COUNTY GOVERNMENT OF MIGORI
Department of Environment, Natural Resources, Climate Change and Disaster Management

COUNTY GOVERNMENT OF MIGORI

PARTICIPATORY CLIMATE RISK ASSESSMENT (PCRA) REPORT

@May 2023

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Acronyms

CSO	Civil Society Organization
DACCA	Devolution and Climate Change Adaptation
GHG	Greenhouse Gases
KEFRI	Kenya Forestry Research Institute
KFS	Kenya Forest Services
NCCAP	National Climate Change Action Plan
NEMA	National Environment Management Authority
CCCAP	County Climate Change Action Plan
DaCCA	Devolution and Climate Change Adaptation
NCCRS	National Climate Change Response Strategy
ToTs	Trainer of Trainers

FORWARD

Climate Change is a major global challenge affecting attainment of Sustainable Development Goals. Migori County is particularly vulnerable to the impacts of climate change since their main sources of livelihoods depend on climate sensitive factors. The major climate change impacts in the County include food insecurity, water scarcity and stress, ecosystem degradation, increased incidences of diseases and infrastructure destruction.

The Participatory Climate risk assessment was a County wide exercise. It sought to involve ward climate change planning committees, community members and other stakeholders to identify current and future climate hazard and their potential impacts in the County. We had forty ward engagement meetings with the community and Ward climate change planning committees, two County level engagements with clusters of stakeholders including government, private sector and civil society organizations. These meetings were held to gather information on climate risks as well as to recommend adaptive interventions.

This report therefore provides an understanding on the level of climate risk across the County; and information on the County climate strategic adaptation investments and action priorities to towards building resilience.

However, it is important to note that this is the first participatory climate risk assessment conducted for Migori County. Thus this PCRA report is vital to the development of the County climate change action plan a document which will improve resource allocation, partnerships and collaboration with State and non –state actors to enable effective implementation of climate change adaptation interventions in the County.

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ACKNOWLEDGEMENT

Migori County participatory risk assessment report is the culmination of close operation between the County Government Directorate of Climate Change and other stakeholders. The journey resulted into this vital document which is envisaged to help in the development of the County Climate Change Action Plan.

While it is not possible to name every individual or entity who fast tracked the PCRA process it is worth mentioning Hon. Rahab Robi (CECM in charge of Climate Change), the Climate Change Unit and the entire team from the Department of Environment Natural Resource, Climate Change and Disaster Management. The input from Agriculture and water focal persons was also of great importance in this initiative.

Vital contributions emanated from line Government Ministries including but not limited to the Kenya Metrological Department, National Environmental Management Authority, Kenya Forestry Research Institute and Kenya Forest service.

We acknowledge the contributions from Western Kenya Water Project, DaCCA, Practical Action, Ripple Effect and other NGOs just to mention a few.

Last but not least we acknowledge the Ward Climate Change Planning Committees and various community members who gave insightful contributions which formed the basis of the of the Migori County participatory climate risk assessment report.

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EXECUTIVE SUMMARY

Climate change is a global challenge that requires a concerted effort by all actors. The main steps of PCRA process was the mapping and analysis of key stakeholders, county and ward level stakeholders' engagement for data collection, Data analysis and finally PCRA report writing.

This PCRA report documents the identified climate risks and vulnerabilities in all the forty wards of Migori County where the assessment was undertaken. The exercise involved various stakeholders including:

- The County Department of: Environment, Agriculture, Water, Energy, Roads and Health; Government agencies: NEMA, KFS and KEFRI;
- The relevant non-governmental organizations operating in the county
- Forty Ward Climate Change Planning Committees and other community members.

The findings of the assessment evidenced a direct manifestation of climate change in the County namely the increasing temperatures, rainfall variability including unpredictable extreme events. These manifestations were found to be affecting various aspects of the County`s socio-economic structure owing to their dependence on climate sensitive resources. Consequently, this severely impacted on the vulnerable groups who were characterized by high poverty levels including women, the elderly, youths, children and the people with disabilities. Some of the risks identified during the assessment were; drought, storms, flood, prevalence of pest and diseases. The adaptation strategies identified were; adoption of climate smart agriculture, promotion of diseases and pest resistant crop varieties, Water resource management and conservation, disaster preparedness and management, afforestation, Rehabilitation of degraded areas, energy conservation and development of climate proof road infrastructure.

In order to effectively achieve the implementation of the adaptation strategies mentioned above. The PCRA report has highlighted the cross-sectoral strategic investment priorities that strengthen the adaptive capacity and resilience of key livelihood, social and economic systems within the county. The highlighted investment priorities were found to be aligned with the Migori County Government project policies, plans and budget aimed at achieving sustainable growth and increased climate resilience.

Chapter one: Context of the Participatory Climate Risk Assessment (PCRA)

1.1 Background

Climate change is a major threat to sustainable development globally. From shifting weather patterns that threaten food production systems and livelihoods to rising sea levels that increase the occurrence of floods, the impacts of climate change are global in spread and are unprecedented in scale. The risk of these natural events turning into a disaster is partly dependent on the severity of the event.

Climate risks are a threat to Kenya's sustainable development goals. Kenya's economy is largely dependent on natural resources, rain fed agriculture and tourism. All of which are greatly susceptible to climate change and variability. The socio-economic burden of climate change to Kenya informed the nationwide focus on climate action.

1.2 Physical and Topographical Features

The county covers a land area of 2,596.5 km^2, of which 11.4385 km^2 is gazetted forest reserve while 45.53 km2 is non-gazetted forest. The County forest cover is 0.31% while the tree cover stands at 10.78[1]. The county's altitude ranges between 1140m above sea level at the shores of Lake Victoria in Nyatike Sub-county to 4625m above sea level in Uriri Sub-County. Undulating hills cover most of the County's landscape with few stretches of flat lands. Some of the hills found in the county include Nyakune (4625m), Ogengo (4300m) and God Sibwoche (1475m) in Uriri sub-county, God Kwer (1420m), Mukuro (1454m) and Nyabisawa (1489m) in Suna West Sub county, God Kwach (1340m), Kiasa Hill in Nyatike Sub-county, Renjoka (1592m) in Kuria West Sub-county, Achama hill in Awendo Sub-Countyand Maeta (1733m)in Kuria East Sub-county[2].

The county's topography is underlain by relatively 'acidic' parent rock and Granite covering most parts of Kuria East, Kuria West, Nyatike and some parts of Rongo and Migori Sub-counties with the rest being covered by the Nyanzian and Bukoban rocks. The low-lying areas of Nyatike experience flooding from run off from the hilly areas.

[1] National Forest Resources Assessment Report 2021
[2]Migori CIDP 2023-2027

1.3 Climatic Conditions

Annual temperatures vary between a mean minimum of 24^0C and maximum of 31^0C, with high humidity and a potential evaporation of 1800mm to 2000 mm per year. Migori County has two main rainy seasons. The long rains fall between March and May while the short rains occur between September and November. Dry seasons are experienced in two annual phases: December-February and June-September.

The total annual rainfall trends showed a slight decrease since 1985 which will continue until 2040 for the long rainy season. In the opposite, the short rainy season will see a sharp increase in the precipitation. The annual mean temperature has increased since 1985 and will continue to do so until 2040 and then 2060 for both rainy seasons.

1.4 Agro-Ecological Zones

The county has six agro-ecological zones ranging from Upper Midlands (UM 1-4) to Lower Midlands (LM 1-5). UM 1-4 covers parts of Rongo, Kuria East, and Kuria West sub-counties; LM 1-5 covers parts of Rongo, Suna East, Suna West and Nyatike sub-counties. These zones determine the types of agricultural activities undertaken in each area. The county experiences an inland equatorial climate, modified by the effects of altitude, topographical relief, and the influence of Lake Victoria. Nyatike, Karungu, Kegonga, and Muhuru areas have harsher climatic conditions compared to the rest of the County. The lakeshore areas of Nyatike, Muhuru, Karungu, and parts of Kegonga experience unreliable and poorly distributed rainfall (County Government of Migori, 2013). Regions of high agricultural potential in Uriri, Awendo, Kuria East, Rongo, Suna East and Kuria West sub-counties are used for food and cash crop production, thanks to their fertile soils and favourable conditions.

Climate change impacts such as floods, frequent and prolonged droughts, increase in incidences of crops and livestock pests and diseases, increase in invasive species, increase of vector-borne diseases including malaria, WASH related diseases including cholera and typhoid and drying up of springs are now observed in Migori county. The County government has put in place climate change governance structures to coordinate climate change interventions in the County. These include the constitution of the climate change directorate, ward climate change committees, County Climate Change Planning committees, County Steering Committee and the County Climate Change Fund Board. These structures are expected to execute their roles as per the County Climate Change Act, 2021. Additionally, the County Government has built the capacity of these committees on climate change adaptation and mitigation for effective discharge of their mandate.

According to the Migori County Climate Change Policy, 2020, The County is expected to conduct a Climate Risk and Vulnerability Assessment from among the following sectors:

- Agriculture, Livestock and Fisheries
- Water and Energy
- Forestry
- Human Health
- Infrastructure
- Biodiversity
- Tourism and Wildlife
- Population, urbanization and Housing
- Wetlands
- And other vulnerable ecosystems

In line with this, the County conducted a Participatory Climate Risk Assessment (PCRA) in all the 40 wards in May, 2023 to identify and understand climate risks and hazards that Migori County is exposed to. This was aimed at strengthening the capacity for climate change adaptation in Migori County as it will inform the preparation of the County Climate Change Action Plan that is aligned to the National Climate Change Action Plan.

A six step process was used during the PCRA process as discussed in section 1.4 of this report.

1.5 Policy Context

In 1992, states came together under the United Nations Framework Convention on Climate Change (UNFCCC) to establish an international environmental treaty to combat dangerous human interference with the climate system. The treaty called for policy agreements aimed at allowing ecosystems to adapt normally to climate change, ensuring food production is not threatened and enabling sustainable economic development. This treaty entered into force in March, 1994 and was ratified by Kenya in August 1994.

Its objective was to stabilize greenhouse gas concentration in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system. This was pegged on the principle of common but differentiated responsibilities and respective capabilities. The member Countries committed to periodically update Greenhouse gas inventories through National reporting. To Implement UNFCCC, countries adopted Kyoto Protocol in 1997, which entered into force in 2005. The Kyoto Protocol established legally binding obligations under international law, for developed countries to reduce their greenhouse gas emissions.

In 2015 parties came together under the Paris Agreement to look into Climate Change, Adaptation and Finance. The greatest aim of this agreement was to hold the increase in average

global temperature to well below 2^0C above pre- industrial level and to pursue efforts to limit the temperature increase to 1.5^0C above pre –industrial level. The Paris Agreement mandates each country to outline and communicate their post-2020 climate actions and efforts by each country to reduce national emissions and adapt to the impacts of climate change known as their Nationally Determined Contributions (NDCs). Through the NDCs, it was realized that there were a series of challenges less developed countries face including how to:

i. build awareness on the need for, and benefits of, action among stakeholders, including key government ministries;
ii. mainstream and integrate climate change into national planning and development processes;
iii. strengthen the links between subnational and national government plans on climate change;
iv. build capacity to analyse, develop and implement climate policy;
v. address resource constraints for developing and implementing climate change policy.

Kenya as a party to UNFCCC has made significant efforts to address climate issues since 1990. The Constitution of Kenya, 2010 provides a legal commitment towards the attainment of ecologically sustainable development.

Article 69 1(a) stipulates that the state shall ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources and ensure equitable sharing of the accruing benefits.

In the year 2010, The Ministry of Environment and Mineral Resources (MEMR) launched the National Climate Change Response Strategy (NCCRS), complimented later by the Climate Change Action Plan, 2013-2017. The NCCAP provides a framework to operationalize the National Climate Change Response Strategy. The strategy aims to strengthen and focus the nationwide actions towards climate change adaptation and reduction of greenhouse gas (GHG) emission.

The enactment of the National Climate Change Act 2016, was the greatest achievement of the NCCAP. The Act provides for mainstreaming of climate change actions into the County government functions and the establishment of Climate Change Fund, designate a CECM to coordinate climate change affairs, Enact legislations to define implementation of its obligation

under this Act and to submit progress report on the implementation of climate actions to the County Assembly.

In line with this, the County Government of Migori has mainstreamed climate change actions into its programs, plans and budgets through the County Climate Change Policy, and The Migori County Climate Change Act, 2021. The County has also enacted the Migori County Climate Change Fund Act, 2021 which authorizes the establishment of County Climate Change Fund, its administration, operation procedure and financing of Climate Change Adaptation and Mitigation activities and projects. The Migori Climate Change Policy further states that the county Government shall undertake a climate vulnerability and risk assessment of the impacts of climate change and variability on various sectors. These legal frameworks are operationalized through the County Integrated Development Plan of 2023-2027.

1.6 Purpose of the PCRA Report

The purpose of participatory climate risk assessment was to co-create a participatory approach for the local community and other stakeholders to assess climate risks in the county and to develop adaptation strategies. The Migori County PCRA report presents the climate hazards in the County, their probability of occurrence, historical, current and potential impacts, and current and new adaptation strategies. Therefore, this report will help in prioritization of climate action and investments by the community, state and non-state actors. The process allowed the local communities to participate in identification of their climate related risks and hazards. It also created a forum for cross-shared learning thereby strengthening systems for sustainability and encouraging ownership of projects on climate mitigation and adaptation.

1.7 PCRA process

1.7.1 Key steps in the county's PCRA process

The county's PCRA process involved the following steps

1. Formation of a cross-sectoral County Technical Working Group (TWG) to support the community in assessing hazard vulnerability, local coping strategies and adaptive capacity. This was done on 7th April, 2023. The TWG was composed of representatives drawn from line County departments, 3 representatives of Civil Society Organizations (CSOs), Climate Change Unit (CCU) representative, Kenya Meteorological Department and NEMA. Their roles included; coordination of stakeholder analysis and engagement at all levels, data collection at ward level, data analysis and interpretation, County level stakeholders workshop and preparation of the PCRA report.

2. Training of the Task Team on key steps and on the tool for the PCRA process. This was conducted at Border Point Hotel in Isibania, Migori County on 3rd and 4th of May, 2023. The task team was composed of technical persons from the department of Environment, Water and Agriculture.
3 Identification of all key stakeholders at county, sub-county and ward levels to participate in the PCRA and climate action planning process. This was done during the first TWG meeting held on 22nd May, 2023 at Border Point Hotel. The outcome of stakeholder analysis is presented in table 1

4 Stakeholder engagement at the ward level to ensure that the communities (women, youth, ethnic minorities, people living with disabilities and other marginalized and vulnerable groups) and other key local actors actively participate in data collection for the climate risk assessment as per the County Public Participation Guidelines. The ward level stakeholders were concurrently engaged as from 7th to 19th of May, 2023 in all the 40 wards on diverse dates. (schedule in the annex)

5 Quantitative and qualitative data analysis and interpretation was done by a County data analyst together with the task team and the climate change directorate at Kehancha, Sunrise Hotel, Migori County as from 16th to 17th May, 2023.

6 Multi-stakeholder climate risk assessment workshop to present the findings from the ward level stakeholders engagement was conducted at Sugarland Hotel, Migori County, as from 23rd to 29th of May, 2023. The participants to the workshop included representatives of line departments, CSOs, representatives of Ministries, Departments and Agencies (MDAs) and other interest groups.

7 Climate risk assessment report which outlines the validated findings to inform the Migori County Climate Change Action Plan. This report outlined all the hazards and risks, mitigation and adaptation strategies identified in all the 40 wards. The reports was prepared by the task team under the supervision of the directorate as from 23rd to 29th May, 2023.

1.7.2 Stakeholder mapping and analysis

Stakeholders are very important group or parties who are affected directly or indirectly by a particular project, program or activity. Migori County is endowed with numerous stakeholders in various fields whose core activities cuts across various issue with global and local perspective in climate change among others.

During the PCRA process, the Technical working group mapped stakeholders guided by the following aspects:

i. Those formally responsible for climate action
ii. Those involved in climate action implementation
iii. Those with knowledge and expertise on climate change
iv. Those affected by climate change

The identified stakeholders were then classified based on their interests and influence on matters climate change as shown in the table below:

Table 1: Stakeholders' Analysis

High Influence, Low Interest • Finance • SONY • Equity • Family • Cooperative • Religious organizations (NCCK) • National chamber of commerce	**High Influence High Interest,** • Environmentt, health, lands, Ken Gen, interior and coordination • Water and energy, Mines and geology • KEFRI, KFS, County Assembly, Mines and geology • Agric, health, KCB, KWFT • KMD, DaCCA consortium, • Kenya Red cross, one vision, practical action, Ripple effect, trees for future, world vision, blue cross, WKWP,WKSP, hand in hand,Care Kenya Lwala community, green world, self-help Africa, Tunaweza empowerment, enter for climate change adaptation, Kenya peasabts league, Micma, Micsof, AHII, NEWOYO, CFAs, MICOWRUA, ISAK • Rongo university, Kisii University, TVETs, TTC • NEMA • KWS • WRA • Ministry of Energy, SMHI
Low influence, Low Interest Communication Officers • Secretarial staff	**Low Influence, High Interest** • KPLC

Ward level community engagement

The Climate change directorate engaged Trainers of Trainers (ToT) previously trained on climate change for data collection at the ward level. The ToTs were taken through the predesigned PCRA data collection tools before they commenced the exercise. Data was collected in each of the 40 wards in Migori County, thereafter, the data analysis and reporting was conducted in a central location. A data analyst was involved in the process.

Different groups in the community were engaged in the process including women, youth, men, PWD and minorities. *(See attendance lists in annexures) Table 2. below shows the stakeholders engagement plan*

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Table 2: Stakeholders Engagement plan

NAME OF STAKEHOLDER	ROLE	STAGE OF ENGAGEMENT	METHOD OF ENGAGEMENT
Technical working group comprising of 1. climate change focal persons in the departments of agriculture, water and energy, health, livestock, fisheries, roads and public works, NEMA, KMD, economic planning, land, 2. CSO representatives (practical action, DACCA, western Kenya water project , western Kenya sanitation project)	To coordinate PCRA process	1. Stakeholder identification and mapping 2. Preparing the work plan and budgeting for PCRA process 3. Ward level engagement 4. County level stakeholder engagement 5. Data analysis and Preparation of PCRA report	- Office meeting / consultation - Focal group discussion - Stakeholder feedback general meeting
Devolution and Climate Change (DaCCA), One Vision Kenya, Western Kenya Water Project (WKWP), Ripple Effect, Tree for Future, Kenya Peasants League, PELUM, Adolescent Health Impact Initiative, NEMA, Kenya Forest Service (KFS), Kenya Forestry Research Institute (KEFRI), MIWASCO, NYAWASCO, Migori - Masaba WRUAs, Care Kenya, World Vision Kenya, National Council of Churches of Kenya (NCCK), Practical Action, Mirema Community Forest Association (CFA), Kenya Meteorological , epartment – Migori Office, Migori County Artisanal Miners' Association, Migori County Sand Harvesting , ssociation, Kenya Red Cross Society, Rongo University, British American Tobacco Plc (BAT), kenya Wildlife Service, Department of Lands, Department of Water, Department of Public Health, Department of Economic Planning, Department of Agriculture, Sony Sugar Company , GreenLife, GIZ, Social Justice Network, Western Kenya Sanitation Project (WKSP).	Collection of county data and sharing experience	County level engagement	- Meetings - Focus group discussions
Ward climate change planning committee and the community:	Collection of data at the ward/community level	Data Collection	- Meetings - Focus group discussions - Presentations

Chapter Two: County Climate Hazard Profile

2.1 Current and Historical Climate Hazards and Trends

Current and Historical climate scenarios in the County were found to align with the community perception that the region experience two major seasons namely wet and dry. Long rains occur during the months of March-May and short rains occur during the months of September to December. The temperatures vary depending on the rainy seasons with high temperatures experienced during the dry season whereas temperatures are relatively lower during the wet season.

Climate change has increased the risk and intensity of flood events, as well as increased average annual rainfall while also furthering the occurrence of drought in the county. Extreme incidences of rainfall experienced has increased cases of soil erosion and water logging in farms leading to reduction of crop yields thus ultimately increasing food insecurity in the county. On the other hand, the rising temperatures in the county is increasing the periods of aridity in Nyatike and some areas in North Kanyamkago. Furthermore, as the temperature rise and drought prolong, water storage capacities are reduced. This results to significant economic losses and damage to agricultural lands. Additionally, land degradation and soil erosion exacerbated by recurrent floods is negatively impacting agricultural productivity, disproponentely affecting the livelihoods of the rural poor.

Below are the scientific historical data presented during the climate risk assessment workshop as well as the current climatic related information provided by the key interest groups/table groups during the climate risk assessment at the wards. Table 3: Presents a summary of risks and threats in Migori County.

2.1.1 Rainfall Pattern and temperature variations

Historically, Migori has been experiencing two main seasons namely: March to May and October to December as depicted in the peaks shown in the figures below:

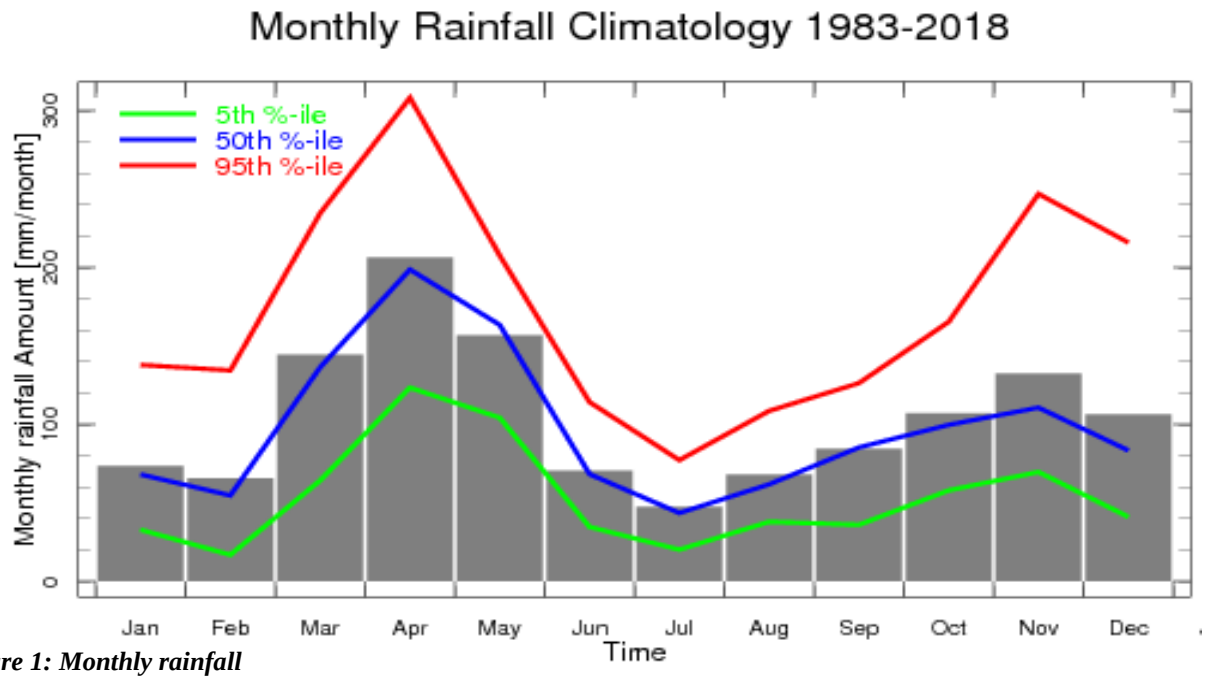


Figure 1: Monthly rainfall

From the data collected during PCRA, Migori County experiences two major seasons namely wet and dry. There are two wet season; long rains that occur during the months of March-May and short rain that occur during the months of September to December.

