COUNTY GOVERNMENT OF MERU

MERU COUNTY PARTICIPATORY CLIMATE RISKS ASSESSMENT (PCRA) REPORT

May, 2023

A United, Prosperous, Green and Happy County

FOREWORD

This Participatory Climate Risks Assessment Report (PCRA) integrates the County residents' understanding of the climate hazards and risks facing them with the County's policies, plans, programs, and projects in line with the provisions of the Environmental Management and Coordination Act (EMCA, 1999) and other environmental frameworks. Specifically, the PCRA report shall inform the County Climate Change Action Plan (CCAP) which shall be the benchmark for all climate actions in the county.

The report captures the climate risks and hazards identified in a participatory process and proposed actions to ameliorate their effects to the vulnerable populations. This is in line with the County's quest to meet the Sustainable Development Goals (SDGs), Vision 2030, Meru County Vision 2040 and the County integrated Development Plan (CIDP). The report shall inform community proposals for locally-led actions that seek support from climate financing in the county, nationally and globally. Its use and implementation of the proposed actions will be monitored through the Annual State of the Environment (SoE) as well as CCAP reporting.

Meru County faces numerous climate risks and hazards, including deforestation, soil erosion, desertification, water catchment destruction, poaching, domestic and industrial pollution, land degradation, loss of biodiversity, degradation of aquatic ecosystems and resources, droughts, floods and landslides and invasive and alien species. Moreover, climate change issues have been, underscored in the global agenda as it affects all spheres of human activity. Our commitment to ensure environmental management is critical, hence the need for the CIDP and sectoral policies to mirror the recommendations of the PCRA report.

The process for the production of this report was participatory, involving various stakeholders from local communities at the ward level, public benefit organizations, marginalized populations, green champions, business sector, administration as well as faith-based organizations.

I look forward to all institutions (public and private), civil society and the public to be engaged in the implementation of the recommendations of this report in order to achieve sustainable low-carbon resilient development in the county. My government is committed to this noble direction and that is why through a county law we have set aside at least 2% of the development budget to the County Climate Change Fund to climate-proof county development.

H.E. HON. KAWIRA MWANGAZA
GOVERNOR - MERU COUNTY

PREFACE

Participatory Climate Risks Assessment (PCRA) Report is a tool that aims at involving the County residents to map out their vulnerability to climate risks and hazards. It further involves the residents in proposing locally-led interventions to the identified risks and hazards. In doing so, the process not only involves the population but also builds their capacity while respecting their indigenous knowledge in addressing the climate vulnerability they face. This process goes beyond the tenets of public participation in decision making and planning to also engaging the population take part in the actions to address the climate change issues.

The Meru County PCRA process was guided by the guidelines provided by the National FLLoCA programme Coordination Unit (NPCU). It commenced with sensitization and training of 46 Technical Working Group (TWG) members who in turn facilitated the field engagement and data collection. The TWG consolidated the field reports and prepared a draft PCRA report which was presented to a multi-stakeholder workshop for technical inputs and validation. The workshop brought into the report new perspectives from science, practice and aligned the report to the global, regional and national law and policies on climate change. The inputs from the workshop were incorporated into the draft to finalize the report.

The PCRA report was further used as source document to develop the Meru County Climate Change Action Plan (CCAP),2023 -2028. The CCAP shall inform all policy reviews and climate actions to be implemented in the medium term and also form a basis for future reviews. The plan shall be used as a benchmark for vetting community proposals for locally-led actions under FLLoCA programme. It shall further be used as a county profile for engagement with partners in climate change for support and collaboration.

I look forward to all institutions (public and private), civil society and the general public to be engaged in the implementation of this plan in order to achieve sustainable development in the county.

Eng. Jackson Muthama Munoru
CECM – DEPARTMENT OF WATER, IRRIGATION ENVIRONMENT,
NATURAL RESOURCES AND CLIMATE CHANGE

ACKNOWLEDGEMENT

The process of preparing this, PCRA report benefited immensely from the support and guidance of Financing Locally-Led Climate Action (FLLoCA) programme, a grant by the National Treasury and Planning. The technical support by National Project Coordination Unit (NPCU) and partners as well as the financial support provided made the required processes possible and easy to deliver.

Pan Africa Climate Justice Alliance (PACJA), National Environmental Management Authority (NEMA), the Meru Meteorological Station and the National Drought Management Authority (NDMA) Meru office provided data, maps and technical support that cannot go unmentioned. The County Department of Finance and Planning provided county statistical data that has enriched the report.

The County Climate Change Unit (CCU) Secretariat worked diligently to ensure that the PCRA report follows the laid down guidelines and procedures. The information and data provided by the department of Agriculture, Livestock and Fisheries, Department of Water and irrigation, Department of Physical Planning, Department of Public Health, Kenya Wildlife Service, Kenya Forest Service, Water Resources Authority, civil societies among other stakeholders and lead agencies formed the basis of this report and the participation of the various representatives is highly appreciated.

I acknowledge the efforts made by all persons who contributed directly or indirectly to the preparation of this report. In particular, I pay special tribute to the CEC - Mr. Jackson Muthamia for providing the policy lead, The Director - Mr. Angelo Gitonga for steering the technical team, the members of the CCU for the long hours put in the process and all public servants who held a stake in the arduous process. We look forward for the PCRA report to contribute in integrating environmental issues in the county's sustainable development and guide appropriately the process of development planning.

I urge the policy makers, all institutions, experts and individuals from various sectors to make good use of this very fundamental document.

GEORGE KIMATHI KOBIA
CHIEF OFFICER - DEPARTMENT OF WATER, IRRIGATION ENVIRONMENT,
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EXECUTIVE SUMMARY

Meru County is prone to several climatic hazards. The major climatic hazards in Meru County are erratic rainfall patterns, drought occasioned by prolonged dry spells, emergent of pests and diseases outbreaks, human wildlife conflict, deforestation, and environmental pollution. Average temperatures have generally increased. The net effects of these hazards include; flooding, soil erosion, reduced soil fertility, environmental degradation, pests and disease, landslides, failed rainfall seasons, drying rivers and over abstraction. This Participatory Climate Risk Assessment (PCRA) report captured all the major climate risks, sources of vulnerability and priority adaptation actions to address the identified risks, through community engagement carried out in 45 wards across the county for incorporation into the county Climate Change Action Plan (CCAP) and the County Integrated Development Plan (CIDP). The report (PCRA) is also one of the Minimum Performance conditions to access Climate Resilience Investment Grants (CCRI) from the National Treasury under Financing Locally Led Climate Action, (FLLoCA) program. Geographically, Meru has a hot, arid climate characterized by two distinct rainy seasons, long rains which falls between March April May (MAM), and short rains falling between October, November December (OND). The distribution of rainfall ranges from 300mm per annum in the lower midlands in the North to 2500mm per annum in the South East. Other areas receive on average 1250mm of rainfall annually. Temperatures range from as low as 8^0C to 32^0C high during the cold and hot seasons respectively. Due to climate change, weather and season variation have become order of the day, such that there are prolonged drought seasons and erratic rainfall (Meru County CIDP, 2023-2027). From the primary data and secondary data analysis; (i) Variability in seasons for MAM and OND depicts inconsistence and interrupted community systems in terms of timing and planning for the seasons; (ii) In view of the historical, current and future trends, the County faces eminent challenges in rainfall distribution and intensity, thus placing the County on the red side of failed rainfall and drought trajectory; and (iii) From the projected future scenario, their will be exacerbation of these climate hazards and risks such as land and soil degradation, diminishing water levels, heat stress, human/wildlife conflict among others.

The most affected segment of the community is, Farmland in sloppy and drainage areas, Rural populations dependence on springs, rivers and streams as water sources due to drying of these sources, Homestead that depends on rainfall for agricultural activities especially crops and livestock pastures, small scale Enterprises, and ecosystem services dependent consumers. Result from the community Ranking of climate related hazards, affected livelihood system and proposed interventions were validated through county multi-stakeholder workshop that sought inputs, critique and congruence of the community views with those of technical team, key players in Environment matters and selected community members including the green champions, considering inclusivity especially to the VMGs. All this process culminated to development of County Climate Change Action Plan to actualize the proposed intervention at Both levels of Engagement for the next five years.

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DEFINITION OF TERMS

Adaptation - Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive Capacity - The ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behavior and in resources and technologies.

Capacity building - In the context of climate change, the process of developing the technical skills and institutional capability in developing countries to enable them to address effectively the causes and results of climate change.

Carbon market - A trading system through which countries or other entities may buy or sell units of greenhouse gas emissions in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union. The term comes from the fact that carbon dioxide is the predominant greenhouse gas, and other gases are measured in units called "carbon dioxide equivalents."

Carbon sequestration - The process of removing carbon from the atmosphere and depositing it in a reservoir or “sink”, such as soil or trees

Climate - The average pattern for weather conditions occurs over a long time period. Weather refers to the atmospheric conditions at a specific place at a specific point in time. Climate has always varied because of natural causes. Increasingly, however, human increases in GHG emissions causing changes in climate as well.

Climate Change - Changes in global or regional climate patterns, including changes in temperature, wind patterns and rainfall. In particular, climate change refers to a change apparent from the mid to late 20th century onwards and attributed largely to human activities that increase levels of GHG emissions, especially atmospheric carbon dioxide produced by the use of fossil fuels. Climate change is sometimes referred to as global warming, which specifically refers to the long-term trend of a rising average global temperature.

Climate Finance - Local, national or international financing that may be drawn from public, private and alternative sources of financing, and is critical to addressing climate change because large-scale investments are required for adaptation and mitigation.

Climate Resilience - Closely linked to adaptation, building climate resilience includes reducing vulnerability to climate change, making sure that the impacts of climate change are avoided or cushioned, and enabling people to respond to climate risks.

Conference of the Parties - The supreme governing body of the UNFCCC, which meets once a year to review the Convention's progress. The word "conference" is not used here in the sense of "meeting", but rather of "association”.

Deforestation - The long-term or permanent loss of forest cover. The term implies transformation of forest into another land use, which is caused and maintained by a continued human-induced or natural perturbation.

Greenhouse gases - The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_20). Less prevalent but very

powerful greenhouse gases are hydro fluorocarbons (HFCs), per fluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

Intergovernmental Panel on Climate Change (IPCC) - Established in 1988 by the World Meteorological Organization and the UN Environment Programme, the IPCC surveys worldwide scientific and technical literature and publishes assessment reports that are widely recognized as the most credible existing sources of information on climate change. The IPCC also works on methodologies and responds to specific requests from the UNFCCC's subsidiary bodies. The IPCC is independent of the UNFCCC.

Kyoto Protocol - An international agreement standing on its own, and requiring separate ratification by governments, but linked to the UNFCCC. The Kyoto Protocol, among other things, sets binding targets for the reduction of GHG emissions by industrialized countries.

Low Carbon Development Pathway - A national development plan or strategy that encompasses low-emission economic growth. Transitioning to this pathway means taking actions, where possible, to encourage GHG emissions that are lower than business-as-usual practice; and reducing the human causes of emissions by moving toward a resource efficient economy that is as low-carbon as possible and enhancing carbon sinks.

Mitigation - In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere.

Measurement, Reporting and Verification Plus (MRV+) - An integrated framework proposed for Kenya to measure, monitor, verify and report results and impacts of mitigation, adaptation and climate finance actions, and the synergies between them.

National Adaptation Plan - A document prepared by developing countries that identifies urgent and immediate needs for adapting to climate change.

National Climate Change Action Plans - National plans of action, prepared at five-year intervals, that set out in detail the requirements and costs for the design and implementation of the various climate change interventions required for Kenya to attain low carbon climate resilient development.

Public Private Partnerships (PPPs) - Public-Private Partnerships are an association between government and private sector through which private financing is utilized to perform a public function, at a profit to the private sector.

REDD+ - Reducing Emissions from Deforestation and Forest Degradation plus the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. REDD+ is a mechanism under the UNFCCC designed to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands.

Sustainable development - Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Technology Transfer - A broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change among different stakeholders.

United Framework Convention on Climate Change (UNFCCC) - An international treaty signed by 195 countries that entered into force in 1994. The objective of the Convention is "…stabilization of greenhouse

gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate systems…"

Vulnerability - The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1.1 Administration and Geography

Administratively, the County is divided into eight (15) sub-counties namely Buuri East, Buuri West, Igembe North, Igembe South, Kiengu, Igembe Central, Imenti North, Imenti East, Nkuene/Mtunguu, Abogeta, Igoji, Meru Central, Tigania East, Tigana Central and Tigania West Sub Counties. Politically, the county is divided into nine (9) Constituencies of Buuri, Igembe North, Igembe Central, Igembe South, North Imenti, South Imenti, Central Imenti, Tigania East and Tigania West. The county has 45 assembly wards with the highest number (6) within South Imenti and the least (4) in Central Imenti. The rest of constituencies share a common number of wards (5). The county also has 392 villages.

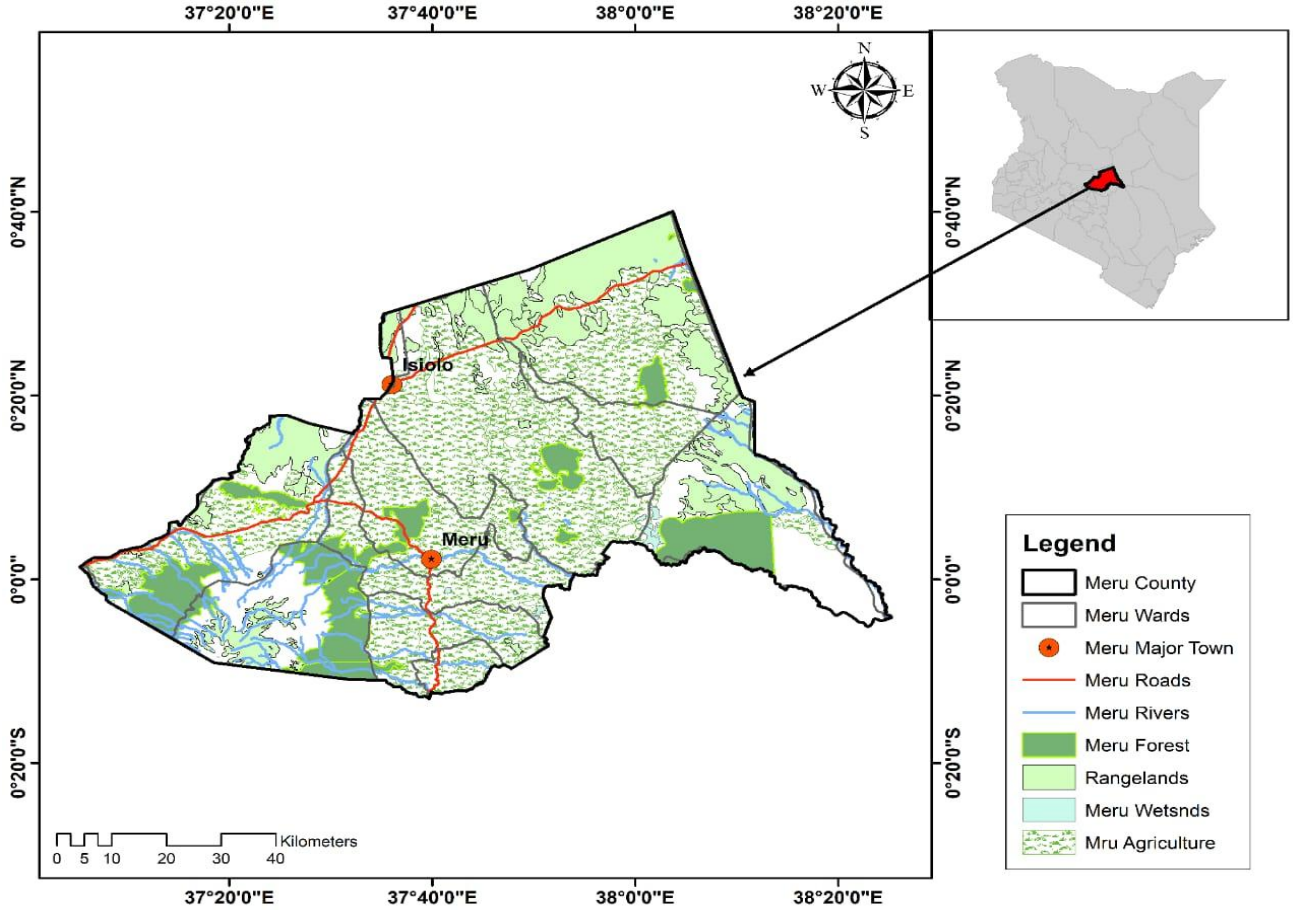


Figure 1: Meru County Geography and Administration Geographic Information System (GIS) generated Map. Source: Robert Muthami (2020).

Meru County is located in the Eastern part of Kenya (formerly Eastern province of Kenya) and has a total area of approximately 70,006km^2, making it amongst the largest counties in Kenya. The county lies between 0^{o}6' North and 0^{o}1' South and between latitudes 37^o West and 38^o East. It borders Isiolo County to the North, Tharaka/Nithi County to the East, Nyeri County to the South West and Laikipia County to the

West making it very prone to immigrants as opposed to emigrants given its high agricultural potential and natural resource base.

Largely, the county's located on the eastern slopes of Mt Kenya and the equator thereby influencing its natural conditions. The county's altitude ranges from 300m to 5,199m above sea level. This has influenced the atmospheric conditions leading to a wide variety of micro-climates and agro-ecological zones. The drainage pattern in the county is characterized by rivers and streams originating from catchment areas such as Mt. Kenya and Nyambene ranges in the North of the county. The rivers cut through the hilly terrain on the upper zones to the lower zones and drain into the Tana and Ewaso Nyiro Rivers. The rivers form the main source of water for both domestic and agricultural use.

Meru County is part of the Central Kenya Economic Bloc (CEKEB) that was previously known as the Mount Kenya and Aberdare Economic Bloc composed of 10 counties of Meru, Tharaka-Nithi, Embu, Nyandarua, Laikipia, Nakuru, Nyeri, Muranga, Kiambu and Kirinyaga. The regional economic bloc mostly aims at leveraging on member counties competitive and comparative advantage through economies of scale, sharing of natural resources and specializations in access to local and regional markets, enhanced food security and economic growth through private sector investments. The County's active role in the bloc is mostly focused on revamping of collapsed regional industries as well as the horticulture sector and also the rehabilitation of poor roads towards the promotion of trade and business travel. The County is also immensely contributing to the bloc through its immediate impact of the actualization of the LAPSSET project connecting Isiolo, Meru, Tharaka Nithi and Embu as illustrated in the Kenya Vision 2030.

The distinct physical features for which the county is famous are Meru National Park, Njuri Ncheke shrine, Mt. Kenya, Meru Museum, Igombe salt lick and Nyambene Complex among others. The County has eleven permanent rivers with the major one being the Kathita River, a tributary of River Tana. The County also has 12 shallow wells, 30 protected springs, two water pans, 16 dams and 242 boreholes. These form the major sources of water for domestic use, irrigation and livestock production.

The County is classified as a semi-arid zone because 67% of the landmass is semi-arid.33% is high potential areas around Meru central and Nyambene ranges. The distribution of rainfall ranges from 300mm per annum in the lower midlands in the North to 2500mm per annum in the South East. Other areas receive on average 1250mm of rainfall annually. There are two seasons with the long rains occurring from mid-March to May (MAM) and short rains from October to December. Temperatures range from a low of 8^{o}C to a high of 32^{o}C during the cold and hot seasons respectively.

The county has varied ecological zones ranging from upper highlands, lower highlands, upper midlands and lower midlands. This has greatly influenced the major economic activities. The upper highlands zones cover areas ranging from Imenti South, Imenti Central, Imenti North, Part of Tigania East, part of Tigania West, Igembe Central and Igembe South constituencies. The lower midland zones are only found in lower parts of Buuri, Igembe North and Tigania East and West which borders Laikipia and Isiolo Counties.

1.1.2 Population, Gender Dynamics and Urbanization

According to the 2019 National Population and Housing Census by the Kenya National Bureau of Statistics (KNBS), Meru County has a progressive population of 1,545,714 hosted in about 426,360 households and approximate household size of 3.6. Considering this against the total land mass of the county of 70,006km^2, the county has about 221 km^2 population density. This, looking at the growth rate projected for the county,

is a huge impending challenge to the natural resources given the continuous demand and continuously growing urbanization.

The majority of the population in the county is between 0-24 years (Census, 2019). This is an indicator of a young and growing population, which will potentially exert pressure on the county's resources and urban areas in the future if the trend continues. Major towns in the county include Meru Town, Nkubu, Laare, Timau, Mikinduri and Maua. The social landscape of the county is characterized climate-induced insecurity especially in the Northern grazing zones, high levels of food aid in low potential areas and rapidly changing household dynamics and livelihoods. Although about 80% of the population is still depending on classical agriculture income, more and more young and well-educated people are moving to urban areas looking for other sources of income. Still another significant number of households become pastoral drop-outs following each major natural disaster like droughts.

1.1.3 Food and poverty index

Meru County poverty index is 19.4% being ranked among the five least poor counties in Kenya. This is attributable to the robust agricultural sector. However, 67% of the landmass in Meru is semi-arid and the high agricultural potential areas depend on rain-fed agriculture. With the changing climatic conditions occasioned by extreme weather conditions, the poverty levels are likely to worsen

1.1.4 Transport, Infrastructure and Energy

In 2018 the percentage of road network stood at 20%, with the county having 5968km of road network. This consists of 582km bitumen, 581km gravel and 4805km of earth surface road. This improved to 6059km which is 1.36% increase in road network coverage. This aided issues of traffic and impassibility i.e., improved access and mobility. The approximate distance/travel time increased from approximately 10km/hr to 35km/hr. Moreover, job opportunities were created for around 2000 youths which improved their living standards. With the aim of making towns dust-free, 36 markets were paved and cabros laid. The move increased accessibility especially for markets that would become impassible when it rained. The dust-free markets reduced incidents of respiratory diseases, occupational lung diseases and parasites like jiggers.

It is reported that initially in 2018, there were 290 markets that had been lit by floodlights. The county increased the number to 379 markets, which was a 23.5% increase. 29 high masts were also erected. This was aimed at promoting Meru County to a 24-hour economy. The project also enhanced the towns and markets' security, making them a good trading environment.

The county is served by the Isiolo International Airport and a number of airstripts, namely: Gaitu, Mitunguu and private airstrips which include; Lewa wild life conservancy, Meru national park, Kisima farm, Oldonyo farm, Embori farm and Maarania farm airstrips.

According to Kenya Population Census 2019, the main source of energy for cooking by household is wood fuel and charcoal which accounts for 86.1 per cent and 6.6 per cent respectively. The number of households connected to electricity is 13.6 per cent; those using paraffin are 4.5 per cent, gas 2.4 per cent, biogas 0.1 per cent and solar 6.6 per cent. Major public and private institutions are connected to national grid but the major challenge for the county is how to connect the over 85 per cent households with electricity.

1.1.5 Education and Literacy level

The county is made up of 15 education divisions and zones. Staffing is inadequate for both teachers and education officers. Majority of the pupils/students are attending government institutions at the schooling levels except for professionals and vocational training where private institutions absorb most students.

The county is endowed with various education institution of various levels such as primary education that host pre-school education and others stands alone

Secondary education - There are 377 public secondary schools in the county which absorbs students from both public and private primary schools.

Tertiary education - There are two universities [one private and one public]; four university campuses; two teachers training colleges and various tertiary colleges offering post-secondary education.

Technical, Vocational Education and Training (TVET) - Meru County boasts of 1 National Polytechnic, 5 Technical Training Institution s (TTI) and 29 Vocational Training Centers (VTC). These offer diverse technical courses to form four leavers at Certificate and Diploma level. Technical, Vocational Education and Training plays a pivotal role in technology diffusion through transfer of knowledge and skills and are recognized as critical channel for social equity, inclusion and viable development. TVETs provide specialized training in specific career field, trade or profession, including computer technology, business administration, culinary arts, electronics, medical assisting, legal assisting, automotive technology and cosmetology.

1.1.6 Agriculture and livestock

Crop farming and value chains: The economy of Meru is primarily agrarian. The growing of a variety of crops and keeping livestock in some parts of the county form a critical chunk of the economic activities of the people of Meru. The Greater Meru is endowed with soils and climatic conditions that allow for the production of a variety of commodities including wheat, barley, potatoes, millet, Sorghum and maize. High grade tea, coffee, bananas and Miraa (Khat) are the key cash crops.

According to Meru County Integrated Development Plan (CIDP, 2023-2027) and the county climate risk profile done by Consultative Group on International Agricultural Research (CGIAR, 2016), Meru County is characterized by high agricultural productivity attributed to favorable climatic conditions and fertile lands. High-input, rain-fed agriculture complemented by irrigation is the main source of livelihood in the County, contributing about 80% to the average household income. Maize, bananas, potatoes and dairy cattle are the key value chain commodities that contribute to both household food security and livelihoods. However, floods and heat stress compromise productivity and food security in Meru County and are expected to pose even greater challenges in coming years. Reduction of agricultural land, declining soil fertility, high input costs, lack of protection of catchment areas, environmental degradation, cross-border conflicts between pastoralists and crop farmers, and poor marketing systems are some of the key factors that exacerbate the impacts of climate change and variability and at the same time limit the ability of farmers and livestock keepers to cope with these impacts.

Livestock and Dairy farming: Meru County is one of the leading milk producing areas in Kenya. Dairy farming is practiced in all AEZs of the County. In 2015, an estimated 120,000,000 liters of milk was produced earning the farmers about KES 4.56 billion. More than half the population (40% - 60%) of the County is involved in dairy farming with the majority of households keeping an average of two animals. Milk

is consumed on a daily basis, hence the importance of dairy farming for food security. Although dairy farming is widespread, productivity is considered to be medium. For the exotic cattle, the productivity per animal is about 6.7 liters/cow/day during the dry season and 8.6 liters/cow/day during the wet season (GoK, 2014). Dairy is an income earner for many households with farmers being paid an average of KES 38 per liter by the Meru Dairy Union, a large-scale processor in the County.

1.1.7 Land Use and Land Use Changes

The major land use in the county is farming for both subsistence and commercial purposes. Approximately 65 per cent of the farmers in the county have title deeds. However, Meru North region which includes the Igembe South, Central and North and Tigania East and West leads with the highest number of farmers without title deeds. This is mainly as a result of slow process of land registration and numerous land cases in courts occasioned by the use of CAP 284. However, the prospect of accelerated land registration is high since the same CAP 284 has since been suspended. The average land holding size per household is 1.8 ha for the small scale and 18.25 ha for the large-scale land owners. The area which is potential for irrigation is 81.262 ha with only 2,131ha under irrigation.

Land in Meru County is utilized in diverse ways including: agricultural, residential, educational, public purpose, public utilities, transportation, industrial, recreation and conservation and commercial. However, the major land use in the county is mainly for agricultural activities for both crop farming and livestock-keeping. Agricultural land use is common in all the sub-Counties and is particularly intense in the Imenti sub counties and Buuri while livestock is common in the Tigania and North Igembe sub counties. Other uses include cultural and forestry conservation. There is large scale farming carried out by private companies in Timau, Buuri constituency. Livestock and Miraa farming is also practiced in Tigania and Igembe areas. Coffee, Tea and Macadamia are also major crops produced in Imenti Central and Imenti South sub counties respectively. Other crops grown in the county include Bananas, maize, beans, sorghum, millet, green grams, potatoes, cabbages, carrots and kales among others.

Urban uses are also rapidly emerging in the County with Meru, Maua, Nkubu, Mikinduri, Laare and Timau developing as urban nodes. The urban areas are also being complemented by other centers in the Sub Counties and ward level. Transportation and forestry use constitute other main users in the county.

1.1.8 Range management

The rangelands of Meru County contribute significantly to national and local economies by supporting livestock production, wildlife conservation, and tourism. Even so, climate change impacts negatively on water availability, pasture productivity, massive livestock and wildlife losses owing to frequent drought episodes, increased human-wildlife conflicts, escalation in resource conflicts between various pastoralist groups especially from Isiolo competing over meager rangeland resources, loss of biological diversity, reduced aesthetics of landscape as a result of degradation and encroachment of invasive species. Observable changes in vegetation patterns across the county are equally forcing specific wildlife species to migrate to newer sites, neighboring counties and/or even across international borders leading to reduced visitation by tourists and therefore loss of revenue.

1.1.9 Health services

Health Services provision at the County Level is centered around the tenets described by both the Kenya Essential Package of Health Services (KEPH) and Schedule IV of the Kenya Constitution 2010. These two key documents define mandates/roles/responsibilities for interventions and service delivery at Level - 1

(Community), Level – 2 (Dispensary), Leve l – 3 (Health Centre), Level – 4 (Sub-County/ district) and Level - 5 (County Referral) of the health system.

1.1.10 Water, Environment and Natural Resources

In 2018 the connections to household's stood at 221,250 HH and the target was to serve 10,000 more households (4.52%) with Improved access to safe, clean and adequate water. A total of 242 boreholes have been drilled and this has improved access to safe, clean and adequate water. Community water projects are being assisted according to their current requirements and this will help in increasing improved access to safe, clean and adequate water. Provision and distribution of storage facilities for rain water harvesting has also improved access to safe, clean and adequate water by 3%. With increased provision of portable water at households' level the rural population using safely managed sanitation services have increased by 15.5%.

Human activities such over cultivation, overgrazing, uncontrolled mining as well as settlements along sensitive ecosystems disturb the ecological setup and expose soil to erosion, reducing its ability to sustain natural regeneration. The main causes of environmental degradation in the county is attributed to anthropogenic activities such as farming, mining, road construction, human settlements and overstocking of livestock, other major degraded areas within the county comprise of degraded riverine ecosystems, hilly ecosystems and forest ecosystems. The major hotspots comprise of stone and sand mining quarries which are prone to collapsing especially during rainy seasons.

1.2 Policy Context

1.2.1 Earth Summit

This was a comprehensive plan of action to be taken globally, nationally and locally by organizations of the UNO, governments and major groups in every area in which human impacts on the environment". The Rio Convention endorsed the global Forest Principles and adopted Agenda 21 for achieving Sustainable Development in the 21st century

1.2.2 Paris Agreement of 2015, on Climate Change

Climate change is a global emergency that goes beyond national borders. It is an issue that requires international cooperation and coordinated solutions at all levels. To tackle climate change and its negative impacts, world leaders at the UN Climate Change Conference (COP 21) in Paris reached a breakthrough on 12 December 2015. This Agreement works on a five- year cycle of increasingly ambitious climate action carried out by countries. The Agreement is a legally binding international treaty, entered into force on 4 November 2016. Today, 194 states (193 States plus the European Union) have joined the Paris Agreement, It includes commitments from all countries to reduce their emissions and work together to adapt to the impacts of climate change, and calls on countries to strengthen their commitments over time. Therefore, this Agreement provides a pathway for developed nations to assist developing nations in their climate mitigation and adaptation efforts while creating a framework for the transparent monitoring and reporting of countries' climate goals.

Every five years, each country is expected to submit an updated national climate action plan - known as Nationally Determined Contributions. In their NDCs, countries communicate actions they will take to reduce their greenhouse gas emissions in order to reach the goals of the Paris Agreement or communicate their NDCs actions they will take to build resilience to adapt to the impacts of rising temperatures.

