

**Effects of Climate Change on Women's Socio-Economic  
Development in Mwea East Sub-County, Kirinyaga County, Kenya**

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## DECLARATION

I, the undersigned, declare that this Thesis is my original work and has not been submitted for examination in any other University. All the sources I have cited have been duly acknowledged. I agree and confirm that the Thesis may be available for reference and photocopying at the discretion of the University.

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## **LIST OF ABBREVIATIONS**

<b>ADB</b>	Asian Development Bank
<b>CSW</b>	Commission on the Status of Women
<b>GAD</b>	Gender and Development
<b>GCHoD</b>	Gender and Culture Head of Department
<b>GHG</b>	Green House Gases
<b>GoK</b>	Government of Kenya
<b>IPCC</b>	Inter-governmental Panel on Climate Change
<b>KCIDP</b>	Kirinyaga County Integrated Development Plan
<b>KDHS</b>	Kenya Demographic and Health Survey
<b>KNBS</b>	Kenya National Bureau of Statistics
<b>NACOSTI</b>	National Commission for Science, Technology and Innovation
<b>NCPD</b>	National Council of Population and Development
<b>NGOs</b>	Non-Governmental Organizations
<b>NIB</b>	National Irrigation Board
<b>OECD</b>	Organization of Economic Development
<b>PI</b>	Principal Investigator
<b>SDGs</b>	Sustainable Development Goals
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>SSA</b>	Sub Saharan Africa
<b>UN</b>	United Nations
<b>UVR</b>	Ultraviolet Radiation
<b>WEC</b>	World Economic Forum

## **ABSTRACT**

Climate change has had adverse impacts on people's lives and the economies of nations across the globe. This research examined effects of climate change on socio-economic development of women in Mwea East sub County, Kirinyaga County. The study was conducted in Ngucwi sub Location, Murinduko Ward, Mwea East sub County, Kirinyaga County. The study explored how climate change events continue to threaten food security, health and income levels among women. The study used descriptive research design and integrated qualitative and quantitative approaches. The researcher used purposive sampling to select Mwea East sub County in Kirinyaga County which has experienced frequency and severity of climate change events of drought. Cluster sampling was used to divide the sample among the different villages. Systematic random sampling was used to select households in each village. Out of the population of 38,734 women of ages 18 years to 69 years; a sample size of 449 was calculated. A semi-structured questionnaire was also used to collect data. Additionally, key informant interviews and focus group discussions were used to gather qualitative information. Quantitative data from questionnaires was analysed using descriptive statistics and regression analysis while thematic and content analysis was used to analyse qualitative data. The study found that climate change was negatively related to food security, a relationship which was statistically significant. The study further found that climate change had a positive relationship with women's health issues but this was insignificant. However, climate change was found to be negatively and significantly related to women's income. The study findings may provide policy and decision-makers with useful information to guide the design of appropriate social-economic programmes to protect women from the adverse effects of climate change. The study recommends ways in which women in Mwea East sub County can participate more actively in mitigation and adaptation programmes of climate change effects.

## OPERATIONAL DEFINITION OF TERMS

<b>Adaptability:</b>	The ability of women in Ngucwi sub location to cope with the drought situation.
<b>Climate Change:</b>	The change in the state of the climate in Ngucwi sub location over a period of ten years or more. The study focuses more on drought which is more prevalent in the area of study.
<b>Food Security:</b>	Food security in this study means availability, effective utilization of food crops and food system stability among the women in Ngucwi sub location.
<b>Health:</b>	Health in the context of this study means the absence of disease during the drought period among the women in Ngucwi sub location.
<b>Income:</b>	Income in this study means adequate household income received from the sale of the food crops harvested and other sources of income.
<b>Mitigation:</b>	In this study, mitigation means the action or actions taken by women and other residents of Ngucwi sub location to reduce the effect of climate change.
<b>Socio-economic development:</b>	For the purpose of this study, socio-economic development refers to the social class of the respondents defined by the state of food security, health and income of women in Ngucwi sub location, Mwea, East sub County.

# **CHAPTER 1: INTRODUCTION**

## **1.1 Introduction**

This chapter presents the insertion into the research topic, the background of the study, problem statement, research objectives, research questions and the significance of the study. It further discusses the scope, delimitation and the limitations of the study.

### **1.1.1 Insertion**

My fascination with nature began as a small girl growing up at the foot of Mount Kenya. I would spend time during weekends and school holidays observing nature and marveling at its beauty. As I grew older, I began to realize that nature was under threat by impacts of climate change. Frequent drought, flooding and the diminishing of the glaciers on Mt. Kenya were some of the notable threats. It became clear to me how climate change and related calamities affect women's socio-economic wellbeing.

The researcher saw women moving from house to house in search of casual labour in exchange for food during drought seasons and others displaced by heavy flooding. The constant struggle by women to feed their children, the health problems they faced during extreme weather changes became a big worry to me. The picture of a woman crying when she could not get food for her children despite having walked for over fifteen kilometers to look for casual labour has never left my mind to date. I saw my mother share the little food we had with her. That gesture from my mother touched my heart deeply and I wondered what could be done to prevent the effects of extreme weather especially among women. These experiences of my childhood, became the remote motivation behind this research project. It is my humble contribution to the solution of challenges posed by climate change to women in Mwea.

## **1.2 Background to the Study**

Climate change is defined as the climatic state variations identifiable through statistical measurements (Santer et al., 2009). It involves changes in the variability and the mean of parameters measured over an extended period spanning decades or more. The Intergovernmental Panel on Climate Change (IPCC) links climate change to natural internal and external forces and human-induced alterations in atmospheric composition and land use.

In less technical language, climate change is simply the alteration of the environment resulting from environmentally unfriendly human activities, such as improper disposal of waste, combustion of fuels, the inadequacy of forested areas, and other influential factors increasing the amount of atmospheric Green House Gases (GHG) (Chhabra & Bele, 2019). Climate change and global warming have resulted to the rising of the sea level, retreating of glaciers and melting of ice caps. The current warming trend is brought about by a rise in carbon dioxide and other greenhouse gases in the atmosphere (Siddik et al., 2021).

According to Mikhaylov et al., (2020), the build up of greenhouse gases in the atmosphere is in most cases caused by the combustion of fossil fuels (such as oil, coal, and gas) and the destruction of forests. Yaduvanshi et al., (2019) stated that there were catastrophic implications of a 2°C increase in temperature as opposed to a 1.5°C increase. The study further showed that it may still be possible to limit global warming below 1.5°C with robust efforts from local communities, civil society, businesses, indigenous peoples, and national and subnational authorities.

According to Gill (2019), if greenhouse gas emissions are not reduced and appropriate adaption measures not implemented, climate change might severely affect the U.S. economy. The researcher continues that increased temperatures, together with elements like extreme weather and sea level rise, will harm property and critical infrastructure, have an adverse effect on people's health and productivity, and harm industries like forestry, agriculture, fisheries, and tourism. Furthermore, even with moderate levels of warming, according to University of Chicago (2020), climate change will affect the American economy. Under a high emissions scenario, the U.S. economy could lose between 1% and 4% of GDP annually by the end of the century due to effects on labor, mortality, and the energy sector.

The IPCC (2014) observed that climate change in Europe had affected the distribution and abundance of animal, fish, and plant species, stagnated wheat yields in some sub-regions and caused forests to decline. The Asian Development Bank (ADB) (2017) estimates that Southeast Asia could experience worse losses due to climate change compared to most regions in the world; climate change, if unchecked, could reduce by 11 % the region's Gross Development Product (GDP) by the end of the century as it takes a toll on key sectors such as tourism, agriculture, fishing, human

health and labor productivity. Additionally, the report indicates that women in the Asian and Pacific regions are extremely vulnerable to climate change impacts and acknowledges that unabated, global warming can significantly undo the gains of previous efforts and achievements made on economic development and the achievements made in improving living standards. Climate change would impact all social and economic sectors across the globe, but with more severity in small cities and rural communities (Kibria, 2016). These include food, water, public health, energy demand and livelihoods. Climate change results to cascading impact from physical features to people and therefore introduces social and economic consequences that affect livelihoods, food and nutrition security (Porzany, 2016). The Commission on the Status of Women (CSW), the principal global inter-governmental body that exclusively promotes gender equality and the empowerment of women, has frequently reported on the problem of differential climate change impacts on men and women and the need for better information to support effective policy development. In its past sessional papers (50, 52, 53, 55, 57, 58, 60, and 61, the CSW, has specifically highlighted the dire climate change impacts on women (Dugard et al., 2020).

All life on Earth is threatened or will be profoundly impacted by the global and unprecedented extent of the effects of climate change (Díaz et al., 2019). For example, the production of food is endangered by altering weather patterns, the potential of catastrophic flooding is raised by rising sea levels, there are major forest fires raging, and there are strong heat waves and droughts. Women, world over, play a key role in food security. The impacts of climate change vary based on regional difference, age, gender and ethnicity. Climate change affects livelihoods of poor people causing risks of food security (Cheikh & Cynthia, 2019).

Climate change and natural disasters threaten the health of women and girls because they restrict access to services and healthcare and raise hazards for maternal and child health. According to research, prolonged periods of high temperatures raise the risk of stillbirth, and climate change is hastening the spread of diseases carried by insects, such as malaria, dengue fever, and the Zika virus, which are associated with poorer maternal and newborn outcomes: Climate change and natural disasters are said to make it more difficult for women to access services and healthcare (UN Women, 2022).

Climate change has far-reaching consequences in regard to social development goals and economic development that include, food and nutrition security, poverty reduction, social equity, gender equality and health. A report by Tschakert & Machado, (2012) showed that women depicted higher vulnerability to climate change impacts compared to men. The report further explained that women were disproportionately exposed to risks such as increased loss of livelihoods, security, and even loss of lives, during and in the aftermath of disasters. This is because women depend more on natural resources, social and cultural norms related to gender roles. Moreover, women suffer more from inequitable distribution of resources and land besides having limited access to decision-making and economic assets.

Climate change is already a reality in Africa (Besada & Sewankambo, 2009). These authors identified such downsides as the over-exploitation of the rain forests in equatorial Africa, flooding in western Africa, increased ocean acidity along the southern coast of Africa and prolonged and intensified droughts in Eastern Africa. Such disparities in weather patterns and unpredictable climatic seasons threaten food, health, water and energy security, in turn standing in the way of socio-economic development in Africa.

Climate change compromises women's income sources and their means of production. For example, climate change undermined women's rain-fed based livelihoods leading to increased food insecurity and exacerbated impoverishment in Zimbabwe (Phiri et al., 2014). This impact was manifested more specifically in livestock and crop production, water sources, and seasonal livelihoods. In Kenya, frequent and severe extreme weather events have been linked to climate change, leading to loss of lives, diminished livelihoods, damaged infrastructure, reduced crop and livestock production among other unfavorable impacts (Government of Kenya [GoK], 2018).

Climate change and associated natural disasters in Kenya have disrupted the socio-economic development of citizens (GoK, 2018). It is manifested in flooding seasons, concurrent drought seasons, and changes in rainfall and temperature patterns. The foregoing has had tremendous effects on socio-economic ramifications across the country with key economic pillars such as tourism, agriculture, mining and industrial sectors, affected negatively (Bargoria, 2022). Other studies in Kenya demonstrated the

impacts of climate change on the income of women who do not own resources such as land and livestock; They noted that the negative impacts such as drought and floods often led to more intense negative impacts on female-headed compared to male-headed households (Tongruksawattana & Wainaina, 2019). This compromises the progress towards the achievement of the Sustainable Development Goals (SDGs). Kirinyaga County, the locale of this study, is already adversely affected by the extreme weather changes affecting various parts of Kenya.

### **1.3 Statement of the Problem**

The sustainable development of Kenya is threatened by climate variability and extremes (Nyika, 2022). The Kirinyaga County Integrated Development Plan (KCIDP) 2018-2022, states that sustainable development of the County is threatened by climate variability and extremes. Ideally, the climate should be favourable enough to enable crop production and adequate water resources resulting to food security, improved health and high household income.

The specific location of the study is the lower part of Murinduko East Ward which experiences drought resulting to crop failure and subsequent low levels of income. Due to insufficient food and high temperatures, the community members also experience health problems.

Waiyaki et al. (2012), indicated that the East African region is already experiencing many widespread climate changes which result in both a direct impact on the development of climate-dependent activities and indirect consequences for social systems. The direct impact includes infrastructure and agriculture while the indirect one comprises issues of poverty, conflict, health and education. Subsequently, climate change is likely to compromise and undo social-economic development in Africa. There is insufficient empirical research (Karaya et al., 2015; Abdimajid et al., 2019; Omolo and Mafongoya, 2019) that has explored the climate change and socio-economic development of women in Kenya. These studies have instead focused on gender adaptations to climate change. The studies also provide information on the various strategies used by women to adapt to climate change impacts in Machakos, Kajiado, Kiambu, and Turkana Counties in Kenya. The researchers largely investigated the gender and social capital nexus in climate variability adaptation in the Counties.



The lack of relevant information makes it difficult to implement climate change response strategies at the local level. This study identifies Mwea East sub-County as a study area with an ideal set-up for identifying climate change impacts on social-economic characteristics. This sub-County is identified because it is vulnerable to the effects of climate change such as limited water resources which becomes severe during dry seasons. If this situation continues, the community is likely to lose its livelihood, experience poor health and low income. The study identified how climate change has compromised the social-economic factors and suggests practical actions that may be taken to mitigate the situation to achieve optimum effects. The study, therefore, attempts to provide information on the local level vulnerability of women to extreme effects of climate change especially drought. It delved into how climate change affects women's food security, health, and income, while also identifying their coping strategies to deal with these effects.

