THE THREAT OF ENVIRONMENTAL DEGRADATION TO HUMAN SECURITY IN KENYA: A CASE OF THE DIMINISHING WATER RESOURCES IN THE MAU FOREST

By

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November, 2019

DECLARATION

Declaration by the Student

This project is my original work and has not been presented for a degree in any other university

Signature…… Date……

John Samuel Ndegwa

R50/21941/2019

Declaration by the Supervisor

This project has been submitted for examination with my approval as University Supervisor

Signature…… Date……

Dr. Paul. Kamau, PhD

University of Nairobi

DEDICATION

This study is dedicated to my family for their patience, support and encouragement during the entire period that I was absent.

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ABBREVIATIONS

BNA: Basic Needs Approach

FAO: Food and Agricultural Organization

GDP: Gross Domestic Product

GHGs: Greenhouse Gases

ILO: International labour Organization

IPCC: Intergovernmental Panel on Climate Change

IRIN: Integrated Regional Information Networks

KFS: Kenya Forest Services

KWS: Kenya Wildlife Service

NACOSTI: National Commission for Science, Technology and Innovation

NEMA: National Environmental Management Authority

REDD: Reducing Emissions from Reforestation and Forest Degradation

RFV: Rift Valley Fever

SPSS: Statistical Package for Social Sciences

UNDP: United Nations Development Programme

ABSTRACT

I set out to carry out a research on the threats of environmental degradation on human security in Kenya with a focus on the diminishing water reserves of Mau Forest. I was guided by the following research questions: What are the trends and causes of environmental degradation in Mau Forest of Kenya? What impact has environmental degradation has on human security in Mau Forest in Kenya? What measures has the Kenyan government used in its efforts to counter human insecurities in Mau Forest in Kenya as a result of environmental degradation? Which were used to formulate my objectives: Analyze the trends and causes of environmental degradation in Mau Forest in Kenya; assess the impact of environmental degradation on human security in Mau Forest in Kenya; evaluate the measures that have been used by the Government of Kenya in its efforts to counter human insecurities in Mau Forest. Basic Needs Approach theory was adopted to elaborate on the phenomena under investigation while still being applied as an analytical tool.

Mixed Methods were used as the research design where both qualitative and quantitative methods were applied. The findings will hopefully enhance existing literature and be beneficial especially in helping policy makers design strategies and mechanisms to combat human insecurities realized due to environmental degradation in Mau Forest. Among the recommendations put forth include, improving the ecological management of Mau catchment through reforestation, rehabilitation of degraded areas, implementation of sound pollution control methods and controlled re-settlement. Sustainable resource utilization, development and use of alternative and renewable resources, sensitization and awareness creation by the government of Kenya through civic education and awareness programs including management. The researcher suggested further studies on role of private sector in combating human insecurities as a result of environmental degradation in the Mau Forest and ways that the Kenyan governments use to reclaim the Mau region.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The debate on the nexus between environment and human security has been highly politicized not only in Africa but the world over. With the beginning of the Donald Trump regime in the United States of America (USA), environmental issues have been given a back seat in global politics due to the desire by America to exploit natural resources for economic growth (Howard, 2017). Environmental degradation is an issue that has been debated and over-politicized as well in Kenya. However, the government has policies to ensure that the environment can withstand the current population.

Such policies include the paper bag ban that provided the removal of plastic bags from circulation in Kenya (Kenya plastic bag ban comes into force, 2017). The charcoal ban also aimed at reducing the number of trees burned to get charcoal by encouraging the use of other, more sustainable sources of energy (Mary 2018). The government has taken strides towards environmental conservation. However, more still needs to be done since ecological degradation continues to rise in the country (Hoke *et al.,* 2015).

This is evident in the many environmental hazards that are prone during heavy rains and prolonged drought periods (Hoke *et al.,* 2015). Population increase in the world over continues to rise, and this will put pressure on the environment, which will, in turn, have an impact on human security, particularly food security.

The UN terms environmental degradation as "the deterioration of the natural environment through human activities and natural disasters" (UNCSD, 1997) It also refer human security as the quality of life of the people of a society. "Anything which degrades their quality of life

threatening their very survival, such as demographic pressures, diminished access to resources, and so on, becomes a threat to that security.

Human security broadens the scope of security analysis and policy from national security to the safety of people. The 2012 United Nations General Assembly (UNGA) Resolution stresses the role of "The Member States in identifying and addressing widespread and cross-cutting challenges to survival, livelihood, and dignity of their people." In other words, threat(s) to – and values under threat in – people's lives are the critical starting point of a human security approach. Social security is identified as the state of wellbeing of the individual in all aspects of security (Anand & Sen, 2017). It brings more focus on the safety of the individual rather than the traditional concept of security that focused on military security. The state is, therefore tasked with the role of ensuring the holistic welfare of its citizens as per the UNDP Human Development Report (1994:4).

Environmental degradation is described as deterioration of environment by diminution of resources such as soil, water and air (Wishitemi *et al*., 2015). The environmental degradation has a severe effect on almost all industries in the country and it affects people in different ways. This implies that the significance of forests cannot be undermined. Forest regulate climate hence emergence of desertification makes people susceptible to poverty and premature deaths (Chikati, 2018). Kenya has three main wooden regions which include, Mount Kenya, Abadares and Mau Complex. Mau forest is the source of water to many rivers that leads to Lake Nakuru and Victoria, which is the source of river Nile. Biodiversity has negatively affected the rainfall patterns leading to periodic droughts and desertification. This has a significant effect on agriculture thus compromising food production (Recha, Makokha & Shisanya, 2017).

The present study not only looked at the causes of environmental degradation in Kenya but also how it has directly impacted on social safety and human wellbeing (Mary, 2018). The researcher addressed the concept of social security and try to create a nexus with environmental degradation. The definition of the tenets of social security as elaborated by the United Nations Development Program's Human development report. Ultimately, the research will shed light on how environmental degradation in Kenya has affected human security in the context of the social development report of 1994.

1.2 Statement of the Problem

Today's world is an insecure place for human survival on many fronts. Human activity on the environment has generated adverse effects that threaten the very existence of basic life. The growing concern on the impact of environmental degradation on human security dominates discussions on the local, regional, and international security arena. Notably, the events unfolding from the Mau Forest have become the center stage of environmental reform policy in Kenya.

Over the past three years, the Mau forest has gone through tremendous land-use changes because of increased human populace demanding land for settlement and subsistence agriculture. The encroachment has brought about intense and substantial land fragmentation, deforestation of the headwater catchments and destruction of wetlands previously existing within the fertile upstream parts. The results of human interest in the region are beginning to take a toll on the population, evident from the diminishing river flows for the duration of periods of low flows and deterioration of river water qualities due to pollution from point and non-point sources. moreover, the results of climate change and variability, intertwined with dwindling land and

water resources has given upward thrust to insecurity and conflicts related to the competition for constrained natural sources.