1.2.3 Constitution of Kenya, 2010

The County is bound by the Constitution of Kenya, 2010 which has set out a legal commitment to attain ecologically sustainable development and all the international and regional protocols on climate change.

1.2.4 National Climate Change Act,2016 and the National Climate change policy 2018

The Act provides for establishment of climate change governance structures to coordinate implementation of activities at national and subnational levels. Section 19 of the Climate Change Act, requires counties to mainstream climate change in their programmes, projects and plans, undertake climate change action planning as well as establish a climate change governance framework. The County has further established a Directorate of Environment and Climate Change in accordance with the National Climate Change Act, 2016 to provide overall guidance to climate change responsive development in the County.

1.2.5 Meru County Climate Change policy, 2019, County climate Change Act,2020 and Meru Climate change Adaptation and Mitigation strategy, 2021

Meru county enacted various climate change legal instrument that seeks to integrate environmental concerns into the county policies, plans, programs and projects in line with provisions of Environmental management and Coordination Act, 1999 and other Environmental legal framework. In particular the Meru Climate Change Policy and Meru Climate Change Act, 2020 addresses environmental issues from various sector in an integrated manner at the county level and their significance in informing planning within the following priority areas: Toward low carbon resilience; mainstreaming Climate change; climate change governance; public awareness and civic education; Research and technology, and knowledge management and access to information. These policies and legislations provides a firm basis to address the challenge of climate change while striving to attain the development goals set out in Kenya Vision 2030 and Meru Vision 2040.

Pursuant to the above policy, law and plan, the county has achieved notable milestones including a 2% of the total development budget contribution set aside for climate change mitigation and adaptation; establishment of Meru Climate Change Fund and a staffed Directorate in-charge of climate change. Further the County has been able to establish a platform for engagement of partners especially non-state actors.

CHAPTER TWO

MERU COUNTY PCRA PROCESS

Purpose of the PCRA Report and its development process

The Participatory Climate Risk Assessment (PCRA) report captures all the identified climate risks, sources of vulnerabilities and priority adaptation actions to address the same. Through the stakeholders' engagement, communities in Meru County from the 45 wards identified their climate change hazards, impacts of the hazards and proposed actions for incorporation into the county Climate Change Action Plan (CCAP) and the County Integrated Development Plan (CIDP). PCRA is also one of the Minimum Performance conditions for Climate Resilience Investment Grants (CCRI) from the National Treasury Financing Locally Led Climate Action, (FLLoCA).

The PCRA process comprise 7 steps as described hereunder;

Step 1: Formation of cross-sectoral Technical Working Group (TWG) to lead participatory county climate risk assessment process.

In forming the Technical Working Group, the CCU considered the following in identifying the TWG:- commitment to create time for the exercise, knowledge, skills, experience relevant to the task and time set to achieve the target as per the PCRA guidelines. A technical team of 46 officers from departments of Environment and Agriculture was constituted by the Chief Officer of Water, Irrigation, Environment, Natural Resources and Climate Change.

Step 2: Training the Technical Working Group

The Technical Working Group was trained for two days on the PCRA process, the various tools relevant to the data needed for PCRA report and

the need for inclusion in all spheres. The training was facilitated by the Director Environment and Climate Change and two environment experts from Embu County. This training equipped the team for the field exercise.

Step 3: Stakeholder analysis and engagement process

The Technical working group during the training identified the various stakeholders, listed, and analyzed them using Johari's Window. The stakeholders represented organizations or individuals responsible for climate impacts, climate actions and building resilience to climate impacts. It also considered those with knowledge and expertise relevant to climate change.

Table 1: Summary of Stakeholders analysis

High Influence, Low Interest • Financial institution • Department of Infrastructure • Media	**High Influence, High Interest** • Governor • CEC- Water, Irrigation, Environment, Natural Resources & Climate Change • CO – WIENR& CC • Meteorological dept • GIS • Dept of Agriculture • NEMA • KFS • WRA • Environmental committees (planning committee, ward committees) • Council of elders • FBOs
Low Influence, Low Interest	**Low Influence, High Interest** • Environment officers • CBOs • Learning Institutions (TVETs, Universities)

Step 4: Stakeholder engagement at all levels

The technical working group was divided into teams of two to facilitate each ward during stakeholders' consultation. Each ward had 25-30 participants for effective, efficient, and representative deliberations. The Stakeholders were mobilized by ward administrators and consisted of different livelihoods groups such as farmers and traders, marginalized, youth, PWDs and local Administration.

In the morning session the stakeholders were taken through introduction on FLLoCA program, PCRA process, it's significance, overview of climate change trends followed by explanation of the process and its application in the county planning and development cycle.

In the mid-morning the facilitators started administering the various climate change risk assessment tools to determine the main hazards, vulnerabilities; prioritized them; and proposed local actions and adaptation strategies. The output of this process was that the communities at ward level identified key climate change risks, hazards and, priority response measures.

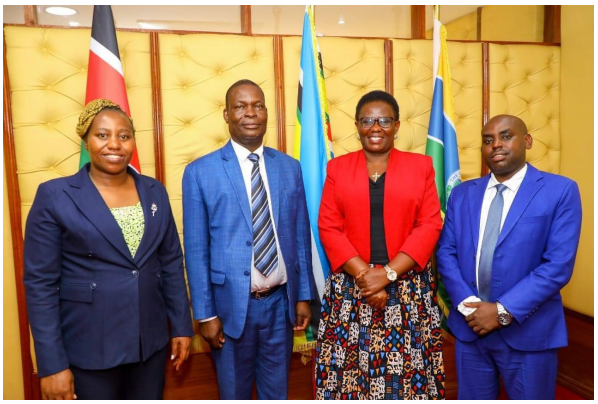
Step 5: Data Collection and Workshop Preparation

The TWG summarized the data from the wards into reports and risk maps digitized by the GIS unit capturing the main hazards and prioritized response actions per ward and at the sub-county level. The team also reviewed relevant documents national development, climate, and sectoral plans and key county development and sectoral plans, such as the CIDP. The information from the reviews formed the concept for the workshop which detailed the background of the exercise, objectives, program and list and invitees. The TWG appointed a small group to facilitate during the multi-stakeholder workshop.

Step 6: Multi-stakeholder climate risk assessment workshop

A one-day workshop was held on the 26th May, 2023 with objective to validate the findings from the community engagements from the wards and have the multi-stakeholders incorporate their views into the Meru County PCRA report. The workshop had 100 participants who included County critical Departments such as Water, Irrigation, Environment, Natural Resources & Climate Change, Agriculture Energy, and Public Health. Other stakeholders included CBOs, FBOs, Community representatives, community leaders, NGOs and CSOs working in the environment and climate change sector. (Annex iii: list of participants)

The presentation covered introduction/overview on FLLoCA program and PCRA process; the county overview, Current Climate context such as current and historical climate risks, impacts and adaptive strategies, responses; and future climate context and plenary to capture stakeholders inputs on priority adaptation areas.



Step 7: Climate Risk Assessment Report

The Technical Working group appointed a skilled 10-member task team to consolidate the data from the field and multi-stakeholders' views and develop a detailed report that outlines risks, impacts ,strategic adaptation, and planning priorities for the county over five-year time-frame. It took four days for the team to develop a draft report of the County Participatory Climate Risk Assessment.

CHAPTER THREE

MERU COUNTY CLIMATE HAZARD PROFILE

Primary Objective

- To gain insight into past climatic hazards and identify trends in their nature, intensity and impact

Secondary Objectives

- To understand historical community reactions to and coping strategies for climatic hazards
- To investigate historical institutions, support following hazard events
- To gather insight into social-economic and political changes in the past
- To introduce the concept of a changing climate to the community

Introduction

The climate of Meru is pleasantly warm with cool nights, being mitigated by the altitude. The city is located in the center of Kenya, practically at the equator, at 1,600 meters (5,250 feet) above sea level, and at the foot of Mount Kenya (© Copyright Climatestotravel.com.).

Meru has a hot, arid climate. Climate is characterized by two distinct rainy seasons, long rains which falls between March April May (MAM), and short rains falling between October, November December (OND). The distribution of rainfall ranges from 300mm per annum in the lower midlands in the North to 2500mm per annum in the South East. Other areas receive on average 1250mm of rainfall annually. There are two seasons with the long rains occurring from mid-March to May and short rains from October to December.

Temperatures range from a low of 8^{o}C to a high of 32^{o}C during the cold and hot seasons respectively. Due to climate change weather and season variation have become order of the day such that there are prolonged drought seasons and erratic rainfall (*Meru County CIDP, 2023-2027*)

2.1 Historical and current climatic Trends of Meru County

According to Climate Change Knowledge portal for Development practitioners and policy makers courtesy of 2021 The World Bank Group report, Trends in climate (past, present and future) always need to be understood in the context of the naturally occurring variability. *Climate variability* here, refers to the ways and how climate conditions (e.g., temperature and precipitation) "flicker" from year to year within their respective typical "range of variability". The cause for this natural variability can be due to quasi random internal variability of the coupled atmosphere-ocean-land-ice system (as weather variability is drawn out over many years). A prime example for a cause of that category is the variability induced by El Niño – Southern Oscillation.

2.1.1 Historical Trends

a) Rainfall

Historical time trend of MAM rainfall distribution in time from 1961-1990

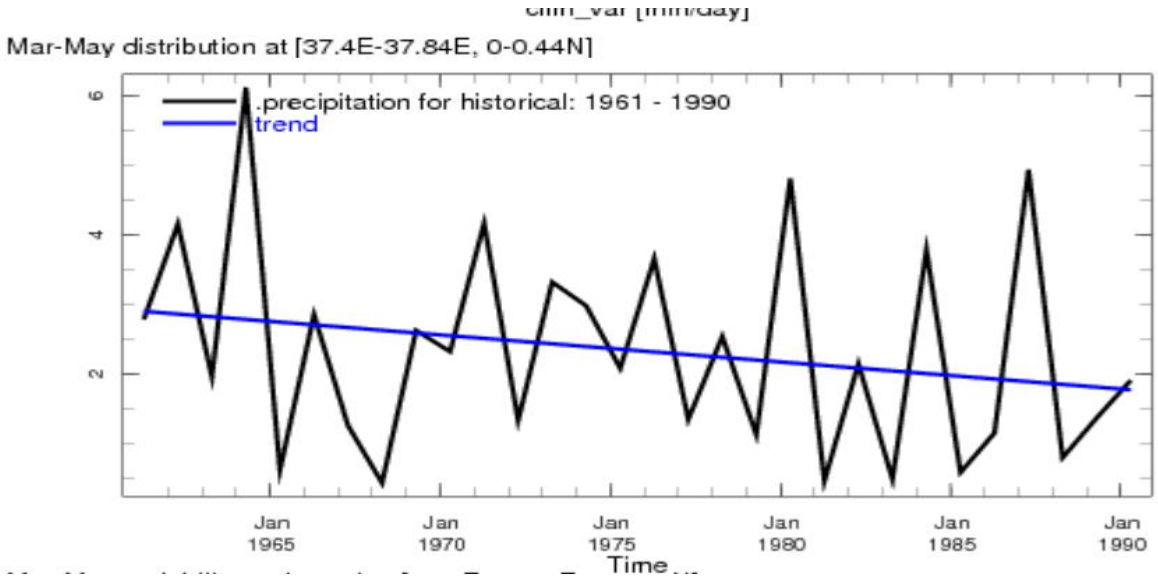


Figure 2: Historical time trend for MAM distribution of rainfall in time from 1961-1990

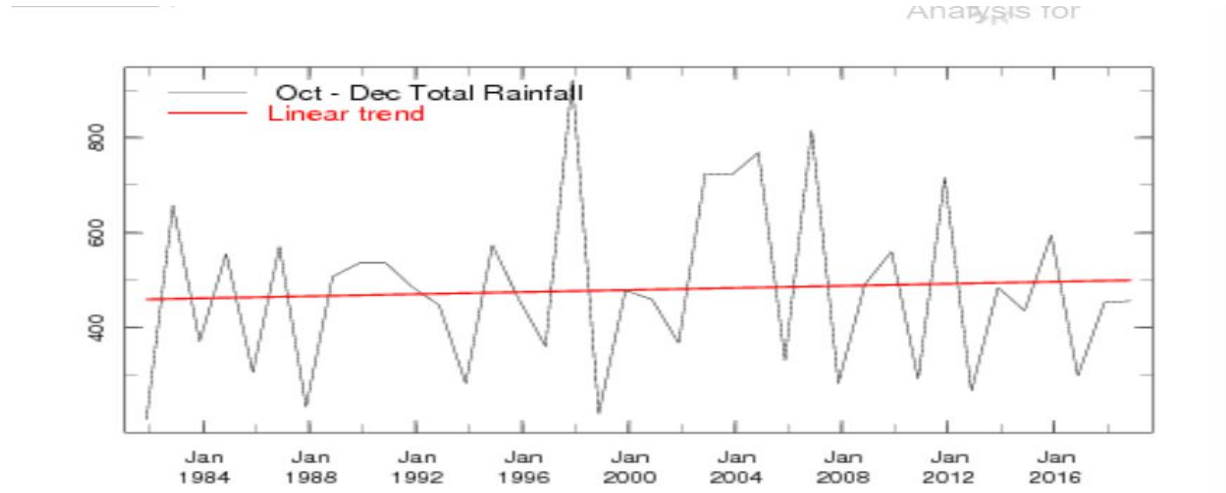


Figure 3: Historical time trend for OND distribution of rainfall in time from 1982 - 2016

Explanation: From the two historical time series presentations of MAM and OND seasons, it is evidenced that rainfall fluctuation has been the norm. Years of 1965 -1970 and 1982 -1984 experiencing below normal rainfall thus famine in the region.

1.2.3 Current Trends

a) Rainfall distribution by time

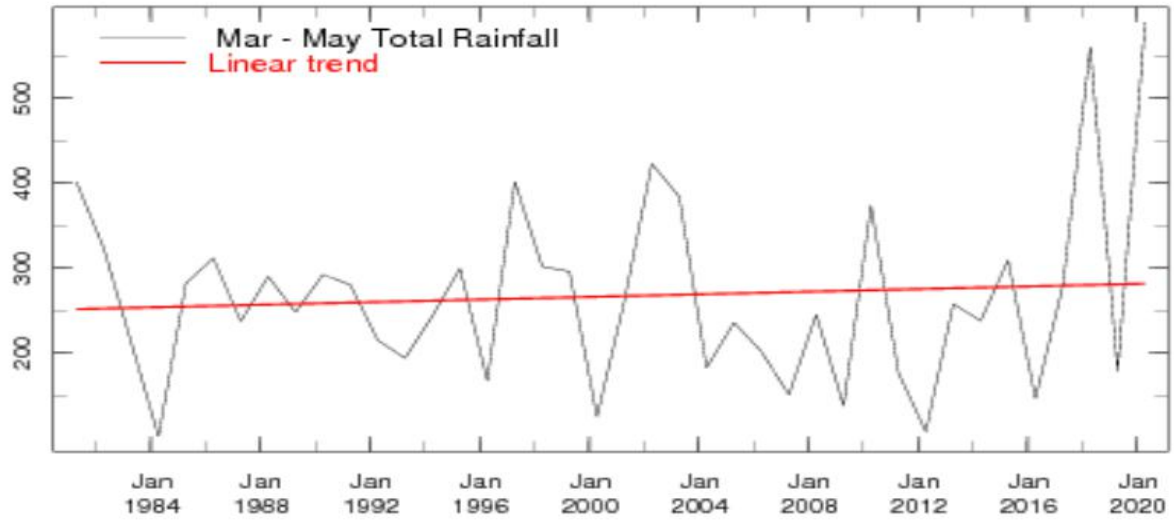


Figure 4: Historical time trend for MAM distribution of rainfall in time from 1982 - 2020

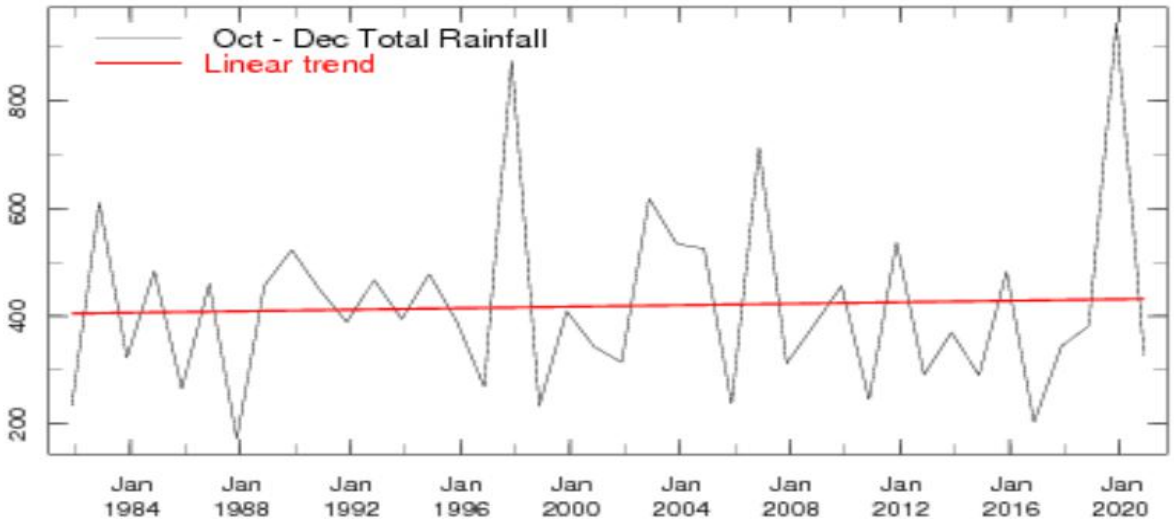


Figure 5: Historical time trend for OND distribution of rainfall in time from 1982 – 2000

Explanation

MAM distribution - In the years of 1984, 1985-1999, 2001 -2004, 2008- 2011 and 2017-2019 the region experienced rainfall of between 250mm to above 500mm in some seasons, while 1984 and part of 1986, 1992 – 1993, 1996, 2000, 2004 -2007 2012-2014, 2016 and 2019 the rainfall distribution was below 200mm for MAM.

OND distribution- In the years of 1986, 1988,1998-2002, 2006,2008, 2011, 2013-2015, 2017 -2019 had failed rainfall wth some regions received less than 200mm

b) Rainfall intensity in (mm)

Graphical presentation of rainfall anomalies in millimeters between 1980 – 2020 in OND

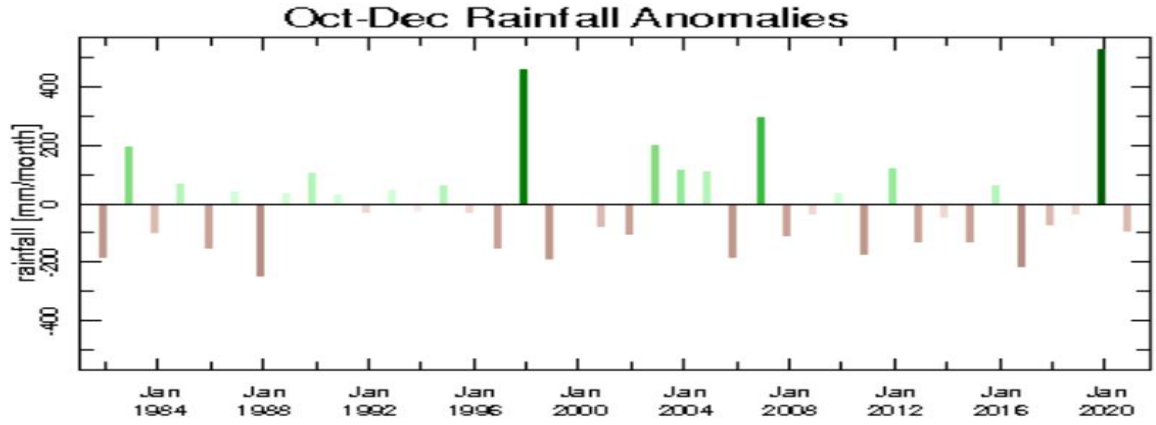


Figure 6: Time trend for OND distribution of rainfall in time from 1980 – 2000

OND in MM - The bar graph above shows that between 1984 and 1996 the region had fluctuating seasons, having below 200mm and a times failed rainfall.

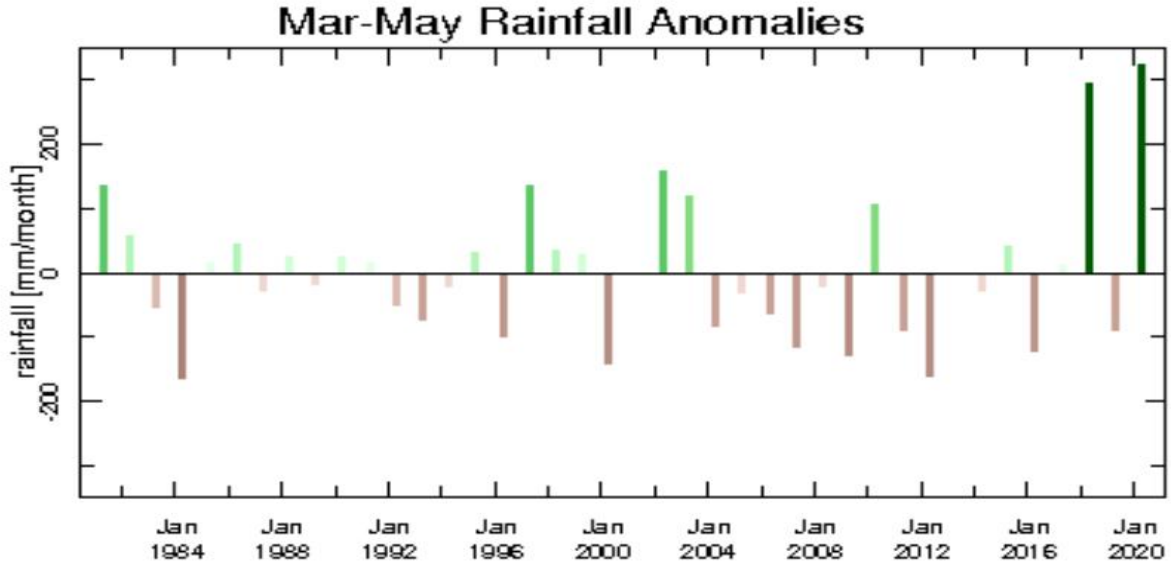


Figure 7: Time trend for MAM distribution of rainfall in time from 1980 – 2000

MAM in MM- In 1882-1997, 2000, 2004-2010, 2011-2018 the region had failed MAM, receiving between 0- to below 200mm of rainfall

Summary

- Variability in seasons for MAM and OND depicts inconsistence and interrupted community systems in terms of timing and planning for the seasons.
- In view of the historical, current and future trends, the County faces eminent challenges in rainfall distribution and intensity, thus placing the County on the red side of failed rainfall and drought trajectory.
- The above future scenario shall exacerbate other climate hazards and risks such as land and soil degradation, diminishing water levels, heat stress, human/wildlife conflict among others.

2.3 Exposure and Vulnerabilities of the County

The major climatic hazards in Meru County are erratic rainfall patterns, drought occasioned by prolonged dry spells, emergent of pests and diseases outbreaks, human wildlife conflict, deforestation, and environmental pollution. Average temperatures have generally increased. The net effects of these hazards include: flooding, soil erosion, reduced soil fertility, environmental degradation, pests and disease, landslides, failed rainfall seasons, drying rivers and over abstraction.

Focus on livelihoods determines vulnerability of the community and the resources available enable them to cope with the vulnerabilities, hazards or their impacts. Several factors compound the impacts of climate change and vulnerability. The increasing dependence on land coupled with demand for food and other natural resources have seen the county land degraded, food quantity and quality reduced, malnutrition increased and livelihoods altered. The PCRA process established the most vulnerable groups to climate risks and hazards as: -

i. Farmland in sloppy areas and drainage areas

Impacts of climate hazards such as soils erosion, landslides and gullies are more common in sloppy areas. Wards such as Kiguchwa and Igoji West are particularly more vulnerable to landslides. Those residing on hill slopes and other steep areas are exposed to topsoil erosion, rock falls, land slides etc. homes and farmlands near water sources are also vulnerable to floods and flash floods resulting from episodes of intense rainfall. The community members in the lower areas of critical catchment area are prone to water scarcity or drying rivers due to over abstraction upstream.

ii. Rural populations depended on springs, rivers and streams

More than 80% rural households in Meru County depend on rivers for water whose output has large seasonal variability. During prolonged dry periods, the overall yields of water in these sources drastically reduces leading to time wastage and internal and external conflict especially on rangelands. During rainy period, it was noted that the overall quality of water in these sources drastically declines except for boreholes due to sedimentation, with rivers and streams being the most affected thus negatively affecting the said populations.

iii. Homestead that depended on rainfall for agricultural activities especially crops and livestock pastures

The rural households depend more on agricultural activities for livelihoods compared to urban households hence making them more vulnerable to the impacts of climate change. Frequent changes in rain patterns affects most households that depend on the agriculture are exposed to the impacts of climate change. Notably, women are the highest portion of laborers in the agricultural sector which further makes them more vulnerable to the effects of climate change. Unsustainable agricultural practices such as cultivation of sloppy areas, overstocking and overgrazing exposes the communities dependent on agriculture to climatic

shocks. The vulnerable groups do not have equal access and control over important resources such as land and decision making due to beliefs that bars women and children from owning family assets with huge monetary values despite them being the prime caretakers.

iv. Small scale Enterprises

The major Enterprises in Meru County are small scale traders dealing in household merchandise, cereals, vegetables & fruits, livestock and small-scale farm dealing with macadamia, coffee and Miraa. Seasonal variability in supplies of agricultural produce affects traders. Infrastructure destruction during heavy rains affects transportation of goods in areas with poorly maintained feeder roads.

2.4 Differentiated impact of Climate Trends and Risks

Destruction of infrastructure during periods of excess rainfalls causes more challenges for the community while accessing essential services like markets, farms and social places. There were indications that climate change has affected livestock rearing and agricultural activities that depend on rain. The cumulative impact of climate change on these sectors include; diminished water and pasture, increased resource conflicts, increased pests and diseases, reduced productivity and production with associated socioeconomic impacts (loss of livelihoods and income and further deprivation). Some households, for instance, lose up to 50 percent of their herds during a drought.

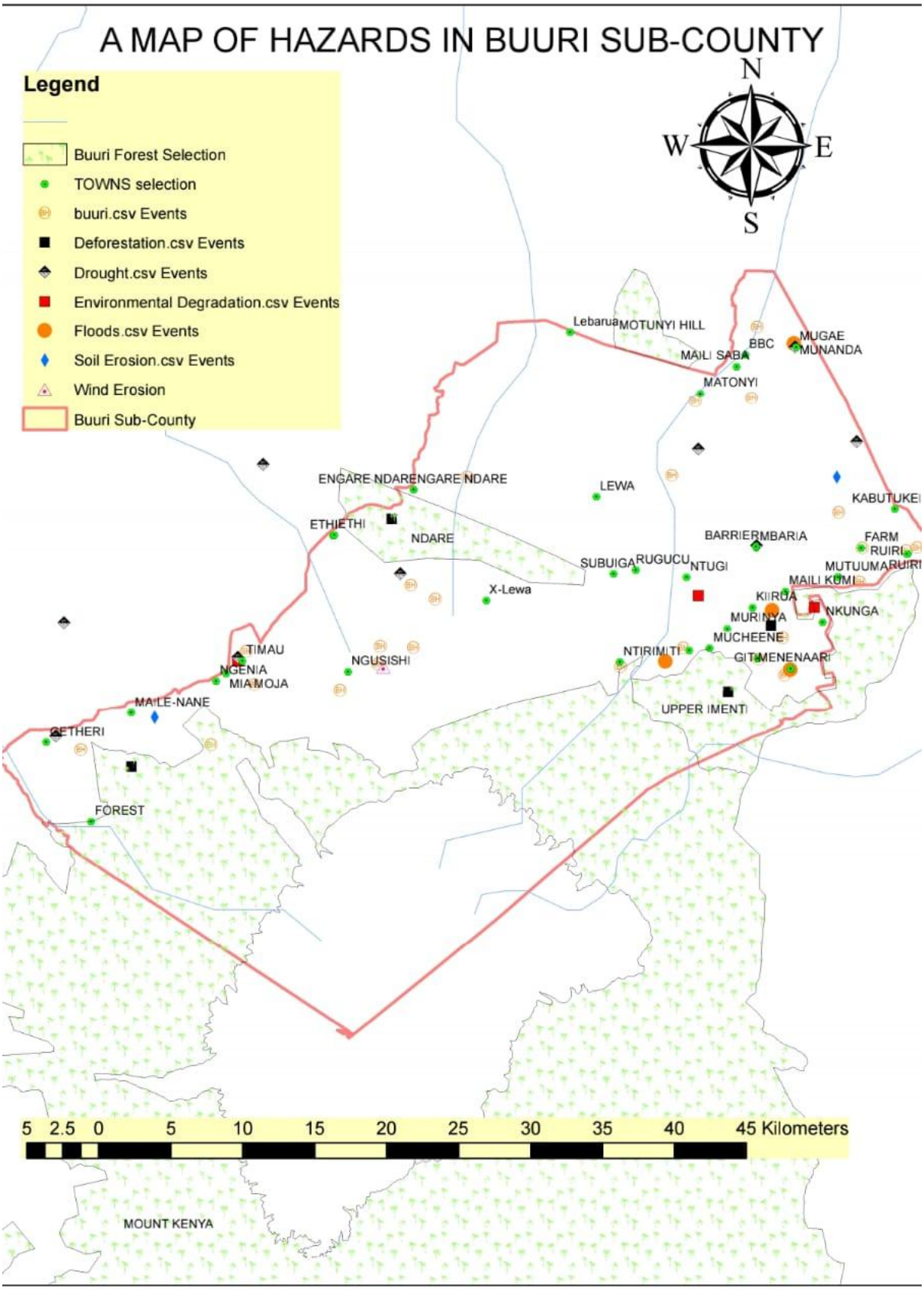
Reduced quantities of water in rivers, streams, springs, Swamps and boreholes affects women more because women bear the responsibility of fetching water for domestic use. As water in the springs and rivers declines during prolonged dry periods, women take more time on queues at water points.

The elderly and Persons with Disabilities (PWD) were found to be more vulnerable to impact of climate change while competing for the community endowed resources in the periods of reduced yields.

2.5 Spatial Distribution of Risks

Largely, the county's located on the eastern slopes of Mt Kenya and the equator thereby influencing its natural conditions. The county's altitude ranges from 300m to 5,199m above sea level. This has influenced the atmospheric conditions leading to a wide variety of micro-climates and Agro-ecological zones. The drainage pattern in the county is characterized by rivers and streams originating from catchment areas such as Mt. Kenya and Nyambene ranges in the North of the county.

To document the spatial distribution of risks in the County and provide a searchable resource, GIS-based maps for each of the 9 sub-counties were developed. The maps shall continuously be updated to reflect the changes that shall occur in future due to resilience investments or further occurrence of climate hazards and risks.