#### **1.4 Objectives of the Study**

The overall objective of the study was to examine effects of climate change on the socio-economic development of women in Mwea East sub-County, Kirinyaga County. The specific objectives of this study were to:

- i. Explore climate change effects on women's food security in Mwea East sub-County.
- ii. Identify the climate change impacts on women's health issues in Mwea East sub-County.
- iii. Assess the climate change impacts on women's income levels in Mwea East sub-County.

#### **1.5 Research Questions**

The study addressed the following research questions:

- i. How has climate change affected women's food security in Mwea East sub-County?
- ii. What is the effect of climate change on women's health in Mwea East sub-County?
- iii. How has climate change affected women's income levels in Mwea East sub-County?

## **1.6 Significance of the Study**

This study is significant in five main ways: First, the study may help key policy and decision-makers as it provides useful information to guide the design of appropriate social-economic programmes to protect women from the adverse effects of climate change. Second, the recommendations from the study, if adopted, may contribute to greater participation by women in climate change mitigation at the national and county levels.

Third, the study may be significant to Non-Governmental Organizations (NGOs) working in the environmental space in Kenya. For example, the findings and suggestions from this research could assist NGOs to design relevant environmental programmes to mitigate climate change impacts and enhance the coping capabilities of women. Such NGOs may also use the results and recommendations for advocacy to advance the rights of women in the area of climate change.

Fourth, the study may be relevant to women leaders in Kenya. The findings could start a discourse on increasing women's participation in decision making on matters pertaining to climate change. Women are often left out when issues affecting them are being discussed at various levels of society.

Fifth, the study could be beneficial to scholars and the academia by contributing to the climate change literature on women's social-economic welfare while providing a source of reference for future studies in this area. Additional areas of further study on climate change and the social-economic welfare of women could also be identified.

Sixth, the study may also be of importance to the researcher as it could expand her knowledge on how climate change impacts on women's food security, health, and income. The study was also aimed at prompting the participants to play active roles in advocating for gender-specific strategies and responses that could mitigate climate change in Mwea East sub County.

## **1.7 Scope and Delimitation of the Study**

The study was conducted in Mwea East sub-County and focused only on women's socio-economic development during and after natural disasters caused by climate change. The study's focus was the areas that have experienced drought and environmental degradation and further explored how these events continue to threaten

food security, health and income levels among women. The study mainly targeted women household respondents, and sub-County officers working among selected communities.

### **1.8 Purpose of the Study**

The goal of the study was to determine how climatic change affected the socio-economic advancement of women in Kirinyaga County's Mwea East sub-County. The researcher hopes that the findings of this study may be applied in other parts of Kenya that face similar threats due to extreme climate changes.

### **1.9 Limitations of the Study**

This study was limited by the COVID-19 restrictions and guidelines, which limited the extent to which the investigator could interact with the respondents during the field research. Nevertheless, every effort was made to adhere to the guidelines when conducting data collection to ensure that both the interviewer and respondents were adequately protected from any health risks. The other limitation of the study was that the problem of socio-economic development cannot be measured objectively and the research depended on subjective explanations from the respondents. In order to address this, the research used data from different sources and groups of respondents in order to enhance the validity and reliability of the information gathered. The final limitation was the fact that probability methods usually consume a lot of time. This limitation was addressed by ensuring proper planning of the interviews and assuring respondents that the researcher would try to work within the stated time.

### **1.10 Chapter Summary**

The introduction, problem statement, problem statement's context, aims, research questions, importance, scope and delimitation of the study, study limitations, and operational definitions of important terminology were all presented in this chapter. The study's literature review is presented in the following chapter.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter reviewed the published and unpublished literature. The chapter has a section focusing on theories that guided the study, the empirical literature for the study, the conceptual framework, and research gaps that the study aimed to fill.

### **2.2 Theoretical Review**

A theoretical framework is described as a group of connected ideas that guide research and forecast and explain the findings. The justification for conducting the research is typically provided by a theoretical framework (Radhakrishna et al., 2007). This section reviewed the literature on gender, development, and intersectionality theories. Additionally, the researcher reasons and discusses how climate change has affected the socio-economic advancement of women in Mwea East sub County.

#### **2.2.1 Gender and Development**

Besides the exclusion of women from economic processes, the Gender and Development (GAD) approach considers many other factors for achieving gender equality and development, from the male-female power relations at micro to macro levels (Correa-Fernandes et al., 2015). The theory of gender and development views issues concerning women more holistically. It emerged from the recognition of gendered role and responsibility differences.

GAD is not women-specific but explores the social construction of gendered roles, expectations and responsibilities; This is in contrast to the emphasis on exclusive female solidarity which is highly esteemed by radical feminists. The GAD perspective takes all aspects of women's lives into account, to bring gender analysis into the core of development policy (Fapohunda, 2012).

GAD can be described as a development approach that equalizes the status, relationships and conditions of men and women. This is achieved by influencing the processes and evaluation that deliberately address the gender issues and concerns affecting the full development of women. GAD aims to integrate women into the development process and identifies transformative innovations to the inequality of social and gender relations (Esteban-Pulmano, 2016).

The importance of the GAD perspective theory for this research is that it acknowledges that men and women often hold dissimilar positions, and their responsibilities and decision-making authorities at the household and community levels differ. There are also differences in the roles played by men and women in society as well as control over and use of resources and their views and needs. This implies that any strategy adopted to address climate change impacts on the food security, health and income of women, should be based on access to resources and decision making. To achieve sustainable solutions to the vulnerability of women, perceptions of climate change should have a gender component.

Critiques of the GAD theory opine that it gives prominence to social differences between men and women while disregarding the bonds between them and the likely changes in roles (Miller & Razavi, 1995). Further, the GAD has been accused of being gynocentric and putting female issues at the forefront at the expense of male issues and thus does not meet the threshold for a theoretical framework for exploring impacts of climate change because this is an issue that affects both genders. Any response to climate change requires input from both males and females. Consequently, the researcher invites intersectionality theory into the women and climate change debate.

### **2.2.2 Inter-sectionality Theory**

Intersectionality is the interaction among factors such as gender and race of individuals including social-cultural and institutional practices and ideologies and the power-related outcomes arising from these interactions (Davis, 2008). The theory has been applied in fields such as climate change vulnerability, human rights, sustainable development, and risk analysis. The theory has also been applied in the fields of diseases, forest fires, earthquakes, environmental, water-related hazards and vulnerability to disasters (Kuran, 2020).

An intersectional analysis demonstrates differential relationships between individuals and groups to climate change mediated by context-specific hierarchical power structures (Kaijser & Kronsell, 2014). It is critical to identify the vulnerable groups, such as the elderly, women, children, and the mentally and physically impaired, especially during hazards or when a crisis occurs. Disaster risk management programmes should address such issues considering the differential exposures to hazards and crises.

More profound understanding of the theory supports a policy development which can address the variety of simultaneously existing inequalities (Larsson, 2017). The use of intersectionality theory in examining the impact of climate change on food security, health, and income of women in the context of a developing nation is important; this is attributed to dissimilarity between gender categorization and the significance of each gender to climate change vulnerability (Arora-Jonsson, 2011).

The majority of people engaged in agricultural production are women and are most vulnerable to climate change impacts. Women endure the brunt of climate change disasters as producers of food; their vulnerability is also amplified by their reproductive, productive, and community roles (Dankelman, 2008). The theory of intersectionality is thus important for this study as it identifies that any actions towards addressing women's vulnerability to climate change require different approaches, agencies, and knowledge from various disciplines to address this problem in the long term. There is a need for both make and frame perspectives and contributions if any long term response to climate change impacts is to be identified and achieved which is the crux of intersectionality theory.

### **2.3 Empirical Review**

This section of the literature review focused on analysing and presenting past findings from earlier empirical studies investigating climate change impacts on food, health and economic security of women. There was a deliberate effort to present studies that have been done from a global, regional, and local perspective.

#### **2.3.1 Climate Change and Women Food Security**

Severe impacts of climate change are felt on food security including availability, access, utilization and stability (Tanny & Rahman, 2016). Natural disasters such as the hurricanes Mitch and Stan in Mexico tend to affect men and women differently (Jungehülsing, 2010). In this study, men mostly suffered losses from remunerated work on farms, while women lost crops and livestock including fruits and chickens. The loss was quite devastating especially for women who previously obtained their daily food from their yards. This provides evidence to show that climate change indeed threaten food security in female headed households.

This trend has also been captured in Asia where studies have shown the precarious situation of women after a climate change event. In one such study in Bangladesh, household food security among 370 married women living at the coastline revealed low awareness of food security status and nutrition among women (Sharmin, 2014). Less than one-third of respondents had a good level of food security, and a smaller group were at an extreme level of food insecurity. Additionally, awareness of issues relating to climate change among coastal women was lacking. Nevertheless, the findings from the study were from respondents living in a coastline and there is need to establish if the results for the rural areas would be similar and thus the present study is conducted in a rural area of sub-Saharan Africa (SSA).

Further analysis on the climate change impact on agricultural production and food security in coastal regions was carried out in Bangladesh, (Hossain & Majumder, 2018). Upon scrutinizing the literature, it was established that vulnerability to climate change was ungendered and groups that were socio-economically underprivileged and marginalised were disproportionately affected. The majority of these groups were women. Evidence has pointed to the failure of the existing policies and adaptation measures to address the influence of powers on marginalized women and the growing trend in the feminization of food insecurity. The researchers identified that effects of climate change were different for men and women and this study therefore focuses specifically on the experiences of women during climate change events.

Findings from a study on gendered vulnerabilities of smallholder farmers to climate change in the Philippines revealed differential impacts of climate change between men and women, resulting in changing farming patterns and coping strategies (Chandra & Dalabajan's, 2017). Women were more disadvantaged, and as such, tended to farm in smaller plots, worked shorter hours or limited their farming routine to favour the cultivation of cash crops. The exposure to climate change disproportionately places women at a disadvantage due to the effect it has on their agricultural yields.

A reduction in agricultural yields led to an increase in food insecurity, which was markedly devastating to female-headed households. The correlation between climate vulnerability based on gender and food insecurity in Malawi was investigated, and the results established a clear difference in the exposures and sensitivity to climate risks between men and women (Kakota et al., 2011). These findings imply that women-

led households were likely to suffer and experience food insecurity on a larger scale compared to male-headed households.

Among the Maasai in Kenya, women were most vulnerable to climate change effects and bore greater responsibility for household food provision, as pointed out by (Wangu, 2014). In West Pokot County, it was established that there was a substantial rise in malnutrition levels, especially among women and children; implying that women were predisposed to food insecurity (Obwocha, 2015). A dominant trend in food insecurity among female-headed households compared to male-headed households in the Oloolua area of Kajiado County (Mayaka, 2018). Similar results were found in Kisii County that men were more well-nourished and obese in comparison to women (Samwel et al., 2018). These studies elaborate on the significance of women in the continuity and survival of the household; the impacts, and dire consequences that climate change has on the ability of women to support their households has however lacked prominence in academic literature and research which this study espouses to do.

### **2.3.2 Climate Change and Women's Health**

In a research, it was documented that respiratory and cardiovascular diseases caused primarily by exposure to poor air quality impacted women's ability to breathe (Sorensen et al., 2018). Poor air quality leads to maternal and child health complications such as stillbirths and congenital defects, among others. While examining effects of the 1997-1998 *El Nino* phenomenon in Peru, it was established there exist household-level gender inequalities in food distribution and consumption (Reyes, 2002). The research found that women and children were disproportionately exposed to widespread malnutrition, leading to severe epidemics such as acute respiratory and diarrheal infections and cholera. Besides suffering from general health complications; women have been found to be vulnerable to climate change due to their reproductive role. This study will test if such health conditions are true during drought situations in the study area.

Meanwhile, expectant women were found to be vulnerable to malaria and subsequent complications in pregnancy. Pregnancy outcomes may be affected by environmental, social and economic factors and cited climate change as part of this system. The researchers further linked climate change to preterm birth, low weight and still birth (Morris, 2022). The World Health Organisation (WHO) stated that the roles,



attitudes and behavior of men and women differed in issues relating to mitigation of climate change. Additionally, WHO cited droughts in developing countries as a key contributor to reduced water availability and food security (WHO, 2019). Other than experiencing reproductive health issues during climate change events; the evidence also points to psychological conditions that women are likely to experience after a catastrophic event.

Women also suffer negative psychological vulnerabilities caused by climate change (Coêlho, 2004). Women in drought-affected areas were more anxious and emotionally distressed than men, a situation linked to the difficulties women face while executing their production and provision roles. In the Ganga river basin in India, a study revealed that psychosocial effects of flooding in women was higher and this was linked to the loss of support networks (Kumar et al., 2020). These psychological vulnerabilities include stress and depression that women experience when faced by challenges in supporting their households and fulfilling their role as caregivers.

A study on climate change and how it impacts the health of African women, made some associations between different climate change effects and how they affect the health of women (Nwoke & Ibe's, 2016). One of these was heatwave and Ultra Violet Radiation (UV). The study confirmed that radiation increased the mortality rate and that women were more at risk of dying in such events. The study also revealed a spike in the vulnerability to food and water-borne diseases by women and children. Again, the study indicated that women were more exposed to the risks associated with vector-borne diseases. The risks to health conditions that threaten their ability to produce food and care for their families is one that women face especially in times of drought.