The development of research on the rise of human security as both a concept and a discourse, has created a wide opening for interrogation of the links between environmental degradation and social security. There has been very little direct attention to this area of research. Whereas there has been some conversation on the relationship between climate change and conflict (Myers, 1993), and on the relationship between biodiversity conservation and violence Matthew, (2002) there has been little emphasis on the broader implications of environmental degradation on human security, Scanty literature is primarily available on the threats posed on social security in Mau region resulting from the disappearing natural water reserves.

1.3 Research Questions

What is the threat of environmental degradation to human security in the Mau of Kenya?

Specific Research Questions

1. What are the trends and causes of environmental degradation in Mau Forest of Kenya?
2. What impact has environmental degradation has on human security in Mau Forest in Kenya?
3. What measures has the Kenyan government used in its efforts to counter human insecurities in Mau Forest in Kenya as a result of environmental degradation?

1.4 Research Objectives

The primary objective of this study was to discuss the threats of environmental degradation to human security in Kenya in Mau Forest.

The specific objectives included to:

1. Analyze the trends and causes of environmental degradation in Mau Forest in Kenya.
2. Assess the impact of environmental degradation on human security in Mau Forest in Kenya.
3. Evaluate the measures that have been used by the Government of Kenya in its efforts to counter human insecurities in Mau Forest.

1.5 Literature Review

This section presented the major studies carried out on the subject areas under study. This is with a view of establishing the major talking points in these studies as well as delineating the literature gaps in the existing literature.

1.5.1 Theoretical Literature Review

The broad objective of this paper is to assess the threat of environmental degradation to human security in Kenya, a case of Mau forest adopting Basic Needs Approach (BNA). The basic needs approach (BNA) is the response to economic growth and environmental issues. It aims at enhancing wellbeing of people using trickledown effect. BNA promoted the development of selective plans that aims at handling basic needs of the whole population directly instead of concentrating on an indirect approach to satisfying basic human desires (Pape, 2016).

At lower level, BNA comprises satisfying minimum levels of material wants like food consumption, shelter and clothing and access to such essential public services as pure water, sanitation, public transport, health and education. In this theory, direct attack of population needs such as deforestation is considered harmful. In this case, forest helps in food production hence meeting human basic needs. Cutting down of trees or deforestation tend to deny humans of their basic needs.

Clarke, (2015) contend: "The purpose of development is to raise the standard of living of the masses of poor people as rapidly as is feasible and to provide all human beings with the opportunity to develop their full potential". The theory aims at eliminating factors that affects distribution of resources for fulfilment of basic needs for those who do not have. The focus on the channeling resources and stopping any depletion. It is recognized that the basic needs of all countries or even of all regions within a country or groups cannot be the same (Muia, 2015). Therefore, the BNA concept is time and place specific.

Climatic and environmental conditions can make a modification in housing necessities among nations. Correspondingly, social customs and traditions cause basic needs to vary between nations. Different physical and living environments needs a varied kind of target in different regions. In regard to the question of at what level these targets should be set: "They should be set at the national level, but in addition most countries may find it useful to set them at regional and local levels as well as to permit diversity and for distinctive issues of some regions" (Clarke, 2015).

The Basic Needs Approach (BNA) presents limitation by showing the relationship between basic needs, environment and sources of conflicts. Nevertheless, in my opinion, when it comes to basic needs fulfilments, there is the idea of survival for the fittest. This is why some individuals feel

disadvantaged and end up clearing forest to survive. Most conflicts are attributed by scarce resources caused by water shortage and poor institutional framework. As such, Basic Needs Approach (BNA) is the most appropriate theory that will help in assessing the relationship between environmental degradation and human insecurity in Mau forest.

1.5.2 Environmental Degradation as a Human Security Threat

The environmental condition and natural unpredictability were compelling determining factors of the security of people and civilizations throughout most of human history: droughts, frosts, storms, animals and other environmental agitations were significant causes of disease, mortality and societal disturbance (Richard *et al.*, 2010). In the present modern cultures, industrial development, trade, technology, the use of fossil fuels, and higher levels of social organization and professional specialization have all deteriorated the constraints that local ecologies place on human security (Recha, Makokha & Shisanya, 2017).

The population globally has increased from one billion to more than six billion people, and most people now live longer, consume more, and are well educated than in preceding generations (Richard *et al.*, 2010). Despite all this progression, the threats that changes in the environment pose to human safety have not been eliminated. The scale of pollution and consumption in contemporary societies has led to significant drops in original forest cover and increased pollution (Richard *et al.*, 2010). The emerging threat from environmental degradation has been lent credence from various authorities on the subject. The then UN Secretary-General, Ban Ki-Moon said;

> *"Deteriorating environment can threaten much what has been accomplished by humanity in the course of the last several decades. It undermines our struggle against poverty. It also, threatens international peace and security"* (Richard *et al., 2010).*

The idea that accelerating levels of industrialization and urbanization, and the attendant depletion of non-renewable natural resources will have a devastating effect on future livelihoods' ability to sustainably guarantee their human security has permeated the scholarly and policy discourse. Ban-Ki-Moon's views have been echoed in numerous literature on the effects of environmental degradation on social security.

The Intergovernmental Panel on Climate Change is candid in its linkage of social activities to extreme fluctuations in temperature, droughts, and floods as well as the melting of icebergs (IPCCC, 2007). Its views are informed by years of study on forestry, among other areas. This study benefits from this IPCC research due to its linkage of forest cover and human security.

The rate of forest cover is continuing to reduce by 2050 due to forest fires, pests and climactic events among them drought, wind, and floods (IPCCC, 2007). However, the cause is human activities such as wood harvesting, urbanization, forest grazing, industrialization, and large-scale farming. Most of these activities do circumvent the domestic legal frameworks of African countries. Numerous studies on the various ways in which Africa is losing her biodiversity and environmental abound.

A Food and Agricultural Organization (FAO) report in an aptly titled document "The Magnitude of the Problem", observes that Africa's forests and woodlands, one of the continent's most valuable resources, are being depleted at an alarming rate. FAO, (2011) underscores the role played by trees in protecting the environment; as principal sources of rural energy and providing countless medicinal and industrial products used in both the home and in small-scale industry. FAO often supply food and feed as the primary source of building materials in the countryside and are a direct source of employment and income for many rural Africans. By inference, it

follows that the depletion of forest cover generates unemployment, leads to a deterioration of health and nutrition standards, thus becoming a human security challenge. FAO's insight shed light on the possible detriments of Mau Forest depletion, something that is the focus of this study.