A MAP OF HAZARDS IN BUURI SUB-COUNTY
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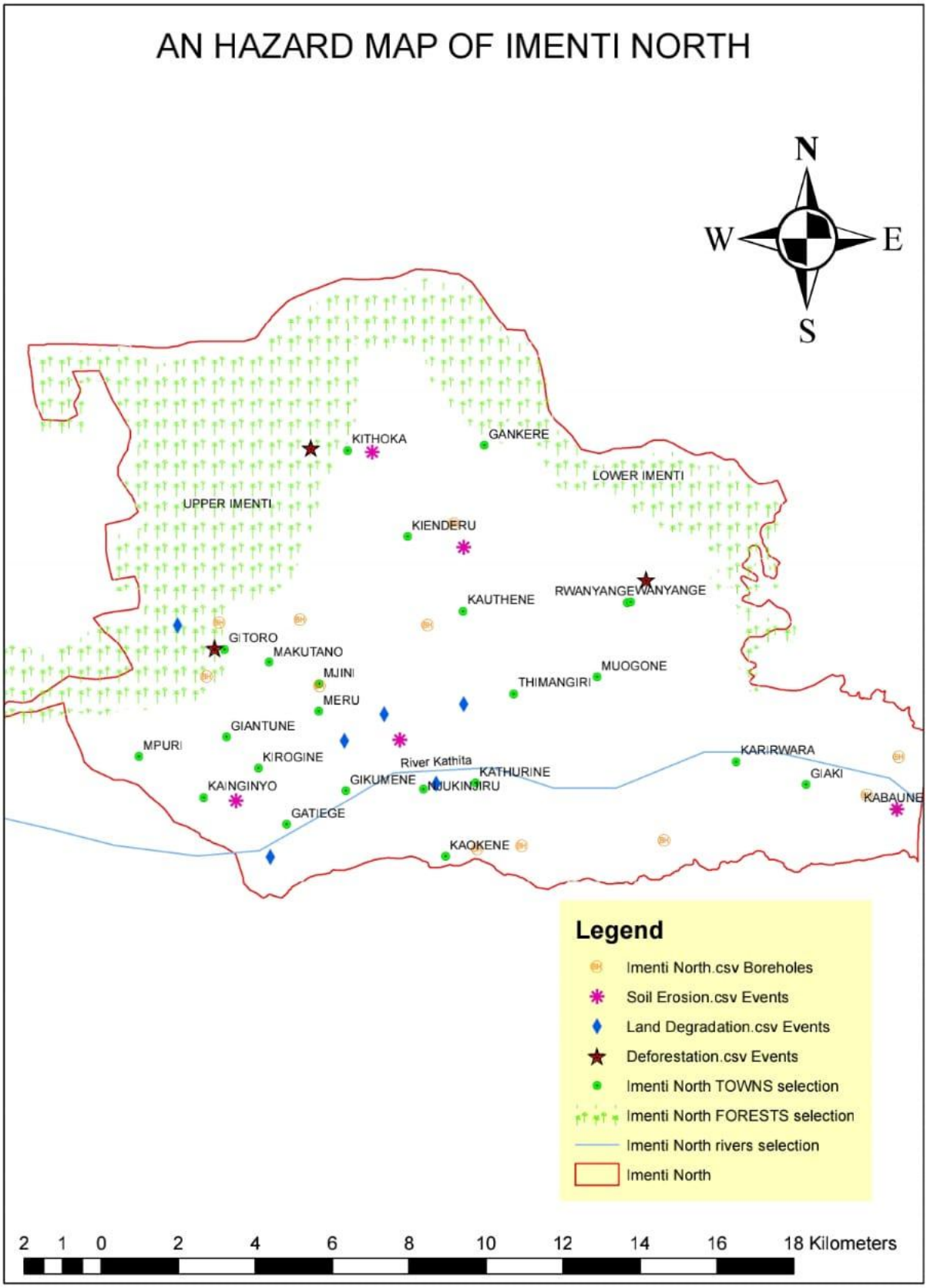
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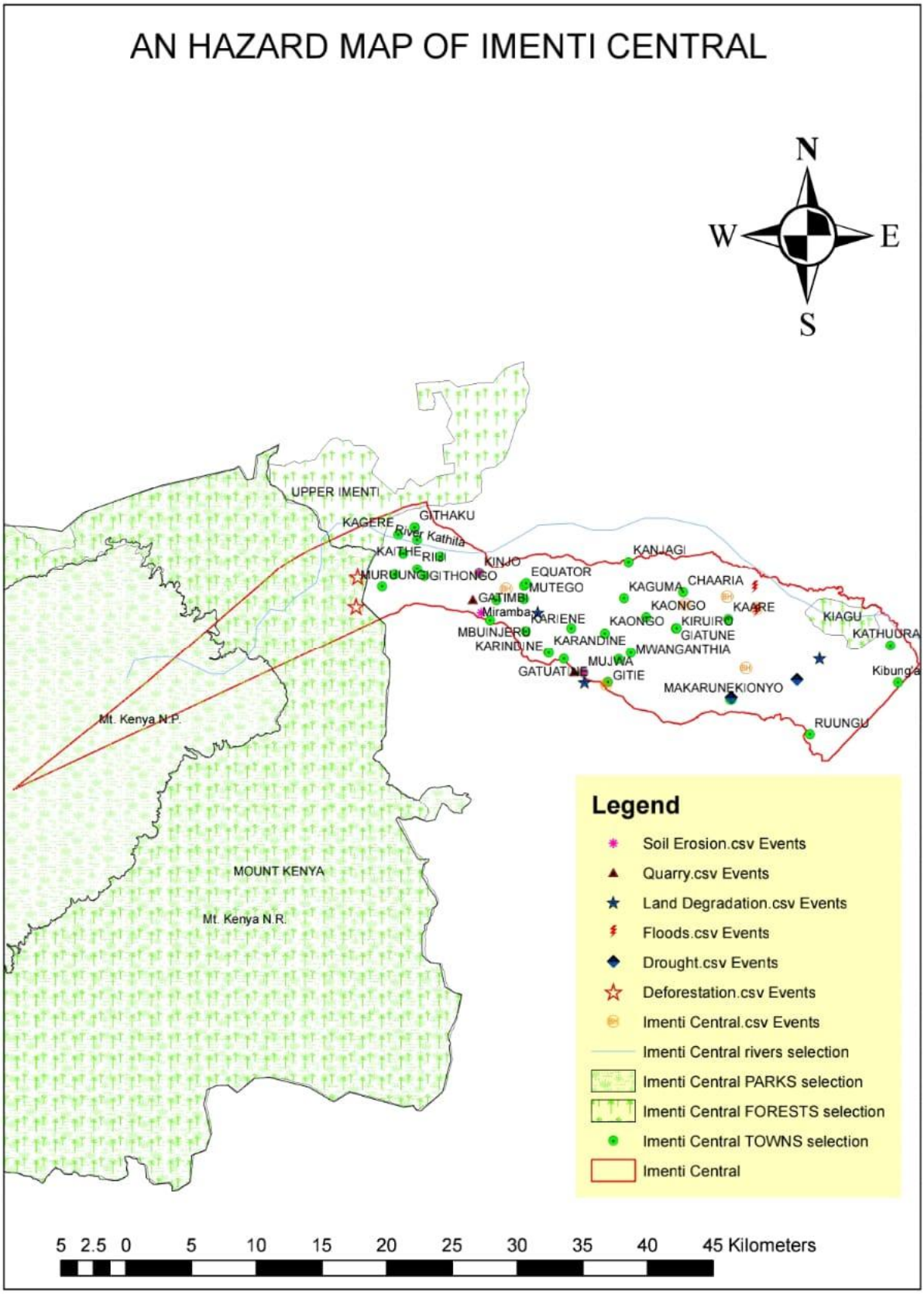
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GATIMBI
Miramba
KARIENE
KAONGO
KIRUIRO
GIATUNE
MBUINJERU
KARANDINE
MWANGANTHIA
KARINDINE
MUJWA
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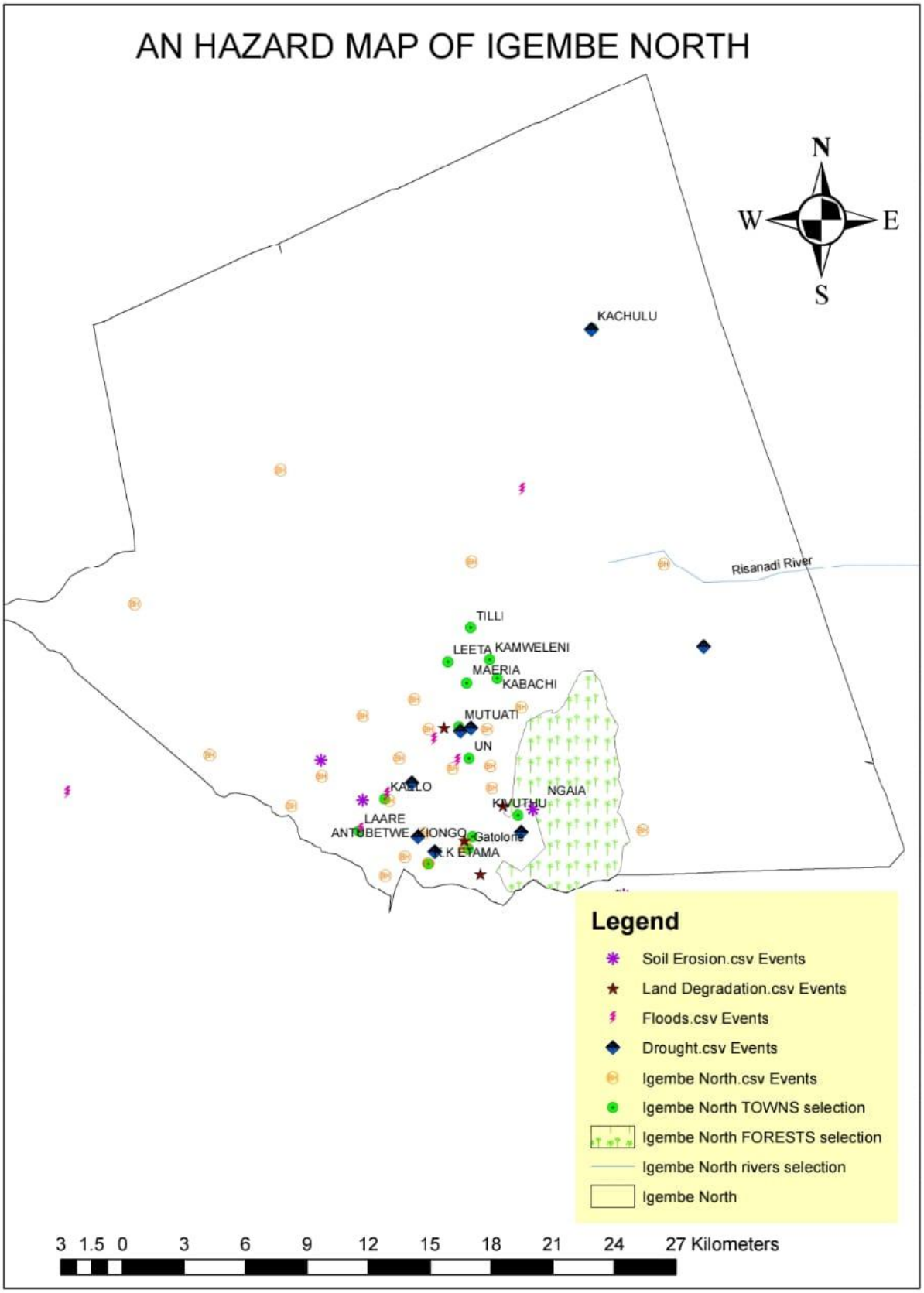
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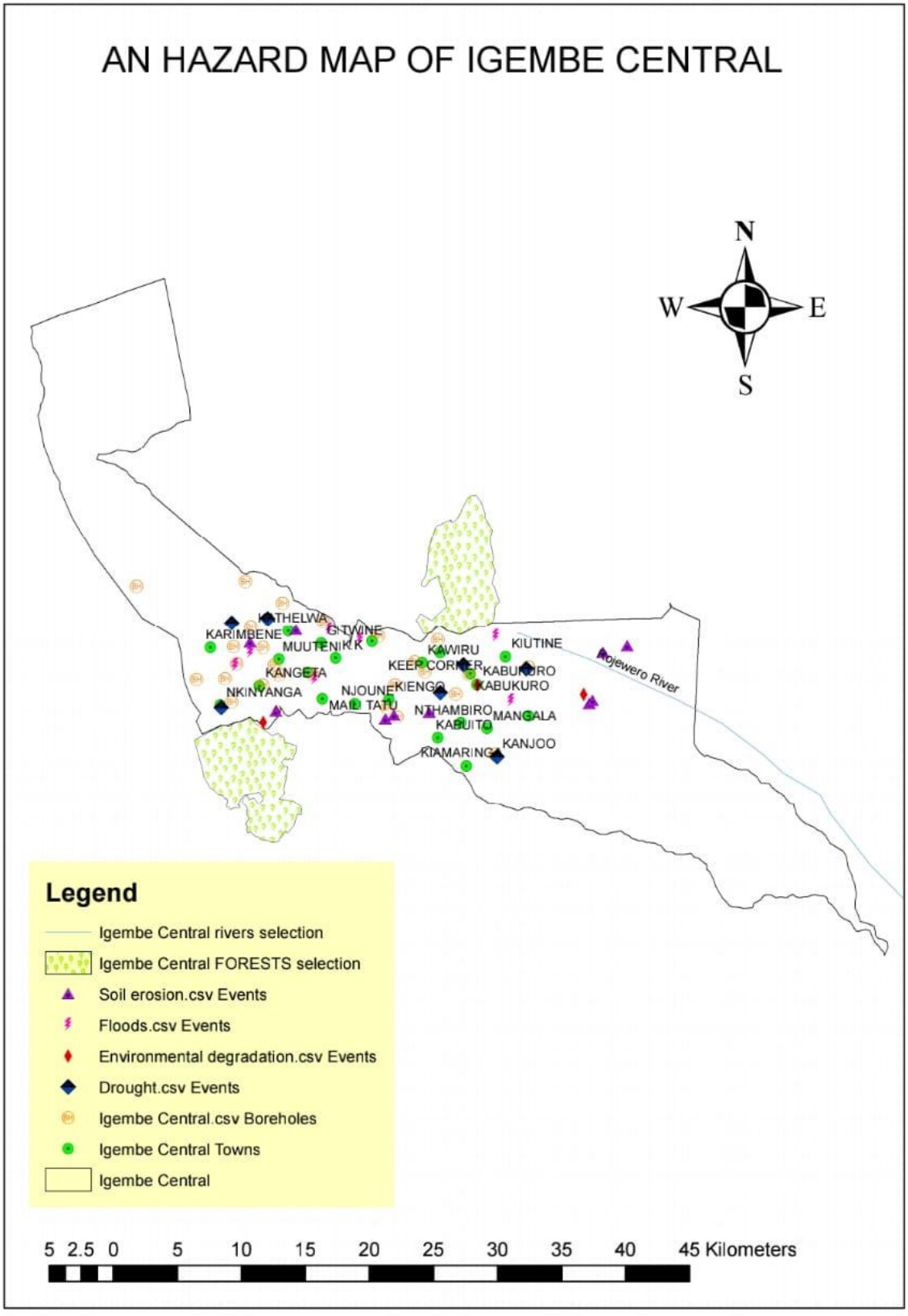
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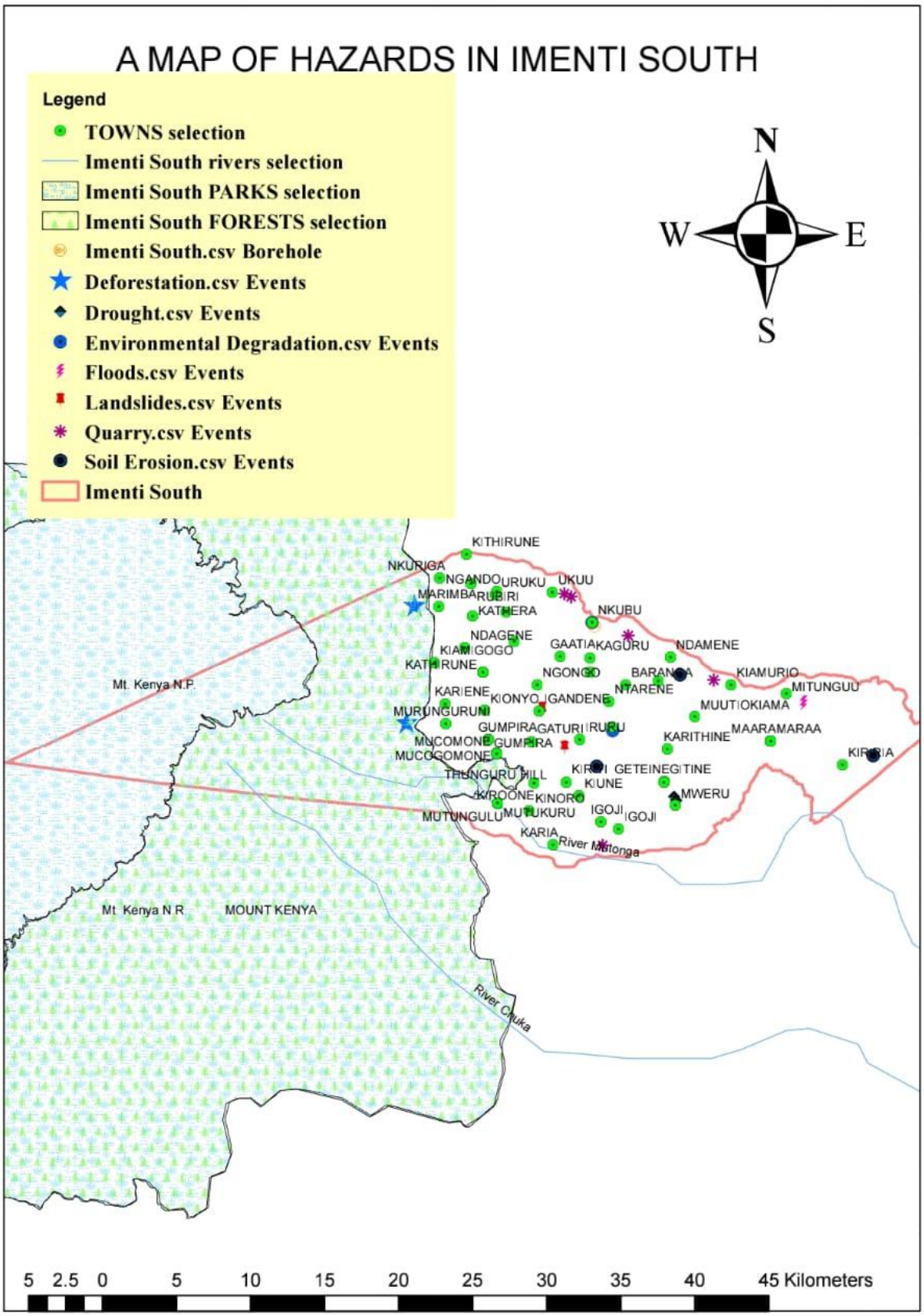
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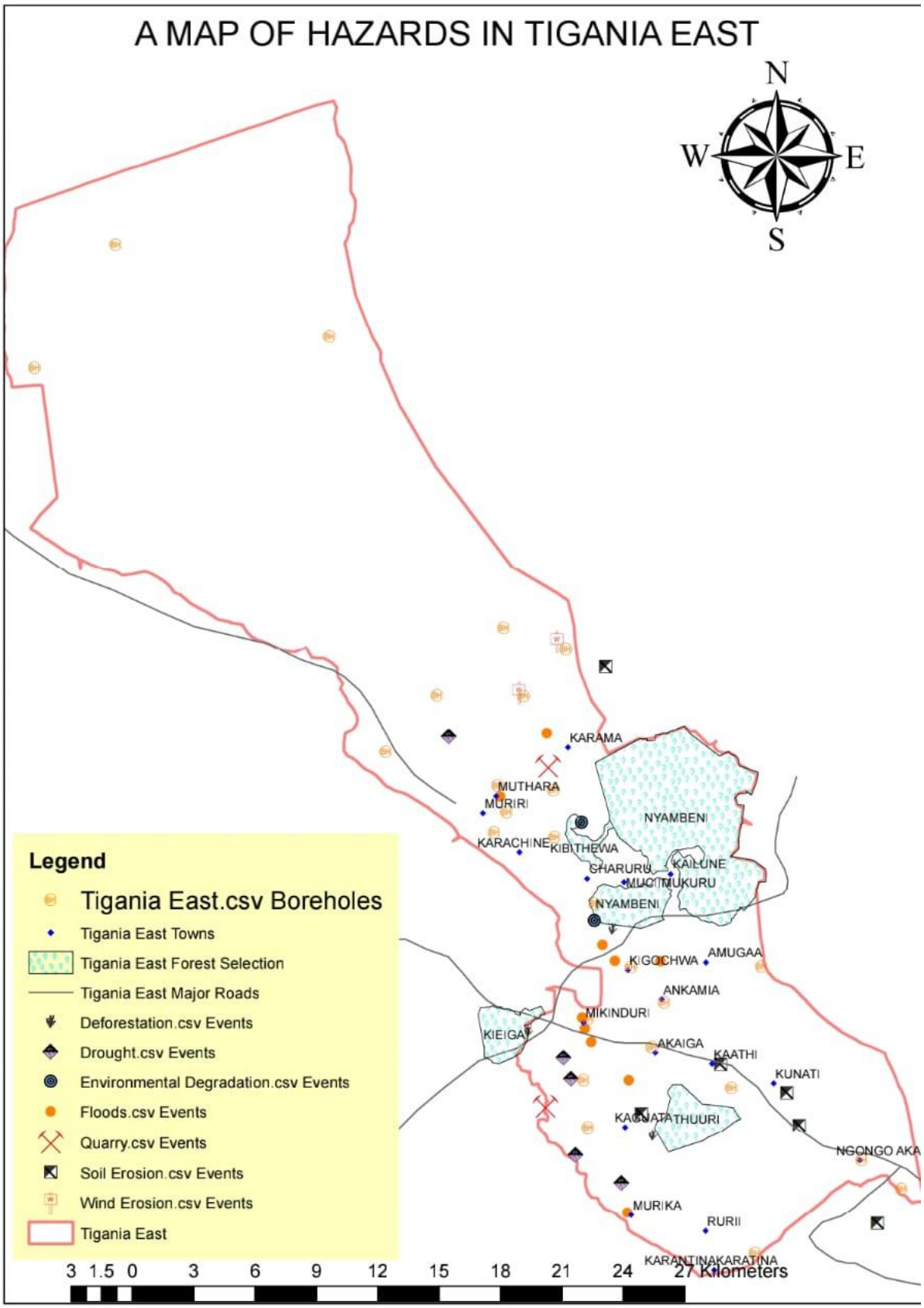
A MAP OF HAZARDS IN TIGANIA EAST
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AMUGAA
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MIKINDURI
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Drought.csv Events
Environmental Degradation.csv Events
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Wind Erosion.csv Events
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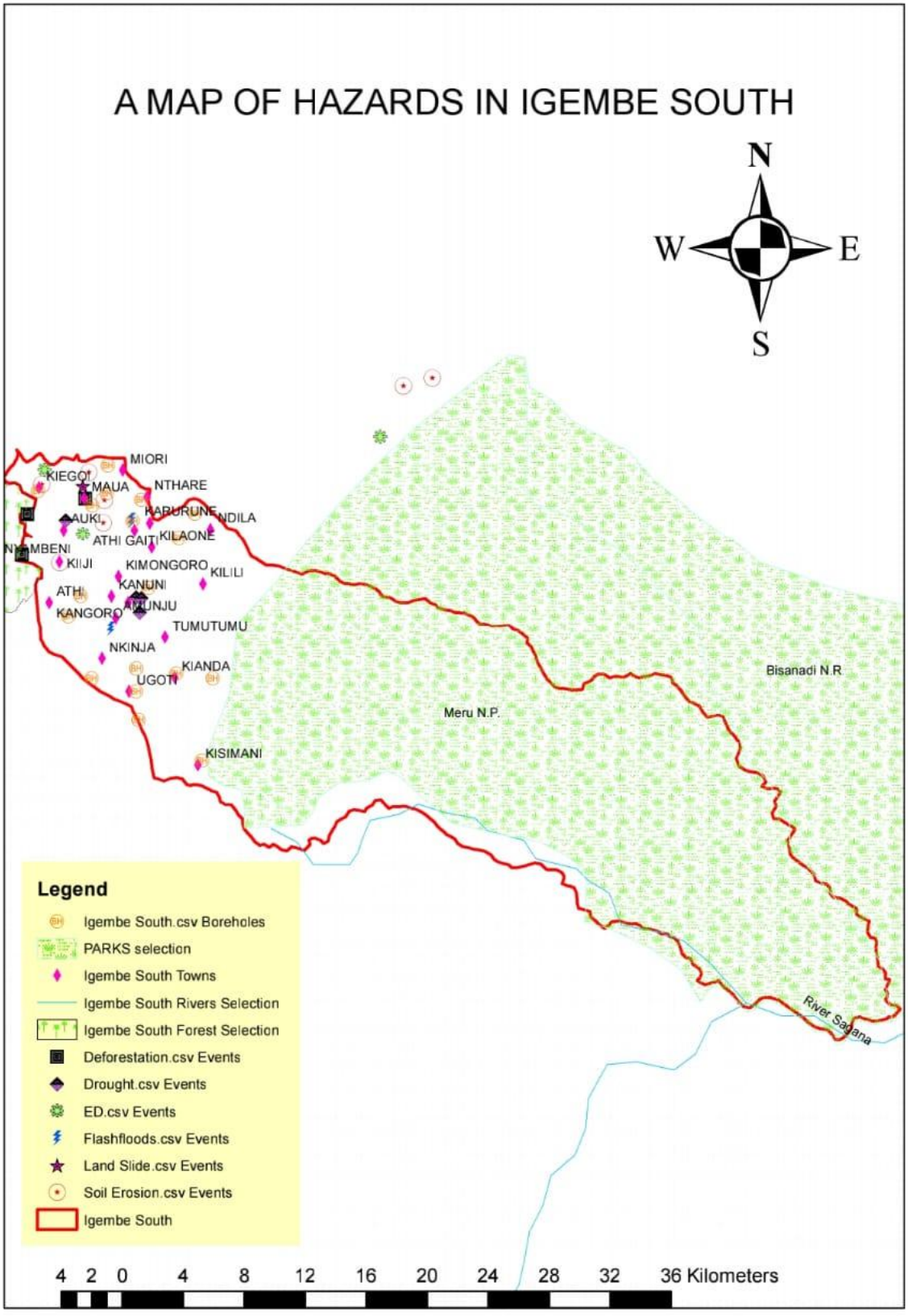
3 1.5 0 3 6 9 12 15 18 21 24 27 Kilometers


A MAP OF HAZARDS IN IGEMBE SOUTH
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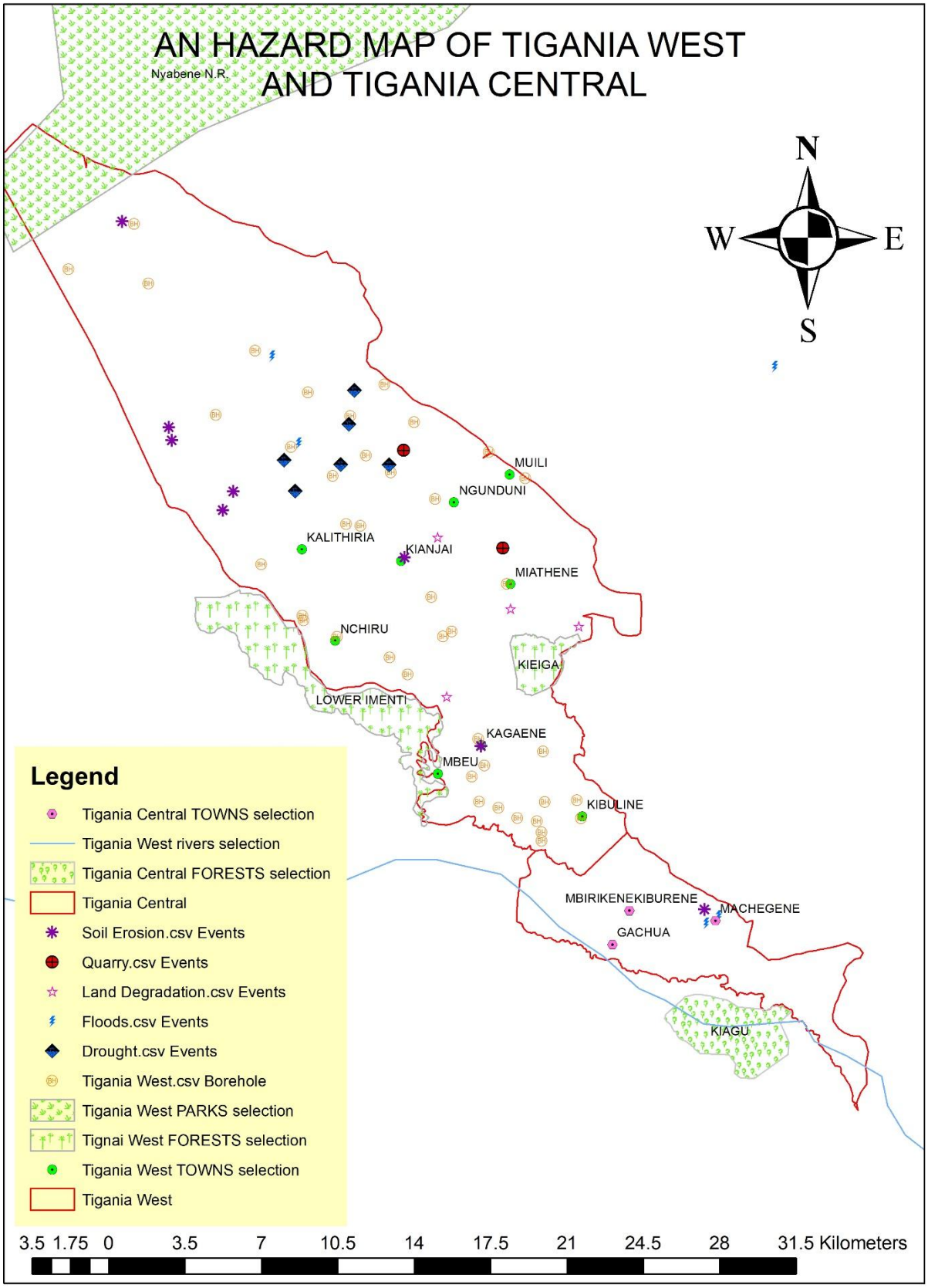
KIEGOI
MAUA
NTHARE
KARURUNE
NDILA
AUKI
ATHI GAITI
KILAONE
NYAMBENI
KIJI
KIMONGORO
KILILI
KANUNI
ATHI
KANGORO
AMUNJU
TUMUTUMU
NKINJA
KIANDA
UGOTI
KISIMANI
Meru N.P.
Bisanadi N.R
River Sadana
Legend
Igembe South.csv Boreholes
PARKS selection
Igembe South Towns
Igembe South Rivers Selection
Igembe South Forest Selection
Deforestation.csv Events
Drought.csv Events
ED.csv Events
Flashfloods.csv Events
Land Slide.csv Events
Soil Erosion.csv Events
Igembe South
4 2 0 4 8 12 16 20 24 28 32 36 Kilometers


AN HAZARD MAP OF TIGANIA WEST AND TIGANIA CENTRAL
Nyabene N.R.
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KALITHIRIA
KIANJAI
MIATHENE
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KAGAENE
MBEU
KIBULINE
MBIRIKENEKIBURENE
MACHEGENE
GACHUA
KIAGU
Legend
Tigania Central TOWNS selection
Tigania West rivers selection
Tigania Central FORESTS selection
Tigania Central
Soil Erosion.csv Events
Quarry.csv Events
Land Degradation.csv Events
Floods.csv Events
Drought.csv Events
Tigania West.csv Borehole
Tigania West PARKS selection
Tignai West FORESTS selection
Tigania West TOWNS selection
Tigania West
3.5 1.75 0 3.5 7 10.5 14 17.5 21 24.5 28 31.5 Kilometers

The rivers in the county cut through the hilly terrain on the upper zones to the lower zones and drain into the Tana and Ewaso Nyiro River basins. This presents in varied ecological zones ranging from upper highlands, lower highlands, upper midlands and lower midlands. This has greatly influenced the major economic activities. The upper highlands zones cover majority of the county's area ranging from Imenti South, Imenti Central, Imenti North, Part of Tigania East, Part of Tigania West, Igembe Central and Igembe South constituencies. The lower midland zones are only found in lower parts of Buuri, Igembe North and Tigania East and West which borders Laikipia and Isiolo Counties.

