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MINISTRY OF GENDER, CULTURE, THE ARTS AND HERITAGE

STATE DEPARTMENT FOR GENDER AND AFFIRMATIVE ACTION

Granular Gender and Climate Change Vulnerability Hotspot Mapping for Decision Support in Kenya

March, 2025

AGNES
African Group of Negotiators Experts Support

KENYA VISION 2030

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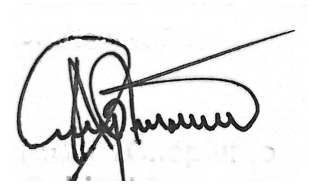
FOREWORD

Kenya is has made tremendous steps in development of gender responsive legislation and policies on climate action in line with the Constitution of Kenya. The Kenya National Adaptation Plan (NAP) and Nationally Determined Contributions (NDCs) also identify gender as a cross-cutting policy priority and commit to mainstreaming gender in sectoral climate change adaptation and mitigation actions. Despite the gender-differentiated impacts of climate change and policy initiation, the full impact of integration of gender equality into climate action is yet to be realized. Considering that climate change exacerbates existing social and gender inequalities, there is a need for a new transformative approach to increase men, boys, women and girls' capabilities and opportunities to boost their productivity and participation with increased adaptive capacity to climate change in Kenya.

Increasing climate risks pose serious threats to achieving Kenya's sustainable development goals and returns on investment in various climate-sensitive sectors such as agriculture, water, and energy. Kenya's updated Nationally Determined Contribution (NDC 2020) indicates that the country loses 3-4 % of the Gross Domestic Product (GDP) annually due to adverse effects of climate change. This hinders the country's overall development efforts. Climate change in Kenya is related to increased temperatures, changes in rainfall patterns, and prolonged dry seasons. In recent decades, the country has observed high frequency and severity of droughts, floods, heat/cold waves, and incidences of pests and diseases. Among the key sectors impacted by increasing climate risks in Kenya are agriculture, water, and energy due to their heavy reliance on the natural environment. These sectors directly impact on critical gender roles and responsibilities.

The focus of the gender and climate vulnerability assessment is to provide information, views and experiences necessary for strengthening gender considerations in adaptation and mitigation in Kenya. The findings are therefore useful in development and implementation of gender responsive climate action in the targeted sectors and beyond. The Government of Kenya is committed to implement the recommendation of this report in collaboration with all the stakeholders.



Hanna Cheptumo
Cabinet Secretary
Ministry of Gender, Culture, the Arts and Heritage

PREFACE AND ACKNOWLEDGEMENTS

The State Department for Gender and Affirmative Action is mandated to promote gender equality and empowerment of all women and girls. The understanding of the nexus between gender and climate change is very crucial in undertaking gender mainstreaming function as envisaged in Executive Order No. 2 of 2023. Gender is a critical factor in understanding vulnerability to climate change for mitigation and adaptation planning in Kenya.

This report was developed through a participatory process from initiation, development and validation by both internal and external stakeholders. The process involved constitution of a multi-stakeholder technical working committee comprised of state and non-state actors. Prior to the study, a national launch of the study exercise was undertaken in order to sensitize and gain initial insights from relevant stakeholders.

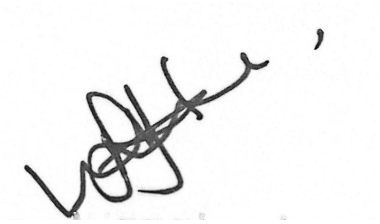
This study utilized a vulnerability assessment framework that was adopted by Intergovernmental Panel on Climate Change (IPCC) to identify gender and climate change hotspot areas in agriculture, energy and water sectors for decision sector in Kenya. Additionally, ground truthing through key informant interviews and focus group discussions was done in order to validate the hotspots generated. The results, therefore, indicate hotspot regions that need immediate action for climate change adaptation. The implementation of the study findings will require concerted efforts by all stakeholders.

The State Department for Gender and Affirmative Action appreciates the Cabinet Secretary-Ministry of Gender, Culture, The Arts and Heritage for providing strategic direction and leadership in the development of this report. I acknowledge the Head of Departments and all the entire staff for their dedication and commitments towards development of the report. Special recognition is extended to the Technical Working Committee under the leadership of Ms. Jackline Makokha- Director, Gender and UNFCCC focal point for Kenya.

The State Department for Gender and Affirmative Action acknowledges all external partners for their valuable support. We appreciate, the Ministry of Environment, Forestry and Climate Change; Ministry of Agriculture; Ministry of Water and Sanitation; Ministry of Energy; Kenya National Bureau of Statistics and Council of Governors. In special way, we appreciate, the African Group

of Negotiators Expert Support (AGNES) for their technical and financial support in the development of this report.

Finally, I wish to call upon all stakeholders for a collaborative approach towards implementation of the study recommendations.



Anne Wang'ombe
Principal Secretary
State Department for Gender and Affirmative Action

ABBREVIATIONS AND ACRONYMS

AGNES	African Group of Negotiators Expert Support
CC	Climate Change
CVI	Composite Vulnerability Index
FLLoCA	Finally Locally-Led Climate Action Program
GDP	Gross Domestic Product
GGI	Gender Gap Index
GHG	Green House Gas
HDI	Human Development Index
ICT	Information, Communication and Technology
IPCC	Intergovernmental Panel on Climate Change
KCSAS	Kenya Climate Smart Agriculture Strategy (2017-2026)
KNBS	Kenya National Bureau of Statistics
LPG	Liquefied Petroleum Gas
MTP	Medium Term Plan
MW	Mega Watts
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan (2018-2022)
NDCs	Nationally Determined Contributions
PCA	Principal Component Analysis
SDGAA	State Department for Gender and Affirmative Action
SDGs	Sustainable Development Goals
UNFCCC	United Nations Framework Convention on Climate Change

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Chapter 1: Introduction

1.1. Background

The contextualization of Kenya's geographical and demographic landscape is vital in understanding gender and climate change vulnerabilities. The country has a total land area of 582,646 km^2 including water bodies (11,227 km^2), agricultural lands (277,100 km^2), and forest areas (36,111 km^2). Its natural heritage is globally recognized for its rich biodiversity and iconic landscapes. The country has unique ecosystems, ranging from mountains, forests, rangelands, arid lands, croplands, and urban areas to marine and inland waters. Kenya's geography and climate vary widely, ranging from cold temperatures in mountains and highlands with vast surrounding forests, wildlife, and fertile agricultural lands to temperate climates in western and rift valley counties. The arid and semi-arid lands account for 80% of the Kenya's land area.

Kenya's population is 47.6 million as per the 2019 Kenya Population and Housing Census. The percentage of the female population is 50.45 % compared to 49.55 % male population. The population is projected to grow to 53.3 million by 2025 at the population growth rate of 2.0%. Gender disparities in Kenya are noted through indicators that include adult literacy rate, school enrollment at all levels and labour force participation. The major sectors by employment in Kenya are manufacturing, followed by agriculture, wholesale/retail, construction, and education sectors. These sectors directly or indirectly depend on rain fed agriculture, water, and energy resources. The country's manufacturing, energy, and financial service sectors are also rapidly growing. In 2022, the share of agriculture in Kenya's gross domestic product was 21%, the industry contributed approximately 18% and the services sector contributed about 55%. The high dependence on climate sensitive sectors such as agriculture exposes the country to vulnerabilities. These vulnerabilities are majorly driven by limited adaptive capacities, limited information and climatic risks (IPCC, 2007)

The identification of the drivers of gender inequality in vulnerability to climate change is important in informing policy interventions to address both climate change and gender inequalities. This will ensure that development and implementation of climate change policies, action plans and strategies does not create further gender and social inequalities.

1.2. Objectives of Hotspot Mapping

The main objective of this study is to identify gender and climate change vulnerability hotspot areas in agriculture, energy and water sectors for decision support in Kenya. The specific objectives of the study are to:

i. Identify gender and climate change hotspot counties in agriculture, water and energy sectors.
ii. Assess the vulnerability of various counties to climate change.
iii. Understand the gendered impacts of climate change in various counties.

1.3. Rationale of gender-climate change hotspot mapping

Adapting to climate change is about reducing vulnerability to current and projected climate risk while vulnerability to climate change is determined in large part by people's adaptive capacity. Climate hazards do not affect all people within a community or even the same household equally because some people have greater capacity than others to manage the crisis. The inequitable distribution of rights, resources, power, and norms constrains many people's ability to act on climate change. This is especially true for women and vulnerable groups. Therefore, gender is a critical factor in understanding vulnerability to climate change. The focus of this assessment is to provide views and experiences on strengthening gender considerations in adaptation planning and implementation in Kenya. It draws on the experiences gained from the national adaptation programs and other initiatives, to inform future adaptation efforts. This assessment discusses gender in the context of adaptation to climate change, presents sample tools for integrating gender into adaptation planning and implementation, provides experiences in the integration of gender into adaptation planning and implementation.

1.4. Scope of the study

The scope of this study was at national level with analysis done for all the counties. The study focussed on the nexus between gender and climate change in agriculture, water and energy sectors.

1.5. Study Approach

The study approach was largely participatory and involved the input of diverse stakeholders. The steps taken involved included: Preliminary meeting and constitution of the study team; Introductory training on hotspot mapping; and national launch of the study exercise.

Chapter 2: Situation Analysis

2.0. Introduction

This chapter presents an overview of the agriculture, water and energy sectors in Kenya. It also presents the nexus between gender and climate change in the sectors. Further, the chapter covers policy and institutional frameworks for climate change in Kenya.

2.1. Overview of agriculture, water and energy sectors in Kenya

2.1.1. Agriculture Sector

The agricultural sector is the backbone of the Kenya's economy, contributing 21% of the Gross Domestic Product (GDP). The sector employs more than 40% of the total population and 70% of the rural population. It accounts for 65% of the export earnings and provides the livelihood (employment, income, and food security needs) for more than 80% of the Kenyan population. The main agricultural products in Kenya include maize, sugarcane, tea, coffee, and fruits. Maize and sugarcane are mostly grown for the domestic markets while tea, coffee, and horticulture are mainly grown for exports. The sector also drives the non-agricultural economy including manufacturing, providing inputs and markets for non-agricultural operations such as building/construction, transportation, tourism, education, and other social services.

The country's entire agricultural sector depends on the bimodal rainy season and 80% of the country is arid and semi-arid with an average annual rainfall of 400 mm. The Economic Survey (2023), reported a deceleration in the growth of the agriculture sector from -0.4% in 2021 to a further contraction of 1.6% in 2022, following prolonged drought conditions that led to a reduction in both crop and livestock production. Smallholder farmers and agricultural enterprises continue to face challenges in growing their businesses and improving the quality of agricultural goods. In addition, the expansion of agriculture into arid lands has affected the dynamics of pastoralism and escalated conflicts over natural resource use in some areas.

Given the importance of agriculture in rural areas of Kenya where poverty is high, the development of this sector can significantly contribute to food security management and poverty alleviation. Strengthening and improving the performance of the agricultural sector is therefore a necessary condition for achieving strong growth in Kenya's economy after recent years of drought and slow development.

2.1.2. Water Sector

Kenya's water resources mainly rely on little and fragile catchments covered by the montane forests in the country's highland areas with a humid climate. The main five water towers include Mt. Elgon, Cherangani Hills, Mau Forest Complex, Aberdare Ranges, and Mt. Kenya. They are the main sources of many rivers in Kenya, feeding into major lakes, including Lake Victoria, Lake Nakuru, Lake Naivasha, Lake Baringo, and Lake Turkana. The water resources are unevenly distributed, both across and within the country, and the catchments contribute to over 75% of the nation's surface water resources. In addition, 33% of Kenya's water resources come from outside the country.

The rapid growth of Kenya's population and rapid urbanization of the rural areas is increasing water demand for domestic, industrial, and agricultural uses. Water is also a major resource for hydropower production in Kenya. Kenyans are annually consuming about 33 billion m^3, of which their total renewable water resources only amount to 30.7 billion m^3, this results in a difference of 2.7 m^3. In addition to rapid population growth, water scarcity has been a major issue caused mainly by years of recurrent droughts, poor management of water supply, and contamination of the available water. The water demand is expected to increase rapidly in the future due to economic activity, population growth, and climate change.

2.1.3. Energy Sector

The Fourth Medium Plan of the Kenya Vision 2030 identifies energy as a key driver of economic growth under the infrastructure sector. The aim is to promote the development of energy generation and distribution by increasing investments in green energy (geothermal, wind, solar and hydro). This has been necessitated by increased energy demand due to increasing economic activities and population growth. According to the 2024 Economic Survey in Kenya, electricity demand increased by 12% between the year 2019 and 2022.

The main sources of energy in Kenya are renewable energy and fossil fuels. Renewable sources account for 89.6% of local electricity production in 2023. Geothermal generation remained the main source of electricity generation, contributing 48.2% of the total local electricity generated, followed by hydro generation at 21.3%, and wind generation at 16.1%. Thermal oil was the only source of non-renewable energy source in 2023, contributing 10.4% to the total local electricity generation (2024 Economic Survey).

Kenya's access to electricity connectivity has increased significantly in the last 20 years, with 75% of the population having access. This is the highest rate of electricity access in East Africa and one of the fastest increases in sub-

Saharan Africa. This increasing access to energy is helping to create new income-generating opportunities in agriculture, manufacturing, and service sectors. However, 25% of Kenyans still lack access, particularly in rural areas where the access rate is 65% compared to 100% in urban areas.

2.2. Nexus between Gender and Climate Change in Agriculture, Water and Energy Sectors

This section presents the nexus between gender and climate change in agriculture, water and enough sectors. These are the key sectors impacted by increasing climate risks in Kenya (USAID, 2018). The nexus approach focuses on integrating and addressing the intersections between these areas to enhance overall sustainability, equity, and resilience.

2.2.1. Nexus between Gender and Climate Change in Agriculture Sector

The agricultural sector plays a critical role in both economic development and poverty reduction by supporting livelihoods. The sector employs over 40% of the total population of Kenya of which 75% are women as compared to 51% of men (World Bank, 2019). Despite the importance of the agricultural sector, it is more sensitive to climate change due to unpredictable weather patterns and frequent occurrence of floods and droughts that lead to low agricultural productivity, land degradation, and conflict. Furthermore, such climate uncertainties can result to high risks to agro-based enterprises, low agro-based investments and low technology uptake for production and value addition. Kenya's updated Nationally Determined Contribution (NDC 2020), notes that progressive climate change impacts estimated losses of 3-4% of Gross Domestic Product (GDP) annually and hinders the country's overall development efforts.

Gender inequalities in the agriculture sector are some of the major factors affecting growth in the sector. Women continue to face challenges of less access to the means of production like land, finance, inputs, modern technologies, extension services, marketing and less participation in decision making on agricultural activities. The 2022 Kenya Demographic and Health Survey shows its only 3% of women in Kenya who own agricultural land alone. Interestingly, of all the women that own agricultural land, its only 13% of them that have their names on the title deeds. Land title deeds are the most common form of collateral required for agricultural credit by financial institutions and lack of it is a constraint to accessing credit.

Climate change worsens the adaptive capacity of women given the widening gender gaps in the agricultural sector. Moreover, when food availability is threatened by extreme weather events such as droughts and floods, the burden of sustaining the family falls disproportionately on women.

Women's inequality in agriculture makes them and their families more vulnerable to climate change and therefore, women must be a priority in both adaptation and mitigation strategies in the agricultural sector.

2.2.2. Nexus between Gender and Climate Change in Water Sector

Water is fundamental to life on earth and is essential for sustainable development. It is integral for socioeconomic development, food security, healthy ecosystems, and is critical in promotion of welfare and productivity of populations. Climate change is basically increasing variability in the water cycle that leads to reduced predictability of water availability and demand that threatens sustainable development globally. Adaptation actions in the water sector are integral to Kenya's response to climate change.

Access to clean and safe drinking water in Kenya stands at 60%. This translates to approximately 40% of Kenyans without access to clean and safe drinking water. In rural areas, 86% of people fetch water from springs, wells, boreholes and streams while only 14% have access to tap water. Climate change is altering the spatial and temporal availability of water resources in Kenya and has led to an increased scarcity of water resources. This makes resource management more difficult, affecting energy production and agricultural systems and increases the likelihood of conflict. Moreover, reduced water quality and quantity for domestic and industrial use can lead to high water pricing and increases in water borne diseases.

These impacts are especially felt in arid and semi-arid lands, which make up 80% of the Kenya's land mass. During the 2017/18 drought, Kenya's dominant rain-fed agriculture system left 3.4 million people severely food insecure and an estimated 500,000 people without access to water (NCCAP 2018-2022). Given their gender roles, women and girls have to travel long distances in search of water during water scarcity period.

In addition, they have to work harder to feed and take care of their families. This has a negative effect on women's time use on learning, social and cultural activities as compared to men. Women's inequality in access to resources such as land, education, credit and control over household income limit their ability to adapt to climate change water related impacts.

2.2.3. Nexus between Gender and Climate Change in Energy Sector

Kenya's energy sector heavily depends on hydropower and biomass (firewood and charcoal) which is also highly sensitive to climate change. Hydro production is substantially reduced in drought years, leading to persistent power outages and reliance on more expensive petroleum-based thermal generation (World Bank, 2019). On the other hand, the increased

frequency and intensity of heavy rainfall have led to flooding and landslides that damaged power plants, transmission, and distribution infrastructure (ACAPS,2024).

According to the 2022 KDHS, 75% of households in Kenya use unclean fuel for cooking, notably firewood, charcoal and paraffin at 55.2%, 11.6% and 7.8%, respectively. The use of firewood as cooking fuel is high in rural areas at 84.2%. In urban areas, 53% of households use LPG, 17.8% use charcoal and 17.7% use paraffin. In addition, the demand for firewood and charcoal has led to the depletion of preferred tree species and an increase in the impact of climate change.

The reliance on renewable energy sources like hydropower renders the energy sector sensitive to climate change. During periods of droughts, hydropower generation is affected resulting in increased use of diesel powered generators that leads to high electricity prices and increased emissions. The fluctuations in energy supply has a bearing on the adaptive capacity of communities given it can affect livelihoods and income generating activities.

Access to energy is vital in meeting both practical gender needs of women like cooking, food production and collection of water as well as strategic gender needs like lighting for study, safety and powering business enterprises. According to the 2021 Kenya Time Use Survey report, the participation rate of women in supplying water and fuel for own household or own final use stood at 27% compared to 8% for men. This is a clear indication that women spend more time and effort to supply fuel to households at expense of their health and safety. The use of unclean fuels exposes women and children who usually accompany them to increased risk for respiratory diseases. Furthermore, the inability of women to participate in decisions making restricts them from influencing allocation of sufficient resources towards transitions to clean fuels. Therefore, addressing the gender issues in the energy sector will not only advance gender equality but also address the drudgery associated with unpaid care and domestic work and provide women with time to engage in income generating opportunities and education.

2.3. Policy and Institutional Frameworks for Climate Change in Kenya

Kenya has established frameworks to address climate change. These include:

a) Constitution of Kenya

The Constitution of Kenya is deliberate in promotion of gender equality and empowerment of women in its various articles on equality and non-discrimination. The Constitution of Kenya is also very particular on

environmental issues which are articulated in Article 42, 43, 69, 70. It accords every person a right to a clean and healthy environment which should be protected for the benefit of present and future generations.

b) Climate Change Act, 2016

The Climate Change Act (No. 11 of 2016), now referred to as Climate Change (Amendment) Act 2023, is the first comprehensive legal framework for climate change governance in Kenya. The objective of the Act is to enhance climate change resilience and low carbon development for sustainable development of Kenya. It mandates the development of climate action plans, establishes the National Climate Change Action Plan (NCCAP), and provides for the establishment of various institutions that include National Climate Change Council, Climate Change Directorate and National Climate Fund.

c) Kenya Climate Smart Agriculture Strategy (2017-2026)

The Kenya Climate Smart Agriculture Strategy (KCSAS) focuses on increasing adaptation to climate change and building the resilience of agricultural systems while minimizing Green House Gas (GHG) emissions. KCSAS aims to achieve three main objectives: sustainably increase agricultural productivity and incomes; adapt and build resilience to climate change; and reduce and/or remove greenhouse gas emissions, where possible. Planned actions will lead to enhanced food and nutritional security, and improved livelihoods.

d) National Climate Change Action Plan (NCCAP) (2023-2027)

NCCAP 2023-2027 is a planning tool to implement Nationally Determined Contribution (NDC) measures aligned with the Kenya Vision 2030 and the Climate Change (Amendment) Act, 2023. It emphasizes sustainability while prioritizing adaptation and enhanced climate resilience for vulnerable groups that include women, Indigenous People and Persons with Disabilities. The Plan has prioritized climate change actions in Disaster Risk Management; Food and Nutrition Security; Water, Fisheries and Blue Economy; Forests, Wildlife and Tourism; Health, Sanitation and Human Settlements; Manufacturing; Energy and Transport; and, Children and Youth.

e) National Climate Change Response Strategy (2010)

Kenya's National Climate Change Response Strategy was the first national policy document on climate change. It sought to advance the integration of climate change adaptation and mitigation into all government planning, budgeting, and development objectives.

f) Climate Risk Management Framework

The Climate Risk Management Framework for Kenya integrates disaster risk reduction, climate change adaptation, and sustainable development so that they are pursued as mutually supportive rather than stand-alone goals. It promotes an integrated climate risk management approach as a central part of policy and planning at National and County levels.

g) Kenya's Nationally Determined Contributions

Kenya's NDC under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) includes mitigation and adaptation contributions. On adaptation, "Kenya will ensure enhanced resilience to climate change towards the attainment of Vision 2030, by mainstreaming climate change into Medium Term Plans (MTPs) and implementing adaptation actions." The mitigation contribution "seeks to abate Kenya's GHG emissions by 32% by 2030, relative to the business-as-usual scenario of 143 MtCO2eq."

h) National Adaptation Plan (NAP)

Kenya's National Adaptation Plan 2015-2030 (NAP) was submitted to the UNFCCC in 2017. NAP aims to consolidate the country's vision of adaptation supported by macro-level adaptation actions that relate with the economic sectors and county-level vulnerabilities to enhance long-term resilience and adaptive capacity. This NAP presents adaptation actions that cover the timeframe 2015- 2030. NAP is aligned to Vision 2030 in which climate change adaptation is represented in the drought risk management and ending drought emergencies, environment, water, energy, agriculture, livestock, and fisheries sectors.

i) National Climate Finance Policy

The National Climate Finance Policy promotes the establishment of legal, institutional, and reporting frameworks for access and management of climate finance. The goal of the policy is to further Kenya's national development goals through enhanced mobilization of climate finance that contributes to low carbon climate resilient development goals.

j) Green Economy Strategy and Implementation Plan (2016-2030)

This enables Kenya to attain a higher economic growth rate consistent with Vision 2030 which highlights the principle of sustainable development. It is designed to support a low-carbon development path by promoting economic resilience and resource efficiency. It targets multiple challenges including climate change and variability.

k) Vision 2030

This is the country's development blueprint from 2008 – 2030. The 2030 vision in Kenya aspires to improve the capacity for adaptation to global climate change. It covers all sectors including water, agriculture, and energy. The 2030 vision for water and sanitation is to ensure that improved water and sanitation are available and accessible for all. Kenya also desires to ensure energy services are accessible to its people with the promotion of resilient agricultural practices.

Chapter 3: Methodology

3.0. Introduction

This section discusses the approach adopted by the study, the variables and their measurements and data sources.

3.1. Theoretical Framework

This study utilized a vulnerability assessment framework that was adopted by the Intergovernmental Panel on Climate Change (IPCC) in its 3rd and 4th Assessment Reports. The IPCC emphasizes on a holistic approach to vulnerability assessment, considering the interactions between exposure, sensitivity, and adaptive capacity. These elements are essential for understanding how climate change impacts affect systems, communities, and regions differently. The formula is thus expressed as:

Vulnerability = Exposure + Sensitivity – Adaptive Capacity

High exposure and sensitivity, coupled with low adaptive capacity, result in greater vulnerability. Conversely, strong adaptive capacity can mitigate vulnerability even in the face of high exposure and sensitivity. The components of the formula are explained as:

Vulnerability: Vulnerability is the intersection of exposure, sensitivity, and adaptive capacity. It represents the degree to which a system, community, or region is susceptible to suffering harm from climate change impacts. Vulnerability assessments integrate these components to quantify and understand the potential risks and impacts of climate change on different sectors and populations. Vulnerability can vary widely across regions and sectors, influenced by socio-economic inequalities, environmental conditions, governance effectiveness, and other factors.

Exposure: This component measures the extent to which the system is exposed to climate-related hazards and stresses, such as extreme weather events (e.g., hurricanes, droughts), sea-level rise, and temperature increases.

Sensitivity: Refers to the system's susceptibility to these climate change impacts. It considers the inherent characteristics of the system, including its physical, biological, and socio-economic aspects that make it more or less vulnerable to harm.

Adaptive Capacity: Represents the system's ability to respond, adapt, and recover from the impacts of climate change. It includes factors such as technological resources, institutional frameworks, financial capabilities, human

resources, and social capital that enable the system to cope with and adapt to changing conditions.

3.2. Empirical Model

An empirical model of vulnerability assessment in climate change was developed to quantify and analyze the susceptibility of systems, communities, or regions to the impacts of climate change using empirical data and statistical techniques. The model was developed through the following structured approach:

3.2.1. Identification of study variables

The study variables were identified by the Technical Working Group composed of members from different Ministries (Ministry of Gender, Culture, The Arts and Heritage, Ministry of Environment, Climate Change and Forestry, Ministry of Agriculture and Livestock Development, Ministry of Water, Sanitation and Irrigation, Ministry of Energy and Petroleum), Kenya National Bureau of Statistics and African Group of Negotiators Expert Support (AGNES). The team played a critical role in selection of appropriate variables and identification of official data sources for the agriculture, water, and energy sectors. The study variables are presented in **Table 3.1, 3.2 and 3.3.**

3.2.2. Data Collection

Data was mainly sourced from relevant government ministries and Kenya National Bureau of Statistics. Additional data was obtained from credible national and international sources to fill the data gaps. The study used national level data that had been disaggregated by county in order to obtain vulnerability index for agriculture, water, and energy sectors per county. This exercise was conducted from May to July 2023 and periodic virtual progress meetings were held to refine variables and their data sources.

3.2.3. Data Analysis

Data analysis and hotspot map generation was conducted from June to August of 2023. The process comprised of creating sub-indexes for exposure, sensitivity, and adaptive capacity to create a composite index of gender and climate change vulnerability for each county. The approach entailed:

a) Exposure sub-index

Historical climate data (temperature and precipitation) collected by Kenya Meteorological Department from 1990 to 2022 are used to calculate county level change in temperature and precipitation over time, annual dry days, coefficient of variation in rainfall, and probability of drought and floods. All

these variables are relevant for climate risks in the agriculture, water, and energy sectors. The climate variables were weighted using the Principal Component Analysis (PCA) to create an exposure sub-index. The PCA considers the distribution of data (variability) and their relative contribution to the index. Climate variables used to create exposure sub-index are presented in **Table 3.1**

b) Sensitivity sub-index

Three separate sensitivity sub-indexes were created for each of the sectors as follows:

i. **Sensitivity sub-index for the agriculture sector:** The sub-index integrates six climate variables that include total agriculture area (crop and pastureland), agriculture land ownership by women, women's dependence on agriculture, agriculture gross domestic products, female population in agriculture, and climate change shocks experienced by female-headed households.
ii. **Sensitivity sub index for water sector:** The sub-index integrates six variables that includes water supply, water demand, access to safe water, water collection time, women in water collection, and women's awareness of climate change shocks.
iii. **Sensitivity sub-index for energy sector:** The sub-index integrates variables that include households' energy access, use of firewood, use of charcoal, biogas use by women, solar use by women, women population, women's access to energy, and total energy demand at the county level.

All the sensitivity variables for each sector were weighted using PCA to create respective sub-indices. A list of selected sensitivity variables for agriculture, water, and energy sectors with their relationship to climate change and data sources are presented in **Table 3.2.**

c) Adaptive capacity sub-index

The adaptive capacity sub-index integrates the variables that help to adjust to climate change conditions to moderate potential damages, to take advantage of opportunities generated by climate change, or to cope with the consequences. The variables used to create the adaptive capacity sub-index include gender gap in income, education and health, and households headed by women. All the adaptive variables for each sector were weighted using PCA to create respective sub-indices. A list of all the adaptive variables used for the agriculture, water, and energy sectors, their relationship with climate change adaptation, and data sources is presented in **Table 3.3**.

3.2.4. Composite Vulnerability Index

The composite vulnerability index for each sector is computed after derivation of the exposure sub-index, sensitivity sub-index and adaptive capacity sub-index for each county. We compute Composite Vulnerability Index (CVI) as:

Composite Vulnerability Index (CVI) = Exposure sub-index + Sensitivity sub-index - Adaptive Capacity sub-index.

The Composite Vulnerability Index for each county was utilized to generate the hotspot maps for analysis. The interpretation of the maps is based on a five level scale of very low, low, medium, high and very high, where "very low" indicates minimal vulnerability and "very high" indicates maximum vulnerability.

3.3. Validation of the Hotspot Maps

This assessment conducted an in-depth ground truthing on gender and climate change vulnerability in agriculture, water, and energy sectors in three counties. These three counties are Bungoma County (Kimaeti and Cheptais sub counties), Kitui County (Nguni and Endau sub counties), and Kajiado County (Kajiado Central sub county). The specific objectives for the ground truthing were to:

1) Validate the hotspot maps that revealed the three counties as highly vulnerable to the impacts of gender and climate change in the agriculture, energy, and water sectors.

2) Identify the most affected locations and communities in the counties.

3) Establish the nature and extent of vulnerability of different social groups to the impacts of climate change in the agriculture, water, and energy sector.

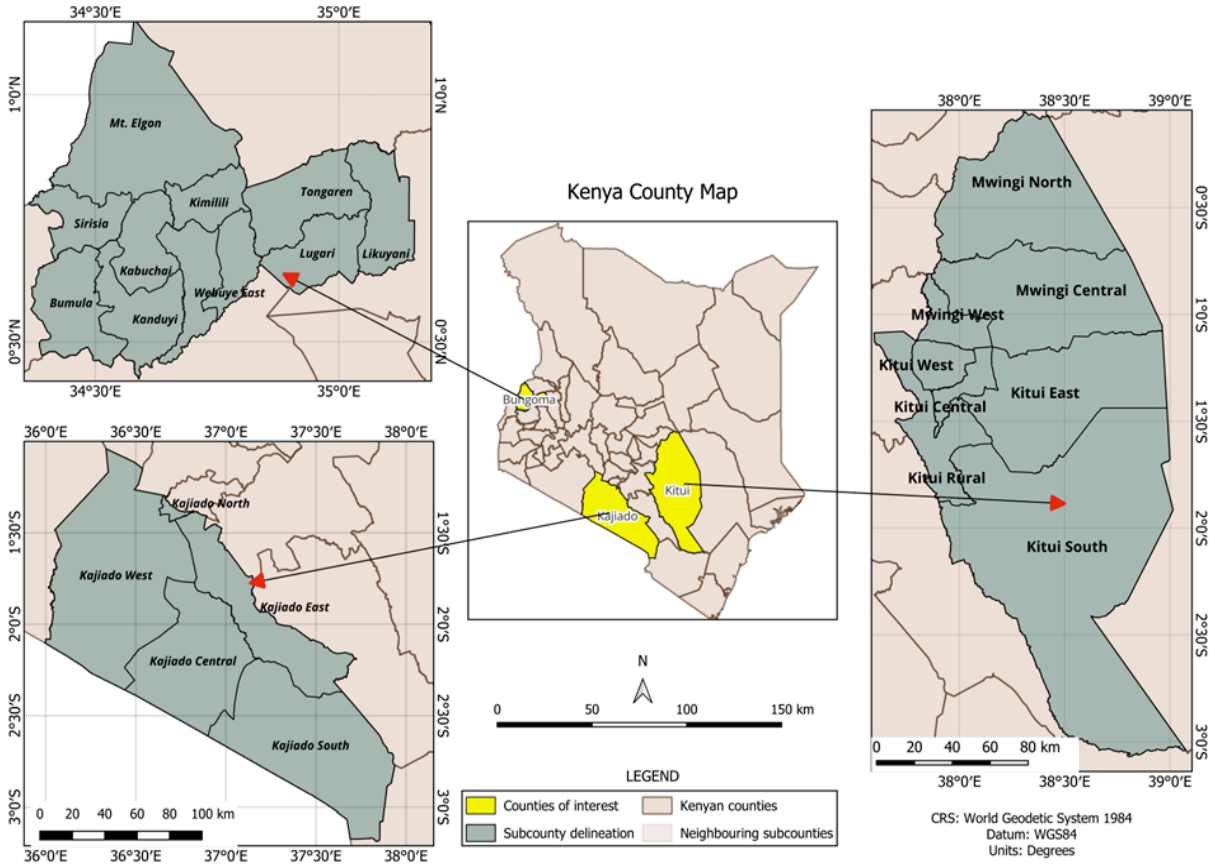

Figure 11: Map showing counties sampled for the ground truthing exercise

The process involved undertaking Key Informant Interviews, focus group discussions and also administering a mini survey to the respondent.

a) Key Informant Interviews

The Key Informant Interviews involved engagement with experts that included County Government officials from relevant departments and staff from civil society organizations engaged in climate change-related initiatives within the identified sub counties. The discussions sought to obtain, information on:

- Climate variability and trends over the past decade in the county.
- Availability and use of natural and environmental resources in the county
- Social economic status of households in the county
- Status and effects of climate change on agriculture, energy and water sectors in the county
- The nature and extent of vulnerability of the different social groups to the effects of climate change by sector.

- Formal and informal institutions working to transform gender inequalities related to climate change.
- Gender and climate change initiatives being implemented in the Sub county; their challenges and effective initiatives that may be scaled up.

b) Focus group discussions.

The selection of the groups and study locations within the counties was guided by information obtained from key informants interviews. The groups had 10 to 12 participants and they were disaggregated by sex, age, physical ability, and socio-economic status. The discussions were conducted in the following groups: A female only group; male only group; mixed youth group (18-35 years), special interest groups composed of persons with disability, the elderly, ethnic minorities, and indigenous people; and an additional group composed of local leaders, cultural leaders, opinion leaders, and representatives from religious institutions

The discussions sought to establish the following information:

- Use and management of resources
- Gender roles, responsibilities, workloads and time use
- Access to and control over assets, resources, services
- Climate risks and vulnerabilities
- Adaptive capacities and coping strategies and institutions

c) Mini-surveys

A mini-survey of largely closed-ended questions was administered to 100 participants at community level to validate the accuracy of the secondary data collected and check the reliability and validity of the exposure, sensitivity, adaptive capacity, and overall vulnerability indexes. The survey questionnaire was translated into local languages spoken in the respective hotspot locations for the benefit of some of the respondents who were not conversant with English, hence ensuring inclusivity. Participants who were not able to read and write were assisted by enumerators.

Table 3.1: Climate variables used to create exposure sub-index.

Climate Variable	Definition	Relationship with CC	Data Source
Average annual rainfall	Average annual rainfall 1990-2022	Indicates the level of water stresses	Kenya Meteorological Department
Average annual dry days	Average annual dry days 1990-2022	High number of dry days high climate risk	Kenya Meteorological Department
Coefficient of variation in rainfall	Change in average annual rainfall 1990-2022. CV = □/μ, where □ is the standard deviation and μ mean of annual rainfall between 1990-2022.	A high CV of rainfall indicates low rainfall predictability and uneven distribution of rainfall	Kenya Meteorological Department
The average change in mean temperature	Change in average annual temperature 1990-2022	Change in mean temperature increases heat or cold stresses	Kenya Meteorological Department
Weighted climate risk	Weight for climate variable based on variability. Principal Component Analysis was used to assign the weight for each variable	Integration of climate risk variables based on their weights. A high value indicates high climate risk	Kenya Meteorological Department

Table 3.2: Indicators for sensitivity used for agriculture, water, and energy sectors in Kenya

Variable Name	Definition	Relationship with CC	Data Source
Agriculture			
Agriculture area	The area under crop and grass/pasture lands	Agriculture is a climate-sensitive sector. More land under agriculture becomes more sensitive to climate risk	Kenya Sentinel 2 Land Use Land Cover data. Available here.
Agriculture land ownership by women	Women own agricultural land (based on legal status)	More % women own climate-sensitive sectors they become more sensitive to climate risk	Kenya National Bureau of Statistics, 2019 Census
Women dependent on agriculture	Women dependent on agriculture as a cultivator or laborers	More % of women dependent on agriculture makes them more sensitive to climate risk	Kenya National Bureau of Statistics, 2019 Census
Agriculture Gross Domestic Product	The total value of agriculture production (crop, livestock, and other products)	More GDP contribution from the agriculture sector become more sensitive to climate risk	Kenya National Bureau of Statistics, 2019 Census
Female population in agriculture	Total number of females in agriculture	More females in agriculture, many females become sensitive to	Kenya National Bureau of Statistics, 2019 Census

Variable Name	Definition	Relationship with CC	Data Source
		climate risk	
Climate change shocks by female households	Female households experience climate change shocks	More female households experience climate shocks indicate more females are sensitive to climate change	Kenya National Bureau of Statistics, 2019 Census
Water			
Water supply	The total amount of renewable freshwater available to a sub-basin includes surface flow, interflow, and groundwater recharge (cm/year).	The amount available water for different purposes (e.g. agriculture, domestic, and industrial uses) determines the level of water stress	Aqueduct (World Resources Institute). Available here.
Water demand	Gross demand is the maximum potential water required to meet sectoral demands. Sectoral water demand includes domestic, industrial, irrigation, and livestock (cm/year).	A high level of water demand indicates a high level of sensitivity to CC	Aqueduct (World Resources Institute). Available here.
Access to safe water	% of household access to safe drinking water	Households with low access to safe drinking water become more sensitive to climate change	Kenya Demographic and Health Survey 2022. Available here.
Water collection time	% of households that need 30 or more minutes to collect water	Households that spend more time on water collection become more sensitive to climate change	Kenya Demographic and Health Survey 2022. Available here.
Women in water collection	% of households where women were involved in water collection	The more women are involved in water collection more they become sensitive to climate change	Kenya Demographic and Health Survey 2022. Available here.
Women's awareness of climate change shocks	% of households where women are aware of climate change shocks	A high level of awareness of CC shocks indicates high women's sensitivity to CC	Kenya Demographic and Health Survey 2022. Available here.
Energy			
Energy access	% of households with access to energy supply	Households connected to energy supply become more sensitive to CC	Kenya National Bureau of Statistics, 2019 Census
Use of firewood	% of households using firewood for cooking and heating	Households using firewood become more sensitive to CC	Kenya National Bureau of Statistics, 2019 Census
Use of charcoal	% of households using charcoal for cooking	Households using charcoal become more sensitive to	Kenya National Bureau of Statistics,

Variable Name	Definition	Relationship with CC	Data Source
	and heating	CC	2019 Census
Biogas use by women	% of women-headed households using biogas	Households using biogas become less sensitive to CC	Kenya National Bureau of Statistics, 2019 Census
Solar use by women	% of women-headed households using solar	Households using solar become less sensitive to CC	Kenya National Bureau of Statistics, 2019 Census
Women population	Total women population	More number of women become sensitive in a location with a large women population	Kenya National Bureau of Statistics, 2019 Census
Women's access to energy	Total number of women having access to different sources of energy	The level of women's access to energy determines their sensitivity to CC	Kenya National Bureau of Statistics, 2019 Census
Energy demand	Estimated total energy demand by county based on population and different uses (domestic, public services, agriculture, and industrial uses)	Locations with high energy demand become more sensitive to climate change	Energy Access Explorer (open access geospatial platform)

Table 3.3: Adaptive capacity variables used for agriculture, water, and energy.