The drying up of water sources under climate change results in water scarcity, forcing women to walk long distances in search of the commodity (Brody et al., 2008). This has a direct impact on women's health. While the cited studies are global and regional, this study aimed at examining the specific impact of drought on the health of women in the Kenyan context and area of study whose literature review affirms the glaring scarcity of related academic outputs. This review thus indicates that women are likely to experience health issues during a catastrophic event and hence the study aims to examine the influence of climate change events on their physical health, physiological health, psychological health, and maternal health.

### **2.3.3 Climate Change and Women's Income Levels**

A research study conducted in Canada, established that women saw fewer opportunities for berry picking and a reduction in quality of sealskins that were used in sewing (Bunce et al., 2016). This reduced their income earning potential and forced them to adapt their livelihood activities. In Sonora, Mexico, women's livelihoods and social connections were seriously affected by changes in climate and loss of water resources (Buechler, 2009). Social support systems that are a source of social capital were unfavourably affected by income losses arising from crop failure (Goh, 2012). This evidence indicates that the financial capital of some women was affected negatively while others turned to distress sales of livestock. These studies point to the need for women not to engage in socio-economic activities that are adversely affected by climate change events and which subsequently place their financial position in greater risk.

In their research on the impacts of climate change on rural-based women, Phiri et al., (2014) reported that climate change posed a great challenge to the livelihoods of women. Climate change essentially affects their means of production and sources of income which enable them to provide for their families. This was attributed to the limited adaptive capacity of women due to the dominance of men in land ownership especially in patriarchal nations like Zimbabwe where the study was undertaken.

Women and girls were, to a large extent, expected to care for the sick especially during times of disaster; thereby taking away time available for other beneficial activities like income generation and education (Brody et al., 2008). Rising medical bills and illness in the family worsens the situation, resulting in poor health and increased levels of poverty. The burden of caring for families and other household responsibilities among elderly women cause a lot of stress and fatigue (Samuel-Hodge et al., 2000). These responsibilities make it difficult for them to socialise and participate in economic activities. Most elderly women are also unable to engage in waged tasks or other forms of income-generating activities. In Kenya, where caring for the sick is a moral duty, the effect may be much more detrimental than elsewhere.

A study on women's vulnerabilities arising from the impact of climate change that was carried out in Bangladesh indicated that poor women who were responsible for homestead-based livelihoods experienced losses in income when crops were blown

or washed away (Mondal, 2014). An examination on female participation in agriculture during climate change revealed that labourers were highly dependent on wage income from agriculture, which was lower for females, especially during times of climatic stresses (Chanana-Nag, 2020). However, during weather related disasters, women are less likely to engage in this form of employment thereby raising their precarious situation as food producers and caregivers in the household. These gender roles are far more manifested in SSA.

In Samburu, studies on the effects of climate change and roles of men and women in community adaptation, established that women engaged in small scale businesses as a source of income to sustain their families (Ongoro & Ogara, 2012). The indication was that a significant loss of income from pastoralism owing to climate change occurred; this was contrary to findings whose research did not reveal any significant variances in the loss of income due to climatic changes among men and women (Nyaruai, 2016).

The findings indicated that women, in comparison to men, faced more challenges from climate change. The majority of the literature showed that women were more affected by climate change, owing to their reduced ownership of resources, and their role as carers for their family members. To cope with climate change, women sell livestock in search of a stream of income or opt to start small businesses. However, some research showed that there may be no gender disparity with regard to extreme climatic conditions; findings that this study aimed to further elucidate. These findings informed the researcher to look out for similar effects of climate change on women in Mwea East sub-County, Kenya.

## **2.4 Critique of Existing Literature and Research Gap**

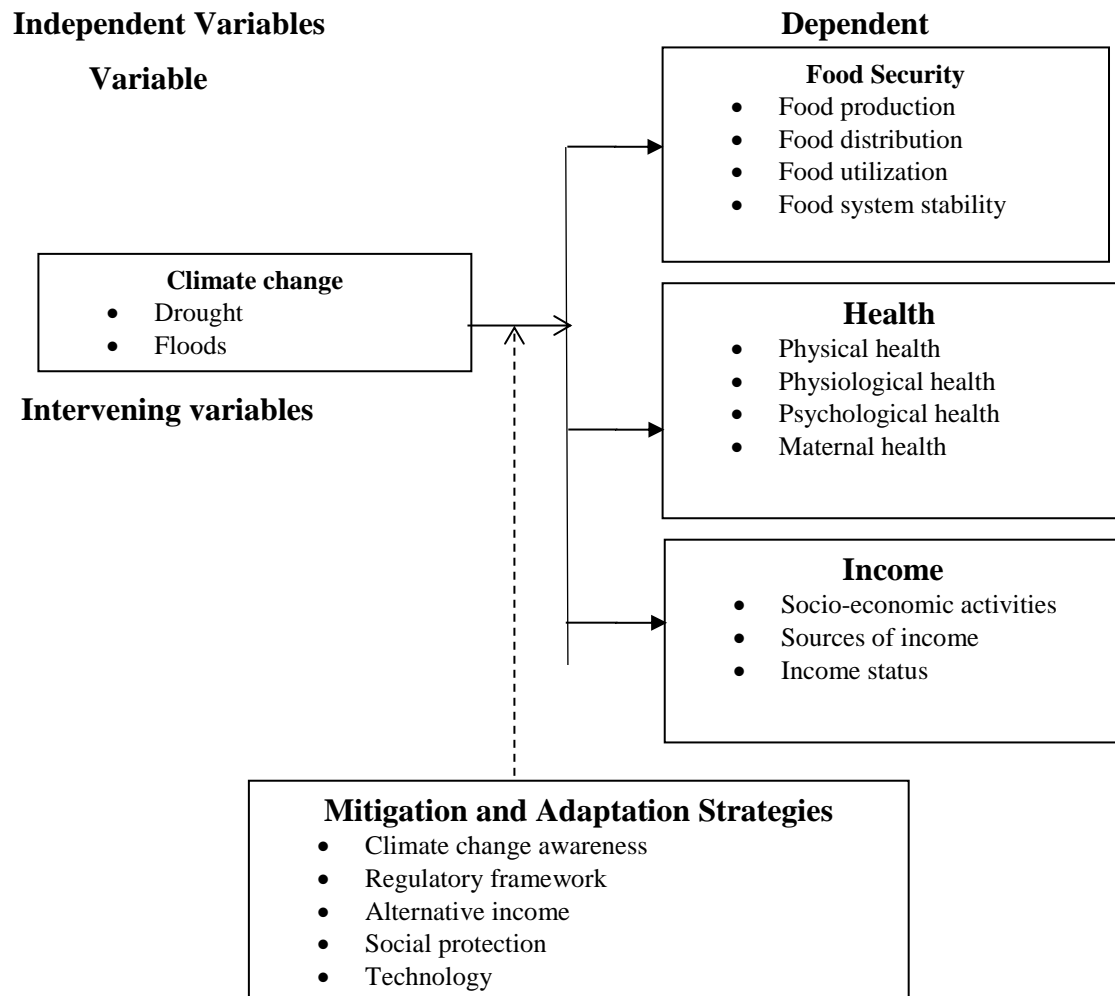
There is inadequate information on the differential vulnerability of various social groups to consequences on climate change regarding food security, health and income in Kenya, specifically in Mwea East sub County which has been experiencing long spells of drought. Researchers in Kenya particularly, need to conduct studies on gender dimensions of climate change and food security, health and income because of the information gap that exists. The researcher has indicated in this chapter that there is a plethora of studies that have proposed the adaptation and mitigation of climate change.

However, there is inadequate evidence of studies that can be cited to further understand gender dimensions of climate change.

This study may provide evidence useful in informing adaptation strategies by different social groups and decision-makers, and serve as another research gap to be addressed. The available climate change literature in the local context has not adopted a gender perspective and have neither incorporated nor mainstreamed these initiatives. The research gap this study aims to bridge is how women in Mwea East sub County are affected by long spells of drought, and how these affect their food security, health and income. The study further contributes towards the frame of knowledge on women response strategies to impacts of climate change in Kenya.

## **2.5 Conceptual Framework**

The conceptual framework shows a graphical depiction of the relationship between climate change and its impact on women's food security, health, and income. There are indicators shown that were used to measure each of the dependent variables as well as indicators for climate change. Climate change mitigation and adaptation strategies are considered as factors that can affect the interaction between climate change and women's food security, health and income and are thus conceptualized as the intervening variables for the study. Figure 2.1 illustrates how the variables were related to this study.



**Figure 2.1: Conceptual Framework**

**Source: Researcher (2023)**

The independent variable for this study was climate change and this was indicated by drought and floods. The manifestation of climate change in the study area and SSA in general has been the frequent incidences of drought. These periods are characterised by various challenges to populations living in these areas. The hypothesis is that these events present unique challenges to the female population given their role in the household and also in their socio-economic activities. These challenges are first grouped under food security as the first dependent variable. Based on the empirical review, the food security of women can be affected by climate change with regard to its availability, access, utilization and stability. Thus, the concept of food security involved asking respondents questions based on availability, access, utilization, and stability components after a drought event in the study area.

The second dependent variable is health of women during a drought event in the study area. The indicators adopted for women health thus included their physical, physiological, psychological, and maternal health and questions on climate change effects were asked on these dimensions of health. Women's maternal health and reproductive health may also be compromised during drought seasons.

The intervening variables consist of climate change awareness, regulatory framework, alternative income, social protection, and technology. The awareness of the population on climate change events can increase their coping. Mitigation can also be enhanced by having legislation that protects the natural environment from any long-term harmful effects on the climate. Having alternative sources of income can be used as a leverage to cope with drought and this can hence maintain the food security of households and women wellness. The central and county governments have started social protection programmes such as cash transfers that target the most poor households in the society. Access to these forms of cash transfers can cushion women from the effects of climate change. The use of modern technology to trap water for later use can also be used to mitigate the climate change effects. In the next chapter, the research methods used in the study are presented and discussed.

## **CHAPTER 3: RESEARCH METHOD**

### **3.1 Introduction**

This chapter describes the study method and advances the explanation and justification of a selection of research techniques that the study used to meet the research objectives. The chapter is presented in sections that consist of research design, the study site, sampling technique, data collection, data analysis, research tools, and ethical considerations.

### **3.2 Research Design**

A research design is the structure of research that binds all the research elements together (Akhtar, 2016). It can be termed simply as a plan of the proposed research work. The four classifications of research designs are exploratory, statistical or descriptive, explanatory, and experimental or analytical research (Ahuja, 2010). This study used descriptive research design as it fitted the motivation for the study which was to explore the interaction between climate change events and women's socio-economic development.

Descriptive research addresses several key questions; what, who, where, how and when of a current situation (Akhtar, 2016). The study aimed to assess the effects that climate change events had on women's food security, health and income. Specifically, it assessed whom the climate change affected, where and how the effects were experienced and when they were detected. The study used mixed methods design which entailed mixing both quantitative and qualitative research methods.

### **3.3 Location of the Study**

The location of the research was Mwea East sub-County in Kirinyaga County. Climate variability is posing a threat to the County's sustainable development (Benson & Christine, 2022). The area has experienced a significant increase in temperatures resulting in an increase in malaria and erratic rainfall. Rivers are rapidly drying up while the lower Mwea has been experiencing massive flooding. Mt. Kenya, a key water tower in the County, is already facing glacial recession. The agricultural sector has been affected more significantly in Kirinyaga County (Minai et al., 2014). The study was conducted in Ngucwi village, which is located in the lower parts of Murinduko Ward in Mwea East sub County (Appendix V). Murindiko Ward has a population of 3,037 (Kenya National Bureau of Statistics [KNBS], 2019). The Ward is the driest area in

Mwea East sub County whose residents are mainly subsistence farmers. The most common food crops are maize, beans and potatoes.

### **3.4 The Case of Mwea East sub-County**

Mwea East sub County is found in Kirinyaga County and covers approximately 1,478.1Km<sup>2</sup>. The topography of the sub-County is that of gently rolling plains covering most of the County. The County is bordered by Nyeri, Murang'a, Embu and Machakos counties (Figure 1.1) and has three ecological zones (GoK, 2018). Between 1,158 and 2,000 meters above sea level is the lowland areas, followed by the midland areas lying between 2,000 and 3,400 meters above sea level and the highlands falling between 3,400 and 5,380 meters above sea level. The County is characterized by sloping rainfall quantities from the slopes of Mt. Kenya to the semi-arid zones in the eastern parts (GoK, 2018).

Mwea experiences significant day-night temperature differences and high radiation, typical of a tropical region, which is attributable to its location near the equator and approximately 1,200 metres above sea level (Njinju et al., 2018). The settlement pattern in the constituency consists of clustered settlements in Wang'uru town and Kagio urban centres, and around Ngariam ranch which is the government's resettlement area for the landless. The rest of the constituency comprises scattered settlement, particularly the lower arid parts (Said et al., 2007).

Irrigated farming is commonly practiced in the lower zones, especially along the rivers Sagana, Thiba, Rwamuthambi and Ragati that have been channeled into canals. Land ownership is predominantly individual. The lower parts of the County however, are largely owned by the Mwea National Irrigation Board (NIB). The average landholdings in Mwea Constituency are larger in contrast to those in the central and upper regions of the County (GoK, 2018).