Soil erosion, prolonged dry spells, deforestation and flooding was evidenced as rampant across all the sub counties more specifically in the ASAL area of Buuri and Nyambene sub counties which leads to reduced agricultural productivity, destruction of infrastructure such roads and buildings, increase cost of farming, siltation of water sources such as streams, swamps and water pans. Heavy rains lead to flooding in low lying riverine areas and growing of eucalyptus trees in water catchment areas have compounded the challenge of water shortage.

Meru County Climate Hazards and risks profile

SNO	Hazard	Risk(s)	Affected Wards
1.	Drought	Drying of rivers, swamps and wetlands	Igoji West, Igoji East, Aboget West, Abogeta East, Nkuene, Mitunguu, Abothuguchi West, Abothuguchi Central, Mwanganthia, Kiagu, Ntima West, Ntima East, Municipality, Naki West, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Kibirichia, Kisima, Timau, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Kiguchwa, Mikinduri, Thangatha, Kangeta, Njia, Akirangondu, Athiru Ruujine, Igembe East, Ntunene, Naathu, A/Kingo, Antuambui, Amwathi, Maua, Athiru Gaiti, Kiegoi/Antubochiu, Kanuni, Akachiu
		Reduced quality and quantity of drinking water	Igoji West, Igoji East, Aboget West, Abogeta East, Nkuene, Mitunguu, Abothuguchi West, Abothuguchi Central, Mwanganthia, Kiagu, Ntima West, Ntima East, Municipality, Naki West, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Kibirichia, Kisima, Timau, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Kiguchwa, Mikinduri, Thangatha, Kangeta, Njia, Akirangondu, Athiru Ruujine, Igembe East, Ntunene, Naathu, A/Kingo, Antuambui, Amwathi, Maua, Athiru Gaiti, Kiegoi/Antubochiu, Kanuni, Akachiu
		Reduced/diminishing water for irrigation	Igoji West, Igoji East, Aboget West, Abogeta East, Nkuene, Mitunguu, Abothuguchi West, Abothuguchi Central, Mwanganthia, Kiagu, Ntima West, Ntima East, Municipality, Naki West, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Kibirichia, Kisima, Timau, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Kiguchwa, Mikinduri, Thangatha, Kangeta, Njia, Akirangondu, Athiru Ruujine, Igembe East, Ntunene, Naathu, A/Kingo, Antuambui, Amwathi, Maua, Athiru Gaiti, Kiegoi/Antubochiu, Kanuni, Akachiu
		Reduced/diminishing water for livestock	Igoji West, Igoji East, Aboget West, Abogeta East, Nkuene, Mitunguu, Abothuguchi West, Abothuguchi Central, Mwanganthia, Kiagu, Ntima West, Ntima East, Municipality, Naki West, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Kibirichia, Kisima, Timau, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Kiguchwa, Mikinduri, Thangatha, Kangeta, Njia, Akirangondu, Athiru Ruujine, Igembe East, Ntunene, Naathu, A/Kingo, Antuambui, Amwathi, Maua, Athiru Gaiti, Kiegoi/Antubochiu, Kanuni, Akachiu
		Total crop failure/low/reduced crop yields/food and nutrition insecurity	Igoji West, Igoji East, Aboget West, Abogeta East, Nkuene, Mitunguu, Abothuguchi West, Abothuguchi Central, Mwanganthia, Kiagu, Ntima West, Ntima East, Municipality, Naki West, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Kibirichia, Kisima, Timau, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Kiguchwa, Mikinduri, Thangatha, Kangeta, Njia, Akirangondu, Athiru Ruujine, Igembe East,

			Ntunene, Naathu, A/Kingo, Antuambui, Amwathi, Maua, Athiru Gaiti, Kiegoi/Antubochiu, Kanuni, Akachiu
		Human-wildlife conflict	Igoji West, Igoji East, Aboget West, Abogeta East, Nkuene, Abothuguchi West, Ntima West, Nyaki West, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Kibirichia, Timau, Nkomo,Akithi, Athwana, Kianjai, Muthara, Karama, Akirangondu, Athiru Ruujine, Igembe East, Amwathi, Athiru Gaiti, Kiegoi/Antubochiu
		Inter-county resource conflicts	Igoji East, Abogeta East, Mitunguu, Mwanganthia, Kiagu, Ntima East, Nyaki East, Ruiri/Rwarera,Timau, Mbeu, Akithi, Athwana, Kianjai, Muthara,Thangatha, Njia, Amwathi, Kanuni, Akachiu
		Dimishining/decimation of mt. Kenya glaciers	Igoji West, Igoji East, Aboget West, Abogeta East, Nkuene, Mitunguu, Abothuguchi West, Abothuguchi Central, Mwanganthia, Kiagu, Ntima West, Ntima East, Municipality, Naki West, Nyaki East,
2	Floods	Land/ soil degradation	Igoji East, Abogeta East, Mitunguu, Kiagu, Ntima East, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Thangatha, Akirangondu, Igembe East, Ntunene, Maua, Athiru Gaiti, Kanuni, Akachiu
		Threat to life and human settlements	Igoji East, Abogeta East, Mitunguu, Kiagu, Ntima East, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Thangatha, Akirangondu, Igembe East, Ntunene, Maua, Athiru Gaiti, Kanuni, Akachiu
		Destruction of public infrastructure	Igoji East, Abogeta East, Mitunguu, Kiagu, Ntima East, Nyaki East, Kiirua/Naari, Ruiri/Rwarera, Nkomo, Mbeu, Akithi, Athwana, Kianjai, Muthara, Karama, Thangatha, Akirangondu, Igembe East, Ntunene, Maua, Athiru Gaiti, Kanuni, Akachiu
3	Landslides/ mudslides	Land and soil degradation	Igoji West, Aboget West, Abothuguchi West, Kiguchwa, Mikinduri, Thangatha,Kiegoi/Antubochiu, Akachiu
		Threat to life and human settlements	Igoji West, Aboget West, Abothuguchi West, Kiguchwa, Mikinduri, Thangatha,Kiegoi/Antubochiu, Akachiu
		Destruction of public infrastructure	Igoji West, Aboget West, Abothuguchi West, Kiguchwa, Mikinduri, Thangatha,Kiegoi/Antubochiu, Akachiu
4	Whirlwinds	Destruction of public infrastructure	Ruiri/Rwarera, Akithi, Athwana, Muthara, Karama,
		Land and soil degradation	Ruiri/Rwarera, Akithi, Athwana, Muthara, Karama,

CHAPTER THREE
FUTURE CLIMATE SCENARIOS FOR THE COUTNY

Evidence of Climate Change in Meru County

Meru County economy just like the rest of the country is highly dependent on the natural resource base, and thus is highly vulnerable to climate variability and change. Rising temperatures and erratic rainfall patterns, resulting in increased frequency and intensity droughts and flooding, threaten the sustainability of the County's development and livelihoods. Climate change adversely impacts key sectors that are important to the economy and society: Environment, Water and Forestry; Agriculture, Livestock and Fisheries; Trade; Extractive industries; Energy; Physical Infrastructure; Tourism; and Health.

The country's drought cycles have been reduced from 20 years (1964-1984), to 12 years (1984-1996), to two years (2004-2006), to a yearly occurrence of drought recorded in the period between 2007 and 2012 (Republic of Kenya, 2016).

In 2019, almost all permanent rivers in Meru County experienced extremely reduced water levels and/or dried up. This caused insurmountable loses to the county residents and resulted to intra and inter-county conflicts over the needed resource. In a response to the County Government of Meru held a Water Dialogue forum themed "towards practical solutions to environmental and water crises" in October 2019.

3.0 Future Climate Scenarios for the County

Large-scale or global climate models (GCMs) are currently used to advance the scientific knowledge and understanding variabilities and changes in large-scale climate variables. Information obtained from GCMs supports a better understanding of the climate at a global scale. In contrast to natural availability, anthropogenic emissions of greenhouse gases and resulting changes in atmospheric concentration such as CO2, methane together in the land surface and aerosol impose different forcing on the climate systems. The search for climate change signals tries to separate their effect from the natural background variability. That signal can show as changes in the magnitude of the variability as well as through a systematic trend overtime.

An assessment of the future projections of extreme weather events such as temperature and precipitation for Meru County in the next 30years paints a grim picture of failed rainfall to prolonged droughts. This scenario shall put pressure to the ever-reducing water levels, land and vegetation in the county. The possible emergent results shall be more extreme soil and land degradation, loss of bio-diversty, emergence of invasive species among other hazards.

3.0.1 Likely impacts

The projected erratic and diminishing rainfall especially for the short rains season will most likely lead to increased land and soil degradation, diminishing water levels, more floods in the low-lying areas, and sedimentation, pollution in water bodies, emergent of pest and diseases outbreaks and human wildlife conflict. The exposure and vulnerability of climate scenarios vary between various community segments as listed below;

i. Farmers

Households that rely mostly on subsistence farming are likely to be more affected by the projected climatic conditions such as erratic and extreme rainfall which will negatively affect crops in the farms and timing of

farming activities. Farmers on steep slopes will suffer more due to increased soil infertility as a result of soil erosion exacerbated by heavy rains and land use changes caused by human activities. A more serious presenting problem will be diminishing water levels, increased incidence of new pests and diseases as a result of increase disease vectors such as mosquitoes for malaria due to imbalances in the ecosystems and human wildlife conflict issues in rangeland and adjacent communities bordering the forested areas.

ii. Livestock keepers

Increased temperatures and diminishing rainfall exacerbate drought which in turn may lead to reduced reproduction, growth rate and production returns. Livestock farmers are likely to suffer more reduced productivity due to seasonal reduction in fodder and water for livestock during dry seasons.

iii. Vulnerable and marginalized groups

Lands access rights in Meru limits women's capacity to invest in land and agricultural enterprises due to their gender roles, such as responsibility for fetching water for households. Immune compromised and old age section o the population has limited ability to cope with climatic hazards and their impacts. Similarly, children are more likely to suffer more due to high incidences of heat stress and vector borne diseases such as malaria and water-based diseases such as amoebiasis, cholera and other diarrheal diseases due to their weak immune system. The people living with disabilities are likely to be adversely affected by climatical hazards due to competition for available dwindling resources such as water scarce scenarios.

Iii. Small scale Enterprises

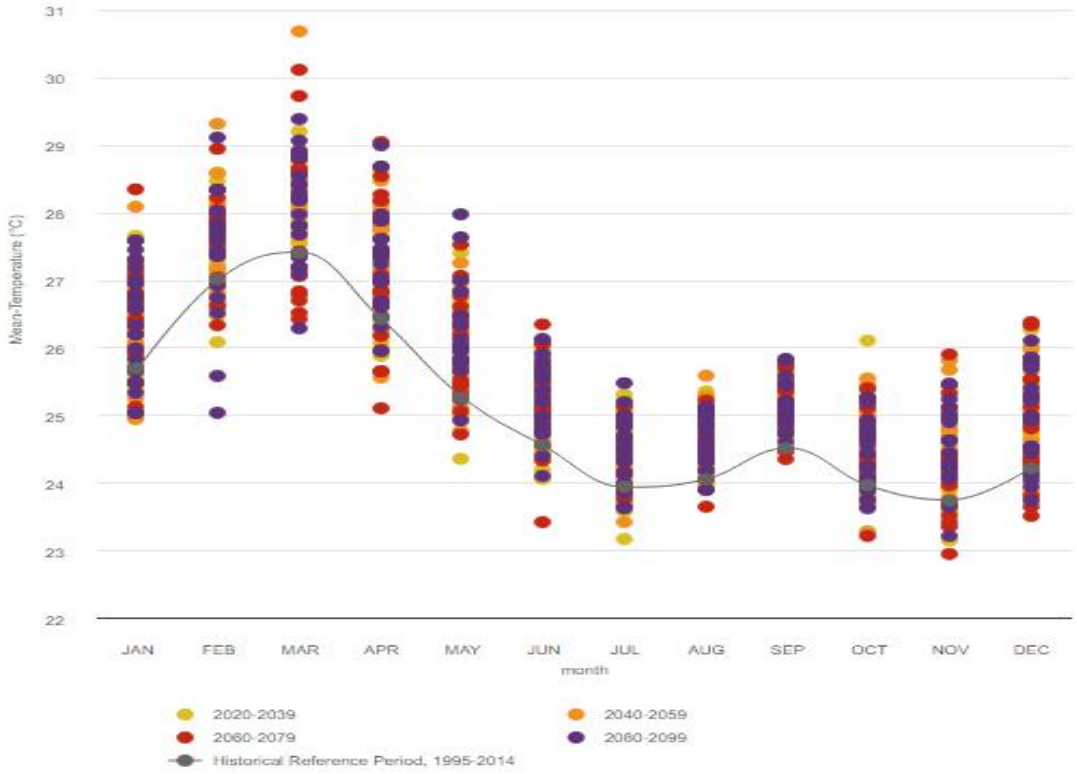
Seasonal variability in supplies of agricultural produce affects market price of agricultural produce. Infrastructure destruction during heavy rains affects transportation of goods in areas with poorly maintained roads.

3.1 National and Downscale Climate Change Projections

The National climate projections indicate that there will be a 1.7°C increase in average temperatures by 2050 and 3.5°C by the end of the 21st century (CIAT 2021). The number of hot days and hot nights will increase by 2050 and consequently reducing the number of cold days and nights. Rainfall is expected to increase slightly by 2050, especially for the 'short rains' which occur between October, November and December. Precipitation remain highly variable and uncertain with extreme rainfall events likely to increase in frequency, duration and intensity. The period between heavy rainfall events is likely to increase as well as the proportion of rainfall that occurs in extreme rainfall events.

Kenya's projected climate data is available as either the projected mean or anomaly (change) and is presented spatially, as a seasonal cycle, time series, or heat plot, which shows seasonal change over long-term time horizons.

Figure 8: heat plot comparison of historical and future time trend for Temperatures



Source: climate Change Knowledge portal, 2021

3.2 Future climate Scenarios

Rainfall distribution

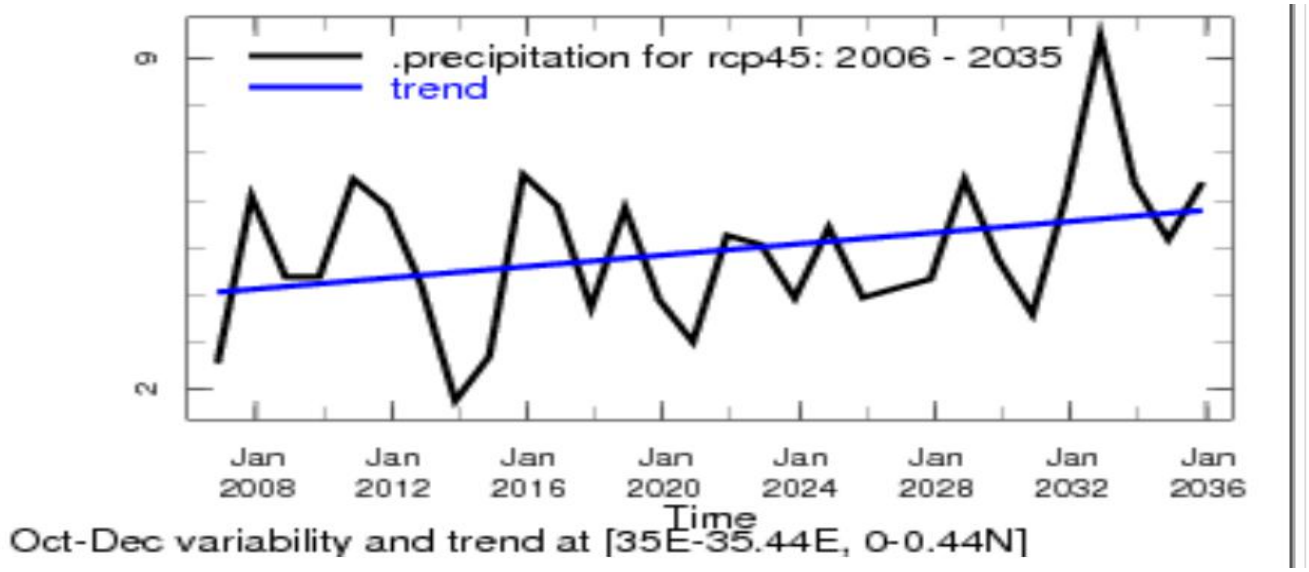


Figure 9: Projected time trend for OND distribution of rainfall in time from 2007 – 2036

OND distribution projections – from 2007 to 2036, the years of 2014, 2017, 2021, 2024-2028, 2031 and 2035 rainfall for OND it was below or is expected to fail/below normal.

b) Temperatures

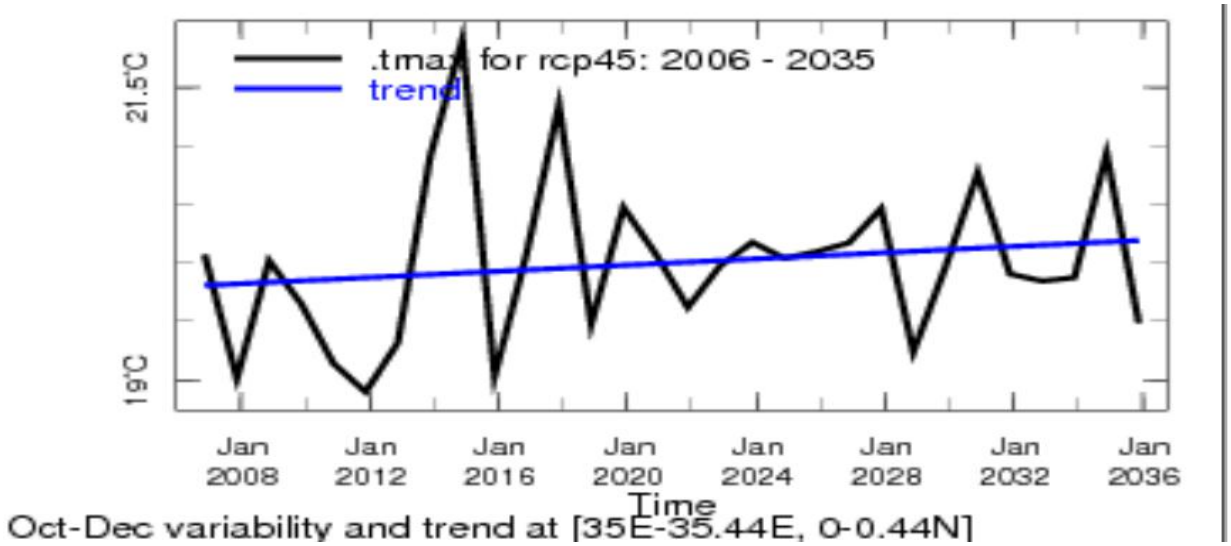


Figure 7: Projected time trend for Temperatures from 2007 – 2036

The above time series analyses temperature fluctuation in time from 2006-2035. It shows that year 2008-2012, -2016, 2019, 2022, 2029 and 2032-2034 the temperature was or will be belo20^{0}C.

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

Various stakeholders in the two levels of government, Civil Society organizations (CSOs), non-Governmental organization (NGOs), Faith based Organizations (FBOs) and communities have been implementing various actions to deal with the impacts of climate change. Strategies such as establishment and strengthening of climate change governance structures at county and community levels, capacity building and awareness raising, putting in place a legislative framework and implementation of climate change resilience investments in various wards, aimed at supporting livelihood improvement. Majority of the community driven investment includes crop farming, livestock keeping, trade and cash crop farming like miraa, coffee, tea and macadamia among others.

The main climatic hazards experienced in Meru County includes erratic and diminishing rainfall leading to shifts in agricultural calendars, which leads to drying of crops and shortage of fodder for livestock. On the other hand increased episodes of intense rainfall results into floods, landslides and environmental degradation resulting to water pollution and their associated impacts.

4.2 Effectiveness of adaptation/resilience strategies to future climate risks in the County

The section below presents the climate related hazards with affected livelihood system, ranked adaptation strategies and the community segment applying the strategy as well as the gender consideration in the strategy in the county. The ranking was done considering the cost of the strategy, usage rate, and its operation effectiveness. This was done from community consultation at the ward level; county multi-stakeholder climate risk assessment and further review and input by technical team at the county level.

Table 2: Tabulation of hazards and existing adaptation strategies

S/no	Hazards	Livelihood/ Economic systems	Climate Resilience strategies	stakeholder group applying the strategy	Gender and social inclusion Information
1	Drought	farming livestock keeping Apiculture Traders Health	• Water harvesting and storage at household, community and institution level as well and on farms through water and soil conservation structures • Conservation of water catchment areas • Reforestation and afforestation of degraded lands	Community members County and National government CBOs FBOs NGOs	Targets both men, youth, women and PLWDs
2	Landslides	Households Farming Infrastructure	• Soil and water conservation structures • Afforestation	Community members County and National government CBOs FBOs NGOs	Targets both men, youth, women and PLWDs
2	Low water volumes (rivers, streams, springs and boreholes)	Farms domestic chores livestock and wildlife trade Health	• Water harvesting and storage at household, community and institution level as well and on farms through water and soil conservation structures • Conservation of water catchment areas. • Reforestation and afforestation of degraded lands	Community members County and National government CBOs FBOs NGOs	Targets both men, youth, women and PLWDs
3	Erratic Rainfall	Farmers livestock keepers infrastructure	• Livelihood diversification • Adoption of innovative farming techniques	Community members County and National government	Targets both men, youth, women and PLWDs

			• Use of appropriate certified seeds • Strengthen early warning systems and access and use of Climate Information Services	CBOs FBOs NGOs	
3	Deforestation and low vegetation cover	farmers livestock and wildlife water quality and quantity	• Reforestation and afforestation of degraded lands • Surveying and gazettement of county hills • Extension services on forestry programs • Promotion of woodlot or farm forestry • Promotion of energy efficiency programs like energy saving jikos	Community members County and National government CBOs FBOs NGOs	Targets both men, youth, women and PLWDs
4	Flooding and Flash floods	farmers trade infrastructure livestock water supply/ availability	• Storm water management stuctures and improvement of urban drainage systems. • Protection of water banks • Construction of water harvesting infrastructure such as pans	Community members County and National government CBOs FBOs NGOs	Targets both men, youth, women and PLWDs
5	Pests, diseases and invasive species	farmers livestock health landscape	• Adoption of disease resistant crop and livestock varieties • Integrated pest management practices	Community members County and National government CBOs FBOs NGOs	Targets both men, youth, women and PLWDs
7	Land	farming	• Sustainable Land	Community members	Targets both men, youth,

	degradation (ballpits, landslides, gulleys among other	trade infrastructure water supply or availability	Management practices (terracing, construction of gabions), • catchment conservation • reforestation and afforestation of degraded lands; and support conservation of communal forest resources • Adoption of Climate Smart Agriculture (CSA) specifically early maturing and drought tolerant crops • Capacity building of the community members on soil erosion conservation mechanisms	County and National government CBOs FBOs NGOs	women and PLWDs
8	Over-abstraction of water resources	Downstream domestic, livestock and wildlife consumers	• water regulation • community sensitization and awareness creation on sustainable water efficiency • construction of common intakes	Community members County and National government	Targets both men, youth, women and PLWDs

CHAPTER FIVE

MERU COUNTY CLIMATE STRATEGIC ADAPTATION INVESTMENT/ACTION PRIORITIES

During Community consultations and multi-stakeholder workshop the major climate risks and hazards identified by stakeholders included erratic and diminishing rainfall, droughts, floods, land, and soil degradation, diminishing water levels, invasive species, Human wildlife conflict and pest and diseases. The climate hazards in the county prioritized at ward level are presented in the view of the current and projected climate outlook. This was followed by identification and prioritization of the response actions for the identified climate risks. The hazards and strategies are summarized in the table below (Detailed ward-based proposed investment areas see Annex I).

Table 3: Summary of Hazards and Priority areas of investment

S/No	Risk /Hazard	Priority Areas of Investment
1	Erratic and Diminishing rainfall	▪ Water harvesting ▪ Construction of water conservation structures such as water pans and dams ▪ Drilling of boreholes ▪ Improve climate information services and early warning systems. ▪ Agro-ecological interventions (Farming techniques) ▪ Afforestation ▪ Awareness creation ▪ Early warning systems
2	Floods	▪ Construction of drainage/storm water structures ▪ Construction of water conservation structures (dams) ▪ Agro-ecological Interventions
3	Land and soil degradation	▪ Promotion of tree growing on farms (farm forestry) ▪ Afforestation and reforestation ▪ Installing of conservation structures (gabions, terraces, grass striping and cover cropping) ▪ Climate smart agriculture ▪ Agro-ecological interventions (farming) ▪ Sustainable waste management ▪ Awareness and sensitization ▪ Law enforcement ▪ Promote high value trees. ▪ Control livestock carrying capacity
4	Diminishing water levels	▪ Protection and rehabilitation of catchment areas ▪ Installation of Water harvesting structures ▪ Adoption of Water efficient technologies (metered water) ▪ Early maturing and drought tolerant varieties and breeds and certified seeds. ▪ Livelihood diversification such as apiculture and aquaculture

		▪ Capacity builds the community on modern farming techniques and gardens practices. ▪ Capacity development in water sector; application of solar energy in water supply and mobilizing resources. ▪ Agro-ecological interventions
5	Invasive species	▪ Chemical/Mechanical removal of invasive species ▪ Rehabilitation of the sites with environmentally friendly species ▪ Surveillance and community involvement ▪ Promotion of indigenous tree species ▪ Research on new species (alien species into the ecosystem) and uses of the same. ▪ Sensitize the community on site-marching of trees.
6	Human wildlife conflict	▪ Provision of wildlife watering point near migratory corridor ▪ Provision of fencing at wildlife hotspots (solar fence) ▪ Afforestation ▪ Introduction of beehives at wildlife hotspots
7	Pest and diseases	▪ Strengthening pest and disease surveillance ▪ Promotion of pest resistant varieties and nature-based solutions to pests and diseases ▪ Vaccination campaigns and extension services (restocking of health facilities with anti- venom) ▪ Universal health care ▪ Integrated pest management ▪ Use of indigenous knowledge on pest and disease control ▪ Research on suitable solution ▪ Agro-ecological interventions
8	Declining tree cover	▪ Promote farm forestry. ▪ Reforesting gazetted forest ▪ Strengthening Conservation local CBOs ▪ Increase extension services. (Environmental and agriculture) ▪ Provision of seedlings ▪ Law enforcement ▪ Reposes wet and forest lands. ▪ Alternative energy, building solutions. ▪ Involve learning institution on conservation. ▪ Develop a reward system for best conservation
9	Industrialization	▪ Adoption of clean energy ▪ Pollution control ▪ Law enforcement (Emissions, EIA)

CHAPTER 6

CONCLUSION

Seasonal changes in rainfall remains the single most important indicator of climatic variability in Meru. Land use changes along the Agro Ecological Zones are consequently explained by various factors with climatic variability being among the most important. Increasing investment in irrigated agriculture and use of drought tolerant varieties is a direct respond to climatic variability. Land use changes were certainly being caused by other factors such as population growth and government policy, whose relative importance calls for further studies.

Development of good roads led to urbanization in upper midland 2, whereas irrigation development drove changes in upper midland 1 and 2; low highland 1 and low midland 3. Land use changes in low midland sub-zone 6 and upper midland sub zone 3 were driven by drought and in addition aggravated by climate variability. Increasing conversion of land to agricultural was associated with decline in forest cover and stream volumes, hence their services to communities. Replacement of some of predominate crops such as coffee and cotton with crops such as bananas are likely to cause significant demand for water use. Mitigation of negative effects of climate variability on land use which focuses on seasonal land use patterns for enhanced land use performance or productivity are imperative.

The agro-ecological differences in rainfall variability and land use changes call for tailored interventions that are agro ecological zone specific. This would require farmers' empowerment and increased inputs access for irrigation and soil fertility improvement. In addition, there is need to put in place policy enforcement and legislation measures for safety and expansion of forest resource

In order to make the adaptation strategies more effective, there is need for improved access and use of climate information; capacity building through strengthened extension services; better coordination between actors for optimal outcomes.