Variable Name	Definition	Relationship with CC	Data Source
Agriculture			
Gender income gap	The average income gap between men and women. The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	The low-income gap increases women's ability to invest in climate action as men do in agriculture.	Demographic and Health Survey, Global Data Lab
Gender education gap	The average education gap between men and women. The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	Low education gap increases women's awareness and adoption of climate-smart interventions	Demographic and Health Survey, Global Data Lab
Gender health gap	The health status gap between men and women. The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	The low health gap increases women's ability to adapt to climate change in agriculture	Demographic and Health Survey, Global Data Lab
Female access to finance	% of females have access to different sources of finance	High access to finance increases their ability to invest in climate adaptation in agriculture	Kenya National Bureau of Statistics, 2019 Census
Ag households'	% of agriculture households' access to different sources of	High access to ICT services increases	Kenya National Bureau of Statistics,

Variable Name	Definition	Relationship with CC	Data Source
access to ICT	ICT services (mobile, TV, radio, internet, etc)	agriculture households' ability to receive agro advisory services, climate, and market information	2019 Census
Ag households' access to the market	% of agriculture households' access to the market for agriculture inputs and outputs	High access to the market increases agricultural households' access to technologies and information	Kenya National Bureau of Statistics, 2019 Census
Ag households' female-headed	% of females manage households as household head	Increases females' decision-making power in climate change adaptation	Kenya National Bureau of Statistics, 2019 Census
Households' food security	% of food-secure households	Increases households' ability to invest in climate change adaptation interventions	Kenya National Bureau of Statistics, 2019 Census
Water			
Gender income gap	The average income gap between men and women. The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	The low-income gap increases women's ability to invest in climate action as men do in the water sector.	Demographic and Health Survey, Global Data Lab
Gender education gap	The average education gap between men and women. The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	Low education gap increases women's awareness and adoption of water-smart interventions	Demographic and Health Survey, Global Data Lab
Gender health gap	The health status gap between men and women. The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	The low health gap increases women's ability to adapt to climate change in water	Demographic and Health Survey, Global Data Lab
Female access to finance	% of females have access to different sources of finance	High access to finance increases their ability to invest in climate adaptation in the water sector	Kenya National Bureau of Statistics, 2019 Census
Female-headed households	% of females manage households as household head	Increases females' decision-making power in climate change adaptation in the household water supply	Kenya National Bureau of Statistics, 2019 Census
Forest land	Total forest lands in the county	Forest area increases ecosystem services and support adaptation in the water sector	Kenya Sentinel 2 Land Use Land Cover data. Available here.
Energy			
Gender income	The average income gap between men and women.	The low-income gap increases women's ability	Demographic and Health Survey,

Variable Name	Definition	Relationship with CC	Data Source
gap	The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	to invest in climate action as men do in the energy sector.	Global Data Lab
Gender education gap	The average education gap between men and women. The value ranges from 0-1, 0 represents high equality, and 1 indicates high inequality.	Low education gap increases women's awareness and adoption of energy-smart interventions	Demographic and Health Survey, Global Data Lab
Access to energy	% of households have access to energy supply	Connectivity to a reliable energy supply increases households' adaptive capacity	Kenya National Bureau of Statistics, 2019 Census
Poverty level	% of population under the poverty level	Low poverty level increases adaptive capacity to change in energy supply	Kenya National Bureau of Statistics, 2019 Census
Access to clean energy	% of households have access to clean energy (solar, biogas, etc)	Increases access to alternative sources of energy under climate change	Kenya National Bureau of Statistics, 2019 Census
Female-headed households	% of females manage households as household head	Increases females' decision-making power in climate change adaptation in the household energy supply	Kenya National Bureau of Statistics, 2019 Census
Energy supply	Energy supply infrastructure available by the county	Increase adaptive capacity with a high level of energy supply-related infrastructures	Energy Access Explorer (open access geospatial platform)

Chapter 4: Results and Discussion

a) Results of the Hotspot Mapping

4.1 Mapping Exposure to Climate Change

The results for the exposure for each county is presented in **Fig 1**. The figure shows that:

- Counties in the North Eastern (Mandera and Wajir) and Eastern (Isiolo and Marsabit) parts of Kenya are highly exposed to climate risks. These regions are largely arid and receives rainfall between 400-700 mm per year. Changes in rainfall amount, number of dry days, and coefficient of variation in annual rainfall indicate the level of water supply and stress in agriculture, water, and energy sectors. The temperature changes can have both direct and indirect impacts on the agriculture, water, and energy sectors. Normally, increasing temperature increases water demand and reduces water supply for agriculture, domestic and industrial uses.

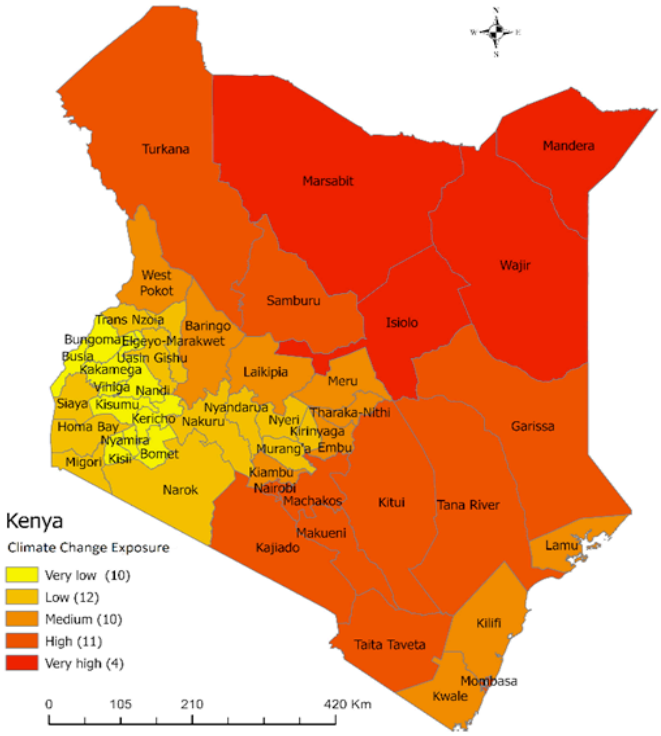

Fig 1: Combined climate risk map of Kenya

- Counties in the western part of Kenya have low and very low climate exposure risk. They are thus cold spots.

- The coefficient of variation in annual rainfall contribute the most weight in determining exposure risk at 34.4%, followed by average annual dry days at 33.9%. The weight for average annual rainfall is 31% and the change in average temperature is 1%. The average temperature change across the counties is insignificant in determining exposure risk. (PCA results presented in Annex 14)

This spatial distribution of climate exposure across Kenya shows hotspot counties that need immediate actions for climate change adaptation.

4.2 Mapping Sensitivity to Climate Change

County-level agriculture, water, and energy sector sensitivity to climate risks exposure mapping for Kenya is presented in Figs 2, 3, and 4.

4.2.1. Mapping sensitivity to climate change in agriculture sector

The results for sensitivity to climate change in agriculture sector is presented in **Fig 2**. The figure shows that:

- Counties with very high sensitivity in agriculture sector are Meru, Nyamira, Kakamega, Bungoma, Nandi and Kisii. These counties have high levels of agricultural land and women's participation in agricultural-related activities is also high.

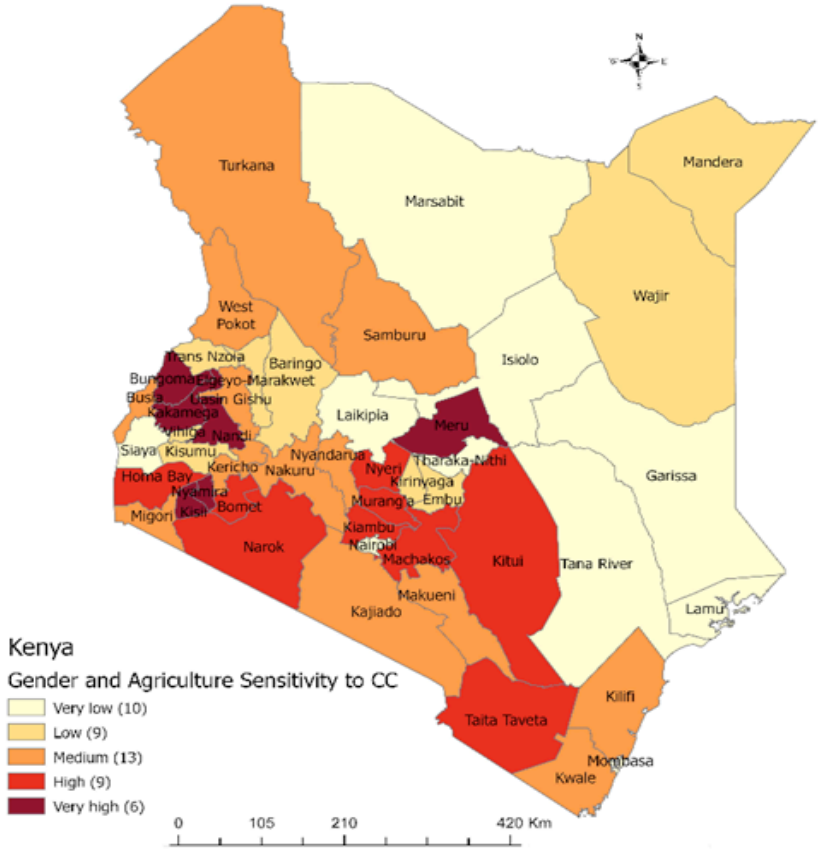

Fig 2: Agriculture and gender sensitivity to climate change

- The PCA[1] results indicates that the agriculture and gender sensitivity sub-index is largely influenced by women's participation in agriculture (53.4%) and agriculture's contribution to GDP from the county (27.7%). These are followed by land ownership by women (22.2%), area under agriculture (11.2%) and Female households experience climate change shocks (3.5%).

[1] Principal Component Analysis that helps to distribute the weight based on distribution of data.

4.2.3 Mapping sensitivity to climate change for water sector

- The sensitivity of the water sector is very high in the counties located in the Rift Valley and Eastern parts of Kenya. A decrease in water supply, increase in water demand, low access to safe water, and high level of women participation in water collection make those counties high to very high sensitive to climatic risk.

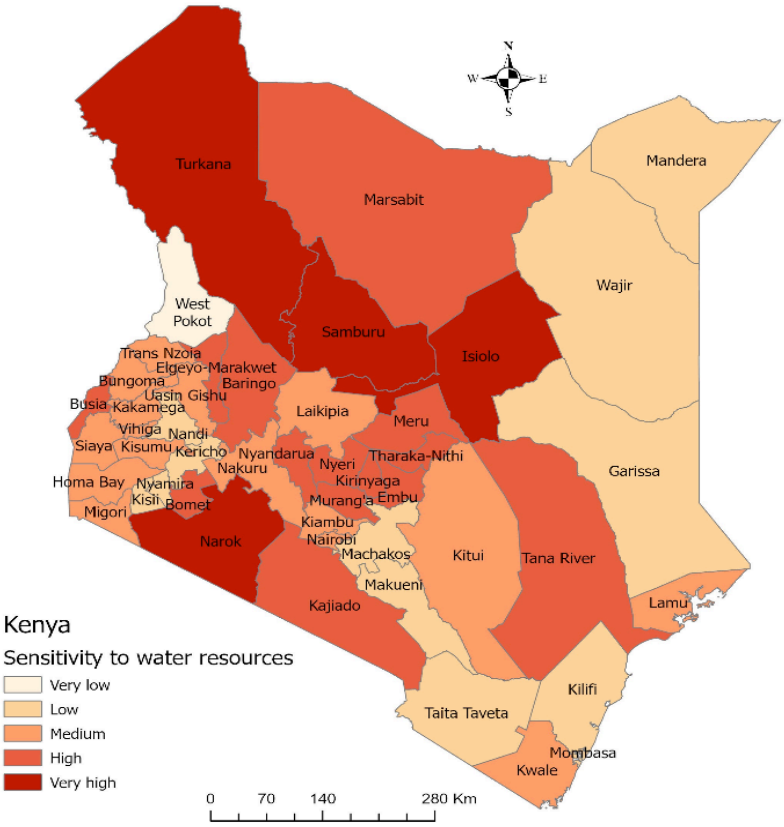

Fig 3: Water and gender sensitivity to climate change

- Among these variables, water demand (23.2%), access to safe water (21.2%), and household water collection time (18.7%) have a large effect on the water and gender sensitivity sub-index.

4.2.3. Mapping sensitivity to climate change for energy sector

- Highly sensitive counties for energy and gender are Nairobi, Kiambu, Nakuru, and Kakamega where both energy demand and women's population are high compared to other counties. In these counties, the use of charcoal is high. The use of firewood is relatively high in the North Eastern counties (e.g. Marsabit, Mandera, and Wajir) but overall energy demand is low.

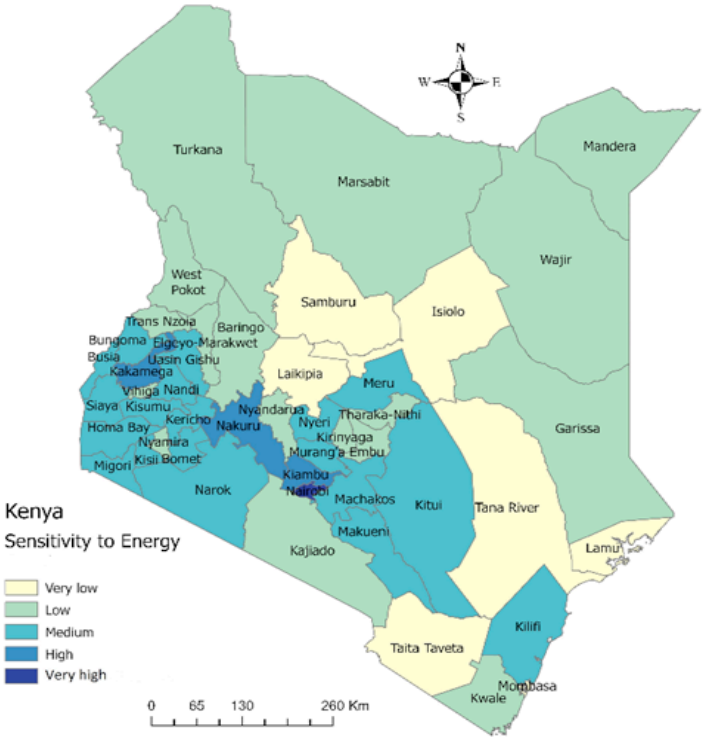

Fig 4: Energy and gender sensitivity to climate change

- The PCA analysis indicates that the energy and gender sensitivity sub-index is largely influenced by total energy demand (24.4%), dependency on firewood for household energy supply (18.4%), Household connectivity with the energy supply system (15.9%) and women's access to energy (15.2%).

Table 4: Top 10 high-sensitive counties to climate risk

Rank	Agriculture	Water	Energy
1	Meru	Turkana	Nairobi
2	Nyamira	Narok	Kiambu
3	Kakamega	Samburu	Nakuru
4	Bungoma	Isiolo	Kakamega
5	Nandi	Baringo	Bungoma
6	Kisii	Elgeyo-Marakwet	Machakos
7	Muranga	Marsabit	Meru
8	Kitui	Kajiado	Kisli
9	Machakos	Muranga	Muranga
10	HomaBay	Nyeri	Bomet

4.3 Mapping Adaptive Capacity to Climate Change

County-level agriculture, water, and energy sectors adaptive capacity to climate risk mapping is presented in Fig 5, 6, and 7.

4.3.1. Mapping Adaptive Capacity to Climate Change in agriculture sector

- The agriculture sector's adaptive capacity to climate change is very high in Kiambu, Nyeri, and Kirinyaga countries (Fig 5). Low gender gap in income, education, and health; agricultural households' high access to ICT services, finance, and markets; and the level of food security is also high compared to other countries.

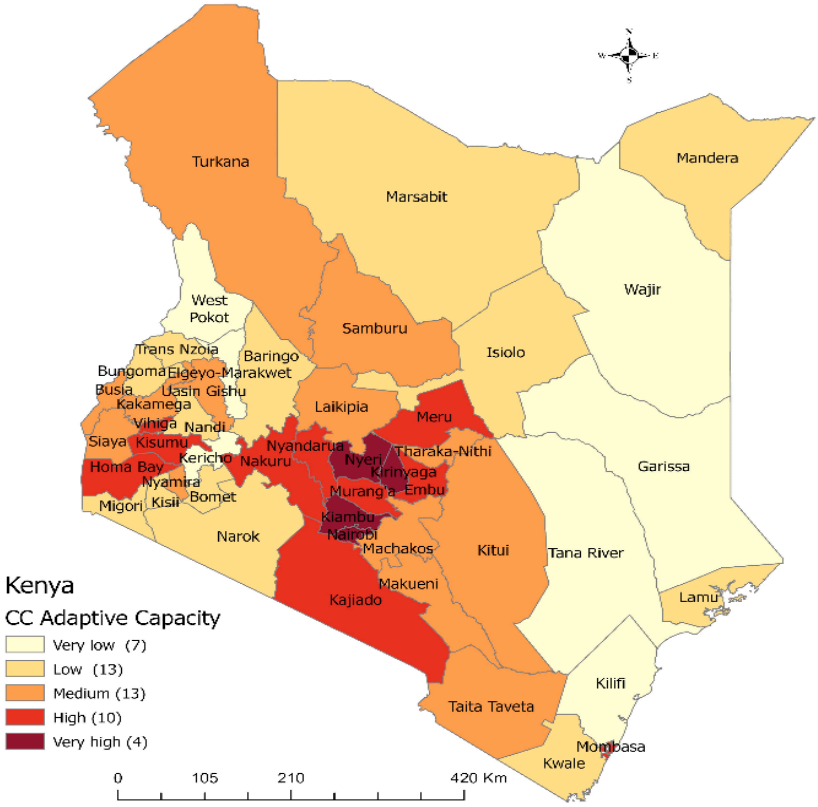

Fig 5: Agriculture and gender adaptive capacity to climate change

- Counties with very low adaptive capacity to climate change are Wajir, Garissa, Tana River, Kilifi, Kericho, Marakwet, and West Pokot.

- The PCA analysis indicates that the agriculture and gender adaptive capacity sub-index is largely influenced by agriculture households' access to ICT services (20.7%0, gender gap in education (19.9%), agricultural households headed by female (17.8%), agricultural households access to market (17.4%), and household food security (14.3%).

4.3.2. Mapping Adaptive Capacity to Climate Change for water sector

- The water sector's adaptive capacity to climate change is very high in Wajir, Garissa, and Tana River counties.
- Counties with very low adaptive capacity to climate change are Nairobi, Embu, Kirinyaga, Migori, Siaya, Vihiga, Busia and Tharaka-Nithi.
- Many counties in the Western and Southern part of Rift Valley, have low adaptive capacity.

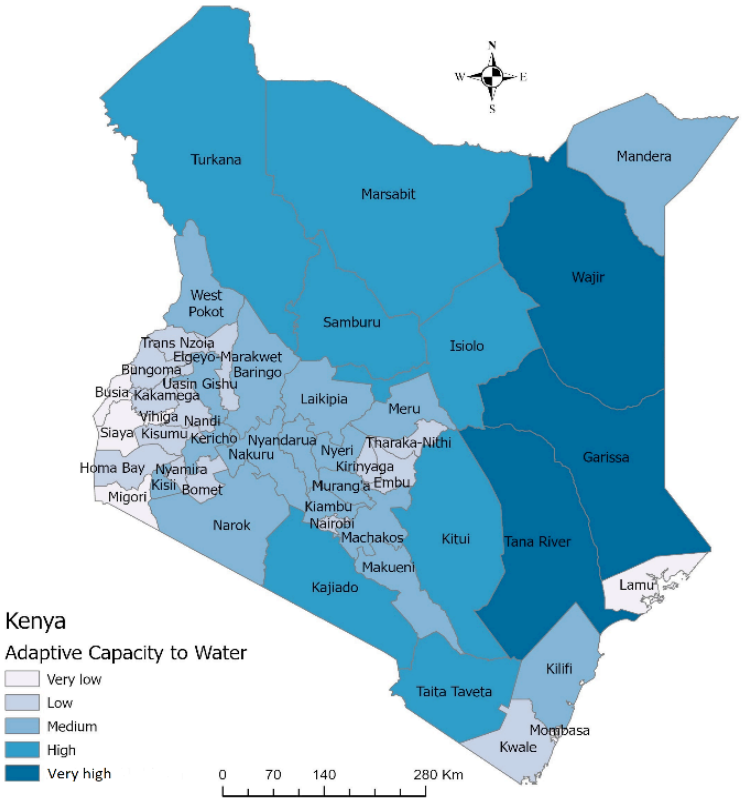

Fig 6: Water and gender adaptive capacity to climate change

- The PCA analysis indicates that the water and gender adaptive capacity sub-index is largely influenced by area under forests (33.1%), gender education gap (32.4%), female headed households (13.1%) and female access to finance (8.9%).

4.3.3. Mapping Adaptive Capacity to Climate Change for energy sector

- The energy sector's adaptive capacity to climate change is very high in Nairobi and Kiambu counties due to the high level of energy infrastructure and households' good connectivity to energy supply.
- Counties around Nairobi and the south part of Rift Valley also have high levels of adaptive capacity in the energy sector.
- The PCA analysis indicates that the energy and gender adaptive capacity sub-index is largely influenced by households' access to energy (25%), gender education gap (23.8%), access to clean energy (19.3%), female headed households (18.9%) and availability of energy supply infrastructures (12.9%).

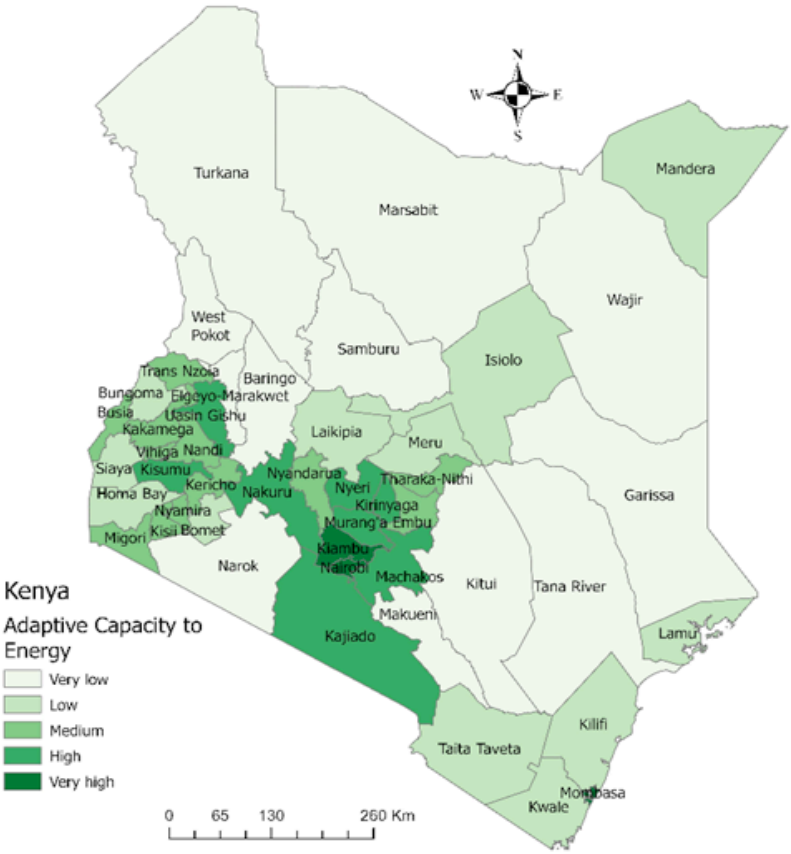

Fig 7: Energy and gender adaptive capacity to climate change

4.4 Mapping Gender-Climate Change Hotspots

A combination of climate change exposure, sensitivity, and adaptive capacity sub-indices are mapped for agriculture, water, and energy sectors in Fig 8, 9, and 10 to identify the hotspot locations of vulnerability to climate change.

4.4.1. Mapping Gender-Climate Change Hotspots for agriculture sector

- Very highly vulnerable counties (hotspots) in agriculture to climate change are Mandera, Wajir, Meru, Kitui, Taita Taveta, Makueni and Machakos (Fig 8).
- All counties in the northern and eastern parts of Kenya are highly vulnerable to climate change.
- Counties with very low vulnerability to climate change in Kenya are Tharaka-Nithi, Kirinyaga, Kisumu, Siaya, Vihiga, and Trans Nzoia.

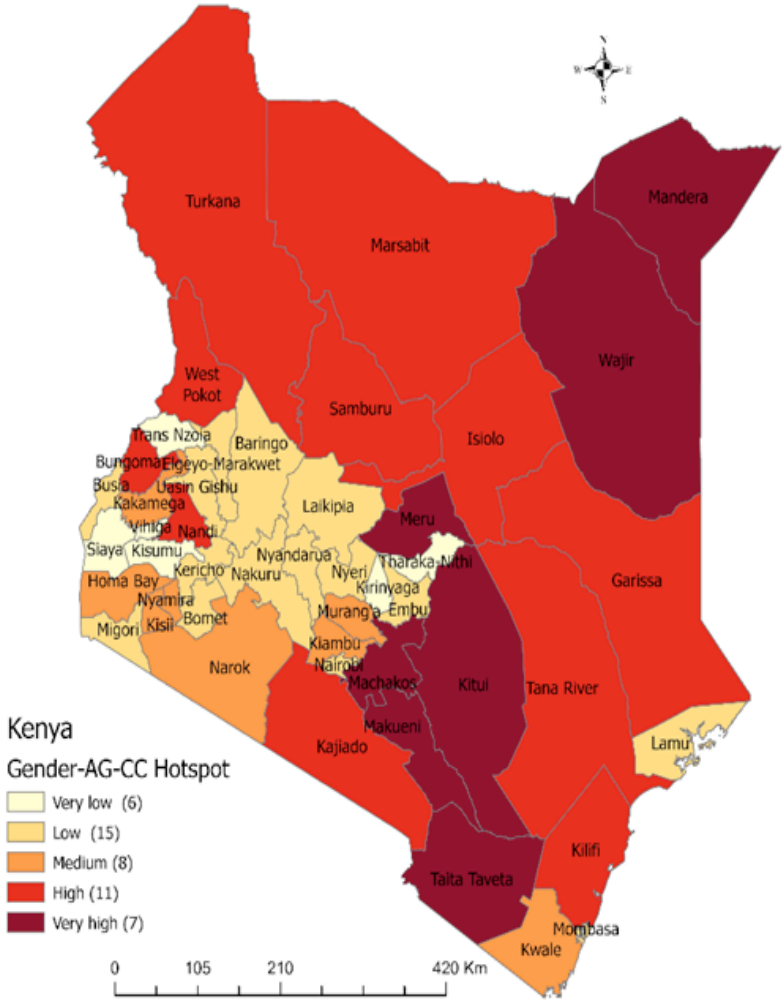

Fig 8: Agriculture-Gender-Climate Change Hotspots

4.4.2. Mapping Gender-Climate Change Hotspots for water sector

- In the water sector, counties in the northern and eastern parts of Kenya are highly vulnerable to climate change (Fig 9). These parts of Kenya are arid with low levels of rainfall and annual dry days are high compared to the western and southern parts of the country.

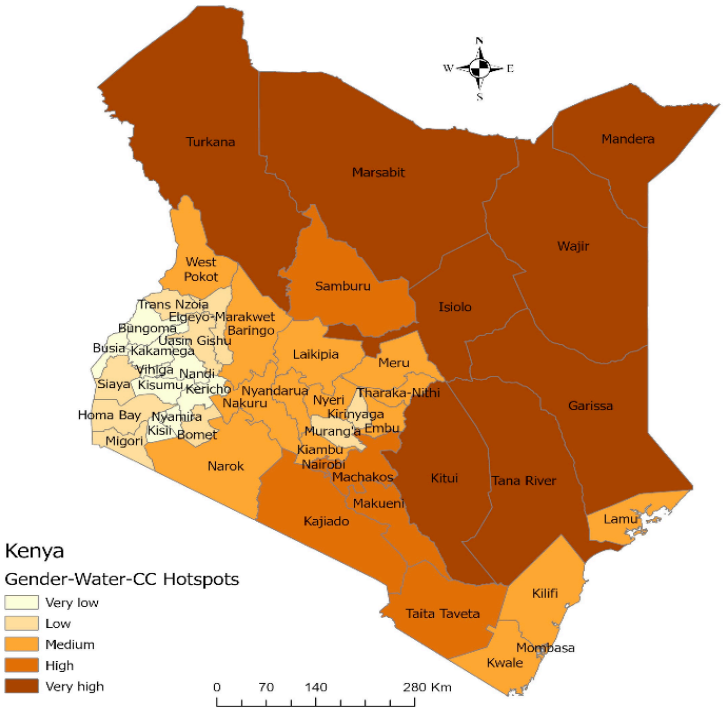

Fig 9: Water-Gender-Climate Change Hotspots

4.4.3. Mapping Gender-Climate Change Hotspots for energy sector

- For the energy sectors, many counties in northern and eastern regions are highly vulnerable to climate change. In these regions, households have less connectivity to energy supply with low energy supply infrastructure.
- The hotspot counties for the energy sector are Mandera, Wajir, Kitui, Makueni, and Nairobi (Fig 10).

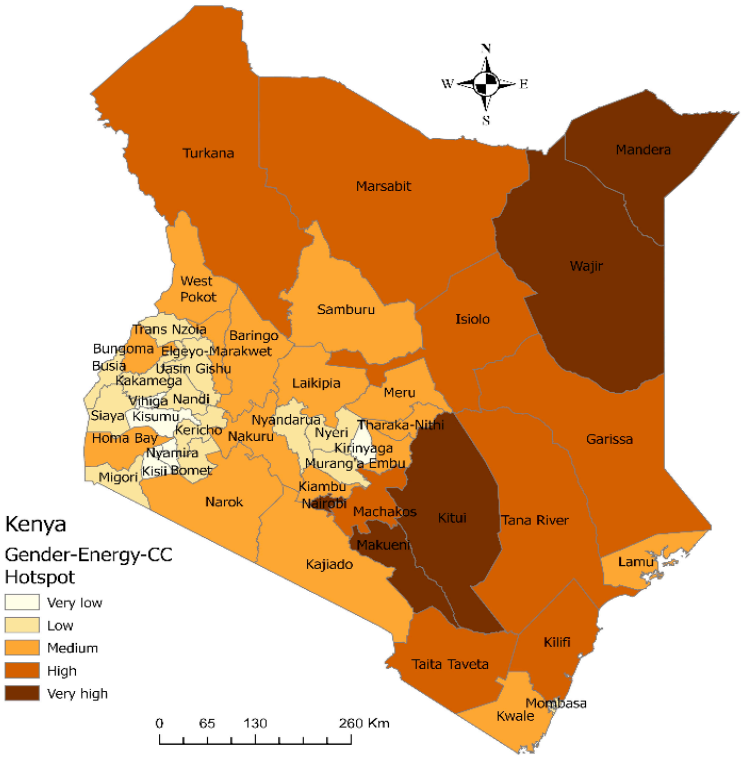

Fig 10: Energy-Gender-Climate Change Hotspots

b) Results of the ground truthing

4.5 Climate risk in the hotspot locations

Fig 12 shows that 82% of respondents in the hotspot areas indicated that increasing drought is a major climate risk followed by high temperatures in hot days (54%), and increasing floods (54%). A significant proportion of the respondents mentioned changes in rainfall patterns (49%), increasing water shortages (46%), and decrease in temperature on cold days (41%). These climate change risks are aligned with the climate data analyzed for hotspot mapping in the agriculture, water, and energy sectors.

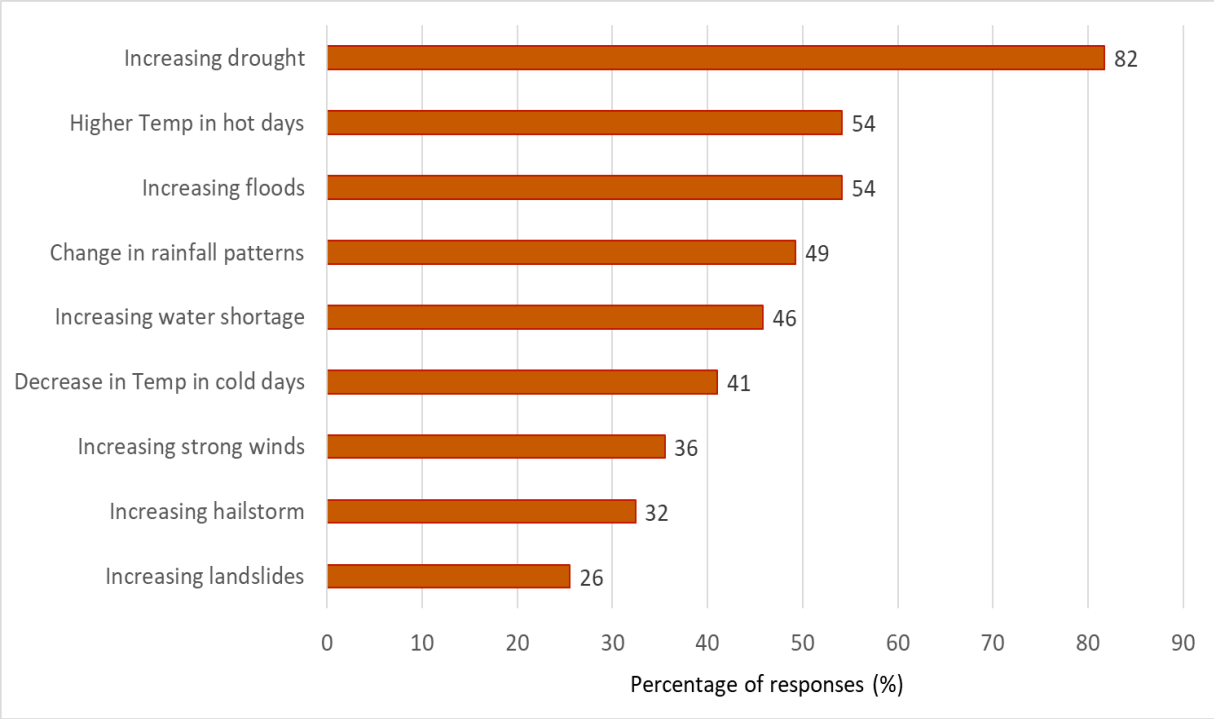

Figure 11: Major climate risks based on the survey in the hotspot areas.

Figure 13 presents the frequency of weather information received by the residents in hotspot areas. About 50% of the respondents receive weather information on daily basis. About 18% of the respondents receive weather information once a week and 9% receive it once a month. This indicates that half of the respondents (50%) receive weather information promptly.

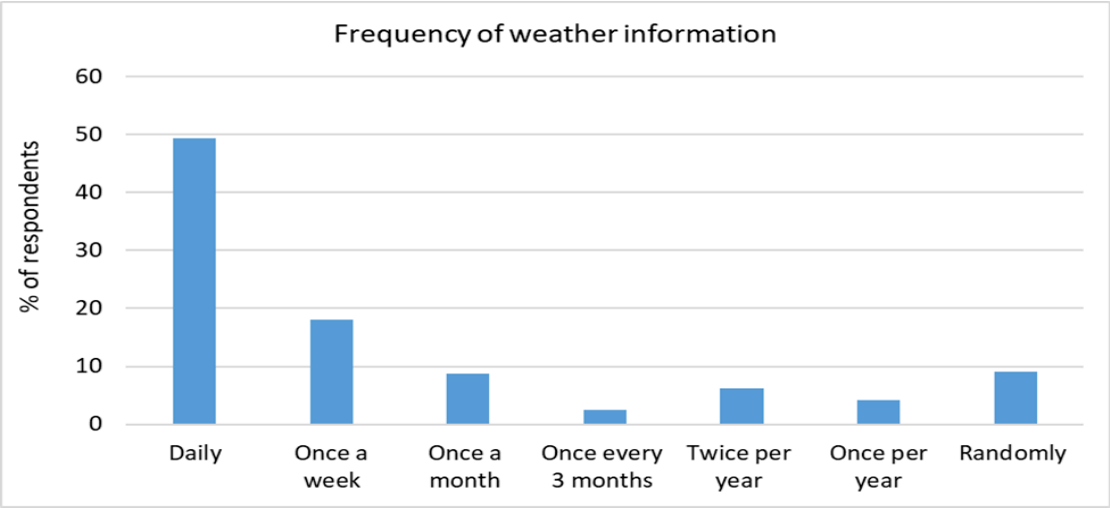

Figure 12: Frequency of weather information received by respondents in hotspot counties

4.6 Summary of access to resources that support climate adaptation

- Figure 13 shows respondents' role and access to resources in the hotspot areas. The results reveal that 90% of women are involved in collecting water for household use compared to 5% of men. The disparities also show that girls are involved more in collection of water as compared to boys.
- The major sources of water for the residents in the hotspot areas are boreholes/wells (42%), followed by natural rivers (40%), and municipal water supply systems (12%).
- A large proportion of women are involved in energy management at household level (41%) compared to men (32%).
- The main source of lighting energy is paraffin lamps (70%) and 22% of respondents use electricity for lighting in their houses. Others use candles (5%) and solar (2%).
- Firewood is a major source of energy for cooking (81%), followed by gas (12%) and charcoal (11%). The use of electricity and biogas for cooking is insignificant.
- Seventy-four percent (74%) of the respondents in the hotspot areas use mobile phones as a means to access ICT service followed by radio (22%) and TV (8%). About 65% of the respondents indicated that they own the means of access to ICT, 30% of them have access but they don't own while 8% don't have access.
- The study found 61% of the respondents use weather information for agriculture-related decision-making as compared to 22% who use it for

disaster preparedness, 21% for water management and 11% for management of energy services.

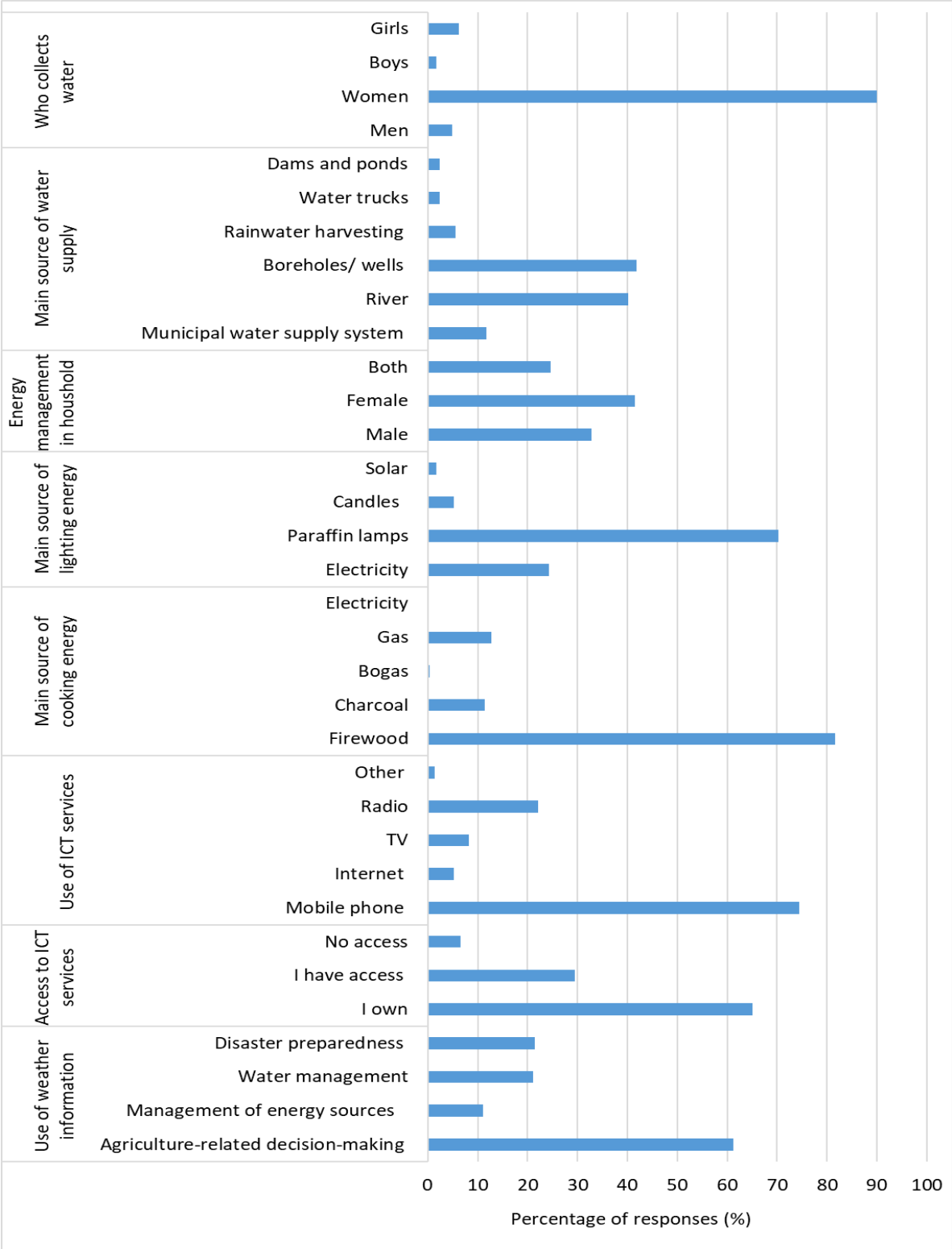

Figure 13: Respondents' access to different resources in the hotpot area

CHAPTER 5: Conclusion and Recommendations

5.1. Conclusion

Climate risks and sector's sensitivity to climate change are high and adaptive capacity is low in hotspot counties. The hotspot counties require immediate actions for climate change adaptation in the agriculture, water, and energy sectors. Improving adaptive capacity is critical to decreasing the vulnerability to climate change. For example, increasing gender equality in income, education, and health, and improving access to ICT services and finance can increase adaptive capacity in the hotspot locations. Programs such as the promotion of rainwater harvesting, reforestation of degraded lands, and increasing women's investment capacity in new technologies and practices can increase the water sector's adaptive capacity to climate change. Increasing households' connectivity to the energy supply grid, development of energy supply infrastructures, and increasing use of alternative energy sources are critical for increasing adaptive capacity in the energy sector.

Hotspot mapping is a valuable tool for identifying risk as it allows for a spatial observance of climate change vulnerabilities. It also provides a spotlight for sub-national outliers. For instance, while climate change adaptation needs are consistently high across the counties in Kenya, some counties have higher climate change adaptation needs in the agriculture, water, and energy sector than other counties. This provides an interesting area for targeting gender and climate change interventions. Examining local differences between counties in Kenya could provide insights into policies or programs that allow for the development of effective climate change strategies.

The findings highlight the main drivers of gender and climate change vulnerability in Kenya. The main drivers are changes in precipitation (total rainfall and its distribution), rainfall variability (coefficient of variation in annual rainfall and annual dry days), and changes in temperatures. This hotspot mapping integrates these indicators and provides:

- Reliable and applicable sex-disaggregated data to enable the various stakeholders, including policymakers at different levels to identify key locations and actions for gender-responsive decision-making. For instance, Kenya commits to Sustainable Development Goals and the Gender Action Plan of the UNFCCC Enhanced Lima Work Programme on Gender that recognizes the linkages between climate change and gender equality. Yet, targeted measures that support sex-disaggregated data collection are not consistently included across these commitments. This gender and climate change hotspot mapping provides sex-disaggregated indicators and data available at the sub-

national level. This can support monitoring and reporting gender outcomes in reference to various climate change policies and commitments.