Climate variability and extremes are perilous to the County's sustainable development of Kirinyaga (Oritogun et al., 2018). A marked temperature rise in the County has increased diseases occurrences such as malaria and extreme weather events including erratic rainfall and sporadic flooding. Furthermore, the effects of the glacial recession on Mt. Kenya, a key water tower in the County are already being felt. The



sector most affected is agriculture (County Government of Kirinyaga, 2018). The researcher has had first hand experience with the issues on the ground.

### 3.5 Target Population

Women between the ages of 18 and 69 from households in the Mwea East sub County that had experienced climate change events made up the study's target population. According to Table 3.1, 38,734 women overall in this age group were predicted to live in Mwea East sub County (KNBS, 2019).

**Table 3.1: Mwea East sub County Female Population**

<b>Age</b>	<b>Population</b>
18-19	2,218
20-24	5,921
25-29	5,587
30-34	6,159
35-39	4,280
40-44	5,303
45-49	3,411
50-54	2,066
55-59	1,692
60-64	1091
65-69	1006
<b>Total</b>	<b>38,734</b>

**Source: KNBS (2019)**

### 3.6 Sampling Frame

The sampling frame is used to identify the elements of the population through enumeration. The sampling frame includes all units in the population constituting the research sample (Creswell & Clark, 2017). The sampling frame was women in households in Mwea East sub County. The sampling frame for the study was developed with assistance from village elders, leaders of the “Nyumba Kumi” clusters and the assistant Chief in all the wards who were acquainted with the residents.

#### 3.6.1 Sampling Techniques

The study adopted cluster sampling where Mwea East sub County was divided into seven clusters representative of administrative wards. Cluster sampling is used where the population is divided by geographic location because creating a sampling frame is nearly impossible due to the large size of the population (Yadua, 2012). This

study used purposive sampling to select Murinduko Ward from the seven wards from which households were selected using systematic random sampling where the field team selected every 5<sup>th</sup> household to interview women aged between 18 to 69 years.

### **3.6.2 Sample Size**

A sample is described as part of a larger group and should constitute a representative section of the whole population. The sample size for the study was drawn from the 38,734 women aged between 18 years and 69 years who had experienced or had been directly affected by climate change events in Mwea East sub County. A sample size of 449 respondents was determined as adequate for statistical analysis using Yamane (1967) sampling formula explained below.

$$n = \frac{N}{1 + N(e^2)}$$

Where;

n = sample size

N = study population

e = Level of precision at 95% confidence level (0.05)

## **3.7 Research Instruments**

The study adopted both qualitative and quantitative approaches to data collection. In this regard, a structured and semi-structured questionnaire, Key Informant Interview (KII) guide and a Focus Group Discussion (FGD) guide were used to collect data from the two categories of respondents.

### **3.7.1 Structured Questionnaire**

The main data collection tool used in this study was questionnaire, which create data on opinions, facts, knowledge and other information (Bloch, Phellas, & Seale, 2011). A questionnaire must be easy to understand and interpret. It should also provide sufficient data to answer the research problem (Bloch et al., 2011). A structured questionnaire was suitable for the study as the investigator aimed at including a relatively large participants in the study, their numbers, and aimed to collect information in a uniform approach to limit deviations from the objectives of the study. The questionnaire had five sections consisting of the background information, climate change experiences on women's food security, health and income, as well as a section

on strategies for mitigation and adaptation to climate change events for women in the study area. The questionnaire had both close-ended and open-ended items and was administered to women from the households from which the respondents were drawn.

### **3.7.2 Key Informant Interviews**

Key Informant Interviews (KIIs) are in-depth interviews with people knowledgeable of the goings-on in the community. The purpose of KIIs is to engage people with first-hand knowledge about the research topic (Ali, David, & Ching, 2013). A good Key Informant not only understands the culture but is also able to reflect on it and interpret the same to the researcher. The key informants for this study were two women leaders who included the Assistant Commissioner, Mwea East sub County and one leader of women groups; the Chief of Murinduko location and an old man who relocated to Murinduko location in his 30's and has lived there for over 60 years. A KII guide was developed based on the research questions and was further revised after analysis of the quantitative data to probe further information based on quantitative findings.

### **3.7.3 Focus Group Discussion**

A focus group discussion (FGD) is an in-depth discussion by a facilitator-led small group on a research subject (Morgan et al., 2002). The effectiveness of FGDs as a data collection tool depends on the dynamics of the group including free discussions. In the study, the researcher facilitated the discussion of 20 household representatives from Ngucwi village in Murinduko Ward. The 20 women were divided into two groups of 13 and 8 women from who the facilitator requested to have the discussions recorded to ensure accuracy in the documentation of information shared. The researcher prepared a set of questions to guide the discussions and consulted the participants regarding the time and venue most suitable for them before the discussions.

### **3.8 Pilot Study**

A pilot study tests the research design, sampling methods, data collection tools, and the protocol for collecting data (Hassan, Schattner, & Mazza, 2006). Other advantages of conducting a pilot study include familiarization of the instruments for the data collectors and providing the investigator with insight into the data collection process and logistics. Samples ranging from 10 to 40 per group are adequate in providing estimates precise enough to meet a variety of possible aims of a pilot study (Hertzog,

2008). 20 respondents were recruited for the pilot and were consequently excluded from the final study. The pilot study was conducted in Ngucwi sub location near Kanjinji village.

### **3.8.1 Validity**

Validity refers to how well the results represent true findings among comparable individuals not in the study. There are two domains to consider in the validity of a research study which is internal and external validity (Zohrabi, 2013). Internal validity is described as the extent to which the observed results represent the truth in the population being studied, while external validity refers to the extent to which the results of a study are generalizable to respondents in their lived experiences, especially for the population that the sample is believed to represent (Zohrabi, 2013).

The internal validity of the study was enhanced by taking two steps. One, the study selected participants perceived to have had experienced the effects of climate change on their food security, health and income. Secondly, the study used constructs, indicators, and items that had been used in previous studies to measure the variables whose suitability were checked by conducting the pilot study. In establishing the external validity of the study, the study relied on the expertise of two University lecturers who have studied environmental studies and statistics. Additionally, the researcher recruited respondents from Mwea East sub-County who had experienced the impacts of climate change. The study included women whose food security, health and income had been affected by climate change.

### **3.8.2 Reliability**

The consistency with which a method assesses the same phenomenon or the ability of a measuring tool to consistently deliver the same result when used on the same item is referred to as reliability (Heale & Twycross, 2015). In quantitative research, reliability refers to the results' repetition, consistency, and stability. In other words, if consistent results have been acquired under similar conditions but distinct circumstances, the results of a researcher are regarded reliable. Contrast this with qualitative research, where a researcher's methodology is constant throughout several projects and researchers (Madan & Kensinger, 2017).

The study adopted the test-retest reliability for the questionnaire. This involved administering the questionnaire twice at different times to a group of 20 individuals. The evaluation of stability was done by correlating the scores from Time 1 and Time 2 (Madan & Kensinger, 2017). The coefficient of stability is between 0 and 1 with a coefficient which is close to 1 signifies signifying excellent reliability while scores closer to 0 signify unacceptable reliability. The second administration of the test was done after one week of the initial test and a correlation coefficient of 0.7 was attained indicting high reliability.

### **3.9 Data Collection Process**

The first step of the data collection process was to acquire authorization from Tangaza University to proceed to the field. This was followed by an application for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). After acquiring this documentation, the researcher sought permission from the Kirinyaga County Assistant Commissioner and area Chief to conduct the study in the location and to engage the local residents in the study by requesting them to provide the required information. A pilot study was then conducted after which the actual study was rolled out.

The pilot study was done among 20 women who did not participate in the actual study. The administration of the questionnaire was done by the researcher along with the KIIs, which were conducted after the questionnaires had been administered. For the KIIs, the researcher interviewed the Assistant Commissioner of Mwea East sub County, the Chief of Murinduko Location, the sub Chief of Ngucwi sub location and two women leaders from Murinduko location. The questionnaires were administered by data collection assistants who were trained by the researcher. The researcher collected data in 5 of the households to demonstrate to the data collectors what was expected. She personally conducted the KIIs and FGDs.

### **3.10 Data Analysis**

The data from the questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 25. Descriptive statistics were instrumental in analyzing the data and the mean, frequency, and percentages which were exploited in this regard. Further, to establish the relationship between variables, correlation and regression analysis was conducted. For the qualitative information, the study used

thematic analysis of the transcription done from the interviews to align information derived from the interviews with the research questions. The qualitative information was used to support the numerical data by highlighting explanations and personal stories and experiences on the climate change impacts on women's food security, health and income. The quantitative data was presented in tables and charts and supported by narrations from the researcher.

### **3.11 Logistical and Ethical Considerations**

Ethical considerations of a research are of significant importance because they promote integrity, reliability and validity of the research findings (Rahman, 2017). The study ensured that anticipated participants of the study were made aware of the voluntary nature of the study and explained their right to either accept or decline participation in the study. After accepting to be interviewed, the study sought the consent of the participants. Informed consent is an ethical and legal provision for human-oriented research which highlights all the aspects of the research to the participants. An informed consent sheet was used at the beginning of all interviews with respondents where their verbal consent to include them in the study was sought. Any information provided by respondents was confidential and was maintained by having all documentation from the field work under lock and key.

The information was only to be disclosed to a Data Analyst under strict guidelines and instructions. There were also ethical considerations that were specific to the researcher. One of them was to avoid plagiarism which was achieved by citing all information not from the researcher and including the citation in the reference list. A plagiarism test and similarity index result (Appendix VI) was included to indicate that the study did not contravene the University's plagiarism similarity index. Avoiding bias was also a critical component of ethics in the research, and the Investigator kept personal opinions to herself and avoided letting her personal experiences determine the direction of the research during data collection. The next chapter presents research findings and subsequent discussions arising from that.

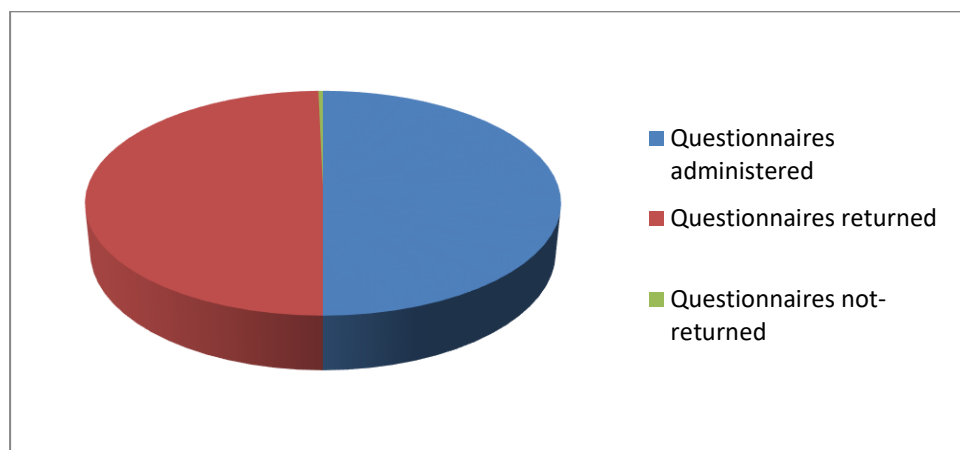
## CHAPTER 4: FINDINGS AND DISCUSSIONS

### 4.1 Introduction

This chapter presents the findings in tabular format and summarizes data using frequency distributions, mean and standard deviation. The chapter consists of several subsections that include a segment on response rate, demographic information of respondents, and subsections for each of the research objectives.

### 4.2 Response Rate

Out of the 449 questionnaires administered, the analysis was conducted using 446 questionnaires that were returned indicating a response rate of 99.3 % as shown in Figure 4.1. The high response rate was achieved due to the assistance from data collectors who conducted the exercise for a duration of three weeks in December 2021 following training conducted by the researcher. The 0.7 % non-response relates to the questionnaires that were left at the homes of the respondents for completion, but were not returned.



**Figure 4.1: Study Response Rate**

### 4.3 Demographic Information

Respondents were asked for demographic data such as their age, education, and employment status. Important indicators of the socioeconomic status (SES) of the families included the type of fuel used and the materials used to construct the homes. Readers and researchers can identify the group of people to whom research findings apply by reading a full description of the participants, which also enables comparisons between replications of studies.

#### 4.3.1 Age

In Table 4.1, the findings indicated that most respondents were in the 45-54 years (21.5%) age group followed by those in the 25-34 years (21.3%) age group, 35-44 years (20.4%), 55-64 years (14.8%) and those over 65 years (13.0%). The least age group represented was 18-24 years which accounted for 9.0% of the sample. These findings are similar to those of Wanja (2019) which found that more respondents in a sample of women in Kirinyaga East were above the 40 years age group; those in the 40 – 49 years accounted for 22.9%, 50 -59 years accounted for 23.6%, and 19.3% were in the 60 and above age group. Those in the 18 – 28 years and 29 – 39 years represented 9.4 % and 17.8% of the sample.

**Table 4.1: Age groups**

Age groups	Frequency	Percent
18-24	40	9.0
25-34	95	21.3
35-44	91	20.4
45-54	96	21.5
55-64	66	14.8
65 years and older	58	13.0
<b>Total</b>	<b>446</b>	<b>100.0</b>

Young people experience challenges in accessing employment opportunities especially in the agricultural sector due to brokers and other factors which may explain their limited participation in agricultural production and consequent movement to urban areas to seek for jobs (National Council of Population and Development [NCPD], 2017). Kagunda (2016), revealed that due to pressure on land, and the incapacity of the farmland to accommodate the excess labour force, majority of people from Kirinyaga County out-migrate in search of jobs, educational institutions and to accompany their husbands. This could explain why the study found only 9.0 % of the women between 18- 24 years engaged in agricultural activities. At this age most of them are in school and colleges or starting to work. The few who remain in the rural areas engage in farming activities and casual jobs.