On the other hand, temperatures vary depending on the rainy seasons with high temperatures experienced during the dry season whereas temperatures are relatively lower during the wet season as shown below. This is in tandem with historical data

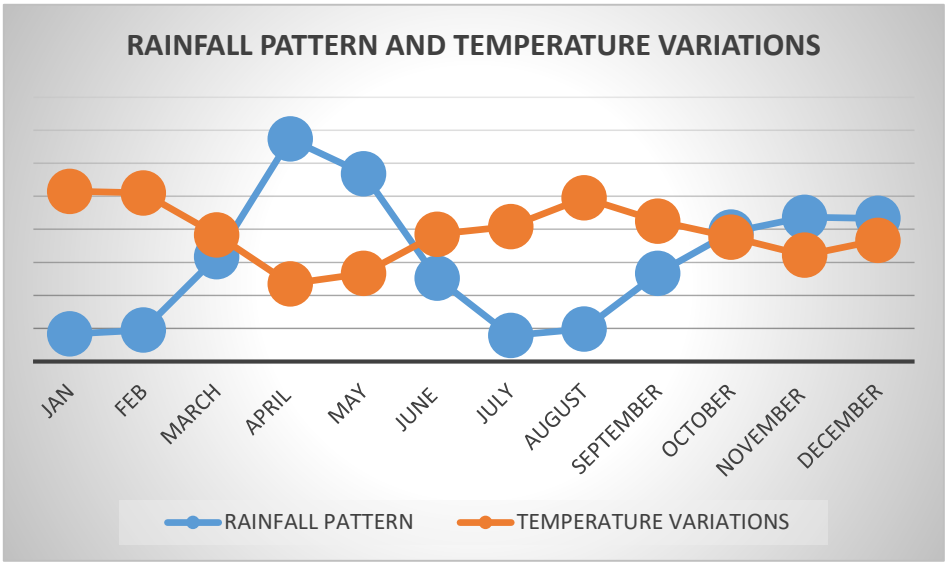


Figure 2: Rainfall Pattern and temperature variations

2.1.2 Food availability and commodity prices

The figure below illustrates that commodity prices in the markets are dictated by food availability with the trend showing high commodity prices when there is little or no food and lower prices during the harvesting seasons.

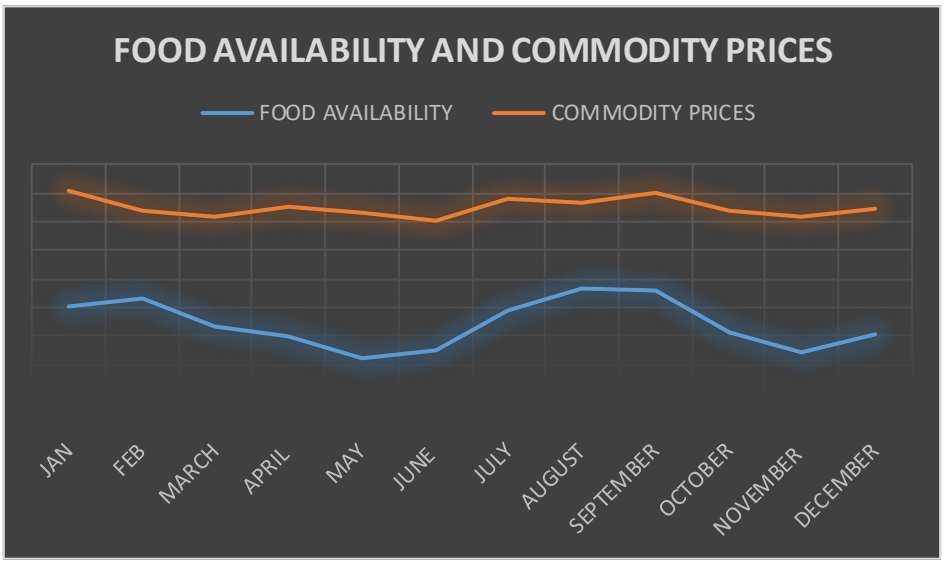


Figure 3: Food availability and commodity prices

2.1.3 Forage patterns

Soil moisture content is high during the rainy season and this encourages foliation and vegetative growth. From the figure below, forage is available for the livestock in the months of March-May and October to December.

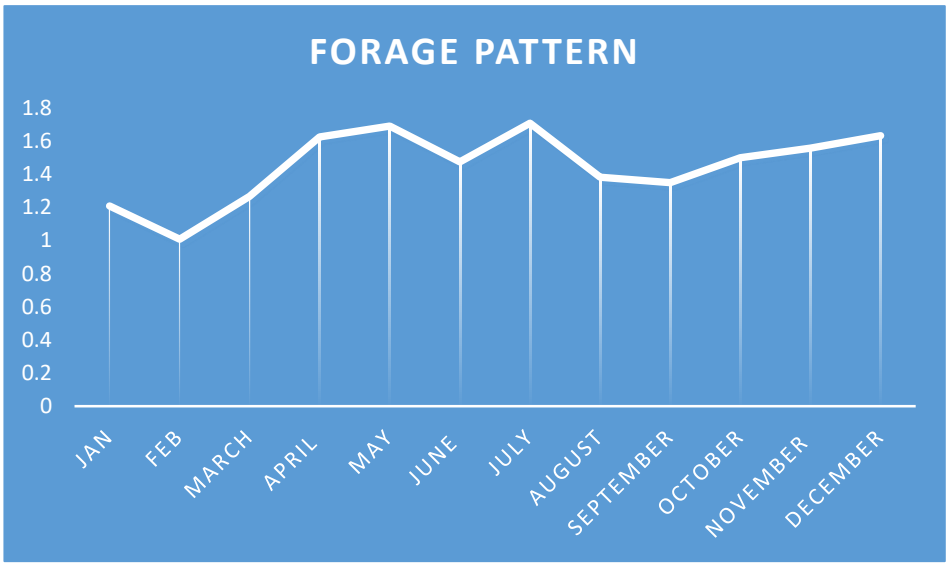


Figure 4: Forage patterns

2.1.4 Workload

Agriculture being the main driver of the economy of the county, the communities tend to be engaged in agricultural activities during the rainy seasons when planting and farm management takes place. They are also engaged in post-harvest handling during the months of January and August.

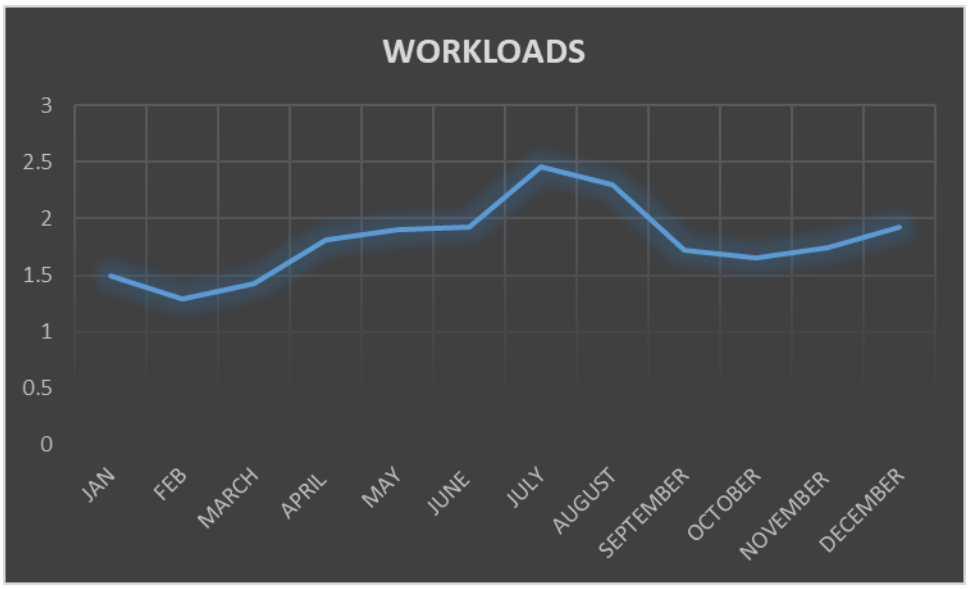


Figure 5: Workload

2.1.5 Natural Disaster prevalence

Natural disaster prevalence is dependent on the amount of rainfall. Disaster cases are usually high in March –May and September –December during the rainy season.

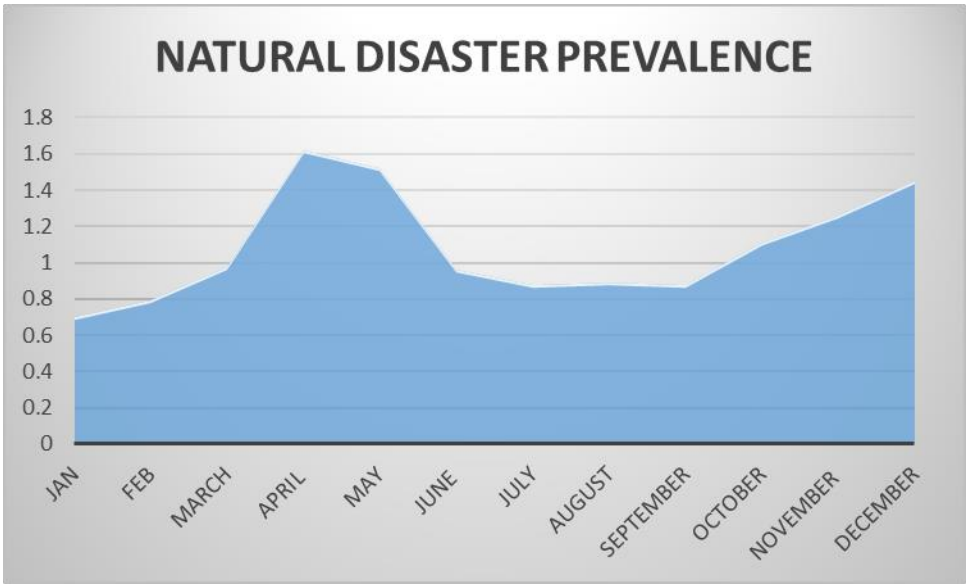


Figure 6: Natural disaster prevalence

2.1.6 Food availability and Household Income

The figure below depicts that household income is directly proportional to food availability and is highest in August and January since Migori is largely an agricultural county.

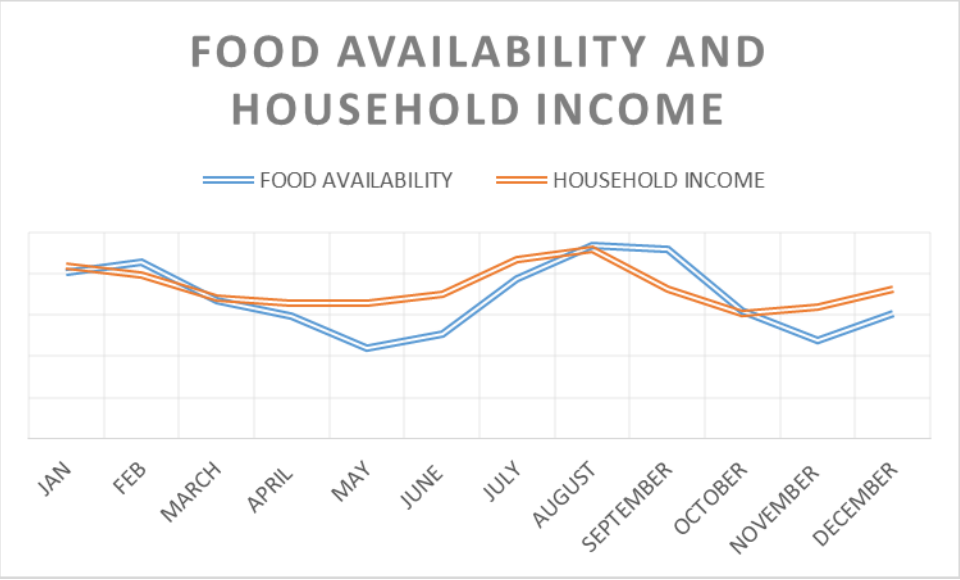


Figure 7: Food availability and Household income

The figure below shows that when there is plenty of food after harvest, household expenditure is low.

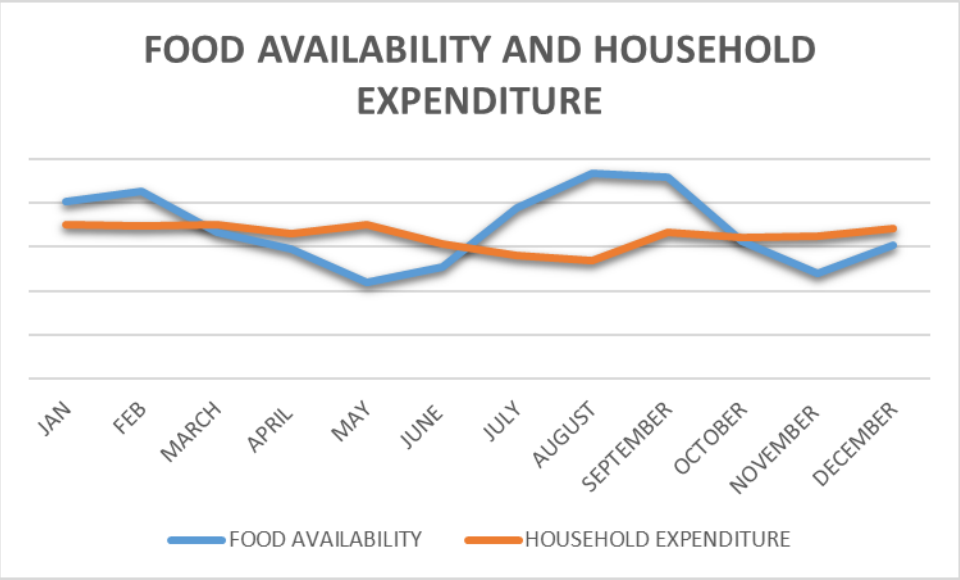


Figure 8: Food availability and Household expenditure

2.1.7 Clean water availability

Availability of clean water is dependent on the rainfall patterns experienced in the county with clean water being available for most homes during the rainy seasons. This is the period when water is harvested within the households and fetching distance is reduced.

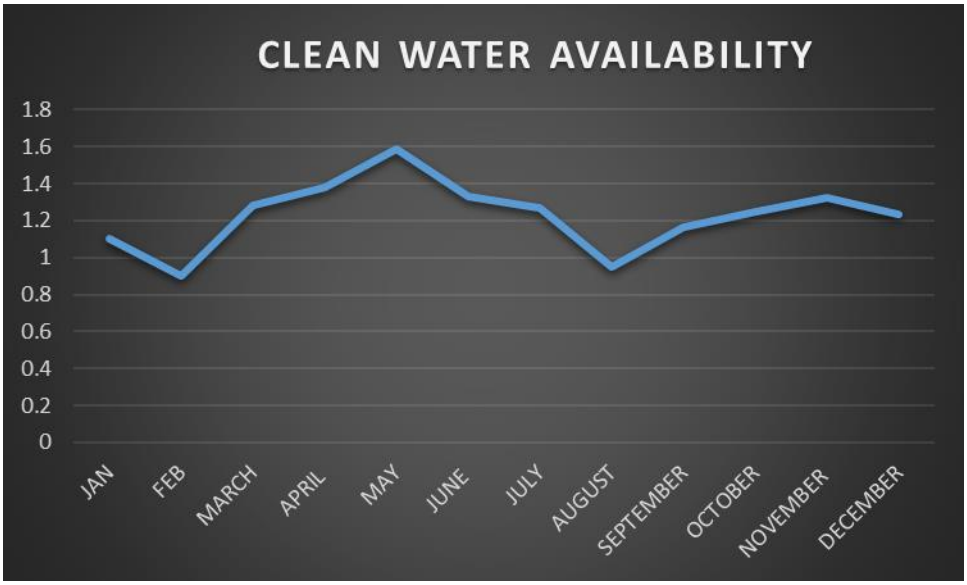


Figure 9: Clean water availability

2.1.8 Disease prevalence

High rainfall during the months of April-June and October-December increases the incidences of occurrence of vector–borne diseases like Malaria, whereas water borne diseases are more common during both the dry and wet seasons due to contamination of water sources.

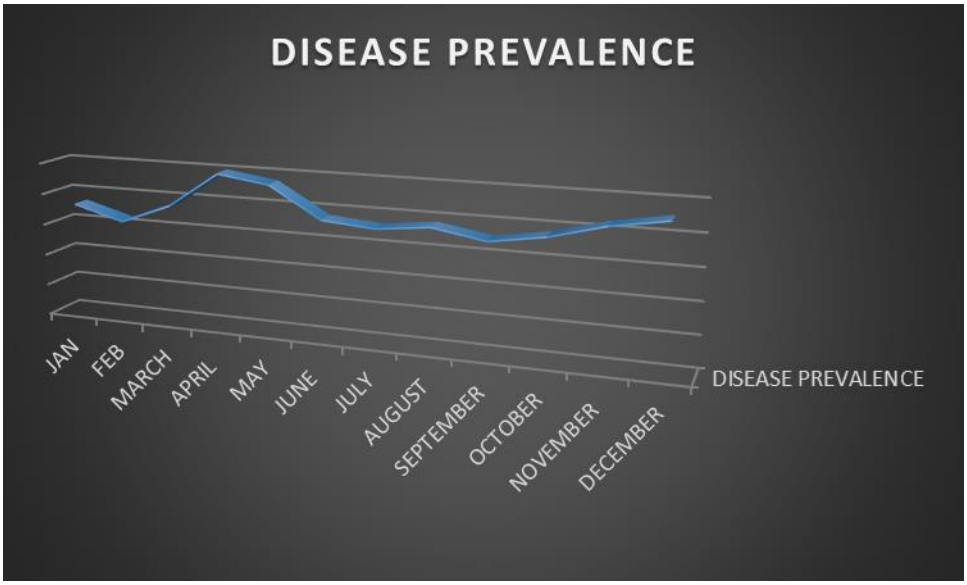


Figure 10: Disease prevalence graph (source: field data collection)

Table 3:Summary of Risks and threats in Migori County

WARD	RISKS THE COMMUNITY IS FACING	INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS	EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS
Ntimaru West	• Drought • Grazing land and water resource conflicts • pests and diseases • poor waste disposal	• drought causes low food productivity which results in low income hence insecurity and conflicts • poor waste management also leads to an increase of pests and diseases	• insecurity and conflicts will increase • Incidences of drought, pests and disease and environmental degradation will increase.
Nyabasi East	• unpredictable rainfall patterns • poor waste disposal • Grazing land and water resource conflicts • loss of pasture	• Unpredictable rainfall pattern-leads to crop failure thus food insecurity • reduced rainfall leads to lack of pastures which lowers livestock productivity hence low income	• insecurity and conflicts will increase • water scarcity • increase of food insecurity • environmental degradation • Low livestock productivity
North Kanyamkago	• Floods • drought • Pests and diseases, • Extreme temperatures • Pollution • Hailstones • Grazing land and water resource conflicts	• Drought leads to crop failure, poor nutrition and insecurity. • Water sources and forage diminish which results in conflicts among different communities	• insecurity and conflicts will increase • Worsening floods, drought, pests and disease and environmental degradation • low income
WARD	**RISKS THE COMMUNITY IS FACING**	**INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS**	**EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS**
South Kamagambo	• Floods, • Soil erosion, • drought, • Pests and diseases, • damage to	• Floods damage roads leading to accidents • Drought leads to crop failure, poor nutrition and insecurity.	• insecurity and conflicts will increase • Worsening floods, drought, pests and disease and environmental degradation • low income

	infrastructure • Grazing land and water resource conflicts • Hailstones • high temperatures	• Water sources and forage diminish which results in conflicts among different communities	
Ntimaru East	• Drought • conflict over livestock, • diseases • locust infestation • flooding	• Drought leads to water scarcity and loss of pasture which causes conflict. • floods cause crop failure resulting in food insecurity which leads to an increase in GBV, high infidelity and HIV/Aids prevalence	• increase of food insecurity • insecurity and conflicts will increase
East Kamagambo	• Drought, • Pests and diseases, • Floods, • Soil erosion, • Extreme temperatures, • Hailstones	• Drought causes crop failure. • Floods damage roads and bridges leading to accidents	• Increase of accidents. • Increase of food insecurity • low household income
South Kamagambo	• Flooding, • Drought, • Grazing land and water resource conflicts • High temperatures, • Disease outbreak • Soil erosion • Well collapse • Damage to infrastructure	• Drought causes crop failure leading to low household income. • Floods damage infrastructure	• Low household income • Increase of food insecurity • insecurity and conflicts will increase
WARD	**RISKS THE COMMUNITY IS FACING**	**INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS**	**EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS**
Nyabasi West	• Drought, • water scarcity, • Grazing land and water resource	• Limited capacity means lack of knowledge on sustainable sand harvesting. • Low rainfall means reduced	• Improved road network and market accessibility • increased household income

	conflicts • unsustainable waste disposal, • uncontrolled logging, • poor road network, • charcoal burning and • unsustainable sand harvesting	crop yield resulting in hunger and theft • Charcoal burning leads to uncontrolled logging and deforestation	• insecurity likely to drop with planned establishment of more police posts n community policing
Bukira East	• Drought, • Floods, • Unreliable rainfall, • Pests and diseases, • Poor sanitation, • Hailstones, • Water scarcity, • Soil erosion	• Drought leads to crop failure • floods cause crop failure	• Low household income • Increase of food insecurity • insecurity and conflicts will increase
Bukira Central	• Insecurity, • Hailstones, • Swamping, • Water shortage, Diseases, • Poor infrastructure, • Inadequate foods, • poor health facilities	• Hailstones lead to crop failure • Floods damage infrastructure	• Low household income • Increase of food insecurity • insecurity and conflicts will increase

WARD	RISKS THE COMMUNITY IS FACING	INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS	EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS
Makerero	• Diseases, • Drought, • Poor road network,	• Drought leads water shortage which cause inter-clan conflict over water resources	• Low household income • Food insecurity