- Supports gender-responsive technology targeting to improve access to productive resources, finance and knowledge, income diversification, and capacity building on adaptation options. The Government of Kenya is committed to achieving gender equality in the agriculture, water, and energy sectors in its National Adaptation Plan (NAP) and Nationally Determined Contributions (NDCS). Some of the actions include enhancing access to finance, strengthening social protection, promoting livelihood diversification, and developing climate-resilient sustainable livelihoods. This analysis helps spatial targeting of gender and climate change interventions to achieve the commitments of NAP and NDCs.

- Support to design and implement transformative approaches to increase women and girls' capabilities and opportunities for climate action in the targeted climate-sensitive sectors. Transformation of existing institutions, finance systems, market linkages, and development of climate-adaptive and gender-responsive social safety systems are necessary. This hotspot analysis identifies counties where transformative climate adaptation approaches are required.

- Information to be used for further development of gender scorecards in relation to climate change impact and adaptation. The information can be used to track gender integration in NDC, SDGs, and other climate adaptation and mitigation policies and programs in Kenya.

- The analysis highlights the importance of the nexus between gender with agriculture, water and energy sector in explain climate change vulnerabilities. The nexus approach addresses externalities across sectors and seeks to achieve the goal of water, energy, and food security together by increasing efficiency, reducing tradeoffs, building synergies, and improving governance across the sectors. Gender focus in the design, implementation, and monitoring of nexus initiatives is critical to ensure sustainable and climate-resilient development of the water, energy, and food sectors with minimal environmental impacts. The integration of the gender dimension into the nexus approach can reshape resource access and control, governance and management, and use. This assessment provides gender disaggregated information to identify gender roles and responsibilities in each sector, cross-linkages, and synergies in climate change adaptation interventions.

5.2. Recommendations

As sector-specific gender and climate change hotspot mapping in Kenya provides a gender-disaggregated assessment of climate change impacts and adaptive capacities, appropriate for the design of appropriate interventions. The next steps will therefore focus on the effective integration of gender into climate change policies, programs and projects across the agriculture, water, and energy sectors with a view to expand this in all the sectors of the Kenyan economy. Specific recommendations are as follows:

a. **Building capacity for developing gender-responsive climate adaptation and mitigation policies, programs and projects**:

   There is a need for training national and county policymakers and implementers on various gender-responsive approaches including gender mainstreaming in climate change actions, and collection and analysis of sex-disaggregated data to inform climate action in agriculture, water, and energy sectors. This will help to identify opportunities that would enhance gender equality and harmonize the national and county climate change policies and programs to ensure gender is mainstreamed. The policymakers at the national and county levels can enhance the participatory process to include all stakeholders to advocate, disseminate, and train on gender and climate change interventions at the grassroots level. This capacity-building of national and county policymakers and implementers will ensure that gender perspectives are appropriately considered during the project design, implementation, monitoring and evaluation in the agriculture, water, and energy sectors.

b. **Targeting investment in gender-responsive climate intervention**: existing climate financing mechanisms must be flexible enough to reflect and address practical and strategic gender needs. The active participation of women and men in the development of funding criteria and allocation of resources for climate change initiatives is critical, particularly at the local level. This hotspot mapping can be used to mainstream gender for investment planning, budgeting, monitoring, and reporting at the subnational level (county, sub-county, and local communities) especially in the ongoing FLLoCA programme.

c. **Collaboration and Harmonization of Efforts**: Gender and climate change are cross-cutting issues and have inter-sectoral connectivity. Inter-departmental coordination can reduce the cost of a project and generate large gender and climate change outcomes and impacts. In the gender and climate change hotspot locations of Kenya, sensitization and

awareness of county government for networking among various sectors is necessary and needs to be initiated.

d. **Gender Responsive and Inclusive Legislation**: There is a need to strengthen mainstreaming of gender into climate change laws, policies, action plans and strategies. The Kenya National Climate Change Action Plan and NDCs incorporates and addresses gender priorities. However, gender integration at the county level is not well reflected in addressing the needs and promoting the involvement of women, youth, and marginalized people in climate change actions. A sound legislative framework, implementation of plans and policies requires more effort to integrate gender and social inclusion in climate actions.

e. **Promoting Nexus approach:** The gender and climate change hotspot mapping and ground truthing based on discussion with the local communities and experts indicated that women are involved in agriculture, water, and energy for managing their own and family livelihoods. These three sectors are key components of a food system where women play a critical role. However, Kenya faces many challenges in implementing the nexus approach including poor infrastructure, weak institutional and legal framework, and lack of coordination among the relevant stakeholders.

   These challenges are significantly affecting the availability and management of water, energy, and agricultural resources. To address these challenges, Kenya has developed cross-sectorial policy interventions, legal instruments, and institutional frameworks. These efforts require the involvement of stakeholders such as policymakers, local community groups, the private sector, and non-governmental organizations to pave the way for promoting the nexus approach.

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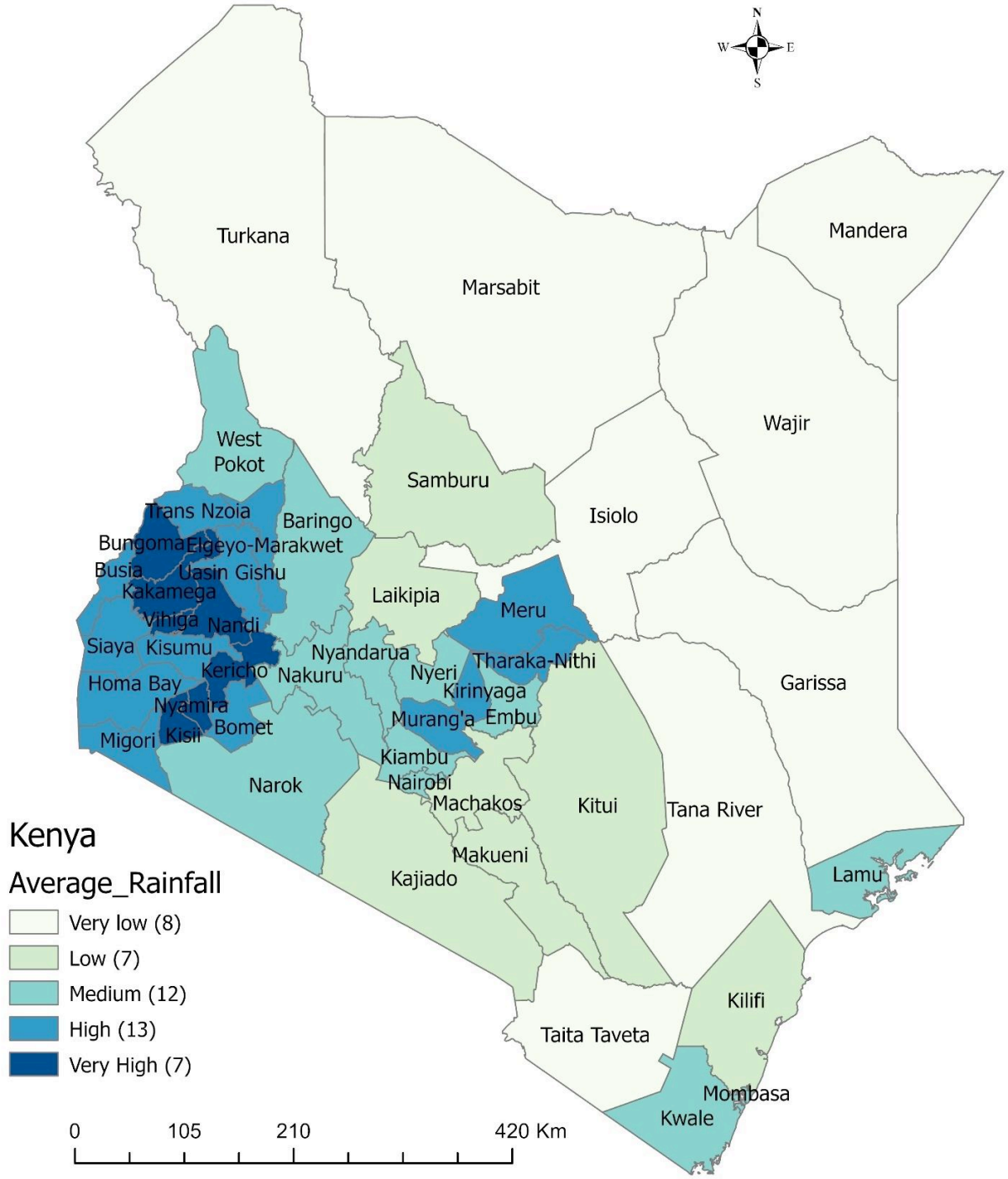
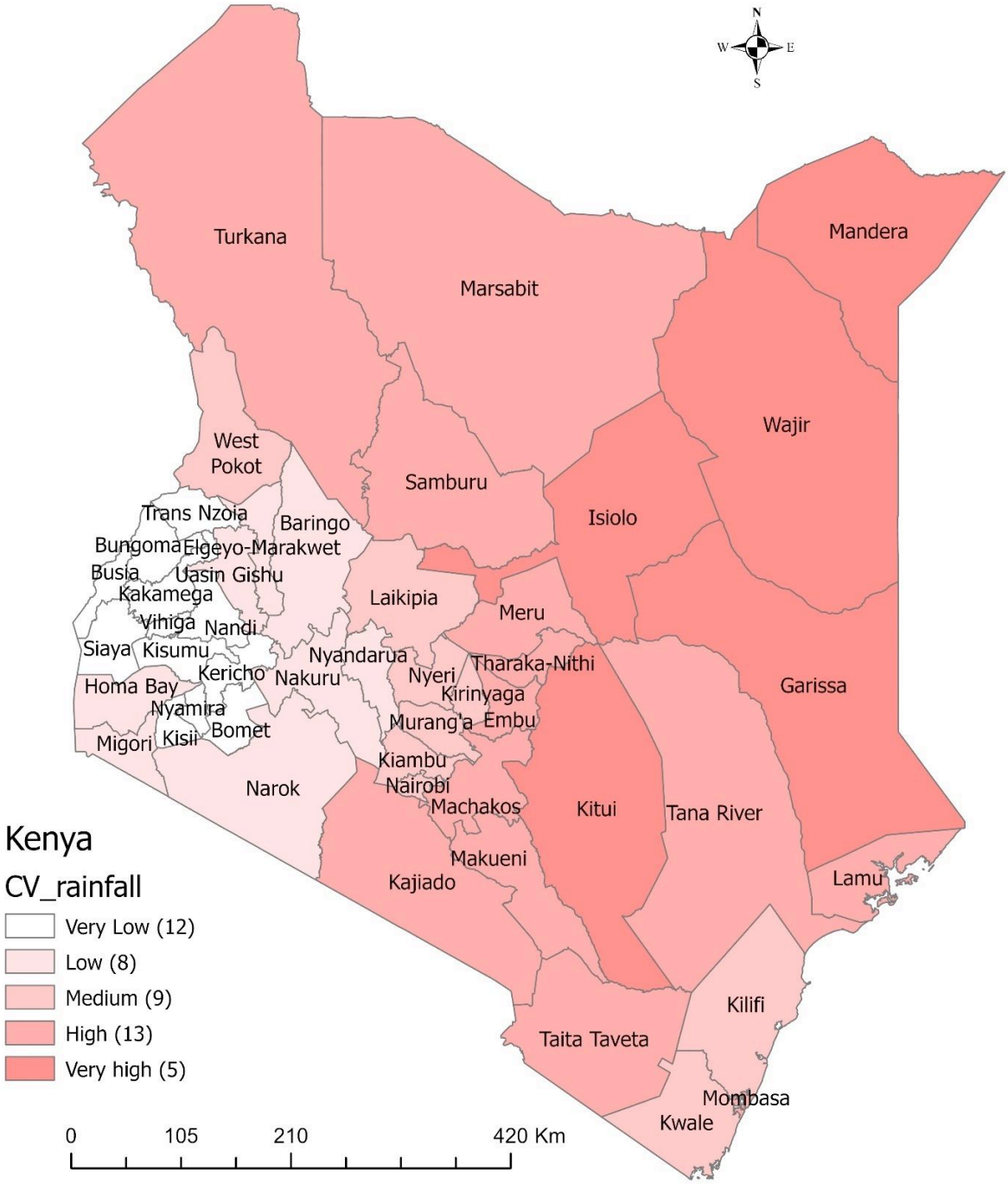
2021 Kenya Time Use Survey.

Annexures

Annex 1: Mapping climate exposure

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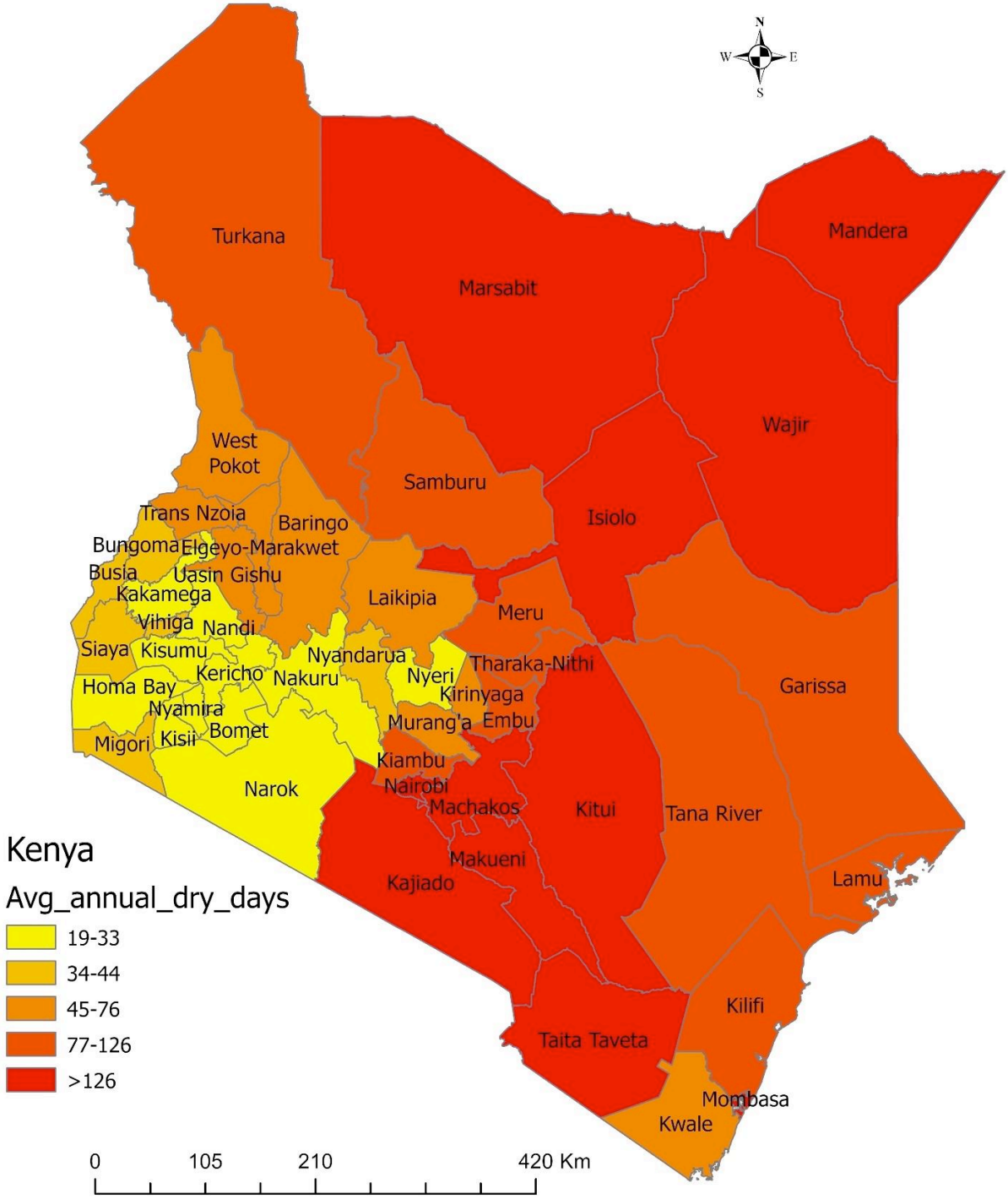
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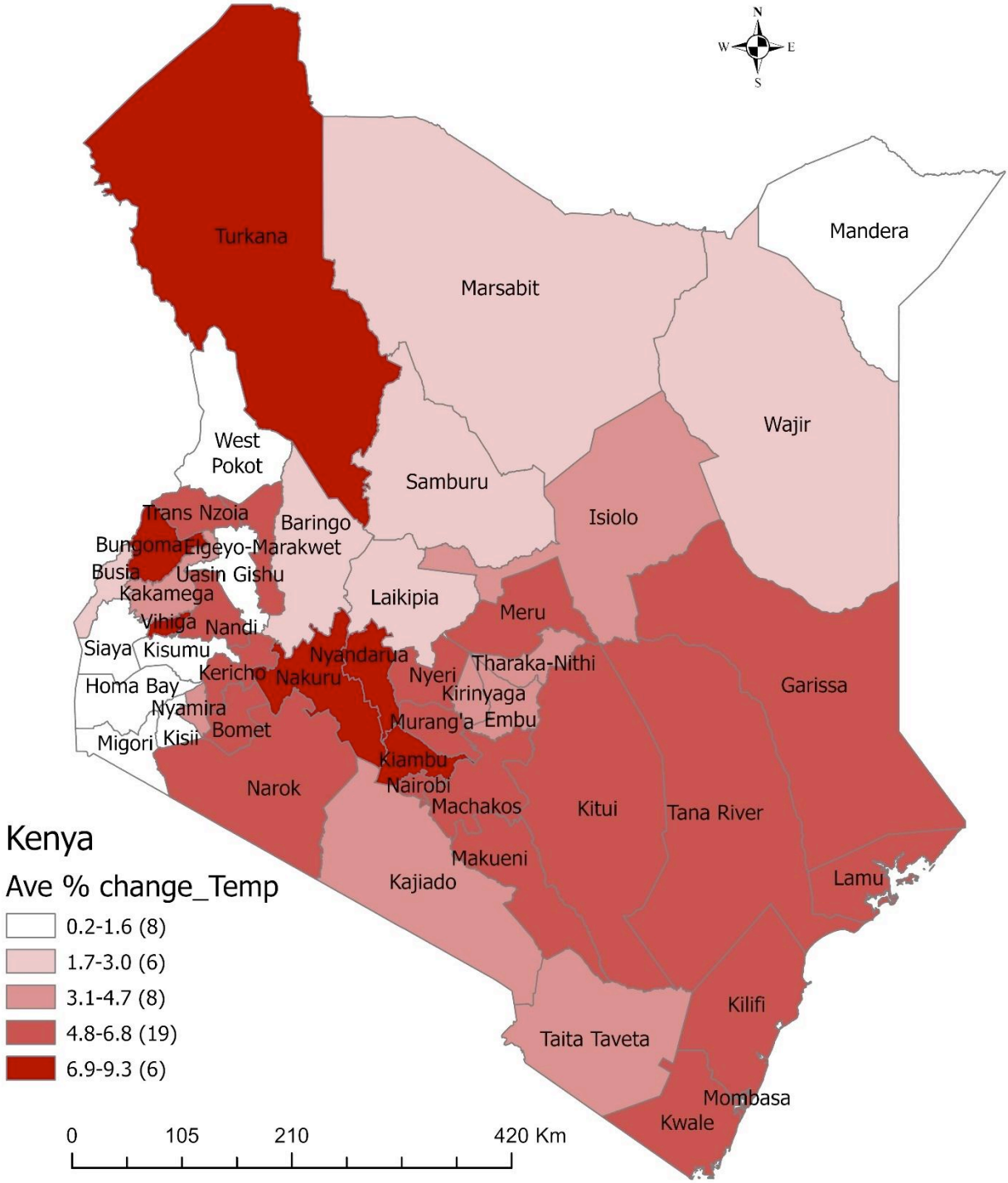
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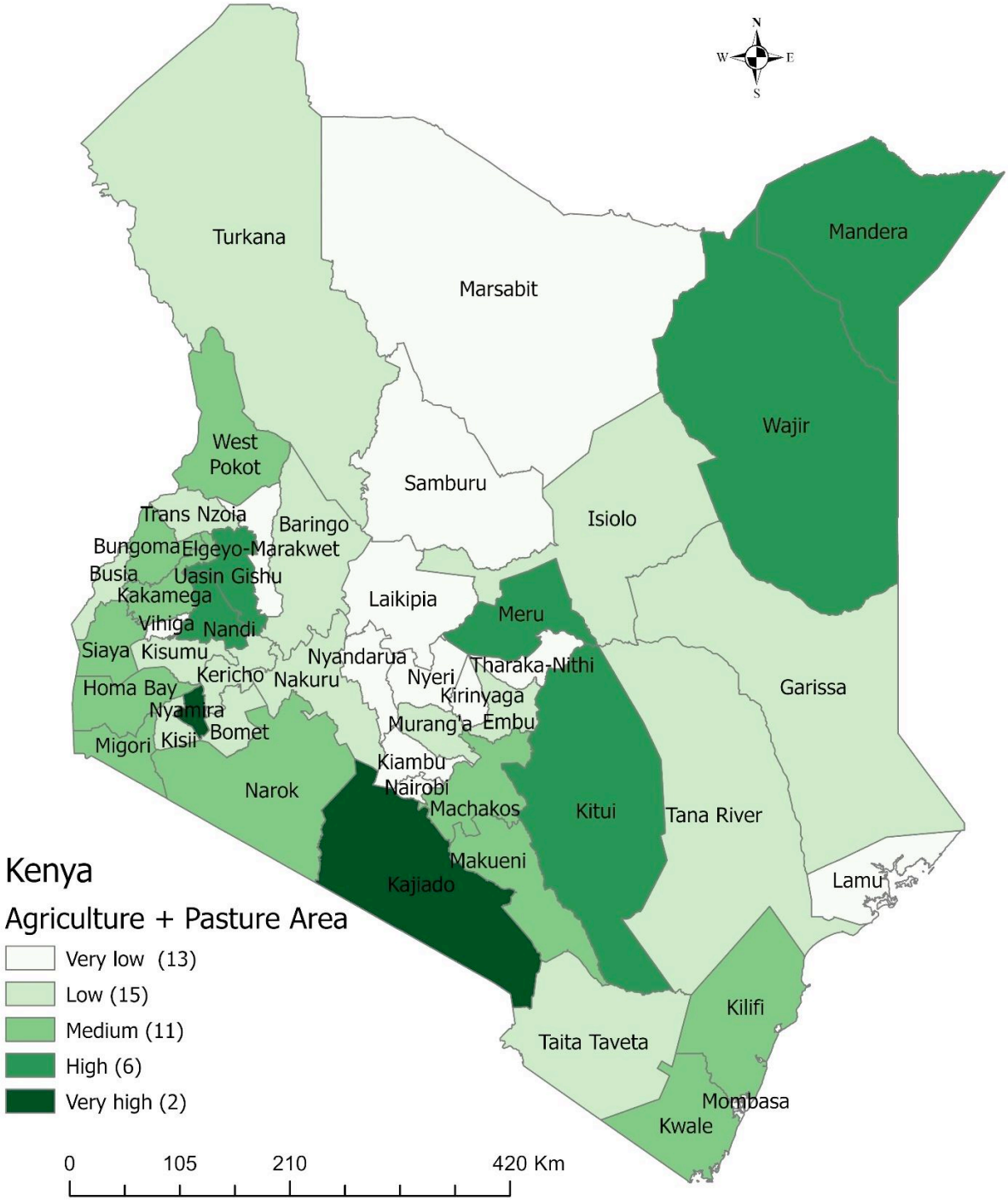
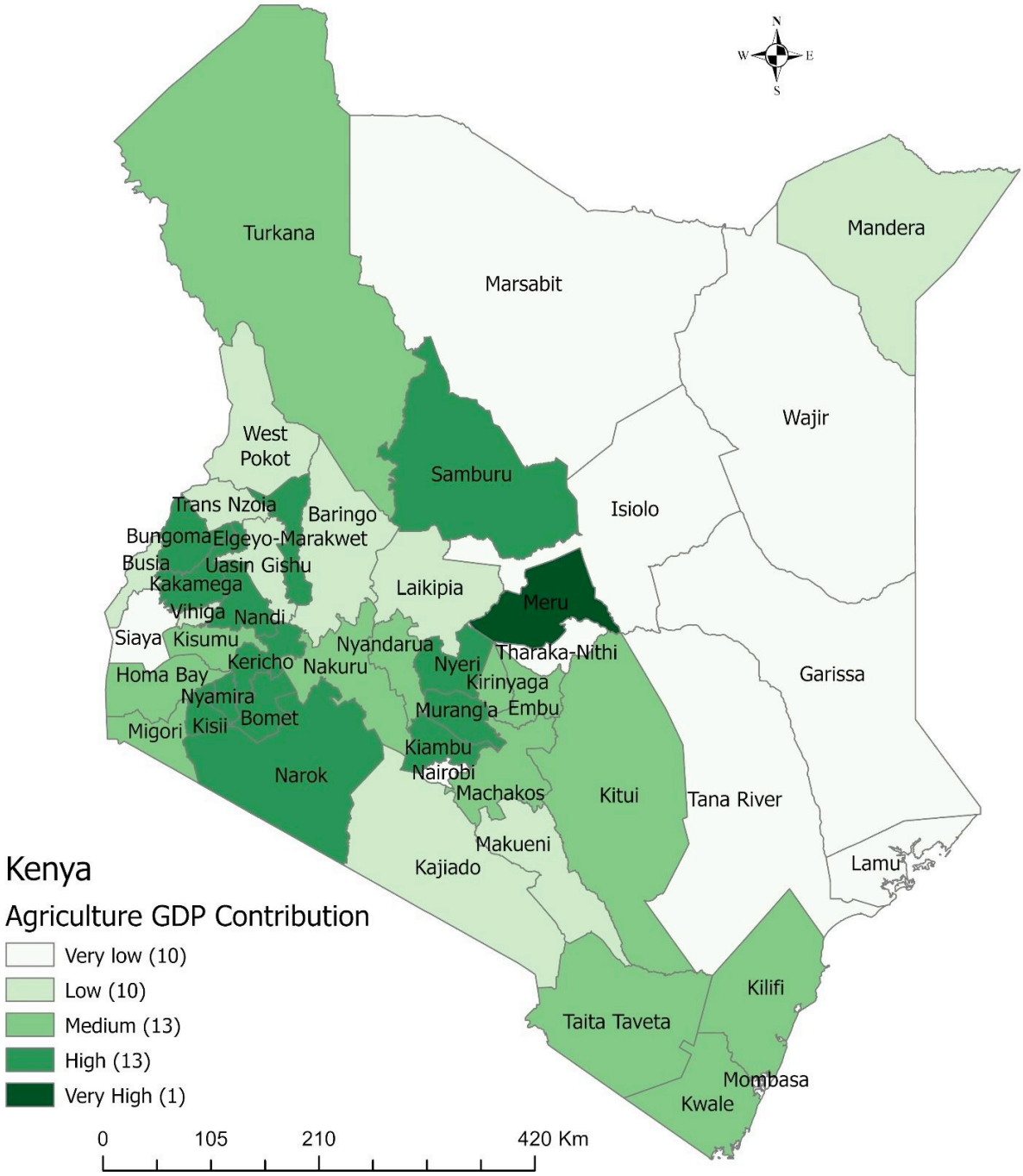
Annex 2: Gender and agriculture sensitivity to climate change