### 4.3.2 Level of Education

In this research, the results showed that 49.1% of the respondents had attained primary education, 31.4% had secondary education and 10.8% had no formal education. The results also showed that 4.7% of the respondents had a college education and 3.1% had vocational training. Only 0.9% had university education as shown in Table 4.2. Globally, around 90% of the world's population had completed a primary education in 2020, whereas only 66% had attained a secondary education. Similarly, in this study, a high number of respondents had only completed basic education. The numbers were even lower in tertiary education. Most of these were female while adult men on average were more literate than women (Organization of Economic Development [OECD], 2022).

The 2022, the Kenya Demographic and Health Survey reported that there were more women (5.5%) with no formal education compared to men (2.7%). There were more women with primary (36.3%) and secondary (38.0%) education than men with a primary (35.9%) and secondary (39.5%) education. There were fewer women (1.1%) with vocational training compared to men (1.5%). More men (20.5%) had attained more than secondary education compared to women (19.1%) ( KNBS, 2022). In Kirinyaga East sub County, findings corroborate those of the 2019 National Census which found that 0.9% (5,860) of female population in Kirinyaga East had never been to school/learning institution (KNBS, 2019). The larger share of respondents had completed primary and secondary education and this is supported by findings from the 2019 National Census where 32.9% (21,289) had left school/ learning institution after completion which was the largest group on the distribution of population by school attendance status.

**Table 4.2: Education Level**

<b>Education level</b>	<b>Frequency</b>	<b>Percent</b>
No formal education	48	10.8
Primary education	219	49.1
Secondary education	140	31.4
Vocational training	14	3.1
College education	21	4.7
University education	4	0.9
<b>Total</b>	<b>446</b>	<b>100.0</b>

There is a high correlation between a nation's education level (as measured by international tests) and its GDP growth rate (Reyes & Useche, 2019). When evaluating secondary and tertiary enrolment rates, the World Economic Forum (WEC) also considers the amount of training provided to employees and the quality of education as evaluated by business executives (Bryl, 2020). A substantial body of research supports these claims. It is difficult to determine exactly how a person's level of education influences their likelihood of future success (Raupovna, 2019).

Economists have mostly used the salary gap between employees with different levels of education as a proxy for the impact of ability on employment opportunities. According to a comprehensive examination of research from around the world, the value of education beyond the elementary level may even outweigh that of primary school (Stromquist, 2022). Not only are the benefits of education substantial, but they also exist at all educational levels. Consequently, the education returns in the study area are poor, as the majority of the population had only completed primary school (Muyaka & 2021). This could affect their level of understanding of climate change effects on their socio-economic status and hinder their ability to address the situation.

#### **4.3.3 Economic Activity**

Table 4.3 shows that farming was the major activity performed by the respondents and accounted for 56.3% of the sample. 22.2% of the respondents were engaged in casual work, 13.5% in housework while 6.3% reared livestock. Other economic activities represented in the sample were mining, carpentry, and masonry. The fact that most respondents were engaged in farming, whose productivity was grossly affected by climate change, could lead to low socioeconomic status. Casual work, which most respondents resorted to when farming activities failed to generate income, also pays very little. The respondents would also most likely not have enough alternative opportunities due to their low level of education. Out of the 60,493 women in Kirinyaga East sub County, 39,193 were working, 1,067 were seeking work/no work available, and 20,225 were outside the labour force (KNBS, 2019). These statistics suggest that most women did not have economically gainfull employment and therefore engaged in casual and house chores.

**Table 4.3: Economic Activity**

<b>Activity</b>	<b>Frequency</b>	<b>Percent</b>
Housework	60	13.5
Farming	251	56.3
Rearing livestock	28	6.3
Casual work	99	22.2
Mining	3	0.7
Carpentry	1	0.2
Mason	2	0.4
No work	1	0.2
Missing responses	1	0.2
<b>Total</b>	<b>446</b>	<b>100.0</b>

The KNBS (2022) statistics indicate that 25% of women own agricultural land; 3% own land alone, while 20% own land jointly with their spouse or partner only. This means that only a small margin of women can make decisions on land use. The same report showed that more women who owned land alone were widowed (37.3%), divorced/separated (7.8%), and married/living together (1.6%). Due to lack of land ownership, 1,345 of women self-help groups are involved in agricultural activities and are funded by both government and donors and this contributes to women participation in agricultural production in Kirinyaga County (County Government of Kirinyaga, 2018).

63.5% of the respondents had their farms registered in the names of their spouses or their fathers-in-law, according to Wanja's (2019) findings. Only 16.8% of the women, all of whom were widowed or single, had land titles registered in their names. Only 19.8% of married women possessed land in joint ownership with their husbands. According to Mwathi and Oluoch (2013), women in Kirinyaga County lacked access to sufficient resources, such as land and money, and as a result, they were unable to decide critically important issues pertaining to farming. Although modern farming techniques and technology have been incorporated, most women hardly ever use them.

#### 4.3.4 Type of Fuel

The respondents were asked to share information on the type of fuel they used in their households. Majority, 82.1% of the sample, used wood as the primary source of fuel. This was followed by those who used charcoal/gas (6.7%), cow dung (2.9%), maize stocks (1.1%), and kerosene (0.4%) as shown in Table 4.4. Nationally, firewood was the most commonly used type of cooking fuel as reported by 55.1% of the households. This was followed by Liquefied Petroleum Gas (LPG) at 23.9% which corroborated the findings of this study (KNBS, 2019).

**Table 4.4: Type of fuel used to cook**

Type of fuel used to cook	Frequency	Percent
Wood	366	82.1
Dung	13	2.9
Charcoal/Gas	30	6.7
Gas	30	6.7
Kerosene	2	0.4
Maize stock	5	1.1
<b>Total</b>	<b>446</b>	<b>100.0</b>

The level of income influences the choice of cooking fuels. Typically, households with a higher income use cleaner fuels, while those with lower income use more traditional fuels. In the remote Mount Kenya region, a net monthly living wage of approximately \$128 US dollars is required to maintain an individual and his/her family (Sovacool, 2019). Due to low income, most firewood in rural Kirinyaga is gathered rather than purchased; resulting to most meals being cooked over wood (Njiru & Letema, 2018). These researchers further explained that only 0.8% of the households in Kirinyaga County used biogas and 0.1% solar energy despite these type of fuels being better alternatives to wood. This constitutes energy poverty which is worsened by insufficient investment in renewable, eco-friendly energy sources. Factors such as low level of education, that was witnessed among the respondents, could also contribute to lack of awareness and knowledge on renewable energy sources.

#### 4.3.5 Type of Shelter

Table 4.5 shows that majority of the respondents lived in mud houses representing 59.9% of the sample while those who lived in concrete block houses

represented 26.7% of the sample. Those who lived in houses made of wooden structures accounted for 11.9% and those in iron sheet structures represented 0.4% of the sample. Only 1.1% of the respondents lived in rented houses.

Based on data from KNBS (2019), 8.2% households were made of mud/cow dung while 8.3% were made of concrete/ concrete blocks/ precast wall and this was similar to findings of this study. The findings however, go against those from the census which found that majority of households were wooden (50.0%). These results suggest that women had access to permanent shelter as the materials used in constructing houses was not temporary.

**Table 4.5: Type of Shelter**

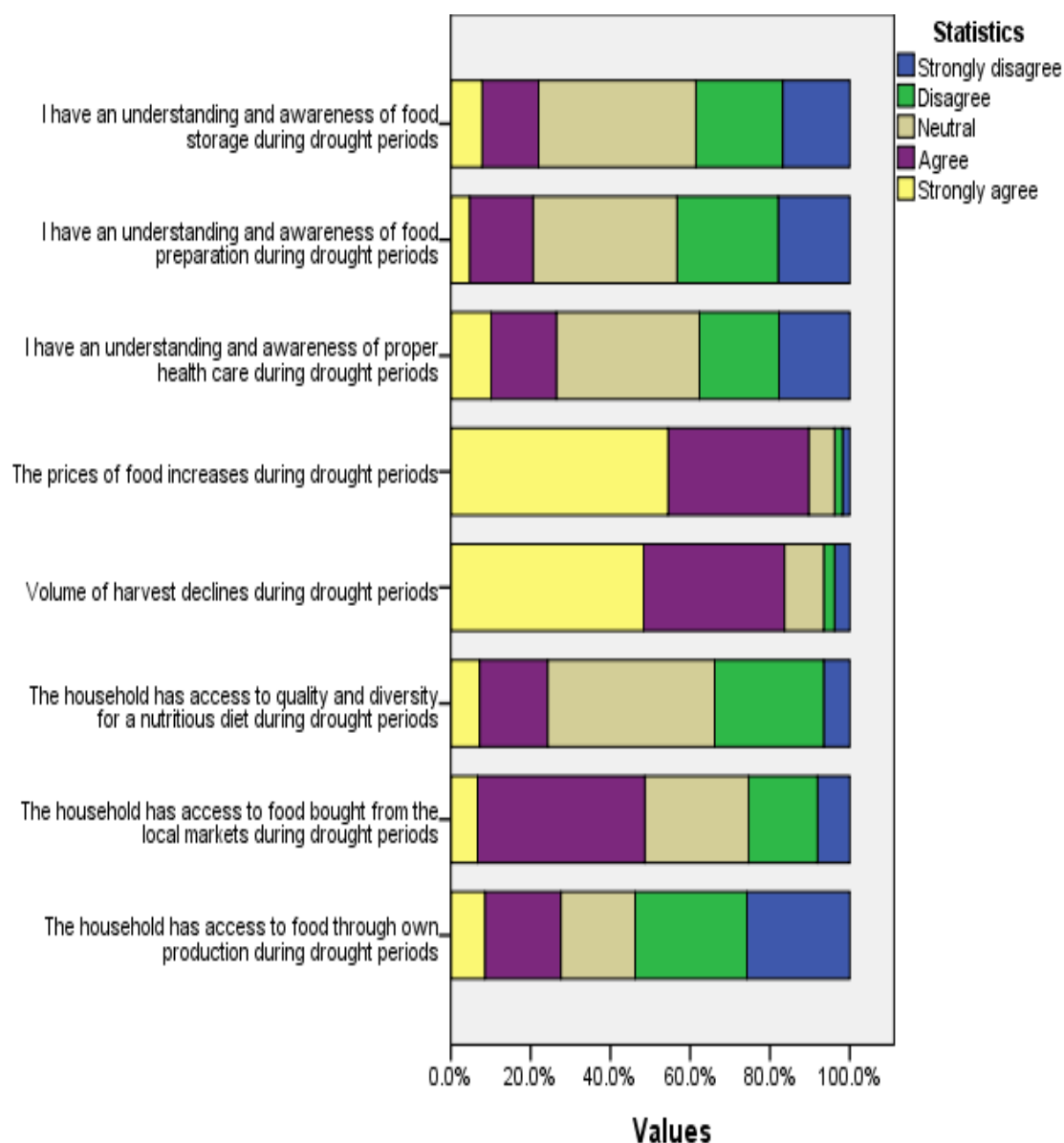
<b>Type of shelter</b>	<b>Frequency</b>	<b>Percent</b>
Mud house	267	59.9
Wooden	53	11.9
Concrete blocks	119	26.7
Iron sheets	2	0.4
Rental houses	5	1.1
<b>Total</b>	<b>446</b>	<b>100.0</b>

The health of a population can be dramatically affected by its living environment. The World Health Organization warns that overcrowding and sub standard housing can lead to the development of infectious diseases such as pneumonia, cholera, malaria, and dengue fever (Mercer, 2021). Though the settlements the residents lived in were not overcrowded, their houses can be described as sub standard. Their inability to build appropriate shelter could be attributed to low socioeconomic standards as a result of the effects of climate change on their main source of income; farming.

#### **4.4 Climate Change and Food Security**

The study's initial goal was to examine the impact of climate change on women's food security in the Mwea East sub-County. Respondents were asked to rate their level of agreement with the eight statements condensed in Figure 4.2 in order to gauge this link. The majority of respondents strongly agreed that the high cost of food was the drought's most pervasive effect. Moreover, respondents strongly agreed that there was

a decline in the volume of harvests during drought periods. It was unique to find respondents agreeing that households still had access to food from local markets during drought periods. This was attributed to food being transported to the local market from other regions though they were more expensive.



**Figure 4.2: Climate Change and Food Security**

In addition to the food security issues already listed, FGD revealed that food security affected women in Ngucwi village. The effects included: poor harvest; buying food soon after harvesting; growing maize and beans as the main food crop; expensive fertilizers resulting in poor harvest and lack of support from the government. Other challenges included inability to maintain livestock for milk production and unavailability of extension officers who when found demanded to be paid for services.

The Chief of Murinduko agreed with the sentiments of the respondents and reported that;

“Ngucwi residents experience food security problems. The area evidently receives low rainfall compared to the upper parts of the location. In fact, they barely produce enough food crops for consumption let alone for sale. This affects their livelihoods. The government mainly helps with education on the types of food crops to plant and the need to plant trees. You see, the residents in the upper parts have planted many trees and I think they help in bringing rainfall.”

The sentiments of the Chief were supported by the Assistant Commissioner, who said,

“Though I have not worked in this place for long, I have noticed that rain is insufficient and the area is dry. Women suffer most because they have to ensure their children have food to eat. Lack of food security affects other aspects of life like education and health. These women mainly earn their livelihood from farming which is a real problem with the uncertainties caused by climate change.”