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WARD-BASED PROPOSED RESILIENCE INVESTMENT AREAS

IGOJI SUB-CCOUNTY

IGOJI WEST

Resources	Current status	Gap	Proposed actions	Time frame	Proposed actors
Quarry	-Left open -Steep cliffs -Not fenced -Storm water accumulate during rainy seasons	-Poor enforcement of NEMA laws -Accidents -Breeding sites for mosquitoes	-Fencing of quarries -Back filling of open quarry sites -Tree planting -Proper enforcement of NEMA laws	-Immediate	FLLoCA CGM NGoK NEMA NGOs PACJA
Irrigation water	- Source; rivers and streams -Piped supply -Canal/furrow conveyance -Use sprinklers -No enough water storage facilities	-Water wastage -Canal lining not complete -Insufficient water	-Installation of drip irrigation systems -Completion of canal lining - Rain water harvesting -Water storage tanks -Construction of dams	Long-term	FLLoCA CGM NGoK NGOs
Roads	-Weather roads Impassable due to rills and gullies caused by erosion	-Not motorable -Accidents	-Diversion of floods water to dams	Immediate	CGM FLLoCA NGoK
Forest	-Low tree cover/deforested -Logging by KTDA, Kinoro Tea factory -Exotic trees such as eucalyptus	-Expensive seedlings, both indigenous and fruits trees -	-Afforestation -Replacing eucalyptus tree species with indigenous trees -Practising agroforestry with fruit trees	Medium term	FLLoCA CGM KFS CFA NGoK PACJA
Rivers and streams	-Low volumes -Over abstraction	-Poor enforcement of WARMA laws	-Enforcement of WARMA laws -Replacing eucalyptus trees with	-Long term	FLLoCA CGM

	-Encroachment on riparian areas -Eucalyptus planted along river banks	-	environmental friendly trees such as giant bamboo -		NGoK NEMA NGOs PACJA

IGOJI EAST WARD

Resources	Current status	Gap	Proposed actions	Project	Time frame	Proposed actors
Irrigation water	-uses sprinklers	-wastage of water	-Adopt drip irrigation	-Trees nursery establishment -Roof water catchment	Immediate	CGM FLLOCA NG-Irrigation
Crop diseases	Low yields	-Lack of certified seeds -inadequate water	-climate smart Agriculture -water harvesting	Water harvesting Technologies	Immediate	CGM FLLOCA NGOs
Livestock diseases	Low production	-Un Improved breeds	Alternative enterprises Use of AI	-keeping of Dairy Goats	Mid term	CGM NGOs FLLOCA NG-Donor
Rivers	-Decreased water Volumes	-over Abstraction -poor water laws enforcement by WRUAs	-Empowerment of water police -	Formation of irrigation schemes	Immediate Mid term Long term	CGM FLLOCA NG
Quarry	-Sleep cliffs -land slides -soil erosion	-Prone to accidents -mass wasting	-Regulations enforcement by NEMA	-Refilling -afforestation	Immediate	CGM NG FLLOCA

ABOGETA SUB-CCOUNTY

ABOGETA WEST WARD

Resources	Current situation	GAP	Proposed Actions	Time frame	Proposed Actors
Land	Erosion	Low soil fertility and diminishing crop yields	Soil conservation structures Climate smart agriculture practices	Immediate	CGM, NG
Rivers	Encroachment of the riparian lands	Pollution and degradation of waterways	Law enforcement, Riparian land pegging river line consrvation and tree planting	Immediate	WRUA, Community, CGM, NG
Wetlands	Encroachment	Conservation, rehabilitation and/or restoration of wetlands	Law enforcement, water-friendly tree planting & fencing	Medium-term	CGM, WRUA, community
Hills and valleys	Eroded, denuded	Stopping/Breaking soil erosion and landscape degradation	Bridges, soil and water conservation structures development and tree planting	Medium-term	CGM, Community

ABOGETA EAST WARD

Resource	Current status	Gap	Proposed action	Timeflame	Proposed actors
Dairy	● A number of dairy cooperative societies are active ● Milk production has been increasing overtime	● High cost of feeds, A.I services ● Fluctuating milk prices ● Importation of dairy products from neighboring countries hurting the local market	● Provision of subsidized feeds, A.I. services ● Protection of local markets ● Strengthening of dairy cooperatives ● Enforcement of standards on quality of feeds	Urgent	State dept of livestock Dept. of Agriculture, Kenya Dairy Board, KEBs, FLLoCA
Rivers/springs/wetlands	● Declining water levels ● Seasonal drying reported ● Over abstraction from	● Poor enforcement of water statutes and regulations by WRA and NEMA	● Catchment protection ● Strengthening of WRA/WRUA on law enforcement	Urgent	Dept. of Environment (CGM), MCA, County Assembly, NGAO, water police,

	streams and rivers ● Encroachment into wetlands and catchment areas ● Impacts of Eucalyptus trees in water catchment areas	● Lack of regulations on Eucalyptus trees at the county level	● Replacement of Eucalyptus with water friendly tree species in catchment areas ● Formulation of county regulations prohibiting eucalyptus in catchment areas		WRA/WRUA, Community, FLLoCA
Coffee	● Low production	● High cost of production/inputs ● Low/fluctuating prices ● Low consumption of coffee locally	● Provision of subsidized inputs ● Value addition ● Introduction of pest, diseases and frost resistance coffee varieties ● Marketing campaign targeting local consumption	Urgent	Dept. of Agriculture, AFA, FLLoCA, NARGIP
Forest	● About 2 out of 5 hectares of forest remaining in Kiringa forest (public land) ● Encroachment and deforestation of Kiringa forest	● Presence of KFS within gazette forest of Kiringa lacking	● Establish and equip KFS office within Kiringa forest ● Preparation of Kiringa forest management plan ● Reforestation programme for Kiringa forest ● Promotion of farm forestry within the ward	Urgent	Dept. of environment, KFS, FLLoCA

NKUENE/MTUNGUU SUBCOUNTY

NKUENE WARD

Resource	Current status	Gap	Proposed actions	Timeline	Actors
Boreholes	Not operational	-Motor dysfunctional -Only one borehole in the entire ward	Replace and fit a new motor. Drill more boreholes	Urgent	CGM FLLoCA
Dispensaries & Health centres (Nkubu GK, Mikumbune, Uruku, Ukuu Prison, Kigane, Ukuu)	Functional	Understaffed Inefficient pharmacies No maternity wing No inpatient male & female wards, paedetriatic wards	Employ/deploy additional medical officers Restock pharmacies Construct and equip a maternity wing (Nkubu GK & Ukuu) Construct and equip paeditriatic, male and female wards (Uruku)	Urgent	FLLoCA CGM MoH Community
Wetlands	Degraded	Degraded and dried up Encroached	Reclaim and rehabilitate wetlands in the area Demarcate wetlands Protection of wetlands	Urgent	FLLoCA CGM WRA NEMA
Springs	Low water volume	Over abstraction Pollution Degradation of riparian land	Enforce water use laws and regulations Reclaim and rehabilitate springs Formation of WRUAs	Urgent	FLLoCA CGM WRA Community
Market for agricultural produce	Inefficient	Too many brokers/middlemen Lack of market for farm produce	Search for a market to meet the farm produce in supply Create a direct link between farmers and consumers, in order to establish and stabilize fair market prices	Long- term	CGM MoA ALF

MITUNGUU WARD

Resources	Current situation	GAP	Proposed Actions	Time frame	Proposed Actors
Quarry	- Open pits - Accumulation of	- Not reclaimed - Failing to adhere to	- Reclaiming the land where excavations have been done	Immediate	-Local community - CGM

	water - Breeding of mosquitoes - Social vices (STIs, drug abuse)	the laws and regulations - Lack of sensitization on social vices - Lack of fence	- Sensitizing the community on NEMA laws and regulations as pertains to quarry excavations - Sensitizing the community on social vices - Enforcing the NEMA laws - Provision of fence - Quarry land reclamation		- FLLoCA - NEMA
Swamps/ Wetlands	- Some dried - Some drying - Encroachment	- Lack of enforcement - unprotected swamps and wetlands - Lack of cover crops and trees	- Swamps/wetland protection - Fencing - Enforcement of law to prevent encroachment - Afforestation	Medium term	-Community - CGM - FLLoCA - CBO - FBO
Forest	- Deforestation - Forest fires - Encroachment	- Lack of fence - Lack of enforcement of law	- Afforestation - Enforcement of law - Surveying - Fencing - Forest rehabilitation	Long term	- Community - CFA - KFS - CGM - FLLoCA
Roads	Impassible	- Poor drainage system - Lack of bridges - Not graded - Broken piped water systems	- Road infrastructure improvement - Provide good drainage system - Grading and gravelling - Provision of bridges - Repair the broken community water pipes	Immediate	- Community - CGM - FLLoCA
Boreholes	Incomplete	Lack of resources	- Installation of solar system - Piping - Completion of incomplete boreholes	Medium term	- CGM - FLLoCA
Banana plantations	- Drying up due to insufficient water for irrigation	Lack of water for irrigation	- Up scaling of banana farming industry - Construction of water pans and dams - Afforestation along the rivers and wetlands - Provision of banana processing industry to cater for the banana product and banana waste e,g banana fiber	Immediate	- Community - CGM - FLLoCA

IMENTI CENTRAL SUB-COUNTY

ABOTHUGUCHI WEST

Resources	Current situation	GAP	Proposed Actions	Time frame	Proposed Actors
Rivers/ springs	Drying, siltaion	Encroachment inappropriate tree species, No law enforcement	Law enforcement Fencing springs Riparian/ spring protection	Immediate	WRUA, Community CGM
Forests	Decreasing	Deforestation, No law enforcement	Tree planting, alternative sources of green energy	Medium Term	CGM, community, FLLoCA, CFA
Market	Not demarcated Polluted	No receptacle	Construction of a receptacle Fencing	Medium term	CGM FILOCA NGO
Roads	Impassable	Impassable spots	Spot improvement	Medium term	CGM FILOCA NGO
Crop	Low yield, diseases/pests	Poor husbandry, poor nutrition	Climate smart Agriculture, agriculture extension service	Immediate	Community, CGM
Livestock	Low production	Poor breeds, poor nutrition	Improve breeds, livestock extension service	Medium-term	GOK, NGO

ABOTHUGUCHI CENTRAL WARD

Resource	Current status	Gap	Proposed actions	Time frame	Proposed actors
Kaguma quarry	Deep excavations left exposed	• Mosquito breeding points • Reduced farming activities • Increased poverty rates • Human deaths and insecurity	• Back-filling of the exposed excavations • Rehabilitation of the excavated quarry areas and the surrounding • Diversification	Immediately	Community County Government of Meru National Government NGOs
Rurii swamp	• Silted • Farming done by	Low water capacity encroachment	• Fencing • Desilting	Urgent	County Government of Meru National Government

	community • Pollution		• Afforestation		NGOs
Ngaura Springs	• Silted • Encroached	Low water capacity	• Desilting • Afforestation • Protection •	Urgent	County Government of Meru National Government NGOs
Burema river	Low water volume	Riparian encroachment	• Afforestation • Community river police	Urgent	Community County Government of Meru National Government NGOs
Mariara river	Low water volume	• Riparian encroachment • Quarry deposits •	• Afforestation • Enforcement • Quarry deposit be removed • Afforestation along riparian land	Urgent	Community County Government of Meru National Government NGOs
Hills	Eroded	• Deforestation • Low vegetation cover	Afforestation	Urgent	Community County Government of Meru National Government NGOs
Forest	• Deforested • Land slide	Desertification Soil erosion	• Afforestation • Soil erosion control • Forest law and policies enactment or enforcement	Urgent	Community County Government of Meru National Government NGOs CFAs KTDA Coffee factories

KIAGU WARD

Resource	Current status	Gap	Proposed action	Timeline	Proposed actors
Boreholes	• insufficient • Not functional • incomplete	• Non-solarisation and insecurity • Inadequate Storage tanks and distribution lines	• Provision of Security • Sinking of More boreholes • Solarization of boreholes • Provision of high capacity Storage tank • Construction of distribution lines	immediate	FLLoCA County government DEPT OF Energy NGOK
Swamps/	• Silted	• Inadequate	• Desilting	Mid-term	NGOK

wetlands	● low water volume ● Encroaching to plant crops ● eucalyptus trees planted	knowledge ● Lack of protection	● Construction of check dams ● soil conservation on farms surroundings ● fencing ● Evict people from public land		-FLLOCA Dep. water and env. DOALF Land and adjudication COUNTY GOVERNMENT OF MERU
Hills	Denuded and degraded	Deforestation	● -Tree seed and nurseries ● fencing ● afforestation	Long term	FLLOCA County govt. Dep. Water and env. Land and adjudication
Land	● Eroded ● Low production ● Not demarcated	● Lack of Soil and water conservation ● Non-demarcation	Provision of title deeds Provision of soil and water conservation structures	immediate	FLLOCA County govt of Meru DOALF Ministry of lands
Market	Not constructed No waste disposal system	Lack of aggregation and marketing center for produce	construction of market at Gitiye Shopping center	Mid-term	FLLoCA County govt. DOALF Dep. Water and env. Land and adjudication
Gully	● Not protected/conserved ● Land slides	-erosion -loss of land	● Gulley control structures -gabions ● check dams ● Water pans ● Flood walls ● Tree planting ● Construct foot bridge	immediate	FLLOCA County gov't of Meru DOALF Dep. Water and environment.
Quarry	Dangerous -landslide	● Not protected ● lack of knowledge and equipment	● Fencing ● Capacity building ● refilling the land ● Soil conservation	Long term	FLLoCA County gov't of Meru. DOALF Department of Water and environment. NEEMA Land owners
Livestock	● Low production ● Use of indigenous flock ● Livestock pests	● inadequate knowledge ● low producing breeds	● capacity building of the livestock owners ● provision of high producing breeds ● Veterinary and livestock production officers	immediate	FLLoCA County gov't of Meru. DOALF KARLO

	and diseases	●			
crops	● Low production ● Unused buildings (store)	● Inadequate knowledge ● use of uncertified seeds ● drought ● non land demarcation ● Crop pests and diseases	● Capacity building ● provision of drought tolerant seeds/crops ● Construct Water pans ● Soil conservation ● fertilizer store and other farm inputs near the farmers ● provision title deeds' ● Soil testing ● Irrigation scheme ● agricultural training center	immediate Mid term Long term	KARLO FLLOCA County gov't Meru. DOALF Dep. Water and env. KARLO

MWANGATHIA WARD

Resources	Current situation	GAP	Proposed Actions	Time frame	Proposed Actors
Wetland (swarmps)	● Source of water ● Arrowroot farming	▪ Wetland not delineated ▪ Encroachment ▪ Drying up	▪ wetland protection ▪ delineation ▪ planting indigenous trees ▪	Immediate	Department of Agriculture MENR Interior FFLoCA OOG NEMA
Borehole	Domestic water for schools and dispensary	▪ inadequate water ▪ no piping hence not available to local community	▪ Excavate more boreholes ▪ Provide piping and connections to community	immediate	Department of Water OOG Ministry of Water and Irrigation FFoCA
Markets	Farm produce sales Chaaria Kaongo Mujwa	▪ not fenced ▪ no security ▪ poor planning hence poor accessibility	▪ Provide flood lights ▪ Open up paths ▪ Fence the markets	immediate	Department of Trade HCD OOG Department of Agriculture Market committees Department of Roads
Rivers	Domestic water	● Declining water	▪ Plant Indigenous trees	immediate	WRMA

	supply	volume • Drying up • Contamination by quarry dust/waste • Planting eucalyptus trees along/near river banks	▪ Remove eucalyptus trees ▪ Better management of quarry business		KFS AGRICULTURE Water and Irrigation FFLoCA
Quarries	Major economic activity in the ward	• Deep unprotected pits • Destruction of water pipes • Solid waste disposal on farm land • Destruction of farmland • Overreliance on quarrying	▪ Refilling of pits ▪ Fencing ▪ Land reclamation ▪ Enterprise diversification	immediate	NEMA MENR Depart of Environment and Environment FFLoCA
Forest	Owned by KTDA	• Deforestation	▪ Re-afforestation ▪ Farmer training	Immediate	KTDA KFS
Mango processor	Low capacity, seasonal	• Lack of water at the facility • Covers one section of the ward	▪ Provide water ▪ Consider expansion	Short term	Department of Trade Department of Agriculture FFLoCA
Tvet-polytechnic	Kiamakoro Muthare Njuthine	• Inadequate equipments • Inadequate tutors • Land ownership • Outdated curriculum	▪ Provide equipments and tutors	Short term	MOE Department of Education OOG KICD
Access roads	Earth road Especially Gitune - Maundu	▪ Impassable during rainy season	▪ Upgrade the road ▪ ▪ Murram the road	Short term	Department of trade Roads and public works KeRRA FFLoCA MTF

IMENTI NORTH SUB-COUNTY

MUNICIPALITY WARD

Resource	Current status	Gap	Proposed actions	Time frame	Proposed actors
Imenti Forest	Low tree cover	- Destruction of trees - Human wild life conflict - Illegal fire wood collection	- Plant more trees - Improve the fence - Bio-digester for bio gas - Energy saving technologies	Long term	KFS FLoCCA Community
Springs	- Contaminated by solid & other wastes - Low output	- Unprotected - Bare of vegetation - Encroachment - Pollution	- Protect by fencing - Plant water friendly trees & bamboo - Construct watering points	Immediate	CGM FLoCCA Community WRUA
River Kathita & Kanyuru streams	- Low capacity - Contaminated	- Polluted by solid waste - Unprotected riparian land - Encroachment - Discharge of effluent - Illegal abstraction	- Plant water friendly trees - Use river scouts to monitor river - Strengthen WRUA to oversee abstraction	Immediate	FLoCCA CGM WRA Community
Land	- Inadequate space for farming	- Lack of urban farming technologies	- Urban agriculture - multi storey, green houses, small stocks,	Immediate	FLoCCA CGM Community

NTIMA WEST WARD

Resource	Current Status	GAP	Proposed Action	Time frame	Proposed Actors
Wetlands	Dry	Not protected Encroached	-Fencing -Planting of trees -Putting soil conservation measures	Immediate	FLLOCA CGM CFA CBO WRUA WRMA Community
Forest	deforestation	-Low water volume -Unreliable rainfall	- Afforestation -Establish tree nurseries	Immediate	FLLoCA COG, KFS

		-Prolonged Drought -Soil erosion	-Capacity building - Enforcement of the law		CFA, NGO, FBO WRUA Community
Springs	Low water volume	-Not protected -No storage tanks -No pipes to distribute to households	-To be rehabilitated Install storage tank -construct a common intake -piping to distribute to water to the households Plant trees	Immediate	FLLoCA CGM CFA, NGO,FBO WRUA Community
Bore holes	Salty water	Can not be used for irrigation or domestic use	- Drill another borehole - Test the water quality	Immediate	FLLOCA CGM NGO Department of water
Crops	Low production	-Crop pest diseases -High cost of inputs --Erratic rainfall -Inadequate knowledge on storage technologies	-Capacity building on IPM -Construction of dams -plant drought resistance crops Soil testing -Use of climate smart agriculture -Excavation of earth dam /pan to harvest water for irrigation	Immediate	FLloCA CGM NGO KALRO Community
Livestock	Low production	Livestock diseases Inadequate fodder. Low quality and expensive feeds	Routine vaccinations -Training on fodder establishment, conservation and utilization -Routine vaccinations. -Introduction of high quality fodder eg brachiaria, super Napier	Immediate	FLLOCA CGM ALF KALRO Community
River (kathita)	Low water volume -encroachment of riparian land overabstraction	Lack of law enforcement	-Planting water friendly trees along the river bank - Enforce the law - Empower WRUA	Immediate	FLLCA NEMA WRMA KFS CGM

NTIMA EAST

Resources	Current status	Gap	Proposed action(s)	Time frame	Proposed actors
River Kathita	• Low flows especially during the dry season. • Water siltation due to soil erosion • Water pollution	• River over-abstraction • Many Eucalyptus trees planted along the river banks • Lack of adequate soil and water conservation measures causing silting	• Regulation of water abstraction. • Uprooting the eucalyptus trees. • Planting environmental friendly trees. • Controlling soil erosion.	Immediate	• CGM • FLLOCA • KFS • National government-NEMA • Community • WRA
Springs and wells	• Encroached • Reduced water volumes • land Grabbed	• Not fenced • Eucalyptus trees planted • Not demacarted	• Fencing • Uprooting eucalyptus trees • Planting environmental friendly trees • demarcation and delineation of public land on which the springs lie.	Immediate	• CGM • FLLOCA • NEMA • KFS • Community

Health facilities	• Not well functioning. • Incomplete infrastructure • Unavailability of modern equipments	• Inadequate medicine • inadequate medical personnel • Lack of modern medical equipments.	• Provision of enough medicine • Upgrading of the health centre to a level 4 hospital • Increase the number of health facilities . • Completion of the incomplete infrastructure. • Addition of more personnel	immediate	• CGM • FLLOCA • World Bank • WHO • National Government
Gakoromone Market	• Functional • Congested • Poorly maintained • High rate of environmental pollution	• Limited space. • Local traders are not protected against unfair competition from outside traders. • Lack of proper market planning • Lack of a sustainable solid waste management system	• Expansion of the market • Revision of the plan of the market. • Establishment of a waste management plan at the market • Establishment of a recycling plant at Gakoromone • Relocation of some activities to other areas	Immediate	• CGM • Traders • FLLOCA • NEMA • National Government

Sewage	• Overflowing sewage. • The sewer system is overloaded. • Stinking	• The current system is inadequate for the increasing population.	• Relocation to a more suitable site. • Establishment of another sewage facility in a different area	Medium	• CGM • FLLOCA • National Government • World bank.
Trees	• Rampant defforestation. • Many Eucalyptus trees planted • Fruit trees also planted	• High rate of Deforestation • Lack of fruit tree seedlings • Lack of indigenous tree seedlings.	• Provision of tree seedlings • Awareness creation on environmental legislation. • Enforcement of environmental legislation.	Medium	• CGM • FLLOCA • National Government . • KFS

NYAKI WEST

Resources	Current status	Gap	Proposed action	Time frame	Proposed actors
Boreholes	-nonfuctional -Manual operation	On private land Time comsuming	- Rehabilitation of existing boreholes -to be made accessible by public -Solarnization -Piping of borehole water to the households	immediate	CGM MCA FLLOCA NGOs MP
Springs	Drying	Water scarcity	-Spring protection -afforestation	immediate	CGM FLLOCA MCA community
Livestock	Influx of diseased animals from neighbouring county	Insecurity along northern grazing zone	-Establishment of police post -Increase NPR from locals -fencing of the boundary -mass vaccination programme	immediate	CGM MCA FLLOCA NGOs MP
Roads	-Weather Roads - dilapidated	-Encroachment of Road reserve -inaccessible roads	Soil and water conservation on surrounding hills -spot grading feeder roads -construction of gabions	Mid term	CGM FLLOCA NG-Roads
Crops	-Low yields -crop pests & disease -soil erosion	-poor crop husbandry -lack of certified seeds -high cost of inputs	-Crop diversification -capacity building -input subsidization -soil and water conservation	mid term	CGM NGOs FLLOCA CARITAS NG-donor
Livestock	-Indigenous Breeds -Low production	-Animals kept on free Range -Insecurity	-Improve range condition -Diversification -Use of Bull scheme -formation of conservancy	mid term	CGM NG-Interior FLLOCA

NYAKI EAST WARD

Resources	Current Situation	GAP	Proposed Action	Time Frame	Proposed Actors
Boreholes	-Two are functional (Nthamiri and Mbirikene Pry school) -Four are non functional (Ruriine, Gachua market, Mbirikene Market, Buuta Market) -Inadequate storage tanks -Four are saline (Ruriine, Gachua market, Mbirikene Market, Mbeu Pry sch)	-Inadequate technical backstopping - No solar panels -Low Recharge - Inadequate water storage	-Solarization -Rehabilitation of boreholes -Construction of storage tanks and distribution -Sinking boreholes -Water harvesting	Immediate	Community NGAO MCG Donors
Rivers	-Low water volumes -Illegal obstruction -Cultivation on riparian area -Water pollution	-Lack of enforcement of law and policies - Lack of protection of the riparian	-Enforcement of law and policies -Civic education -Strengthening WRUA -Tree nurseries establishment -Soil and water conservation structures -Tree planting - Water treatment	Immediate	Community KFS NGAO MCG Donors
Forest	-Deforestation -Encroachment	-Lack of enforcement of law and policies - Deforestation	-Enforcement of law and policies -Creation of awareness -Establishment of tree nurseries -Tree planting -Fencing	Midterm	Community CFA KFS NGAO MCG Donors
Hills	-Deforestation -Soil erosion -Encroachment	-Lack of enforcement of law and policies -Lack of -catchment protection	-Enforcement of law and policies -Creation of awareness -Soil and water conservation structures -Establishment of tree nurseries -Tree planting	Midterm	Community NGAO MCG Donors
Swamps	-Encroachment -Environmental unfriendly trees planted -Drying up	-Lack of enforcement of law and policies -Lack of catchment protection	-Enforcement of law and polic0oies -Catchment protection -Creation of awareness -Establishment of tree nurseries Tree planting	Midterm	Community NGAO MCG Donors

			-Fencing		
Springs	-Encroachment -Environmental unfriendly trees planted -Drying up	-Lack of enforcement of law and policies -Lack of catchment protection	-Enforcement of law and policies -Catchment protection -Creation of awareness -Establishment of tree nurseries Tree planting -Fencing	Midterm	Community NGAO MCG Donors
Water Pan	-Incomplete -Mosquitoes breeding site Not fenced	-Inadequate finance - Lack of awareness on water utilization	-Solarization -Construction of tank and distribution -Fencing	Midterm	Community NGAO MCG Donors
Murram sites and Quarries	-Open pits -No back filling -Pollution (Air, Noise and water) -Mosquitoes breeding sites	-Lack of enforcement of law and policies -No back filling -Not fenced	-Enforcement of law and policies -Back filling -Fencing -Control of Mosquitoes	Midterm	Community NGAO MCG Donors

BUURI EAST SUB-COUNTY

KIBIRICHIA WARD

Resources	**Current status**	**Gap**	**Proposed actions**	**Time frame**	**Proposed actors**
Boreholes	Low water table non-functional boreholes In adequate boreholes	Low water output Low access to water Incomplete boreholes	Rehabilitation of existing bore holes Equipping the boreholes Improving aquifer recharge through water pans Line distribution to households & kiosks	Immediate to long term	CGM CARITUS FLLOCA NGOs GoK
Quarry	No fencing Steep cliffs Pollution due to dust	Un regulated quarrying Lack of fencing Land degradation	Refilling of open quarries Tree planting Land Rehabilitation Fencing open quarries	Mid term	CGM FLLOCA NEMA NG-Roads
Forest	Low tree cover Forest fires	Illegal logging Illegal access to forest	Afforestation community sensitization regulated access to forests	Mid term	CGM KFS GoK

		Afforestation Fire wood collection	Empowerment of CFAs Promotion of energy saving technologies Promotion of energy saving technologies		FLLOCA
Roads	Weather Roads	Encroachment of Road reserve landslides and soil erosion Construction of road side farm ponds Road degradation due to erosion	Establish the cut off drains Installation of culverts Provision of roadside farm pods Soil & water conservation	Mid term	CGM FLLOCA NG-Roads
Dam	Low water volumes Siltation Non protected dams In adequate dams	Dam protection and equipping Pollution piping dam liners	De siltation Dredging Fencing Excavation and equipping of dams & water pans	urgent	CGM FLLOCA NGO NG-water
Crops	Low yields High crop pest & diseases Drought	Low soil fertility In adequate drought tolerance crops High crops disease & pest preference	Provision of drought tolerance crop Provision of pest & diseases tolerance Diversification Soil testing Promotion of high value crops Water harvesting & drip irrigation	Urgent to mid term	CGM NGOs FLLOCA CARITAS NG-donor
Livestock	Low production Lack of markets Drought	Indigenous breeds Low prices Provision water	Improved breeds Diversification Water harvesting technologies	Urgent to mid term	CGM NG-Interior DONOR
Land	Degraded Eroded Unfertile &exhausted soils	Restoration of soil fertility Control of erosion	Improvement of soil fertility &soil testing Establishment of soil & water conservation structures	Mid term	CGM NGOs FLLOCA NG-donor
Seasonal rivers	Decreased water Volumes Pollution	-over Abstraction -poor water laws enforcement by WRUAs River bed irrigation	-Empowerment of water police River bed protection Formation of irrigation schemes Pegging & planting of water friendly trees	Urgent Mid term Long term	CGM FLLOCA NG

Hills	Degraded Bare Encroachment	Afforestation Soil &water conservation Weak laws	Re afforestation Soil &water conservation structures Strengthen the laws Controlled cultivation on hills	Urgent Mid term Long term	CGM NGOs FLLOCA NG-donor

KIRUA-NAARI WARD

Resource	Current statuses	GAP	Proposed actions	Time frame	Proposed actors
Bore holes	• Pumping machine not working • Covers on top of bore holes broken • Broken distribution pipes • Lack of distribution pipes • Some bore holes with low water capacity.	• Bore holes not in use due to lack of pumping machines • Communities not connected to boreholes with distributions pipes	• Solarisation • Installation of pumping machines • Purchase and installation of distribution pipes • Re assessment of boreholes to determine why low water capacity in boreholes • Digging of more boreholes	Immediate	Community CGM FLoCCA
Springs/wells	• Drying • Deforested • Encroached • Majority privately owned	• Many not fenced • Not surveyed •	• Tree planting • Soil and water conservation measures 1.	Medium term	Community CGM FLoCCA
Stones and ballast	• Crushing using hand and hammer	• No control in use and sale of stones • Non organized marketing	• Forming of cooperative to enhance sustainable stone harvesting • Mechanization to use stone crushers(youth groups)	Medium term	Community CGM FLoCCA
Lake nkunga	• Lake covered by vegetation • Silted	• Not fenced • Contamination of the lake • Overgrazing in the nearby forest • Deforestation near the lake	• Desilting • Clean the lake the vegetation • Controlled grazing and farming in the nearby forest • Making it a tourist attraction site	Medium term	Community CGM FLoCCA

Lands	• Stony land in kiirua areas • Seriously eroded soils	• Shortage of agricultural extension officers	• Terracing • Tree planting drives • Soil and water conservation measures	Medium term	Community CGM FLoCCA
Crops	• Crop disease • Low crop production	• Few agricultural extension officers • Poor soils • Eroded soils • Deforestation	• Provision of extension officers • Training on climate smart agriculture • Good agriculture practices • Soil and water conservation structures	Medium term	• Community • CGM FLoCCA
Roads	• Eroded and therefore impassable	• Lack of routine maintenance • Poor road drainage systems	• Roads repairs • Soil and water conservation measures	Medium term	Community CGM FLoCCA

RUIRI RWARERA WARD ACTION PLAN

Resource	Current Status	GAP	Proposed Actions	Time frame	Proposed Actors
Boreholes	-Not working -Broken water pumps -Insufficient water distributed to the community	-Broken pumps -No pump -No distribution pipes -No solar panels -storage tanks	-Solarization and installation of distribution structures for major boreholes	Immediate	-County government -FLLoCA Program -NGOs -
Seasonal River	-Eroded - Frequent floods -Road runoff	- No dam liners -No pump -No distribution pipes -No water pan	-Construction Of dams and water pans for seasonal rivers in Ruiri rwarera ward -Distribution of water through piping	Mid Term	-County government -National government -FLLoCA program -NGOs -Community
Land	Highly eroded, -Huge gullies formed	-Inadequate extension services	-Establishment of Soil and water conservation structures	Mid Term	-County government -Community