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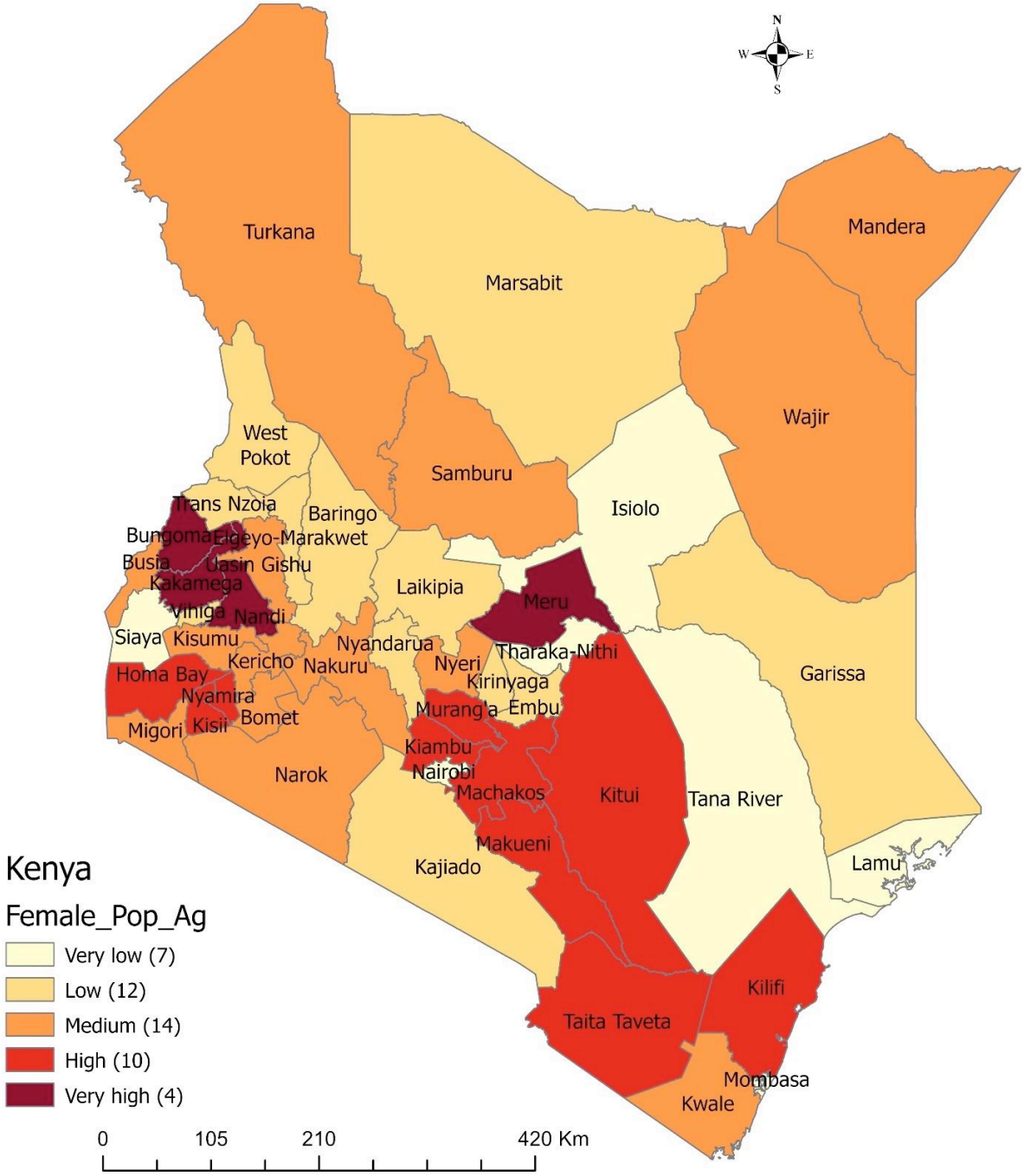
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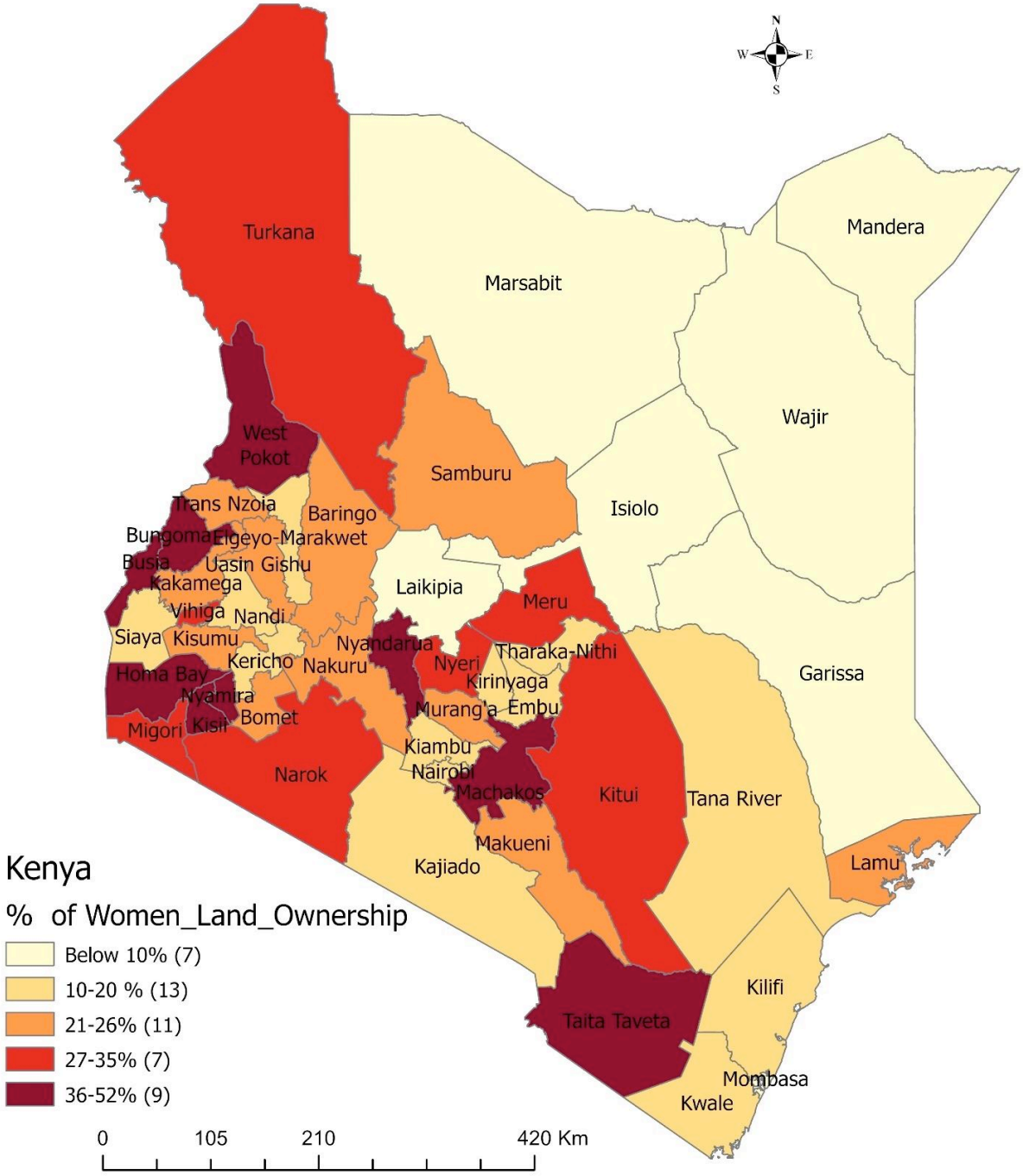
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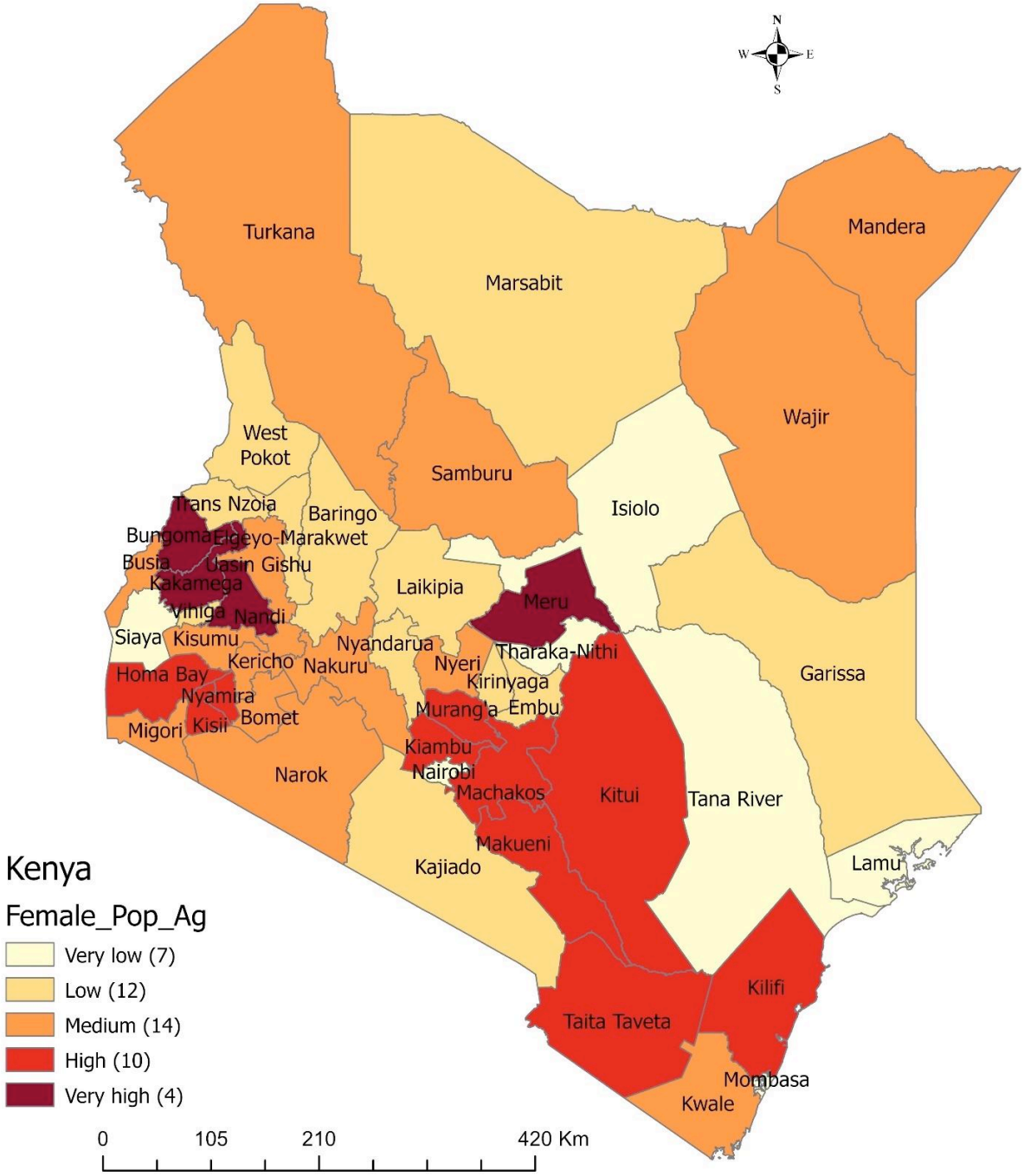
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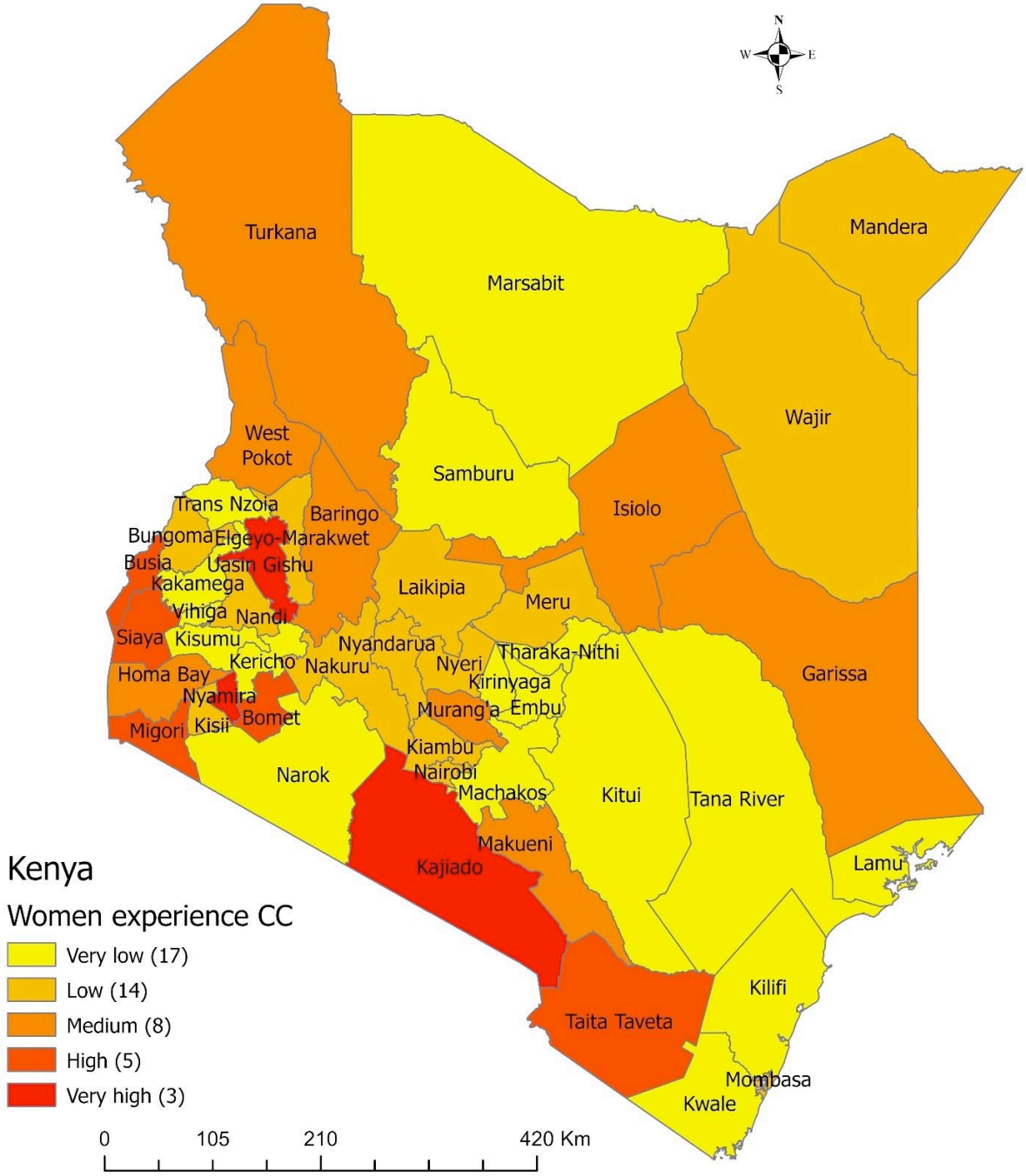
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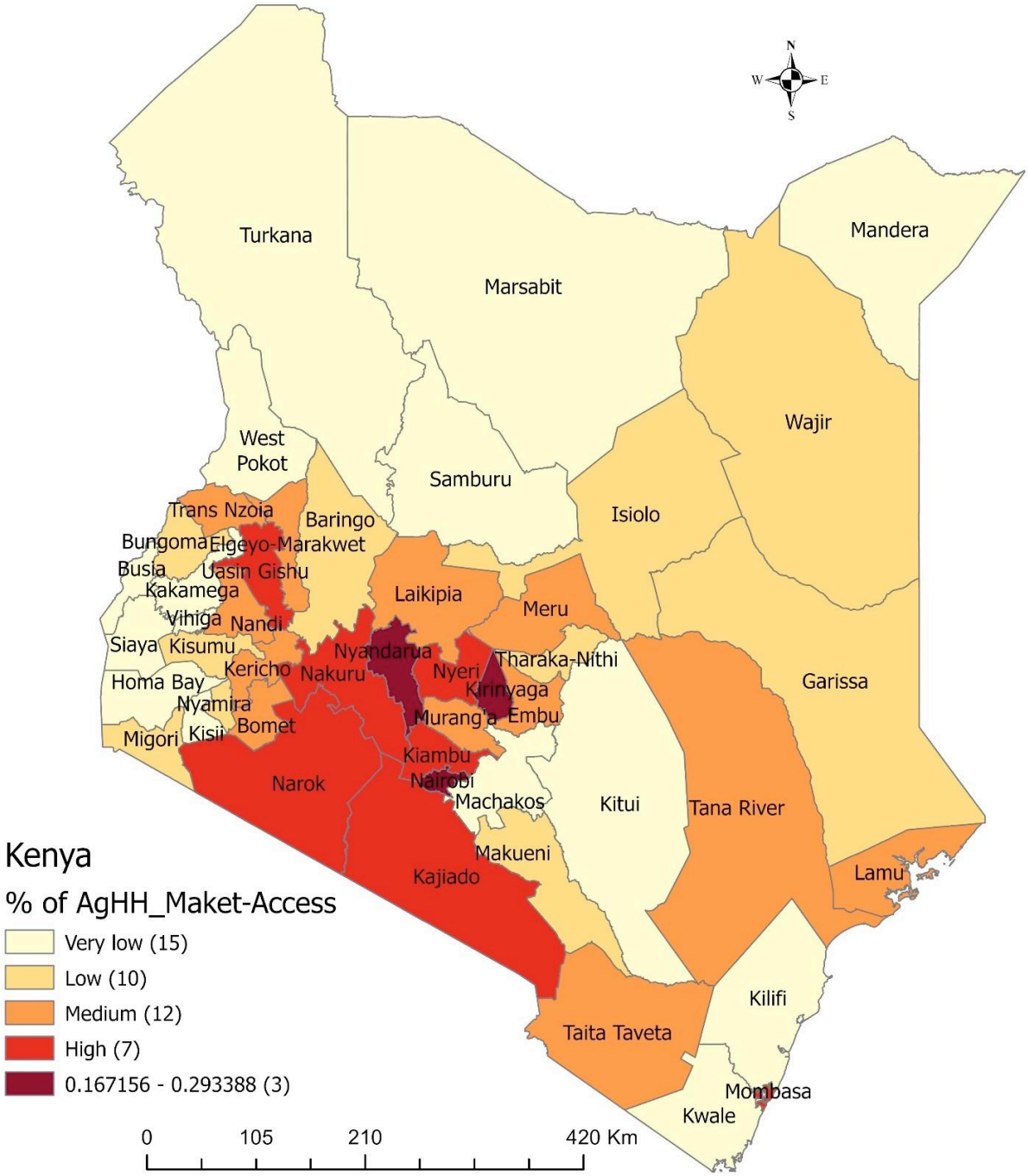
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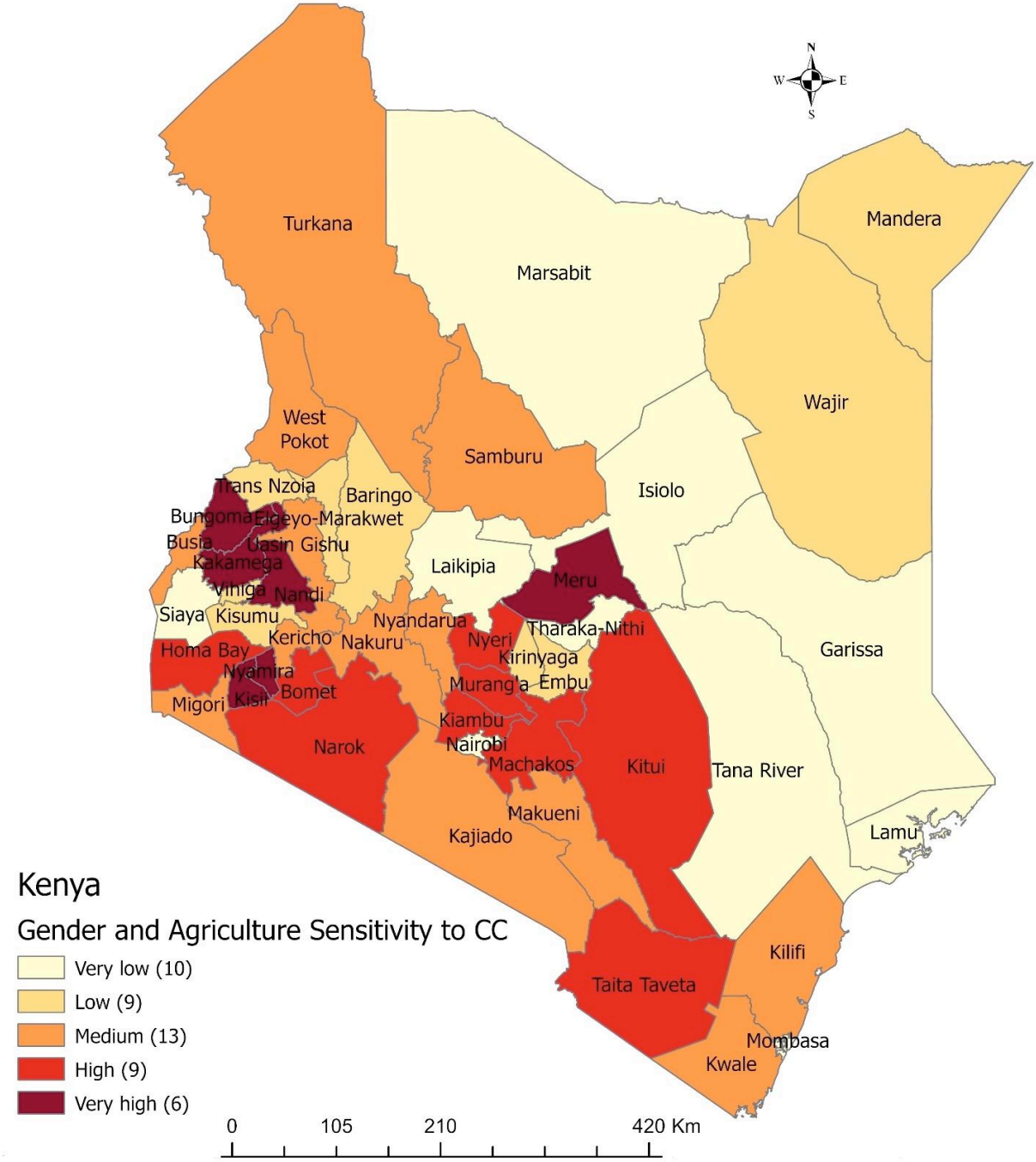
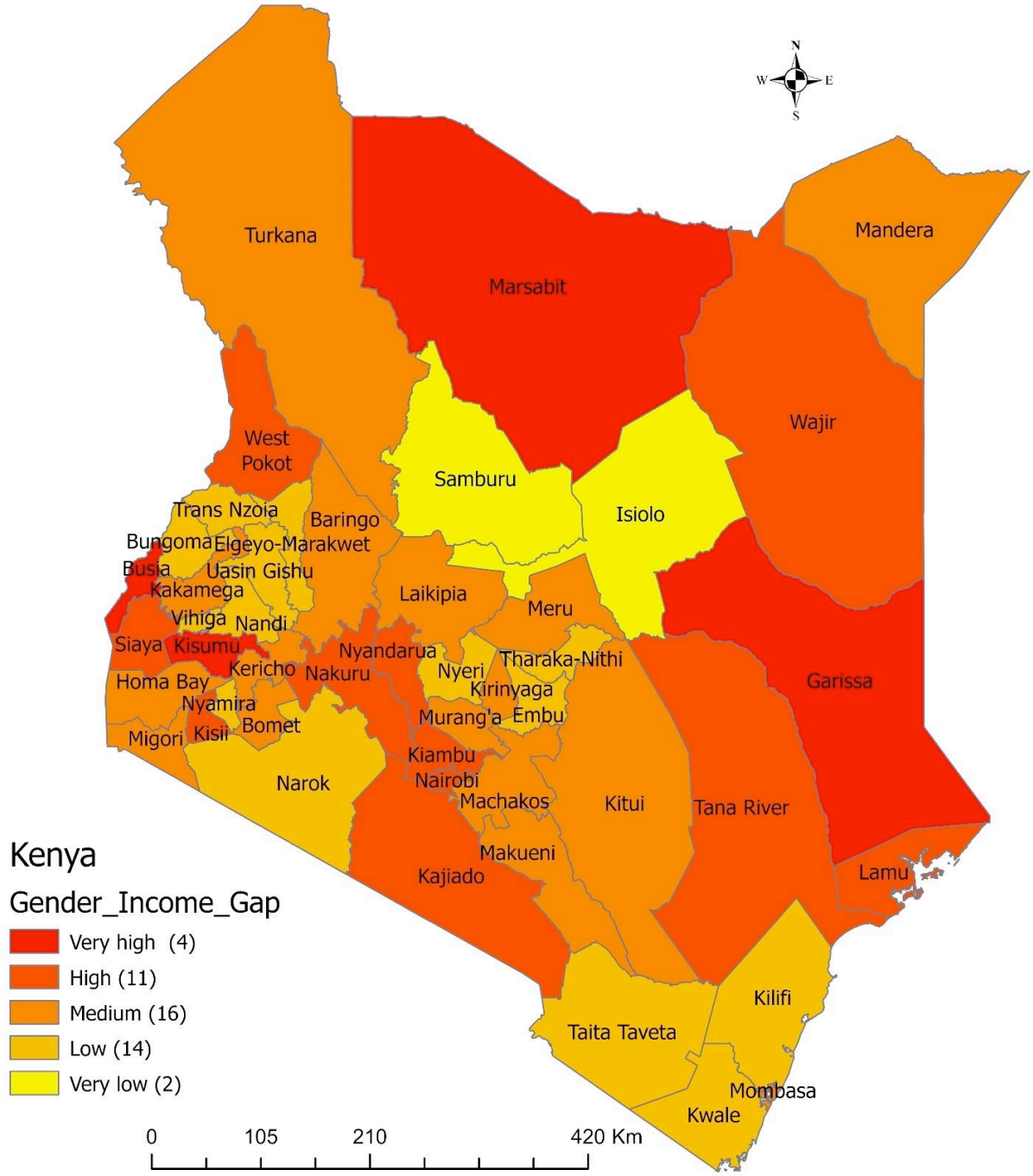
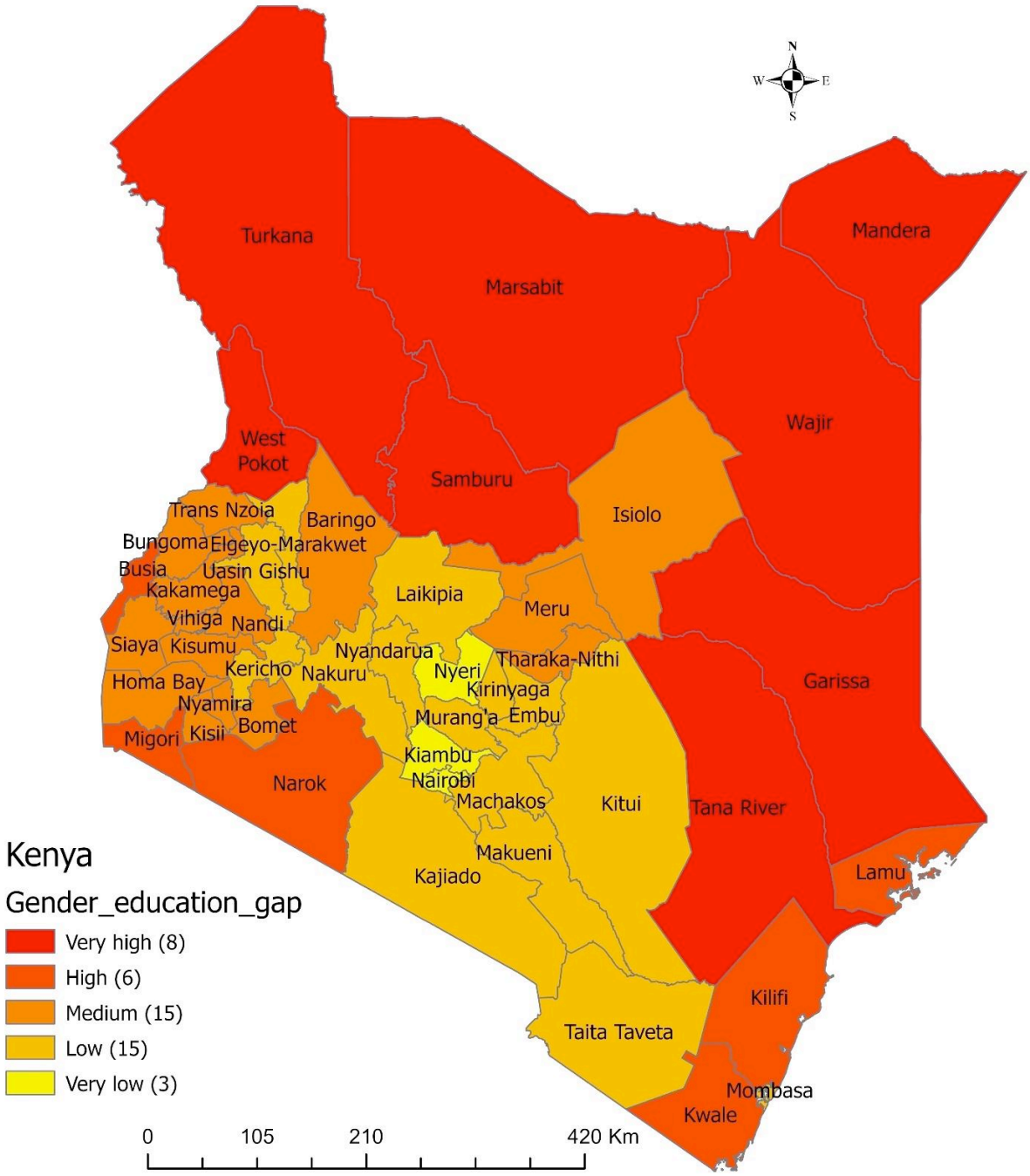


Fig 2: Agriculture and gender sensitivity to climate change

Annex 3: Gender and agriculture adaptive capacity to climate change

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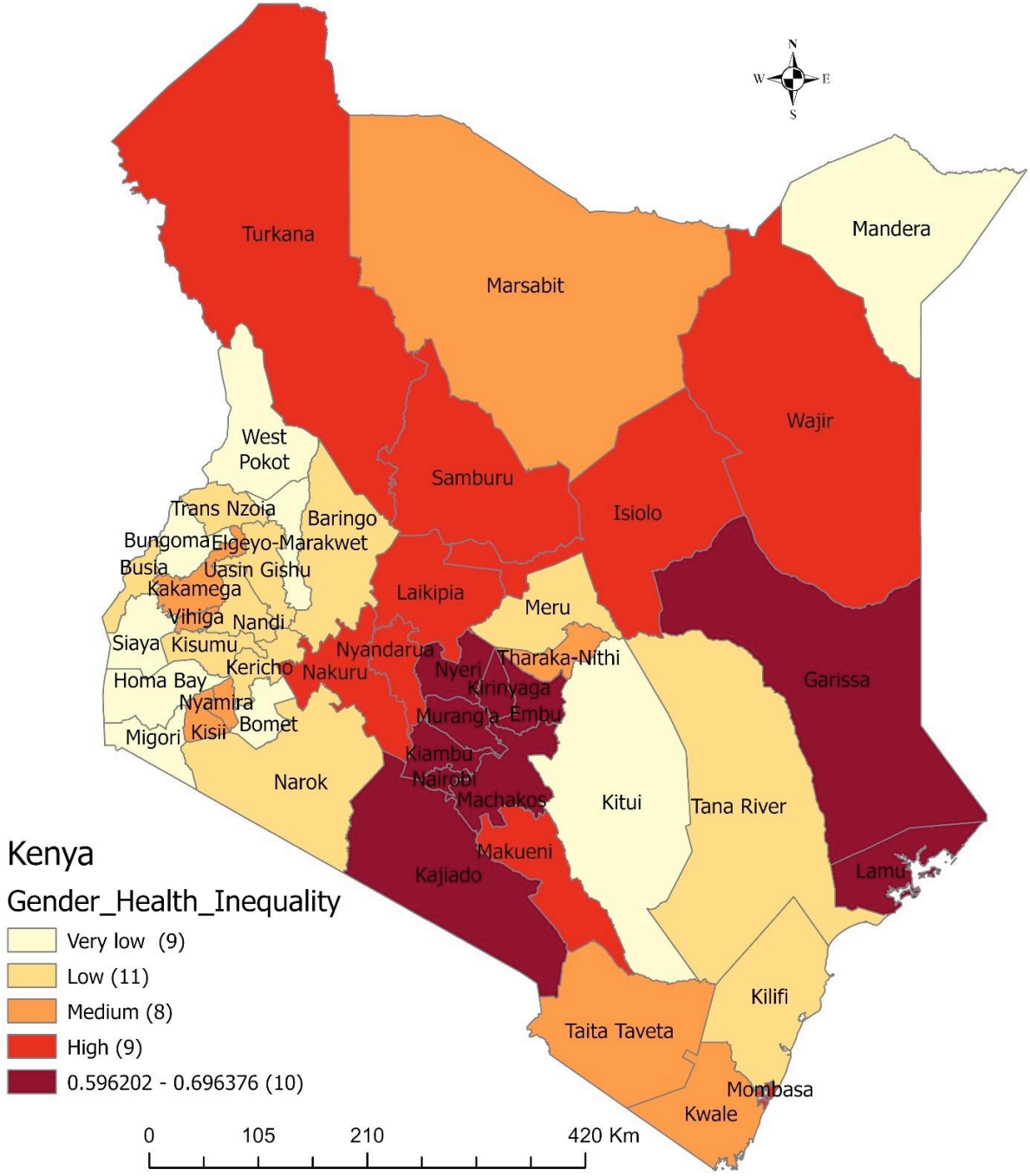
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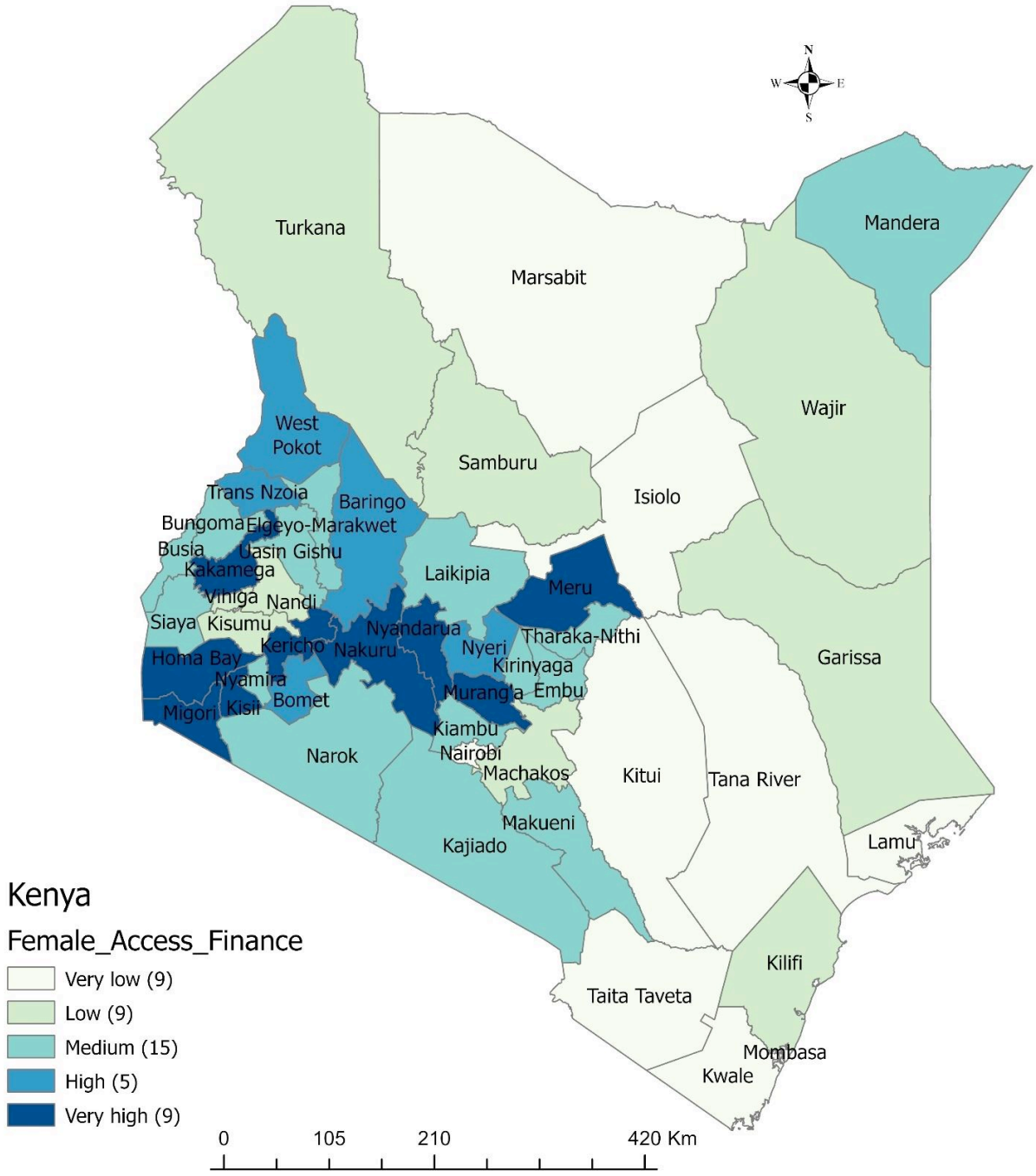
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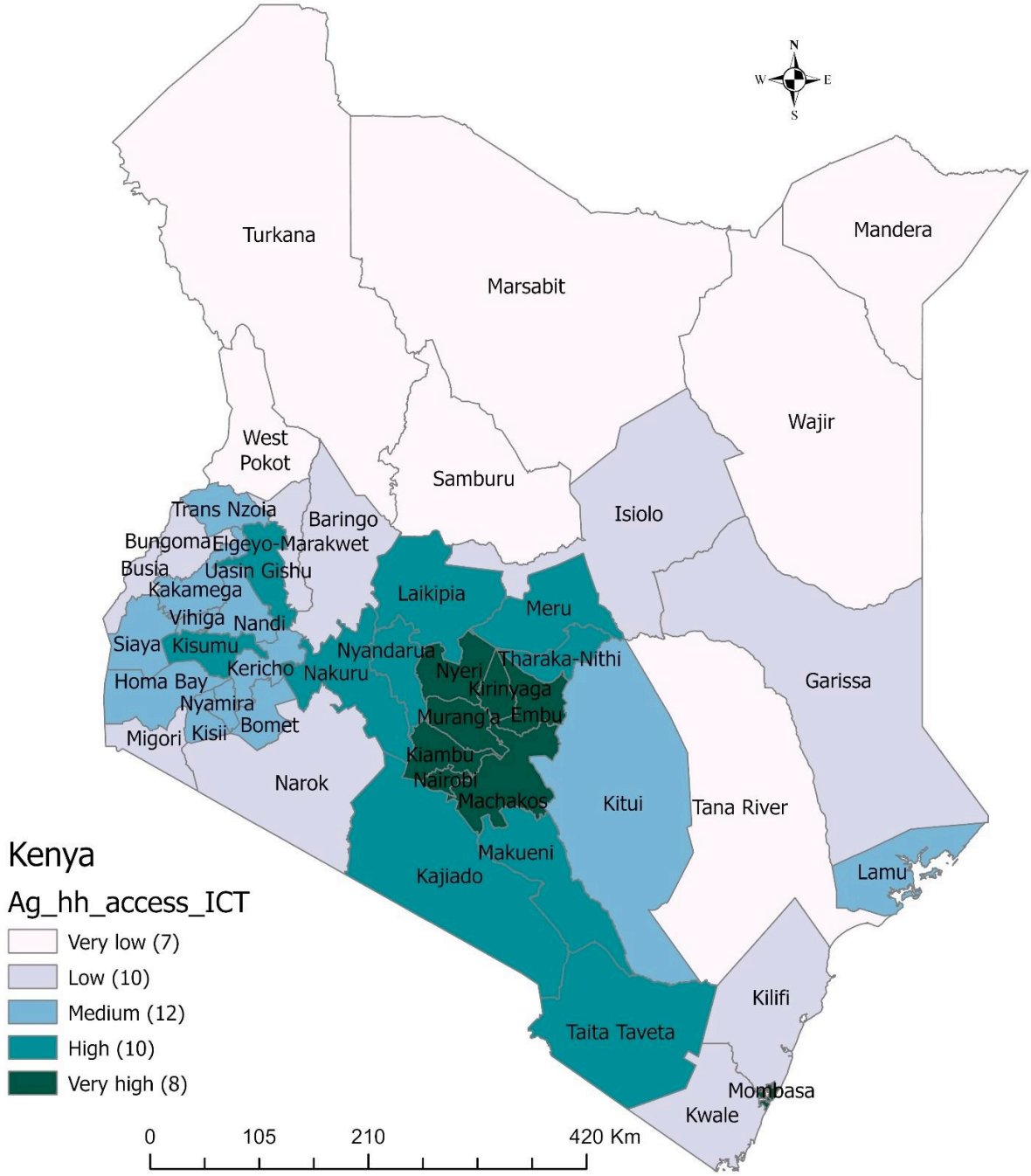
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Ag_hh_access_ICT
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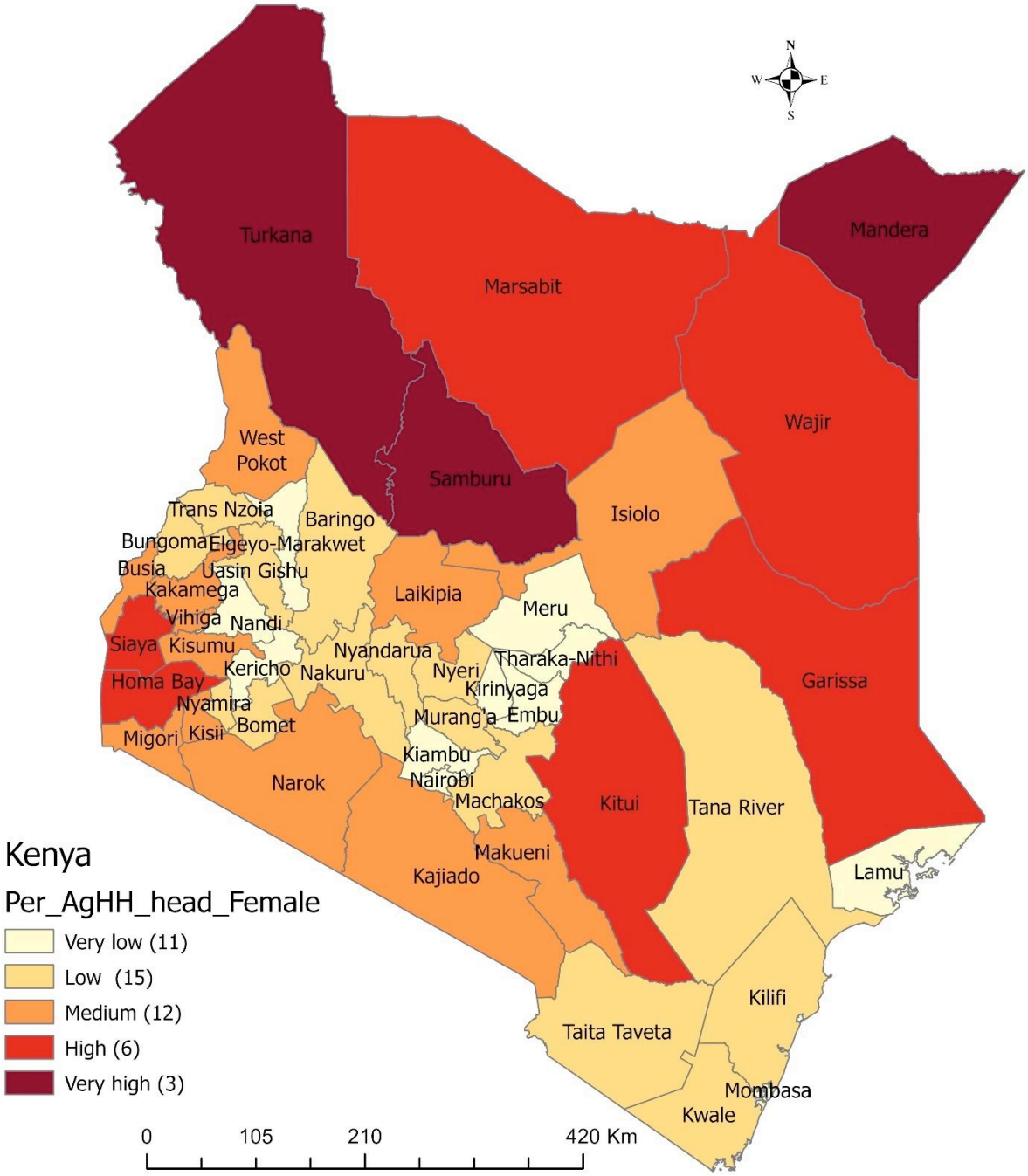
Low (10)
Medium (12)
High (10)
Very high (8)
0
105
210
420 Km
N
W
E
S
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Baringo
Bungoma
Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Nyandarua
Tharaka-Nithi
Kericho
Nakuru
Nyeri
Homa Bay
Kirinyaga
Garissa
Nyamira
Murang'a
Embu
Bomet
Migori
Kisii
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale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Medium (12)
High (6)
Very high (3)
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Marsabit
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Wajir
Samburu
West Pokot
Isiolo
Trans Nzoia
Baringo
Bungoma
Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Nyandarua
Tharaka-Nithi
Kericho
Nakuru
Nyeri
Homa Bay
Kirinyaga
Garissa
Nyamira
Murang'a
Embu
Bomet
Migori
Kisii
Kiambu
Nairobi
Narok
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Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
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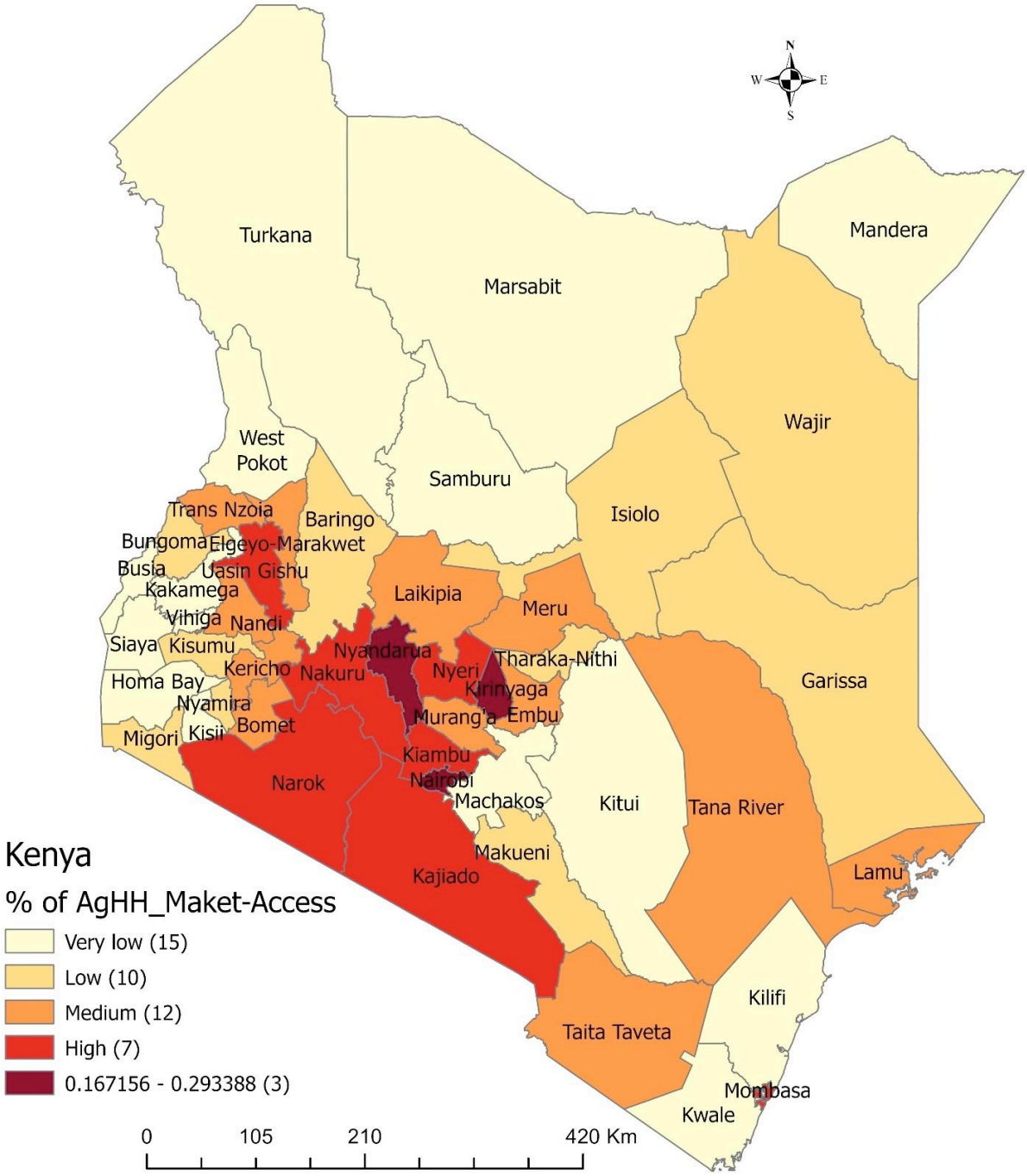
Kwale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Low (10)
Medium (12)
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105
210
420 Km
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Mandera
Wajir
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Samburu
Isiolo
Trans Nzoia
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Nyandarua
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Garissa
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Kiambu
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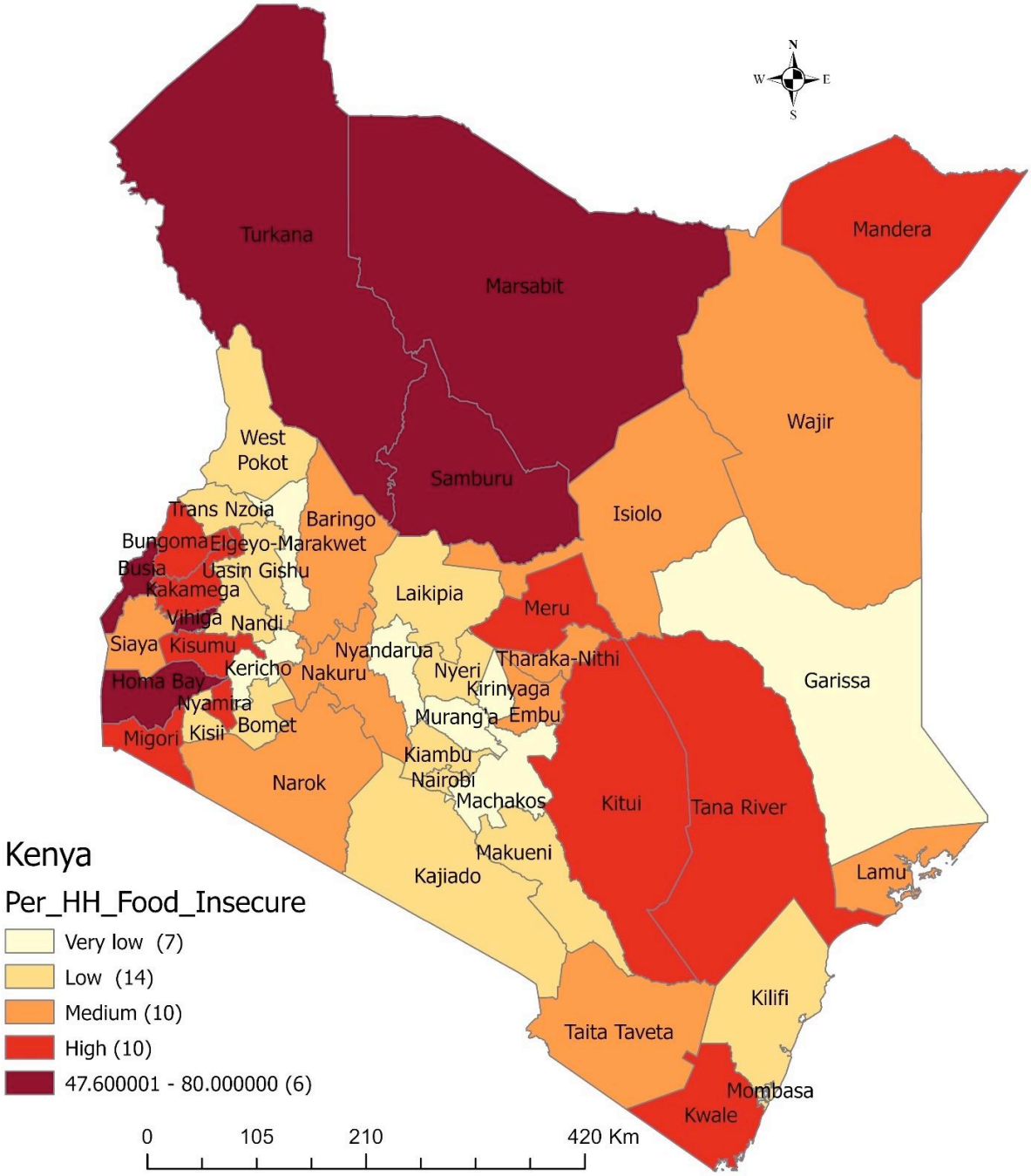
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Per_HH_Food_Insecure
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High (10)
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420 Km
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West Pokot
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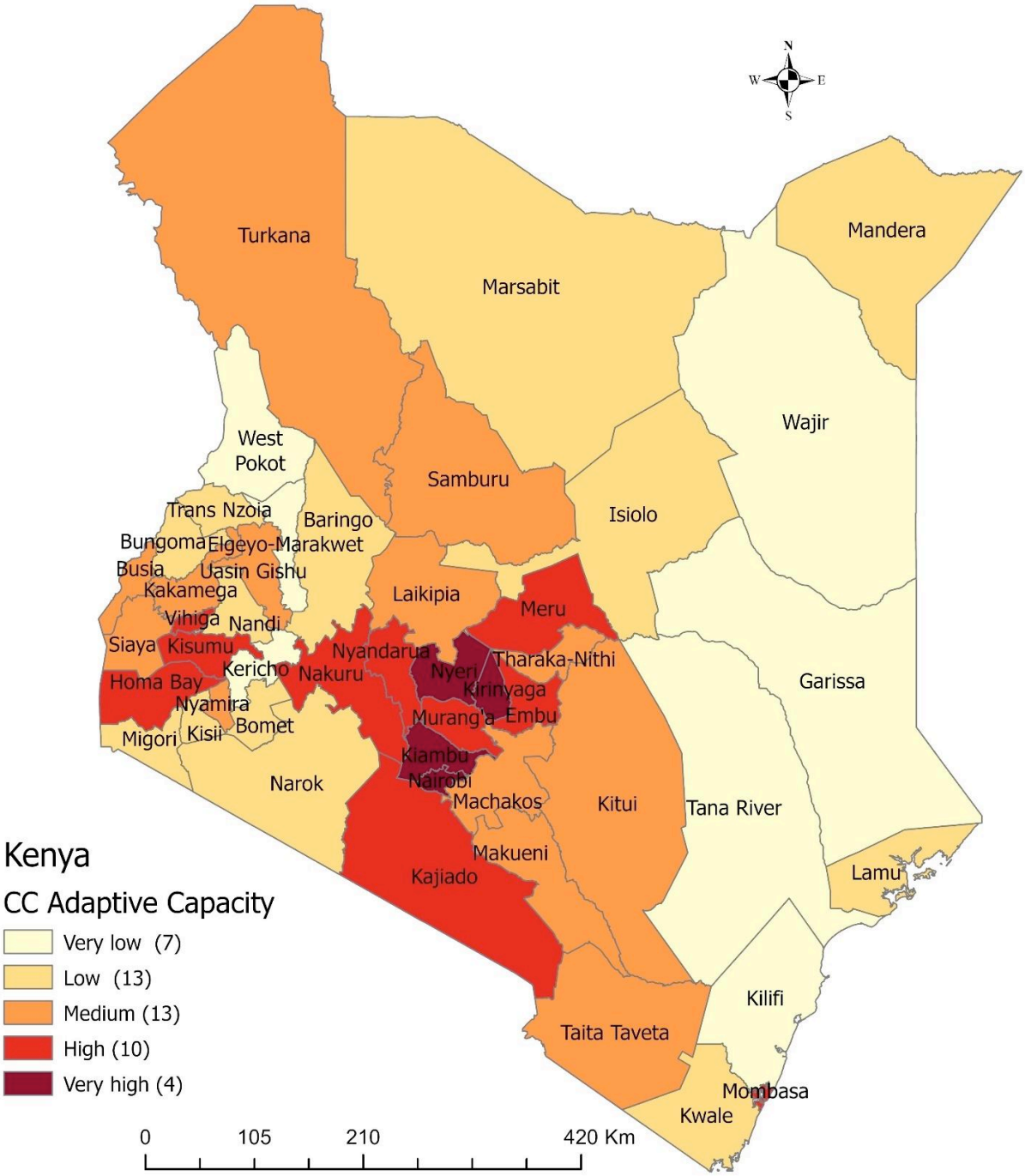