FAO's summations are echoed in a study carried out by Olang and Kundu, (2011) who directly link dilapidations of ecosystems to loss of income, increasing the unemployment rate, and unequal distribution of wealth. Olang and Kundu, (2011) broaden the definition of the term environmental degradation and livelihood by contextualizing the occurrences in Africa. According to them, nearly 4 million hectares of this resource is declining annually, mainly in West Africa where Cameroon, Côte d'Ivoire, and Nigeria are witnessing the most destruction. According to Olang and Kundu, (2011) the cause of deforestation is mostly clearing for agriculture, uncontrolled logging, gathering for fuel wood, fire, and overgrazing.

A study by Kehl *et al. (*2015) reveals that Uganda's deforestation levels are also worsening, as is the case in West Africa. From the 1990s, an annual decrease of 2% has resulted in the decline of Uganda's forests. This authoritative study observes that regions previously malaria-free are now witnessing a steady rise in temperatures-a conducive climate for this disease. Kehl et *al. (*2015) further notes that Uganda's main cash crop-coffee is threatened with extinction due to these rising temperatures. The rate of deforestation has significantly increased hence affecting temperature changes. Therefore, Uganda's foreign exchange earnings from coffee are in danger of being wiped out by deforestation. This study benefits from this study by Kehl *et al. (*2015) as exposed the wide-ranging disadvantages of malicious deforestation seconding the study in the Mau.

Balabán, (2017) presents the human insecurity challenge posed by environmental degradation. According to him, the African continent is becoming water-scarce and that the increase in desertification will lead to prevalence of infectious diseases. He further posits that deepening degradation will lead to scarce natural resources such as water, pasture, arable land and thus increase societal conflicts in these African countries, some of the regions experiencing conflict might provide operation bases for violent extremist groups- a culmination of which is going to be failed states (Balabán, 2017). This study by Balabán, (2017) examines the linkage between environmental degradation and the resultant threat to human security. In its examination of the Mau Forest, our study seeks to advance these arguments by Balaban, (2017).

Muigua, (2018) underscores the vital role played by the environment in guaranteeing the enjoyment of a right to life. It is worth noting that environmental degradation has prompted a re-examination of the traditional conceptions of traditional security approaches. As the globe transitioned from focusing on regime security as the sole referent point of international peace and security, there was need to focus on security threats. According to Floyd, (2008) the importance of environmental safety as one key to human security cannot be overstated. Floyd, (2008), she elucidates on the role played by ecological protection as gathered in the concerted efforts to ensure an ecological balance between nature and human development. From this study, it emerges that an ecocentric approach to sustainable development needs to be enmeshed in national and global development discourses. It is therefore, follows that diminishing natural resources are part of this threat, a situation that was not adequately covered in Floyd, (2008) study. The study, therefore, seeks to accommodate this in the Kenyan context in particular.

Eswaran and Reich, (2001) have carried out a study on the effects of land degradation in North and West Africa on food security and agricultural production. To them, most of the Mediterranean countries are highly susceptible to desertification and that the dense populations and immense population pressure of West Africa are contributing to deforestation, overgrazing and in the worsening situation as livelihoods dependent on the environment are slowly but surely descending into poverty.

A similar situation is portrayed in a study Mark and Kudakwashe, (2010) who state that right from the 1980s, there has been a seemingly irreversible trend in the land use and land-cover patterns as revealed by sustained upsurge in cultivated areas and the attendant decline in natural woodland, and grassland in the world as well as in Zimbabwe. The study indicated that land is becoming scarce resource due to immense agricultural and demographic pressure in Zimbabwe, and this is resulting in an accelerated rate of environmental degradation.

Muiruri, (2016) acknowledges the critical role played by forests in regulating climates, checking of desertification and in key resource providers to communities who depend on it. It is on this basis that forests have been thrust at the Centre of environmental conflicts as different communities compete for a share of the resources that lie within.

1.5.2 The Human Security Challenge with the Degradation of the Mau

Nabutola, (2010) documents the social-economic effects of the depletion of the Mau ecosystem. One direct impact cited by Nabutola, (2010) is the collapse of wildlife tourism due to the diminishing water levels of the major lakes which are habitats of diverse flora and fauna. He cites the example of Lake Nakuru National Park and Maasai Mara National Game Reserve as examples. Further evidence of the economic impact of the collapse of this vital ecosystem is the

prevalence of drought in Narok area, a situation that is leading to large scale losses by the Maasai whose livestock is being decimated by these harsh weather conditions.

At the societal level, Nabutola (2010) cites the displacement of families who are now forced to search for other sources of livelihoods besides the forest. There is also an emerging human-wildlife conflict as well as conflicts between communities as a result of deforestation. Nabutola's (2010) study is valuable to this study in its exposition on the causes and impact of the degradation of the Mau. The human security angle is, however, glossed over, something that this study seeks to address. This study, therefore, builds up from Nabutola's (2010) study.

Chaudhry, (2014) documents the colonial and post-colonial assault of the Mau. He notes that the deliberate efforts of successive governments to resettle landless people. The desire to gain political mileage by placing communities of a particular political/ethnic leaning propelled the excision of large areas of the forest the result of which was the intermittent ethnic clashes in the Rift Valley (Theisen, 2012).

Chaudhry, (2014) notes the uninspiring efforts to evict and reforest amid more excisions of the forest over the years. The result has been receding water tables of underground aquifers, and as the integrity of the soil protection properties of the forest diminishes due to deforestation, there arises large scale soil erosion, siltation, and sedimentation that has resulted into loss of agricultural productivity (Wanjohi *et al.*, 2011). As the figure below suggests, the situation is dire for the Mau, and a failure to check this human encroachment will be disastrous for this ecosystem.

Boitt, (2016) undertakes a study on the Impacts of Mau Forest catchment depletion on the Great Rift Valley lakes in Kenya. From his research, it is evident that Mau Forest, the largest water catchment area at 273,300 hectares is the source of dozens of rivers and catchments areas to Lakes Victoria, Baringo, Nakuru, Natron, Naivasha, and Turkana. It is also evident from this study that Mau's depletion rate between 1989 and 2010 was estimated to be 7%. This insight is valuable as there is statistical evidence presented to show the steady decimation of the forest.

The study further outlines the role of the Mau Complex to East African economy. The study, however, delimits itself to the geospatial survey of the drastic decline of the forest. This study, therefore, proceeds from the crisis presented in this study by Boitt, (2016) to lay bare the human insecurity brought about by this degradation. The study conducted by Boitt, (2016) indicated that Kenya's forest cover stands at 1.7% against the international threshold of 10%. From their research, the Mau, which is Kenya's ultimate water tower has shrunk drastically over the years and has subsequently reduced Kenya's environmental sustainability.

