKELLO	22283735	0722818833		□		□	44
31.	HORACE SEDA	24702741	0712277419	□			□	37
32.	JOEL BIWOTT	27774698	0740941716	□			□	36
33.	EMMANUEL OMOLLO	25807216	0721648714	□			□	39
34.	CONSLATA ORIEDI	4823440	0715598295		□		□	60
35.	CCHARLES OCHIENG	27893668	0711684249	□			□	35
36.	PELSCAH OGENYO	26431136	0729838785		□		□	37
37.	BRIAN OMBODO	33380943	0724383210	□			□	28
38.	JOSEPH OTIENO	3586710		□			□	29
39.	DELSON NYABERA	27893688	0702860276	□			□	33
40.	EMMANUEL OTIENO	40632438	0713899353	□			□	24
41.	FESTUS ABUODHA	4879685	0743374623	□			□	68
42.	JEZACA OMOUMA	33229783	0761355023		□		□	26
43.	AATIENO ONYANGO	32534934	0703831153		□		□	28
44.	PETER MINANI	2703166	0711309167	□			□	65
45.	JOSEPH OCHIENG	1421176	0725529130	□			□	63
46.	NICHOLAS SOGO	8210057	0723285758	□			□	61

47.	ABEL OMONDI OTIENG'	24617568	0706338797	□			□	35
48.	HENRY OBONYO ONANJE	16081840	0740783829	□			□	
49.	SAMSON ODINGA	29450560	0715429408	□			□	
50.	CONSLATA OKUMU	29543848	0758042232		□	□		30
51.	EDWIN OGINGA			□			□	28
52.	PAMELA ADHIAMBO	13039210	0793869585		□		□	40
53.	PETER OKETCH	4251714	0728961855	□			□	64
54.	DANIEL AGUTU SEWE	0647467	0701176155	□			□	70
55.	MILLICENT ANYANGO	25553840	0791003378		□		□	46
56.	CALEB NGULI	25582955	0729522141	□			□	36
57.	JOAN AKINYI	32832265	0715681347		□		□	30
58.	MAURICE OMONDI	11670683	0708481161	□			□	44
59.	JANE ADHIAMBO	3337123	0708481161		□		□	28
60.	AMOS ODHIER	1218153	0720982012	□			□	65

Annex 2: Ward Adaptation Priorities

No.	Risk	Proposed Intervention	Affected Wards
1	Eroded Roadsides - Formation of Gulleys along the Roads e.g., Sidindi-Sikalame Tarmac Road	Construction of Check Dams on the Roadsides for control of Run-Off Construction of On-farm Small-Holder pans to support mini-irrigation Construction of Gabions	Yala Township, North Gem, Central Gem, West Gem, East Gem, parts of South Gem, Sidindi, Sigomre, Ugunja, West Ugenya, East Ugenya, North Ugenya, Ukwala, North Alego, parts of Central Alego, parts of South-East Alego and parts of North Sakwa Ward
2	Strong Winds Causing destruction of Human Settlements, Public Buildings in schools, dispensaries, etc.	Boundary Planting of trees in homesteads, Public Buildings, etc.	All Wards
3	High Temperatures leading to High Heat Stresses	Establishment of Green Spaces in Public Facilities through woodlot Planting -Greening roads through Avenue planting of trees -Promote On-farm forestry	All Wards
4	Crop failures	-Promotion of Climate Smart Agricultural Technologies e.g., Drought tolerant crops, zero tillage, cover cropping, on-farm terracing. -Promote Public Education on access to weather information -Promote Rainwater Harvesting & Storage through water pans, installation of Water Tanks.	Quite Severe in All Wards but less severe moderate in Yala Township, North Gem, Sidindi and Sigomre Wards

5	Air Pollution through emissions from vehicles, traditional cookstoves, factories, etc.	-Promote use of improved cookstoves -Enact legislations to control vehicular emissions - Public Education on	All Wards
6	Loss of Biodiversity e.g., Weaver birds, Butterflies, Hippos, Guinea Fowls, Porcupines, Gazelles, Grasshoppers, *Oripa, Ochol*, Tree Species such as *Siala, Ober, Ochuoga, Oduogo,*	-Establish Land Use Plans -Establishment of Conservation areas by demarcation -Establishment of arboreta -Enhance public awareness on biodiversity conservation	All Wards
7	Floods	-Demarcation of riparian lands & wetlands -Development of Riparian Management Plans -Mapping of Riparian zones and Wetlands -Enhance Community awareness on riparian protection -Promotion of Nature-Based Solutions for Riparian Management	West Ugenya,East Ugenya,Usonga,East Yimbo,and sections of West Uyoma
8	Drying up of streams	-Water Catchment Protection through demarcation & planting of recommended tree species -Promote Community Awareness on Water Resources Management -Development of Sub-Catchment Management Plans -Development of Solar-Powered Boreholes	Common in All Wards but rare in Yala Township, Central Gem, North Gem, Sidindi & Sigomre Wards

		-Construction of water pans and dams	

		-Construction of Rainwater Harvesting in Public Facilities	
9	Land Degradation through erosion, brick-making in Ratado, Humwend & Nyaolo in West Ugenya Ward, Aluny, Anduro, etc.in Siaya Township Ward	-Public Awareness on erosion control -Landscape Restoration through tree-planting -Enactment of bylaws to control brick-making -Promote environment friendly brick-making technologies e.g.inter-locking blocks machines, etc.	High in most Wards but low in South Uyoma, North Uyoma, West Uyoma, East Asembo, West Asembo, South Sakwa, Central Sakwa & West Sakwa Wards
10.	Prolonged Dry Spells causing livestock deaths	-Establishment forage reserves -Construction of Water Conservation Structures e.g., Dams	All Wards but livestock deaths is more common in West Uyoma, North Uyoma, and South Uyoma Wards
11	Artisanal Mining Accidents	-Public Education on Mining Safety	-South Sakwa, Central Sakwa, North Sakwa, East Gem, and South East Alego Wards.
12	Lake Water Rises	Public Education on Riparian Distancing	East Yimbo, West Yimbo, North Uyoma, South-East Alego, West Alego & Central Alego Wards

Annex 3: List of all the wards in Siaya county

Constituency	No of Wards	Ward	Ward Area km²
Alego-Usonga	6	Township	42.6
		Usonga	79.2
		North Alego	53.8
		South East Alego	191.5
		Central Alego	139.8
		West Alego	98.9
Gem	6	North Gem	86
		South Gem	63.3
		East Gem	71.9
		Central Gem	52.5
		Yala Township	46.1
		West Gem	85.2
Ugenya	4	N. Ugenya	68
		East Ugenya	97.3
		Ukwala	55.9
		West Ugenya	101.1
Ugunja	3	Ugunja,	80.3
		Sigomre,	68.4
		Sidindi	52.2
Bondo	6	North Sakwa	96
		South Sakwa	102.7
		C. Sakwa	85.2
		W. Sakwa	109.8
		East Yimbo	159
		W. Yimbo	40.3
Rarieda	5	North Uyoma	73.9
		S. Uyoma	57.8
		East Asembo	78.5
		W.Asembo	101.1
		W.Uyoma	92.1