#### **4.4.1 Regression Analysis between Climate Change and Food Security**

To further understand the influence of climate change on food security, bivariate regression analysis was used, as shown in tables 4.6. The model summary shows that climate change accounted for 6% of the variability in food security ( $R^2 = 0.060$ ). This indicated a weak relationship between climate change and food security. Nevertheless, food security was negatively related with climate change ( $\beta = -0.298$ ) and this relationship was found to be statistically significant ( $p < .05$ ). It was therefore concluded that food security had a negative statistically significant relationship with climate change.

**Table 4.6: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.246 <sup>a</sup>	.060	.058	.67957		
Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	3.867	.181		21.416	.000
	Food Security	-.298	.056	-.246	-5.345	.000

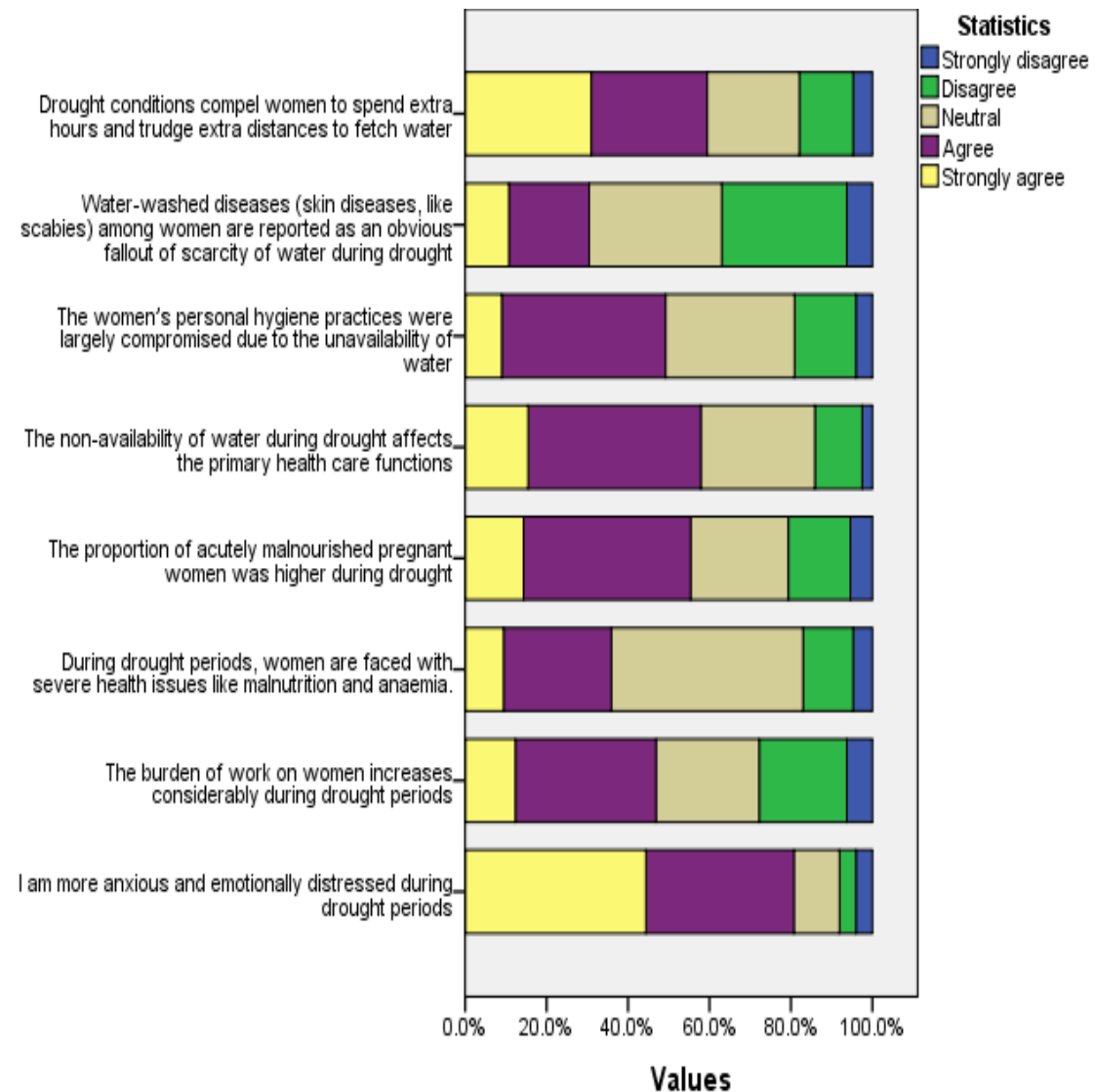
Several studies have found that climate change had a negative effect on food security. This finding supports Mekonnen et al., (2021) who found that climate change over the last three decades was had a negative impact the food security status of households. Crop production was constrained by poor rainfall, severe erosion and increases in temperature. This result was also found in Dasgupta and Robinson (2022) analysis which suggested that climate change was seen to reverse some of the improvements in food security that would otherwise have been realized; with Africa being the most affected. Likewise, Affoh et al. (2022) established that an increase in temperature as an indicator of climate change was harmful to food availability and accessibility. The findings of this study reveal similar results.

#### 4.5 Climate Change and Women Health

The second objective was to identify climate change effects on women's health in Mwea East sub-County. Respondents were asked to show their level of agreement with eight statements on this variable as summarized in Figure 4.3. Women strongly agreed that they experienced more anxiety and distress during drought periods and this was supported by the finding that they walked long distances to get water during drought periods. The respondents also agreed that their personal hygiene practices were compromised during drought periods and this could have a negative effect on their health. The respondents disagreed that there was a higher incidence of water-washed diseases during drought periods and this can be attributed to water purification that women undertook for they water that they acquired during drought. The respondents



confirmed this during FGDs when they explained how the health issues that affected them during drought seasons.



**Figure 4.3: Climate Change and Women Health**

This result reflected what findings from past studies showed that women experienced psychological issues owing to climate change. For instance, it was found that women in drought-affected areas were more anxious and emotionally distressed than men, a situation linked to the difficulties that women face while executing their production and provision roles (Coêlho, 2004). In another study, it's revealed that psychosocial effects of flooding in women were higher and this was linked to the loss of support networks (Lamond et al., 2015).

The results are in line with the focus group discussions where the participants attributed high levels of stress to the problems caused by drought and low income to meet basic needs. Additionally, the leader of women groups in Ngucwi area said:

“ if you go to hospital today, you will find many women suffering from high blood pressure. Women are suffering due to the problems they face when they harvest little or no crops at all. They have no one to turn to because the husbands do to have jobs.” She added “ some of the women don’t have husbands and have to rely on their own efforts.”

Further, the study established that respondents had not experienced water-washed diseases during drought periods due to scarcity of water as shown by a mean score of 2.98 and a 1.090 standard deviation. This implied that the findings did not agree with a prior study which showed that there was a spike in the vulnerability to food and water-borne diseases by women and children (Paul & Routra, 2011). Yet again, the study indicated that women were more exposed to the risks associated with vector-borne diseases. In the interview, the Chief of Ngucwi explained:

“the area has not experienced floods for a long time. When it floods, the water quickly drains and does not stagnate. Water washed diseases are common in lower rice growing areas of the sub County where there are canals.”

#### **4.5.1 Regression Analysis between Climate Change and Women Health Issues**

A linear regression model was fitted to the data to help gain a deeper understanding on the relationship between climate change and women health issues as shown in Table 4.7.

**Table 4.7: Model Summary and Coefficients**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.056 <sup>a</sup>	.003	.001	.69999
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Beta	Std. Error	
1	(Constant)	2.660	.220	12.084 .000
	Women's health issues	.075	.063 .056	1.185 .237

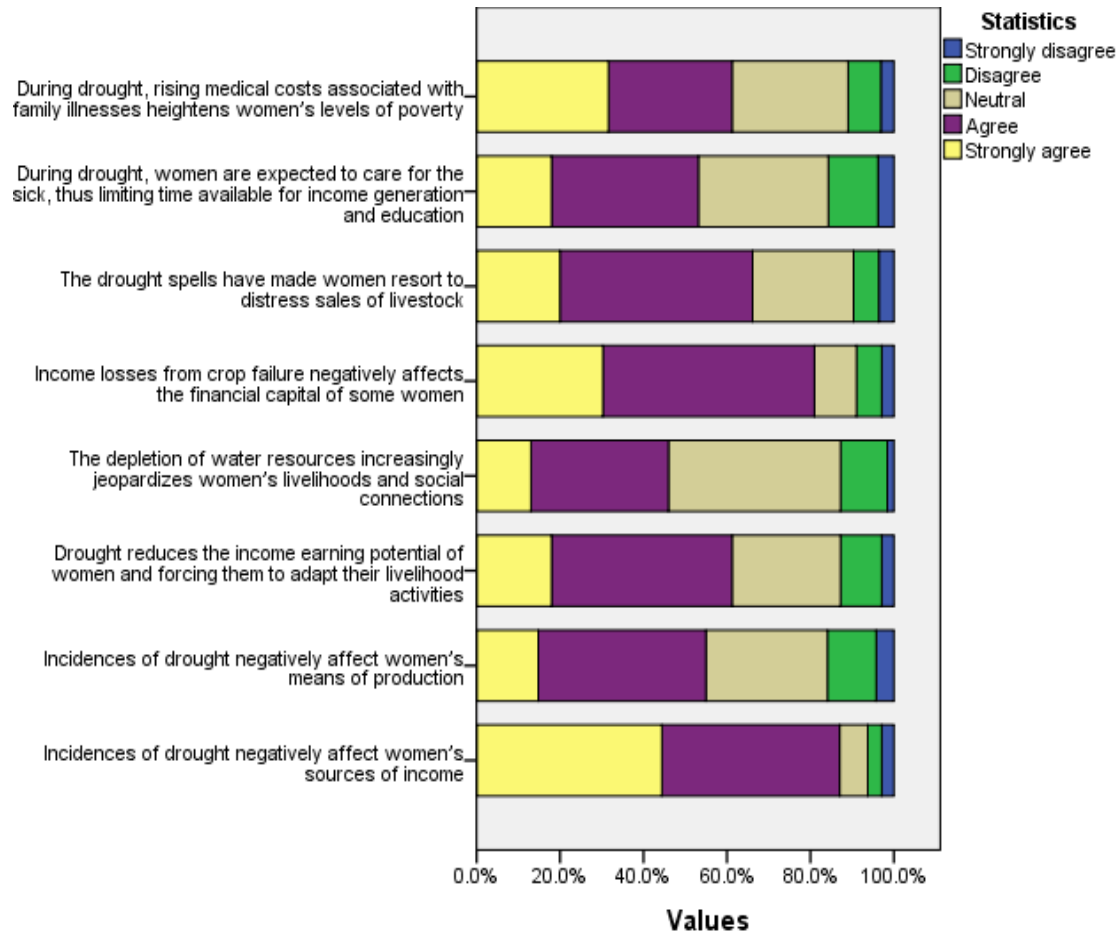
From Table 4.7, the regression yielded a coefficient of determination, R-square of 0.003 indicating that climate change accounted for only 0.3% of variability in women's health issues. This indicates a very weak relationship between climate change and women health issues. Table 4.7 of coefficients indicates that women health issues had a positive relationship with climate change ( $B = 0.075$ ). The  $p$  value of the association needs to be more than 0.05 for it to be deemed statistically insignificant (Halsey, 2019).

Statistical significance was employed to demonstrate that the observed patterns cannot be explained by chance alone. Statistical hypothesis testing is a decision-making tool employed by analysts. This test's  $p$ -value indicates the probability that findings as extreme as those found in the data would be observed by chance alone. Studies with  $p$ -values of 5% or less are frequently deemed significant. It was therefore concluded that climate change does not significantly influence women's health issues.

#### 4.6 Climate Change and Women Income

The third objective assessed climate change impacts on women's income levels in Mwea East sub-County. The respondents were presented with 8 statements which asked for their level of agreement and these findings are summarized in Figure 4.3. the respondents strongly agreed that their sources of income were affected during drought periods and this finding aligns with several past studies (Bunce et al., 2016; Phiri et al.,

2014) that found women having experienced loss of income due to climate change effects in the global, regional, and local arena. The findings further show women experienced rising medical costs due to declining income during drought periods due to crop failure. To cope with these challenges, the findings show women agreed that they resulted to selling livestock such as goats and chicken.



**Figure 4.4: Climate Change and Women Income**

Its established that women saw fewer opportunities for berry picking and a reduction in the quality of sealskins that were used in sewing; this reduced their income earning potential and forced them to adapt their livelihood activities in Canada (Bunce et al., 2016). In Zimbabwe, climate change posed a great challenge to livelihoods of women (Phiri et al., 2014). Climate change essentially affects their means of production and sources of income which enable them to provide for their families. In Kenya, it was established that women identified small scale businesses which they engaged in as a source of income to sustain their families due to significant loss of income from pastoralism owing to climate change (Ongoro & Ogara, 2012).

Regarding reduction in income, FGD respondents shared how they addressed the reduction in income from agricultural economic activities. The results indicated that several strategies were adopted by the women and these included: selling food crops soon after harvest which left little or nothing for consumption; selling domestic animals such as chicken and goats, engaging in casual labour which involved traveling long distances to more productive areas of the County in search of work and selling land to meet their basic needs. Selling of land reduced the space available for farming and other agricultural activities such as livestock keeping.