Scholars have alluded to the disrupted harvests and erratic crop yields, high prevalence of destructive floods and droughts (Nabutola, 2010). There have been recording of prolonged frost and hailstorms that are ravaging tea farms in the Mau. Populations of rare species of wildlife such as the Yellow Back Duikers, the bongo and elephants are now easily accessed as man forays deeper into the forest. Maasai Mau Forest Status Report, (2005) details the 39% decline in the land area of the Mau Forest and the resultant impact. This study has established that the environmental degradation of the Mau Forest will have a drawback effect on Kenya's economy; in worsened water supply, and energy generation, loss of tourism earnings, soil erosion, which will have grave consequences for the agricultural and pastoral communities.

1.6 Theoretical Framework

This study adopted the Basic Needs Approach (BNA), which outlines the absolute minimum resources that are necessary for sustainable livelihoods. This approach advances the concept of a poverty line that denotes the number of resources (income) that is necessary for the enjoyment of quality of life. This approach generally examines community's needs, the deficiencies in such a society that hinder the satisfaction of basic human needs. It ascribes specific names and resources required in candid, clear terms, thus avoiding any ambiguity (Richard, 1976).

Basic Needs Approach is an effective method used in examining the development process and its impact on people's welfare and recommends a more conscientious and environmental objective implementation. This theory was established by the International Labour Organization in 1976, in previous writings of the *Cocoyoc Declaration* of 1974 and the *What Now-Another Development*? It proposed that the overriding goal of any societal, national, or international developmental policies should focus on the satisfaction of basic needs.

According to the ILO, (1976) the minimum requirements of a typical family include adequate food, shelter, and clothing. These are the essential services that ought to be availed at the societal level. Other needs include safe drinking water, health, and educational facilities. Besides these, the family requires sanitation, public transport, and cultural facilities. An individual is also to entitled to access to employment and decision-making avenues. This implies a self-reliance and participation approach in ensuring that decisions aimed at empowering communities to take into consideration their immediate basic needs.

Galtung, (1980) professes that the BNA focuses on structures (that facilitates access to goods and services), processes (where interactions among the various actors take place) and capabilities. Galtung, (1980) fronts this approach as a way of fostering development by developing the human-centered approach to all progress. This theory is linked to his theory of cultural violence, which identifies symbolic violence as a form of conflict faced by communities due to disparities between the actual and ideal. By inference, it can be said that this approach views local as well as global environmental problems as affecting poor people most.

To advance this further, this approach regards local ecological concerns such as pollution and waste disposal, deforestation, and soil degradation as causing a direct effect on the society. By focusing on the environmental degradation of the Mau, it has become clear that water pollution and contamination, air pollution, domestic solid waste, industrial hazardous waste, soil degradation and desertification, deforestation and loss of biodiversity are some of environmental issues that have affected communities to the forest.

BNA theory has been critiqued for being overly top-down, which conditions are required by "experts" in albeit paternalistic way that disregards the unique individual and communal preferences. This theory is however chosen for its strong points, especially in this context of environmental degradation. This challenge is as a result of man's desire for subsistence and that the fact that there are no adequate options for sustenance away from the Mau, communities are resorting to exploiting the only resource within their reach-the forest. It also follows that an approach at development must address the human insecurity challenges that are driving such destructive practices. The table below presents Basic Needs Approach;

Table 2.1: ***The Basic Needs Approach***

	Features	Basic Need Approach
1	Conceptual basis	People must have a minimum subsistence
2	Poverty definition	Deprivation of consumption
3	Poverty reduction	Ensure adequate access ton consumption
4	Policy objective	Subsistence
5	Power relationship	Paternalistic; little scope for voice of the poor.
6	Level of application	Generalized, but allows regional diversities

Source: ILO, (1976)

1.7 Justification of the Study

The research findings of this study are useful to policy makers as they provide information that will hopefully assist during policy making and formulation of environmental policies. The findings will hopefully be beneficial especially in helping policymakers design strategies and mechanisms to combat human insecurities realized as a result of diminishing natural water reserves, a form of environmental degradation in Mau Forest in Kenya to be specific and in Africa at large.

The findings of this research will hopefully contribute to a wide range of knowledge that will be used to enrich the already existing literature on the areas of research that the study will focus on. These areas include: Assessing the influence of environmental degradation in Kenya, determining the relationship between environmental degradation and social security in Kenya.

1.8 Research Methodology

This section provided a guide on how the findings of the study were achieved. This section covered the description of the study design, sampling techniques, scope and limitations of the research and nature and sources of data. It also described the tools and instruments for data collection, procedures as well as the analysis of data collected.

1.8.1 Research Design

Mixed methods design where quantitative and qualitative approaches were combined, was adopted for this study. Since the study objective was to assess the relationship between environmental degradation and human security in Mau forest, the researcher used primary data to assess resident's perception.

1.8.2 Data Collection Techniques

Tools and instruments that were used to collect primary data included questioners and interview guides. Questionnaires were used to collect primary data. Questionnaires contained both open ended and close ended questions, open ended questions were used to gather information on opinions of the respondents i.e.to measure the objective responses while close ended were used to help in ensuring standardization and compatibility of information i.e. to measure subjective responses, questionnaires were distributed to the targeted population and collected later.

1.8.3 Target Population

The residents (including area leaders) of Mau region were targeted to provide their experiences and perhaps suggest ways to mitigate on the challenges emanating from environmental degradation. Practitioners familiar with issues of environmental degradations were also considered to weigh in as far as the topic of study is concerned. The target population in this

study consisted of 100 people who were drawn from two groups; Local residents and area leaders.

1.8.4 Sample and Sampling Procedure

Based on Mugenda (2008) resources accessibility and time are not always enough to permit the researcher to use the whole population in a study, hence it is essential to select a representative sample from the accessible population that can easily be studied and inference made to the larger population. The researcher adopted purposive sampling to choose a sample size of 50 respondents from the two group that is 40 participants from local residents and 10 elders. The sample size was enough given the qualitative nature of the study that will yield rich data to answer to the study objectives.

1.8.5 Types and Sources of Data

The main source of data used in this research was primary data. Primary data was based on respondents' opinions and experiences concerning the area of investigation. This was achieved through the administration of data collection tools to the already sampled population. Secondary data was obtained from books, published articles, internet sources and reports from conference proceedings.

1.8.6 Scope and Limitation of the Study

The study attempted to discuss the threats to human security due to environmental challenges in Kenya with a focus on environmental degradation in Mau Forest. The study examined and analyzed the causes of environmental degradation in Kenya, assessed the impact of ecological degradation in Mau Forest in Kenya and evaluated the measures that have been employed by the

Kenyan Government in its efforts to counter the rising human insecurities in Mau Forest in Kenya as a result of environmental degradation.