	• clean water shortage, • floods • pests, • poor sanitation,	• Floods damage infrastructure	• insecurity and conflicts will increase
Gokeharaka Getambwega	• pests and diseases, • poor road network, • lack of clean water, • inter-clan conflicts, • poor sanitation, • flooding	• Lack of clean water for domestic use leads to inter-clan conflicts	• insecurity and conflicts will increase
North Kamagambo	• Diseases, • water pollution, • deforestation, • increase in price commodity,	• Water pollution leads to water scarcity and spread of diseases • Excess rainfall cause collapse of mines	• Increase in collapse of mines • food insecurity • Increase in price of commodities
North Sakwa	• Flooding, • pest infestation, • cholera during dry season, • food shortage, • heavy rainfall • human wildlife conflict (monkeys destroying crops) • Increased cases of animal diseases (foot and mouth).	• Human wildlife conflict leads to destruction if farmlands e as monkeys destroy crops and livestock • pest infestation and disease cause low crop productivity	• Low household income • Food insecurity • insecurity and conflicts will increase

WARD	RISKS THE COMMUNITY IS FACING	INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS	EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS
Tagare	• rainfall variability • destruction of infrastructure-roads	• excess rains results in bad roads	• Road status will worsen if interventions are not put in place
West Kanyamkago	• High and erratic rainfall • drought • pest and diseases (malaria and tsetse fly), • low crop yield, • Grazing land and water resource conflicts • malnutrition, • crop failure • destruction of infrastructure • water shortage, • siltation of water pans and low income	• Low rainfall and drought causes pest and diseases, low crop yield and crop failure thus Malnutrition, insecurity and low income. • High and erratic rainfall causes destruction of infrastructures (roads) due to soil erosion and poor drainages thus siltation of water pans and rivers. This results to low water retention capacity hence water shortage	• There will be more cases of malaria therefore increased cases of children and women mortality rates. • Increased insecurity • Increased resource use conflict
Nyamosense Komosoko	• Drought, • food shortage, • changing season, • increase in temperature, • high rainfall	• Drought and changing seasons causes Food shortage and drying of dams hence water shortage • High rainfall causes siltation of water pans, prevalence of diseases such as malaria and land degradation due to soil erosion	• increased food insecurity • More water pans will dry up hence there will be no enough water thus there may be conflict over the remaining water sources due to population pressure

	• siltation of water pans, • diseases especially malaria, • land degradation		
Macalder Kanyarwanda	• High and erratic rainfall • Collapse of mines, • Floods • Pollution	• Collapse of mines is caused by high rainfall,	• Technological advancement will lead to safer mining methods. • Proper sensitization will lead to reduced pollution.
WARD	**RISKS THE COMMUNITY IS FACING**	**INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS**	**EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS**
Wiga	• Drought, • inadequate drinking water, • Pest and diseases.	• Drought leads to breeding of more pest and diseases and water shortage	• With the new adaptation strategy such as drilling of bore holes, more water will be available for animal and human consumption.
Isebania	• Hailstone, • pest and diseases, • soil erosion, • flooding, • bad roads, • drought, • unreliable rainfall, • high cost of farm inputs and • Poor extension services.	• Drought causes Pest and diseases such as foot and mouth disease • Roads -our roads are degraded by storm water during rainy season; • Soil erosion results to bad roads	• The impacts are expected to worsen if the interventions to address bad roads, agricultural extension services, pest and diseases are not undertaken. These will majorly impact negatively on health, food security and transport thus high cost of leaving
North Kadem	• Floods, • droughts, • pest and diseases • food shortage	• Longer drought periods and floods leads to breeding of more pests and diseases • Longer drought periods and floods food shortage	• Provision of cheap and safe pesticides will eradicate pests. However, if no interventions are put in place there will be prevalence of pest, diseases and food shortage hence deteriorated community health standard and famine

Masaba	• Water scarcity; • Drought; • bad roads; • pest and diseases; • high and erratic rainfall variability; • Soil erosion. • Mine collapse	• Drought caused food insecurity, pest and diseases, water scarcity • High and erratic rainfall causes erosion on roads thus bad roads erosion • Excess rainfall exhausts the soil resulting to more incidences of mine collapse	• The community expects the situation to worsen in the next 30 years if no proper intervention is taken. • Water scarcity will be high hence conflict relating to its access • Increased mine collapse hence increased loss of lives thus more widows
WARD	**RISKS THE COMMUNITY IS FACING**	**INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS**	**EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS**
Kanyasa	• Drought, • pest and diseases • Food shortage	• Longer dry periods lead to famine and breeding of more pest and diseases.	• Introduction of cheaper pesticides will eradicate the menace of pests in kanyasa
Muhuru	• Drought • Crop failure, • Water Scarcity, • Grazing land and water resource conflicts • Gender Based Violence, • Waterborne diseases, • Economic shocks	Drought causes crop failure thus: - • Food insecurity hence rise in gender based violence cases in various villages • Economic shocks thus cases of early marriage and teenage pregnancies	• the trend of all the risks is likely to rise due to population pressure on the existing resources
South Kanyamkago	• Soil erosion • Pest and diseases; • Water scarcity; • Indoor air pollution; • Food insecurity;	• Drought caused food insecurity, water scarcity • Floods causes pest and diseases, bad roads and soil erosion	• The situation will tend to worsen if the relevant interventions are not implemented. e.g increased Soil erosion causing soil infertility, low food production, food insecurity thus high cost of living and inaccessible roads.

	• Drought; • Floods; • Bad roads.		• water scarcity hence conflict over the resource
West Sakwa	• Drought, • Grazing land and water resource conflicts • disease	• Drought causes diseases such as cholera and insecurity due to low crop yield that results to high cost of living	• Increased food insecurity, prevalence of water borne diseases thus increased household expenditures • There will be increased cases of insecurity
Central Sakwa	• Insecurity, • drought, • Diseases	• Drought causes diseases such as cholera and insecurity due to low crop yield that results to high cost of living	• Increased food insecurity, prevalence of water borne diseases thus increased household expenditures • There will be increased cases of insecurity

WARD	RISKS THE COMMUNITY IS FACING	INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS	EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS
Got Kachola	• Drought • Crop failure, • Water shortage, • insecurity, • waterborne diseases, • GBV, • early marriage	• food shortage causes an increase in cases of insecurity as well as teenage pregnancies	• the trend of all the risks is likely to rise due to population pressure on the existing resources that keeps on reducing due to prevalence of the risks
Central Kanyamkago	• Disease and pest, • Drought, • Floods • Food insecurity • Insecurity	• Drought, flood, disease and pest cause low productivity of crops and livestock hence food insecurity. This leads to low income high cost of leaving thus insecurity	• Increased food insecurity, prevalence of water borne diseases thus increased household expenditures • There will be increased cases of insecurity
Kachieng	• Drought • resource conflicts; water and pasture • gender based violence cases,	• Resource conflicts are on the rise due to competition for reduced resources such as water and pasture • Drought causes crop failure thus food insecurity, gender based violence cases and	• the trend of all the risks is likely to rise due to population pressure on the existing resources that keeps on reducing due to prevalence of the risks

	• insecurity, • crop failure, • water shortage • food insecurity	insecurity	
South Sakwa	• Heavy rains • Poor road network, • Drought • poor health care services	• Heavy rains cause poor road networks thus poor health care services	• Road will continue to worsen resulting to ever increasing cost of transport, high cost of commodities thus high cost of living. • Health care service will continue to deteriorate
WARD	**RISKS THE COMMUNITY IS FACING**	**INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS**	**EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS**
Kaler	• water shortage, • food insecurity, • resource conflicts, • GBV, • Grazing land and water resource conflicts	• Resource conflicts are on the rise due to competition for limited resources such as water and pasture	• With ever growing population resource conflict will increase as a result of competition for the already constrained resources; water and this will cause a steady increase in non-climate risks thus a vulnerable society. • Food insecurity will be on the rise hence frequent insecurity and GBV cases
Suna Central	• Drought • Food insecurity • accidents, • inadequate clean water	Drought causes food insecurity, inadequate clean water.	• Increased food insecurity, prevalence of water borne diseases thus increased household expenditures. • There will be increased cases of insecurity
Kakrao	• drought • Food insecurity, • inadequate clean water • high rate of accidents	Drought causes food insecurity, inadequate clean water.	• Increased food insecurity, prevalence of water borne diseases thus increased household expenditures. • There will be increased cases of insecurity
Oruba Ragana	• Insecurity • pollution,	• Increased diseases and pest causes low crops and	Crop and livestock production will tremendously reduce hence low income, high cost of living thus

	• increased diseases and pest, • food shortage and • political risk	livestock productivity thus food shortage, political risks and insecurity	reduced standards of living.
Wasweta II	• Drought, • Low crop yield, • diseases infestation, • Grazing land and water resource conflicts • Economic risk.	• Drought causes low crop yield thus increased food prices, low income high cost of living consequently leading to insecurity • Drought leads to infestation of diseases	The risks will increase resulting to high cost of leaving, high house hold expenditures, political unrest and stunted economy

WARD	RISKS THE COMMUNITY IS FACING	INTERACTION BETWEEN CLIMATE AND NON CLIMATE RISKS	EXPECTED CHANGES ATTRIBUTED TO NON CLIMATE RISKS IN THE NEXT 30 YEARS
Wasimbete	• Pests and diseases, • drought, • airborne disease, • Grazing land and water resource conflicts • floods,	Drought result to • increased pests and diseases; tsetse fly and cholera respectively • reduced agricultural production hence malnutrition, related diseases and insecurity	The risks will increase resulting to high cost of leaving, high house hold expenditures, political unrest and stunted economy
East Kanyamkago	• Pest and disease, • insecurity , • drought, • political risk, • economic risk, • heavy rainfall,	• Drought, pest, diseases and heavy rainfall will lead to economic risk due to reduced crop yield that leads to low income, high household expenditures and insecurity.	Risks will increase resulting to high cost of leaving, high house hold expenditures, political unrest and stunted economy
Godjope	• Food insecurity , • Inadequate clean	• flooding leads to reduced water quality and food insecurity	• Increased food insecurity resulting to high cost of leaving, • reduced health as a result of

	water and • Flooding		increased cases of water borne diseases and malnutrition
Kwa	• Drought • Food insecurity , • inadequate clean water and • crop failure	• Drought causes food insecurity, in adequate water and crop failure	• increased food insecurity hence high cost of leaving

2.2 Exposure and vulnerability profiles of the county

The communities in Migori County reported that their main economic activities i.e. agriculture, trade, commercial tree growing, gold mining and sand harvesting have been impacted by the effects of climate change. The Climate change and variations have led to economic and social consequences such as income losses, increased poverty levels, death, spread of diseases and food insecurity. This consequence severely impacts the vulnerable groups in the County who are characterized by high poverty levels including women, the elderly, youths, children and the physically challenged people.

For instance, the drought experienced especially in Nyatike and Kuria East sub-counties quite often depletes the water reservoirs thus forcing the women to travel long distances in search of water; it has also led to the migration of men and the youth to urban and gold mining areas in search of gainful employment. However, the erratic rainfall has also increased the prevalence of the collapse of gold mine shafts putting the lives of many youths in the mining sector under threat.

The Frequent droughts also increase the county's vulnerability to food insecurity and poverty. High temperatures destroys crops and pastures. In Migori County, high evaporation rates caused by high temperatures necessitate supplemental irrigation of food crops. High temperatures reduces the rate of animal feed intake, resulting in poor growth performance and low production of milk, eggs, and meat. This situation severely affects the farming households as they experience food shortage and loss of income.

On the other hand, many regions of the county have reported increasing occurrences of flush floods and floods. Excessive flooding leads to soil degradation and increased outbreaks of diseases, Destruction of crops, Food shortage, Displacement of people, Destruction of homes and properties and finally destruction of road infrastructure. People with Disabilities, Children and the elderly are the most vulnerable group in the cases floods since they are less able to cope with its effects. *Table 4. Below shows a summary of exposure and vulnerability in Migori County.*

Table 4:Summary of the Exposure and Vulnerability

	VULNERABLE GROUP	CHARACTERISTICS	LOCATION	SPECIFIC ECONOMIC ACTIVITIES ASSOCIATED WITH THE GROUP	RESOURCES THE GROUP RELIES ON OR VALUES	ACCESS TO RESOURCES	LEVEL OF PARTICIPATION IN COMMUNITY/LOCAL DECISION MAKING
1	Women	most susceptible to impacts of climate change due to their gender roles: fetching water, cooking, child care, washing	Countywide	-processing of fish -hawking -sand harvesting -weeding -fetching water -alcohol brewing -prostitution - searching for water - house work	-forests - water resources -farm lands - infrastructure services including road networks - markets -health facilities - schools	-lack access to credit facilities -considered subordinate to men - victims of gender inequality and discrimination - lack of rights to land ownership	-have no say in the community decision making because of cultural perceptions
2	Youths	- unemployed - afflicted by drug addition -	Countywide	-farming -mining -bodaboda - small scale businesses -Provision of security -transportation - herding of cattle - sex workers - sand harvesting -casual labourers - cottage/jua kali industry - post harvest activities Fishing	-roads -lakes -markets -mines - infrastructure	-do not own properties	-discriminated against on grounds of age not involved in decision making

	VULNERABLE GROUP	CHARACTERISTICS	LOCATION	SPECIFIC ECONOMIC ACTIVITIES ASSOCIATED WITH THE GROUP	RESOURCES THE GROUP RELIES ON OR VALUES	ACCESS TO RESOURCES	LEVEL OF PARTICIPATION IN COMMUNITY/LOCAL DECISION MAKING
3	PWDs	-physically challenged -economically inactive -no source of income - without movement aid - no resources like farms - lack property -discriminated against - lack of access to education - epileptic	Countywide	- -cobblers -tailors - home guarding - beggars -Small scale businesses Smallscale farmers	-farmlands -well-wishers aid -infrastructure services. -markets	None- they are difficulty in accessing resources	They are voiceless because they are a minority group
4	Elderly	-sixty years and above -depend on the youth and women for provision of essential services - low immunity to diseases - prevalence to disease attacks	Countywide	-no specific economic activities - begging - watchmen in institutions and schools -elderly women carry out babysitting	- farmlands -rivers and waterpans -infrastructure services like roads	-their property is subdivided to the children - incapacitated so not taken seriously	- mostly regarded as mentally incapacitated - perceived to be wise in some issues hence involved in decision making.
5	Child headed families	Leave school so as to provide for their siblings Do odd jobs Not involved in decision making	Countywide	Farming Small scale trading Mining Odd jobs such as mjengo	- Mining areas - Farms - Market - Constructio n sites	Have no control over resources due to their young age	-no equal say in decision making

2.3 Differentiated impacts of climate trends and risks

In generating the profile for the differentiated impacts of climate trends and risks on the different key interest groups in the county. The past and the current climatic trends were assessed with key focus on rainfall and temperature patterns. According to projections the total annual rainfall trends showed a slight decrease since 1985 which will continue until 2040 for the long rainy season. In the opposite, the short rainy season will see a sharp increase in the precipitation. The annual mean temperature has increased since 1985 and will continue to do so until 2040 and then 2060 for both rainy seasons. Table 5 below shows the risks and impacts figured out from these two variables.

Table 5:Differentiated Impacts of Climate Trends and Risks

Weather parameter	**Climate trends**		**Risks**	**Impacts**	**Key interest group**	**Vulnerable groups**
	Past	Current				
Rainfall	predictable rainfall pattern	unpredictable rainfall pattern	• Crop failure	• Food insecurity • Rise in food prices • Reduction in household income	Farmers	Women, elderly, PWD, children
	Regular rainfall distribution	Erratic rainfall distribution	• Destruction of crops • Soil erosion • Flooding • Shift in seasons	• Low yield • Siltation • Pollution • Affects water availability	The community	Women, elderly, PWD, children
	Optimal amount of rainfall	Increased rainfall	• Destruction of crops • Soil erosion • Flooding	• Low yield • Siltation • Pollution	The community	Women, elderly, PWD, children
Temperature	Cooler	Warmer	• Pest infestation • Human wildlife conflict	• Low yield • Loss of biodiversity • Invasive species • High mortality of fish • Reduced moisture in wetlands	The community	Women, elderly, PWD, children

2.4 Spatial Distribution of Risks

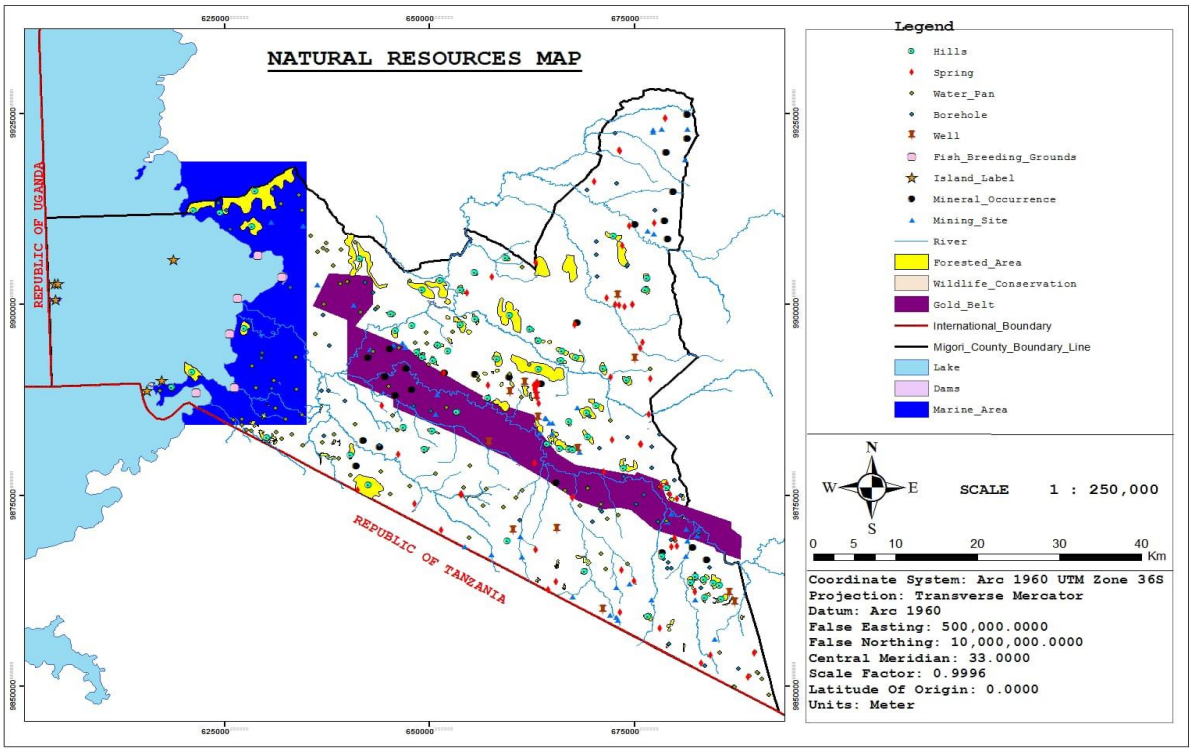
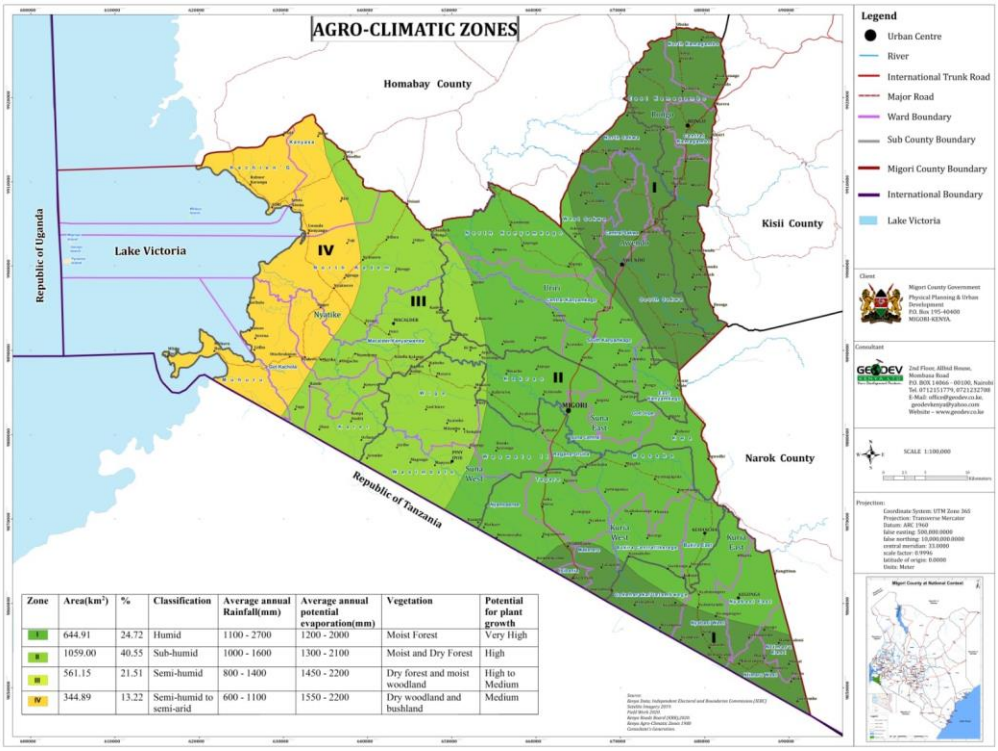


Figure 11:Migori county Natural Resources map



Zone	Area(km²)	%	Classification	Average annual Rainfall(mm)	Average annual potential evaporation(mm)	Vegetation	Potential for plant growth
I	644.91	24.72	Humid	1100 - 2700	1200 - 2000	Moist Forest	Very High
II	1059.00	40.55	Sub-humid	1000 - 1600	1300 - 2100	Moist and Dry Forest	High
III	561.15	21.51	Semi-humid	800 - 1400	1450 - 2200	Dry forest and moist woodland	High to Medium
IV	344.89	13.22	Semi-humid to semi-arid	600 - 1100	1550 - 2200	Dry woodland and bushland	Medium