#### **4.6.1 Regression Analysis between Climate Change and Women's Income Levels**

A linear regression model assessed the relationship between climate change and women's income levels where regression results showed a coefficient of determination of 0.010 implying that climate change accounted for 1% of variability in women's income levels; climate change was found to be negatively related with women's income ( $\beta = -0.133$ ) and this was statistically significant ( $p < .05$ ).

Thus, it was concluded that climate change had a negative statistically significant relationship with women's income levels. This finding has also been reported in Mexico where Buechler (2009) found that women's livelihoods and social connections were seriously affected by changes in climate and loss of water resources. The evidence from Goh (2012) indicated that the financial capital of some women was affected negatively while others turned to distress sales of livestock to deal with incidences of drought periods in SSA. Chanana-Nag (2020) research on female participation in agriculture during climate change revealed that labourers were highly dependent on wage income which was low especially during times of climatic stresses. Moreover, women were less likely to engage in wage employment during weather related disasters thereby raising their precarious situation as food producers and caregivers in the household. Table 4.8 gives details.

**Table 4.8: Model Summary and Coefficients**

<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1	.099 <sup>a</sup>	.010	.008	.69767

<b>Model</b>		<b>Unstandardized Coefficients</b>	<b>Standardized Coefficients</b>	<b>t</b>	<b>Sig.</b>
		<b>B</b>	<b>Std. Error</b>	<b>Beta</b>	
1	(Constant)	3.412	0.239		0.000
	Women's income levels	-0.133	0.063	-0.099	0.037

**4.7 Chapter Summary**

This chapter presented the findings from the study starting with the response rate section followed by the demographic information subsections. The findings were presented by objective beginning with the descriptive analysis followed by regression analysis. The findings revealed that climate change was positively but insignificantly related with women's health issues indicating that the relationship was not significant. A negative relationship was observed between climate change and income implying that an increase in climate change resulted in reduced income opportunities. The next chapter presents the study summary, conclusions and recommendations.

## **CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

The summary, conclusions, and recommendations are presented in this chapter. The chapter also offers suggestions for further study as well as those for policy.

### **5.2 Summary**

Regarding the demographic information, the study collected data on age, the level of education, economic activity, type of fuel used in the household and the type of shelter they lived in. Most of the respondents were in the age groups 45-54 years (21.5%) and 25-34 years (21.3%) followed by those in the age group 35-44 (20.4%). The age group with the least number of people was 18-24 years (9.0%). The study showed that 49.1% of the respondents had attained primary education while 31.4% had attained secondary education and 4.7% had a college education. Only 0.9% of the respondents had attained university education.

Most of the respondents representing 56.3% of the sample had farming as their main economic activity while 22.2% of them were casual workers. Housework and livestock rearing accounted for 13.5% and 6.3% respectively. Regarding the type of fuel used in the households, a majority of the respondents, 82.1%, used wood as the primary source followed by 6.7% who used charcoal and gas. 59.9% of the respondents had mud houses while those who had concrete houses accounted for 26.7%. Only 1.1% lived in rental houses.

#### **5.2.1 Climate Change and Food Security**

The findings on climate change and food security showed that the harvest declined during drought periods, demonstrated by a mean score of 4.22 and 0.995 standard deviation. Similarly, according to the findings, food prices increased during drought seasons ( $M=4.39$ ,  $SD=0.840$ ). The findings further showed that the respondents lacked access to nutritious diets and did not understand proper healthcare and food storage. The FGDs revealed that women in Ngucwi village experienced poor harvest, and resorted to buying food a few weeks after harvesting. Participants in the group discussions argued that fertilizer was expensive and that there was lack of support from the government in form of technical advice on good agricultural practices. On the

whole, the findings showed a negative, statistically significant relationship with climate change.

### **5.2.2 Climate Change and Women Health**

The results showed that respondents were more anxious and emotionally distressed during drought periods as shown by a mean score of 4.13 and 1.033 standard deviation. Further, the respondents stated that they had not experienced water-washed diseases during drought periods due to scarcity of water as shown by a mean score of 2.98 and a 1.090 standard deviation. The regression analysis between climate change and women's health issues revealed a weak relationship of only 0.3% of the variability. Coefficients for regression analysis showed a positive relationship ( $\beta = 0.075$ ) which was not significant at  $p > 0.05$ . According to these findings, climate change does not significantly influence women health issues.

### **5.2.3 Climate Change and Women Income**

The findings on climate change and women's income showed most of the respondents agreeing that drought had a negative effect on sources of income as demonstrated by a mean score of 4.22 and standard deviation of 0.928. Participants of the FGDs indicated that drought had a negative effect on sources of income and explained that they sold food crops and domestic animals leaving little for consumption and engaged in casual labour to address the problem of low income. Coefficient for regression analysis between climate change and women's income revealed a statistically significant relationship of ( $p > 0.05$ ).

## **5.3 Conclusion**

The conclusions we may draw are based on impacts of climate change on food security, women's health, and women's income.

### **5.3.1 Climate Change and Food Security**

The first objective explored climate change effects on women's food security in Mwea East sub- County. The study concludes that the volume of harvest declines during drought periods and the prices of food increases during drought periods thereby affecting women's food security. Additionally, the study also concludes that households lacked diversity of food sources to maintain a nutritious diet. Overall, the



study concludes that an increase in climate change resulted in a reduction in women's food security.

### **5.3.2 Climate Change and Women's Health**

The second objective aimed to identify climate change impacts on women's health issues in Mwea East sub-County. The study concludes that women experience more anxiety and emotional distress during drought periods. The study further concludes that malaria was more common during flooding periods. Nevertheless, the study concludes that climate change did not significantly influence women's health issues.

### **5.3.3 Climate Change and Women's Income**

The third objective assessed climate change impacts on women's income levels in Mwea East sub-County. The study concludes that drought periods had a negative effect on women's income from agricultural economic activities. The fact that the respondents sold crops soon after the harvest denoted that they lacked adequate sources of income and that the crop yield was insufficient to generate enough income. The study concludes that climate change had a negative effect on women's income.

## **5.4 Recommendations**

On policies, the study recommends that the Ministry of Agriculture reinstates agricultural extension services to provide guidance to farmers on the most appropriate crops to plant during the drought season. The government should provide the extension services free of charge or offer subsidies to ensure affordability by the farmers. Additionally, the government should educate communities about climate change and its impacts and offer advice on adaptation measures to mitigate the effects. This education can be done through the existing community structures and the media.

The study also recommends that the Ministry of Agriculture reinstates demonstration farms in various villages where farmers can learn appropriate farming methods in light of the prevailing climate alterations.

The study recommends that the meteorological department becomes more proactive and technologically able in order to provide more precise predictions on climate conditions. This could improve the level of preparedness among the farmers.

The other recommendation is for the Ministry of Agriculture in partnership with the Ministry of Environment and Forestry to provide tree seedlings for planting by farmers. Currently in Ngucwi village, only a few tree seedlings are provided by the government in schools and other public places and their impact is hardly felt.

The study further recommends that the leadership of Mwea East sub County partners with the private sector and Non for-Profit organizations to create awareness on energy saving cooking methods in order to minimize the use of wood for fuel. This can be done through women groups in Ngucwi village.

It is recommended that the local administration lobbies the relevant ministries to establish water piping systems for irrigation so that the residents of Ngucwi village can engage in horticultural activities which seem to thrive in areas with accessibility to water schemes.

## **5.5 Theological Reflection**

The final reflection this research provides regards the link between environmental degradation and the African spiritual view of the same. Africans have always stressed on the sacredness of nature. Human beings have to exercise a symbiotic relations with the environment. This call for care of creation is now a global outcry and call if humanity has to survive. Pope Francis in his *Laodato Si* (2015) invites all peoples to return to their traditional ways of protecting the environment.

The Pope reminds us that God gave Adam and Eve the earth and told them to till and keep (Gen. 2:15). The Psalmist also tells us that the “earth is the Lord’s” (Psalm 24:1). He commanded and they were created (Psalm 148: 5ff). Consequently, the Pope wants us to appreciate the relationship between humanity and creation (*Laodato Si* (LS), Nos65-75). We should be filled with awe at the tremendous mystery of the universe (LS, 76-83). If we do this, then we should practice universal communion and stop the destruction of our common home (LS, 89-92). All these have to be done because all human beings have a common destination (LS, 93-95). The Pope then invites all to promote cultural ecology, ecology of daily life, and to know that we are stewards with the vocation to keep the earth healthy as given to us by God (LS, 143 – 158). These attitudinal changes called for by Pope Francis may help us to avoid living lives that

endanger our environments. The people of Mwea need to embrace this proposal by the Pope.

### **5.6 Recommendations for Further Research**

The study recommends that further research be conducted to determine the impact of climate change on women's health. This study did not collect sufficient data to demonstrate how specific diseases affected human beings during drought seasons. The researcher was limited by the restrictions of COVID-19 pandemic which barred close interaction with the respondents. It is recommended that further research collects data in health facilities and compare trends of diseases.

Climate change is observed over a long period of time. The study therefore recommends that a longitudinal research study be done to determine the effects of climate change on the social economic status of women over an extended period of time. This would ensure more conclusive findings on the variables which were measured in this study. The researcher did not have sufficient resources to plan for such a study.

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## **APPENDICES**

### **APPENDIX 1: INFORMED CONSENT FORM**

#### **Informed Consent Form**

My name is Eva Mwai, a graduate student at the Tangaza University College in Nairobi. I am inviting you to participate in a research study voluntarily which I am going to explain to you now. Please feel free to ask any questions that you may have about the research. I will be happy to explain anything in greater detail.

#### **Title of the Study**

Effects of Climate Change on Women's Socio-Economic Development in Mwea East sub-County, Kirinyaga County, Kenya.

#### **Purpose of the Questionnaire**

The purpose of this questionnaire is to understand the effects of climate change on women's socio-economic development in Ngucwi Village, Murinduko location of Mwea East Sub County.

#### **Study Procedures**

The researcher has sought authority from Tangaza University College where she is undertaking her studies. She has also sought authority from the relevant departments in Kirinyaga County and Mwea sub -County as well as from the local leaders in Murinduko Ward and Ngucwi Village. The study entails conducting interview in households in Ngucwi Village focusing on women. The interview will take between 45 minutes to one hour.

#### **Risks**

The study is being undertaken during the COVID 19 pandemic when there is a likelihood of infections when people interact without taking precautions. The Researcher will observe the guidelines provided by the Ministry of Health strictly to ensure the responds are fully protected.

#### **Benefits**

By responding to the questions, you will contribute to the body of knowledge relating to climate change and how it affects women's food security, health and income. It is



expected that the results of the Study will influence change in policy which may help to address the climate change problems experienced in this area.

### **Confidentiality**

Your responses will be unanimous and will never be linked to you personally. Your participation is purely voluntary. You are free to skip any question you do not feel comfortable with. You are also free to stop the interview process and any time. You may ask for clarification on any question at any time.

### **Consent**

I understand that I have been asked to participate in the study on the effects of Climate Change on Women's Socio-Economic Development in Mwea East sub-County, Kirinyaga County, Kenya voluntarily. The title and purpose of the study have been explained to me.

My participation in this study should take 45 minutes to one hour. I understand that my responses will be confidential and that anonymity will be preserved. I am aware that I may refuse to answer any question asked and that I may discontinue participation at any time.

I understand that all of my questions and concerns about this study have been addressed. I choose, voluntarily, to participate in this research project. I certify that I am at least 18 years of age and hence eligible to participate.

I therefore consent and will respond to the questions in the questionnaire.

**Participant's signature** \_\_\_\_\_ **Date** \_\_\_\_\_

## APPENDIX II: QUESTIONNAIRE

My name is Eva Mwai, an M.A student at the Tangaza University College in Nairobi. I am conducting this research as part of the requirements for the award of Master of Arts in Social Transformation. The purpose of this questionnaire is to understand the effects of climate change on women's socio-economic development in Ngucwi Village, Murinduko location of Mwea East sub County. Your responses will never be linked to you personally. Your participation is purely voluntary. You are free to skip any question you do not feel comfortable with. You are also free to stop the interview process and any time. You may ask for clarification on any question at any time. You are being requested to participate in this research, because you have the knowledge and the experience needed for the success of this study. We would be delighted and grateful if you could participate. We thank you in advance.

**DATE:** .....

### Section A: Background information

1. Please indicate your age.

- 18-24 years                      [ ]
- 25-34 years                     [ ]
- 35-44 years                     [ ]
- 45-54 years                     [ ]
- 55-64 years                     [ ]
- 65 years and over            [ ]

2. Please indicate your highest level of education.

- No formal education [ ]
- Primary education    [ ]
- Secondary education [ ]
- Vocational training   [ ]
- College                    [ ]
- University                [ ]

3. What socio-economic activity are you engaged in?

- House work                [ ]
- Farming                    [ ]
- Business                   [ ]
- Rearing livestock        [ ]

Other (*specify*) .....

4. What type of fuel do you use?

Wood [ ]

Dung [ ]

Charcoal/Gas [ ]

Gas [ ]

Kerosene [ ]

Maize stock [ ]

Other (*specify*) .....