The researcher acknowledged that there were limitations to the study. Not all respondents would be aware of the significance of this research. As a result, mistrust and mistaken identity perception may be realised. Hence some of them may refuse to divulge information and/or participate in the research. To overcome these challenges, the researcher did not stop at the first rejection. There was perseverance, making contacts and networking with people and making phone calls and sending emails.

The researcher also developed relationships to find study participants who helped gain access. To overcome these limitations, the researcher consulted the supervisor well in advance to avoid last minute rush. The study focused on a sample of the population, which was identified through probability sampling making the research findings generalizable to the large population. The researcher had made financial savings in advance to overcome financial constraints. To mitigate this challenge, the researcher budgeted for all expenses so as to facilitate the research.

1.8.7 Data Analysis

The study used the Statistical Package for Social Sciences (SPSS) software to analyze the primary data obtained. This software was necessary due to the multiple questionnaires that was available for the analysis, moreover, it was appropriate for the analysis of quantitative data. The software also generated accurately the findings using graphs and pie charts. Content analysis was used to analyze qualitative data.

1.8.8 Validity and Reliability

Reliability checks confirm whether the results of an instrument are stable and consistent, and it's the extent to which a given measuring instrument produces the same effect each time it is used. This study achieved reliability through the assembly and coding of information gathered to ensure that only credible information was used. Moreover, the researcher was keen to identify and document the opinions of respondents and authorities in the field of study without any biases and subjectivity.

Validity measures whether the individual results of an instrument are meaningful and allows the researcher to draw sound conclusions from the sample population being studied. Content validity was realized through proper "inspection" and "sieving" of the information. Various themes, as guided by the objectives of the study, were adopted, providing the benchmarks for which to admit or reject information.

1.8.9 Ethical Consideration

The researcher observed research ethics in various ways. Firstly, the researcher ensured that formal consent from the institution of Diplomacy and International Studies (IDIS) is sought and that a letter from the institution is produced during data collection. This was in an attempt to give confidence to the respondents that the study was indeed for educational use. Research authorization from National Commission for Science, Technology, and Innovation (NACOSTI) was sought as it is a requirement for any researcher before collecting primary data in Kenya. Secondly, the researcher made sure to avoid Plagiarism and fraud by confirming that all other scholar's works were appropriately acknowledged. Respondent's confidentiality and anonymity were guaranteeing in case they wished so.

1.9 Chapter Outline

This research paper was divided into six chapters with each chapter covering a specific topic area as follows;

Chapter One: This is the introduction, providing a background to the study. It grounds the study within the global context-as an issue requiring concerted policy and practical attention as well as a research problem that demands scholarly study to fill the gap in the literature. This chapter further lists the statement of the problem, research questions, objectives of the study, justification of the study, literature review, and including the research methodology. The rest of the chapters were organized as follows:

Chapter Two: Objective two was expounded as chapter two of this research study where the researcher analyzed the trends and causes of environmental degradation in Mau Forest.

Chapter Three: This chapter focused on assessing the impact of environmental degradation on human security in Mau Forest.

Chapter Four: Under this chapter, policy dynamics are discussed at length as the researcher evaluated measures that have been used by Government of Kenya in its efforts to counter human insecurities in Mau Forest.

Chapter Five: Research findings for data collected are analyzed and presented in various ways.

Chapter Six: This is the concluding chapter for the study, containing a summary of the research findings as well as conclusions based on the observations made in the previous section. Recommendations and suggested areas for further studies.

CHAPTER TWO

ENVIRONMENTAL DEGRADATION IN THE MAU FOREST

2.1 Introduction

Scientifically, the earth is the only planet in the solar system that has an environment that can support human life. However, it is believed that the primary cause of environmental degradation is a social disturbance (Muiruri, 2016). Africa's environmental degradation has been largely contributed by the human activities such as wood harvesting, urbanization, forest grazing, industrialization, and large-scale farming. Although, climate change is a contributor to the menace, it remains a consequence from human activities in the environment (Ameehi, 2009). It's worth nothing the change in climate has been attributed to anthropogenic greenhouse gases (GHGs) that comes from human and industrial activities. Lack of proper mechanisms to environmental management has led to increased cases of conflict in Mau. This chapter presents the relationship between environmental degradation and conflicts or insecurity in Mau complex. Human activities affect the environment in many different ways;

2.2 Overpopulation

The human population is one of the most pressing environmental issues. Currently, the global population is estimated to be over 7.6 billion people and growing (Collier & Gunning, 1999). It is projected that the world's population would reach approximately 8 billion by 2025 and 9 billion by 2040 and an overwhelming 11 billion by 2100 (Collier & Gunning, 1999). The rate at which the global population is increasing is by far outpacing the earth's ability to support it.

The current paper found out that population growth had put pressure on both local and government institutions. Where there is association between environmental degradation and

population increase and uneven resource distribution, there is a great pressure on wages that attributes to economic marginalization. This kind of pressure results to rural urban migration and leads to ethnical conflicts over land use. These sentiments were supported by Smith, (2017) who stated that there is a significant relationship between overpopulation and environmental degradation.

As the global population increases, there is an increased need for timber hence deforestation. This indeed increases the demand for land to support agricultural production, which is met through extensive deforestation to create new farmlands. Donelson and Esparza, (2016) opined that over 75% of the world's sparse population live in rural Africa and mostly rely on subsistence farming for livelihoods support (Connor, 2015). Competition for arable land for subsistence agriculture has indeed increased cutting and felling of forest vegetative cover.

The study also revealed that urbanization has put pressure on the national ability to offer essential services like housing. People in rural areas tend to cut trees to supply timbers to the city population. It is important to note that communities moving to forest land is caused by political and economic instability or tension. Moreover, deforestation is mainly the leading cause of environmental degradation in Kenya.

Galvani et al., (2016) highlighted that the effects of human activity in the region are beginning to take a toll on population. This is evident by diminishing water flow and deterioration of river water qualities as a result of pollution from point and non-point sources. Additionally, the effects of climate change and variability, intertwined with dwindling land and water resources has given rise to insecurity and conflicts associated with the competition for limited natural resources.

Until lately, the Mau Forest was rated the largest remaining closed-canopy montane in the Eastern African region. The forest is an important water catchment area for numerous rivers

including White Nile (Elfert, 2016). These rivers support various agricultural activities, hydropower, urban water supply, wildlife habitat, and tourism. The forest is also home to some of the world's rare indigenous trees such as cedar, bamboo, African olive among others (Connor, 2015). However, over the past few years' encroachment in the Mau forest has led to extreme and considerable land fragmentation, deforestation of the headwater catchments and destruction of wetlands previously existing within the fertile upstream parts.

2.3 Desertification

Desertification is scientifically defined as the process of converting fertile arable land into desert. It occurs as a result of overexploitation of the soil through human activities (Elfert, 2016). There are two broad categories of desertification; where deserts arise as a result of natural inertia or through artificial depletion of forest cover as a result of human exploitation.