Figure 12:Migori County Agro-Climatic Zone map

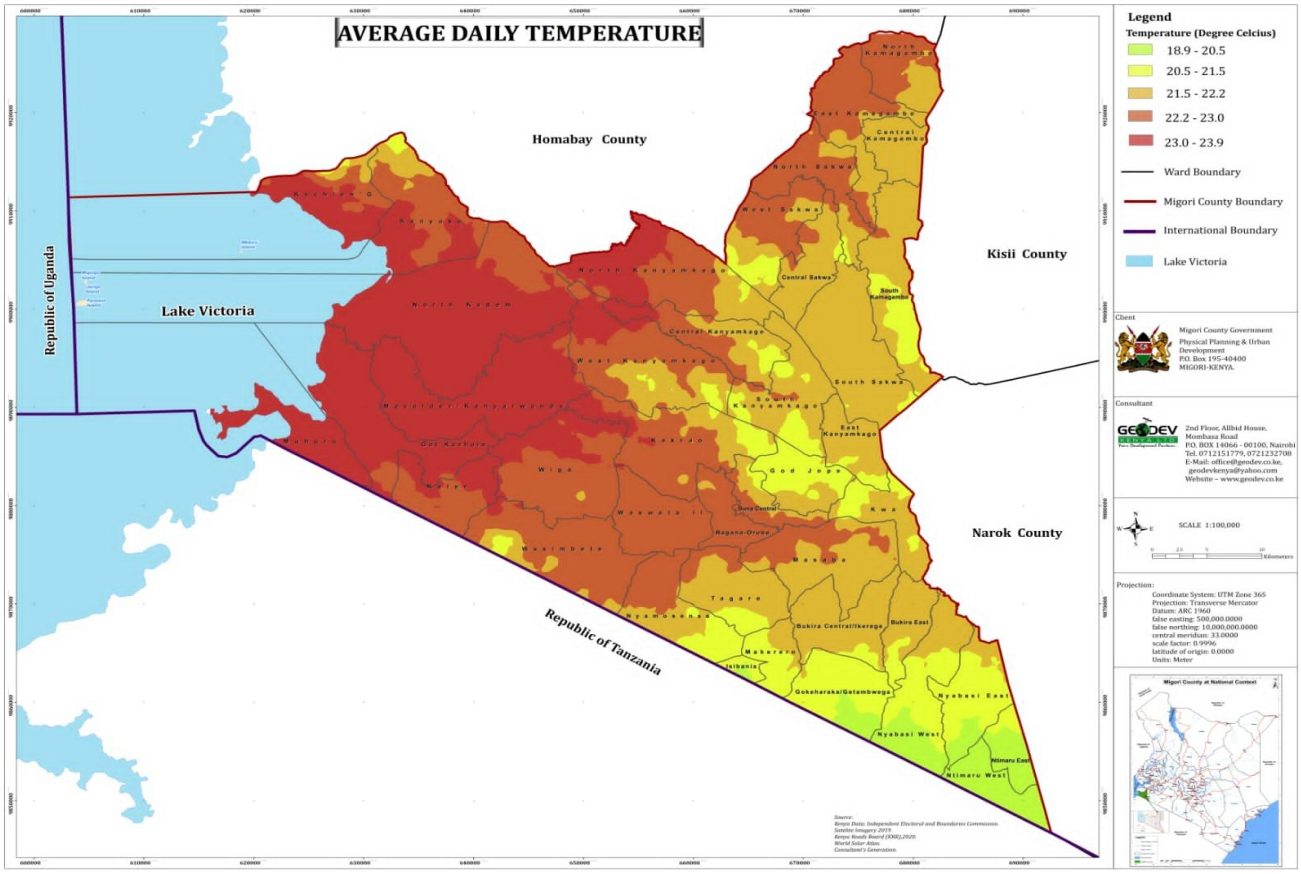


Figure 13:Migori County Average Daily Temperature Map

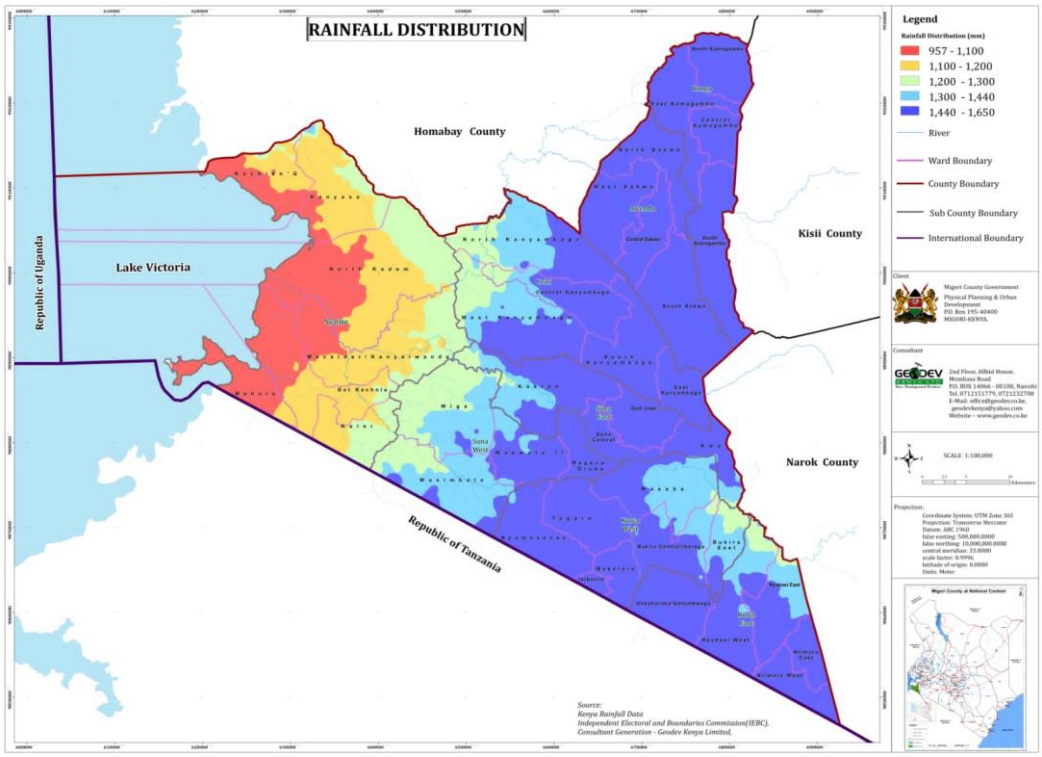
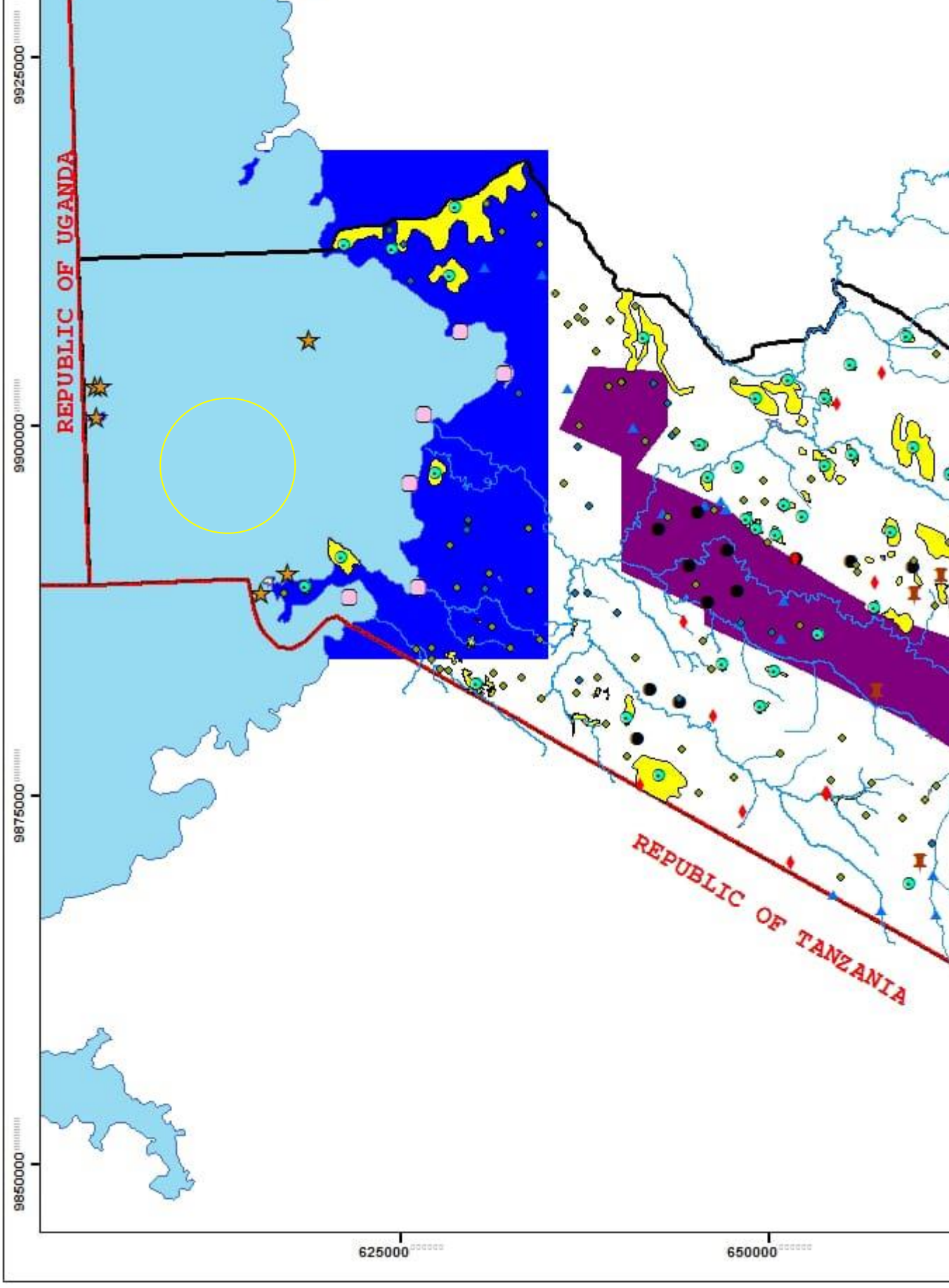


Figure 14:Migori County Map of Rainfall distribution


REPUBLIC OF UGANDA
REPUBLIC OF TANZANIA
9925000
9900000
9875000
9850000
625000
650000

Chapter Three: County Climate Profile

3.1 Climatology and Historical Climate Trends

3.1.1 Climatology of Rainfall and Temperature

This section seeks to underscore the importance of the historical calendar in the PCRA process and link it to the impacts of various climate hazards experienced in the past. Based on the findings at the ward level of this report, droughts and floods stands out to be the most prioritised climate related/induced hazards that negatively impact the communities living in the 40 wards of Migori County. Findings from this PCRA indicate that communities are aware of the general climate trends in their various wards, its variability and the impacts of extreme weather events on their livelihood. The main climate changes perceived by the residents of Migori County include more erratic and reduced amounts of rainfall, rise in temperature and prolonged and frequent periods of drought. Residents mainly view population pressure caused by overpopulated metropolis of Migori, Awendo, Rongo, Isibania and poor land management practices coupled with cutting of trees as the major causes of climate change. Further, this study found that there are no existing climate risk programmes and early warning systems across the county. Notably, the reported negative impacts of climate change on agriculture, livestock and fishing sectors is substuncial to cause loss of livelihoods. The severe recurrent drought periods result in shortage of forage and water, leading to cattle starvation and malnutrition. The resultant decrease in the surface and sub-surface water sources such as rivers Kuja, Migori and Riana often cause decrease in agricultural productivity in the sugar and tobacco sectors.

The County experiences modified equatorial climate conditions due to its proximity to the Lake Victoria. Figures 3.1 and 3.2 show the annual and temporal distribution of rainfall and temperatures over the county. The driest months are February-March while the coldest months are experienced during July. The long rainy season falls in the months of March, April and May and October through December seasons. The elevation and orientation of the major topographic features such as hills (e.g. Nyakune (4625m), Ogengo (4300m) and God Sibwoche (1475m) in Uriri sub-county, God Kwer (1420m), Mukuro (1454m) and Nyabisawa (1489m) in Suna West Sub county, God Kwach (1340m) in Nyatike Sub-county, Renjoka (1592m) in Kuria West Sub-county, and Maeta (1733m) in Kuria East Sub-county) influences rainfall distribution. The rainfall patterns are also influenced by the land-sea breeze effect of the adjacent and Western Rift Valley Mountains. The North-eastern sub-counties of Rongo and Awendo receives more rainfall compared to other parts of the county with the least rainfall being received in Nyatike sub-county

with rainfall stress being more intense in the wards such as Muhuru and Got Achola which receives between 700-1000mm of annual rainfall. While rainfall is adequate to support agricultural sector, the topography and land cover and use possess potential landslide disasters in the mining sector which is affected by collapse of the caves.

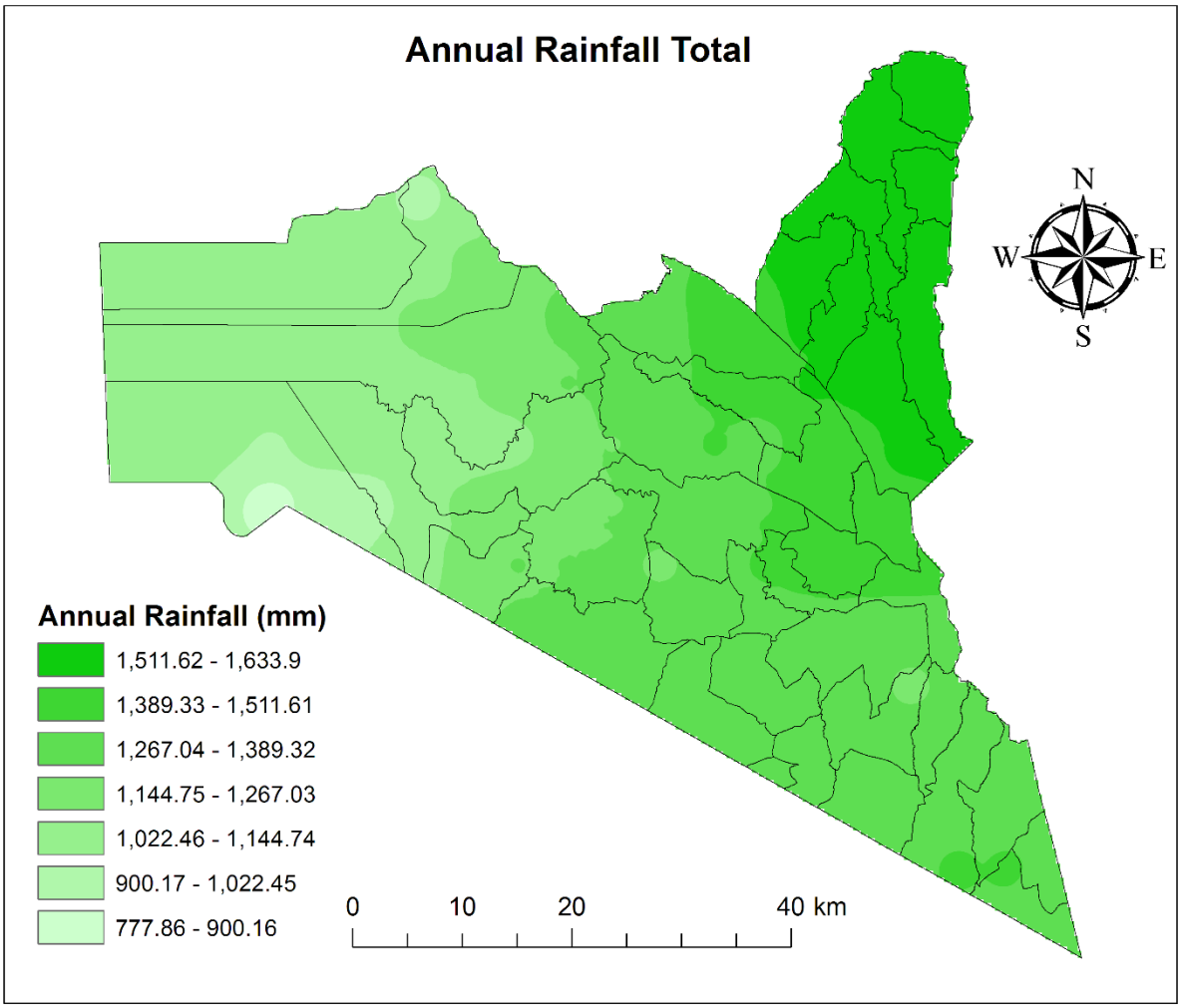


Figure 3.1 Annual rainfall in Migori County

The county has an annual mean monthly minimum temperature of 24^0c with the maximum mean temperatures of 31^0C. The lakeshore wards of Muhuru, Got Achola, North Kadem and Kachieng' experience unreliable and poorly distributed rainfall coupled with high temperatures.

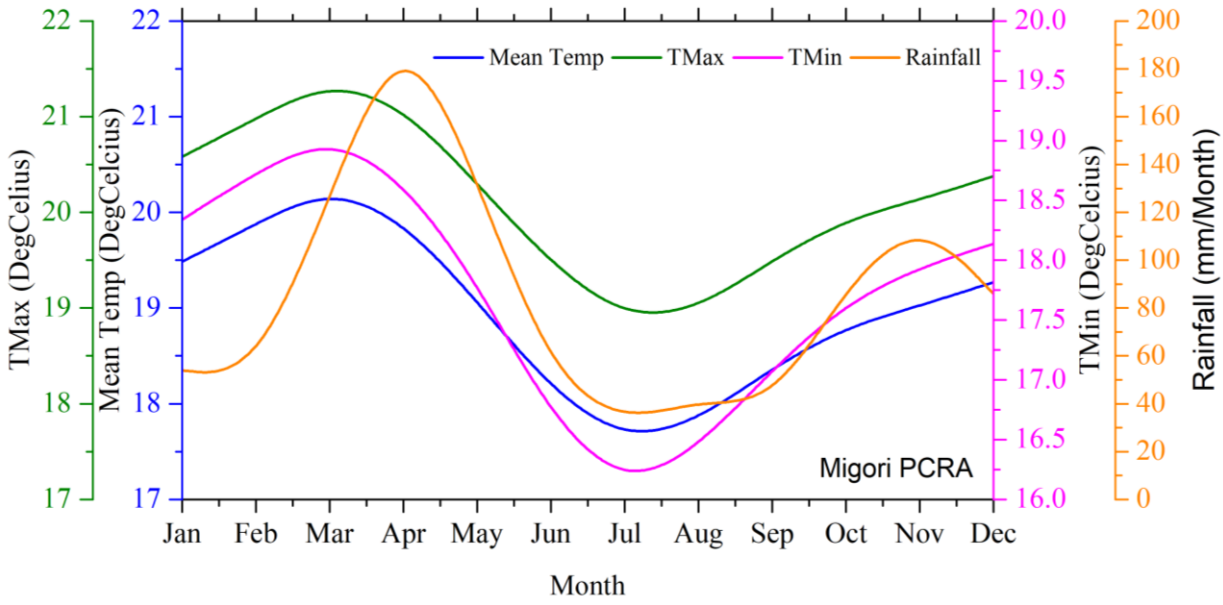


Figure 3.2 Annual cycles of rainfall, mean temperature, maximum temperatures and minimum temperatures

3.1.3 Annual and Seasonal Rainfall Variation

The drought highlighted in the sections of this report are observed in the annual anomalies of rainfall as illustrated in Figure 3.3. For instance, the 1984 drought was caused by up to 160mm deficiency in the annual rainfall total received over Migori County. Other notable extreme events that can be identified from the analysis of the historical rainfall trends are the 1990-1992 drought as identified by Muhuru ward, the year 2000 drought, 2010 and the recent drought of 2015 that spread in most parts of the county which led to water shortages in wards which are not bordering the lake and populated areas especially the townships. In addition, the 2020 floods that ravaged some wards are visible with a record 600mm positive rainfall anomaly being observed. The analysis further depicts a scenario of rising trend of annual rainfall from 1981 to 2022. This have adversely affected the physical infrastructure, with roads damages being observed coupled with frequent power outages.

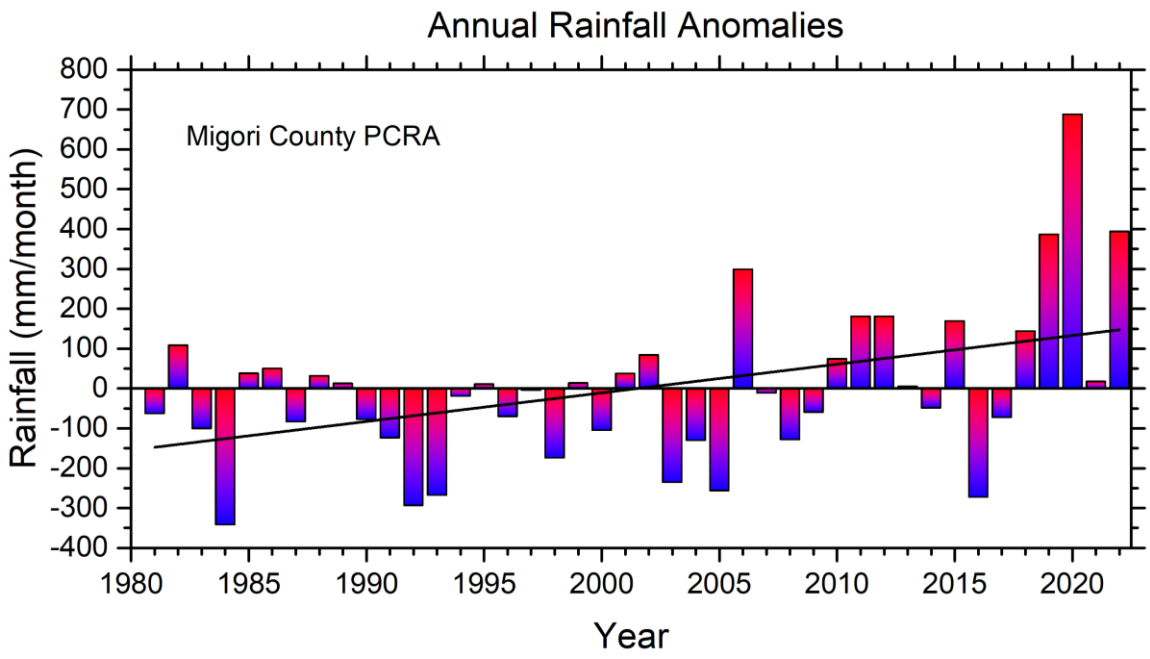


Figure 16.3 Annual variation of rainfall in Migori County 1981-2022

The rainfall over Migori county varies at both temporal (monthly and seasonal scales) and spatial (geographically) over various parts of Migori county. Figure 3.4 demonstrates the seasonal variability of rainfall over Migori County. Rainfall variability is of great importance in Migori County, where small-scale and large scale sugar cane farmers dominate. Their livestock production activities are heavily dependent on rainfall, which affect their seasonal calendar. The main areas that practice agriculture as a livelihood with dependence on rain-fed water are the wards of North Kamagambo, East Kamagambo, Central Kamagambo, South Kamagambo, West Sakwa, South Sakwa, Central Sakwa and Kanyamkago. Notably, the county depends on MAM and OND seasons with harvesting mainly happening depending on the maturity period of the crop grown. It is observed that the historical rainfall trends for both MAM and OND seasons have been on the rise. With the OND seasonal rainfall rising significantly compared to the MAM seasonal rainfall. However, there are also inter-annual variations within the season with some years experiencing failed seasons while other seasons receiving fairly high rainfall amounts.