Fig 5: Agriculture and gender adaptive capacity to climate change

Annex 4: Gender, agriculture, and climate change hotspots

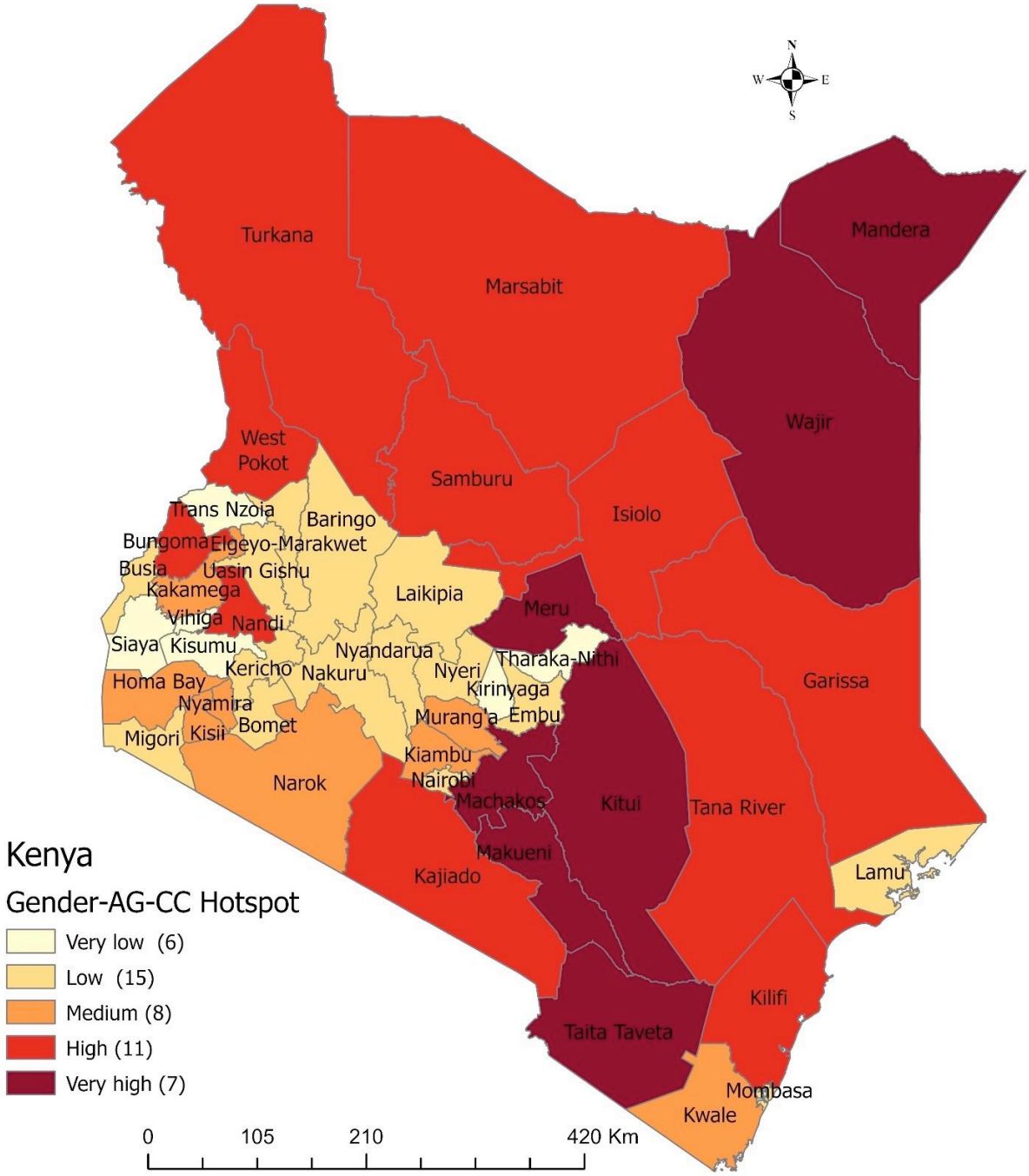
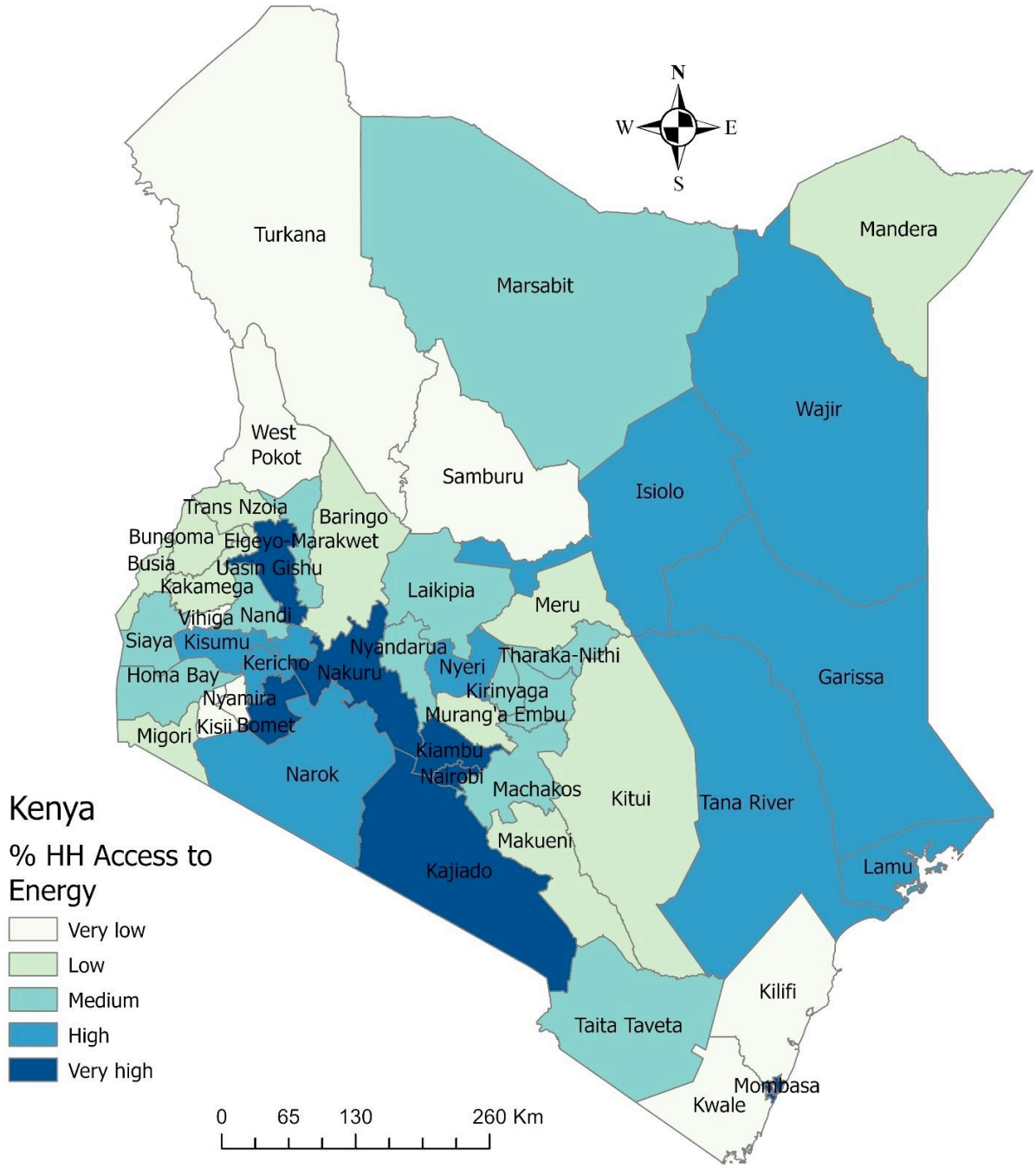
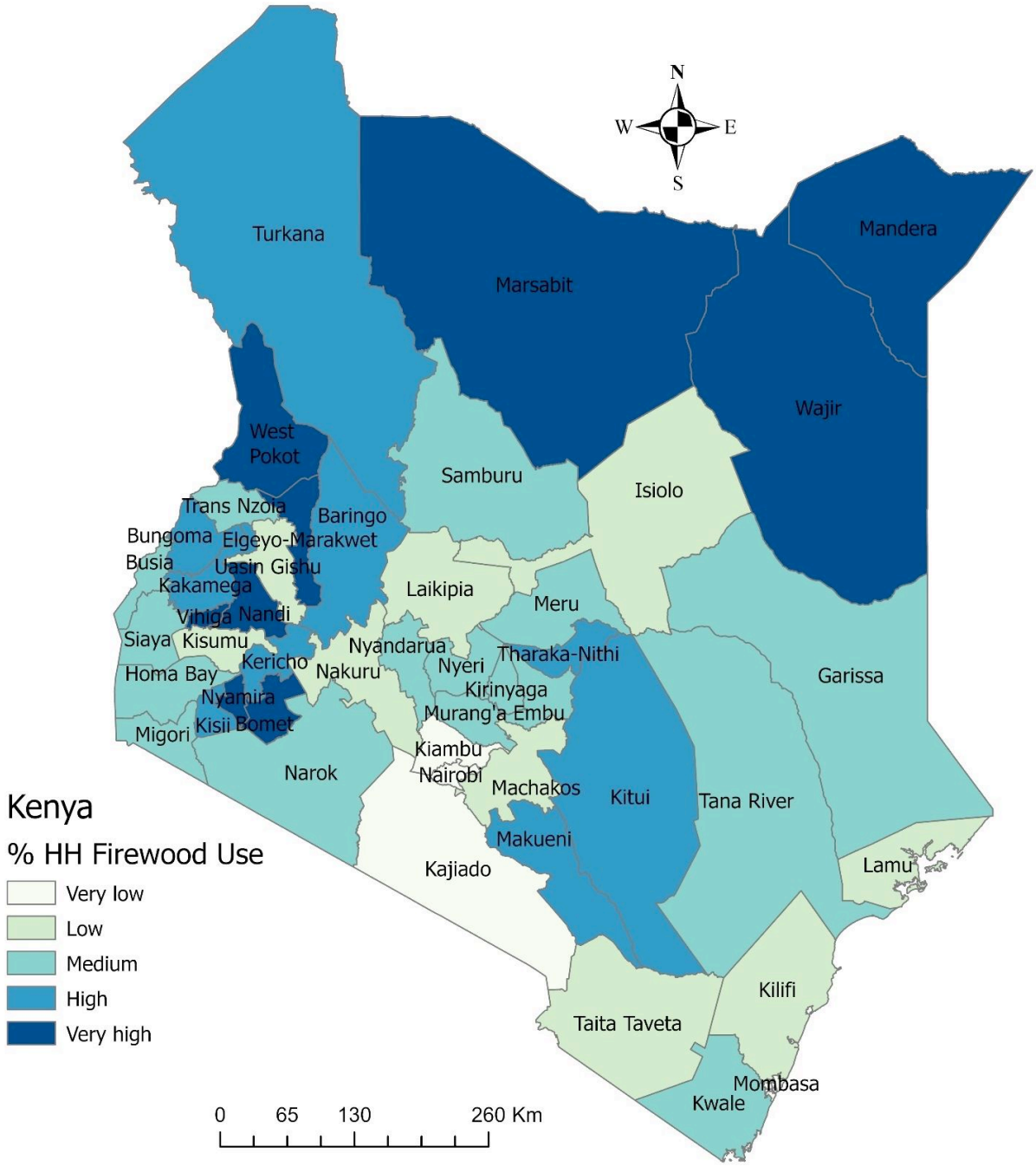


Fig 8: Agriculture-Gender-Climate Change Hotspots

Annex 5: Gender and energy sensitivity to climate change

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Uasin Gishu
Kakamega
Laikipia
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Homa Bay
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Garissa
Nyamira
Murang'a
Embu
Kisii
Bomet
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
% HH Firewood Use
Very low
Low
Medium
High
Very high
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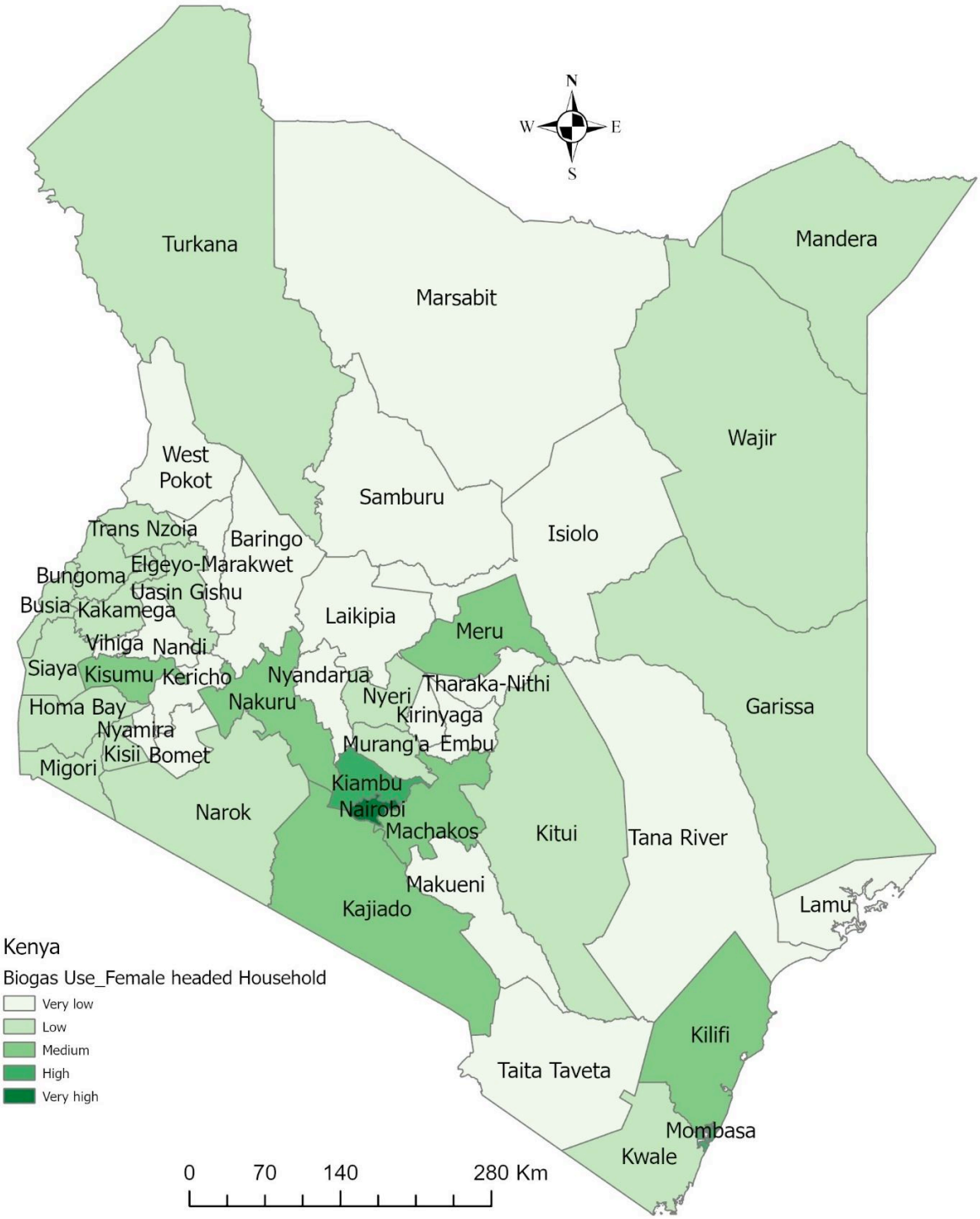
65
130
260 Km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Busia
Kakamega
Laikipia
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Nyandarua
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Kisii
Bomet
Migori
Kiambu
Nairobi
Narok
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kenya
Biogas Use_Female headed Household
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Medium
High
Very high
Kilifi
Taita Taveta
Mombasa
Kwale
0
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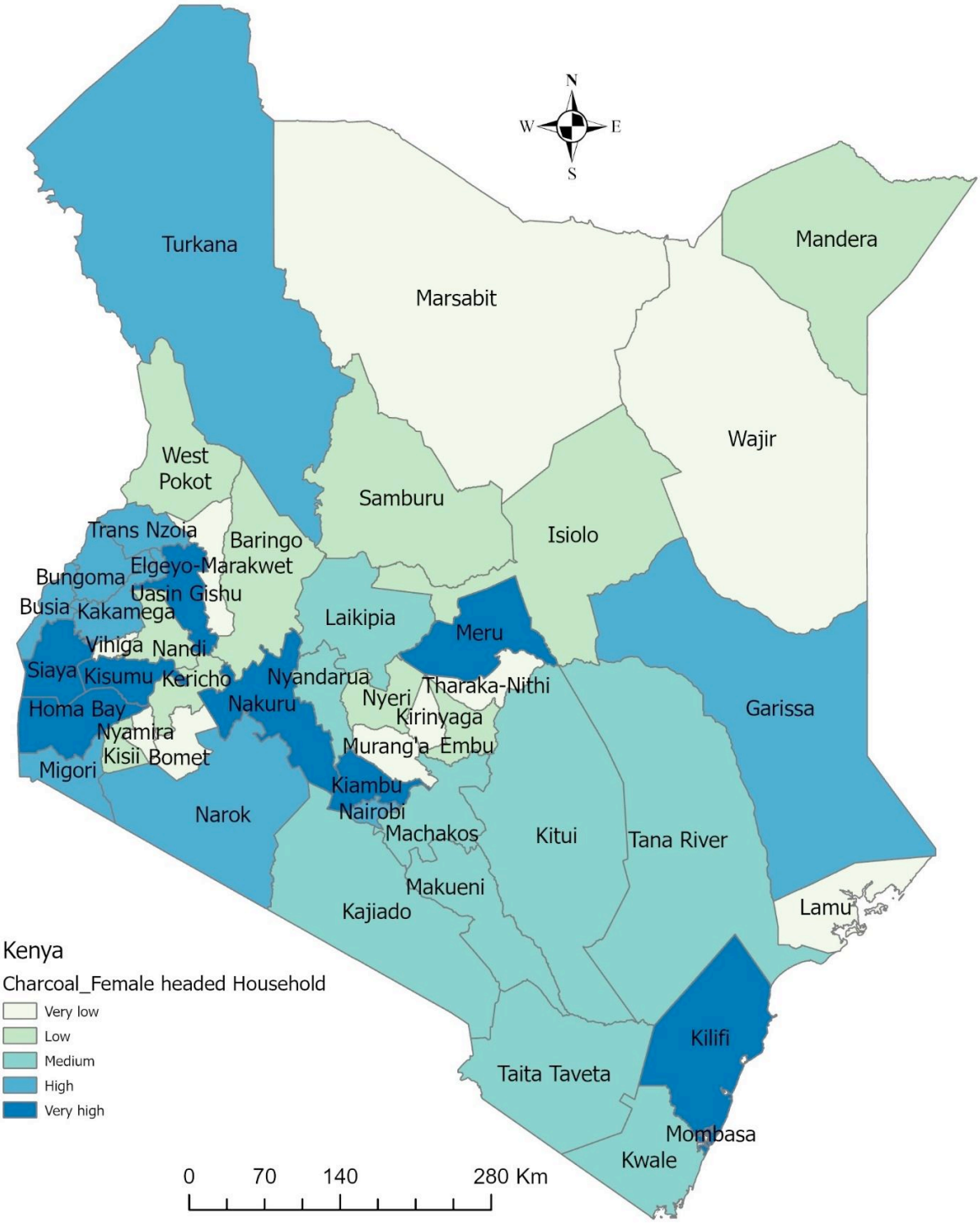
140
280 Km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Bungoma
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
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Kisumu
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Nyandarua
Tharaka-Nithi
Nyeri
Nakuru
Homa Bay
Kirinyaga
Garissa
Nyamira
Murang'a
Embu
Kisii
Bomet
Migori
Kiambu
Nairobi
Narok
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
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Kwale
Kenya
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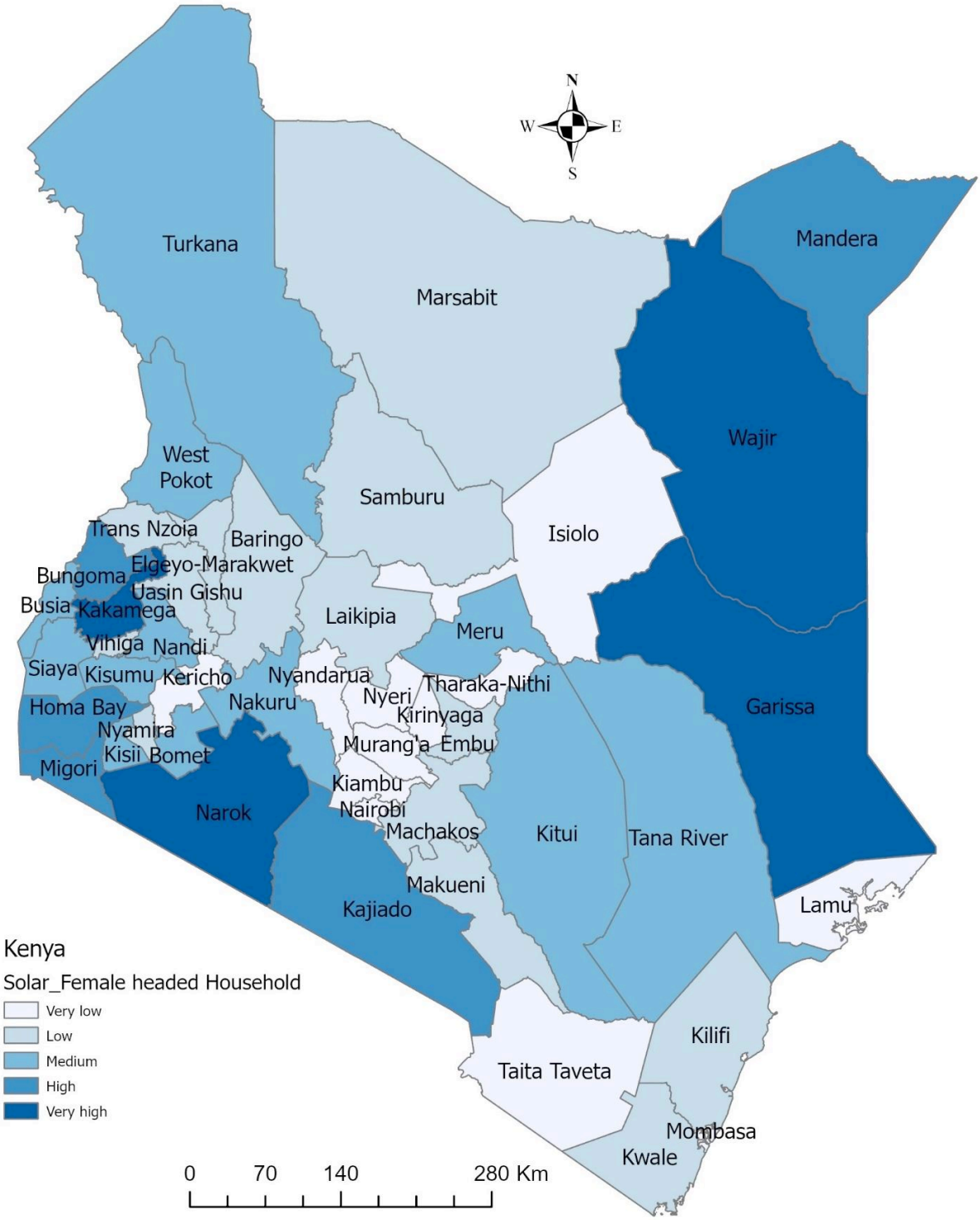
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Bungoma
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
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Kisumu
Kericho
Nyandarua
Nyeri
Tharaka-Nithi
Homa Bay
Nakuru
Kirinyaga
Garissa
Nyamira
Murang'a
Embu
Kisii
Bomet
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kenya
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Very high
Kilifi
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Mombasa
Kwale
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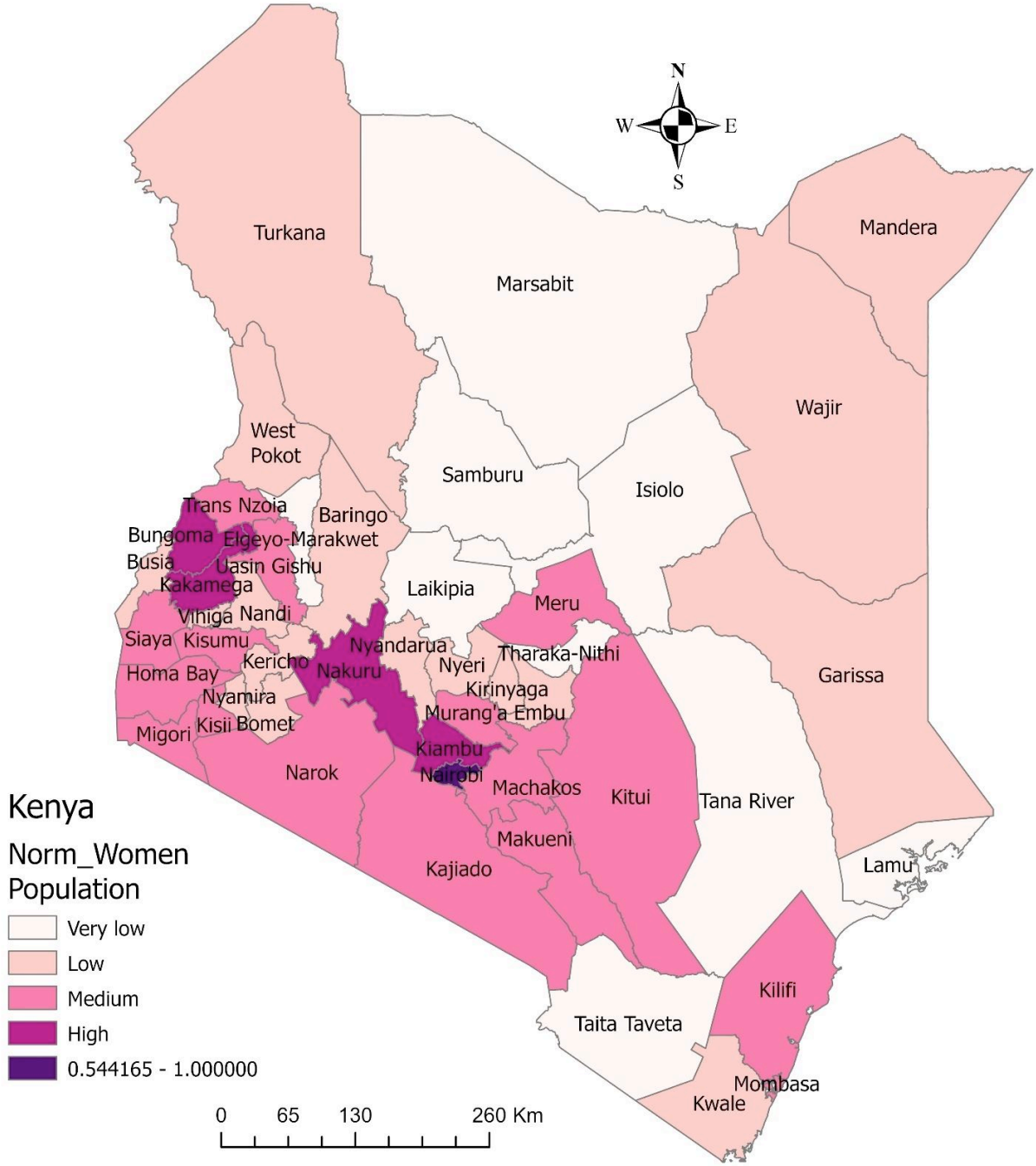
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Kakamega
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Nyandarua
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Murang'a
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Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
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Kwale
Kenya
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Low
Medium
High
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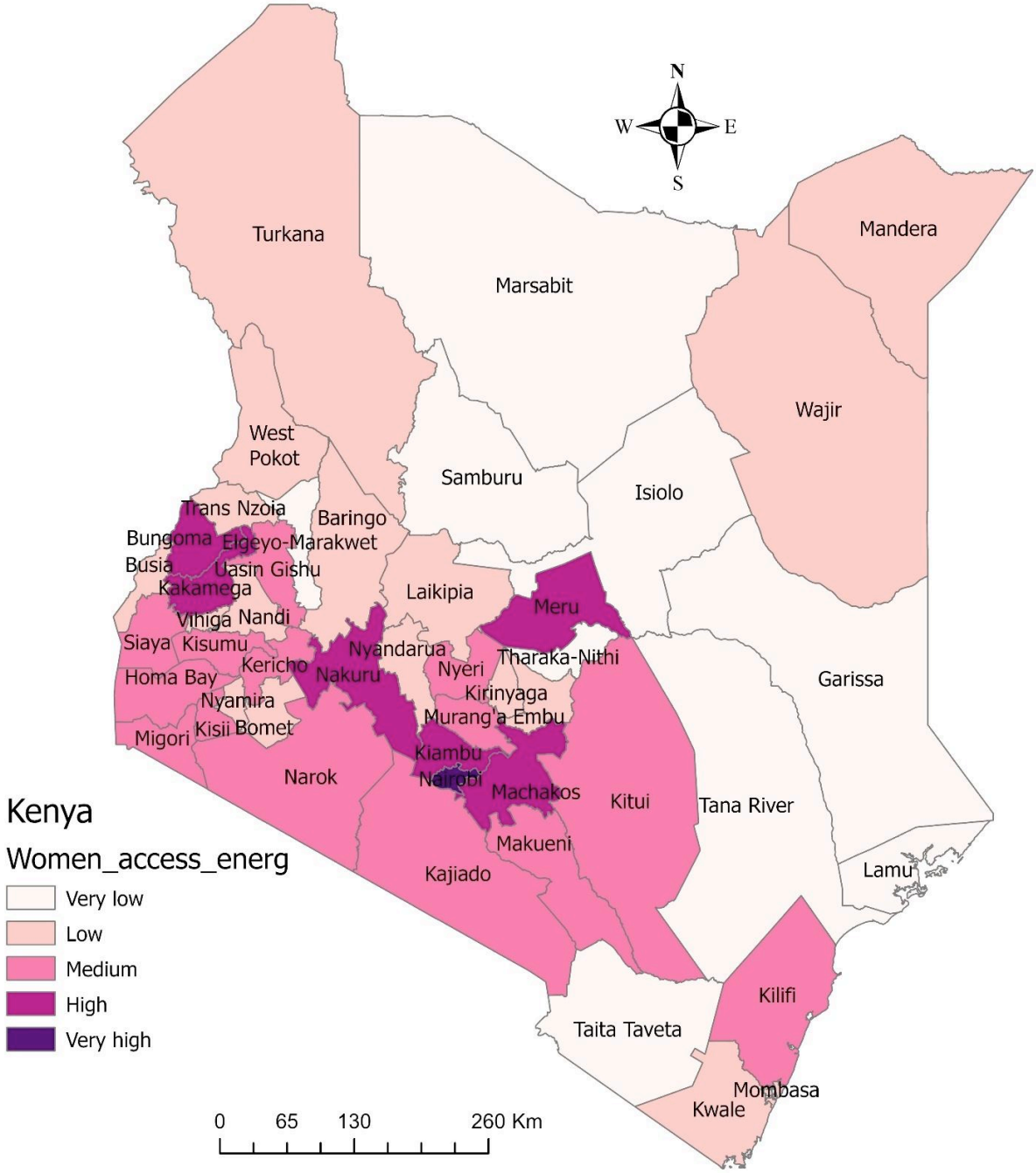
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Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
Meru
Vihiga
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Siaya
Kisumu
Nyandarua
Tharaka-Nithi
Kericho
Nyeri
Homa Bay
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Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
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Kwale
Kenya
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Medium
High
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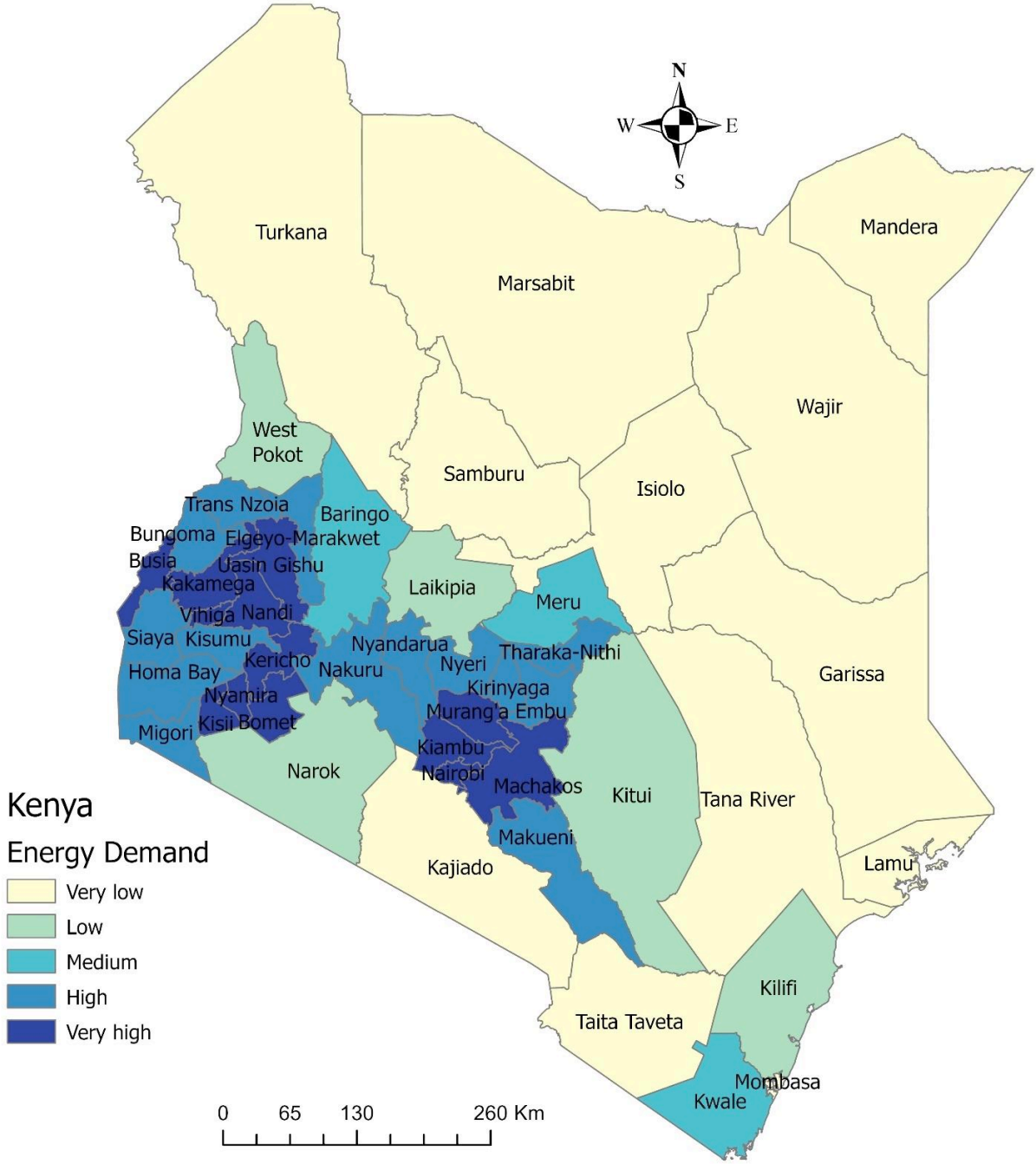
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Kericho
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Homa Bay
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Garissa
Nyamira
Murang'a
Embu
Kisii
Bomet
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
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Kwale
Kenya
Energy Demand
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Medium
High
Very high
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260 Km