		Lack of soil and water conservation structures			FLLoCA
Forests	deforested	-Lack of knowledge on alternative source of energy -Inadequate adoption of alternative energy source -Poverty -Illegal charcoal burning	-Protection and Afforestation of county forests -Provision of energy saving devices	Long Term	County government National goverment -CFA FBOs CBOs FLLoCA Njuri Ncheke
Hills	-Bare hills –Few and scattered trees	-Lack of environment friendly tree (a lot of eucalyptus tree) Inadequate extension services.	Rehabilitation of Ruiri Rwarera hills	Long Term	-County government -Ministry of energy -FLLoCA
Infrastructure	Poor roads	-Lack drainage -Lack culverts -Lack bridges -Inadequate maintenance	Grading and Murraming of main weather roads	Mid Term	-County government -National government -FLLoCA
Catchment Areas(spring)	siltation	-Poor farming practices -Encroachment -Lack of law enforcement on flood plains -Cultivation on riparian areas - No pegging of riparian areas - Presence of environment	Desilting,Protection and rehabilitation of catchment areas	Long Term	-County government -National government -FLLoCA WRUAs

		unfriendly trees(eucalyptus)			
Coffee Factory	Rundown	Vandalized coffee factory structures	Rehabilitation of Tutua coffee factory	Long Term	-County government - national government -FLLoCA -
VMGs	-Formed registered groups -Inadequate social and economic empowerment	Insufficient resources	-Support VMGs with Micro- investments -Capacity building	Immediate	-County government -national government -FLLoCA
Renewable energy	Not available	-Lack of knowledge on renewable energy -Lack of equipment to conserve energy -Poverty	Procurement of energy saving devices for groups	Immediate	-County government -national government -FLLoCA
Dips	Old technology	-Lack of new technology in livestock disease management	Construction of animal washing area	Mid Term	County government -National government -FLLoCA Any other Program

BUURI WEST SUB-COUNTY

TIMAU WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Forest	Deforestation	Lack of knowledge on alternative energy sources	Protection and afforestation in county and national forests	Longterm	KFS, County Government of Meru, C.F.A, FLLOCA
Water	Piped,boreholes,springs	Encroachment of water sources	Enforcement by wrma,protection of riparian land,water pans construction repairing boreholes	Longterm	WARMA, C.G.M FLLOCA, government of Kenya
Land	Highly eroded huge gullies, hill	Lack of conservation structures	Soil and water conservation	Urgent	C.G.M, FLLOCA government of Kenya
Livestock	Low production	Poor husbandry	Alternative enterprises	Midterm	Department of livestock ,national

					government
Roads	Accessibility is poor	Soil erosion land slides	Construction of infrastructure	Longterm	County government of Meru, FLLOCA, national government
Crops	Poor yields	Poor farming methods ,lack of knowledge on better farming methods	Climate Smart Agriculture	Midterm	County government of Meru, FLLOCA, NGOs

KISIMA WARD

RESOURCE	CURRENT STATUS	GAPS	REQUIRED ACTION	TIME FRAME	PROPOSED ACTORS
Forest	Defforestation	Lack of knowledge on alternative energy sources	Protection and afforestation in county and national forests	Longterm	KFS, C.G.M FLLoCA, Government of Kenya, CFAs
Water	Piped,boreholes,springs	Encroachment of water sources	Enforcement by wrma,protection of reparian land,water pans construction repairing boreholes	Longterm	WRA,C.G.M FLLoCA, Government of Kenya
Land	Highly eroded huge gullies, hill	Lack of conservation structures	Soil and water conservation	Urgent	C.G.M FLLoCA, Government of Kenya
Livestock	Low production	Poor husbandly	Alternative enterprises	Midterm	Department of livestock ,national government
Roads	Accessibility is poor	Soil erosion land slides	Construction of infrastructure	Longterm	C.G.M FLLoCA, Government of Kenya
Crops	Poor yields	Poor farming methods ,lack of knowledge on better farming methods	C.s.a	Midterm	CC.G.M FLLoCA, Government of Kenya,NGOs

TIGANIA WEST SUB-COUNTY

NKOMO WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Land	Community ownership	Title deeds/cases	Division	Immediate	CGM, NG
Rivers	Dried up	Encroachment	Law enforcement, tree planting	Immediate	WRUA, Community, CGM, NG
Boreholes	Incomplete, Inadequate	Lack of water	Completion & more to be drilled	Medium-term	CGM
Swamps	Eroded /siltation	Encroachment	Desilting, rehabilitation, fencing	Medium-term	CGM, FLLOCA
Valleys	Eroded	Breaking	Bridges, gabions, tree planting	Medium-term	CGM, Community
Sand/murram	Illegal mining	Beacons	Legal framework	Medium-term	CGM/NG
Hills	Encroachment	No beacons	Tree planting, terraces, demarcation and gazettement	Medium-term	CGM, FLLOCA
Water pan	incomplete	Scarcity of water	Completion	Medium-term	CGM, NG

MBEU WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Kiorimba Irrigation Scheme	Operational	Poor management Reduced water supply	Introduce drip irrigation	Midterm	County Government FLLoCA
River	Reduced water levels	Poor water policies Planting of Eucalyptus trees along the riverbanks	Rehabilitation Uprooting the eucalyptus trees	Midterm	County Government WRUA WARMA FLLoCA
Hills	Deforestation	• Reduced indigenous trees	Planting more indigenous trees	Long-term	County Government CBOs FLLoCA
Boreholes	Operational	• Distribution of water to homesteads	Drilling more boreholes	Midterm	County Government FLLoCA
Roads	Impassible roads	• Soil Erosion • No	Construction of all-weather roads Construction of effective drainage systems Construction of gabions	Immediate	National Government County Government

		Drainage Systems			
Springs and Swamps	Unprotected	• Flooding the rainy season	Fencing the areas Tree Planting	Midterm	County Government FLLoCA CBOs
Quarry	Land Slides Steep Cliffs Soil erosion	Increased accidents due to the steep cliffs Increased school drop-outs Mass Sliding	Refilling of the open quarries Improving the environment policies	Long-term	County Government NEMA FLLoCA

AKITHII WARD

Resources	Current status	Gap	Proposed actions	Time frame	Responsible
Rivers	▪ Low water volume ▪ Presence of 'water unfriendly' tree species (Eucalyptus)	▪ Riparian not conserved and protected ▪	▪ Legislation and enforcement of existing conservation laws ▪ Protection and conservation of riparian ▪ Removal of Eucalyptus and riparian conservation	Immediate	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Springs	▪ Low water volume ▪ Encroachment into riparian areas ▪ Presence of 'water unfriendly' tree species (Eucalyptus)	▪ Spring not protected ▪	▪ Protection and rehabilitation of the spring ▪ Removal of Eucalyptus and riparian conservations	Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Swamps	▪ Bare and drying up ▪	▪ Not protected ▪	▪ Protection and Rehabilitation of swamps ▪	▪ Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Water pan	▪ Silted ▪	▪ Not desilted ▪ Surrounding farmlands not	▪ De-siltation ▪ Soil and Water conservation of farmlands around the pan	▪ Immediate	▪ Community ▪ CGM ▪ National

		protected			government ▪ CBO/NGOS/International organizations
Quarries	▪ Not decommissioned	▪ Reclamation	▪ Reclamation and protection	▪ Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Hills	▪ Bare and eroded	▪ No SWC done on the hill ▪ Deforestation ▪	▪ Afforestation ▪ Construction of water and soil conservation structures ▪ Enforcing conservation laws	▪ Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Roads	▪ Fairly impassable	▪ No road reserves ▪ Poor drainage	▪ Surveying and demarcation of road reserves ▪ Construction of bridges, culvert, gabions and other infrastructure proofing activities ▪	▪ Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Forest	▪ Low tree cover ▪	▪ Deforestation ▪ unsustainable utilization of forest services and goods	▪ Afforestation ▪ Adoption and use of efficient fuel wood saving technologies	▪ Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
institutions such as markets, schools and societies (Macadamia, coffee among others)	▪ unsustainable environmental management and conservation practices ▪	▪ No waste management systems	▪ Set up safe effluent disposal e.g., lagoons	▪ Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Land	▪ Degraded	▪ Poor agricultural	▪ Establishment of Soil and Water	▪ Midterm	▪ Community

	▪	and land management practices ▪	Management structures		▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Boreholes	▪ Not equipped ▪ Water not accessible to all due to low volumes	▪ Low yielding capacity	▪ Borehole solarization. ▪ Promotion of agroforestry to recharge the aquifer ▪ Provision of storage tanks and piping to enhance accessibility	▪ Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations

KIANJAI WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Swamps	-Encroached -some have dried up -eucalyptus planted in the swamps -siltation (mbututia swanp)	-Inadequate rainfall -Not surveyed and fenced -some are in private lands	-Afforestation with indigenous trees -Survey of the swampy areas, reclamation protection and fencing of public lands - Policy enactment.	Immediate	-County government -FLLOCA -MCA & Community
Boreholes	-Not properly equipped -pump failure in some boreholes (muthiru,antubeiga ,kairakai market,antuamakia,machaku,mitunt u girls,nauchii soteni day mixed school)	-Using hand pumps -Low water volumes -Lacking distribution and storage tanks(time consuming)	-Solarization of the boreholes. -distribution. -Provision of storage tanks	Immediate	-County government- Water department -National Government-Min of water -community -FLLOCA

Springs	Unprotected	- Encroached -low water volumes due to Inadequate rainfall -Not surveyed and fenced -some are in private lands -some have dried up -eucalyptus planted around the springs	-Afforestation with indigenous trees -survey of the springs areas, reclamation, protection and fencing of public lands where these springs are. - Policy enactment.	Immediate	-County government -FLLOCA -MCA & Community -WRUA's -WRMA -FLLOCA
Livestock	Low yielding	- lack of good breeds -lack of feeds -Finance -livestock diseases -No dairy centers Market -livestock theft	-Subsidy of inputs -construction of a livestock market -provision of good livestock breeds -provision of extension services -introduction of animal washing area	Immediate	-Agriculture -Livestock -Social -FLLOCA -interior
Infrastructure	-poor roads -No electricity -No internet	Lack of: -Finance -Labor -Graders -Network boosters. -Transformers -Electric posts - Construction materials	- Grading & murraming and compacting of all-weather roads. -Installation of network boosters. - Rural electrification. Construction of bridges	Immediate	-Ministry of roads. -Kenya power. -Ministry of ICT. -Community. -FLLOCA
Crops	-low crop yield	-inadequate /Erratic rainfall -Lack of (Subsidy on farm inputs, Soil analysis, Extension services. &Good Agricultural	Ensuring there is Subsidy on farm inputs -Soil analysis. -Extension services. -Good Agricultural Practices -Water harvesting. -Water pans -crop pest control	Immediate	-Min.Agriculture -Community -county government -Flloca

		Practices. -crop diseases			
Land	Non-productive lands	Lack of Labour -Finance -Extension officers and proper Soil and water conservation tools. -Soil erosion -Flooding	- provision of Labour, Finance, Extension officers and Soil and water conservation technology,	Immediate	- Min.Land -Community -county government -Flloca
Forests(hills)	-Deforested &Bare((kithuri ,mut hiru,kiamikwi,kiega ,kieru,kanjai,libubu ngi and mumui hills)	-Encroached for the purpose of excavation of ballast and marram from the hills -Erosion -Lack of environmental friendly trees	-Rehabilitation-afforestation -terracing. -Policy enactment.	Immediate	-county government community -FLLOCA -CBOS -CFAS -
Water pans/dam(ngut hiru laingo dam)	Incomplete	-Not retaining water	-Completing of the said water pans	Immediate	County government community -FLLOCA -National government
Seasonal rivers/streams	-Low volume	Riparian not protected	Riparian tree planting of water friendly trees	Immediate	County government community -FLLOCA

ATHWANA WARD

RESOURCE	CURRENT STATUS	GAP	PROPOSED ACTIONS	TIMEFRAME	PROPOSED ACTORS
Boreholes	Operational	Lack of water storage tanks The boreholes are few	Provide storage tanks to store water from the boreholes, for use in cold and rainy seasons when solar energy is little. Sink more boreholes	Immediate	CGM FLLoCA
Dam	Not Operational	-Homesteads not connected to the dam	Piping of homesteads to facilitate and enhance water distribution from the	Immediate	CGM FLLoCA

			dam		
Infrastructure	Operational	Poor road network riddled with potholes	Maintenance and rehabilitation of the road network Construction of a proper drainage system	Long-term	CGM FLLoCA KeRRA
Livestock	Low production	Insecurity Livestock pests and diseases Inadequate pasture and fodder	Increase security in the area Secure grazing fields and reseed the pasture and fodder Increase veterinary extension services	Immediate	CGM FLLoCA National Government
Forest	Reduced tree cover	Deforestation Human-wildlife conflict Human encroachment	Reforestation Reinforce the fence to prevent elephants from leaving the reserve and people from encroaching in the forest	Immediate	CGM FLLoCA Community CFAs KFS KWS
Springs	Low water volume	Over abstraction Destruction of riparian land Not protected	Rehabilitation and reclamation of springs and wetlands Enforcement of water use regulations	Immediate	Community FLLoCA WRA CGM NEMA
Livestock market	Not operational	Site/Land ownership conflict	Sort out the land ownership wrangles Relocate the market to public land	Mid-Term	CGM FLLoCA
Quarry	operational	Land scarred Not fenced Collection of rain water posing a risk of drowning and insect breeding grounds	Land rehabilitation Fencing	Immediate	CGM FLLoCA

TIGANIA CENTRAL

MIKINDURI WARD

Resources	Current status	Gap	Proposed actions	Time	Proposed actors
1. Rivers – Thanantu, Thiitu	- Low volume - Contaminated	- - Un-conserved riparian - Pollution - - Illegal abstraction	- Conservation of riparian land - Plant water friendly trees - Scouting	Immediate to medium	FLoCCA CGM Community
2. Swamp	Dried up	- Encroachment - Prolonged drought	- -Fence off - -Rehabilitation	Midterm	FLoCCA CGM Community
3. Forest	Bare of mature trees Few trees	Illegal logging and deforestation	- Planting trees - Re-afforestation - Enforcement	Medium to long term	KFS CBO FLoCCA
4. Hills	- Bare - Highly eroded and degraded	- No tree cover - No vegetation cover - Gulleys - Cultivation on slopy areas	- Plant trees - Plant grasses - Regulate farming on hills - Soil & water conservation	Immediate to mid term	FLoCCA CGM Community
5. Boreholes	3 – working 1 vandalised 1 non operational	- No solar power connection - Salty water -	- Feasibility study - Restore solar power connection - Drilling of additional boreholes	Immediate to midterm	FLoCCA CGM NGO'S GOK
6. Springs	- Low volume - Contaminated	- Unprotected - Pollution	- Protect by fencing - Plant trees & bamboo	Immediate	FLoCCA CGM Community
7. Markets	- Littered with solid waste	- Poor waste mgt	- Proper garbage collection - Recycling of waste	Immediate	FLoCCA CGM Community

KIGUCHWA WARD

Resources	Current status	Gap	Proposed Actions	Time frame (duration)	Proposed actors
Rivers	▪ Low water volume ▪ Over abstraction ▪ Encroachment of riparian areas ▪ Planting of 'water unfriendly' tree species (Eucalyptus)	▪ Existing laws not Enforced ▪ Riparian not surveyed and protected ▪ Lack of Soil and Water Conservation structures on surrounding farmlands	▪ Protection and Rehabilitation of riparian areas ▪ Legislation and enforcement of existing laws ▪ Removal of Eucalyptus near riparian areas ▪ Establishment of Soil and Water conservation structures ▪ Promotion of Common intake	Immediate	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Springs	▪ Low water volume ▪ Encroachment into riparian areas ▪ Deforestation and not protected ▪ Planting of 'water unfriendly' tree species (Eucalyptus	▪ Existing laws not enforced ▪ Spring not demarcated ▪ Rehabilitation and Protection not done	▪ Demarcation of riparian areas ▪ Legislation and enforcement of existing laws ▪ Establishment of Soil and Water conservation structures ▪ Planting of water friendly trees ▪ Protection and rehabilitation of the spring	Immediate	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Hills	Bare and eroded	▪ Enforcement of existing laws	▪ Afforestation ▪ Establishment of water and soil	Midterm	▪ Community ▪ CGM

		and Legislation not being done ▪ Lack of Soil and Water conservation structures ▪ Deforestation	conservation structures ▪ Enforcing existing conservation laws		▪ National government ▪ CBO/NGOS/International organizations
Roads	In accessible	▪ Road reserve not demarcated ▪ Soil and Water Conservation Structures not done ▪ Landslide/mudslides	▪ Surveying and demarcation of road reserves ▪ Construction of water pods, bridges, culvert, gabions and other infrastructure Climate proofing activities	Midterm	▪ Community ▪ CGM ▪ National government ▪ CBO/NGOS/International organizations
Forest	Low tree cover	▪ Forests not fenced ▪ Encroachment of the forest by the community	▪ Protection of the forest ▪ Afforestation ▪ Adoption of fuel wood saving technologies	Midterm	▪ Community ▪ CGM ▪ National government (KFS) ▪ CBO/NGOS/International organizations
Land	▪ Degraded ▪ Public land grabbed in some areas	▪ Poor land management practices ▪ Part of public land privately owned	▪ Establishment of Soil and Water Conservation structures ▪ Survey to reclaim public land	Midterm	▪ Community ▪ CGM ▪ National government (KFS) ▪ CBO/NGOS/International organizations
Boreholes	▪ Not well equipped ▪ Water not accessible to all	▪ Low yielding capacity	▪ Borehole solarization ▪ Provision of storage tanks and piping to enhance accessibility	Midterm	▪ Community ▪ CGM ▪ National government (KFS) ▪ CBO/NGOS/International organizations

THANGATHA WARD

Resource	Current statuses	GAP	Proposed actions	Time frame	Proposed actors
Boreholes	• Pumping machine not working • Lack of distribution pipes • No power in some boreholes. • No storage tanks	• Bore holes not in use due to lack of pumping machines • Communities not connected to boreholes with distributions pipes	• Solarisation • Installation of pumping machines • Purchase and installation of distribution pipes • Buying of storage tanks	• Urgent	• Community • CGM • FLoCCA
Rivers/springs/ wetlands	• Drying • Deforested • Eroded banks • Encroachments • Over abstraction • Use of sprinkler as mode of irrigation	• Swamps not surveyed • Springs not fenced • Riverbanks not marked • Lack of enforcement of water laws	• Tree planting • Soil and water conservation measures • Planting of water friendly trees • Enforcement of water laws	• Medium term	• Community • CGM • FLoCCA
Lands	• Seriously eroded soils • Gulley erosions • Very low soil fertility	• Few agricultural staff. • Lack of enough knowledge on Good Agricultural Practices	• Terracing • Tree planting drives • Soil and water conservation measures • Composting • Gabions building	• Medium term	• Community • CGM • FLoCCA
Roads	• Eroded and therefore impassable • No bridges	• Lack of routine maintenance	• Roads repairs • Soil and water conservation measures	• Medium term	• Community • CGM • FLoCCA
Clay	• Modeling of clay pots manually • Exercise tedious and time consuming	• Lack of modeling machines	• Up scaling of clay industry in Thangatha	• Medium term	• Community • CGM • FLoCCA

Livestock	• Local breeds • Low milk production • Use of bulls to service • Expensive AI services • Livestock diseases	• Shortage of AI service providers •	• Provision of AI services • Training of farmers	Long term	• Community • CGM • FLoCCA

TIGANIA EAST

KARAMA WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Roads	All weather roads, except the ones proceeding to Mula and Kirima	• No Drainage Systems • Soil Erosion especially in Kirima area	Construction of effective drainage systems Construction of gabions	Mid-term	National Government County Government
Boreholes	Operational	• Distribution of water to homesteads	Drilling more boreholes Piping metered water to the homesteads	Mid-term	County Government National Government FLLoCA
Forest	Increased Deforestation Illegal Logging	Encroachment Less indigenous trees	Tree Nursery establishment Inclusion of local CBOs (e.g. Friends of Nyambene Forest CBO) CFAs Capacity Building	Long-term	KFS County Government FLLoCA
River	Reduced water levels	Poor water policies Pollution by Livestock in the grazing zone Pollution of the river by the livestock during consumption	Enforcement and implementation of the water policies Rehabilitation	Mid-term	County Government WRUA WARMA FLLoCA

Crops	Poor crop yields	Less drought resistant crops Reduced soil fertility Inadequate Water supply Lack of certified seeds Increased crop diseases	Provision of certified seeds Training of farmers Irrigation Schemes	Immediate	FLLoCA County Government National Government
Livestock	Reduced production	Increased animal diseases Loss of animals due to drought Cattle rustling	Introduction of AI services Training of Community on the livestock breeds suitable for Karama Introduction of improved animal breeds	Mid-term	County Government National Government FLLoCA
Quarry	Land Slides Steep Cliffs Soil erosion	Increased accidents due to the steep cliffs Increased school drop-outs Mass Sliding	Refilling of the open quarries Improving the environment policies	Mid-term	County Government NEMA FLLoCA
Hills	Deforested	Increased soil erosion	Planting more indigenous trees	Long-term	County Government CBOs FLLoCA

MUTHARA WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Swamps	-Encroached -Some have dried up -Eucalyptus planted in the swamps	-Inadequate rainfall -Not surveyed and fenced Some are in private lands	-Afforestation with indigenous trees -Survey of the swampy areas, reclamation protection and fencing of public lands - Policy enactment. -Catchment protection	Immediate	-County government -FLLOCA MCA & Community
Boreholes	-Not properly equipped	-Using hand pumps -Low water volumes -Lacking distribution and storage tanks(time consuming)	-Solarization of the boreholes. -Distribution. -Provision of storage tanks	Immediate	-County government- Water department -National Government-Min of water -community

					-FLLOCA
Springs	Unprotected	- Encroached -Low water volumes due to Inadequate rainfall -Not surveyed and fenced -Some are in private lands -Some have dried up -Eucalyptus planted around the springs	-Afforestation with indigenous trees -Survey of the springs areas, reclamation, protection and fencing of public lands where these springs are. - Policy enactment.	Immediate	-County government -FLLOCA -MCA & Community -WRUA's -WRMA -FLLOCA
Livestock	Low yielding	- Lack of improved breeds -Lack of fodder -Finance -livestock diseases -No dairy centers -No livestock market -Livestock theft	-Subsidy of inputs -Construction of a livestock market -Provision of good livestock breeds -Provision of extension services - Marking of livestock	Immediate	-Agriculture Dept -Livestock Dept -Social services -FLLOCA -Ministry of interior
Infrastructure	-Poor roads -No electricity -No internet	Lack of: -Finance -Labor -Graders -Network boosters. -Transformers -Electric posts - Construction materials	-Spot road improvement- Grading & murraming Bridge construction- -Installation of network boosters. - Rural electrification.	Immediate	-Ministry of roads. -Kenya power. -Ministry of ICT. -Community. -FLLOCA
Crops	-low crop yield	-Inadequate /Erratic rainfall -Lack of (Subsidy on farm inputs, Soil analysis, Extension	Ensuring there is Subsidy on farm inputs -Soil analysis. -Extension services. -Good Agricultural Practices -Water harvesting.	Immediate	-Min.Agriculture -Community -county government -Flloca

		services. &Good Agricultural Practices. -Crop diseases	-Water pans -Crop pest control Promotion of drought tolerant crops -Conservation Agriculture		
Land	Land degradation Eroison Non-productive lands	Lack of soil erosion control measures -Extension officers and proper Inadequate Soil and water conservation tools.	- Soil and water conservation measures provision of Labour, Extension officers Conservation Agriculture technologies ,	Immediate	- Min.Land -Community -county government -FLLOCA

IGEMBE CENTRAL SUB-COUNTY

KANGETA WARD

Resource	Current Status	GAP	Proposed actions	Time frame	Proposed Actors
Boreholes	-Not working -Broken water pumps -Insufficient water distributed to the community	-Pump broken -No pumps -Lack of distribution pipes -Vandalized solar panels -No solar panels -storage tanks	-Solarization and installation of distribution structures for major boreholes	Immediate	-County government -FLLoCA Program -NGOs -NDMA -NEMA
Dams	Excavated	-No outlets -No dam liners -No pump -No pipes	-Protection and rehabilitation -Pumping and piping	Long Term	-County government -National government -NEMA -FLLoCA program -NGOs -Community
Land	-Highly eroded -Huge gullies	-Lack of conservation structures	-Establishment of Soil and water conservation structures	Mid Term	-County government -Community

		-Inadequate extension officers			FLLoCA
Forests	deforested	-Lack of knowledge on alternative source of energy -Inadequate adoption of alternative energy source -Poverty -Illegal charcoal burning	-Protection and Afforestation of county forests -Provision of energy saving devices	Long Term	County government National goverment -CFA FBOs CBOs FLLoCA -Njuri Ncheke
Hills	-Bare hills -Few and scattered trees	-Lack of environment friendly tree (a lot of eucalyptus tree) Inadequate extension services.	Rehabilitation of Kangeta Ward hills	Mid Term	-County government -Ministry of energy -FLLoCA -CBOs
Infrastructure	Poor roads	-Lack drainage -Lack culverts -Lack bridges -Inadequate roads maintenance	Grading and Murraming of main weather roads		-County government -National government -FLLoCA -KERRA -Kiegoi Tea Factory
Catchment Areas	degraded	-Poor farming practices -Encroachment -Lack of law enforcement on flood plains -Cultivation on riparian areas - No pegging of riparian areas - presence of environment unfriendly trees(eucalyptus)	Protection and rehabilitation of catchment areas		-County government -National government -FLLoCA -WRUAs -Water Towers

Crops (Miraa)	Disorganized marketing system	Lack of miraa aggregation centres	Constuction of Miraa aggregation centre		County government

NJIA WARD

Resource	Curent Status	GAP	Proposed Action	Time frame	Proposed Actors
Crops	Low production	-Crop diseases -High cost of inputs -Inadequate knowledge on the crop varieties to plant. -lack of organized market for the produce --Erratic rainfall Inadequate knowledge on storage technologies	-Capacity building -Construction of dams -plant drought resistance crops -Soil testing -Use of climate smart agriculture - sustainable market for the produce -Excavation of earth dam /pan to harvest water for irrigation	Immediate	FLIoCA CGM NGO NDMA Community ALF NDMA
Miraa	Low production	-Pest and diseases -Erratic rainfall Unreliable market	-Government to negotiate for organized market Training on IPM -Construction of earth dams /pans to harvest water for irrigation - training on value addition For miraa	Immediate	MOA FLLOCA CGM NDMA Community
Forest	Deforestation Increased exotic tree species eg eucalyptus	-Low water volume -Erratic rainfall -Prolonged Drought -Drying of catchment -Low water tables	-Re-afforestation -Increase tree nurseries -Capacity building -Enforcement of the law -Planting of indigenous trees -Cutting down of exotic trees	Immediate	FLLoCA COG, KFS CFA, NGO, FBO WRUA Community
Springs	Low water volume	-Not protected -No storage tanks -No pipes to distribute to households	To be rehabilitated Install storage tank -construct a common intake -piping to distribute water to the households	Immediate	FLLoCA CGM CFA, NGO,FBO WRUA Community

			Plant trees		
Bore holes	Low water volume	Not functional No pipes to distribute water to households	-Maintenance of broken pumps Buy pipes to distribute water to households	Immediate	FLLOCA CGM NGO NDMA Community
Wetlands	not safe for consumption	Not protected Encroached	-Fencing -Rehabilitation -Afforestation -Put up soil conservation measures	Immediate	FLLoCA CGM, KFS CFA, NGO, FBO
Livestock	Low production (milk &beef)	Overstocking, Insecurity, Inadequate grazing pastures and fodder, Competition of pasture and fodder with neighboring communities leading to Community conflicts Livestock diseases Unreliable market	-Keep few animals. -Introduction of drought tolerant pastures and fodder, reseeding the grazing land , routine vaccinations, -increase security in the area. -Have organized market Introduction of improved breeds	Immediate	National government, FLLOCA, Community, County government NDMA ELRP KALRO ALF

ATHIRU RUUJINE WARD

Resources	Current Situation	GAP	Proposed Action	Time Frame	Proposed Actors
Boreholes	-Public functional - 12 -Public non functional -11 -Public saline - 1	-Inadequate technical backstopping - No solar panels -Low Recharge - Inadequate water storage	-Solarization -Rehabilitation of boreholes -Construction of storage tanks and distribution -Sinking boreholes -Water harvesting	Immediate	Community NGAO MCG Donors NGOs
Swamps	-Encroachment -Siltation -Deforestation	-Lack of enforcement of law and policies - Lack of catchment protection	-Enforcement of law and policies -Afforestation -Soil and water conservation structures -Establishment of tree nurseries	Mid term	Community NGAO MCG Donors

			-Fencing		NGOs
Springs	-Encroachment -Siltation -Deforestation	-Lack of enforcement of law and policies - Lack of catchment protection	-Enforcement of law and policies -Afforestation -Soil and water conservation structures -Establishment of tree nurseries -Fencing	Mid term	Community NGAO MCG Donors NGOs
Hills	-Deforestation -Soil erosion -Encroachment	Lack of enforcement of law and policies - Lack of catchment protection	-Enforcement of law and policies -Soil and water conservation structures -Establishment of tree nurseries -Tree planting	Immediate	Community NGAO MCG Donors NGOs
Quarry	-Open pits -No back filling -Mosquitoes breeding sites	-Lack of enforcement of law and policies - No back filling	-Enforcement of law and policies -Back filling -Fencing -Control of Mosquitoes	Immediate	Community NGAO MCG Donors NGOs
Dump site	-Solid waste -Pollution of land and air -Mosquitoes breeding sites	-Lack of enforcement of law and policies - Poor solid waste management	-Solid waste recycling and management -Enforcement of law and policies -Garbage collection trucks to be covered -Proper fencing -Guarding of the site -Control of Mosquitoes	Immediate	Community NGAO MCG Donors NGOs

AKIRANGONDU WARD

Resources	Current status	Gap	Proposed action	Time frame	Proposed actors
Boreholes	-nonfuctional -Manual operation	On private land Time comsuming	- Rehabilitation of existing boreholes -to be made accessible by public -Solarnization -Piping of borehole water to the households	immediate	CGM MCA FLLOCA NGOs MP
Springs	Drying	Water scarcity	-Spring protection -afforestation	immediate	CGM FLLOCA

					MCA community
Livestock	Influx of diseased animals from neighbouring county	Insecurity along northern grazing zone	-Establishment of police post -Increase NPR from locals -fencing of the boundary -mass vaccination programme	immediate	CGM MCA FLLOCA NGOs MP
Roads	-Weather Roads - dilapidated	-Encroachment of Road reserve -inaccessible roads	Soil and water conservation on surrounding hills -spot grading feeder roads -construction of gabions	Mid term	CGM FLLOCA NG-Roads
Crops	-Low yields -crop pests & disease -soil erosion	-poor crop husbandry -lack of certified seeds -high cost of inputs	-Crop diversification -capacity building -input subsidization -soil and water conservation	mid term	CGM NGOs FLLOCA CARITAS NG-donor
Livestock	-Indigenous Breeds -Low production	-Animals kept on free Range -Insecurity	-Improve range condition -Diversification -Use of Bull scheme -formation of conservancy	mid term	CGM NG-Interior FLLOCA