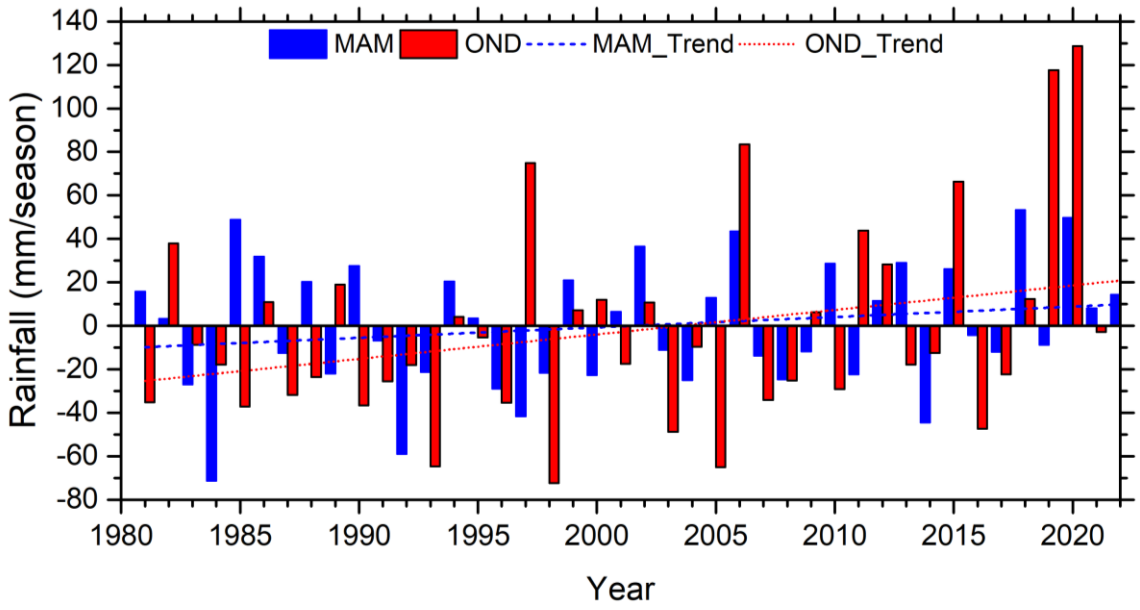


Figure 3.17 Seasonal rainfall variation over Migori County

3.2 Future Climate Scenarios for the county

There are many uncertainties in future projections of climate change and its impacts. Several of these are well-recognised, but some are not. One category of uncertainty arises because we don't yet know how mankind will alter the climate in the future. For instance, uncertainties in future greenhouse gas emissions depend on the future socio-economic pathway, which, in turn, depends on factors such as population, economic growth, technology development, energy demands and methods of supply, and land use. The usual approach to dealing with this is to consider a range of possible future scenarios. Many factors have to be taken into account when trying to predict how future global warming will contribute to climate change. The amount of future greenhouse gas emissions is a key variable.

Developments in technology, changes in energy generation and land use, global and regional economic circumstances and population growth must also be considered. The projections for rainfall and temperatures for Migori County were constructed as part of the PCRA procedure. This concentrated on both the historical and future temporal scales. The main objective of climate analysis in the PCRA process is to aid in generating adaptation options for key assets (natural, physical and social assets), livelihoods, and economic investments in the sectors that are sensitive to climate change and its resulting impacts. Climate projections provide a possible future climate situation based on rainfall and temperature and the likely resultant climate hazards.

This helps in defining the climate actions/adaptation strategies to be undertaken with a view of building long term climate resilience.

3.2. 1 National Level Climate Projections

3.2.1.1 Temperature Projections

Future climate trends on temperature and rainfall show that Kenya's economy will continue to be affected. Global Climate Modelling (GCM) data indicates that the mean annual temperature is projected to increase by between 0.8 and 1.5°C by the 2030s and 1.6°C to 2.7°C by the 2060s. Compared to pre-industrial levels, median climate model temperature increases over Kenya amount to approximately 1.4 °C by 2030 and 1.7 °C by both 2050 and 2080 under the low emissions scenario RCP2.6. Under the medium/high emissions scenario RCP6.0, median climate model temperature increases amount to 1.3 °C by 2030, 1.6 °C by 2050 and 2.2 °C by 2080. All projections indicate decreases in the frequency of days and nights that are considered 'cold' in current climate. These events are expected to become exceedingly rare, and do not occur at all under the highest emissions scenarios (A2 and A1B) by the 2090s.

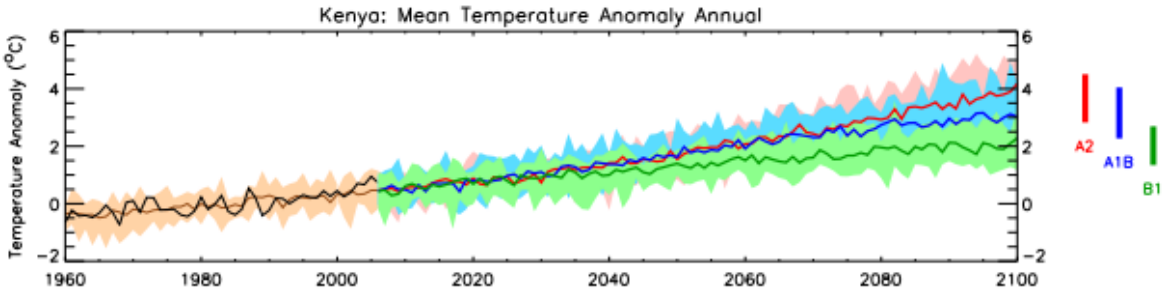


Figure 3.5 Air temperature projections for Kenya for different GHG emissions scenarios.

3.2.1.2 Rainfall Projections

Future projections of precipitation are less certain than projections of temperature change due to high natural year-to-year variability. Under RCP2.6, median model projections indicate a slight increase towards the year 2030 but an overall decrease towards the end of the century. Under RCP6.0, the projected rainfall increase is likely to intensify after 2050, reaching 53 mm per year at the end of the century compared to 2000. Higher concentration pathways suggest an overall wetter future for Kenya. For the A1B emissions scenario, projections for temperature increases over Kenya, of up to around 3°C, show good agreement between the CMIP3 ensemble members.

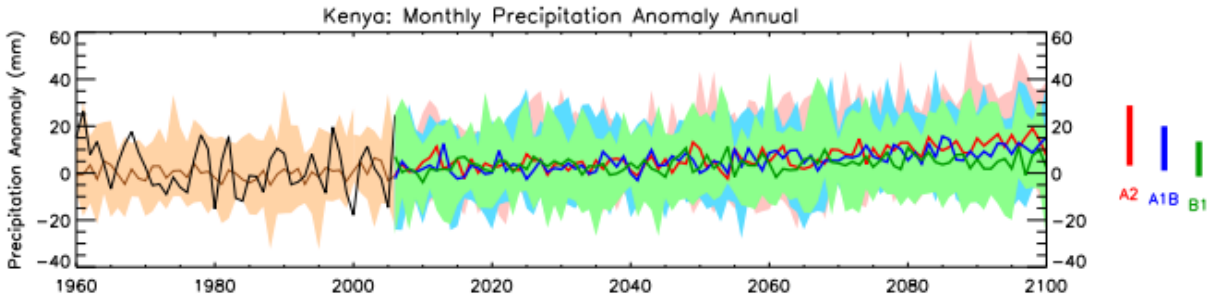


Figure 3.6 Annual mean precipitation projections for Kenya for different GHG emissions scenarios, relative to the year 2000.

Decadal MAM and OND seasonal rainfall changes (mm/day) over Kenya

Figures 3.7 and 3.8 shows the projected decadal MAM seasonal rainfall changes (mm/day) over Kenya based on the ensemble means of the best four model runs under RCP 4.5 and RCP 8.5 scenarios respectively. Spatial variability is noticed over the 8 future decades where in general a reduction in projected seasonal rainfall over northern Kenya and increase over southern regions for both RCP4.5 (Fig. 3.7) and RCP 8.5 (Fig. 3.7) scenarios compared to the 1981-2005 present climate simulations of best-model ensemble mean. Under the RCP 8.5 (Fig. 3.8) scenario, MAM 2081-2090 decadal rainfall change, the projected reduction appears to intensify and expand southwards.

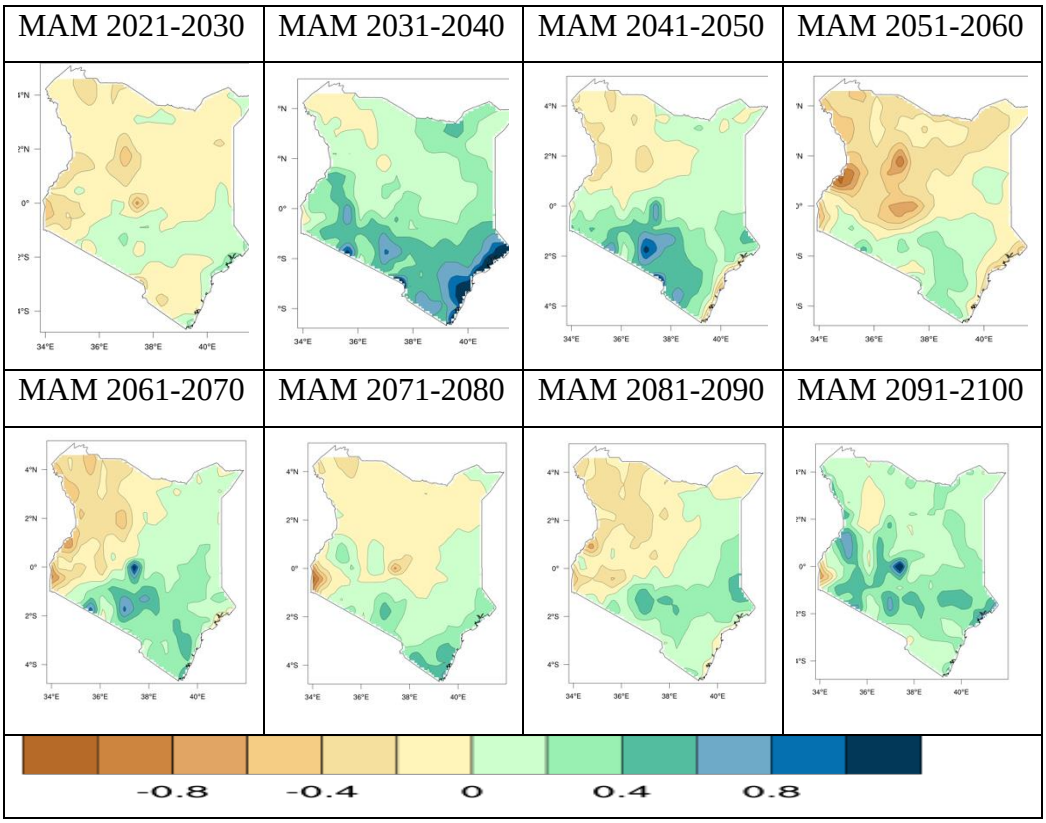


Figure 3.7: March-May seasonal rainfall changes (mm/day) over Kenya obtained from ensemble means of four top performing RCMs under the RCP4.5 scenario for future ten-year periods (Decadal) from 2021 relative to historical simulations for the period 1981–2005.

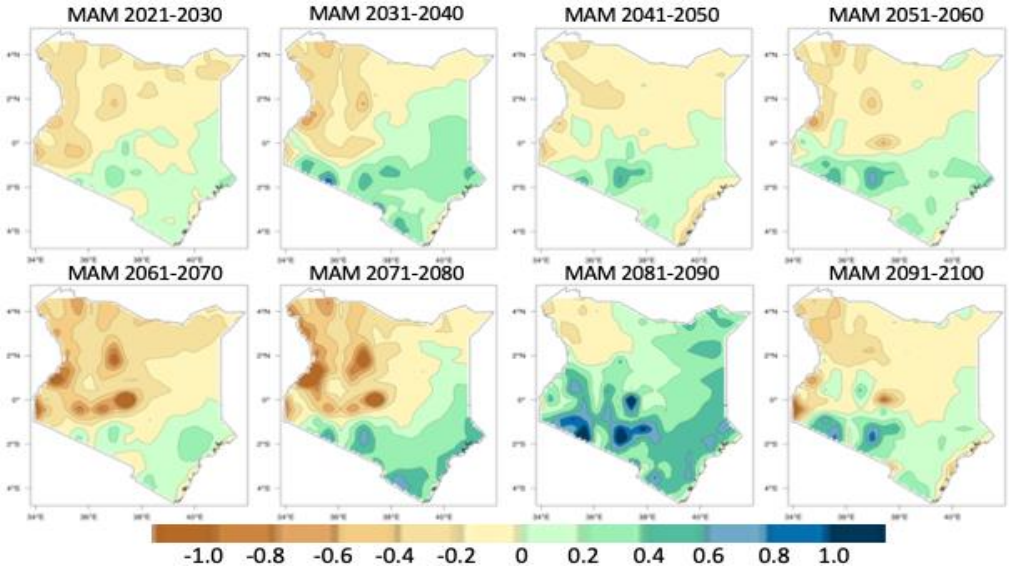


Figure 3.8: March-May seasonal rainfall changes (mm/day) over Kenya obtained from ensemble means of four top performing RCMs under the RCP8.5 scenarios for future ten-year periods (Decadal) from 2021 relative to historical simulations for the period 1981–2005.

Figures 3.9 and 3.10 shows the projected decadal OND seasonal rainfall changes (mm/day) over Kenya based on the ensemble means of the best four model runs under RCP 4.5 and RCP 8.5 scenarios respectively. Although there is spatial variability over the 8 future decades, there is generally an increase in projected seasonal rainfall over Kenya for both RCP4.5 **(Fig. 3.11)** and RCP 8.5 **(Fig. 3.12)** scenarios compared to the 1981-2005 present climate simulations of best-model ensemble mean. **Fig. 3.12,** The OND 2081-2090 decadal rainfall change shows the highest increase in future rainfall under the RCP 8.5 scenario.

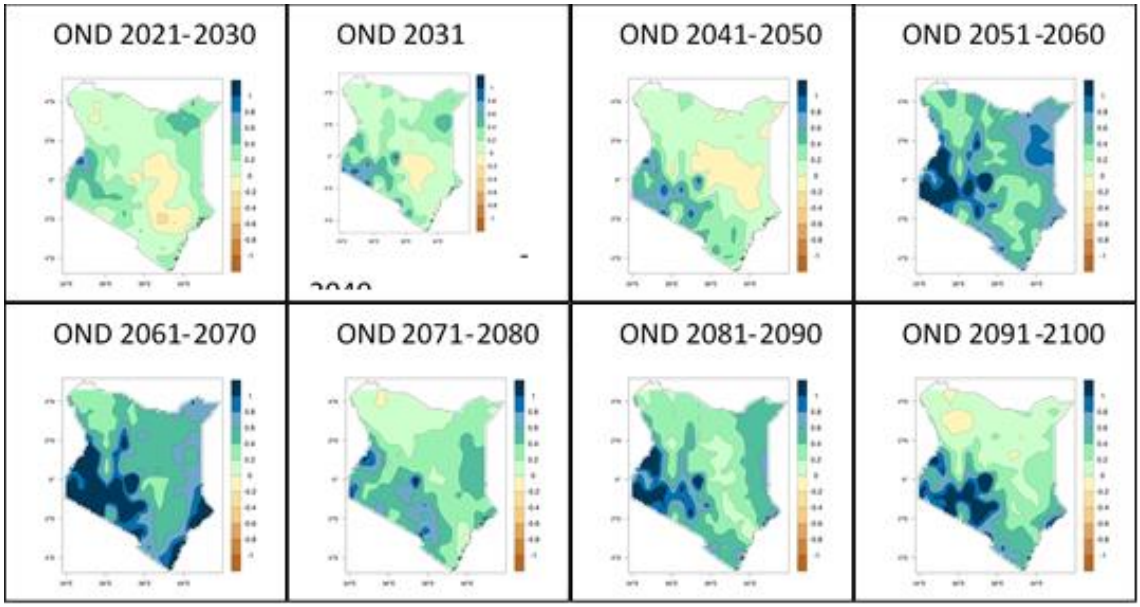


Figure 3.11: October-December seasonal rainfall changes (mm/day) over Kenya obtained from ensemble means of four top performing RCMs under the RCP4.5 scenarios for future ten-year periods (Decadal) from 2021 relative to historical simulations for the period 1981–2005.

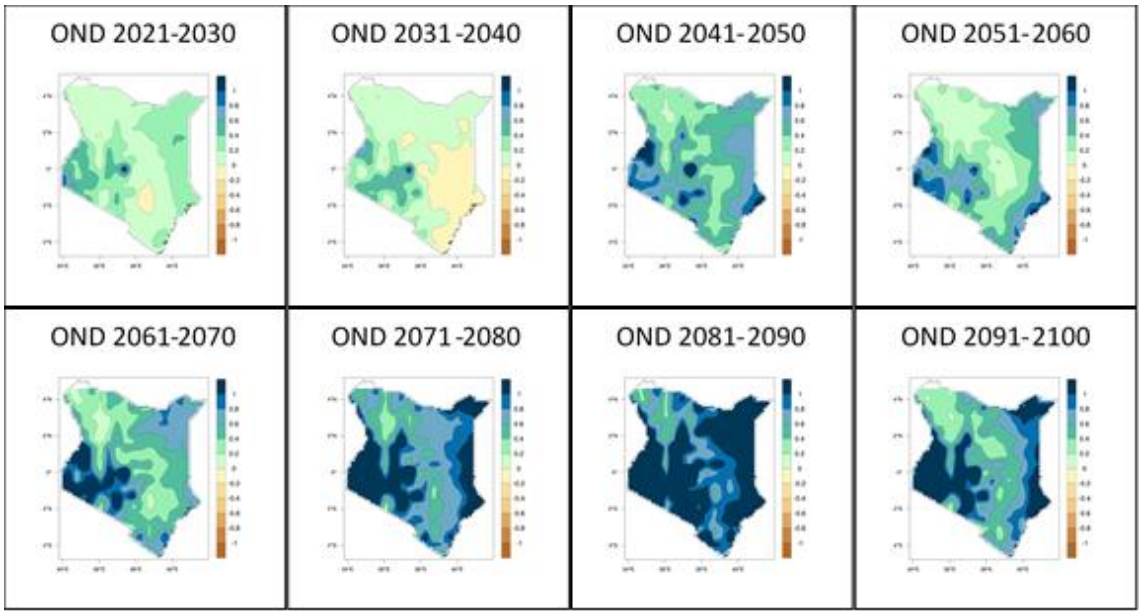


Figure 3.12: October-December seasonal rainfall changes (mm/day) over Kenya obtained from ensemble means of four top performing RCMs under the RCP8.5 scenarios for future ten-year periods (Decadal) from 2021 relative to historical simulations for the period 1981–2005.

Rainfall

1) Precipitation in Kenya is projected to remain highly variable and uncertain, however average rainfall is expected to increase by mid-century, particularly during the 'short

rains', which occur between October and December by 2050.

2) Extreme rainfall events (heavy downpours) are likely to increase in frequency, duration and intensity. Additionally, land degradation and soil erosion, exacerbated by recurrent floods, will negatively impact agricultural productivity disproportionately affecting the livelihoods of the rural poor.
3) The period between heavy rainfall events is likely to increase
4) Rainfall in the arid zones is generally projected to decrease.
5) Annual average precipitation is expected to increase slightly by end of the century under a high emissions scenario (RCP8.5).
6) The pattern and temporal distribution of rainfall is likely to change. Where proportion of rainfall that occurs in extreme rainfall events (heavy downpours) is likely to increase

Key Trends

Climate change is expected to increase the risk and intensity of flood events, as well as increase average annual rainfall amounts, while also furthering drought likelihoods for some areas across Kenya. Intense rainfall and flooding may increase the likelihood of mudslides and landslides, particularly in mountainous areas. As the incidence of extreme rainfall rises, additional soil erosion and water logging of crops is likely to reduce yields and increase food insecurity.

3.2.2 County future climate scenarios

Understanding the potential impacts of climate change is essential for informing both adaptation strategies and actions to avoid dangerous levels of climate change at sub-national level. A range of valuable national studies have been carried out and published, and the Intergovernmental Panel on Climate Change (IPCC) has collated and reported impacts at the global, regional, national and to some extent sub-national scales. But assessing the impacts is scientifically challenging and has, until now, been fragmented. To date, only a limited amount of information about past climate change and its future impacts has been available at national level, while approaches to the science itself have varied between countries. It is therefore vital to develop these scenarios at a local scale to guide the community driven interventions based on Ward Climate Change Action Plans (WCCAP). Migori County being an agricultural county is likely to benefit from such climate products through identification of climate priority areas of investment which aims at building long term climate resilience. These is achieved by adopting climate smart technologies and practices that can withstand the uncertainties in the projected climate change scenarios.

3.2.2.1 Rainfall Projections

Rainfall extremes over Migori County, either excess or deficit, can be hazardous to human health, societal infrastructure, and livestock and agriculture. While seasonal fluctuations in Rainfall as shown in Figure 3.15- 3.17 are normal and indeed important for a number of societal sectors (e.g. tourism, farming, mining etc.), serious negative impacts can arise from landslides, flooding and drought events. These are complex phenomena and often the result of accumulated excesses or deficits or other compounding factors such as changes in land use and cover. The analysis section below deals purely with precipitation changes expressed as percentages.

Annual Rainfall Projection

The projected change of annual rainfall is presented in Figure 3.13. Both the RCP4.5 and RCP8.5 showing an increase in the annual rainfall over the county in the near future scenario. The greatest rise in rainfall is likely to be experienced in the eastern wards in the sub-counties of Rongo, Awendo, Uriri, Suna East, Kuria West and Kuria East. The RCP4.5 in the mid-century scenario and RCP8.5 in the near future period also show similar projected state of climate. The least change is likely to occur in Western wards especially in Kanyasa, Muhuru, Got Achola, Kachien'g and North Kadem. This paints a picture of a likely wet future in both scenarios which is likely to result in increased flood frequency. According to the ward PCRA reports, the wards in the sub-counties of Awendo, Rongo, Uriri, Suna East, Kuria West and Kuria East regions are prone to land degradation and therefore this scenario may lead to increased incidences of soil erosion and flash floods with key resources such as roads being highly impacted through destruction. This may lead to transport cut-off in some incidents. High precipitation amounts can lead to flooding of transport infrastructure, especially in areas with low altitudes which ar closer to the rivers such as Kuja and Riana. This will necessitate higher maintenance costs. Transport infrastructure is vulnerable to extreme weather events, yet essential for agricultural livelihoods. Roads serve communities to trade goods and access healthcare, education, credit and other services.