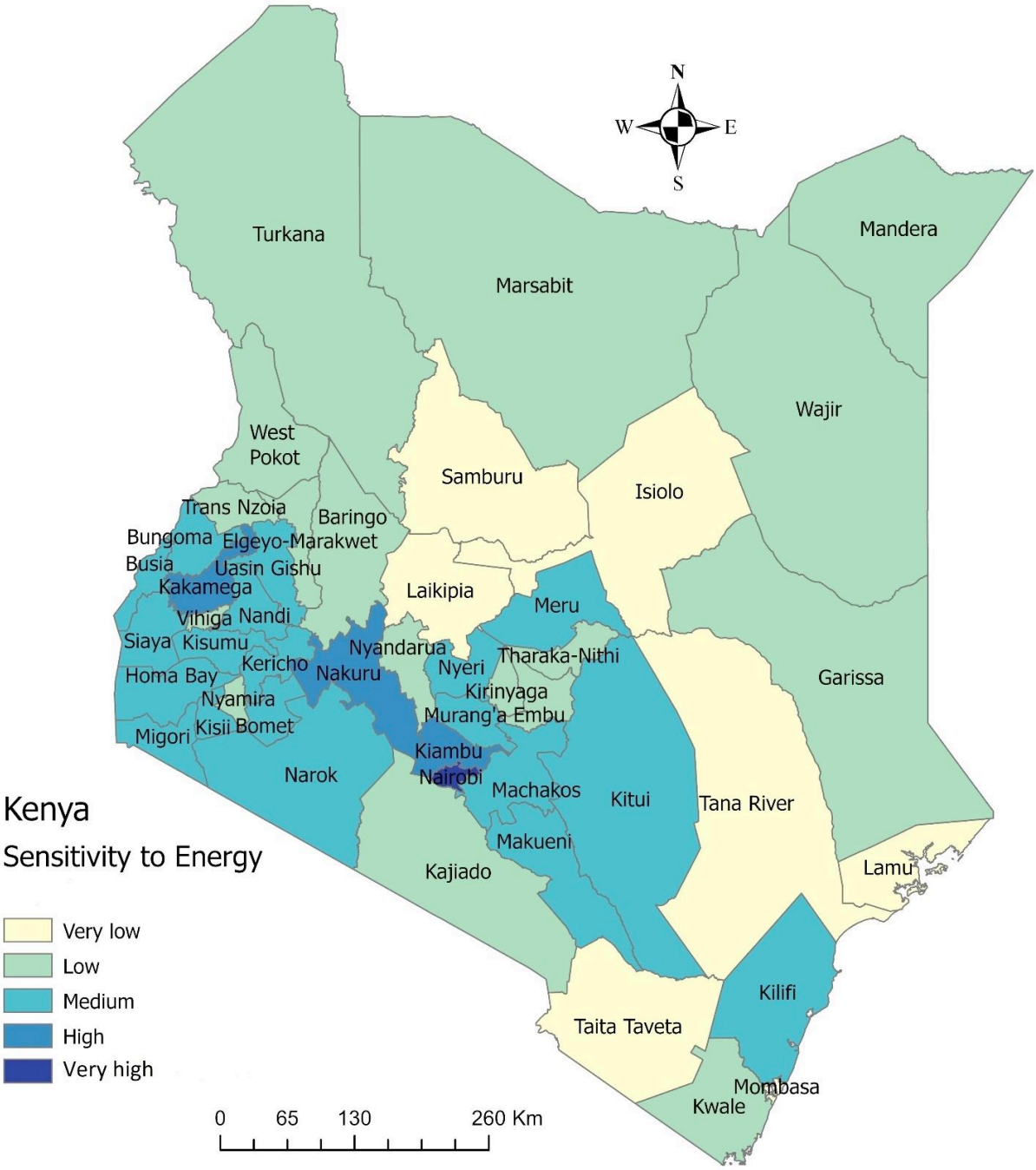
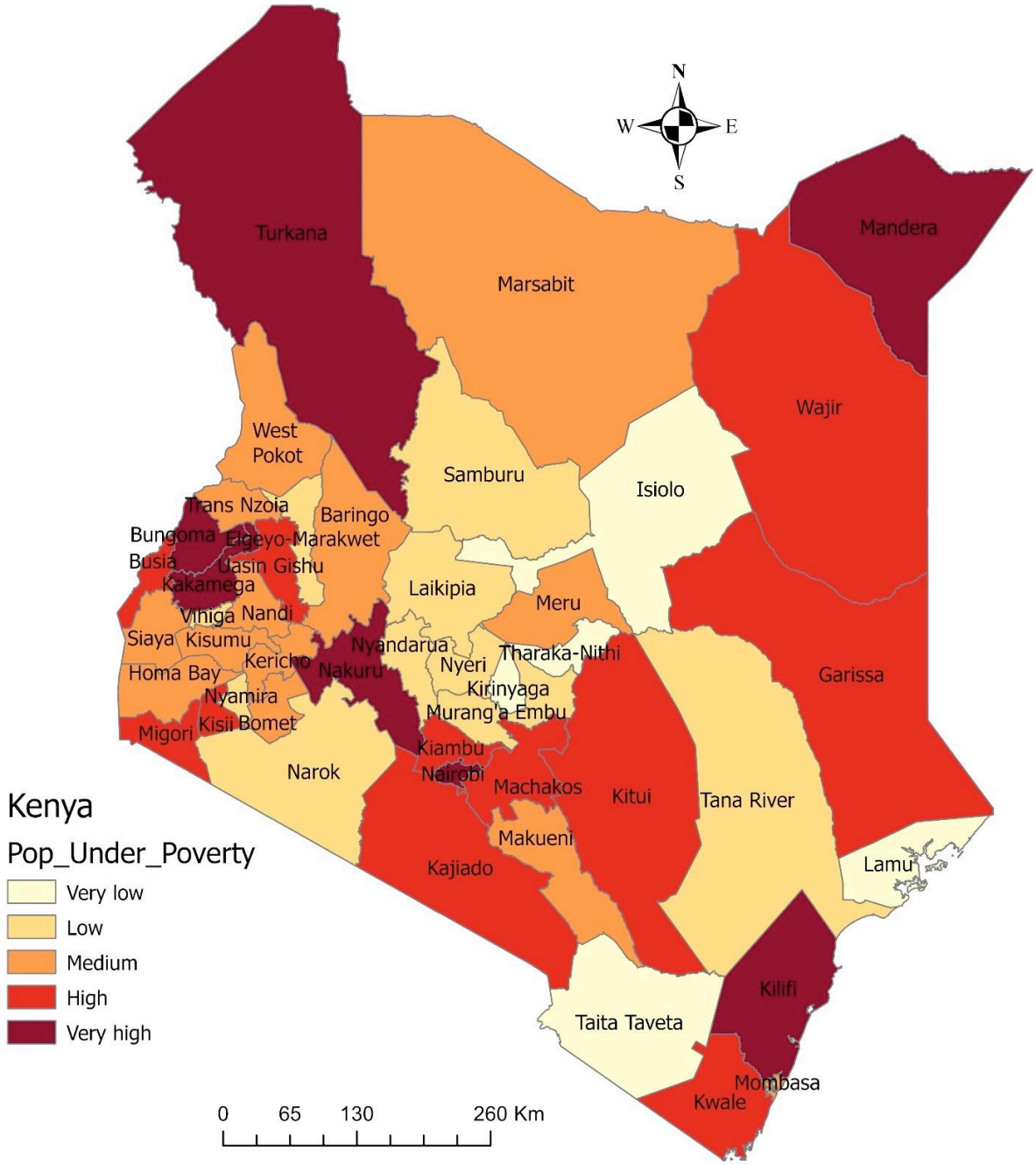
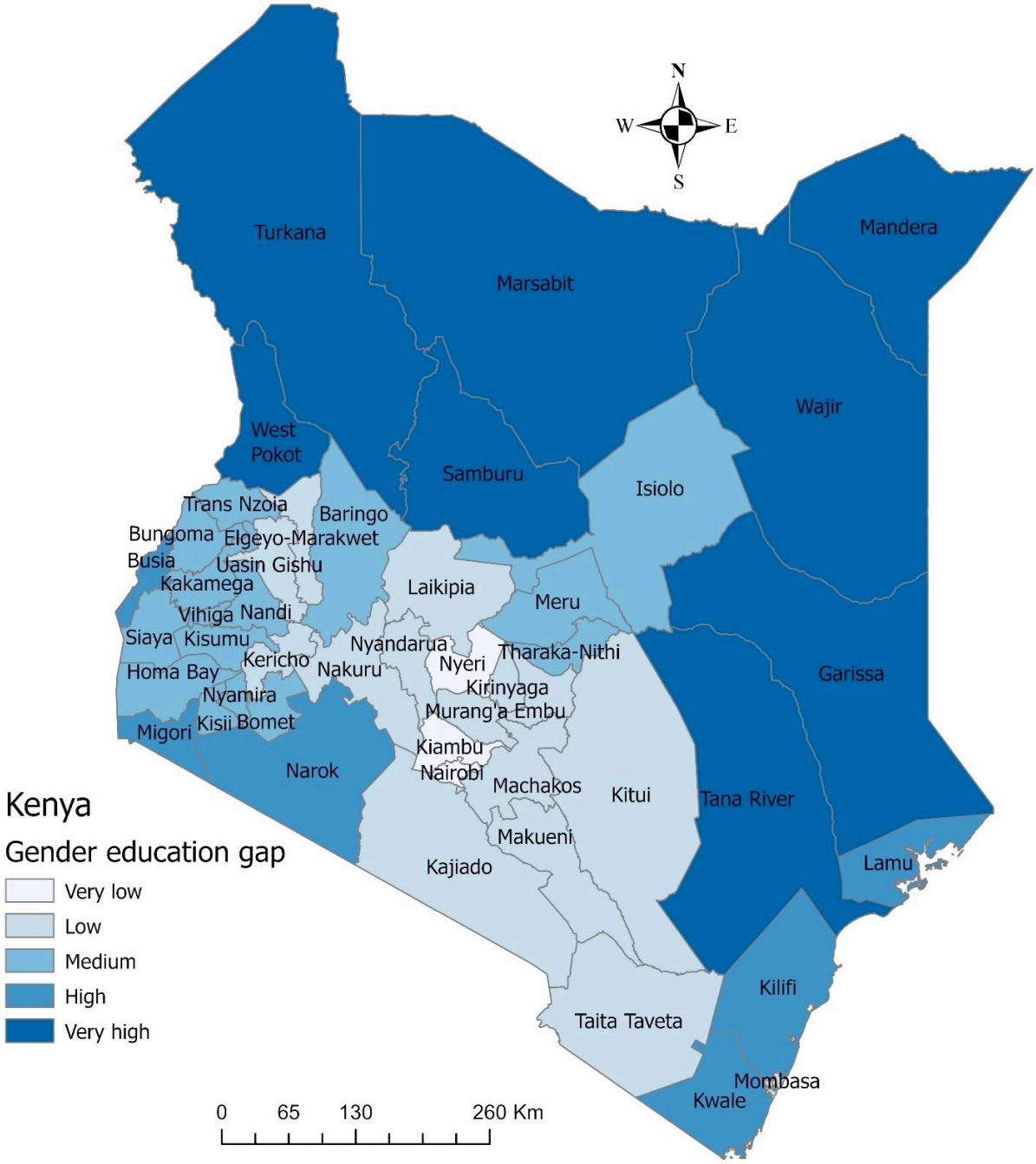


Fig 4: Energy and gender sensitivity to climate change

Annex 6: Gender and energy adaptive to climate change

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Baringo
Bungoma
Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
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Kisumu
Nyandarua
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Kericho
Nyeri
Homa Bay
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Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
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Kenya
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Medium
High
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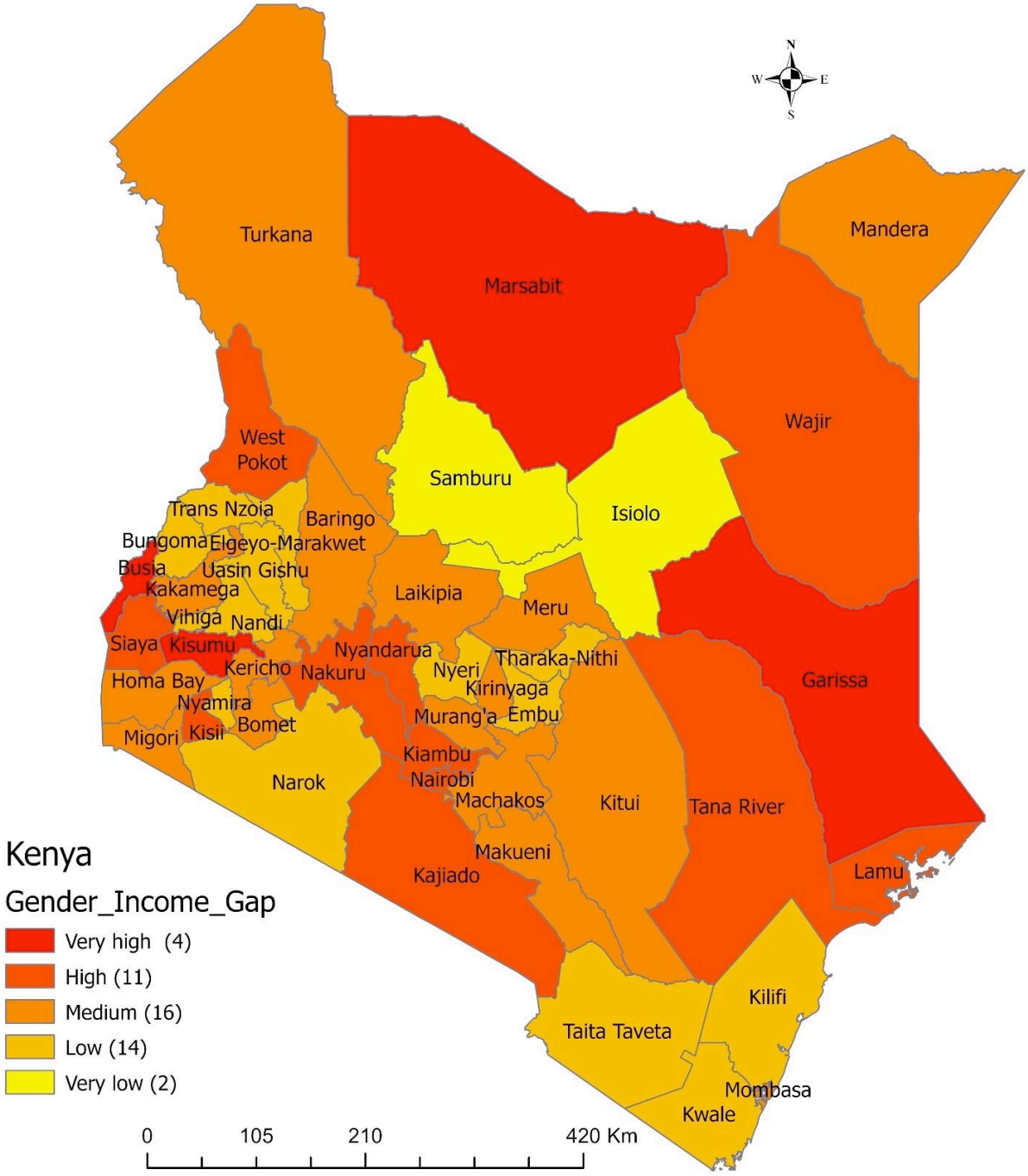
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Busia
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Kakamega
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Garissa
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Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
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Medium (16)
Low (14)
Very low (2)
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210
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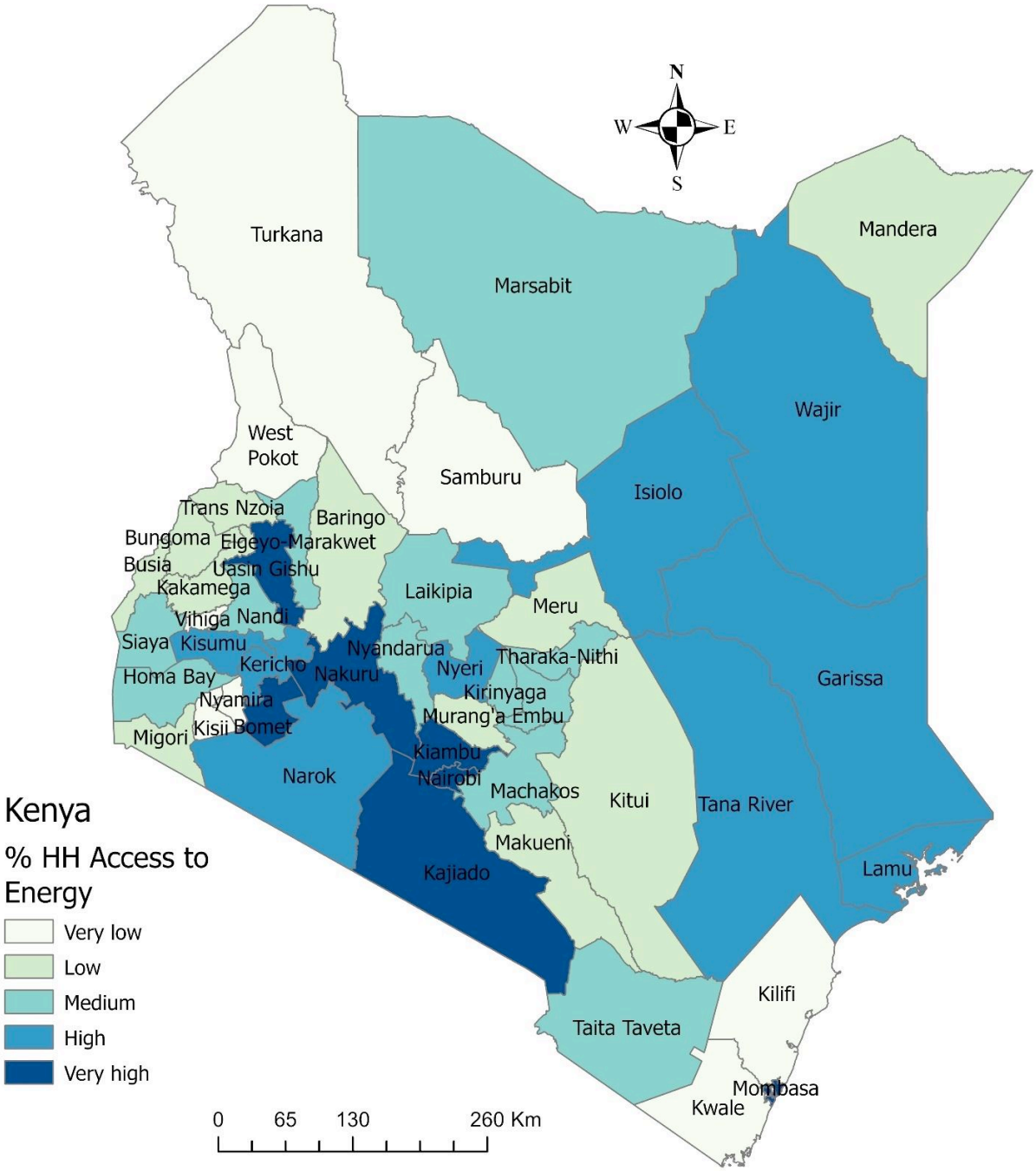
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Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
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Kwale
Kenya
% HH Access to Energy
Very low
Low
Medium
High
Very high
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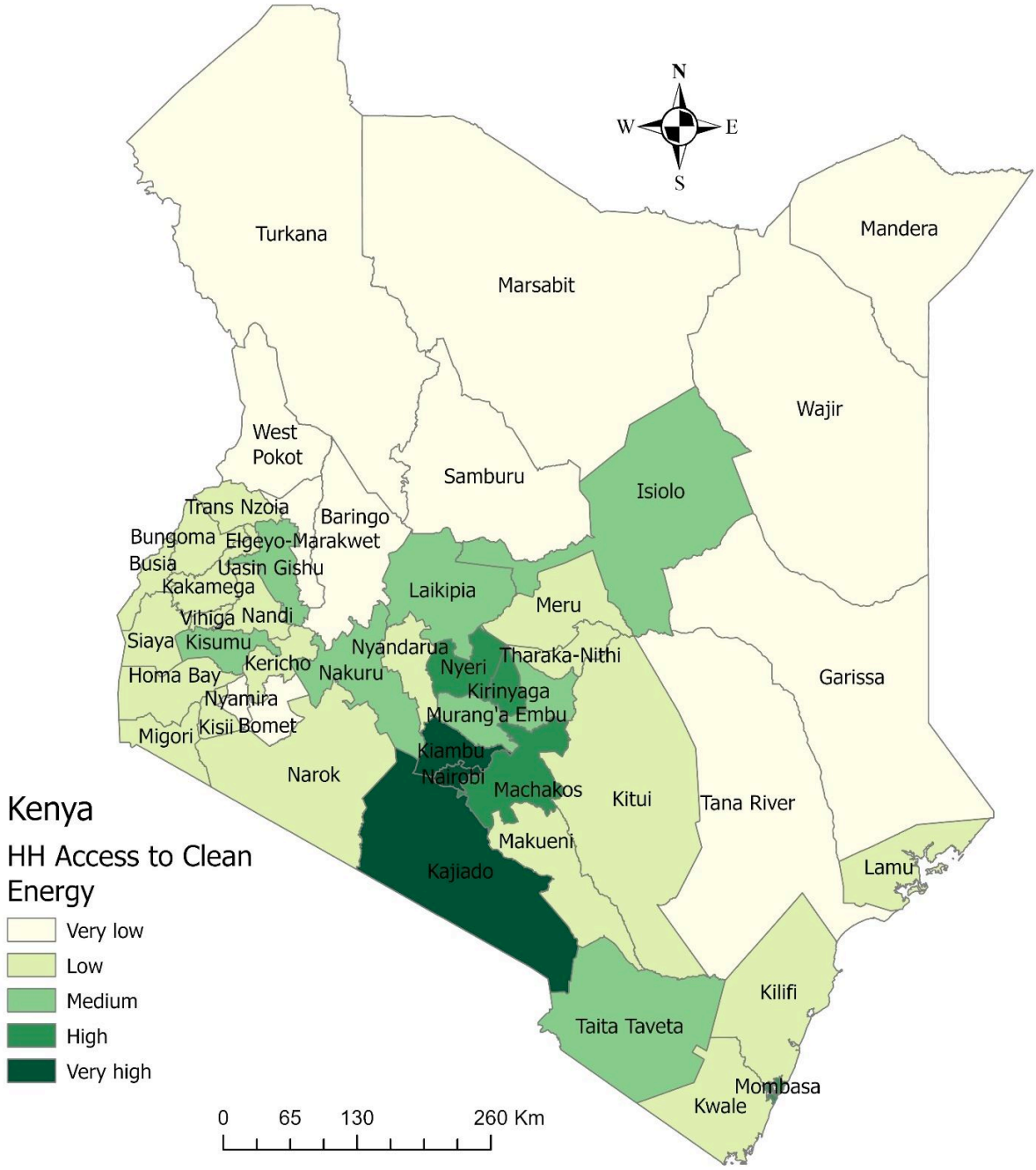
65
130
260 Km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Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
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Kwale
Kenya
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High
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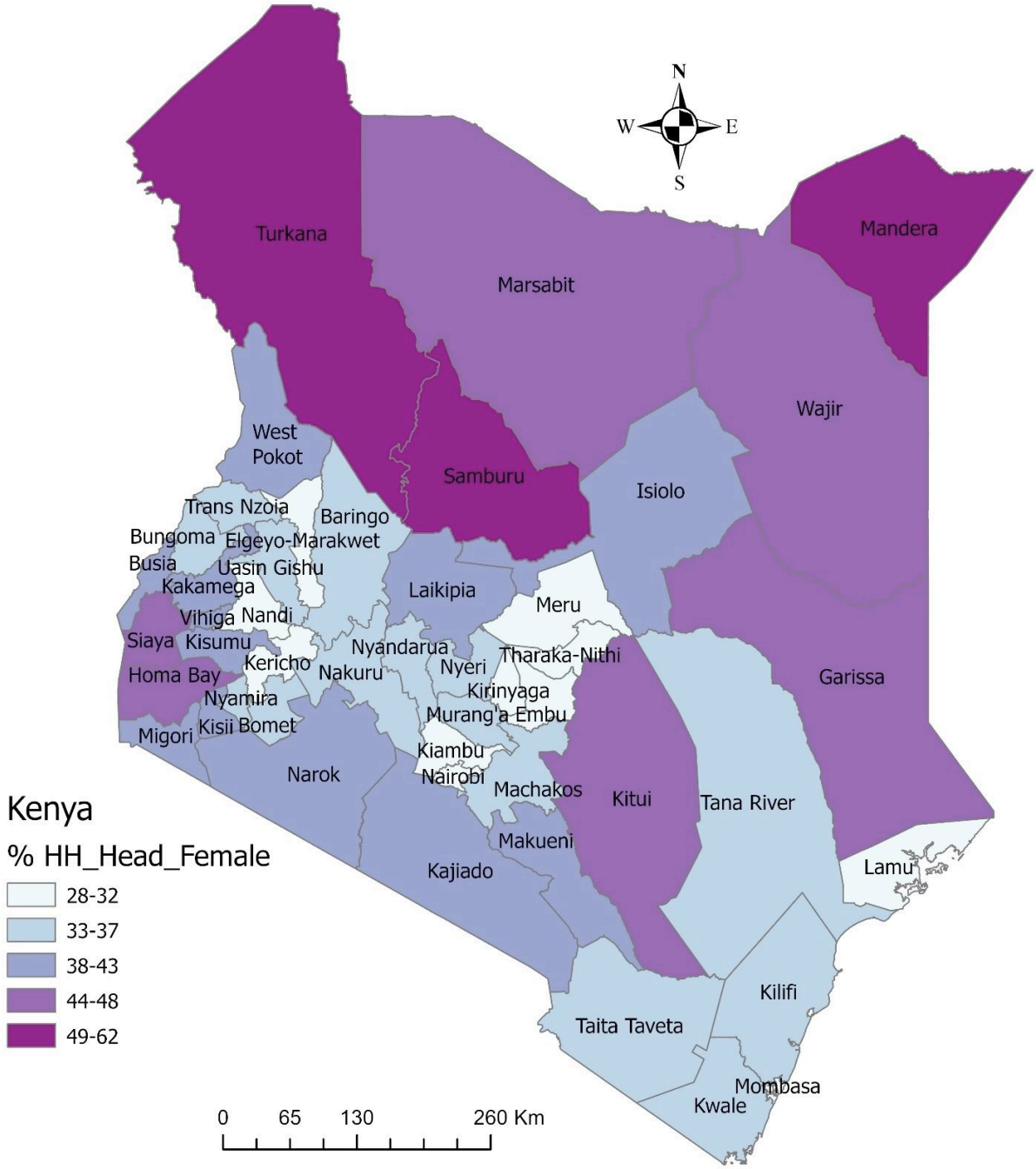
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Nairobi
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Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
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38-43
44-48
49-62
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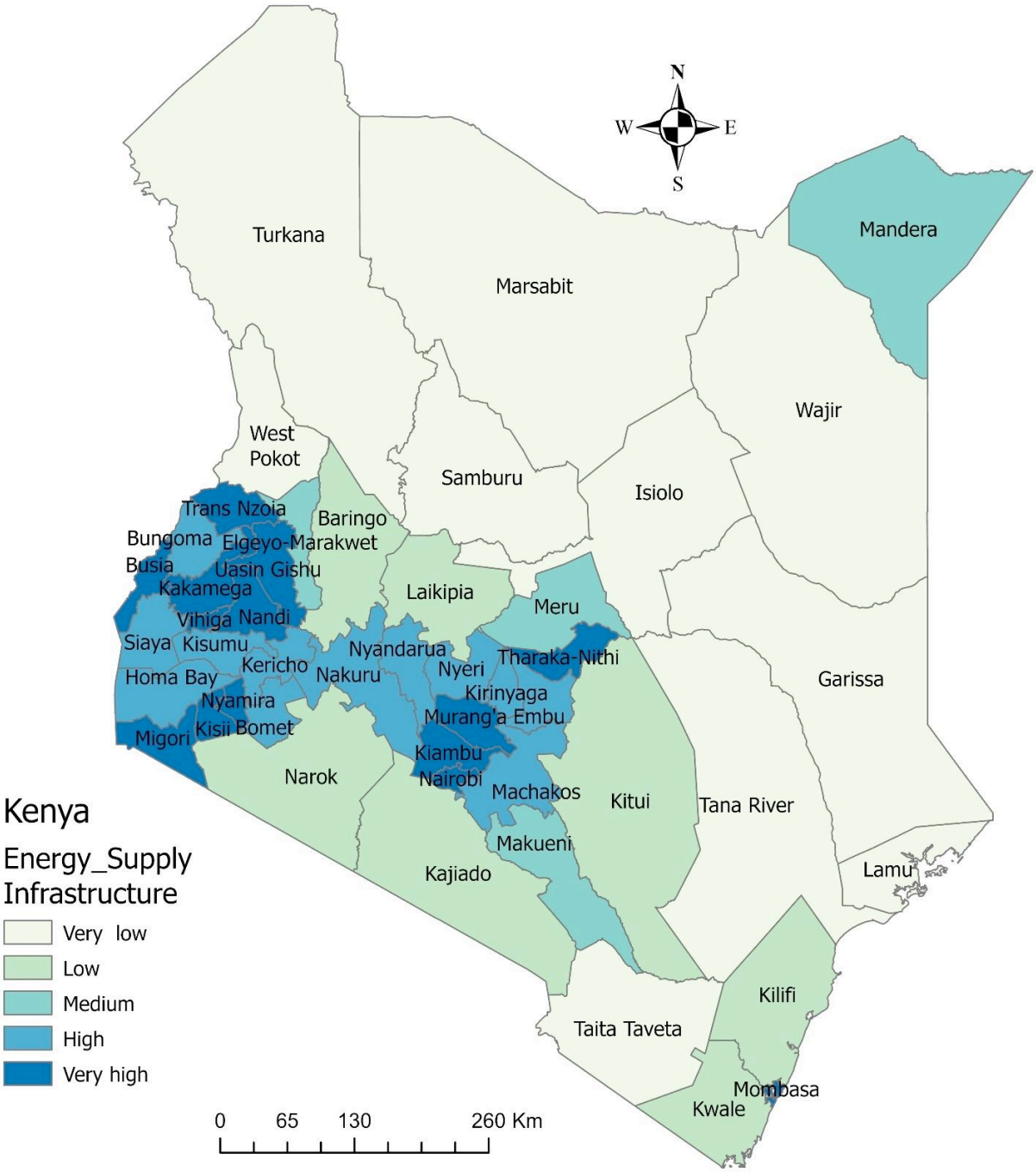
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Samburu
Isiolo
Trans Nzoia
Baringo
Bungoma
Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Nyandarua
Tharaka-Nithi
Kericho
Nyeri
Homa Bay
Nakuru
Kirinyaga
Garissa
Nyamira
Murang'a
Embu
Kisii
Bomet
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
Energy_Supply Infrastructure
Very low
Low
Medium
High
Very high
0
65
130
260 Km

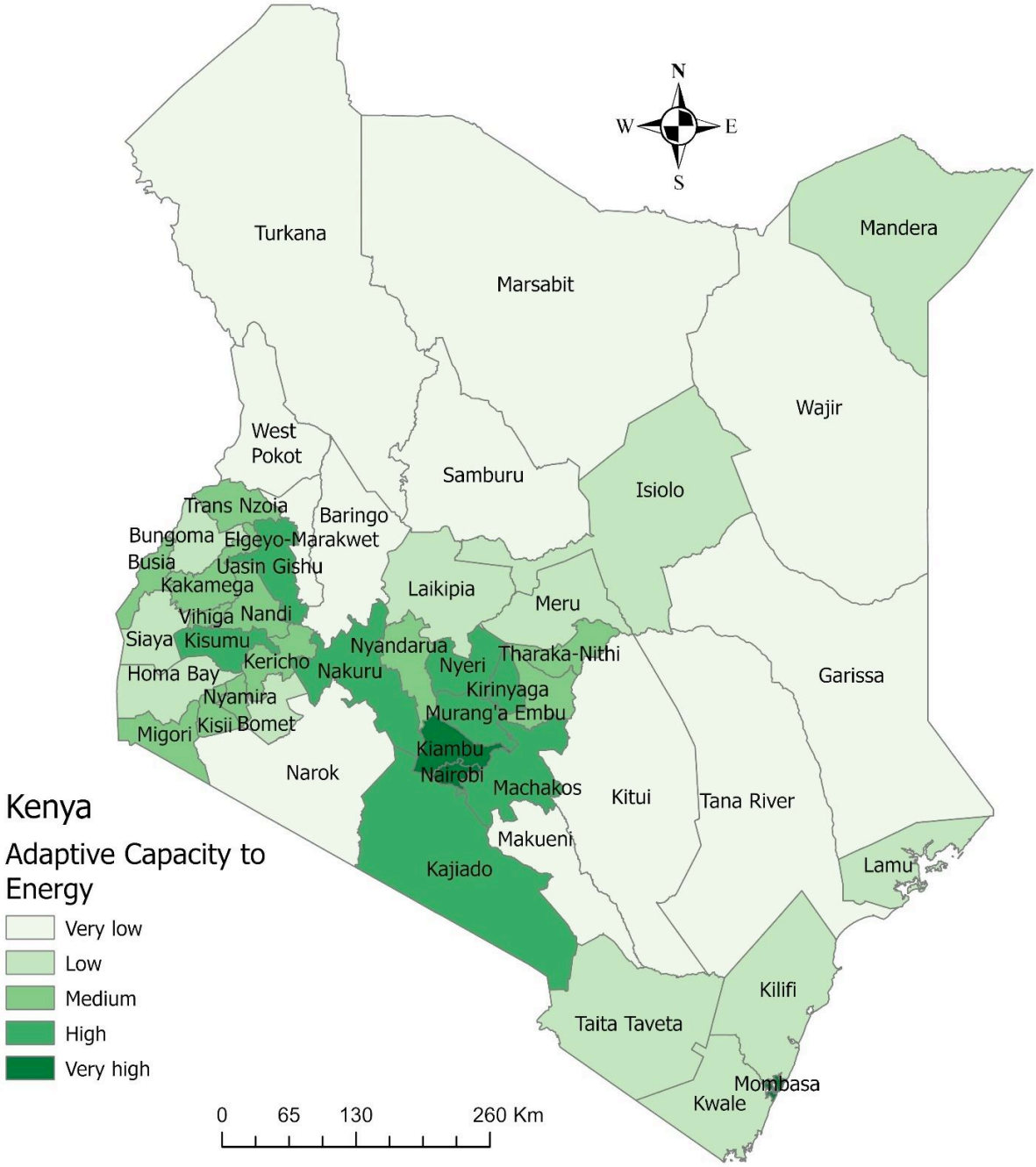


Fig 7: Energy and gender adaptive capacity to climate change

Annex 7: Gender, energy, and climate change hotspots

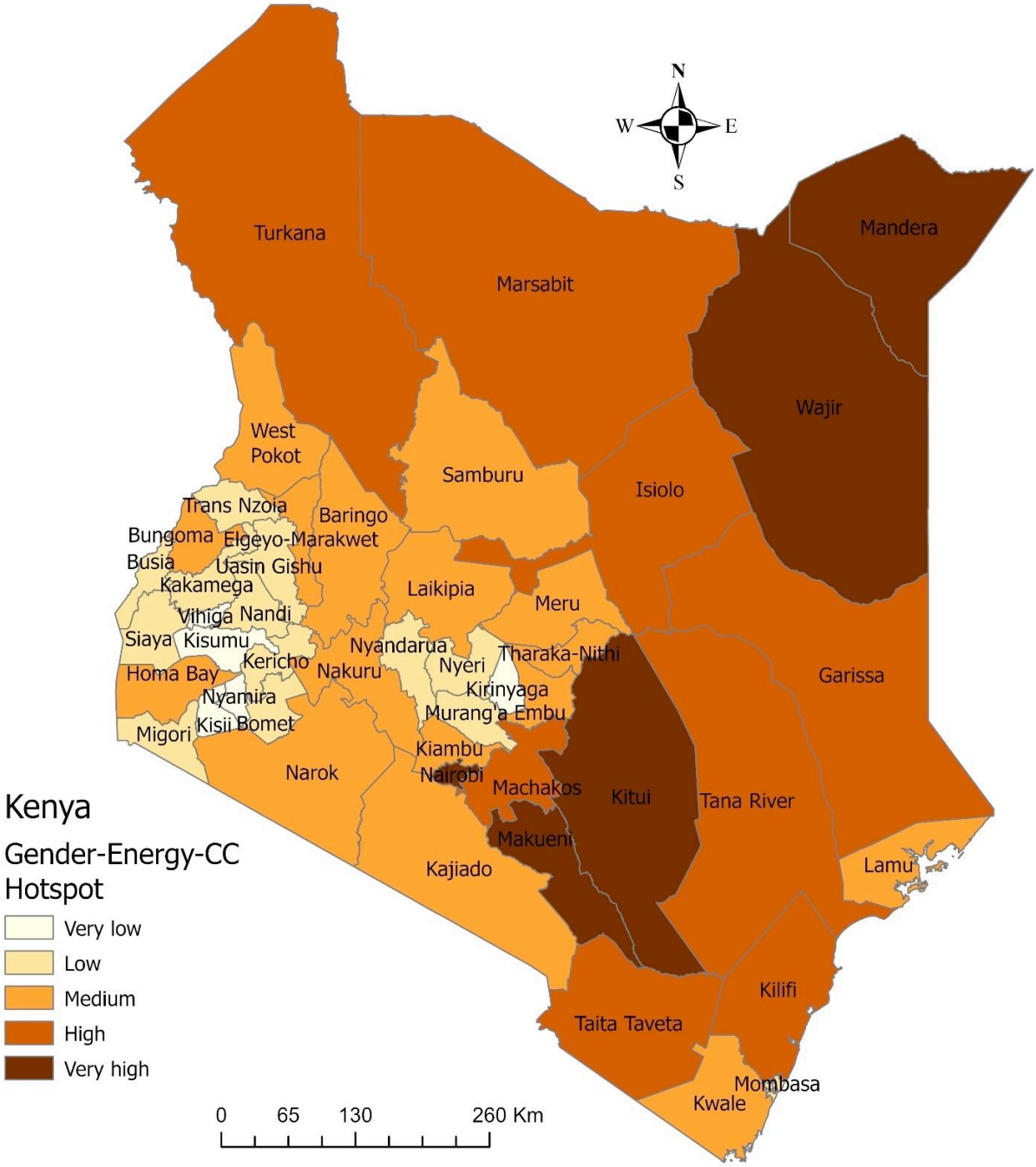
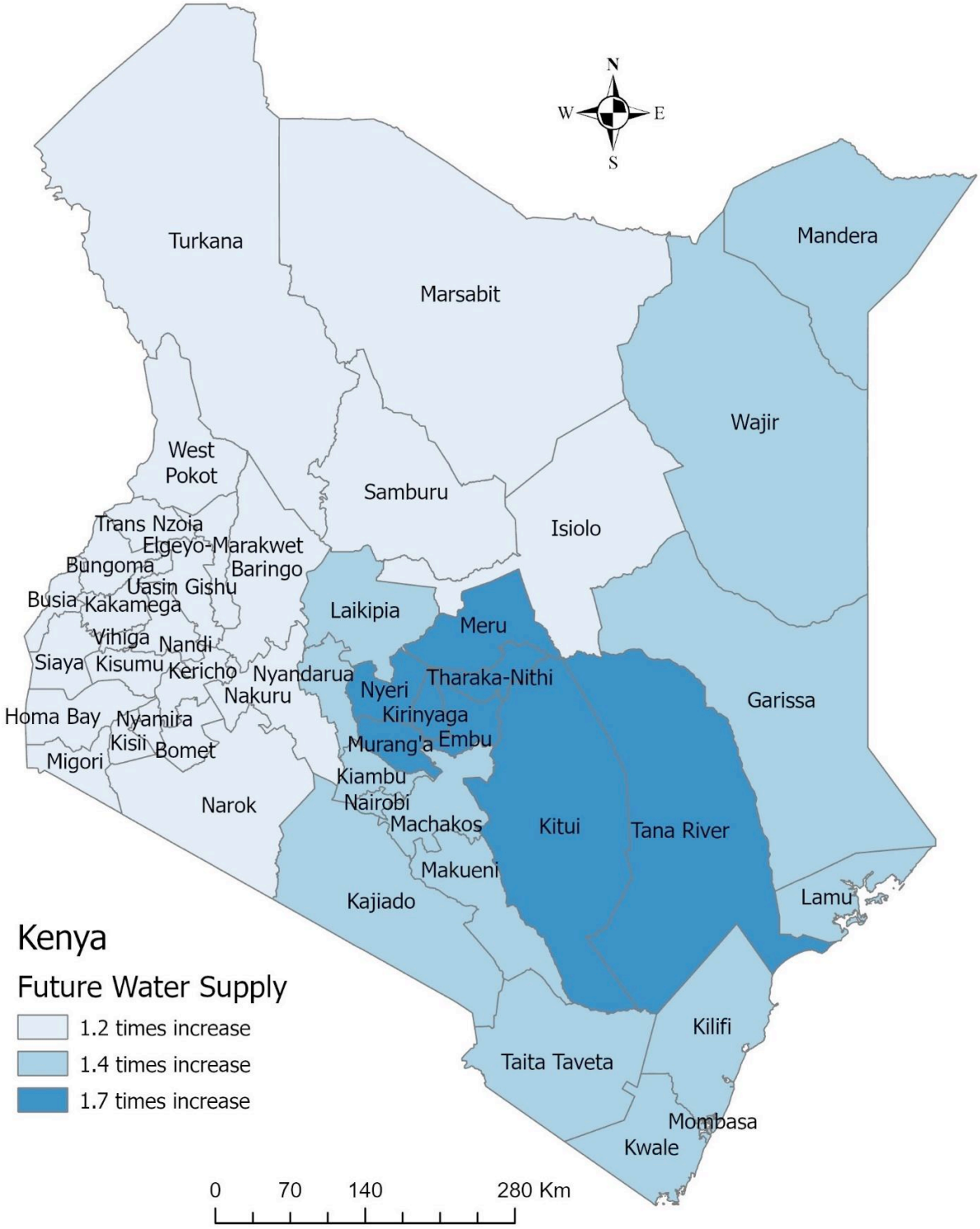
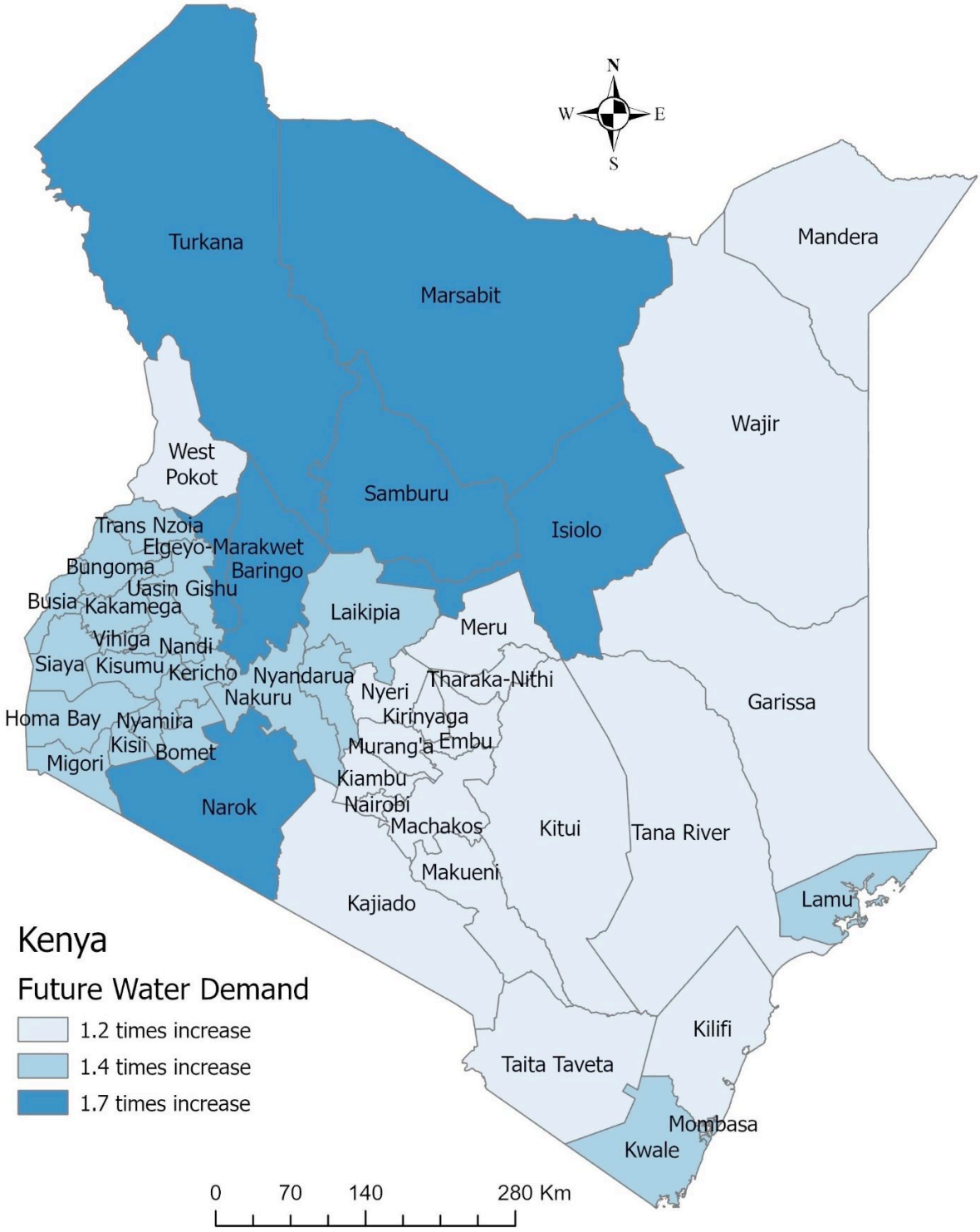
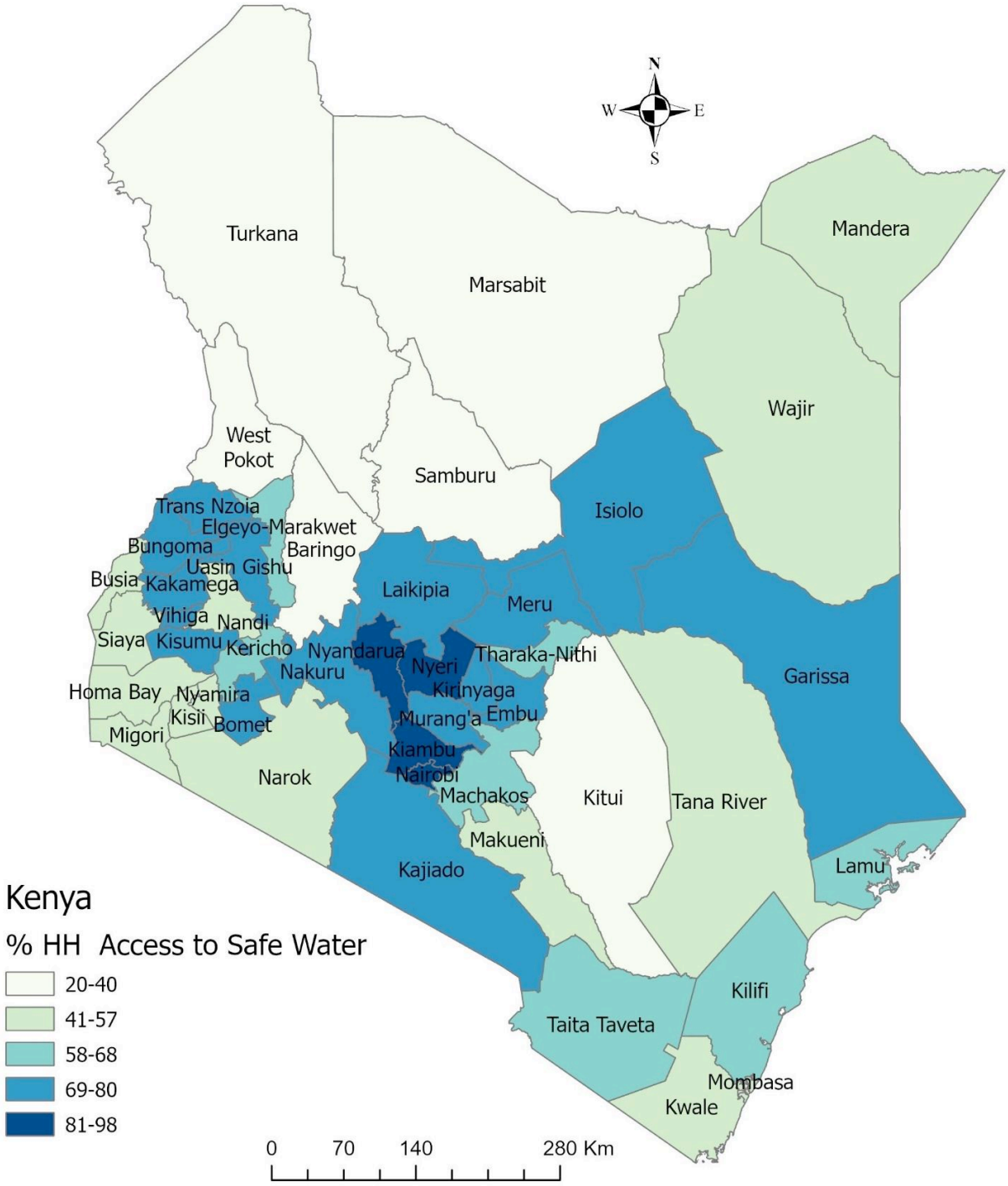