5. What type of shelter do you live in?

Mud house [ ]

Wooden [ ]

Concrete blocks [ ]

Iron sheets [ ]

Rental houses [ ]

## Section B: Food security

**5.0** The table below shows statements regarding food security. Please indicate if you agree or disagree with the statements using the following scale. **1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree**

Statements	1	2	3	4	5
The household has access to food through own production during drought periods					
The household has access to food bought from the local markets during drought periods					
The household has access to quality and diversity for a nutritious diet during drought periods					
Volume of harvest declines during drought periods					
The prices of food increases during drought periods					
I have an understanding and awareness of proper health care during drought periods					
I have an understanding and awareness of food preparation during drought periods					

I have an understanding and awareness of food storage during drought periods					
--	--	--	--	--	--

5.1 What types of food crops do you grow?

.....

.....

5.2. How many harvesting seasons do you have per year?

.....

.....

5.3. How much of each of the food crops you have mentioned do you harvest per season?

.....

.....

5.4. How do you store the food crops you harvest?

.....

.....

5.5. What types of food is consumed in your household?

.....

.....

5.6. In your opinion, is the food consumed nutritious enough? Yes No

Please explain

.....

.....

5.7. Do you receive subsidies from the national or County Government? Yes

No.....

5.8. If yes, what types of subsidies do you receive?

.....

.....

5.9. Do you receive any advice from technical experts such as extension workers? Yes

No.....

5.10. If yes, what kind of technical advice do they offer?

.....

.....

### Section C: Women's health issues

**6.0** The table below shows statements on the impact of climate change on women's health issues. Please indicate your level of agreement with the statements based on the following scale: **1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree.**

Statements	1	2	3	4	5
I am more anxious and emotionally distressed during drought periods					
The burden of work on women increases considerably during drought periods					
During drought periods, women are faced with severe health issues like malnutrition and anaemia.					
The proportion of acutely malnourished pregnant women is higher during drought					
The non-availability of water during drought affects the primary health care functions					
The women's personal hygiene practices are largely compromised due to the unavailability of water					
Water-washed diseases (skin diseases, like scabies) among women are reported as an obvious fallout of scarcity of water during drought					
Drought conditions compel women to spend extra hours and trudge extra distances to fetch water					
The continued malnourishment of women during periods when water is scarce puts their health and well-being at risk					

6.1. When did you last visit the health facility/clinician/herbalist?

.....

.....

6.2. How often do you visit the health facility/clinician/herbalist?

.....

.....

Weekly [ ]

Monthly [ ]

Quarterly [ ]

Annually [ ]

6.3. Which health problems caused you to visit the health facility/clinician/herbalist?

.....

.....

6.4. Have you ever been referred to a health facility/clinician/herbalist for specialized treatment? Yes No.....

6.5. If yes, please indicate what kind of health facility or clinician you were referred to.

a) Level 2 [ ]

b) Level 3 [ ]

c) Level 4 [ ]

d) Level 5 [ ]

e) Specialist Doctor/Consultant [ ]

## Section D: Women's income levels

7.0. The table below provides statements on impact of climate change on women's income levels. Please indicate your level of agreement with the statements based on the following scale. 1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree.

Statements	1	2	3	4	5
Drought affects women's sources of income					
Drought affects women's means of production					
Drought reduces the income earning potential of women and forcing them to adapt their livelihood activities					
Depletion of water resources increasingly jeopardizes women's livelihoods and social connections					
Income losses from crop failure negatively affects the financial capital of some women					
Drought spells have made women resort to distress sales of livestock					
During drought, women are expected to care for the sick, thus limiting time available for income generation and education					
During drought, rising medical costs associated with family illnesses heightens women's levels of poverty					

7.1. Do you sell the crops you harvest? Yes No .....

7.2. Which crops do you sell?

.....  
 .....

7.3. Where do you sell your crops?

.....  
 .....

7.4. What is the distance to the closest market?

.....  
 .....

7.5. Who in your household takes the crop to the market?

.....  
.....

7.6. Who in your household receives the cash after sales?

-----  
-----

7.7. How much income do you receive from the sales per season?

1,000 – 10,000 [ ]

11,000 – 20,000 [ ]

21,000 – 30,000 [ ]

31,000 – 40,000 [ ]

Above 50,000 [ ]

7.8. Please mention other sources of income?

.....  
.....



## Section E: Coping strategies

8.0. The table below provides statements on coping strategies to mitigate the effects of climate change on women's socio-economic development. Please indicate your level of agreement with the statements based on the following scale. 1=strongly disagree, 2=disagree, 3= neutral, 4= agree, 5= strongly agree.

Statements	1	2	3	4	5
There a good Regulatory framework in place to manage climate change					
I have developed alternative income sourcing ventures to mitigate against effects of climate change					
The government affords the citizens adequate social protection					
There is sufficient use of technology to help mitigate against climate change					
I have adapted our farming schedules to new climatic conditions					

What are some of the coping strategies you have adopted in your household to deal with impacts of climate change?

.....  
.....

9.0. What other coping strategies would you need assistance with in order to deal with the impacts of climate change?

.....  
.....

**Thank you for your participation**

### **APPENDIX III: FOCUS GROUP DISCUSSION GUIDE**

My name is Eva Mwai, an M.A student at the Tangaza University College in Nairobi. I am conducting this research as part of the requirements for the award of Master of Arts in Social Transformation. The purpose of this questionnaire is to understand the effects of climate change on women's socio-economic development in Ngucwi Village, Murinduko location of Mwea East sub County. Your responses will never be linked to you personally. Your participation is purely voluntary. You are free to skip any question you do not feel comfortable with. You are also free to stop the interview process and any time. You may ask for clarification on any question at any time. You are being requested to participate in this research, because you have the knowledge and the experience needed for the success of this study. We would be delighted and grateful if you could participate. We thank you in advance.

#### **The Process**

The focus group discussion will be guided by a series of questions which seek to examine the effect of climate change on the women social economic development in Mwea Sub County, Kirinyaga County.

The discussion will be in the form of brainstorming and general group discussion. The sequence of the questions will follow the key topics of the Study; Food security, health, income and mitigation and adaptation measures.

The discussions will be moderated by the researcher and will target twenty women from the households in Ngucwi Village who will not have participated in the household study.

#### **Introduction and warm up session**

The moderator will introduce herself to the group and ask the participants to do the same. The participants will be asked not to refer to people who are not in the group. The moderator will then introduce the purpose of the group discussion and assure the participants that the information shared will be confidential. She will lead the participants to list some ground rules and request them to participate actively. She will then define climate change using simple terms.

### **1.0. General question**

- 1.1 Which changes in climate have been experienced in Ngucwi Village during the last ten years?

### **2.0. Food security issues affecting women**

- 2.1 Please describe the food security situation in Ngucwi village?
- 2.2 Who is the most affected by food security issues?

### **3.0. Women health issues**

- 3.1. Which health problems do people in Ngucwi village experience as a result of climate change?
- 3.2. Where do the residents of Ngucwi seek health services?

### **4.0. Income levels**

- 4.1. What are the sources of income in the households in Ngucwi Village?

### **5.0. Coping strategies**

- 5.1. Which measures do the residents of Ngucwi village use to reduce the effects of climate change?

### **Conclusion**

The moderator will thank the participants for their time and contribution.

## **APPENDIX IV: KEY INFORMANT INTERVIEW GUIDE**

My name is Eva Mwai, an M.A student at the Tangaza University College in Nairobi. I am conducting this research as part of the requirements for the award of Master of Arts in Social Transformation. The purpose of this questionnaire is to understand the effects of climate change on women's socio-economic development in Ngucwi Village, Murinduko location of Mwea East sub County. Your responses will never be linked to you personally. Your participation is purely voluntary.

You are free to skip any question you do not feel comfortable with. You are also free to stop the interview process at any time. You may ask for clarification on any question at any time. You are being requested to participate in this research, because you are one of the key leaders in Mwea East sub County and have the relevant knowledge and the experience needed for the success of this study. We would be delighted and grateful if you could participate. We thank you in advance.

### **Study Procedures**

The researcher will explain to the interviewee that she has sought authority from Tangaza University College where she is undertaking her studies as well as from the relevant departments in Kirinyaga County and Mwea sub –County.

She will also clarify that the interview will take between 30 to 45 minutes. T

### **The Process**

The interview will be guided by a series of questions relating to women's food security, health, income and mitigation and adaptation measures in Ngucwi village in Mwea East sub County. The interviewer will select a quiet place where the interview will be conducted. She will introduce herself and ask the questions in a polite and respectful manner. The interviewer will request the interviewees to respond to the questions in detail in order to enrich the study.

### **The Interviewees**

The interviewees will include the Chief of Murinduko Location, the Assistant Chief of Ngucwi sub Location, one Agricultural Extension worker, two women opinion leaders from Ngucwi sub Location.

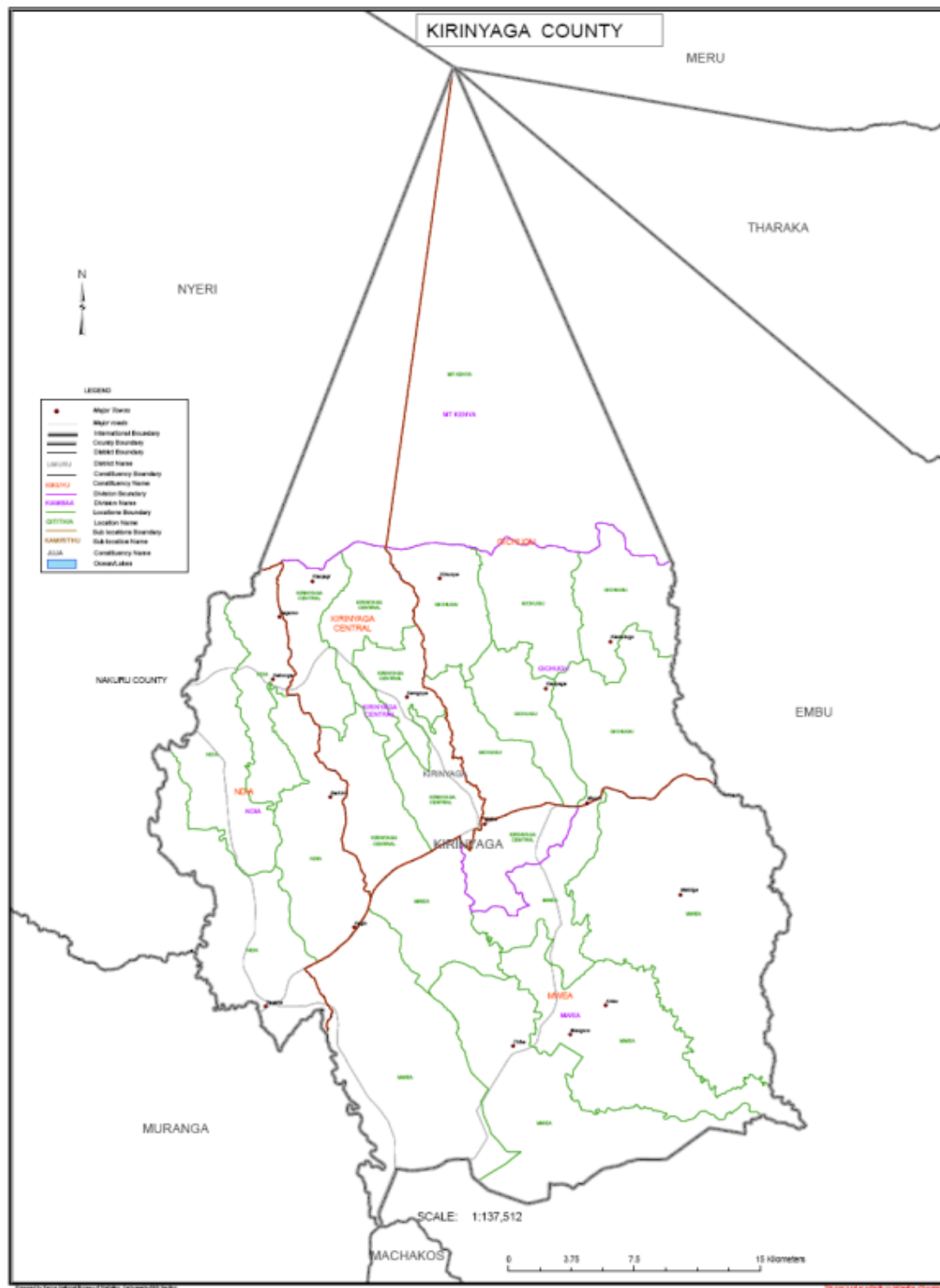
## Questions

- 1.0.Name: ..... (Optional)
- 2.0.Occupation.....
- 3.0.For how long have you worked or lived in Mwea East sub County?
- 4.0.Please explain what you know about the climate change in Ngucwi sub Location  
.....
- 5.0.In your opinion, what are the main changes in climate in Ngucwi sub Location?  
.....
- 6.0.How have the changes affected the socio-economic development in Ngucwi sub location? Please specify according to the variables listed here below.
- i) Women's food security
  - ii) Women's health
  - iii) Women's Income
  - iv) The ability to cope with the climate changes
- 7.0.Which gender is more affected by climate change?
- 8.0.Are there any adaptation and mitigation measures taken either by the government, non-governmental agencies or the residents?
- 9.0.If your answer to question 8.0 above is **yes**, please explain and specify what has been done by each of the institutions mentioned above;
- i) Governmental agencies.....
  - ii) Non-governmental agencies.....
  - iii) The residents of the area.....
- 10.0. Please add any other information which you have regarding the climate change in Ngucwi sub Location.  
.....  
.

## Conclusion

The interviewer will thank the interviewees

## APPENDIX V: MAP OF THE LOCATION OF THE STUDY



**Figure 10.1:** Map of the Location of the Study