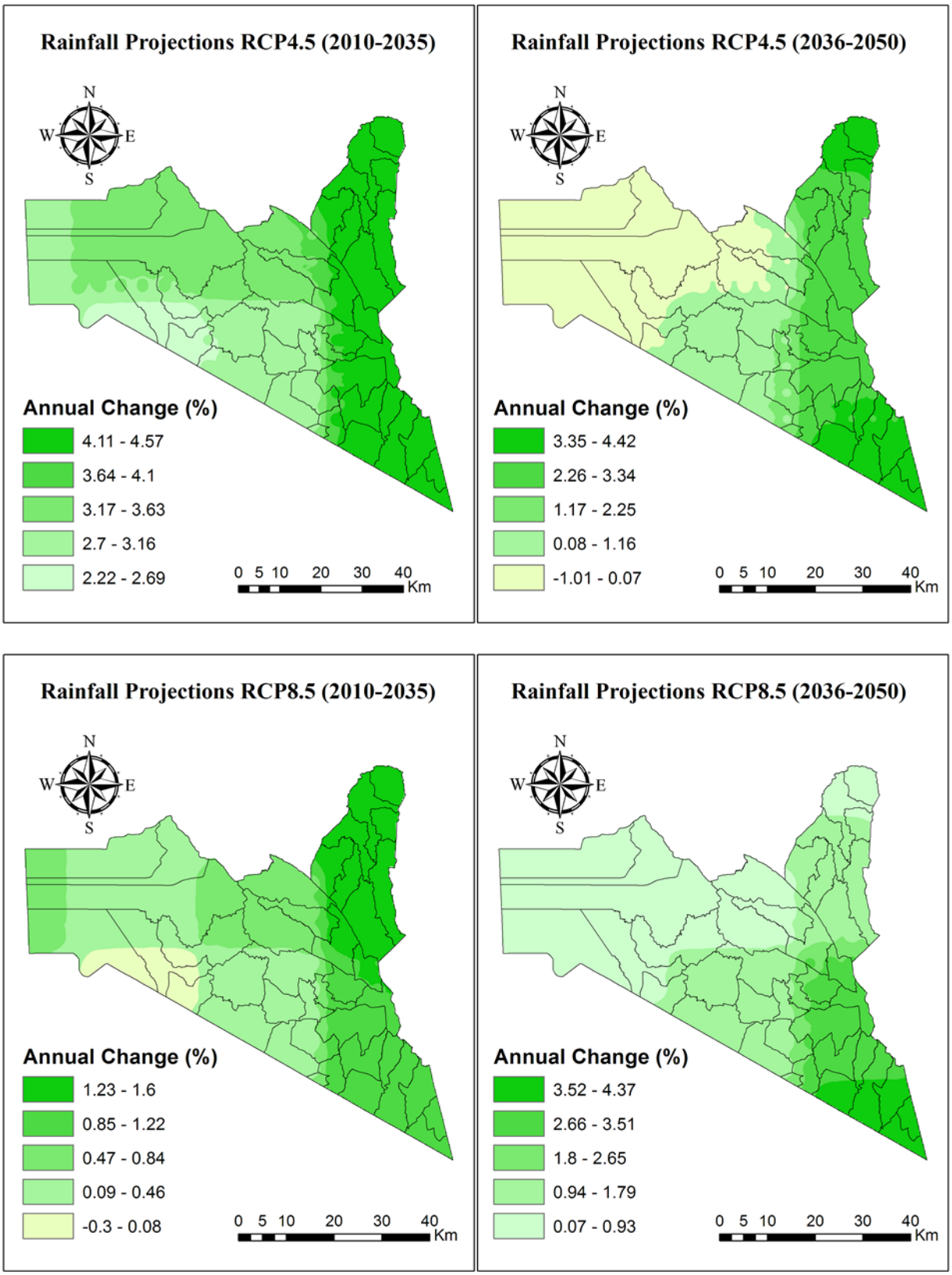


Figure 3.13 Spatial change of annual temperatures over Migori County

The annual variation of the projected rainfall under the two RCP scenarios are presented in Figure 3.14. The negative rainfall anomalies represents rainfall deficit years while the positive

anomalies show the rainfall surplus years. This shows that future water availability is uncertain, with potential increases in annual run-off masking overall reductions in water availability during certain periods. Climate variability and the steady degradation of water resources are likely to make water availability even less predictable and limit capacities. Even areas which were known to receive high precipitation amounts and to be abundant in freshwater, such as the Rongo and Awendo sub-counties, experience more dry spells with rivers and boreholes water levels falling in an increasing frequency. This leaves the residents of the densely populated regions like Migori, Awendo and Rongo metropolis exposed to water scarcity and water-borne diseases.

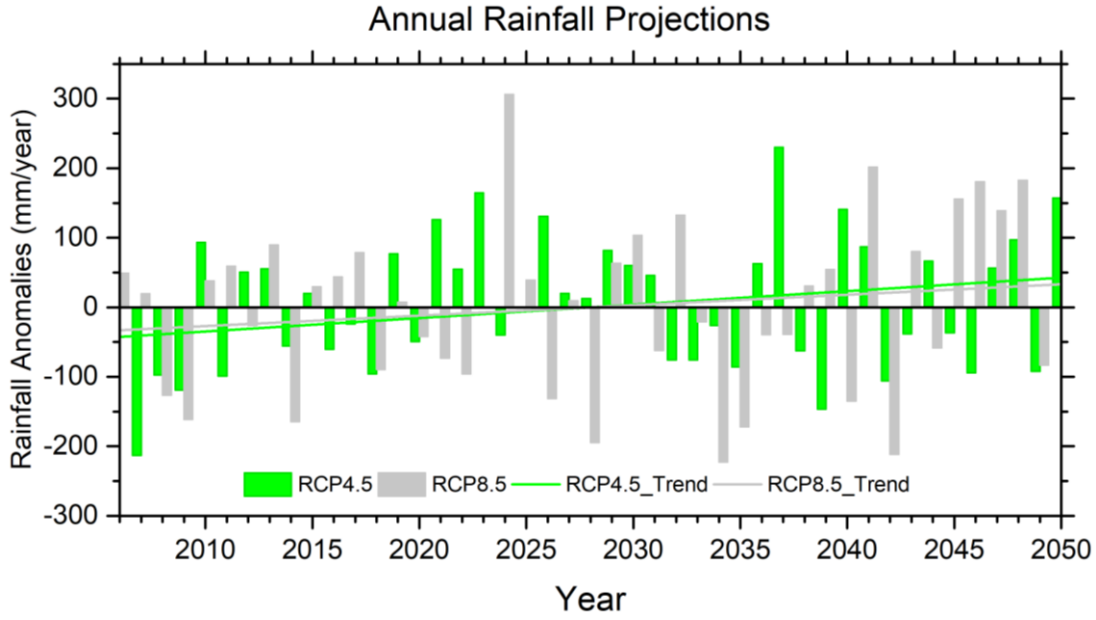


Figure 3.14 Temporal variation of the annual rainfall projection over Migori County

Seasonal Rainfall Projection

Migori County depends mainly on rain-fed agriculture to support its crop and livestock production. Smallholder farmers in Migori County 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 and intensity of the rainy season is becoming increasingly unpredictable and the use of irrigation facilities remains limited due to poor extension services and irrigation management, and lack of credit and technical equipment.

Most of the wards experience two rainfall maxima which is observed in March-April-May (MAM) and October-November-December (OND) and confirmed by the historical calendar developed during the PCRA process, however the PCRA process also looked at the June-August (JJA) season which is a temperature season for the county. 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. Figure 3.15-3.17 demonstrates the seasonal patterns of rainfall change over Migori County in the latter climate scenarios and seasons. During MAM, all the scenarios at near future period showed a similar pattern with increased rainfall trend being projected in all parts of the county except in Kuria East wards of Ntimaru West, Ntimaru East, Nyabasi East and Nyabasi West showing a decline in the MAM seasonal rainfall in the near future. However, under both RCPs 4.5 and 8.5, the changes in mid-century scale are all showing and increasing rainfall trends.

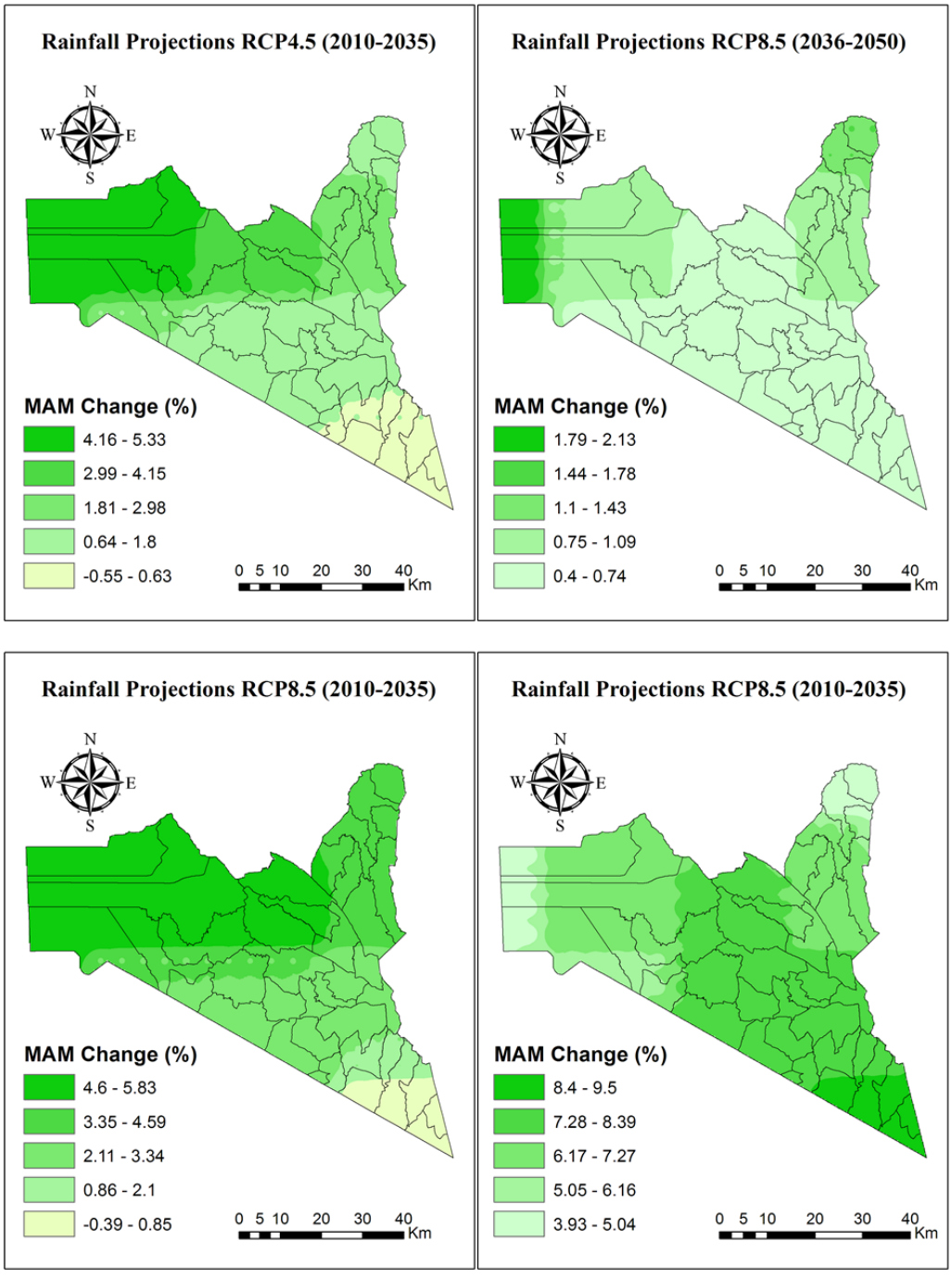


Figure 3.15 MAM rainfall change

Notably, the JJA change depicts a homogeneous positive change except the mid-century scale under RCP8.5 scenario projection. The increase in the JJA seasonal rainfall may alter the seasonal calendar of the farmers which may increase the agricultural productivity during this particular season. Kuria East, Kuria West and Suna West sub-counties may benefit from this shift in the seasonal calendar.

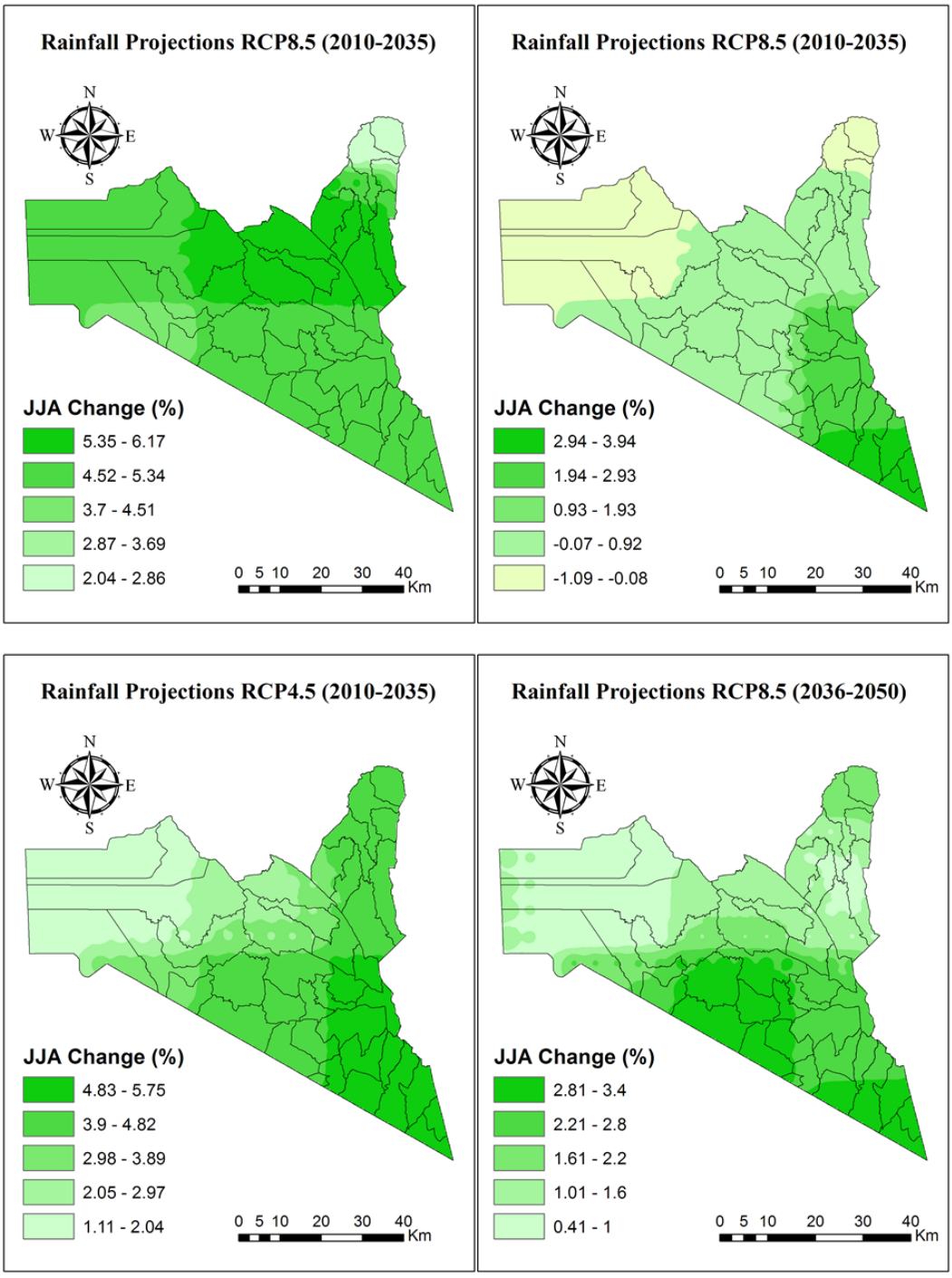


Figure 3.16 JJA rainfall change

The OND seasonal rainfall performance is likely to reduce in spatial representation in all the assessed scenarios except in the near future under the RCP4.5 which shows and increase in the OND rainfall in the sub-counties of Awendo, Rongo, Suna East, Kuria West and Kuria East.

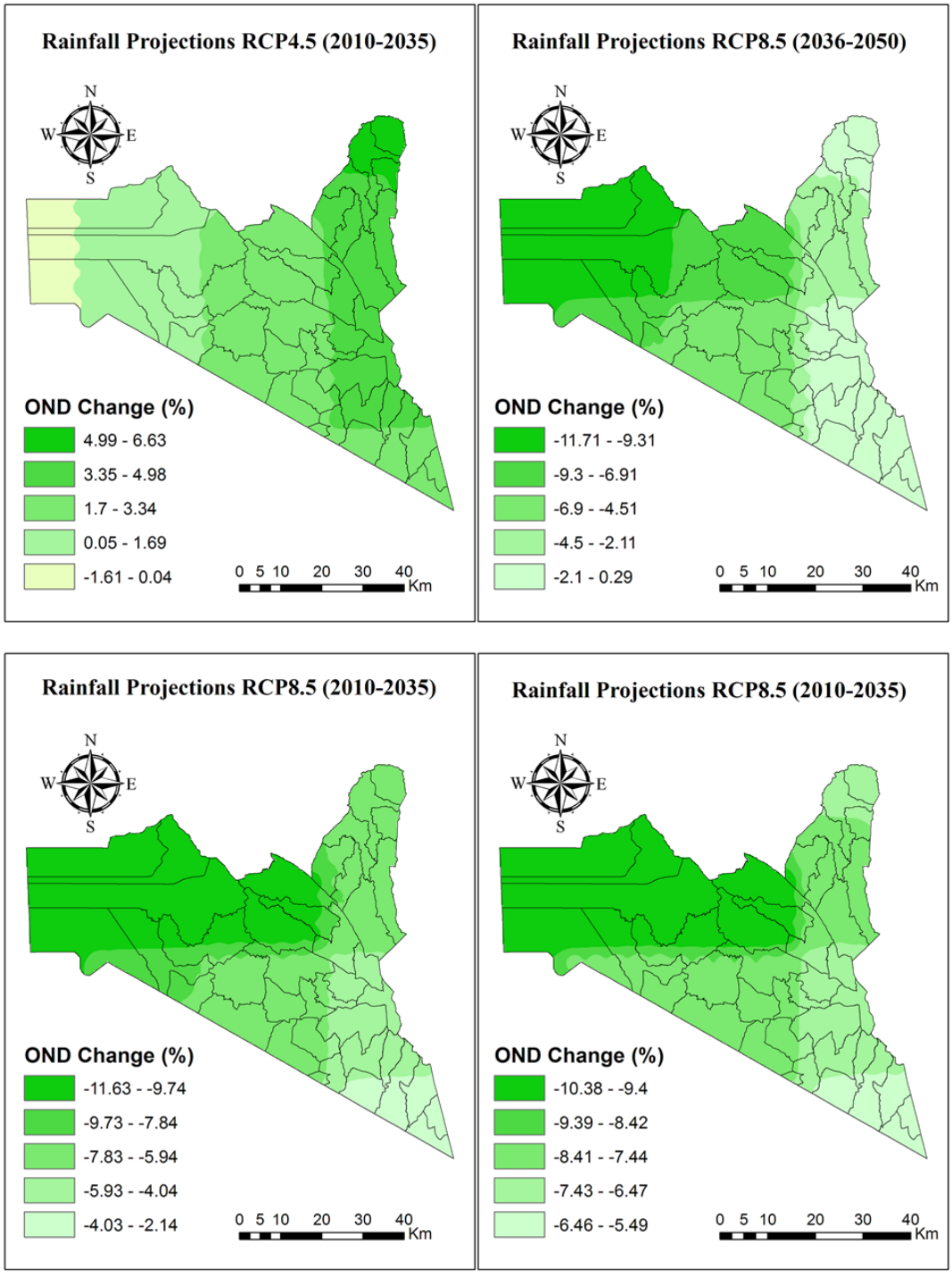


Figure 3.17 OND rainfall change

3.2.2.2 Temperature Projections

Both hot and cold temperature extremes can place many demands on society. While seasonal changes in temperature are normal and indeed important for a number of societal sectors (e.g. tourism, farming etc.), extreme heat or cold can have serious negative impacts. Importantly, what is 'normal' for one ward in the county may be extreme for another region that is less well adapted to such temperatures. Figure 3.18 and 3.19 shows a rising pattern of both the minimum (night time) and maximum (day time) temperatures over Migori county.

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 can 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 animal and plant biodiversity.

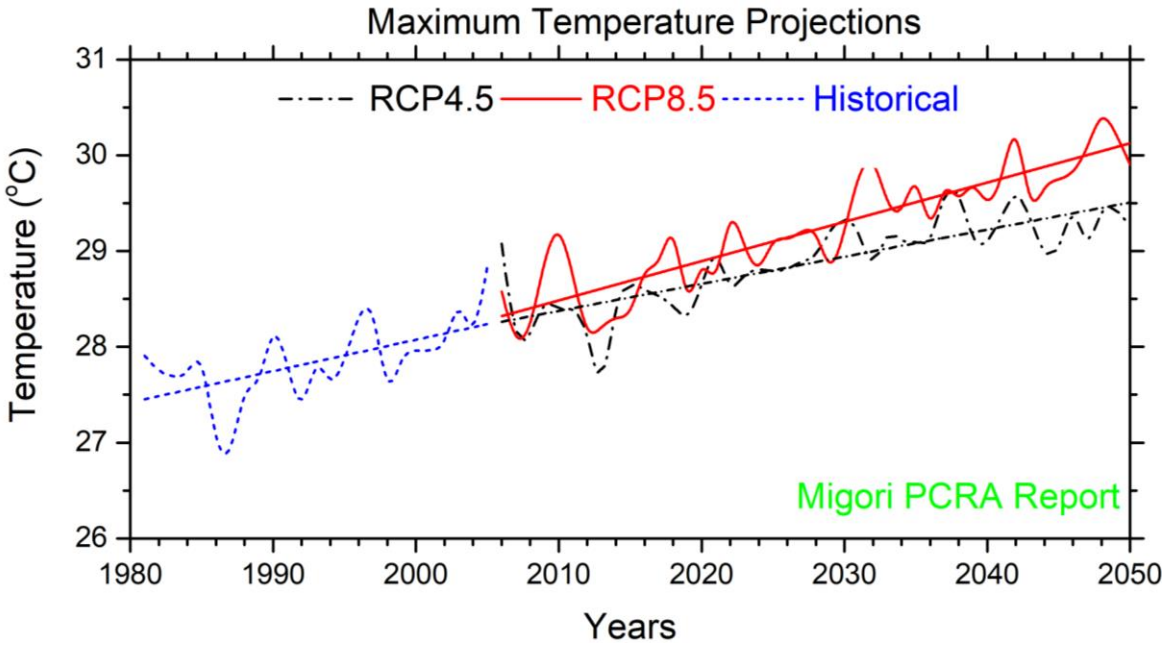


Figure 3.18 Maximum projected temperature trends

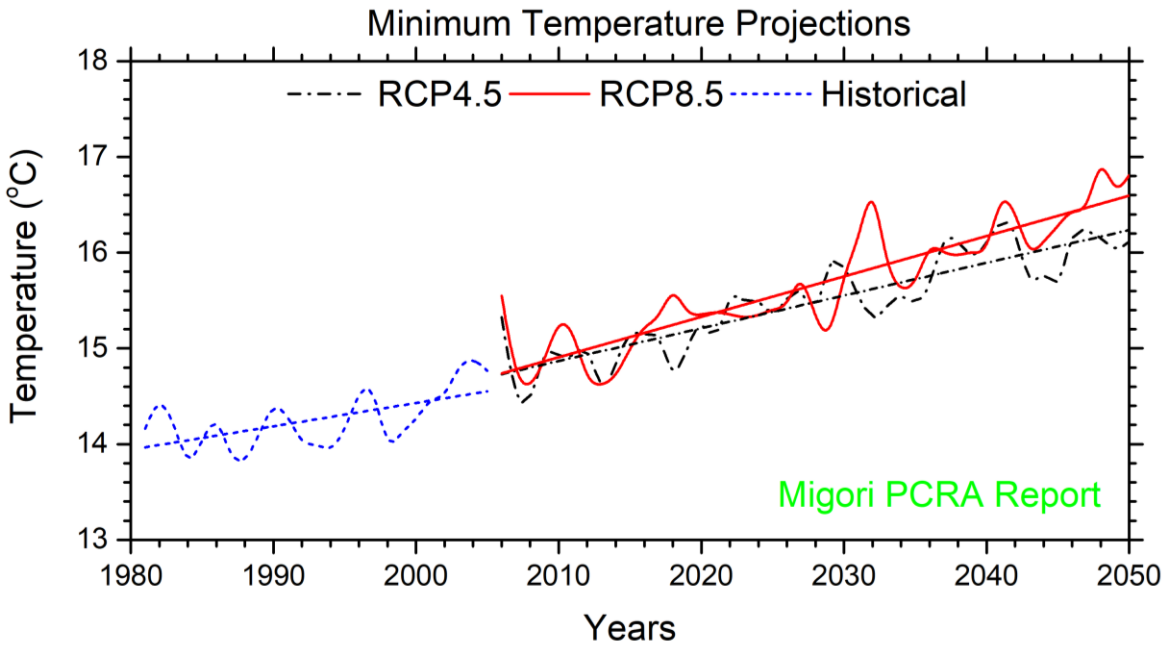


Figure 3.19 Minimum projected temperature trends

The spatial presentation of the minimum and maximum temperature changes are presented in Figures.3.20 and 3.21. Both scenario show a rise in all over the county with up to 0.95°C and 1.9°C rise being projected under RCP4.5 and 8.5 respectively. The eastern wards are more likely to be impacted by the rise in surface are temperature. As mentioned earlier, the rise in surface air temperatures coupled with the anticipated rise in the annual rainfall projections paints a picture on a hot and wet future over the county. This might lead to rise in the tropical diseases such as malaria, frequent occurrence of drought and floods in these hotspot areas. Inversely, under the maximum temperatures are expected to rise more significantly in the western parts of the county with the affected sub-counties being Nyatike, Suna West and Uriri. This will lead to worsen depressed rainfall situation due to excessive evapotranspiration in the wards such as Muhuru, Got Achola and North Kadem that has historically received less rainfall. This may impact water availability and lead to water-borne diseases such as typhoid, cholera and bilharzia.