Fig 10: Energy-Gender-Climate Change Hotspots

Annex 8: Gender and water sensitivity to climate change




N
W
E
S
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Elgeyo-Marakwet
Bungoma
Baringo
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Kericho
Nyandarua
Nakuru
Nyeri
Tharaka-Nithi
Garissa
Homa Bay
Nyamira
Kirinyaga
Kisii
Bomet
Murang'a
Embu
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kenya
Future Water Demand
1.2 times increase
1.4 times increase
1.7 times increase
Kilifi
Taita Taveta
Mombasa
Kwale
0
70
140
280 Km


N
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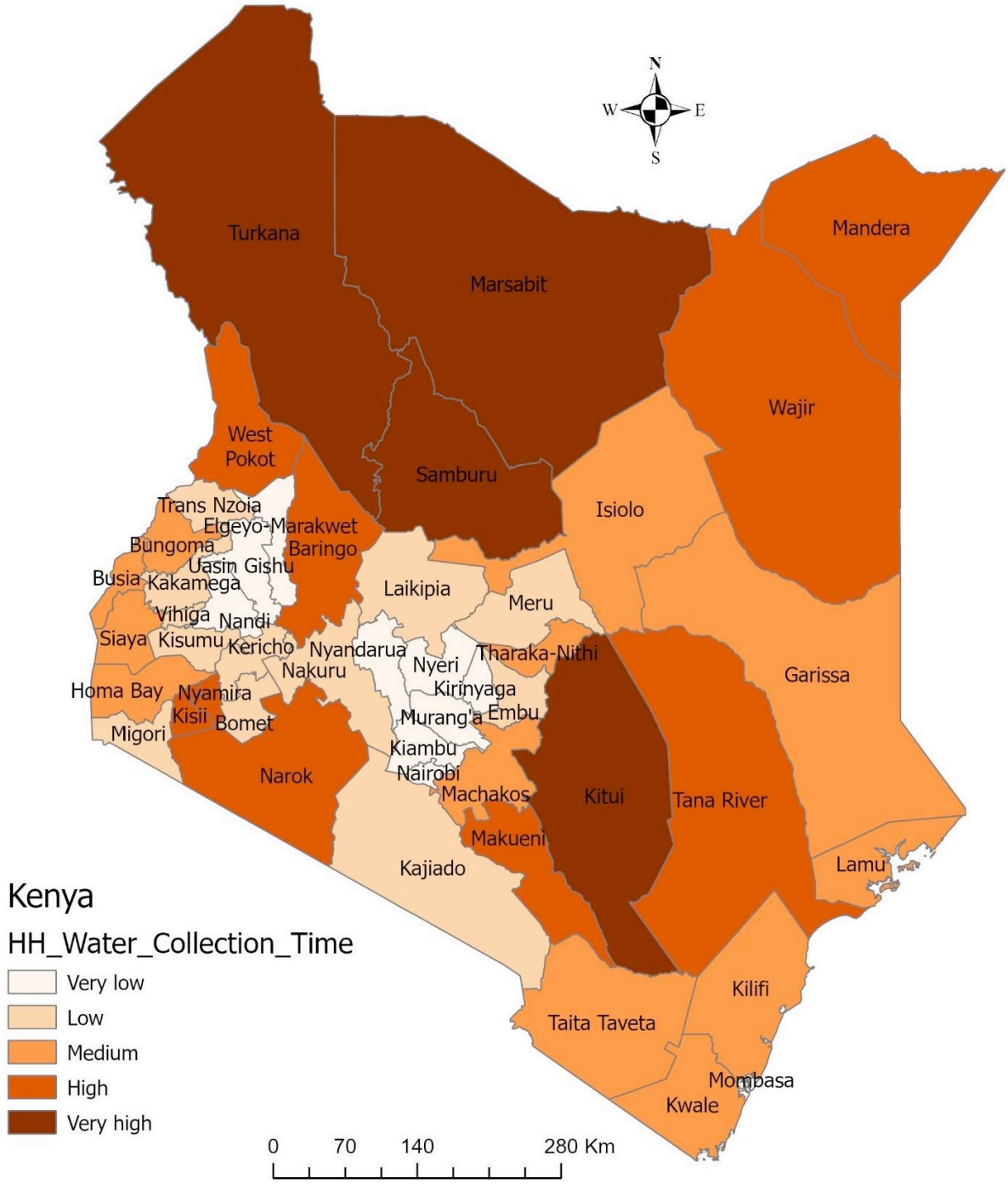
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Elgeyo-Marakwet
Bungoma
Baringo
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Kericho
Nyandarua
Nakuru
Nyeri
Tharaka-Nithi
Garissa
Homa Bay
Nyamira
Kirinyaga
Kisii
Bomet
Murang'a
Embu
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
% HH Access to Safe Water
20-40
41-57
58-68
69-80
81-98
0
70
140
280 Km


N
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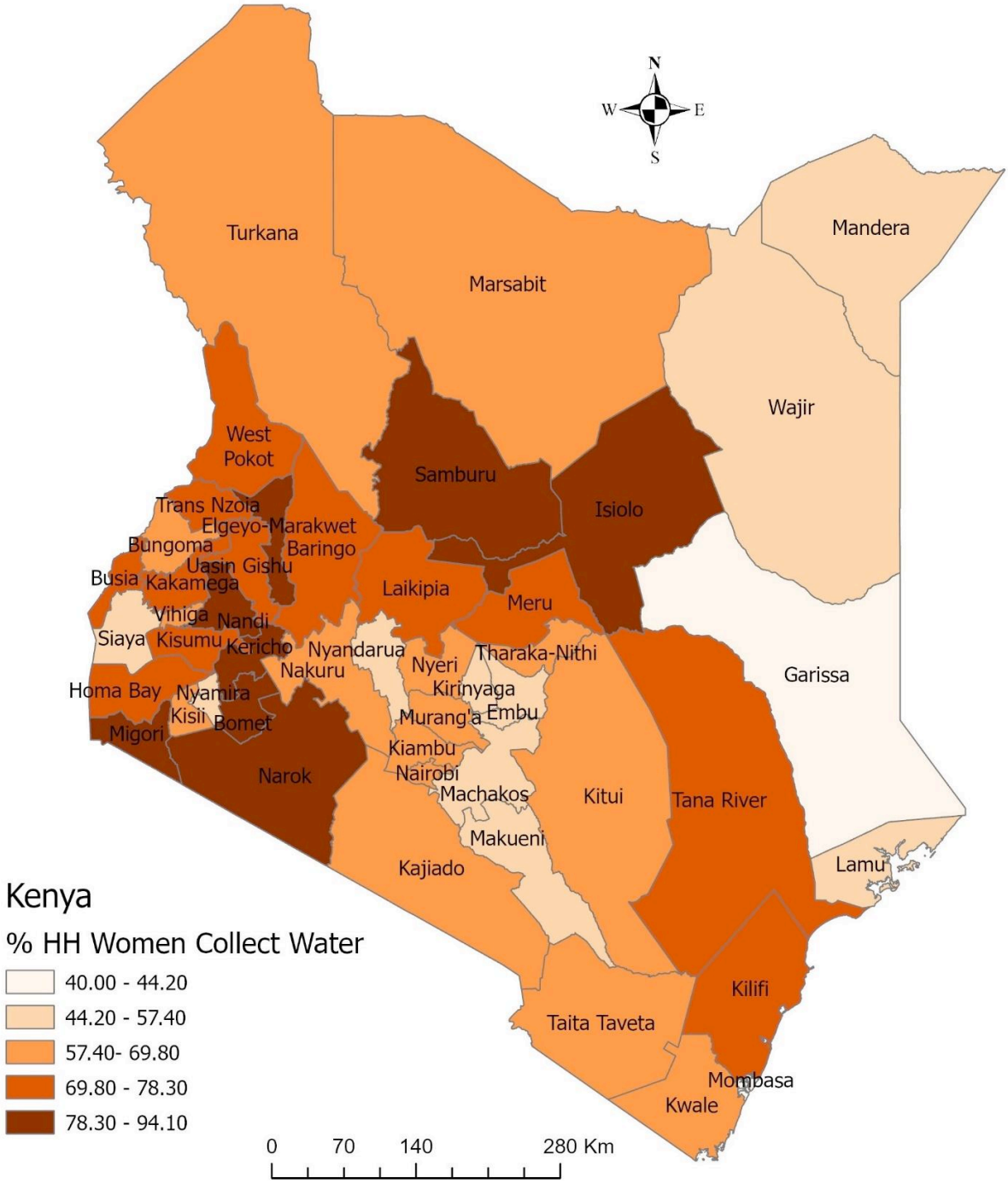
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Elgeyo-Marakwet
Bungoma
Baringo
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Kericho
Nyandarua
Nyeri
Tharaka-Nithi
Nakuru
Garissa
Homa Bay
Nyamira
Kirinyaga
Kisii
Bomet
Embu
Murang'a
Migori
Kiambu
Nairobi
Narok
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
HH_Water_Collection_Time
Very low
Low
Medium
High
Very high
0
70
140
280 Km


N
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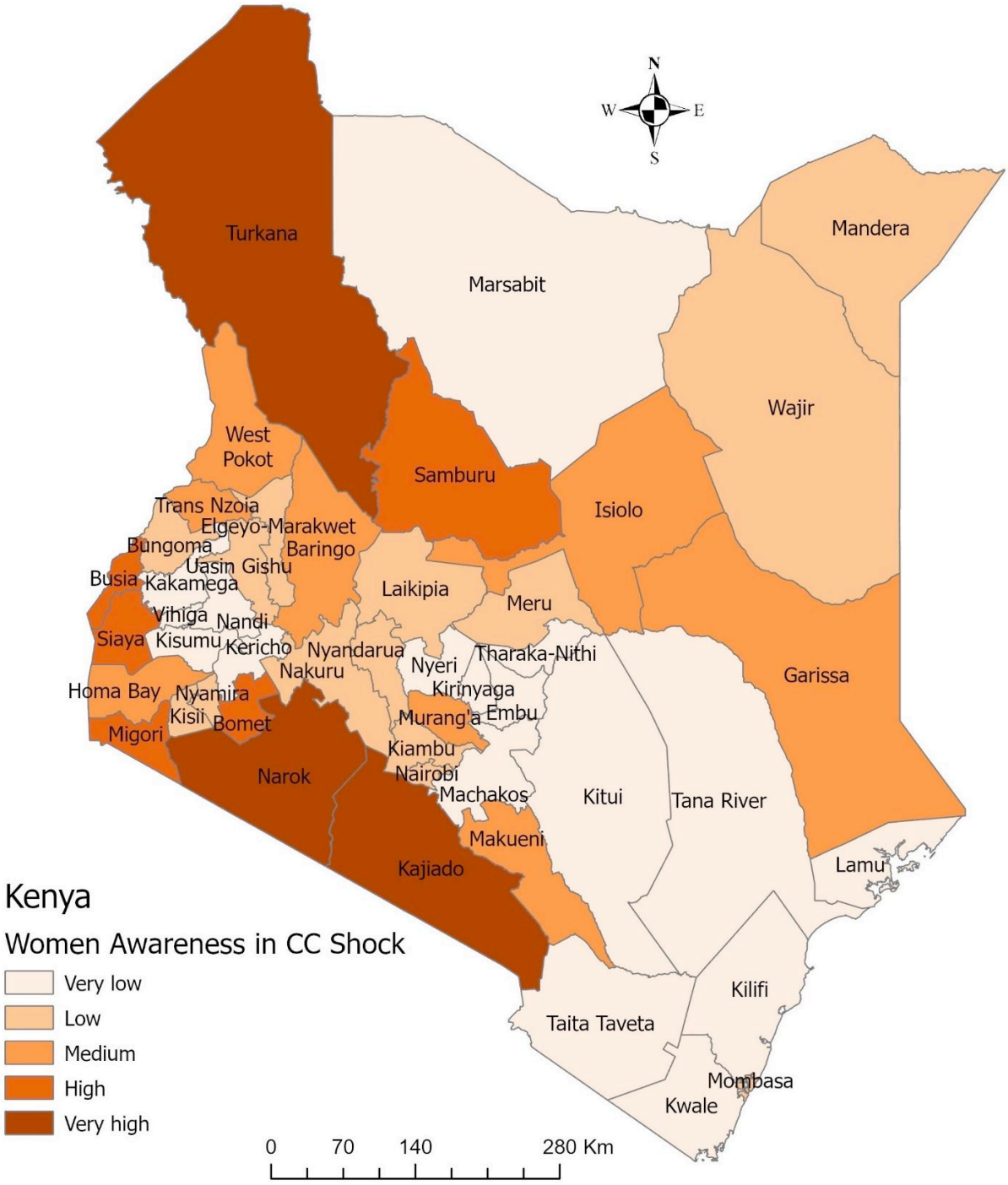
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Elgeyo-Marakwet
Bungoma
Baringo
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Kericho
Nyandarua
Nakuru
Nyeri
Tharaka-Nithi
Garissa
Homa Bay
Nyamira
Kisii
Bomet
Kirinyaga
Murang'a
Embu
Migori
Kiambu
Nairobi
Narok
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
% HH Women Collect Water
40.00 - 44.20
44.20 - 57.40
57.40- 69.80
69.80 - 78.30
78.30 - 94.10
0
70
140
280 Km


N
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Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Elgeyo-Marakwet
Bungoma
Baringo
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Kericho
Nyandarua
Tharaka-Nithi
Nakuru
Nyeri
Garissa
Homa Bay
Nyamira
Kirinyaga
Kisii
Bomet
Murang'a
Embu
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kenya
Women Awareness in CC Shock
Very low
Low
Medium
High
Very high
Kilifi
Taita Taveta
Mombasa
Kwale
0
70
140
280 Km

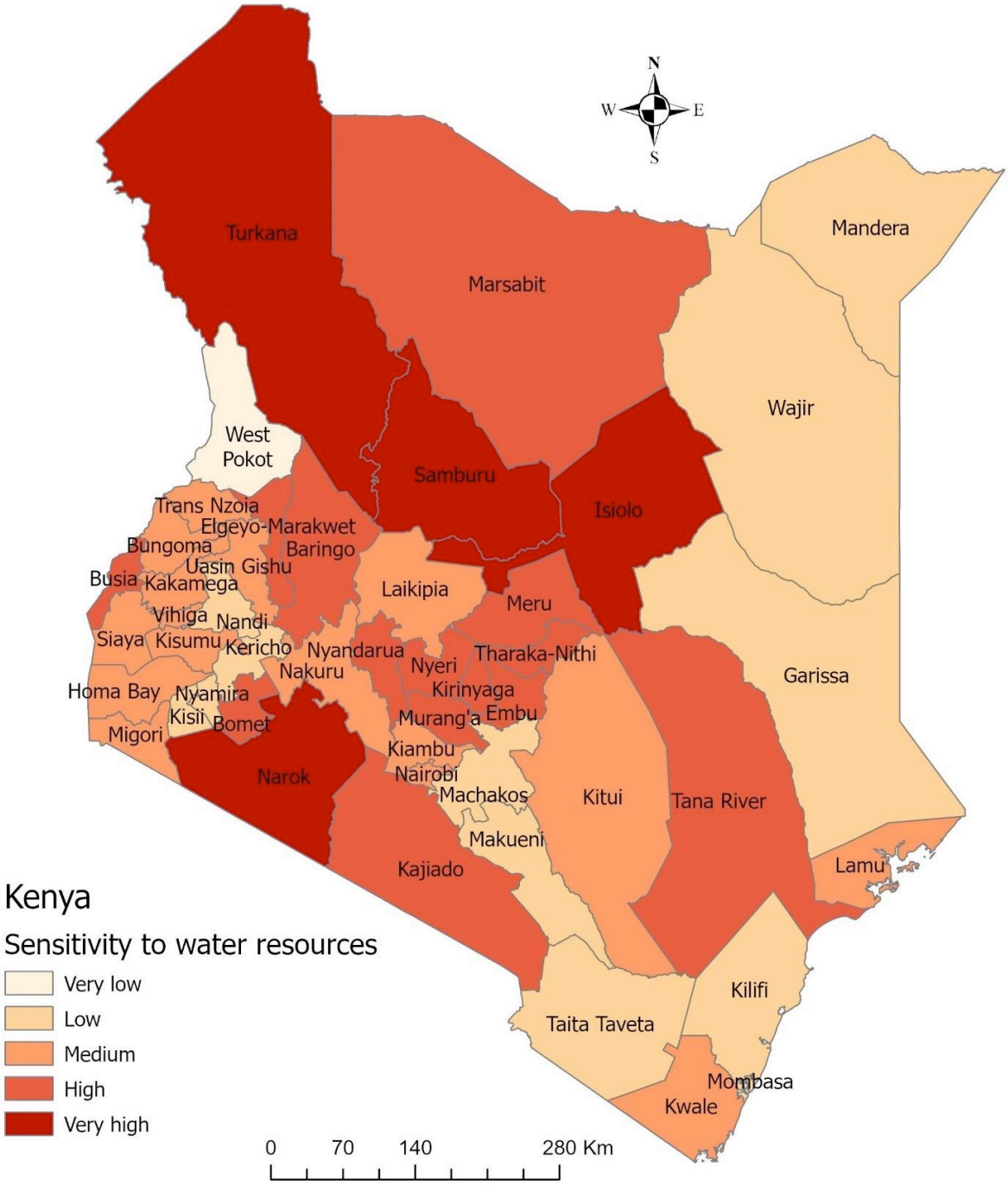
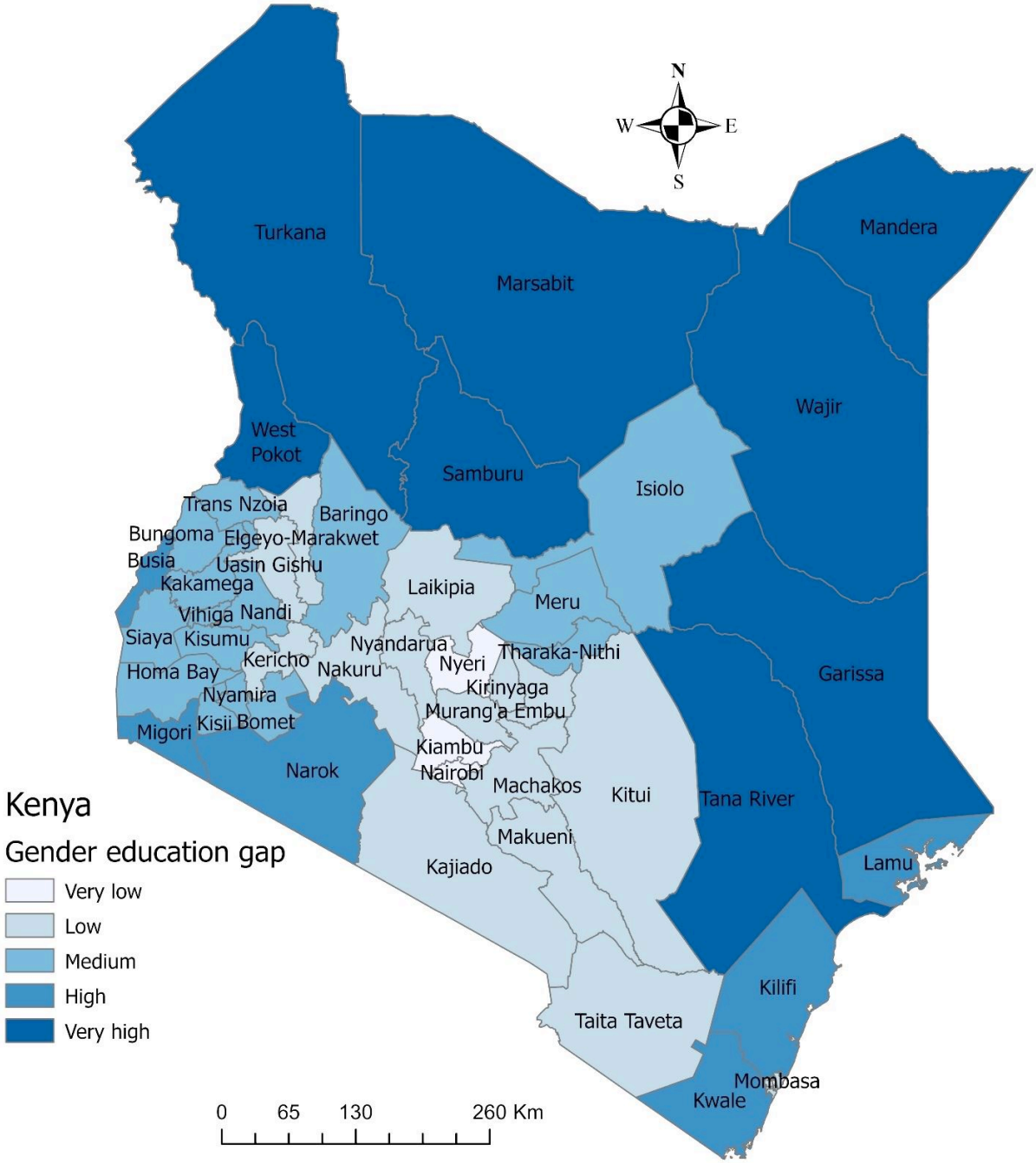
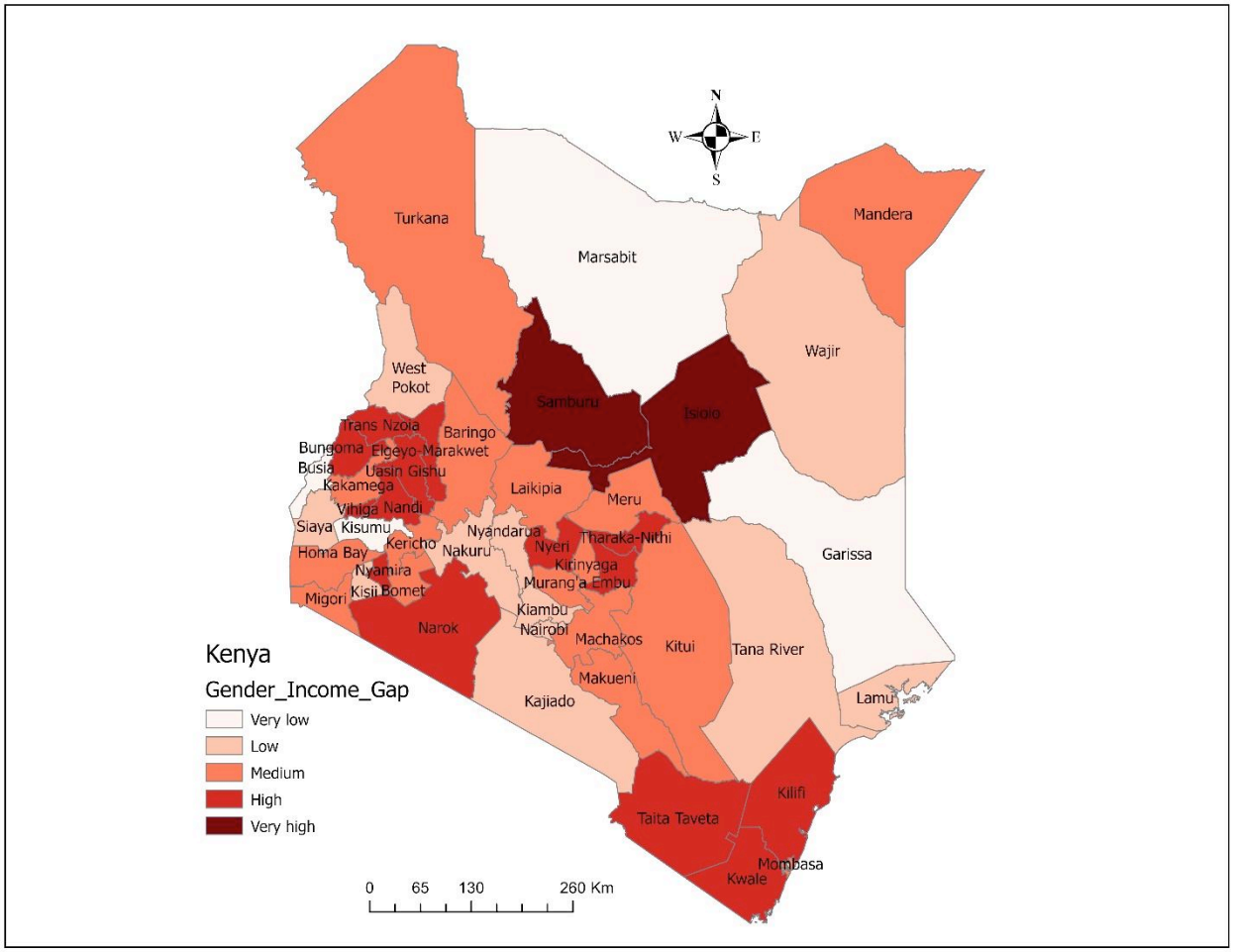


Fig 3: Water and gender sensitivity to climate change

Annex 9: Gender and water adaptive capacity to climate change




N
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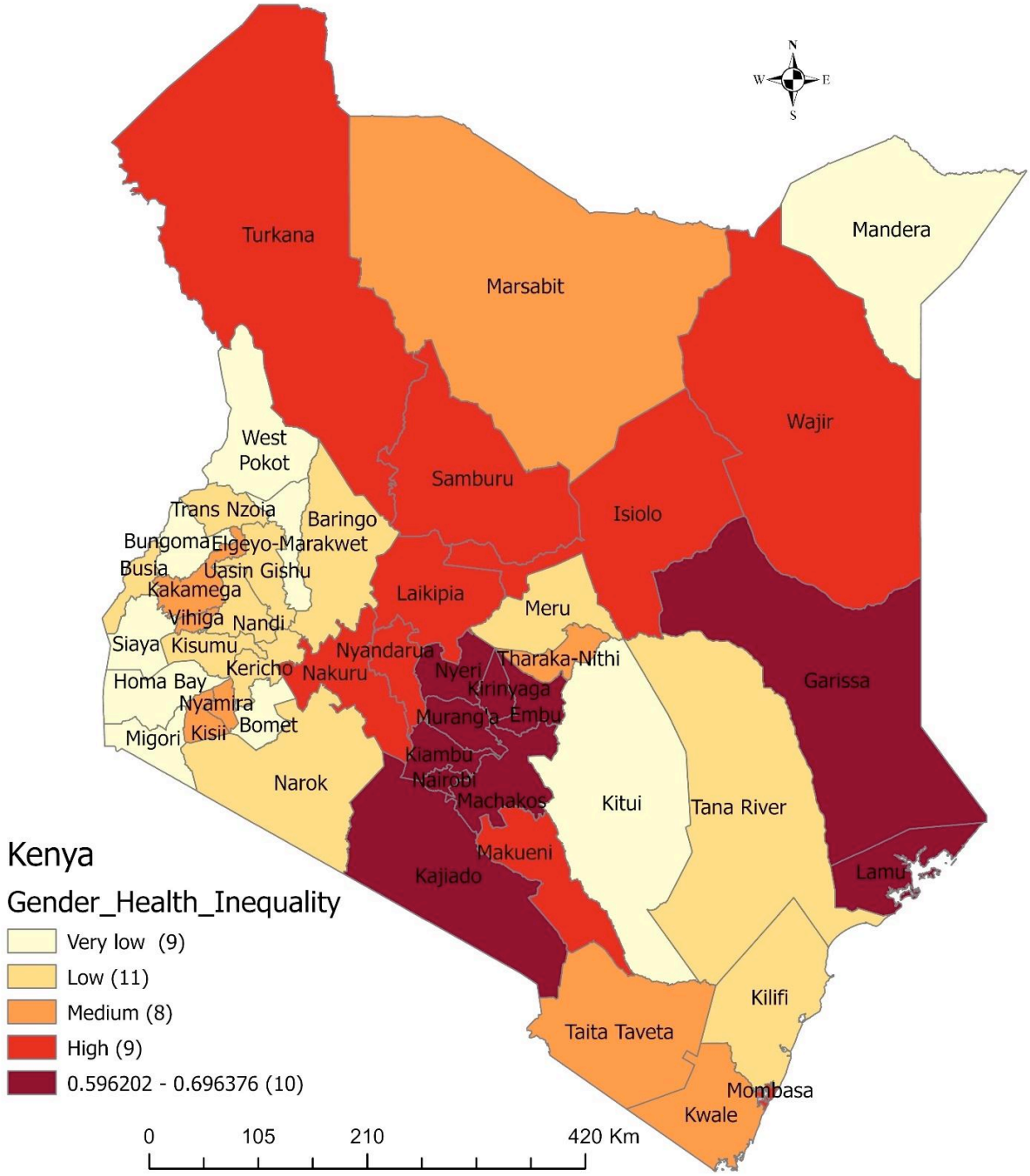
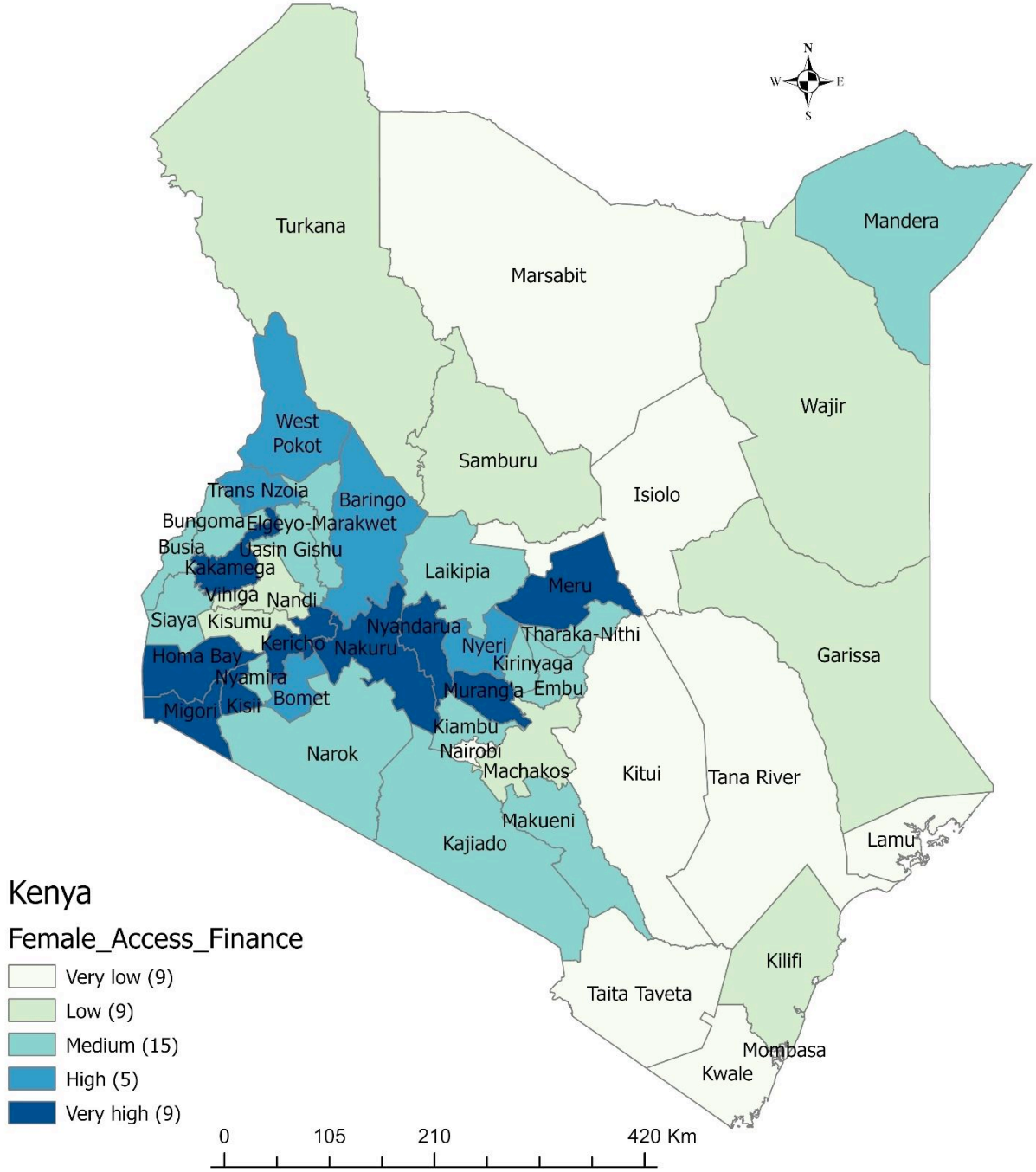
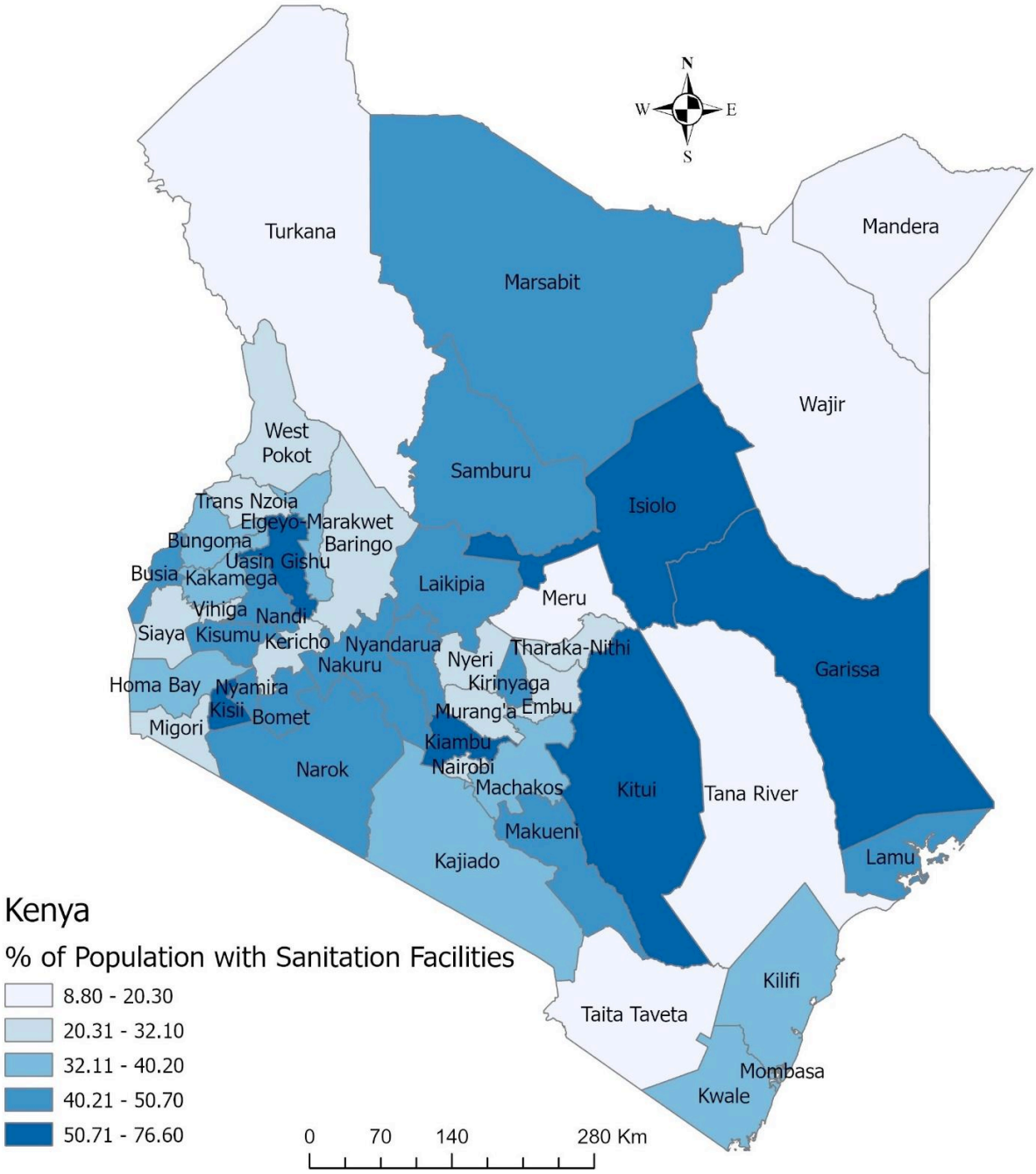
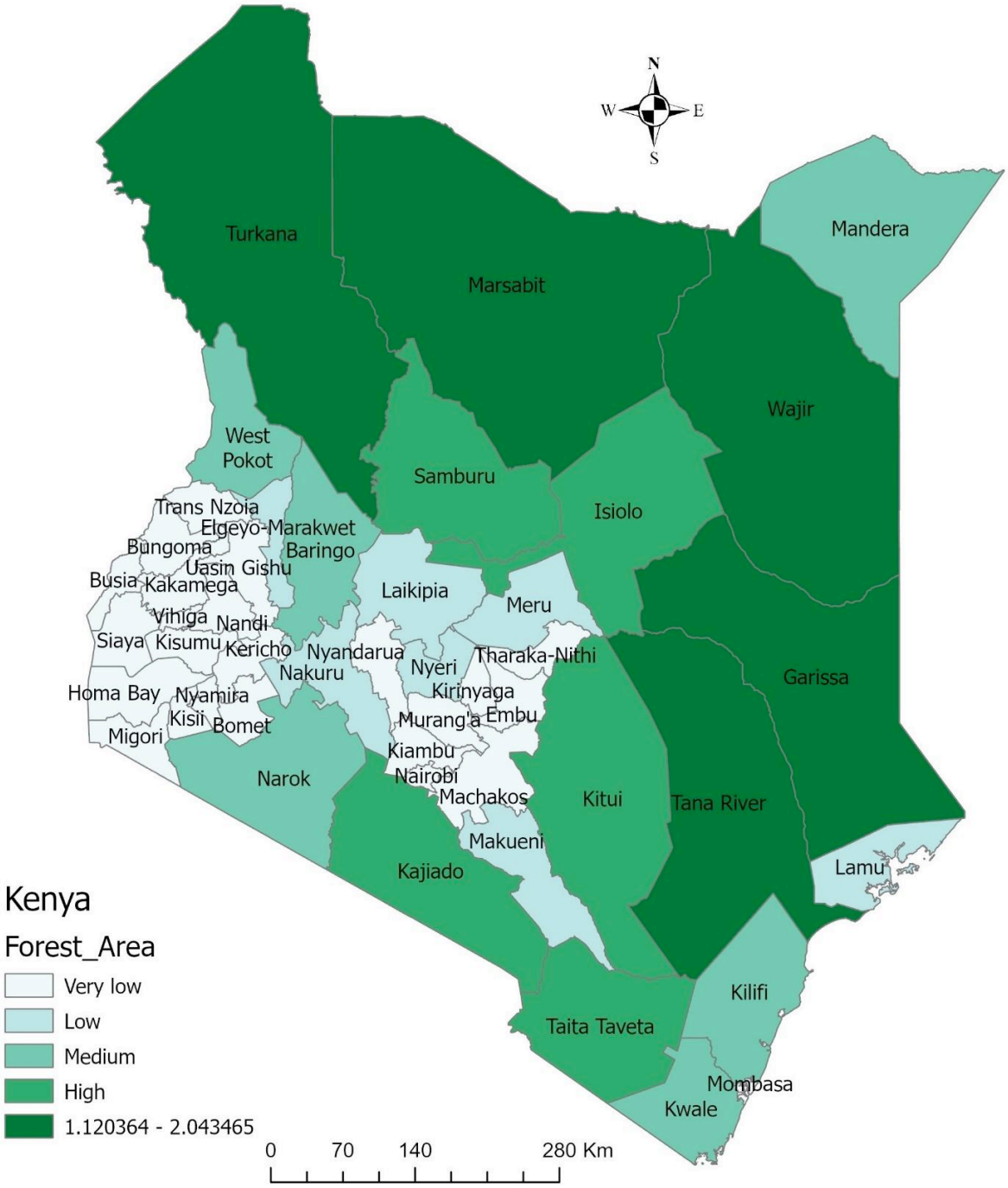
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Baringo
Bungoma
Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Nyandarua
Tharaka-Nithi
Kericho
Nakuru
Nyeri
Garissa
Homa Bay
Kirinyaga
Nyamira
Murang'a
Embu
Kisii
Bomet
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
Gender_Income_Gap
Very low
Low
Medium
High
Very high
0
65
130
260 Km