The study found out that the effect of environmental degradation in Mau complex, manifest itself through aridity desertification, calamities and disasters that perpetuate to violent conflict over reliance to environmental resources. As a result of human activities in Mau especially logging contribute to the raising of temperature, inadequate supply of rainfall, extreme natural events like famine and droughts where these factors do contribute to competition and scramble for these scarce resources and its supply.

Desertification, unsustainable use or drought can bring communities with competing livelihoods into further conflict. Galvani *et al.,* (2016) stated that the primary cause of desertification in the Mau forest is logging. The practice of logging in the Mau complex ranges from large-scale commercial timber plantations to the individual harvest of firewood and felling of trees for charcoal burning. Although logging is an illegal business in Kenya, the industry has thrived over the years perpetuated by corrupt government systems.

Exploiting forest from a catchment can also cause significant hydrologic consequences such as decreased rainfall interception leading to variations in the stream water quality and quantity. Research has shown that tree canopies can intercept 10-40% of incoming precipitation depending on the age, location and density of stand, tree species, and rainfall intensity and evaporation rates.

Incidentally, forests and other woodlands systems are the most vulnerable because they are the primary sources of income and livelihood for the majority of Kenyans (Olagunju, 2015). With this in mind, the detrimental impacts of environmental degradation are being borne disproportionately by less fortunate, politicians thus leading to inequalities among the people and in most cases, they are the leading causes of environmental conflict and poverty. The Mau forest and its surrounding environments are not exceptional to this conflict (Tang, An, Zhu & Shangguan, 2018).

2.4 Environmental Pollution

From the current study interregional or interstate conflicts can emanate from upstream pollution or appropriation of upstream freshwater in Mau forest. Population growth affects the scarce natural resources which can impact negatively on the environment. Local renewable resources are depleted by logging, over-grazing, over cultivation or pollution among others. In other words, there is a growing link between increased scarcity and violent conflict. Environmental degradation can be caused by over use, overstrain or impoverishment of either resources or living space.

According to Hai, Gobin and Hens, (2016), environmental pollution can be defined as the process of introducing contaminants/impurities into an ecosystem, which bring about adverse changes that affect the healthy life of living things. Environmental pollution occurs in many

forms, water, air, noise, and land. With increased population growth and modernization, environmental pollution has reached its peak, giving rise to global warming and human illnesses. Air pollution is the most prevalent form of environmental contamination, and it is considered to relate with industrialization (Hai, Gobin & Hens, 2016). There are many causes of air pollution but, the primary cause results from excessive combustion of fossil fuels that release umpteen number of gases that deplete the ozone layer.

Environmental stress associated with deforestation, soil erosion, water scarcity, climate variability, and natural hazards place essential natural resources at risk. However, though pastoral lands have higher than average levels of poverty and insecurity, they possess rich biodiversity, mineral resources, livestock and products such as gums, resins, dyes, honey, medicines and cosmetics, which if exploited will ameliorate the factors that lead to conflicts and promote environmental insecurity.

Glantz, (2019) soil erosion results from excessive use of agricultural products that produce toxins that affect the fertility of the soil. Other factors include; wind and soil erosion, soil harvesting, loss of soil fertility through the so-called soil nutrients mining, wind and water erosion of the soils, rangeland degradation, and desertification.

Mau is a water catchment area and its degradation will mount pressure in accessing for this precious commodity. From the beginning of this millennium there has been manifestation of population growth, pollution of all forms and more so loss of diversity (Tang, An, Zhu & Shangguan, 2018). From the findings it is evident that, the above factors do have implication to environmental change and in return this perpetuate inadequate access to water in many parts of the Mau forest and its environ (Glantz, 2019). Due to population growth, there is high demand and degradation which hinder some population to reach this precious commodity.

It is estimated that pollution affects more than 200 million people globally (Hai, Gobin and Hens, (2016). Water pollution is the leading cause of aquatic life in both freshwater lakes and oceans in Africa. Every year it's estimated that billions of tons of waste are dumped in the oceans (ibid). As a result, marine ecosystems are dying out because of pollution, leading local fish processing to dwindle.

2.5 Rapid Urbanization and Globalization

Urbanization occurs as a result of the increase in the extent and density of urban centers. Globalization, on the other hand, refers to the interconnectedness of the world as a result of advancements in technology. Today, the percentage of Africans living in cities is 40 percent, and it is projected to grow to 50 percent by 2030 (Salahuddi *et al.,* 2019).

The critical role of the Mau is in the water it provides to urban centres and some of the most densely populated regions of Kenya supporting livelihoods and economic development. Africa is facing an unprecedented water crisis: about 25 percent of Africa's population is living in water stressed area and this figure will rise dramatically to an estimated 500 million people by 2050 (Brahmasrene & Lee, 2017). While some of this will be caused by climate change in arid and semi-arid lands, the water stress in the Mau area is largely the result of land degradation and deforestation whose effects are to be felt far beyond the Mau complex.

In both rural and urban areas, energy is key for the sustenance of population. In Mau complex, deforestation has been carried out as a result of high demand of energy in urban cities. More so, logging of timber which has led to depletion of forest cover. Also, in rural areas timber and firewood are used as source of energy. The implication here is that the sub-Saharan Africa 80 percent of total energy used is derived from forests and other related biomass. Moreover,

approximate 50 percent of Kenya large cities in one way or another rely on catchment areas for water supply (Brahmasrene & Lee, 2017).

Urbanization is taking place in an alarming rate in Kenya and this is evident in the declining of Mau products to cater for this growth through illegal logging as well as unsustainable human settlements. The security will be threatened through carbon dioxide (CO2) release to the atmosphere and this will hinder carbon dioxide storage. Security wise forests act as center for struggle and testing of apparatus. In Mau forest localization of violent conflict manifest itself through territorial and territory proximities.

The burgeoning urban populations in Africa have caused considerable strain on the environment, and Salahuddi *et al.,* (2019) believed it will worsen as more and more people move into urban towns. Many of the direct effects of urbanization are felt more in the rural and peri-urban areas which serve as the food baskets for the urban dwellers. Population growth increases the demand for agricultural products and as a result, the need for farmland. This results in deforestation and felling of trees to clear land for cultivation.

Consequently, population growth increases the demand for decent modern houses and hence the need for raw material such as timber which is fetched from the rural forests. The modern dwellings created by globalization facilitate room for environmental degradation while at the same time trees are destroyed to look for fuel like charcoals to support this urban population.

2.4 Poor Governance

Research has shown that environmental degradation and poor governance are intertwined. The more affected a nation is by corruption, the weaker a country's environmental performance. The World Bank, in numerous reports, has demonstrated how corruption affects ecological sustainability (Leisher *et al.,* 2016). The sectors particularly vulnerable to bribery include forestry, illegal trafficking of endangered species, hazardous waste management, fisheries, and oil exploitation.