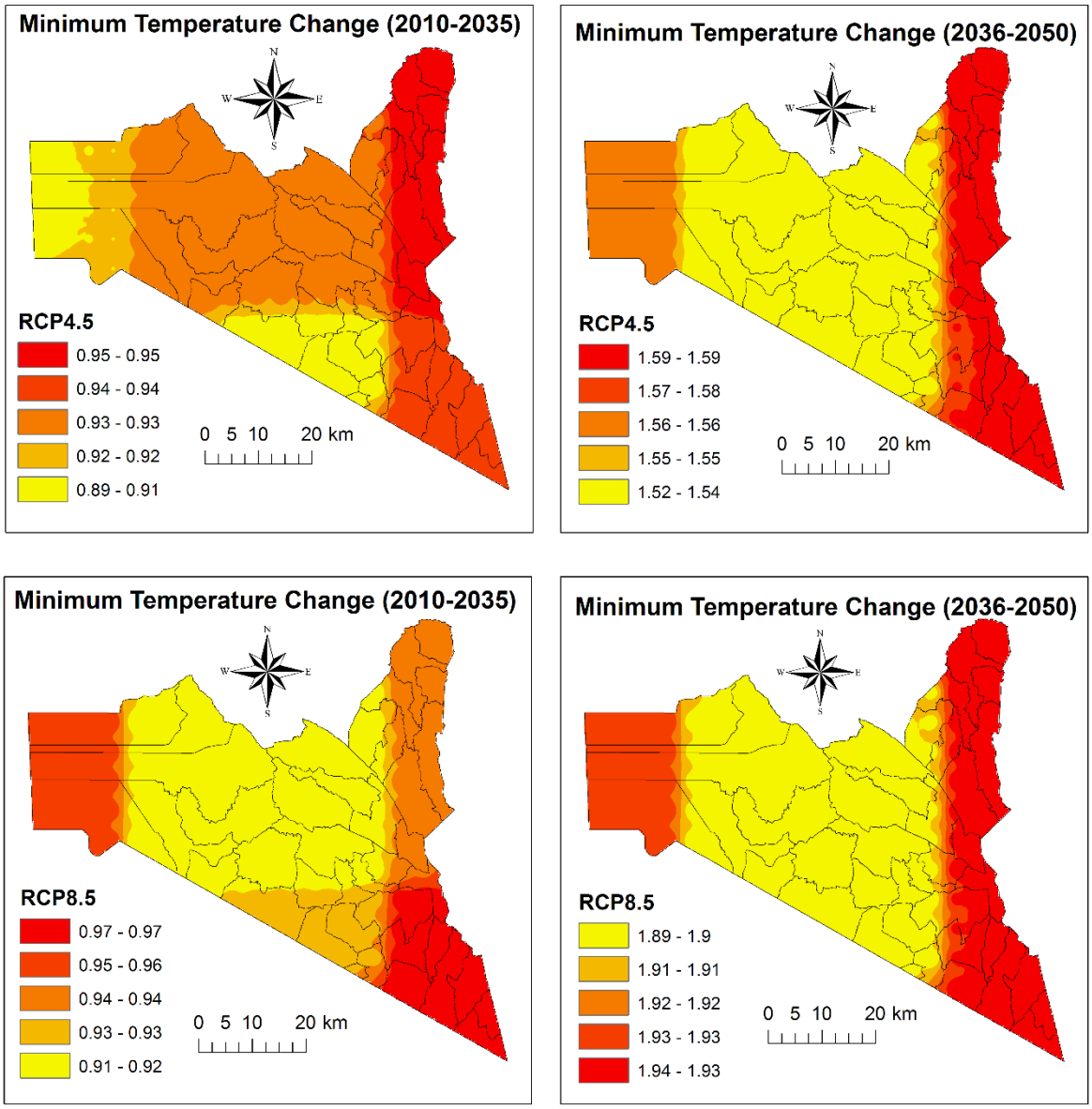


Figure 3.20 Minimum projected temperature trends

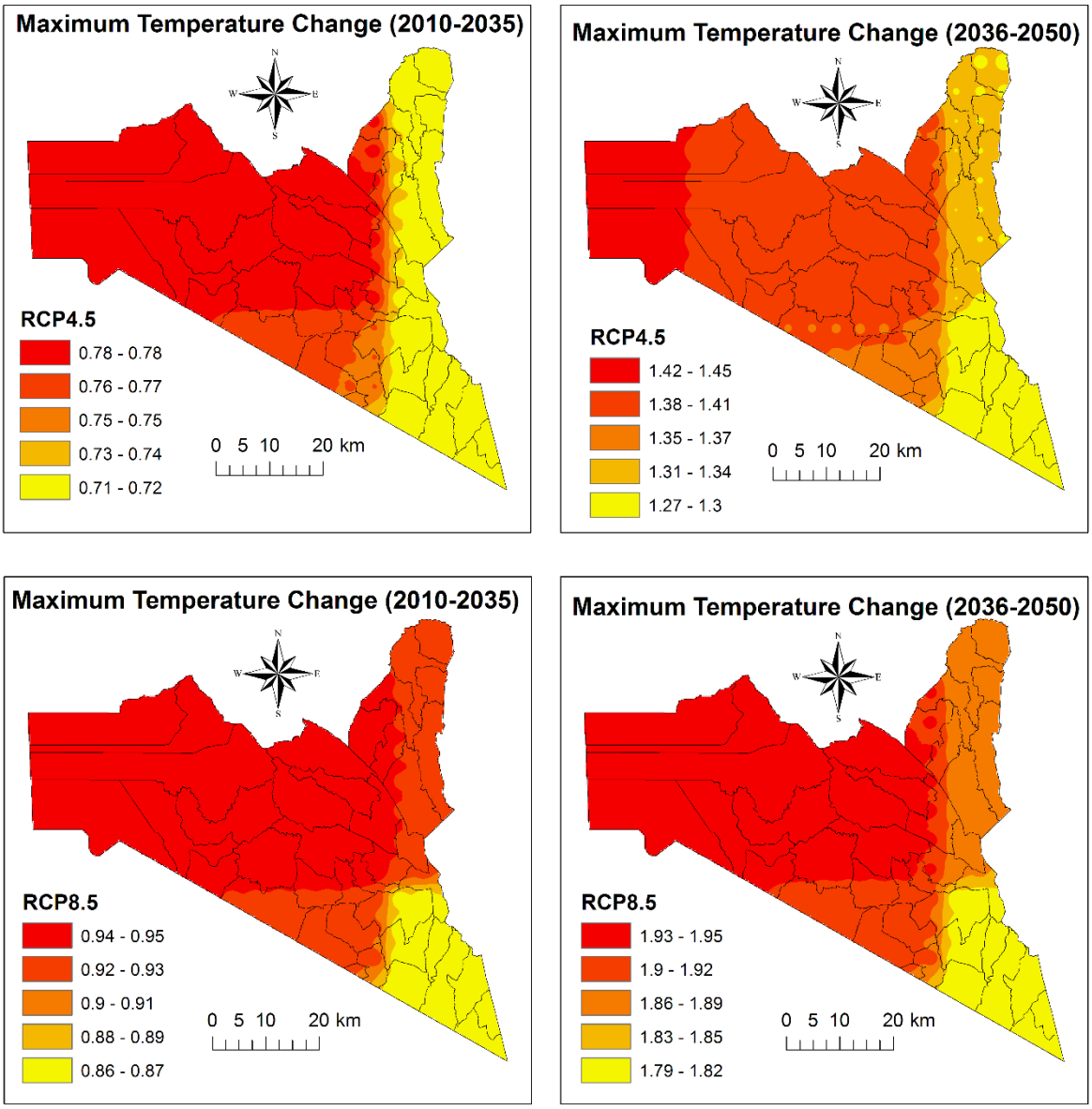


Figure 3.21 Minimum projected temperature trends

Chapter Four: Analysis of Existing Resilience/Adaptation Strategies to Current and Future Climate Risks

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

In response to the main climate risk/hazard in the county, people have adopted various resilience strategies in the following sectors water resources, agriculture, livestock, agroforestry, energy and infrastructure. However, there are a number of factors undermining the effective implementation of the strategies as summarized in the table below. *Table 6 and 7 below shows a summary of current and new adaptation strategies.*

Table 6:Current Adaptation Strategies

Current adaptation strategies						
	HAZARD	**IMPACT CHAIN**	**RESILIENCE STRATEGY**	**VULNERABLE GROUPS**	**FACTORS THAT SUPPORT STRATEGY**	**FACTORS THAT UNDERMINE STRATEGY**
1	PESTS AND DISEASES	Crop Failure, loss of agricultural products during storage	crop rotation	Women, Men, Elderly, Children PLWD	Availability of alternative crops. Traditional/cultural practices	Inadequate information.
			Mixed cropping		Traditional farming practices	Lack of proper information on different crops to be mixed
			Spraying with pesticides and traditional measures eg application of ash		Support from government	High cost of pesticides
		Reduction in livestock productivity	Destocking and culling.		Community training and knowledge sharing	Culture
			Spraying and treatment		Access to veterinary extension services	Inadequate veterinary personnel

Current adaptation strategies						
	HAZARD	**IMPACT CHAIN**	**RESILIENCE STRATEGY**	**VULNERABLE GROUPS**	**FACTORS THAT SUPPORT STRATEGY**	**FACTORS THAT UNDERMINE STRATEGY**
		Lowers fish quality and productivity	Use of predator nets		Capacity building of the farmers Government support	Government budget constraints Change of use by farmers
			Adoption of proper feeding levels		Capacity building on feeds and feeding;	Low adoption on new technology by farmers
2.	DROUGHT	Crop failure/ Food insecurity/ Malnutrition.	Timely planting, crop rotation	Women, Men, Elderly, Children PLWD	Government incentives such as reduced fertilizer cost	High cost of farm inputs
			Establishment of woodlots		Availability of land and seedlings	Deforestation for wood fuel and charcoal
		Water Scarcity	Drilling of water pans and earth dams, shallow wells. Water storage		Availability of storage tanks to store clean water. County Water and Sanitation policy.	Water tanks and Huge capital investment
		Waterborne diseases.	Boiling of drinking water and chemical water treatment e.g chlorine, pur, aquatab		Provision of water treatment tablets by the government	chemicals used for water treatment are expensive.
		Reduced water levels reduces	Adopt the use of water harvesting systems;		Provision of pond liners, construct water proof concrete ponds	Very costly

Current adaptation strategies						
	HAZARD	**IMPACT CHAIN**	**RESILIENCE STRATEGY**	**VULNERABLE GROUPS**	**FACTORS THAT SUPPORT STRATEGY**	**FACTORS THAT UNDERMINE STRATEGY**
		breeding sites for fish	construction of boreholes			
3.	FLOODS	Crop failure	Livelihood diversification	women, children, elderly and youth, PLWD	Agricultural extension services	lack of capacity building/training and awareness creation.
		Destruction of infrastructure and property	Disaster management		Capacity building	Environmental degradation
			Sustainable land use practices			Unsustainable sand harvesting.
		Increase in siltation of water bodies causes turbidity thus reducing fish feeding.	Dredging	Fisherfolks	Government intervention and NGOs	Budgetary constraints
4.	EXCESSIVE RAINFALL	Destruction of crops	Agroforestry	Children, women and Youth PLWD	Agricultural programmes and extension services	Inadequate funding; inadequate facilitation of agricultural extension officers
		Soil erosion	Planting of cover crops and terracing		Capacity building and extension services	
		Collapse of mines	Reinforcement of mine shafts		Training of artisanal miners and Early warning systems	Weak policies and laws

Current adaptation strategies						
	HAZARD	**IMPACT CHAIN**	**RESILIENCE STRATEGY**	**VULNERABLE GROUPS**	**FACTORS THAT SUPPORT STRATEGY**	**FACTORS THAT UNDERMINE STRATEGY**
		Destruction of roads and other infrastructure	Climate proofing of roads and infrastructure			Low uptake of the technology by contractors

Table 7: New Adaptation Strategies

	HAZARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
1	Pest and diseases	✓ Crop Failure ✓ High cost of production	✓ Producing and promoting of diseases and pest resistant as well as early maturing crop varieties, ✓ use of pesticide ✓ Promoting orphan crops e.g. sorghum, cassava and sweet potato ✓ Improving of the genetic composition ✓ soil and land Management ✓ (Adoption of FMNR, Conservation Agriculture with trees) ✓ Promotion of alternative livelihood systems such as beekeeping, aloe Vera farming, fruit farming ✓ use of certified seeds	Farmers PLWD	✓ Financial support ✓ capacity building on good agronomy practices
		✓ Loss of agricultural products in store ✓ High cost of production	✓ promoting agricultural produce post-harvest processing, storage and value addition (Use of hermetic bags)		
2	Drought	✓ Crop failure ✓ Food shortage and malnutrition ✓ Decrease in livestock production	✓ Adoption of climate smart agriculture (Crop diversification, Growing drought tolerant crops, irrigation etc) ✓ providing special livestock insurance schemes to spread and transfer risk from climate change. ✓ Promotion of Agroforestry to enable the poor rural households to meet their subsistence and energy needs ✓ Promotion of dryland forestry and adoption of fruit farming	Farmers PLWD	✓ Financial support ✓ capacity building on climate smart agriculture ✓ capacity building on sustainable water resource use
			✓ Development of recreational parks and urban green zones	Urban dwellers	✓

	HAZARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
		• Water scarcity (domestic and non domestic) • Waterborne diseases	✓ Increasing capture and retention of rainwater through the construction of waterways, strategic borehole and other water harvesting structures to ensure availability of water during dry seasons ✓ Developing and maintaining appropriate stock of water infrastructure (dams water pans, boreholes, and supply line) ✓ Conservation and protection of catchment areas ✓ Wetlands and springs protection and conservation ✓ Adoption of chemical and mechanical water treatment technologies ✓ Integrated water resource management	Women PLWD Children	✓
3	Floods	• Destruction of crops • Food shortage, • Death and spread of environmental diseases associated with contaminated water (Bilharzia, Typhoid, Cholera, amoeba • Displacement of people • Destruction of homes and properties Destruction of road infrastructure	✓ Building of dykes ✓ Establishment of early warning system ✓ Development of rescue centers ✓ Rehabilitation of the degraded land in the sand harvesting areas ✓ Afforestation ✓ Protection of riparian land		✓ Financial support ✓ capacity building on flood management and preparedness

	HAZARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
4.	Excess Rainfall	Crop failure	✓ Practice of agroforestry (conservation agriculture with trees ✓ Crop diversification		Financial support Automated weather station
		Soil Erosion	✓ Afforestation program ✓ Development gabions ✓ Development of grass strips ✓ Planting of cover crops		
		Collapse of Mines	✓ Training and Adaption of occupation health and safety measure in gold mining areas ✓ reinforcement of mine shaft		

Table 7:Additional Adaptation/Resilience Strategies.

Risk/Hazard	Livelihood/economic system	Climate resilience strategies	Stakeholder/group apply the strategy	Gender and social inclusion information
Drought	Agriculture Livestock Fisheries	✓ Adoption of climate smart agriculture (Crop diversification, Growing drought tolerant crops, irrigation etc) ✓ providing special livestock insurance schemes to spread and transfer risk from climate change. ✓ Promotion of Agroforestry to enable the poor rural households to meet their subsistence and energy needs ✓ Promotion of dryland forestry and adoption of fruit farming	Famers Farmers	Men, Women and youths work in the agriculture, livestock and fisheries sector. However, youths and women are mostly involved in the labor intensive work while men are the managers. The income from the agriculture, livestock and fisheries are not usually shared equally across the genders.
Floods	Agriculture Fisheries Trade	✓ Building of dykes ✓ Establishment of early warning system ✓ Development of rescue centers ✓ Rehabilitation of the degraded land in the sand harvesting areas ✓ Afforestation ✓ Protection of riparian land	Farmers Farmers Traders	Men, Women and youths work in the agriculture, livestock, fisheries and trade sector. However, youths and women are mostly involved in the labor intensive work while men are the managers. The income from the agriculture, livestock and fisheries are not usually shared equally across the genders.

Risk/Hazard	Livelihood/ec	Climate resilience strategies	Stakeholder/grou	Gender and social inclusion

	onomic system		**p apply the strategy**	**information**
Excess Rainfall	Agriculture Livestock sand harvesting Gold mining, sand harvesting	✓ Afforestation program ✓ Development gabions ✓ Development of grass strips ✓ Planting of cover crops ✓ Practice of conservation agriculture with trees Crop diversification) ✓ Training and Adaption of occupation health and safety measure in gold mining areas ✓ reinforcement of mine shaft	Miners Sand harvesters	Men, Women and youths work in the agriculture, livestock, sand harvesting and mining sector. However, youths and women are mostly involved in the labor intensive work while men are the managers. The income from the agriculture, livestock and fisheries are not usually shared equally across the genders.
Pest and deseases	Agriculture Livestock	✓ Producing and promoting of diseases and pest resistant as well as early maturing crop varieties, ✓ use of pesticide ✓ Promoting orphan crops e.g. sorghum, cassava and sweet potato ✓ Improving of the genetic composition ✓ soil and land Management ✓ (Adoption of FMNR, Conservation Agriculture with trees) ✓ Promotion of alternative livelihood systems such as beekeeping, aloe Vera farming,fruit farming ✓ use of certified seeds		Men, Women and youths work in the agriculture, livestock, fisheries sectors However, youths and women are mostly involved in the labor intensive work while men are the managers. The income from the agriculture, livestock and fisheries are not usually shared equally across the genders.

Chapter Five: County Climate Strategic Adaptation Investment/Action Priorities

The county government of Migori has identified climate change as a major challenge to the livelihoods of its populace. The county has identified priority interventions in response to climate variability and change and to achieve the implementation of this interventions. The county has developed and implemented several policies and programs with a focus on adaptation and mitigation; mainstreamed climate change into the various sectors and programs as presented in the county integrated plan 2023-2027; and the county is currently developing the County Climate Change Action plan as a concerted effort that addresses climate and development challenges together. Finally, it's worth to note that the intervention identified are addressing hazards/risks affecting the key livelihoods and economic systems in the county. *Table 9: below represents a summary of the priority area of investments.*

Table 8:The Priority Area of Investments

Hazards/Risks	**Key Priority Area:**	**Priority area of investment**
Drought Flood Excess rain	Forestry and Natural Resources	• Afforestation and Reforestation targeting additional 100,000 Ha of land under forest cover: • Enhancing Conservation and Management of all types of forests: • Promoting Sustainable Management and Utilization of Forest Plantations: • Engagement with an Expanded Portfolio of Stakeholders: • Mobilization of Volunteers to Support Forestry and Environmental Conservation Programmes: • Pursuit of Innovative Funding Mechanisms for Forestry Development.
Drought Flood Excess rain	Water	• Enhance capacity of institutions and bodies responsible for water and sanitation on climate change impacts and strengthen community water resource development and availability of clean water: • Promote awareness on climate change impacts and the water sector including promoting public awareness on water conservation (recycling, waste water management) and efficient water use:

Hazards/Risks	Key Priority Area:	Priority area of investment
Drought Flood Excess rain Pest and diseases	Agriculture and Livestock Development	• Promotion of Conservation Agriculture, Climate-Smart Agricultural Practices, irrigated agriculture and diversification of rural economies: • Enhance the resilience of the livestock value chain, financing, awareness, capacity building, technology development:
Drought Flood Excess rain Pest and diseases	Fisheries	Livelihood diversification, (Economic Stimulus Programme), Cage fishing projects, Awareness, capacity building, financing, technology:
Drought Flood Excess rain	Energy	Enhance implementation of an energy use mix plan that increases the resilience of the current and future energy systems to the impacts of future climate variability and change:
Drought Flood Excess rain	Infrastructure and settlement	Enhance climate proofing of infrastructure that underpin social and economic systems to curb/lessen increasing pressure to meet changing user needs (as exposures and vulnerabilities increase) in a changing climate:

Chapter Six: Conclusion

Community engagement at a local level is critically important to climate action. The PCRA exercise in Migori County was an inclusive and deliberative process that empowered the community and other stakeholders with decision making on climate change related issues. This process provided a platform for everyone (women, youth, ethnic minorities, people living with disabilities and other marginalized and vulnerable groups) to share information and experiences which greatly assisted in prioritization of climate action and investments.

The findings of the assessment evidenced a direct manifestation of climate change in the County namely the increasing temperatures, rainfall variability including unpredictable extreme events. These manifestations were found to be affecting various aspects of the County`s socio-economic structure owing to their dependence on climate sensitive resources. Consequently, this severely impacted on the vulnerable groups who were characterized by high poverty levels including women, the elderly, youths, children and the people with disabilities. Some of the risks identified during the assessment were; drought, storms, flood, prevalence of pest and diseases. The adaptation strategies identified were; adoption of climate smart agriculture, promotion of diseases and pest resistant crop varieties, Water resource management and conservation, disaster preparedness and management, afforestation, Rehabilitation of degraded areas, energy conservation and development of climate proof road infrastructure.