Kenya
Gender_Health_Inequality
Very low (9)
Low (11)
Medium (8)
High (9)
0.596202 - 0.696376 (10)
0
105
210
420 Km
N
W
E
S
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Baringo
Bungoma
Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Nyandarua
Tharaka-Nithi
Kericho
Nakuru
Nyeri
Garissa
Homa Bay
Kirinyaga
Nyamira
Murang'a
Embu
Bomet
Migori
Kisii
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale


Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Baringo
Bungoma
Elgeyo-Marakwet
Busia
Uasin Gishu
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Nyandarua
Tharaka-Nithi
Kericho
Nakuru
Nyeri
Homa Bay
Kirinyaga
Garissa
Nyamira
Murang'a
Embu
Bomet
Migori
Kisii
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
Female_Access_Finance
Very low (9)
Low (9)
Medium (15)
High (5)
Very high (9)
0
105
210
420 Km


N
W
E
S
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Elgeyo-Marakwet
Bungoma
Baringo
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Kericho
Nyandarua
Nakuru
Nyeri
Tharaka-Nithi
Kirinyaga
Garissa
Homa Bay
Nyamira
Kisii
Bomet
Embu
Murang'a
Migori
Kiambu
Nairobi
Narok
Machakos
Kitui
Tana River
Makueni
Kajiado
Lamu
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
% of Population with Sanitation Facilities
8.80 - 20.30
20.31 - 32.10
32.11 - 40.20
40.21 - 50.70
50.71 - 76.60
0
70
140
280 Km


N
W
E
S
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Elgeyo-Marakwet
Bungoma
Baringo
Uasin Gishu
Busia
Kakamega
Laikipia
Meru
Vihiga
Nandi
Siaya
Kisumu
Kericho
Nyandarua
Nyeri
Tharaka-Nithi
Nakuru
Garissa
Homa Bay
Nyamira
Kirinyaga
Kisii
Bomet
Murang'a
Embu
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Makueni
Lamu
Kajiado
Kilifi
Taita Taveta
Mombasa
Kwale
Kenya
Forest_Area
Very low
Low
Medium
High
1.120364 - 2.043465
0
70
140
280 Km

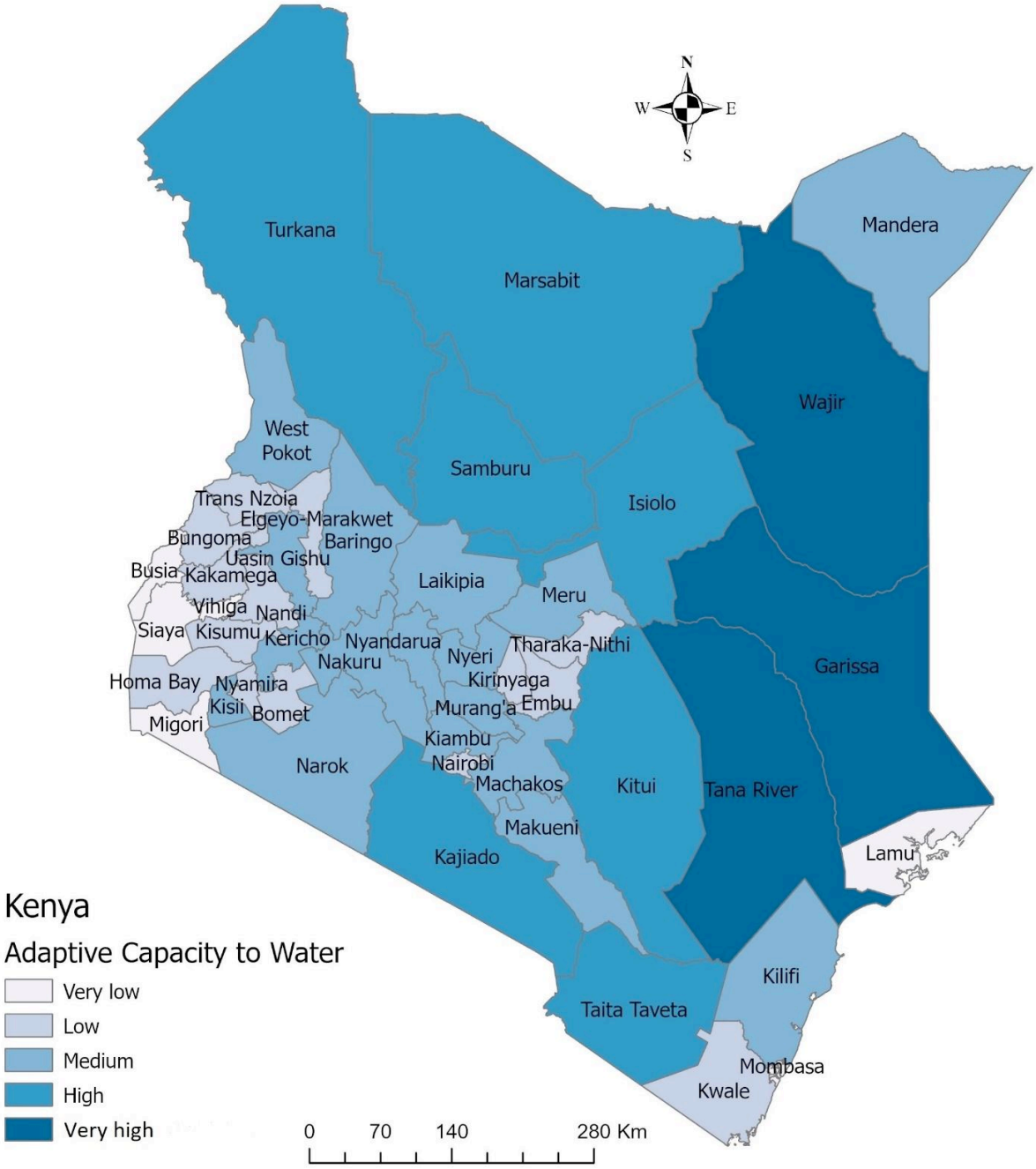


Fig 6: Water and gender adaptive capacity to climate change

Annex 10: Gender, water, and climate change hotspots

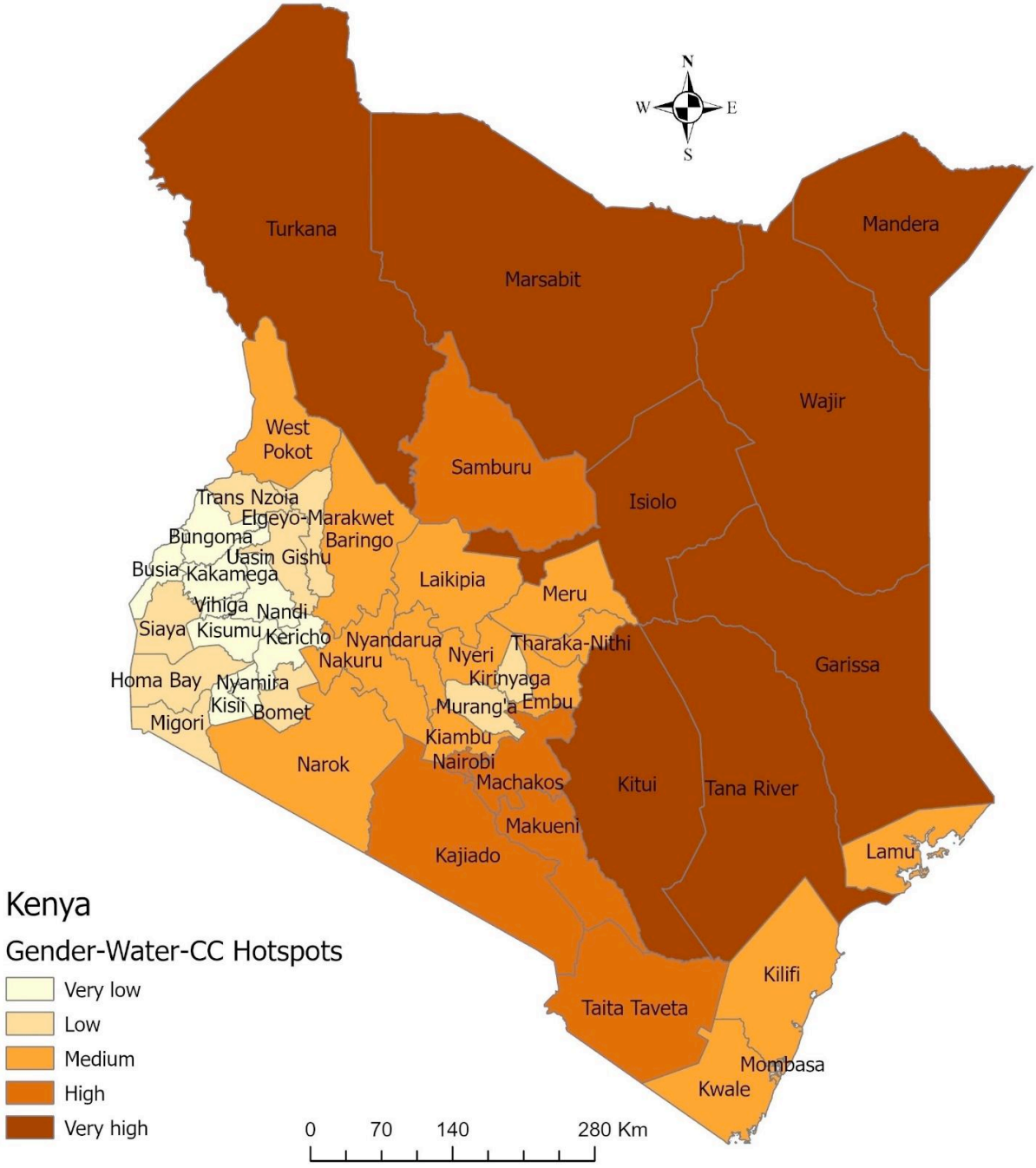


Fig 9: Water-Gender-Climate Change Hotspots

Annex 11: Climate risk, sensitivity, adaptive capacity, and vulnerability index by counties for the agriculture sector

Exposure rank	County	Exposure Index	Sensitivity Rank	County	Sensitivity Index	Adaptive Capacity Rank	County	Adaptive Capacity Index	Vulnerability Rank	County	Vulnerability Index
1	Mandera	0.792	1	Meru	0.675	1	Meru	0.382	1	Mandera	0.770
2	Wajir	0.715	2	Nyamira	0.553	2	Nyeri	0.369	2	Kitui	0.730
3	Isiolo	0.695	3	Kakamega	0.549	3	Nakuru	0.360	3	Meru	0.685
4	Marsabit	0.637	4	Bungoma	0.542	4	Nyandarua	0.358	4	Wajir	0.683
5	Kitui	0.617	5	Nandi	0.541	5	HomaBay	0.341	5	Machakos	0.658
6	TaitaTaveta	0.598	6	Kisii	0.490	6	Muranga	0.341	6	TaitaTaveta	0.635
7	Makueni	0.587	7	Muranga	0.437	7	Embu	0.334	7	Makueni	0.608
8	TanaRiver	0.573	8	Kitui	0.422	8	Kirinyaga	0.333	8	Turkana	0.532
9	Garissa	0.572	9	Machakos	0.415	9	Kiambu	0.327	9	Kajiado	0.508
10	Kajiado	0.550	10	HomaBay	0.405	10	Kakamega	0.327	10	Kilifi	0.505
11	Machakos	0.549	11	Kiambu	0.383	11	Kajiado	0.314	11	Samburu	0.490
12	Nairobi	0.521	12	Narok	0.368	12	Migori	0.309	12	Garissa	0.484
13	Turkana	0.508	13	Bomet	0.356	13	Kisii	0.308	13	Isiolo	0.473
14	Mombasa	0.476	14	Taita-Taveta	0.356	14	Tharaka-Nithi	0.306	14	Marsabit	0.446
15	Samburu	0.476	15	Nyeri	0.355	15	Vihiga	0.305	15	West Pokot	0.441
16	Kilifi	0.426	16	Migori	0.349	16	Samburu	0.303	16	Tana River	0.422
17	Lamu	0.389	17	Uasin-Gishu	0.336	17	Turkana	0.303	17	Bungoma	0.402
18	Laikipia	0.384	18	Makueni	0.330	18	Laikipia	0.303	18	Nandi	0.400
19	Kwale	0.369	19	Kilifi	0.330	19	UasinGishu	0.302	19	Kwale	0.370
20	Embu	0.360	20	Turkana	0.329	20	Nyamira	0.302	20	Kiambu	0.368
21	West Pokot	0.346	21	Samburu	0.325	21	Nairobi	0.296	21	Muranga	0.339
22	Kiambu	0.340	22	Busia	0.324	22	Kisumu	0.296	22	Nyamira	0.337
23	Meru	0.332	23	Kericho	0.323	23	Busia	0.294	23	Kakamega	0.320
24	Tharaka-Nithi	0.332	24	West Pokot	0.307	24	Makueni	0.294	24	Narok	0.315
25	Baringo	0.306	25	Kajiado	0.294	25	Kericho	0.290	25	Kisii	0.295
26	Nakuru	0.257	26	Nyandarua	0.294	26	Isiolo	0.289	26	HomaBay	0.285
27	Nyandarua	0.254	27	Nakuru	0.288	27	TransNzoia	0.287	27	UasinGishu	0.268

Exposure rank	County	Exposure Index	Sensitivity Rank	County	Sensitivity Index	Adaptive Capacity Rank	County	Adaptive Capacity Index	Vulnerability Rank	County	Vulnerability Index
28	Nyeri	0.250	28	Kwale	0.277	28	Baringo	0.285	28	Baringo	0.264
29	Kirinyaga	0.248	29	Kirinyaga	0.254	29	Siaya	0.285	29	Migori	0.261
30	UasinGishu	0.248	30	Kisumu	0.248	30	Narok	0.284	30	Nyeri	0.242
31	Elgeyo-Marakwet	0.235	31	Mandera	0.246	31	Bungoma	0.284	31	Embu	0.234
32	Narok	0.228	32	Baringo	0.238	32	Machakos	0.281	32	Bomet	0.231
33	TransNzoia	0.226	33	Elgeyo Marakwet	0.230	33	TaitaTaveta	0.280	33	Elgeyo Marakwet	0.224
34	Muranga	0.226	34	Wajir	0.222	34	Mombasa	0.274	34	Laikipia	0.215
35	HomaBay	0.211	35	Vihiga	0.221	35	Mandera	0.272	35	Nairobi	0.214
36	Siaya	0.200	36	Embu	0.212	36	Bomet	0.270	36	Nyandarua	0.209
37	Migori	0.199	37	Trans Nzoia	0.173	37	Kwale	0.258	37	Nakuru	0.204
38	Busia	0.169	38	Laikipia	0.148	38	Marsabit	0.256	38	Kericho	0.197
39	Kisumu	0.168	39	Garissa	0.147	39	Kitui	0.255	39	Busia	0.186
40	Bomet	0.143	40	Siaya	0.141	40	Nandi	0.251	40	Lamu	0.179
41	Bungoma	0.143	41	Tana River	0.106	41	WestPokot	0.249	41	Mombasa	0.170
42	Kericho	0.126	42	Tharaka-Nithi	0.102	42	ElgeyoMarakwet	0.246	42	Kirinyaga	0.144
43	Nandi	0.123	43	Marsabit	0.100	43	Lamu	0.245	43	Tharaka-Nithi	0.123
44	Nyamira	0.100	44	Lamu	0.072	44	Wajir	0.244	44	TransNzoia	0.120
45	Kisii	0.089	45	Isiolo	0.068	45	Kilifi	0.239	45	Kisumu	0.085
46	Kakamega	0.077	46	Nairobi	0.058	46	TanaRiver	0.228	46	Siaya	0.041
47	Vihiga	0.076	47	Mombasa	0.023	47	Garissa	0.221	47	Vihiga	0.035

Annex 12: Climate risk, sensitivity, adaptive capacity, and vulnerability index by counties for the energy sector

Exposure Rank	County	Exposure Index	Sensitivity Rank	County	Sensitivity Index	Adaptive Capacity Rank	County	Adaptive Capacity Index	Vulnerability Rank	County	Vulnerability Index
1	Mandera	0.792	1	Nairobi	0.84	1	Nairobi	0.748	1	Wajir	0.623
2	Wajir	0.715	2	Kiambu	0.56	2	Kiambu	0.705	2	Mandera	0.622
3	Isiolo	0.695	3	Nakuru	0.48	3	Mombasa	0.668	3	Nairobi	0.613
4	Marsabit	0.637	4	Kakamega	0.46	4	Nyeri	0.584	4	Kitui	0.577
5	Kitui	0.617	5	Bungoma	0.41	5	Kajiado	0.578	5	Makueni	0.511
6	Taita-Taveta	0.598	6	Machakos	0.40	6	Uasin Gishu	0.573	6	Marsabit	0.479
7	Makueni	0.587	7	Meru	0.39	7	Kirinyaga	0.567	7	Isiolo	0.454
8	Tana River	0.573	8	Kisli	0.37	8	Muranga	0.561	8	Garissa	0.425
9	Garissa	0.572	9	Muranga	0.37	9	Nakuru	0.557	9	Machakos	0.407
10	Kajiado	0.550	10	Bomet	0.35	10	Machakos	0.539	10	Tana River	0.387
11	Machakos	0.549	11	Homa Bay	0.34	11	Kisumu	0.538	11	Turkana	0.383
12	Nairobi	0.521	12	Kitui	0.34	12	Kisli	0.515	12	Taita-Taveta	0.365
13	Turkana	0.508	13	Kericho	0.34	13	Vihiga	0.511	13	Kilifi	0.309
14	Mombasa	0.476	14	Nandi	0.34	14	Nyamira	0.508	14	Meru	0.268
15	Samburu	0.476	15	Makueni	0.33	15	Trans Nzoia	0.504	15	Samburu	0.264
16	Kilifi	0.426	16	Siaya	0.33	16	Embu	0.497	16	WEST Pokot	0.252
17	Lamu	0.389	17	Uasin Gishu	0.33	17	Busia	0.491	17	Kajiado	0.242
18	Lalkipia	0.384	18	Migori	0.33	18	Tharaka-Nithi	0.488	18	Kwale	0.229
19	Kwale	0.369	19	Kilifi	0.33	19	Migori	0.481	19	Kiambu	0.198
20	Embu	0.360	20	Narok	0.32	20	Kakamega	0.477	20	Baringo	0.192
21	WEST Pokot	0.346	21	Busia	0.32	21	Nyandarua	0.474	21	Nakuru	0.177
22	Kiambu	0.340	22	Kisumu	0.32	22	Kericho	0.474	22	Lalkipia	0.158
23	Meru	0.332	23	Nyeri	0.31	23	Nandi	0.469	23	Narok	0.155
24	Tharaka-Nithi	0.332	24	Trans Nzoia	0.31	24	Meru	0.457	24	Embu	0.147
25	Baringo	0.306	25	Nyamira	0.29	25	Lalkipia	0.453	25	Lamu	0.138

Exposure Rank	County	Exposure Index	Sensitivity Rank	County	Sensitivity Index	Adaptive Capacity Rank	County	Adaptive Capacity Index	Vulnerability Rank	County	Vulnerability Index
26	Nakuru	0.257	26	Vihiga	0.29	26	Siaya	0.449	26	Elgeyo-Marakwet	0.123
27	Nyandarua	0.254	27	Wajir	0.29	27	Mandera	0.449	27	Bungoma	0.114
28	Nyeri	0.250	28	Nyandarua	0.28	28	Homa Bay	0.445	28	Homa Bay	0.109
29	Kirinyaga	0.248	29	Embu	0.28	29	Kilifi	0.443	29	Tharaka-Nithi	0.108
30	Uasin Gishu	0.248	30	Kirinyaga	0.28	30	Bungoma	0.436	30	Siaya	0.078
31	Elgeyo-Marakwet	0.235	31	Mandera	0.28	31	Bomet	0.428	31	Bomet	0.066
32	Narok	0.228	32	Kwale	0.28	32	Isiolo	0.428	32	Nyandarua	0.064
33	Trans Nzoia	0.226	33	Baringo	0.28	33	Lamu	0.424	33	Kakamega	0.056
34	Muranga	0.226	34	Elgeyo-Marakwet	0.27	34	Taita-Taveta	0.423	34	Migori	0.045
35	Homa Bay	0.211	35	Kajiado	0.27	35	Kwale	0.416	35	Mombasa	0.035
36	Siaya	0.200	36	Tharaka-Nithi	0.26	36	Makueni	0.408	36	Muranga	0.030
37	Migori	0.199	37	WEST Pokot	0.26	37	Samburu	0.403	37	Trans Nzoia	0.029
38	Busia	0.169	38	Garissa	0.25	38	Garissa	0.402	38	Uasin Gishu	0.003
39	Kisumu	0.168	39	Turkana	0.25	39	Marsabit	0.397	39	Busia	-0.005
40	Bomet	0.143	40	Marsabit	0.24	40	Narok	0.397	40	Kericho	-0.009
41	Bungoma	0.143	41	Lalkipia	0.23	41	Baringo	0.390	41	Nandi	-0.010
42	Kericho	0.126	42	Mombasa	0.23	42	Elgeyo-Marakwet	0.386	42	Nyeri	-0.022
43	Nandi	0.123	43	Tana River	0.19	43	Kitui	0.382	43	Kirinyaga	-0.036
44	Nyamira	0.100	44	Samburu	0.19	44	Tana River	0.380	44	Kisumu	-0.053
45	Kisli	0.089	45	Taita-Taveta	0.19	45	Turkana	0.378	45	Kisli	-0.057
46	Kakamega	0.077	46	Isiolo	0.19	46	Wajir	0.377	46	Nyamira	-0.118
47	Vihiga	0.076	47	Lamu	0.17	47	WEST Pokot	0.354	47	Vihiga	-0.147

Annex 13: Climate risk, sensitivity, adaptive capacity, and vulnerability index by counties for the water sector

Exposure Rank	County	Exposure Index	Sensitivity Rank	County	Sensitivity Index	Adaptive Capacity Rank	County	Adaptive Capacity Index	Vulnerability Rank	County	Vulnerability Index
1	Mandera	0.792	1	Turkana	0.62	1	Wajir	0.450	1	Mandera	0.910
2	Wajir	0.715	2	Narok	0.59	2	Tana River	0.426	2	Isiolo	0.885
3	Isiolo	0.695	3	Samburu	0.57	3	Garissa	0.421	3	Turkana	0.768
4	Marsabit	0.637	4	Isiolo	0.56	4	Marsabit	0.374	4	Marsabit	0.758
5	Kitui	0.617	5	Baringo	0.50	5	Isiolo	0.368	5	Nairobi	0.745
6	Taita-Taveta	0.598	6	Elgeyo-Marakwet	0.50	6	Turkana	0.363	6	Samburu	0.742
7	Makueni	0.587	7	Marsabit	0.49	7	Kajiado	0.337	7	Makueni	0.714
8	Tana River	0.573	8	Kajiado	0.47	8	Kitui	0.329	8	Kitui	0.701
9	Garissa	0.572	9	Muranga	0.47	9	Taita-Taveta	0.305	9	Machakos	0.692
10	Kajiado	0.550	10	Nyeri	0.46	10	Samburu	0.300	10	Kajiado	0.681
11	Machakos	0.549	11	Meru	0.46	11	Narok	0.271	11	Mombasa	0.663
12	Nairobi	0.521	12	Bomet	0.45	12	Baringo	0.260	12	Taita-Taveta	0.662
13	Turkana	0.508	13	Nyandarua	0.45	13	Nyandarua	0.249	13	Wajir	0.633
14	Mombasa	0.476	14	Busia	0.44	14	Mandera	0.249	14	Lamu	0.628
15	Samburu	0.476	15	Tana River	0.44	15	Nakuru	0.248	15	Embu	0.608
16	Kilifi	0.426	16	Tharaka-Nithi	0.44	16	Nyeri	0.245	16	Tana River	0.586
17	Lamu	0.389	17	Embu	0.43	17	Meru	0.241	17	Tharaka-Nithi	0.583
18	Lalkipia	0.384	18	Kirinyaga	0.43	18	Lalkipia	0.240	18	Kilifi	0.578
19	Kwale	0.369	19	Lalkipia	0.42	19	Kisli	0.238	19	Kwale	0.572
20	Embu	0.360	20	Lamu	0.41	20	Kiambu	0.234	20	Lalkipia	0.569
21	WEST Pokot	0.346	21	Siaya	0.41	21	WEST Pokot	0.230	21	Meru	0.550
22	Kiambu	0.340	22	Trans Nzoia	0.41	22	Makueni	0.229	22	Baringo	0.550
23	Meru	0.332	23	Kitui	0.41	23	Kericho	0.225	23	Narok	0.543
24	Tharaka-Nithi	0.332	24	Migori	0.41	24	Muranga	0.218	24	Garissa	0.527
25	Baringo	0.306	25	Nairobi	0.41	25	Uasin Gishu	0.217	25	Elgeyo-Marakwet	0.525
26	Nakuru	0.257	26	Kiambu	0.40	26	Kilifi	0.216	26	Kiambu	0.510
27	Nyandarua	0.254	27	Kakamega	0.40	27	Machakos	0.216	27	Kirinyaga	0.481

Exposure Rank	County	Exposure Index	Sensitivity Rank	County	Sensitivity Index	Adaptive Capacity Rank	County	Adaptive Capacity Index	Vulnerability Rank	County	Vulnerability Index
28	Nyeri	0.250	28	Kwale	0.40	28	Bomet	0.210	28	Muranga	0.474
29	Kirinyaga	0.248	29	Bungoma	0.40	29	Elgeyo-Marakwet	0.208	29	Nyeri	0.466
30	Uasin Gishu	0.248	30	Kisumu	0.40	30	Homa Bay	0.205	30	Trans Nzoia	0.455
31	Elgeyo-Marakwet	0.235	31	Uasin Gishu	0.39	31	Kirinyaga	0.201	31	Nyandarua	0.452
32	Narok	0.228	32	Homa Bay	0.39	32	Kakamega	0.201	32	Busia	0.442
33	Trans Nzoia	0.226	33	Nakuru	0.39	33	Kwale	0.195	33	Migori	0.439
34	Muranga	0.226	34	Vihiga	0.39	34	Kisumu	0.188	34	Siaya	0.438
35	Homa Bay	0.211	35	Nyamira	0.38	35	Bungoma	0.188	35	Uasin Gishu	0.425
36	Siaya	0.200	36	Garissa	0.37	36	Embu	0.187	36	Nakuru	0.401
37	Migori	0.199	37	Kisli	0.37	37	Tharaka-Nithi	0.186	37	Homa Bay	0.399
38	Busia	0.169	38	Kericho	0.37	38	Nairobi	0.186	38	WEST Pokot	0.383
39	Kisumu	0.168	39	Taita-Taveta	0.37	39	Trans Nzoia	0.185	39	Bomet	0.381
40	Bomet	0.143	40	Kilifi	0.37	40	Nandi	0.184	40	Kisumu	0.375
41	Bungoma	0.143	41	Wajir	0.37	41	Nyamira	0.183	41	Bungoma	0.351
42	Kericho	0.126	42	Mandera	0.37	42	Siaya	0.176	42	Vihiga	0.303
43	Nandi	0.123	43	Machakos	0.36	43	Lamu	0.175	43	Nyamira	0.297
44	Nyamira	0.100	44	Mombasa	0.36	44	Migori	0.173	44	Kakamega	0.279
45	Kisli	0.089	45	Makueni	0.36	45	Mombasa	0.170	45	Kericho	0.274
46	Kakamega	0.077	46	Nandi	0.33	46	Busia	0.168	46	Nandi	0.268
47	Vihiga	0.076	47	WEST Pokot	0.27	47	Vihiga	0.160	47	Kisli	0.226

Annex 14: PCA analysis for climate risk, sensitivity and adaptive capacity sub-index

Table 14.1: PCA analysis for climate risk sub-index and weight for individual variables.

```
. pca nor_dry_day nor_avg_rainfall cv_rainfall norm_temp_change

Principal components/correlation                  Number of obs    =         47
                                                  Number of comp.  =          4
                                                  Trace            =          4
    Rotation: (unrotated = principal)             Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.68905	1.68955	0.6723	0.6723
Comp2	.999502	.779179	0.2499	0.9221
Comp3	.220324	.129199	0.0551	0.9772
Comp4	.0911247	.	0.0228	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
nor_dry_day	0.5822	0.0144	0.4658	-0.6662	0
nor_avg_ra~l	-0.5623	0.0024	0.8227	0.0838	0
cv_rainfall	0.5868	0.0251	0.3255	0.7410	0
norm_temp_~e	-0.0217	0.9996	-0.0169	-0.0092	0

Variable	Component	Square	Weight
Nor_dry_day	0.5822	0.3390	33.90
Nor_Avg_rainfall	0.5623	0.3162	31.62
CV_rainfall	0.5868	0.3443	34.43
Norm_Temp_Change	0.0217	0.0005	0.05

Table 14.2: Agriculture sector PCA analysis for sensitivity sub-index and weight for individual variables.

```
. pca norm_ag_area women_land_own norm_gdp norm_female_agriculture norm_climate_shcok_female

Principal components/correlation                  Number of obs    =         47
                                                  Number of comp.  =          5
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.19411	.736547	0.4388	0.4388
Comp2	1.45756	.702341	0.2915	0.7303
Comp3	.75522	.374051	0.1510	0.8814
Comp4	.381169	.169228	0.0762	0.9576
Comp5	.211941	.	0.0424	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
norm_ag_area	0.3335	0.5651	-0.5023	-0.4396	0.3520	0
women_land~n	0.4715	-0.0115	0.7669	-0.4041	0.1615	0
norm_gdp	0.5266	-0.3772	-0.1641	0.5246	0.5276	0
norm_femal~e	0.5953	-0.1954	-0.2606	-0.0859	-0.7295	0
norm_clima~e	0.1866	0.7071	0.2543	0.6008	-0.1988	0

Variables	Component 1	Square	Weight
Norm_Ag_Area	0.3335	0.1112223	11.12223
Women_Land_Own	0.4715	0.2223123	22.23123
Norm_GDP	0.5266	0.2773076	27.73076
Norm_Female_Agriculture	0.5953	0.3543821	35.43821
Norm_climate_shcok_female	0.1866	0.0348196	3.481956

Table 14.3: Agriculture sector PCA analysis for adaptive capacity sub-index and weight for individual variables.

```
. pca gender_income_gap female_access_finance gender_edu_gap ag_hh_access_mobile per_aghh_maketaccess gender_health_inequality per_hh_food_insecure per_aghh_head_female

Principal components/correlation                 Number of obs    =        47
                                                 Number of comp.  =         8
                                                 Trace            =         8
    Rotation: (unrotated = principal)            Rho              =    1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.76986	2.56443	0.4712	0.4712
Comp2	1.20543	.211628	0.1507	0.6219
Comp3	.993802	.315388	0.1242	0.7461
Comp4	.678414	.0696882	0.0848	0.8309
Comp5	.608725	.211789	0.0761	0.9070
Comp6	.396936	.113475	0.0496	0.9566
Comp7	.283461	.220084	0.0354	0.9921
Comp8	.0633769	.	0.0079	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8	Unexplained
gender_inc~p	0.0069	0.5539	0.7454	0.1607	-0.3082	0.0533	-0.0468	-0.1082	0
female_acc~e	0.1213	-0.6995	0.3030	0.5931	-0.1667	0.1035	-0.1145	-0.0300	0
gender_edu~p	0.4459	0.0042	0.2942	-0.0095	0.4240	-0.1614	0.2369	0.6728	0
ag_hh_acce~e	0.4550	0.1022	-0.0032	0.1851	0.4729	-0.1687	0.1476	-0.6887	0
per_aghh_m~s	0.4166	0.0578	-0.1810	-0.0428	-0.2922	0.7061	0.4522	-0.0036	0
gender_hea~y	0.2898	0.3896	-0.4713	0.5569	-0.1968	-0.1498	-0.3442	0.2288	0
per_hh_foo~e	-0.3788	0.1730	0.0107	0.3092	0.5894	0.5880	-0.1763	0.0814	0
per_aghh_h~e	-0.4223	0.0918	-0.1051	0.4249	-0.0477	-0.2552	0.7435	0.0384	0

.

Estimations of weights for each variable using principal component 1

Variables	Component 1	Square	Weight
Gender_Income_Gap	0.0069	0.00005	0.004761
Female_Access_Finance	0.1213	0.01471	1.471369
Gender_edu_gap	0.4459	0.19883	19.88268
Ag_hh_access_mobile	0.455	0.20703	20.7025
Per_AgHH_Maket-Access	0.4166	0.17356	17.35556
Gender_Health_Inequality	0.2898	0.08398	8.398404
Per_HH_Food_Insecure	0.3788	0.14349	14.34894
Per_AgHH_head_Female	0.4223	0.17834	17.83373

Table 14.4: Water sector PCA analysis for sensitivity sub-index and weight for individual variables.

```
. pca water_supply_value waterdemandvalue per_hh_access_safe_water per_hh_water_collection_time per_hh_women_water_collection norm_climate_shcok_female

Principal components/correlation                 Number of obs    =         47
                                                 Number of comp.  =          6
                                                 Trace            =          6
    Rotation: (unrotated = principal)            Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.54068	1.11717	0.4234	0.4234
Comp2	1.4235	.605888	0.2373	0.6607
Comp3	.817614	.164177	0.1363	0.7970
Comp4	.653437	.242551	0.1089	0.9059
Comp5	.410886	.257002	0.0685	0.9744
Comp6	.153884	.	0.0256	1.0000

Variable	Component 1	Square	Weight
ıter_Supply_Value	0.3954	0.156341	15.63412
ıter-Demand-Value	0.48	0.23	23.24
r_hh_access_safe_water	0.46	0.21	21.22
r_hh_water_collection_tim	0.43	0.19	18.70
Per_hh_women_water_collect ion	0.28	0.08	7.75
rm_climate_shcok_female	0.37	0.13	13.45

```
Principal components (eigenvectors)
```

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
water_supp~e	-0.3954	-0.4059	0.1298	0.5909	0.5515	-0.0934	0
waterdeman~e	0.4821	0.2872	0.0005	-0.2317	0.7886	-0.0975	0
per_hh_acc~r	-0.4607	0.4942	-0.1747	0.0032	0.1881	0.6910	0
per_hh_wat~e	0.4324	-0.5577	0.0837	-0.0196	0.0198	0.7030	0
per_hh_wom~n	0.2783	0.4203	0.6801	0.4960	-0.1656	0.0997	0
norm_clima~e	0.3668	0.1443	-0.6951	0.5923	-0.1034	-0.0089	0

Table 14.5: Water sector PCA analysis for adaptive capacity sub-index and weight for individual variables.

```
. pca gender_income_gap norm_accesstofinance gender_edu_gap gender_health_inequality norm_forestland hh_head_female per_pop_sanitation

Principal components/correlation                 Number of obs    =         47
                                                 Number of comp.  =          7
                                                 Trace            =          7
    Rotation: (unrotated = principal)            Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.11156	.679924	0.3017	0.3017
Comp2	1.43163	.282881	0.2045	0.5062
Comp3	1.14875	.127327	0.1641	0.6703
Comp4	1.02142	.461379	0.1459	0.8162
Comp5	.560046	.0794395	0.0800	0.8962
Comp6	.480606	.234627	0.0687	0.9649
Comp7	.24598	.	0.0351	1.0000

Variable	Component 1	Square	Weight
Gender_Income_Gap	0.11	0.01	1.10
_access to finance	0.30	0.09	8.92
er_EDU_Gap	0.57	0.32	32.36
er_Health_Inequality	0.14	0.02	2.00
_forestland	0.58	0.33	33.12
lead_Female	0.36	0.13	13.07
op_Sanitation	0.31	0.10	9.54

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
gender_inc~p	0.1050	0.1797	0.4010	-0.8083	0.3535	0.1325	-0.0023	0
norm_acces~e	0.2987	-0.5565	-0.2568	0.1060	0.6902	0.1038	0.1917	0
gender_edu~p	0.5679	-0.1000	0.3201	0.0340	-0.3858	-0.0354	0.6432	0
gender_hea~y	0.1415	0.1963	0.6730	0.5306	0.3556	-0.1318	-0.2513	0
norm_fores~d	-0.5755	0.2851	0.0386	0.1239	0.2880	-0.0483	0.6967	0
hh_head_fe~e	-0.3615	-0.4635	0.3804	0.0705	-0.1845	0.6859	-0.0188	0
per_pop_sa~n	0.3088	0.5598	-0.2677	0.1801	0.0796	0.6930	0.0239	0

Table 14.6: Energy sector PCA analysis for sensitivity sub-index and weight for individual variables.

```
. pca per_hh_with_energy per_hh_dep_firewhood norm_womenpopulation norm_women_energy_access norm_women_emp_energy energydemand

Principal components/correlation                 Number of obs    =         47
                                                 Number of comp.  =          6
                                                 Trace            =          6
    Rotation: (unrotated = principal)            Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.64178	2.39363	0.6070	0.6070
Comp2	1.24815	.550608	0.2080	0.8150
Comp3	.697545	.4219	0.1163	0.9312
Comp4	.275645	.155072	0.0459	0.9772
Comp5	.120574	.104275	0.0201	0.9973
Comp6	.0162983	.	0.0027	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
per_hh_wit~y	0.2840	-0.4868	0.7276	0.3822	-0.0819	0.0115	0
per_hh_dep~d	-0.3951	0.4603	0.1057	0.7379	0.2763	0.0018	0
norm_women~n	0.4906	0.1798	-0.2564	0.2779	-0.2468	0.7232	0
norm_women~s	0.4825	0.2656	-0.1767	0.2576	-0.3684	-0.6807	0
norm_women~y	0.4939	-0.0777	-0.1580	0.0188	0.8465	-0.0901	0
energydemand	0.2138	0.6650	0.5809	-0.4068	0.0615	0.0730	0

Variables	Component 1	Component 2	Square 1	Square 2	Avarage	Weight
Per_HH_with_Energy	0.28	0.49	0.08	0.24	0.16	15.88
Per_HH_Dep_Firewhood	0.40	0.46	0.16	0.21	0.18	18.40
Norm_Women Population	0.49	0.18	0.24	0.03	0.14	13.65
Norm_women_energy_access	0.48	0.27	0.23	0.07	0.15	15.17
Norm_women_emp_energy	0.49	0.08	0.24	0.01	0.12	12.50
Energy Demand	0.21	0.67	0.05	0.44	0.24	24.40

Table 14.7: Energy sector PCA analysis for adaptive capacity sub-index and weight for individual variables.

```
. pca norm_povery_adaptivecapacity incomegap_adp_cap education_gap_adp_cap per_access_energy per_access_clean_energy hh_head_female energy_supply

Principal components/correlation                  Number of obs    =         47
                                                  Number of comp.  =          7
                                                  Trace            =          7
    Rotation: (unrotated = principal)             Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.31681	1.90066	0.4738	0.4738
Comp2	1.41615	.598197	0.2023	0.6761
Comp3	.817956	.0551473	0.1169	0.7930
Comp4	.762808	.384908	0.1090	0.9020
Comp5	.377901	.153533	0.0540	0.9559
Comp6	.224368	.140361	0.0321	0.9880
Comp7	.0840068	.	0.0120	1.0000

Variable	Component 1	Square	Weight
Norm_Povery_Adaptive Capacity	0.03	0.00	0.08
Income-Gap_Adp_Cap	0.01	0.00	0.02
Education_Gap_Adp_Cap	0.49	0.24	23.80
Per_Access_Energy	0.50	0.25	25.00
Per_Access_Clean_Energy	0.44	0.19	19.32
HH_Head_Female	0.43	0.19	18.87
Energy_Supply	0.36	0.13	12.91

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
norm_pover~y	0.0283	-0.7079	-0.0519	0.5207	0.4421	0.1306	-0.1085	0
incomegap_~p	-0.0133	0.6291	-0.2318	0.7022	0.1996	-0.1273	0.0330	0
education_~p	-0.4879	0.1556	0.1227	0.0569	-0.0335	0.8463	-0.0460	0
per~s_energy	0.5000	0.0516	0.3450	0.0560	0.1252	0.2698	0.7326	0
per~n_energy	0.4396	0.2116	0.5466	-0.0050	0.1905	0.1081	-0.6443	0
hh_head_fe~e	-0.4344	0.1316	0.2685	-0.3005	0.7369	-0.2559	0.1520	0
energy_sup~y	0.3593	0.1189	-0.6622	-0.3728	0.4106	0.3172	-0.1001	0