However, to tackle corruption in the environmental sector, many countries, especially in developing countries, have adopted environmental laws concerning relevant multilateral environmental agreements. Nevertheless, corruption, in many ways distorts the implementation and enforcement of such laws (Boitt, 2016).

In Kenya, for instance, corruption involving senior police officers and civil servants in illegal logging activities in the Mau forest is a serious problem. It includes payments to senior politicians to obtain timber concessions (state capture) and payments made to bureaucrats to under-report the amount of harvesting (administrative corruption). The lack of institutions to enforce rules or the existence of officials swayed through bribes has led to the overharvesting of timber and the use of unsustainable forest management practices.

Violent conflict in Mau is interwoven with environmental factors in a heterogeneity way which can be seen and be driven by factors like political temperatures, ethnic tensions and balkanizations and more importantly poor governance. The implication here is that, there will be severe competition based on capitalism ideology so as one can gain access and take a supervisory role on environmental resources like agriculture, pastoralism hence leading to eruption of violent conflict. Mau forest was and has been used for succession politics and at the

same time, emergency of youth in some communities being armed in escalation of violence. Mau has been exploited during electioneering period by rewarding royal cronies with huge pieces of land so as to create motivation and in return peaceful efforts can be derailed.

Although logging is an illegal activity, about a quarter of the complex has been cleared of trees in the past 15 years, affecting rainfall and river flows (Leisher *et al.*, 2016). The consequences of the illicit logging in the Mau complex are increasingly becoming more visible. For instance, the Mara River, whose waters ran throughout the year has seen its normal flow cut to half in some periods. Expert attributes the changing water flows of the Mau complex to the effects of deforestation exacerbated by climate change and its impact (Boitt, 2016).

The study notes that scarcity of pasture, water and other related resources, weak and limited state structures and institutions of governance as well as the erosion of traditional value systems and the authorities that enforced them combine in an intricate web of complexity that contributes towards conflict and environmental insecurity that characterizes the pastoral landscape. Furthermore, conflict driving factors, environmental insecurity generating factors coupled with governance deficit combine in a very multifaceted manner to shape and in a very crucial way influence the livelihood of the pastoral communities

Good governance is supposed to be exercised so as to uplift the weak institutions of governance and social ills like corruption, tribalism and favoritism, have failed to provide a conducive environmental protection, key to the management of diversity.

CHAPTER THREE

IMPACT OF ENVIRONMENTAL DEGRADATION ON HUMAN SECURITY IN THE MAU FOREST

3.1 Introduction

Many studies have been carried on the effect of environmental degradation on the economy eg. (Chaudhry, 2014). However, there are few studies on the relationship between environment and human security. The impacts of environmental degradation on human security can be classified into two broad categories; direct and indirect.

3.2 Direct Impacts of Environmental Degradation on Human Security

Human security is simply described by the quality of life for the people in a certain setting or in the society. Quality of life is the parameter within the society or their place of living that promotes their health living. Factors that degrades the human living conditions include demographic pressure, restricted assess to natural resources and diminished resources. Conversely, factors that promotes quality of life include; economic growth, social and political empowerment and improved access to resource (Chacha, J. S. (2015). In regards to the policies, social security is an integrated, sustainable, comprehensive security from fear, conflict, ignorance, poverty, social and cultural deprivation, and hunger, resting upon positive and negative freedoms." (Van Geelen, 2017). Its main concern is not primarily on the physical threats to individuals but also explores the economic, environmental concerns and the health status" (ibid).

The UN secretary-general, Kofi Annan (now late), observed that the term security means far more than the absence of violence. In his understanding, Annan stressed that we could not have safety, amidst starvation. Additionally, we cannot build peace without alleviating poverty. Nevertheless, we cannot achieve freedom on the foundations of injustices.

Human survival is fundamentally depended on the well-being of the environment. Man depends on the environment to meet all his basic needs. However, depletion of the environment, destruction of ecosystems, and extinction of wildlife lead to enormous strain on the population's ability to meet its needs (Muiruri, 2016).

3.2.1 Poverty

UNDP defines poverty as lack of basic and human development opportunities that leads to a long, healthy and creative life to a standard of living, freedom, dignity, self-esteem and the respect of others" (Eneh, 2017). The NEPAD Environmental Action Plan (NEPAD-EAP) has acknowledged poverty as the leading cause and consequence of human-made environmental degradation and resource depletion in Africa (Muiruri, 2016) Therefore, it can be reasoned that environmental deprivation and poverty are inseparably entangled.

Public and private levels within the African continent has been a key witness of the effects of prolonging environmental degradation on poverty levels (Eneh, 2017). The amount of public fund spent on environmental protection by African countries has been as a result of public harshness of environmental degradation in Africa. The poor at their individual level as a result of poverty are forced to heavily depend on the ecosystem for their nutritional and energy needs thus leading to environmental degradation (Were, Singh & Dick, 2015). Johnson, pointed out

that “the venerable individuals are forced to destroy the environment because they had no other possibilities.” “It was a question of sheer survival.”

The high demand for charcoal and fuelwood for energy is the main cause of deforestation in the region (Were, Singh & Dick, 2015). The high demand is solely caused by failure of the poor in Africa to access current and cleaner energy sources caused mainly by lack of income (Cropper & Griffiths, 1994). The hostile effects on the need for clean energy isn’t constrained to deforestation alone, it has also led to loss of biodiversity including increased atmospheric air pollution within the region (Cropper & Griffiths, 1994).

Kenya’s production and consumption of charcoal as compared to the transport and manufacturing industry combined are thought to be releasing more GHGs (Were, Singh & Dick, 2015). The cause of poverty is not limited to degradation and overexploitation of the environment as it equally affects the demand for better environmental quality by citizens from their governments. Nevertheless, the contrary is the case when such nations became high-income economies as such high income would lead to citizens’ demand for firmer and better environmental control from their policymakers (Muiruri, 2016).

3.2.2 Agriculture

Encroachment in Mau forest has threatened several social pillars of the economy like pastoralism, tourism and agriculture. For example, tourism has suffered a setback following the drying up of rivers like Mara River, which is a hub of wild beasts and other wildlife. The implication here is that some of the communities which practice agriculture are accused by the communities which relay on tourism for their livelihood. The accusation leveled against them is

as a result of destroying forest for agriculture practices which hinder and threaten environment through desertification (Cropper & Griffiths, 1994)

The conversion of forest into agriculture and built-up land in the MFC has led to noteworthy environmental impacts. Generally, increased impervious and hardened surface areas such as roads, parking lots, sidewalks and rooftops diminishes infiltration-based processes and, consequently, recharge to the groundwater systems. These processes not only impair the ability of the system to cleanse runoff and protect wetlands, but also amplify the potential for soil erosion and floods, thereby contributing to the degradation of streams and other water bodies. The replacement of forest and woodland by depletive subsistence agriculture has also caused massive inflow of sediments into the nearby Lakes.