IGEMBE EAST WARD

Resources	Current status	Gap	Proposed action	Time frame	Proposed actors
7 boreholes	• Solar pumped • Water is available •	• Lack of water distribution network. • Inadequate water storage facilities.	• Provision of pipes and storage tank • Increase the number of boreholes to 15	Immediate	• CGM • FLLOCA • World Bank • National government
Springs and wells	• Encroached • Grabbed • Decrease in the	• Not fenced • Eucalyptus trees planted	• Demarcation and fencings of all the springs and wells in the ward • Uprooting eucalyptus trees	Medium term	• CGM • FLLOCA •

	water level	• Not demarcated	• Planting environmental friendly trees •		• NEMA • • KFS • • Community.
Forests	• Deforestation • Land Grabbing • Encroachment by human beings	• Not fenced • Forest areas not well demarcated	• Fencing of forests • Surveying and demarcation of forests • Provision of tree seedlings to the community	Medium term.	• CGM • FLLOCA • KFS • Community
Dispensaries (3)	• Not well functioning • Sparsely distributed(very few) • Poor infrastructre •	• Inadequate medicine • Lack of enough medical personnel • dispensary infrastructure in need of repair and renovations. •	• Provision of enough medicine • Increase the number of health facilities • Completion of the incomplete infrastructure at the dispensaries • Addition of more personnel • Upgrading of the dispensaries into health facilities	immediate	• CGM • FLLOCA • World Bank • National Government
Markets	• There are existing markets. • Some are grabbed • Poorly maintained .	• Some not fenced • Some markets not well demarcated. • Poorly planned	• Fencing of the unfenced Markets • Renovations • Repossession of the grabbed markets.	● Immediate.	• CGM • FLLOCA • National Government • Traders • Community.
Miraa	• Production is on the decline. • Dwindling miraa market. • •	• Invasion by pests and diseases • Lack of profitable market for miraa. • Miraa cartels. • Numerous miraa levies. • Lack of proper marketing channels	• Provision of agrochemicals to farmers • Training on value addition of miraa and production • Search for more profitable market for miraa • Organized marketing structures.	Immediate.	• CGM • National Government. • FLLOCA • Traders •

Roads	• Impassable. • Poorly maintained • Encroachment	• Poor drainage • Majority Not murramed or tarmacked	• Spot improvement of roads which include culvert installation and murraming.	Immediate.	• CGM • World Bank • National Government

IGEMBE SOUTH SUB-COUNTY

MAUA WARD

RESOURCES	CURRENT STATUS	GAPS	PR0P0SED ACTIONS	TIMEFRAME	PROPOSED ACTORS
1forest	deforestation . Low coverage of tree. Small scale planting of tree on going	lack of seedling .lack of information and enforcement , forest fires human wildlife conflicts	tree planting ,promotion of energysaving devices, use of renewable energy enforcement of regulations.forest acts	Immediate	Flloca.NGO.NG.MCGKFS .CFA. WRUA.
2. land	demaketed ,squart ors, largescale farming	soil erosion effects, pollution,lack of information on land issues. Ministry of land corruption	rehabilitation of erroded areas, siol and water conservation structures, improve on solid ,liquid waste mgnt, safe and effective use of pesticide, storm water control methods.land acts.enforcement of regulations	mediumterm	Flloca.NGO.NG.MCG,NG,MOL

3 earth dams	siltation ,enchroac hment	low volume of water	fish farming,constrution of watering point and sanitation block , water distribution pipeline desilting, protectiom and rehabilitation dam,	mediumterm	Flloca.NGO.NG.,MOL.MCG
4 boreholes	stalled 3. functional 7	salinity shallow.not equiped/lackof equipements	borehole equiping, water distribution pipeline, solarization, rehablitation of shallow boreholes,enforcement of regulations.water acts .meru county water and sanitation acts	Immediate	FLLoCa.NGO.NG.MCG water dept
5. rivers	overabstrution.poll ution	low water levels, water conflicts,water pollution, waterborne desease, Weak WRA regulations.lack of enforcements water and environment laws	river protection and riperian areas.water management practises, strength wruas, smart irrigation methods, water harvesting methods, water treatment methods	mediumterm	NGO.NG.MCG, NEMA, WRA MWI AND MOH

6,springs	overabstrution.pollution	weak WRA regulations.lack of enforcements water and environment laws	Spring protection and riperian areas,Water management practises, strength wruas, smart irrigation methods, water harvesting methods, water treatment methods	mediumterm	NGO.NG.MCG, NEMA, WRA MWI AND MOH
7 swamps	enchroachment	lack of enforcement	land reclamation, friendly tree planting, growing suitable crops, swamp protection	Immediate	dept ol lands.deptof water.irrigation and ministry of agriculture NGO.NG.MCG

KIEGOI ANTUBOCHIU WARD

Resources	Current status	Gap	Proposed actions	Time frame	Proposed actors
Rivers	Domestic use	• Rivers drying up • Eucalyptus on river catchments • Farming along river banks	• Protection of water catchments • Afforestation • Removal of eucalyptus from water catchments and river banks • Planting of indigenous trees • Enforce water act 2015 •	Immediate	WRMA KFS AGRICULTURE Water and Irrigation
Forests	Used to provide livestock feed, poles, timber, farming, firewood	• Deforestation • Illegal farming • Drought • Wild life and human/livestock conflict	• Land reclamation • Fencing • Reseeding •	Immediate	KFS, FFLoCA MENR

Boreholes	Domestic use	• Inadequate water •	• Provide Storage tanks • Piping and connections •	Immediate	FFLoCCA
Crops		• Low income • Poor market arrangements(Miraa, coffee, horticulture) • High inputs cost	• Subsidize farm inputs • Organize market and look for new market outlets • Mobilize and register farmers for inputs subsidy	Immediate	Department of Agriculture Department of trade Farmer groups HCD KARLO FFLoCA
TVET	Catering for approximately 500 students	• Inadequate facilities • Low enrollment	• • Provide more modern equipment • Employ more tutors • Expand the institute	Immediate	MOE OOG
Livestock	Private AI services	• High cost of AI services • Inadequate AI services • Poor livestock breeds	• Employ more AI service providers • Support breed improvement • Subsidize AI services • Capacity build on livestock production	immediate	Department of Livestock Directorate of Veterinary Services Department of trade KARLO FFLoCA
Access roads	Kiegoi- Nturuba Itumbi -Andula Lulu- Giteretu	• Impassable • during rainy seasons • Rough roads • Vehicle breakages	• Upgrade • Murram	Short term	Department of trade Roads and public works KeRRA FFLoCA MTF
Forests	Used to provide livestock feed, poles, timber, farming, firewood	• Deforestation • Illegal farming • Drought • Wild life and human/livestock conflict	• Land reclamation • Fencing • Reseeding •	Immediate	KFS, FFLoCA MENR

ATHIRU GAITI WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Miraa plantations	- Infestation by pests and diseases	- Lack of sensitization on prevention and control measures. Lack of agriculture extension officer - Unstable market - Lack of value addition	- Up scaling miraa farming industry - Sensitization on prevention and control measures of pests and diseases. - Provision of an agricultural extension officer - Sourcing for a stable market - Provision of a miraa processing industry	Immediate	-Local community - CGM - FLLoCA
Springs/ Wetlands	- Some dried - Some drying - Encroachment	- Lack of enforcement - Lack offence - Lack of cover crops and trees	- Springs/wetlands protection - Fencing - Enforcement of law to prevent encroachment - Afforestation	Medium term	-Community - CGM - FLLoCA - CBO - FBO
Forest	- Deforestation - Forest fires - Encroachment	- Lack of fence - Lack of enforcement of law	- Forest rehabilitation - Afforestation - Enforcement of law - Surveying - Fencing	Long term	- Community - CFA - KFS - CGM - FLLoCA
Roads	Impassible	- Poor drainage system - Lack of bridges - Not graded - Broken piped water systems	- Road infrastructure improvement - Provide good drainage system - Provision of bridges - Grading and gravelling - Repair the broken community water pipes	Immediate	- Community - CGM - FLLoCA
Boreholes	Incomplete Dried up	Lack of resources Shallow pits	- Completion of incomplete boreholes - Rehabilitation of boreholes that are not functioning - Installation of solar system - Piping - Drilling deeper - Provision of storage tanks	Immediate	- CGM - FLLoCA
Livestock	- Low production - Exotic breeds - Infestation by	- Lack of breed improvement - Lack of extension	- Up scaling of livestock farming industry - Introduction of improved breeds - Provision of an extension officer	Immediate	- Community - CGM - FLLoCA

	diseases	officers - Lack of community sensitization on breeds and diseases affecting animals	- Routine vaccinations - Community sensitization on breeds and diseases		

AKACHIU WARD

Resources	Current status	Gap	Proposed actions	Time frame	Proposed actors
Water	Piped,boreholes, springs , low water levels	Encroachment of water sources	Enforcement by WRA, protection of riparian land,spring protection ,repairing boreholes	Urgent	Wrma, CGM, FLLOCA, government of Kenya
Land	Highly eroded huge gullies, land slides	Lack of conservation structures	Soil and water conservation structures	Urgent	CGM, FLLOCA, government of Kenya
Livestock	Low production	Poor husbandry	Alternative enterprises training by extension officers	Midterm	Department of livestock ,national government
Roads	Accessibility is poor	Soil erosion land slides	Construction of infrastructure structures gabions, bridges.	Midterm	CGM, FLLOCA, ,National government
Crops	Poor yields	Poor farming methods ,lack of knowledge on better farming methods	Climate Smart Agrculture	Urgent	County government of meru, FLOCCA,NGOS,.KTDA Igembe Tea Factory.

KANUNI WARD

Resources	Current situation	GAP	Proposed Action	Time frame	Proposed Actors
Rivers	Reduced water volume	Deforestation Siltation No law enforcement Over abstraction	Planting water friendly trees Law enforcement Riparian protection	Immediate	Community FFLOCA CGM NGO

		Encroachment planting of Eucalyptus			WRUA
Springs	Drying up	Siltation Encroachment	Survey and Mapping Spring protection	Medium term	CGM FLLOCA Community WRUA CFA
Hills	Denuded	Deforestation Encroachment Soil erosion	Survey and Mapping Afforestation Law enforcement Terracing	Medium term	Community CGM FLLOCA KFS CFA
Land	Eroded/ Gullies	Soil erosion	Terracing	Immediate	Community CG M FLLOCA NGO
Roads	Impassable	No drainage ways Eroded No culvert No murram	Build Gabion Build Culvert Spot improvement	Immediate	CGM Community FLLOCA NGO
Crops	Low yield Crop diseases/ pests	Lack of certified seeds poor husbandry	Climate smart Agriculture Agriculture extension service GAP	Immediate	Community CGM FLLOCA
Livestock	Low production Livestock diseases and pests	Poor nutrition Poor husbandry Poor breeds	Improved breeds Alternative livelihoods Introduction of animal washing areas	Immediate	Community CGM FLLOCA
Boreholes	Low water production Few Not working	Not protected No storage tank Poor installation	Drill more boreholes Solarization Build storage tank Build dam/ water pan	Immediate	Community CGM FLLOCA

Markets	Not used	Not demarcated No water No floodlights No toilets	Fencing water piping Install Floodlights Construct modern toilets	Immediate	CGM FLLOCA NGO

IGEMBE NORTH SUB-COUNTY

NTUNENE WARD.

Resources	Current status	Gap	Proposed action	Time frame	Proposed actors
Water catchments	-Degraded -Exotic tree species like eucalyptus planted -	-Low water yields -	-Mapping of water catchments -protection and rehabilitation -Removing exotic tree species and replacing with indigenous tree species -	Long term	FLLoCA CGM NGoK NGOs PACJA
Bo reholes	-Water from some boreholes not distributed to homesteads -Some are malfunctioning -Inadequate boreholes	-Time wastage -Water scarcity	- Provision of pipes to connect more homesteads -Bigger storage tanks -Repair of malfunctioning boreholes -Sinking more boreholes	Medium term	CGM FLLoCA NGoK NGOs PACJA
Water	-Scarce	-Inadequate water for both domestic and irrigation use -	-Rain water harvesting -Rain water harvesting structures such as dams and water pans -Water storage tanks	Immediate	CGM FLLoCA NGoK PACJA NDMA
Feeder roads	-Weather roads -Impassable due to rills and gullies caused by erosions/floods	-Time wastages -Accidents -landslides and soil erosion	-Establish the miter drains and diversion of floods water to dams - Grading and gravelling -Installation of culverts -	Immediate	CGM FLLoCA NGoK

Forest/Trees	-Low tree cover/deforested -Bare hills -Exotic trees such as eucalyptus -Invasive species	-Massive soil erosion -Low rainfall -Drying up of springs -Extinction of some tree and animal species	-Afforestation -Replacing eucalyptus tree species with environmentally friendly trees -	Long term	FLLoCA CGM KFS CFA KWS NGoK, PACJA

ANTUAMBUI WARD

Resource	Current status	Gap	Proposed actions	Timeflame	Proposed actors
Miraa	• NACADA classification as a drug • Shrinking of national & international markets	• Research and publication of research data on psychosocial effects of various miraa varieties	• Reclassification of Miraa from a drug to cash crop • Sourcing of new national & international markets for Miraa	Immediate	Ministry of Agriculture, Governor, Senator, MP, NACADA, ACADEMIA, FLLoCA
Water reservoirs/ borehole	• No natural surface water sources eg. River, springs, wetlands. • A number of boreholes have been sunk by CGM and other actors • Ndumuru water pan functional • Tuuru water project serves both Ntunene and Antuambui wards	• Inadequate water for domestic & irrigation • Additional water reservoir is proposed and in the pipeline at Ndumuru	• Drilling and equipping of boreholes • Construction of more rainwater harvesting reservoirs	Immediate	Ministry of water and Irrigation, County dept. of water, Ministry of Agriculture, NGCDF FLLoCA

Infrastructure – Roads & Bridges	• Feeder roads connecting markets, water points and social amenities in poor state • Areas around Kaelo and Mwere wa Ngundu susceptible to flooding and landslide	• Feeder roads that are unpassable during wet seasons • Poor accessibility to key community assets due to inadequate drainage amenities	• Spot improvement of feeder roads connecting key resource routes • Embarkment protection and installation of drainage amenities at flooding and landslide hotspots	Immediate	Ministry of transport and public works, MCA, Governor, Dept of roads, MP FLLoCA
Forest	• Hillslopes (Kaelo, Kaiye hills) highly degraded contributing to flooding and soil erosion	• Low awareness on soil protection measures • Low tree seedling survival due to lack of protection	• Establishment of tree nurseries • Provision of tree seedlings through a participatory afforestation programme • Awareness creation on soil protection measures	Medium term	Dept of environment, KFS, NGOs, FLLoCA

MUTUATI SUB-COUNTY

ANTUBETWE-KIONGO

Resources	Current status	Gap	Proposed actions	Time frame	Proposed actors
Boreholes	-Low water table -Manual operation	Time consuming	-Solarnization -Cutting Eucalyptus trees near boreholes	Immediate	CGM CARITUS FLLOCA NGOs
Quarry	-Not fetched -Steep cliffs -Storm water accumulation during rain season	-No controlled harvesting of quarry wastes -No enforcement of NEMA laws	-Refilling of open quarries -Tree planting -	Mid term	CGM FLLOCA NEMA NG-Roads

Forest	-Low tree cover -Illegal logging	-Ignorance -Corruption -Dominated by exotic trees	-Afforestation -community empowerment	Immediate	CGM KFS NG-
Roads	-Weather Roads -	-Encroachment of Road reserve -landslides and soil erosion	-Establish the cut off drains -Installation of culverts	Mid term	CGM FLLOCA NG-Roads
Dam	-Low water volumes -Siltation	-Not protected -pollution	-Disiltation -Dredging	Immediate	CGM FLLOCA NGO NG-water
Crop diseases	-Low yields -crop pests & diseases	-poor crop husbandry -lack of certified seeds -No crop diversification (over reliance on Miraa)	-Crop diversification -Training by field Agricultural officers -CSA	Immediate to mid term	CGM NGOs FLLOCA CARITAS NG-donor
Livestock diseases	-Indigenous Breeds -Low production	-Animals kept on free Range -Insecurity	-Improve range condition -Diversification -Use of Bull scheme	Immediate mid term	CGM NG-Interior DONOR

NAATHU WARD

Resource	Current status	Gap	Proposed action	Time frame	Proposed actors
Borehole	Incomplete boreholes (Thirua, Bolu,inono etc)	No water	To complete the incomplete boreholes Equipping and repairs of boreholes Provide high capacity elevated water tanks Boreholes to be solar powered Construction of water kiosks Supply pipes, materials and fittings for water distribution Drill new boreholes	Urgent	National Government County Government of Meru NGOs
Springs	Silted springs (Tamaru, Inono etc)	Low water volume Community encroachment Blue gum	Desilting Afforestation Planting indigenous or environmental tree	Immediately	FLLoCA National Government County Government of Meru

		or non-environmental friendly tree species along the springs	species Community policing or law enforcement Fencing to reduce pollution or contamination with waste		NGOs WRUA WRMA IWUAs
Earth Dams	None	Water scarcity	To be excavated or constructed especially in the lowlands, fenced and embarked Excavation of new earth dams	Mid	FLLoCA National Government County Government of Meru NGOs
Water pans	Two non-functional water pans Silted	Water scarcity	Desiltation To be rehabilitated Excavation of new water pans especially in the lowlands	Immediately	
Hills	Eroded Land degradation	Deforestation Low vegetation cover	Afforestation Land conservation Enforcement of NEMA laws Implementation of climate change act and policies	Urgent	National Government County Government of Meru Community NGOs CFAs
Land	Vast dry lowlands where farming and grazing takes place	Overgrazing Inadequate or low rainfall Drought Water scarcity Soil erosion Wildlife human conflict especially monkeys(baboons cave) Market access challenge due to impassable rural feeder roads	Drought tolerant crops Sinking boreholes Destocking in Northern Grazing Areas (NGAs) Excavation of Water pans and earth dams Diversification Or embracing alternative livelihoods bee keeping Fodder and pasture establishment and conservation Climate Smart Agriculture like on-farm water harvesting Road spot improvement Planting trees	Mid	National Government County Government of Meru Community NGOs KWS
Miraa	Lack of aggregation centres Pest attack	Soil and air pollution Low and poor quality yields	Alternative livelihoods like kitchen gardening, fish farming, green house technology Diversification Capacity building on Integrated Pest		

			Management Circular economy		
Renewable Energy -solar	Most households not covered by the rural electricity grid	Inadequate energy	Promotion of Biogas Energy saving devices Solarization	Immediately	
Bulo iron	High mining	Low salt for livestock	Fencing	Immediately	

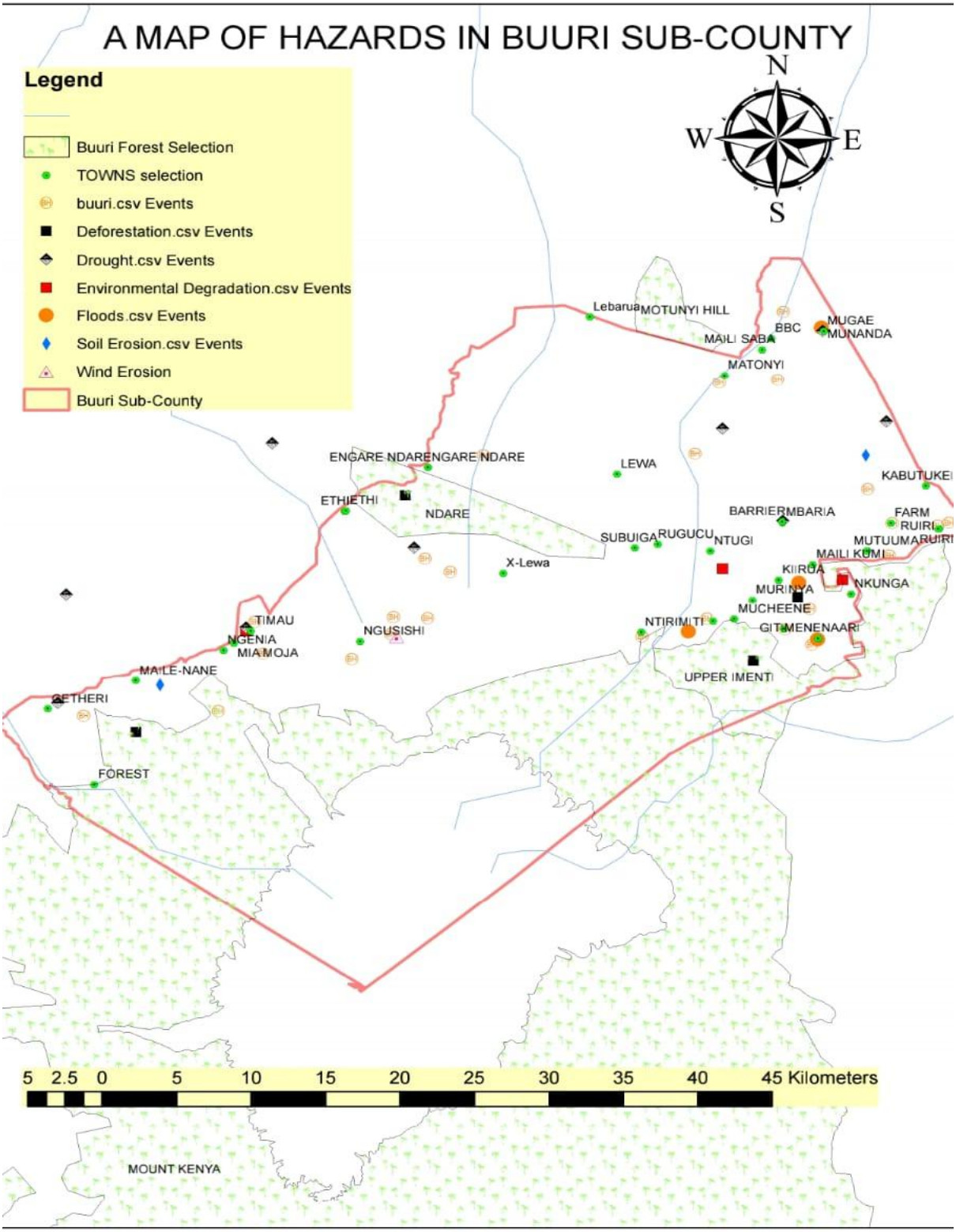
AMWATHI WARD

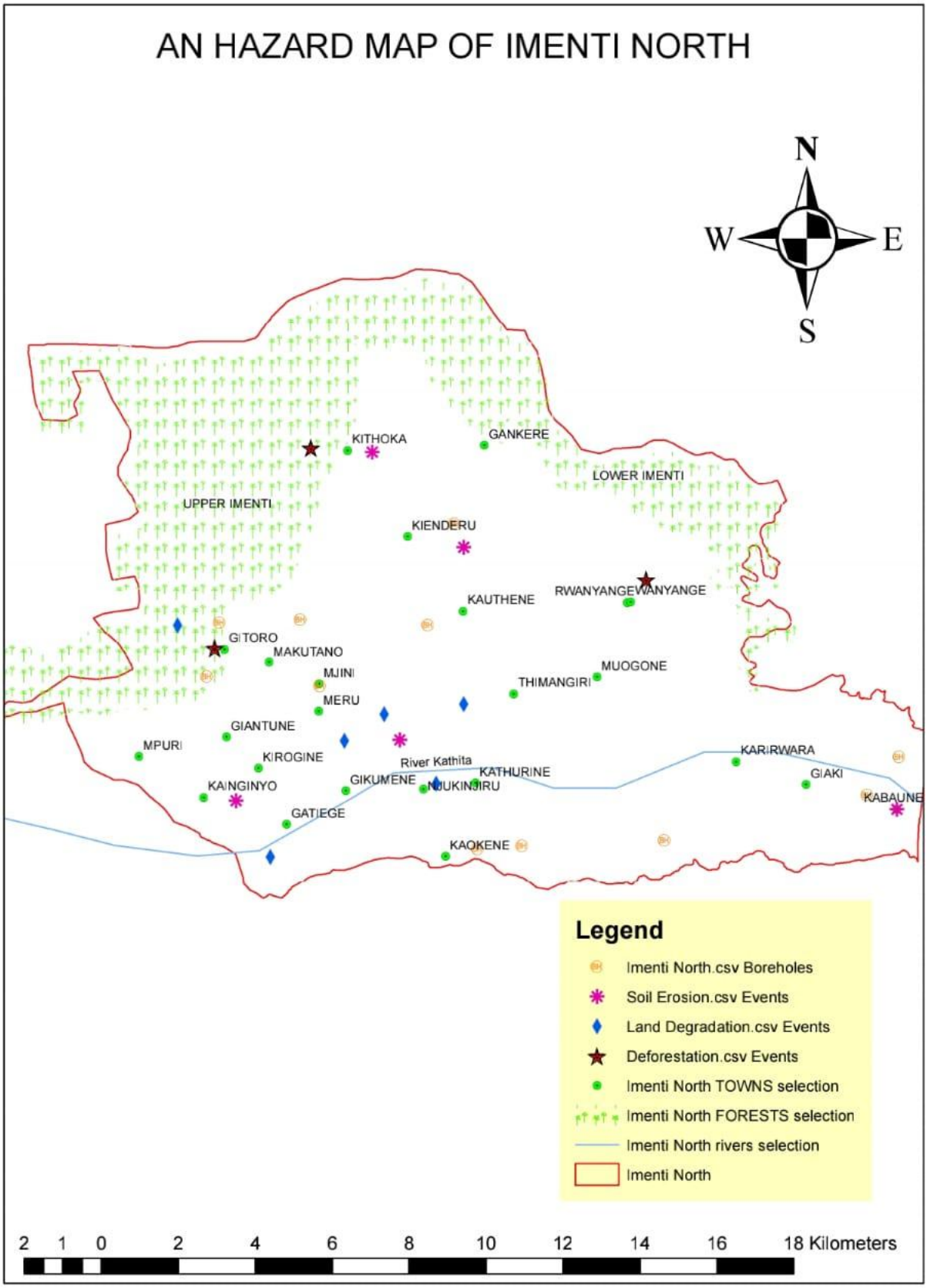
Resource	**Current status**	**Gap**	**Proposed actions**	**Timel frame**	**Proposed actors**
Bole holes	-inadequate -Not functional/ vandalized	Lack Wind power Solarization and security Insufficient water Storage tank for human and livestock	-Security -Solar panels -Wind pumps -Storage tanks -KDF post -More bore holes	Short term	FLLoCA County government of Meru Energy EABL NGOK Dep. Water and evn.
Forest	-deforestation -fires -Animal human conflict	-Security -afforestation	-electric fence -tree seeds and nurseries water	Mid term	FLLOCA County gvt KWS KFS Dep. Water and evn.
Water pans	-Silted inadequate	-desilt insecurity	-More water pans -provide Security -Soil conservation	Short term	NGOK -FLLOCA Dep. water and env.
Hills	Degraded	afforestation	-Tree seed and nurseries -fencing -soil conservation	Long term	FLLOCA County govt. Dep. Water and env. Land and adjudication
Land/Grazing land	Eroded Low production Not demarcated Use of non-certified	-Soil and water conservation -demarcation - whirl winds	-title deeds -soil and water conservation structures - Tree planting	Short term	FLLOCA County govt. DOALF Land and adjudication

	seeds				
Crater (salty)	-not protected -dries during hot seasons	-protection -Soil erosion	Soil conservation around the resort Tree planting- improve cutting, package and standardization of the salty block Fencing	Short term	FLLOCA County govt. DOALF Dep. Water and env. Department of trade KEBS
Market	Mobile miraa market -no waste disposal mechanism -roof and road erosion	-lack of aggregation and marketing center -No water disposal channels -No sewage system	Construction of aggregation center for miraa and other produce. -water conservation construct channels to check dams -solid waste disposal systems	Mid term	FLLOCA County govt. DOALF Dep. Water and env.
Gullys	Not protected/conserved Land slides	-erosion -loss of land -mudslides	-Gulley control structures -gabions -check dams -Water pans - tree nurseries -tree planting	Mid term	FLLOCA County govt. DOALF Dep. Water and env.
Livestock	Low production Use of indigenous flock -Livestock pest and diseases	inadequate knowledge -low producing breeds. -no government veterinary officer	capacity building -high producing breeds -animal health assistant. -animal production officer	Short term	FLLOCA County govt. DOALF
Crops	Low production	-Inadequate knowledge -use of uncertified seeds -drought -Crop pest and diseases	-Capacity building -introduction of drought tolerant seeds/crops -Water pans -Soil conservation - agriculture extension officer	urgent	KARLO FLLOCA County govt. DOALF Dep. Water and env.
spring	Low water volume Land slides Not protected	No tree cover Mud slide Not protected	Desilt Flood walls Tree planting Tree nurseries	short term	FLLOCA County govt. DOALF Dep. Water and env.