In order to effectively achieve the implementation of the adaptation strategies mentioned above. The PCRA report has highlighted the cross-sectoral strategic investment priorities that strengthen the adaptive capacity and resilience of key livelihood, social and economic systems within the county. The highlighted investment priorities were found to be aligned with the Migori County Government project policies, plans and budget aimed at achieving sustainable growth and increased climate resilience.

ANNEXES

Table 9:Current Adaptation Strategy Identified in Each Ward

	HAZARD	AFFECTED WARDS	IMPACT CHAIN	RESILIENCE STRATEGY	VULNERABLE GROUPS	FACTORS THAT SUPPORT STRATEGY	FACTORS THAT UNDERMINE STRATEGY
1	Army warm infestation	Tagare	food shortage	crop rotation		promotion of various crop varieties	Inadequate funds
2	Bad roads	Masaba Tagare North Kamagambo	High cost of trasport	Use of alternative routes	traders	availability of alternative routes	inadequate financial for development of road infrastructure
3	COLLAPSE OF MINE SHAFTS	**MACALDER**	Loss of lives and man power	avoiding mining shafts during rainy seasons	youth,men	provision of improved mining equipments	lack of proper knowledge on how to operate modern mining equipment's
4	Crop destruction	Gokeharaka Getambwega Makerero Bukira East		Pests spraying with ash	Elderly, PLWDs	Ash spraying helps reduce pests	Ash spraying doesn't completely eradicate pests
5	destruction of infrastructures	West Kanyamkago	accidents, delay of goods getting to the market , high transport cost,	road maintanance, traditional produce preservation methods, use of moterbykes instead of vehicles	youths, women	government policies and budgetary allocation	low budgetary allocation and low cost of living
6	Destruction of properties, crops and environment.	Godjope	floods	growing crops that can thrieve in floods eg rice.	women, children and youth.	extension services and growing of alternative crops.	lack of capacity building/training and awareness creation.
7	DISEASE PREVALENCE	North Kamagambo Central Sakwa	reduced health, death, low school turn out, law manpower for production	provision of clean water, provision of mosquito nets, indoor spraying, creating, awareness and treatment at	children and women	government policies and incentives, health policies and budgetary allocation	high cost of treatment

	HAZARD	AFFECTED WARDS	IMPACT CHAIN	RESILIENCE STRATEGY	VULNERABLE GROUPS	FACTORS THAT SUPPORT STRATEGY	FACTORS THAT UNDERMINE STRATEGY
				the hospital			
8	Drought	South Kanyamkago Isebania South Kamagambo North Kanyamkago Central kamagambo South Kamagambo WIGA NORTH KADEM KANYASA West Kanyamkago Muhuru Got Kachola Kaler Kachieng East Kanyamkago Oruba Ragana Wasweta II Wasimbete Central Sakwa West Sakwa Central Kanyamkago Nyamosense Komosoko	food shortage	climate smart agriculture	farmers	capacity building on climate smart agriculture	Inadequate finance
9	EXTREME TEMPERATURES	East Kamagambo	LOW INCOME	PLANTING IMPROVED SEEDS	WOMEN CHILDREN PWD	GOVERNMENT POLICIES	CORRUPTION
10	famine	Gokeharaka Getambwega, kanyasa		drought-resistant crops	Women, Elderly, Children	Drought resistant crops are scientifically viable	Expensive certified seeds

	HAZARD	AFFECTED WARDS	IMPACT CHAIN	RESILIENCE STRATEGY	VULNERABLE GROUPS	FACTORS THAT SUPPORT STRATEGY	FACTORS THAT UNDERMINE STRATEGY
11	Flood	NORTH KADEM Muhuru Got Kachola North Sakwa Central kamagambo East Kamagambo MACALDER Wasimbete South Sakwa West Sakwa Central Kanyamkago	Destruction of food crops	establishment of irrigation schemes	women,children,PWDs	sensitization by government agencies	unpredictable rainfall patterns
12	food insecurity	Suna Central Isebania Ntimaru East North Kamagambo South Kanyamkago	High prices, insecurity and reduced income	use of fertilizers, intercropping, and timely planting	youth and women	government incentives such as reduced fertilizer cost	high cost of farm inputs, lack of enough and adequate facilitation of agricultural extension officers
13	Heatwave	Kachieng	water scarcity	water harvest and storage	Everybody	storage facilities	Corruption
14	heavy rainfall	East Kanyamkago Oruba Ragana Wasweta II Nyamosense Komosoko North Sakwa	destruction of crops;soil erossion	agroforestry	female headed household,poor plwd	agricultural programs, agricultural extension servises	inadequate funding,
15	high disease prevalance	Kakrao Suna Central Godjope Kwa		Use of treated water.	women ,men and youth	Use of storage tanks to store clean water, water treatment before use.	Water tanks are very expensive and chemicals used for water treatment are expensive.
16	High mortality rate	Kakrao Kwa	Frequent road accidents	Proper/regular road maintenance.	Youth, women and men.	Regular road maintenance by government and awareness creation on traffic rules to the road users.	Lack of regular road maintanace and lack of awareness on traffic rules.

	HAZARD	AFFECTED WARDS	IMPACT CHAIN	RESILIENCE STRATEGY	VULNERABLE GROUPS	FACTORS THAT SUPPORT STRATEGY	FACTORS THAT UNDERMINE STRATEGY
17	high rate of school drop out	Ntimaru West		capacity building the community on the importance of education; equiping schools; support sponsership to learners; sex education to the adolascence	Children, PWDs Women	availability of financial resources, mentorship programs, scholarships,	lack of school fees; high cost of living; poverty;
18	HIGH TEMPERATURE	Central kamagambo	HUNGER AND FAMINE	EARLY PLANTING AND DROUGHT TOLERANT CROPS	WOMEN, PWD YOUTH, CHILDREN	GOVERNMENT SUBSIDIES, PLANTING FAST MATURING CROPS	LACK OF EXTENTION SERVICES
19	Human diseases	Nyamosense Komosoko	poor health, low school turnout, low manpower for agricultural and economic activities, death	providion of clean water, provision of nets, creation of awareness, vaccination, provision of free cholera and malaria drugs, indoor fumigation	children and women	government policies and incentives, health policies and budgetary allocation	high cost of treatment,
20	IN ADEQUATE DRINKING WATER	**WIGA**	water borne diseases	drilling of water pans and bore holes	all	provision of water services by government agencies	lack of knowledge on proper conservation of water
21	inaccessability	Nyabasi West		tarmaking of feeder roads	PWD,Elderly, Children,Women	Availability of financial resources	inequitable distribution of resources
22	Increase	Nyabasi East		purchase of	PWD,Elderly,	Availability of adequate skips,	inadequate financial

	HAZARD	AFFECTED WARDS	IMPACT CHAIN	RESILIENCE STRATEGY	VULNERABLE GROUPS	FACTORS THAT SUPPORT STRATEGY	FACTORS THAT UNDERMINE STRATEGY
	in disease outbreak			skips, construction of transfer station, regular collection of wastes, capacity building, purchase of land for final waste disposal	Children,Women	effective waste collection routine, availability of land for construction of transfer station, availability of financial resource	resource, poor coodination on waste collection, lack of land for final waste disposal
23	insecurity	Central Sakwa West Sakwa Central Kanyamkago	high crime rate	peace initives, livelihood diversifiation everybody community policing /nyumba kumi low empl	everybody		low employment rate
24	lack of clean water	Bukira Central		boil drinking water	Women, Elderly, Children	Boiling water is recommended	Boiling water is time consuming
25	low crop yield	Bukira East Makerero Bukira East Gokeharaka Getambwega Makerero		drought-resistant crops	Women, Elderly, Children	Drought resistant crops are scientifically viable	Expensive certified seeds
26	malnutrition	Kakrao Suna Central Godjope Kwa		farm inputs eg fertilizers and intercropping	women and children	extension services and government subsidy on fetilizers.	weak extension services and expensive fertilizers
27	PEST & DISEASES	North Kanyamkago South Kamagambo WIGA NORTH KADEM KANYASA	Food insecurity	provision of pest resistant crops, application of pesticidesin time	all	sensitization by agricultural extension officers	in adequate knowledge on ways of pest control

	HAZARD	AFFECTED WARDS	IMPACT CHAIN	RESILIENCE STRATEGY	VULNERABLE GROUPS	FACTORS THAT SUPPORT STRATEGY	FACTORS THAT UNDERMINE STRATEGY
		Muhuru Got Kachola Kaler Kachieng North Sakwa East Kanyamkago Oruba Ragana Wasweta II Wasimbete					
28	POLLUTION	MACALDER Ntimaru West	Contamination of water sources	no resilient strategy so far	all	sensitization on safe mining methods	in adequate knowledge and lack of sensitization on safe mining methods
29	poor health care	South Sakwa	outbreak of diseases	Provision of public health services and improvement of sanitation capacity of the locals	Children, women, elderly	established health care centres/institutions	Poor road networks, the bushy sugarcane belt, improper planning for financial services
30	poor road network	South Sakwa	high cost of trasportation		everybody	use of boda boda	hiked trasprtaion cost
31	Rainfall Variability	Masaba	Food shortage	crop diversification	farmers	capacity building on climate smart Agriculture	Inadequate financial resources
32	reduced crop and livestock productivity	Ntimaru West		Crop and livestock diversification; sustainable grazing and farming; capacity building	PWD,Elderly, Children,Women	Increased extension services, providing subsedised farm inputs ; capacity building	high cost of farm input , limited financial and technical capacity; poor coordination; inaccessible to weather and climate information
33	reduced household income	Ntimaru East		diversification of livelihood sources	PWD,Elderly, Children, women	availability of financial resources	unpredictable weather patterns
34	reduced proceeds from	Nyabasi West Ntimaru East		fencing	men, PWD	availability of financial resources	cultural believes

	HAZARD	AFFECTED WARDS	IMPACT CHAIN	RESILIENCE STRATEGY	VULNERABLE GROUPS	FACTORS THAT SUPPORT STRATEGY	FACTORS THAT UNDERMINE STRATEGY
	livestock farming						
35	resource conflict	Nyabasi West		Water resource protection and management	PWD,Elderly, Children,Women	Availability of financial resource	inequitable distribution of resources
36	Unsustainable sand harvesting	Nyabasi East		Promote alternative source of livelihood;capacity building; rehbailitation of degraded lands	PWD,Elderly, Children,Women	Awareness creation, availability of financial resource, provision of tree seedlings	Cultural believes, Limited financial resources, deforestation, thurst for quick money
37	Water borne diseases	Kaler	Increase of household expenditure	water treatment	Everybody	training	hugecapital needed
38	Water Scarcity	South Kanyamkago Isebania Masaba Tagare Nyabasi East Bukira Central West Kanyamkago	Poor hygiene	havesting and storage of rain water	Women	availability of water havesting material in the local market	inadequate finance

Table 10:New Adaptation Strategies Proposed in Each Ward

	HAZARD	AFFECTED WARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
1	Army worm infestation	Tagare	food shortage	use of pesticide	farmers	capacity building on good agronomy practices
2	Bad Roads	Masaba Tagare North Kamagambo North Kanyamkago	High cost of transport	development and maintainance of roads	traders	financial resources

	HAZARD	AFFECTED WARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
3	COLLAPSE OF MINES	**MACALDER KANYARWANDA**	loss of lives	rainforcement of mine walls	youth,men	huge financial capital
4	Crop destruction	Bukira Central	Construction of gabions and terraces	Women, Elderly, PLWDs	Funds	
5	disease and pest	Central Kanyamkago	outbreak of diseses	Use of modern medical health care, embracing of Community Health Volunteers		
6	Disease prevelence	Nyamosense Komosoko	reduced health stabdards	provision of free malaria and cholera drugs, vaccination against malaria, distribution of enough nets, using air friendly indoor sprays	women and children	finance and technical resource,
7	Drought	WIGA NORTH KADEM South Kanyamkago Isebania North Kanyamkago South Kamagambo KANYASA Muhuru Got Kachola Kaler Kachieng east Kanyamkago Oruba Ragana Wasweta II Wasimbete Central Sakwa South Sakwa West Sakwa Central Kanyamkago West Kanyamkago Nyamosense Komosoko Suna Central	Food insecurity	planting drought resilient crops	all	availability of seeds and proper farm equipments
8	EXTREME TEMPERATURES	South Kamagambo, East Kamagambo	LACK OF WATER FOR DOMESTIC	CONSTRUCTION OF LARGE WATER PANS	WOMEN CHILDREN YOUTH	FINANCIAL RESOURCES

	HAZARD	AFFECTED WARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
9	FAMINE	**KANYASA**	mulnutrition	storage of exess produce	children, eldrly	safe storage faclities
10	FLOOD	Wasimbete Godjope North Sakwa North Kanyamkago Central kamagambo East Kamagambo Central kamagambo MACALDER KANYARWANDA NORTH KADEM Central Sakwa West Sakwa Central Kanyamkago	destruction of crops; soil erosion, insecurity	sustainable land management	poor;pwd;female headed families	capacity building,extension services
11	food insecurity	Suna Central Godjope Kwa Kakrao Isebania South Kanyamkago North Kamagambo Ntimaru East		diversification of crops, food storage for future use and early maturing crops	children and women	government subsidy on basic commodities and financial support
12	Heavy rainfall	east Kanyamkago Oruba Ragana Wasweta II Nyamosense Komosoko North Sakwa North Sakwa	destruction of crops; soil erosion	agroforestry and intercropping, ; terracing	poor;pwd;female headed families	capacity building, give tree seedlings
13	high accident rates.	Kakrao, Kwa		awareness creation on floods control and regular road maintanance.	youth,women and men.	finance and awareness creation on traffic rules.
14	High rate of school drop out	Ntimaru West		provision of learning equipment, education on mentral hygiene management, construction of community liberary; employment of more teachers	Children, parents, elderly	technical and financial resources
15	HIGH TEMPERATURES	Central kamagambo	HUNGER AND FAMINE	MODERN FARMING TECHNOLOGIES	WOMEN PWD YOUTH OLD	INCENTIVES AND FINANCIAL

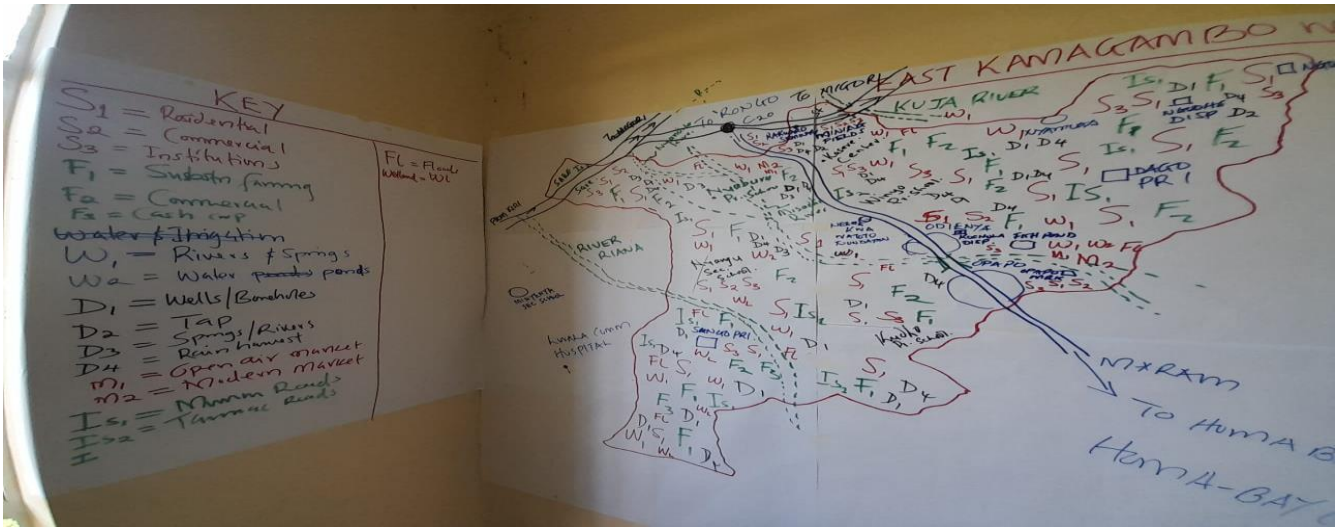
	HAZARD	AFFECTED WARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
						SUPPORT
16	Hunger	Makerero		Provision of relief foods	Women, Elderly, PLWDs	FUnds
17	IN AQUATE DRINKING WATER	WIGA	water born diseases	conservation of catchment areas	children	water consevation knowledge/driling equipments
18	inaccessibility	Nyabasi West		proper maintenance of existing roads	elderly, children, women , PWD, Children	financial and technical resources availability
19	inadequate clean water	Kakrao Suna Central Godjope Kwa		use of treated water.	women, men and youth.	finance and awareness creation on hygine practices.
20	Increase in desease outbreak	Nyabasi East		Purchase of skips, prepare waste collection routine, purchase of land for construction of transfer station, awareness creation	elderly, children, Women, PWD, Children	Financial resource, proper coordination of waste collection, capacity building
21	insecurity	Central Sakwa, west sakwa	high crime rate	none	none	evrybody
22	Low crop yield	Bukira East		Distribution of drought resistant crops	Women, Elderly, PLWDs	Funds
23	PEST & DISEASES	East Kamagambo South Kamagambo North Kanyamkago WIGA NORTH KADEM KANYASA east Kanyamkago Oruba Ragana Wasweta II Wasimbete	Food insecurity	use of pesticides in farms and on farm produce	all	extension services
24	POLLUTION	**MACALDER KANYARWANDA**	contamination of water and land	use of safe chemicals	all	availability of safe chemicals and proper sensitization
25	Pollution	Ntimaru West	Apply reuse, recover and recycle strategy; use of landfill for disposal; use of	PWD, elderly, women and children	awareness creation; financing waste management activites, procurement of dust bins to traders, purchase	

	HAZARD	AFFECTED WARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
			incinerators, waste prevention and minimization		of land for final waste disposal	
26	Rainfall Variability	Masaba	Food shortage	crop diversification	farmers	capacity building on climate smart agriculture
27	reduced crop productivity	Ntimaru West		increased access to medical services; distribution of treated mosquito nets; income diversification; crop diversification	elderly, children, women, PWD, Children	equipping more medical facilities; setting up more medical facilities ; adequate financial and technical resources; more extension services; farm subsidies
28	reduced household income	Ntimaru East		diversification of income streams	elderly, children, women , PWD, Children	
29	Reduced proceeds from livestock farming	Nyabasi West		Farming of drought tolerant livestock breeds	men and PWD	Capacity building, provision of drought tolerant livestock breeds
30	reduced proceeds from livestock farming	Ntimaru East		improved security	men and PWD	financial resources
31	Resource conflict	Nyabasi West		Intergrated water resource ,managemente	elderly, children, women	Financial and technical resource availability
32	Unsustainable sand harvesting	Nyabasi East		Introduction of alternative sources of livelihood; afforestation of degraded lands, favourable legal frameworks	elderly, children, Women, PWD, Children	Capacity building; provision of tree seedlings; enacting favourable legal frameworks
33	Water scarcity	Isebania Masaba Tagare Nyabasi East South Kanyamkago Gokeharaka Getambwega Bukira East	poor sanitation, malnutrition of livestock, outbreak of diseases i.e cholera, disruption of economic	enforcement of rainwater harvesting policy, drilling of boreholes for community, construction of more water pands and rehabilitating the silted onces	women and children	teachnical and financial resources, adequate budgetary allocation

	HAZARD	AFFECTED WARD	IMPACT CHAIN	NEW ADAPTATION STRATEGIES	VULNERABLE GROUPS	RESOURCES OR PRIOR ACTIONS NEEDED
		Bukira Central Makerero Gokeharaka Getambwega Bukira East Bukira Central Makerero Gokeharaka Getambwega West Kanyamkago West Kanyamkago	activities due to long distance search of water			

ANNEX 2: **PICTORIAL PRESENTATIONS OF COMMUNITY ENGAGEMENT ACTIVITIES DURING PCRA**

Public participation in Central Kamagambo ward PCRA activities



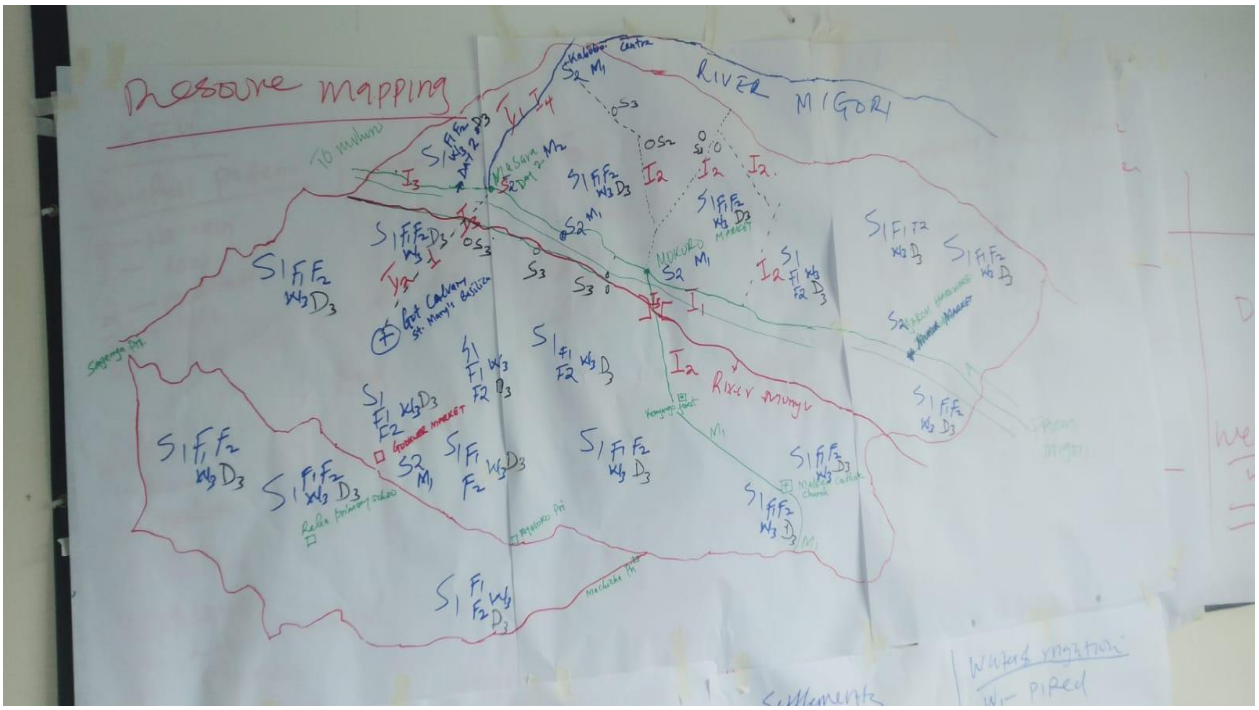
Resource Map for East Kamagambo Ward developed during the PCRA community engagement forums

PCRA activities in Got-Kachola War

Focus Group Discussion during the ward engagement meeting

Kachieng Ward PCRA Activity

Suna Central Ward Climate Change Planning Committee



Sketch of Wiga Ward Resource Map developed during the Ward Engagement Forum