ANNEX II

MERU COUNTY SPATIAL DSTRIBUTION OF CLIMATE RISKS/HAZARDS PER SUB-COUNTY

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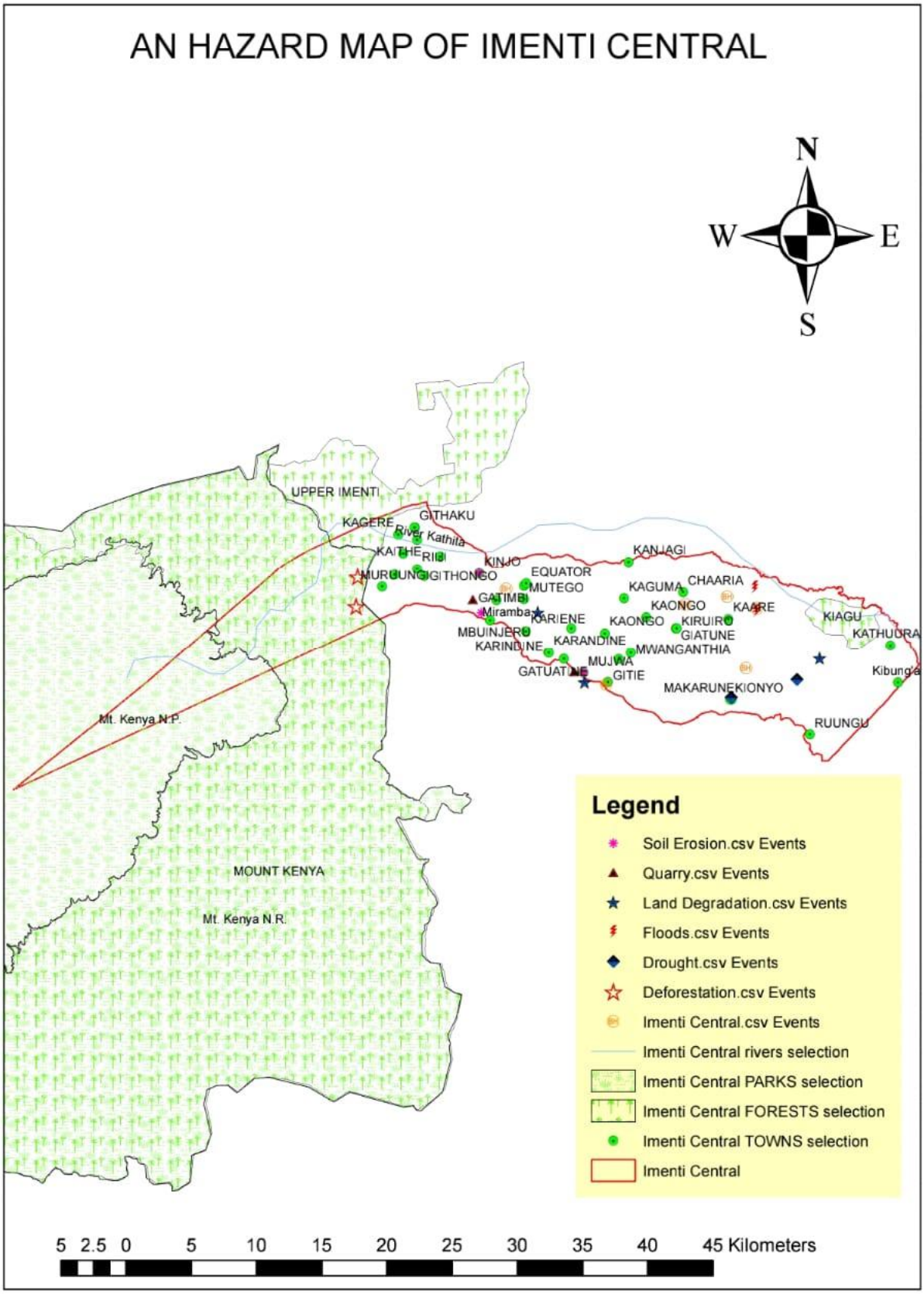
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GITHONGO
GATIMBI
Miramba
KARIENE
KAONGO
KIRUIRO
GIATUNE
MBUINJERU
KARANDINE
MWANGANTHIA
KARINDINE
MUJWA
GITIE
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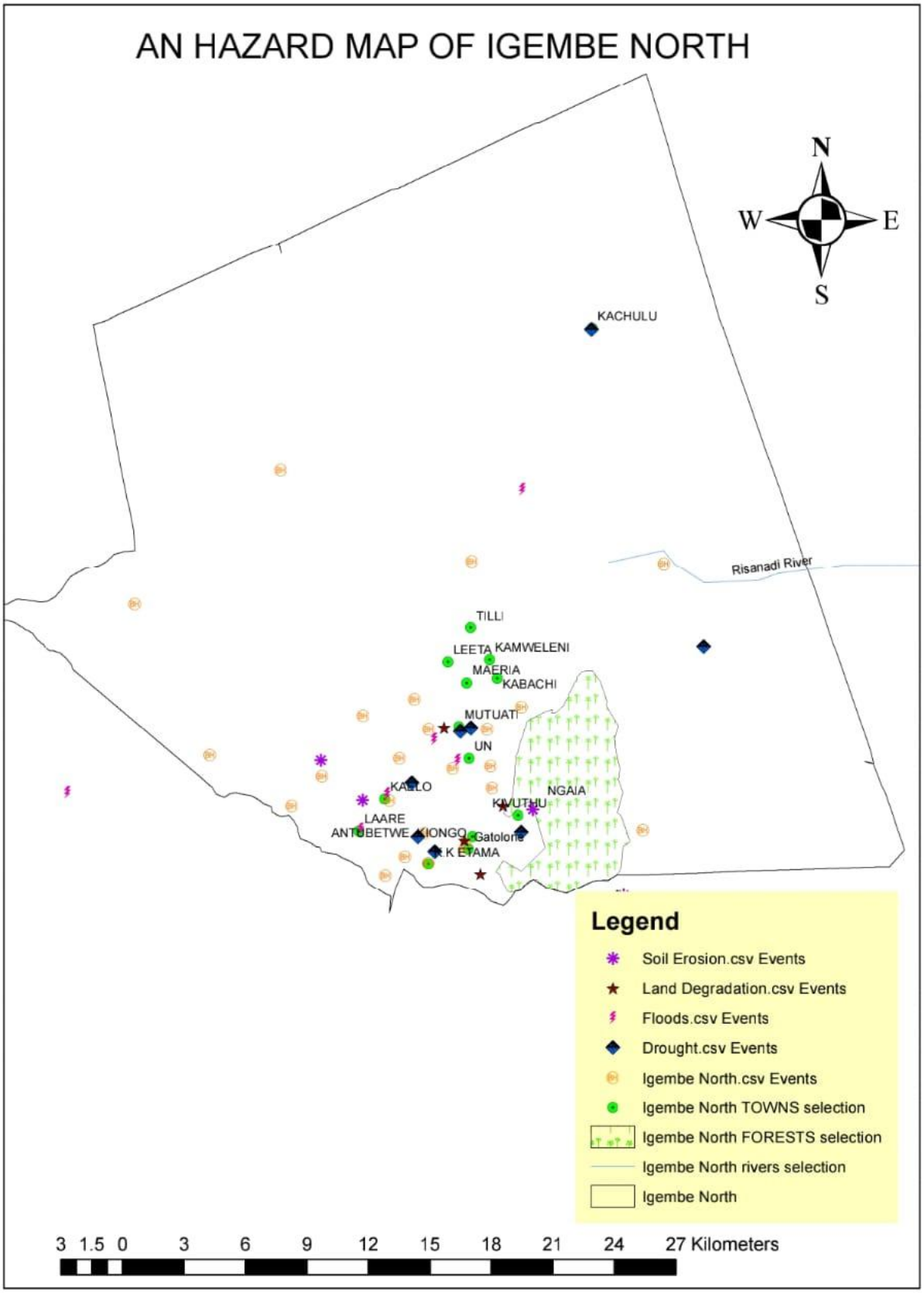
AN HAZARD MAP OF IGEMBE NORTH
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Legend
Soil Erosion.csv Events
Land Degradation.csv Events
Floods.csv Events
Drought.csv Events
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Igembe North FORESTS selection
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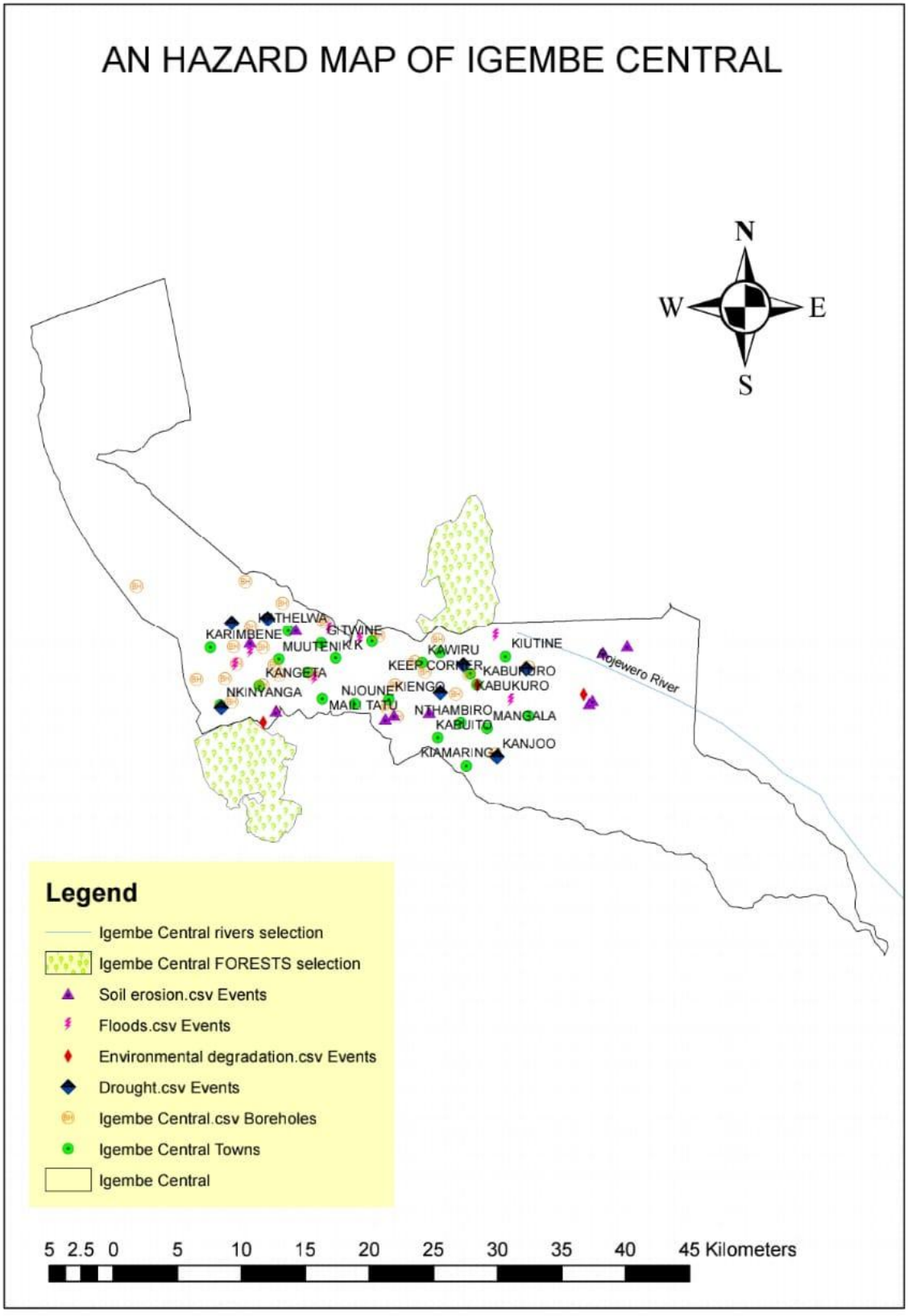
AN HAZARD MAP OF IGEMBE CENTRAL
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KEEP CORNER
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Rojewero River
NTHAMBIRO
MANGALA
KABUITO
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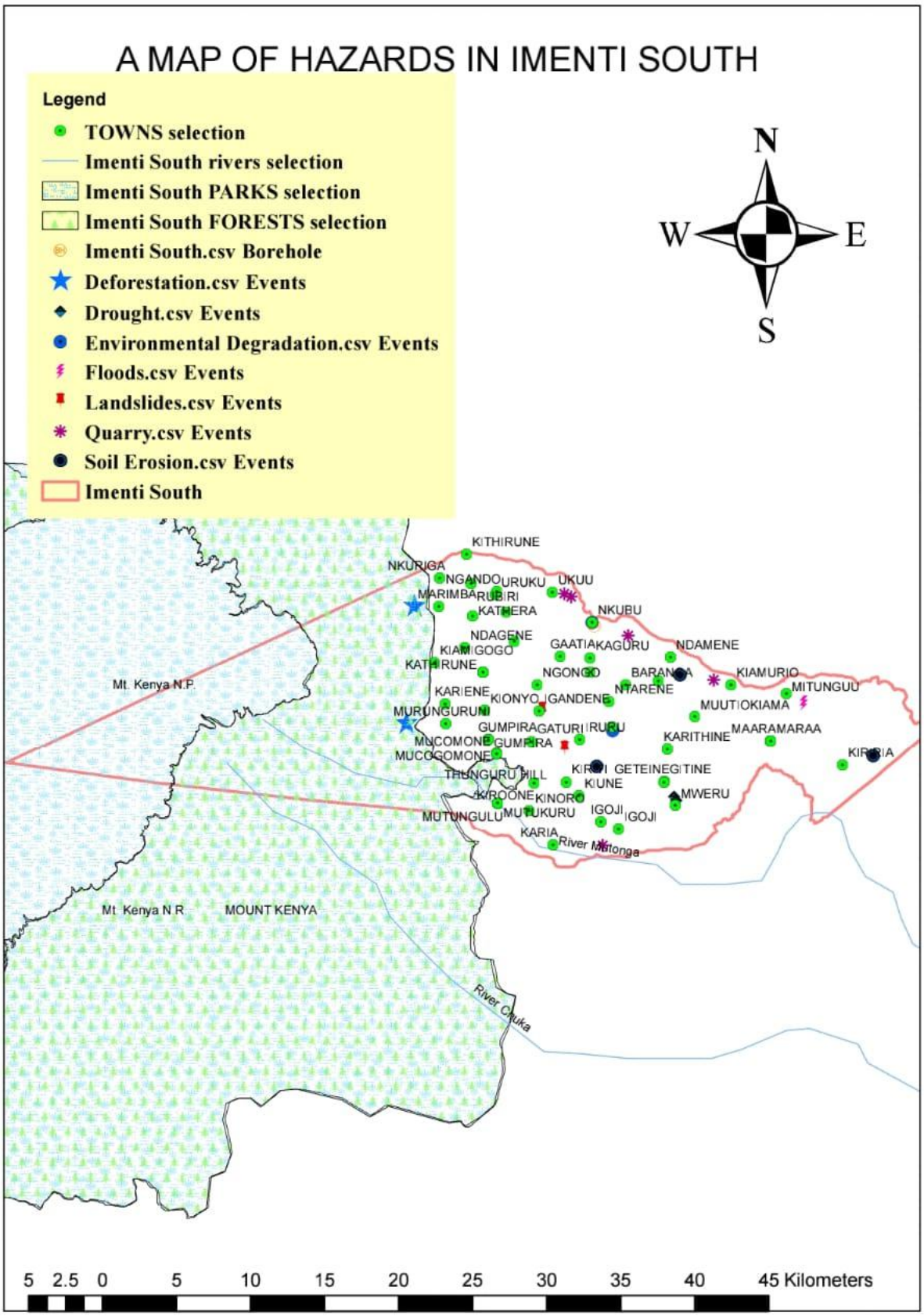
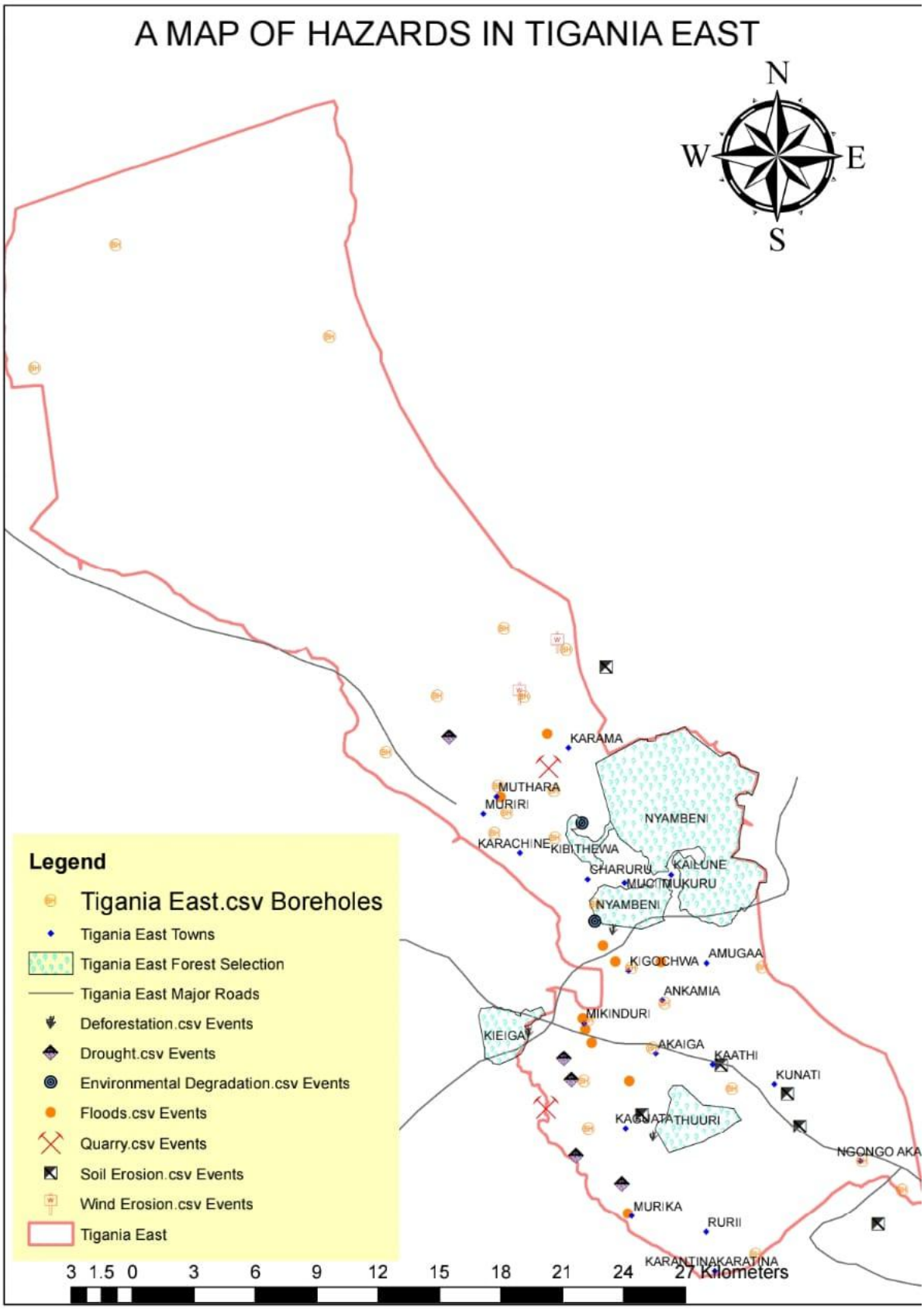
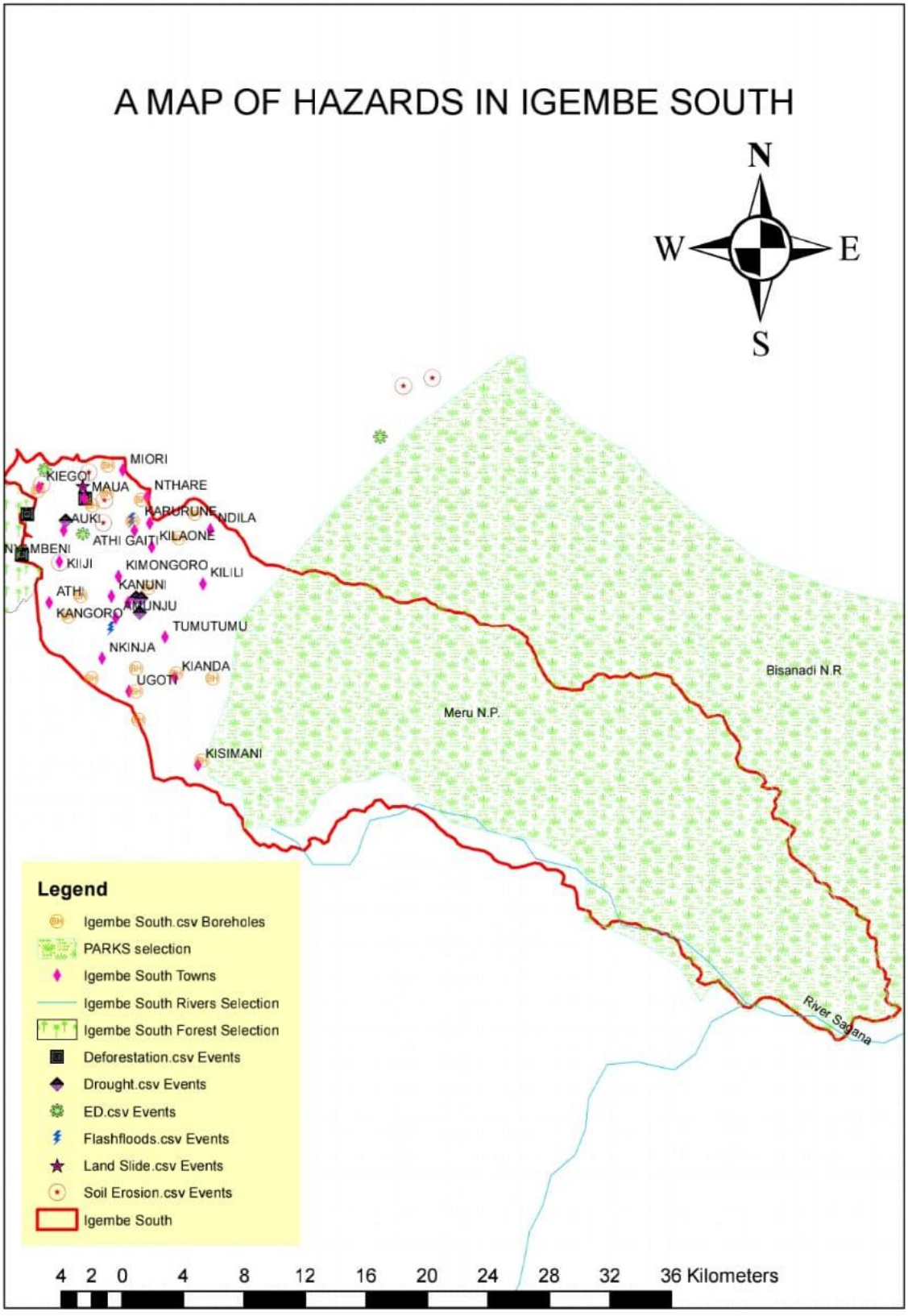
Igembe Central rivers selection
Igembe Central FORESTS selection
Soil erosion.csv Events
Floods.csv Events
Environmental degradation.csv Events
Drought.csv Events
Igembe Central.csv Boreholes
Igembe Central Towns
Igembe Central
5 2.5 0 5 10 15 20 25 30 35 40 45 Kilometers


A MAP OF HAZARDS IN IMENTI SOUTH
Legend
TOWNS selection
Imenti South rivers selection
Imenti South PARKS selection
Imenti South FORESTS selection
Imenti South.csv Borehole
Deforestation.csv Events
Drought.csv Events
Environmental Degradation.csv Events
Floods.csv Events
Landslides.csv Events
Quarry.csv Events
Soil Erosion.csv Events
Imenti South
N
W
E
S
KITHIRUNE
NKURIGA
NGANDO
URUKU
UKUU
MARIMBA
RUBIRI
KATHERA
NKUBU
NDAGENE
KIAMIGOGO
GAATIA
KAGURU
NDAMENE
KATHIRUNE
NGONGO
BARANGA
KIAMURIO
MITUNGUU
KARIENE
KIONYO
GANDENE
NTARENE
MUUTIOKIAMA
MURUNGURUNI
GUMPIRA
GATURI
RURU
MAARAMARAA
MUCOMONE
GUMPIRA
KARITHINE
MUCOGOMONE
KIRIRIA
THUNGURU HILL
KIRIRI
GETEINEGITINE
KIUNE
MWERU
KIROONE
KINORO
MUTUNGULU
MUTUKURU
IGOJI
IGOJI
KARIA
River Mutonga
Mt. Kenya N.P.
Mt. Kenya N R
MOUNT KENYA
River Chuka
5 2.5 0 5 10 15 20 25 30 35 40 45 Kilometers


A MAP OF HAZARDS IN TIGANIA EAST
N
W
E
S
KARAMA
MUTHARA
MURIRI
NYAMBENI
KARACHINE
KIBITHEWA
CHARURU
KAILUNE
MUCHUKURU
NYAMBENI
KIGOCHWA
AMUGAA
ANKAMIA
MIKINDURI
KIEIGA
AKAIGA
KAATHI
KUNATI
KAGNATATHUURI
NGONGO AKA
MURIKA
RURII
KARANTINAKARATINA
Legend
Tigania East.csv Boreholes
Tigania East Towns
Tigania East Forest Selection
Tigania East Major Roads
Deforestation.csv Events
Drought.csv Events
Environmental Degradation.csv Events
Floods.csv Events
Quarry.csv Events
Soil Erosion.csv Events
Wind Erosion.csv Events
Tigania East
3 1.5 0 3 6 9 12 15 18 21 24 27 Kilometers


A MAP OF HAZARDS IN IGEMBE SOUTH
N
W
E
S
MIORI
KIEGOI
MAUA
NTHARE
KARURUNE
NDILA
AUKI
ATHI GAITI
KILAONE
NYAMBENI
KIJI
KIMONGORO
KILILI
KANUNI
ATHI
KANGORO
AMUNJU
TUMUTUMU
NKINJA
KIANDA
UGOTI
KISIMANI
Meru N.P.
Bisanadi N.R
River Sadana
Legend
Igembe South.csv Boreholes
PARKS selection
Igembe South Towns
Igembe South Rivers Selection
Igembe South Forest Selection
Deforestation.csv Events
Drought.csv Events
ED.csv Events
Flashfloods.csv Events
Land Slide.csv Events
Soil Erosion.csv Events
Igembe South
4 2 0 4 8 12 16 20 24 28 32 36 Kilometers

ANNEX III: PCRA MULTI-STAKEHOLDER WORKSHOP PARTICIPANTS

SNO	NAME	DESIGNATION	ORGANIZATON	TEL. NO
1	RUTH KAWIRA	CEO	NETCARE	720135502
2	DAISY MAINA		NEMA	796252729
3	JAMES KANYI		KPCG	729037817
4	MILKA MUSYOKI		NATURE KENYA	720703213
5	CHARLENE WANDELA		MT. KENYA TRUST	726228333
6	BEN MWANGI		KFS	728101241
7	JOHN NGALIA		KWS	727565053
8	PATRICK MWIRIGI		MERU WRUAS	725321299
9	ZIPPORAH MATUMBI		CFA	725664059
10	DANIEL KARANJA		EDEN RESTORATION	718034897
11	MORIS KIRIMI	DIRECTOR	CARITAS	721355650
12	NURO A GODANA		NDMA	720488916
13	JUSTIN MURIITHI		MET	735809085
14	JOHN KINOTI		LEWA DOWNS	721661072
15	EVANS KIOGORA		MEDIA COUNCIL	724777404
16	KANANA NTEERE	CHAIRLADY	MAENDELEO YA WANAWAKE	724555501
17	REUBEN MUTHINJA		WRA	720987608
18	MOHAMMED SALIM		SUPKEM	722261889
19	RAMJI VENOD		CHAMBER OF COMMERCE	722872314
20	STEPHEN MWORIA	CHAIRMAN	NJURI NCHEKE IMENTI	727515101
21	JOSEPH MURIUNGI	CHAIRMAN	NJURI NCHEKE TIGANIA	721348160
22	FRANCIS GITIYE	MEMBER	NJURI NCHEKE	714015567
23	PATRICK M'ACIETA	CHAIRMAN/PWD	NJURI NCHEKE IMENTI NORTH	727473260
24	DR. ESTHER MBAABU		KEMU	722552530
25	JOSHUA THAMBURA		MUST	722351312

26	ONESMUS KIRUI		MUST	724716912
27	DR. MUCHIRI		KEMU	705269086
28	MWENDA ITHANA	CECM	EDUCATION,GENDER,CULTURE	
29	MONICA KATHONO	CECM	FINANCE	
30	JACKSON MUTHAMIA	CECM	WATER,ENVIRONMENT&C C	724644798
31	GEORGE MUNGANIA	CECM	HEALTH	727326193
32	ANGELO GITONGA	DIRECTOR	WATER,ENVIRONMENT&C C	725851659
33	PAUL MWITI MBAE		YOUTH REP	726238935
34	FRANCIS MITHIKA		PRIVATE SECTOR	710411523
35	DENNIS MURIIRA	DIRECTOR	YOUTH REP	726683155
36	JANICE KAGENI IKIANYA	DIRECTOR	SOCIAL SAFEGUARDS	712443788
37	JOYCE KAGWIRIA	CCU	ENV OFFICER NORTH IMENTI	724986029
38	RITA MURUNGI	CCU	ENVIRONMENTAL SAFEGUARDS	722556168
39	EVELYN KAIMENYI	CCU	GRM	721946210
40	PURITY NKATHA	CCU	ADMIN	726789268
41	KELVIN MUNENE	CCU	COMMUNICATION	743165896
42	NELLY GATWIRI	CCU	GIS	729533089
43	GEORGE MWENDA	CCU	DATA ANALYST	710613012
44	JAMES KOOME	CCU	ACCOUNTANT	725875748
45	BONFACE MIRITI	CCU	M&E	700676970
46	STANLEY KIUNGA	CCU	ENV OFFICER IMENTI CENTRAL	103593678
47	FLORENCE GAKII	CCU	ENV OFFICER TIGANIA EAST	729948911
48	ELLYJOY MUKOMUNENE	CCU	ENV IGEMBE SOUTH	719831756
49	FRANK KOOME	CCU	ENV IGEMBE CENTRAL	706948166
50	MISHECK THIRARI	CCU	ENV IGEMBE NORTH	714643420
51	ELIJAH KOBIA	CCU	NATURAL RESOURCES	727663486
52	ALEX GUANTAI	CCU	BUURI EAST	727546720

53	PURITY WANJA	CCU	TIGANIA WEST	729746547
54	EDITH MUKAMI		SIGN LANGUAGE INTERPRATOR	721416001
55	ADIEL MURITHI	PWD	MEMBER	713072205
56	BEATRICE KIMATHI	PWD	BOARD MEMBER	720215416
57	DOREEN MWENDWA	PWD	MEMBER	708403202
58	THOMAS KITHINJI	PWD	MEMBER	725705765
59	ISAIAH NKUMBUKU	PWD	MEMBER	728739121
60	REV. SOLOMON GITONGA	PWD	ADAP KENYA	111899056
61	MOSES KIMSON		MUYOFO	758166721
62	ATHANASIO KOBIA	PWD	GREEN CHAMPION MPOROKO PWD	726161393
63	KEN MATIBA		GREEN CHAMPION THANGATHA	795895836
64	NATHAN MUTABARI		CGM	723422309
65	ISAAC KIOME		GREEN CHAMPION	720876538
66	KARANI MWENDA		GREEN CHAMPION	719414569
67	LINUS KAIYONGI		KARAMA CBO	728260360
68	SHADRACK GITONGA		SALI CBO	726981055
69	JUSTUS MWINZI		GREEN CHAMP ATHIRU	700694966
70	RASHID O. WAZIR		SUPKEM	726882404
71	ACHIKU DANIEL		GREEN CHAMP MUTHARA	718331339
72	SELINA KITHINJI		ALF	728526603
73	FRANCIS MUTHWA		GREEN CHAMP IGEMMBE .C	710411523
74	PATRICK MURITHI		NETCARE	716208082
75	NICHOLUS MUREGA		GREEN CHAMP/YOUTH NYAKI WEST	745771972
76	WALTER M MUTWIWA		NETCARE	712557212
77	JOHN MAGAJU		GREEN CHAMP MUNICIPALITY	720881033
78	KOBIA JULIUS		GREEN CHAMP IGEMBE C	723890703
79	TITUS MURITHI		FCPS	700773545

80	MARTHA K MUGUNA		NETCARE	712093663
81	JOHN KIRERIA		GREEN CHAMPION	725705765
82	HENRY KINYUA		NCFA	727080158
83	JAMLICK THARAMBA		NETCARE	713224952
84	PHYLLIS MURUNGI		GREEN CHAMPION	721526445
85	DAVID GIKUNDA		MWERU CFA	724087450
86	MARY KIRIMA		FORK	711655074
87	NANG GACHERI		KFS	702671417
88	DORCAS MAKENA		CIFORD KENYA	724625264
89	NAMAN MUKARIA		MAUA DEAF COMMUNITY	713778325
90	ELIAS MWIRIGI		KFS	720251818
91	MARTIN MWIRIGI		GREEN CHAMPION	704728283
92	JOHN MBAABU		KAMULU CFA	721335522
93	MUKUCHA JOSHUA		CGM	711572615
94	EDWARD GITONGA		GREEN CHAMPION IGEMBE NORTH	740066301
95	BRIAN THURANIRA		KFS	725661503
96	MARGARET MUGURE		KFS	729262861
97	LONAH KAGENDO		CGM-ENV	798449371
98	ERIC GIKUNDA		CGM	724757880
99	KEN KIRIMA		CGM	703445495
100	DANIEL KITHIA		GREEN CHAMPION	725238447