The rising nutrient levels from the sediment have affected the growth of blue-green algae *t* (spirulina platensis), which forms the main food for flamingo birds, known to be a major touristic attraction for Lake Nakuru. Apart from reduced revenues associated with ecotourism in the area, the ecological effect of this has been the loss of biodiversity through migration of the birds to other water bodies within the rift valley where complimentary food is available. Conversion from forest to agriculture and grazing land has also disrupted the hydrological cycle of the river drainage basins through increased evaporation and runoff process, especially during rainy seasons.

Escarcha, Lassa and Zander, (2018) about 75% of the population in rural Africa rely on agriculture for livelihood support. In Kenya, Agriculture is the backbone of Kenya's economy. Agriculture contributes approximately 80% of the realization of food security in Kenya. At the same time, it is only 20 percent of Kenya's total land area, which is suitable for farming (ibid).

The environmental impact of agriculture is the effect that different farming practices have on ecosystems around them and how those effects can be tracked to those practices. For a country to sustain the growing population with food, issues of technology and value addition are supposed to be considered without degrading the environment.

However, this is not the case in Kenya, and the degradation of the Mau complex has contributed to low agricultural production, which is contributing to the change of precipitation patterns as well as variability. Moreover, the rising temperature as a result of global warming will indeed be the basis for increased crop diseases and infections of crop pests. This, in turn, results in low yields that can barely sustain the livelihoods of the growing population in the Mau. Cases of malnutrition consequently arising, therefore, threatening their health.

3.2.3 Livestock Loss

In the Mau forest, just like any other part of the world, resource scarcity is a reality. Communities that rely on livestock farming are already experiencing the adverse effects of climate change. Reduced rainfall, unpredictable seasons, increased temperatures, and prolonged drought has triggered migration in search of greener pastures for livestock. At the same time, the competence of these people to deal with those threats are severe to cope with. Since these communities and predominantly pastoral, they find themselves unable to engage in other income-generating activities as they have to wander in search of pastures. This only intensifies their poverty levels and hence a threat to their human security.

Drought and famine negatively affect the main sources of pastoral livelihood i.e. pastures and water which often leads to death of livestock because pastoralists depends mainly on meat, blood and milk though they occasionally practice transhumance nomadic system that primarily depends on animal sales to purchase food mainly grains (Tegegn, Assefa & Ademe, 2018).

The effect of Mau degradation was felt by and large, as there came persistent droughts and famine. The agrarian communities were directly hurt, and this made the government take quick action to save the Mau. This concluded the debate that ‘if we destroy nature, it will destroy us. Many farmers lost their livestock during this period. However, it was shocking to hear a former head of state explain on the National Media that 'rain did not come from the trees, but rather came from the clouds’. This was rather absurd, as he was protecting his interests.

3.2.4 Loss of Biodiversity

Environmental degradation had and still has serious implications to all sectors in the society which affect people differently in all circles of life. This means that the importance of forests cannot be underrated. This is because forests regulate climate thus emergence of desertification, thus makes people vulnerable to lack and inadequate food for their sustainability. In Kenya there are three major wooded areas which are Mount Kenya, Aberdares and Mau Forest

Impacts on the natural resource base in terms of land clearing for development and agricultural production as well as the effects of genetically modified crops on biodiversity are important considerations as well (Bulleri *et al.*, 2018). There is evidence to suggest that if conservation and environmental management policies are not formulated and implemented in a holistic way to balance the needs and interests of conservation and people, it can lead to conflict. Mau as a major water tower, biodiversity has been encroached and this dictates the change of rainfall pattern causing recurring droughts and more importantly desertification. This has more effects on agricultural production, thus compromise livelihood of the population.

Environmental degradation has recorded, continued the destruction of forests and its inhabitants leading to the mass extinction of species (Bulleri *et al.,* 2018). This is as a result of human activities such as acidifying of water systems, overexploitation of natural resources, deliberate and indirect destruction of natural systems necessary to the support and survival of different species. These activities generally alter the natural process combined, thus destroying the natural ecosystem.

Loss of biodiversity causes considerable effects in the tourism industry. In Kenya, the tourism industry contributes significantly to the country's GDP. In 2012 the government of Kenya had a blueprint for receiving at least 2 million tourists in Kenya per year (Bulleri *et al.,* 2018). According to the economic survey that was conducted by the Ministry of planning and vision 2030 in 2012, the following figures were deduced from the revenue previously collected from the tourist sector 97.9 billion in the year 2011 from 73.7 billion from in the year 2010.

Despite the tremendous growth in the tourism industry, environmental degradation is increasingly creating new threats in the industry. For instance, reduced water flows of the Mara River is affecting the wildlife migration patterns that occur annually. At the same times, the growing population is increasingly encroaching on the forest cover and reducing the spaces that support wildlife (Tegegn *et al*., 2018). As a result, destruction of the Mau forest will make wildlife to suffer, and migration will manifest itself as a result of drought and search for pastures and water in the neighboring countries.

3.3 Indirect Impacts of Environmental Degradation on Human Security

In a broader sense, environmental degradation does affect human health. Human beings rely on the environment for basic survival and provision of nutrients that the body requires. However, environmental degradation affects human health in different ways. For instance, the rising global temperatures are responsible for the increasing scale of skin-related conditions in most of the tropical African countries. Reduction in water quality is responsible for more than two million deaths and billions of sicknesses globally (Dellmuth *et al.*, 2018).

Environmental degradation is increasingly been called a 'security' problem, and there has been speculation that it may increase the risk of violent conflict. This research identifies the inter linkage between environmental degradation, livelihoods and conflict. The scarcity of resources increasingly undermines human security in the present day, and will increasingly do so in the future, by reducing access to, and the quality of, these natural resources that are important to sustain livelihoods. Johnson also argues that resource scarcity and environmental degradation are increasingly understood to play an important role in generating or exacerbating conflicts. The depletion of water resources, overexploitation of fisheries, degradation of arable land, decimation of forests, and growing interference in ecosystems from forests to wetlands to coral reefs are among the principal processes of human induced environmental change (Dellmuth *et al.*, 2018).

Safeguarding environment is a collective responsibility. This means that when environment id degraded both causes and effects of violent conflict will also affect us all. Due to its degradation in Mau Complex, disputes have occurred into different communities which have been living in harmony from the time immemorial. This is because degradation reaches to a point of intolerance which will escalate into violent conflict where conflict transformation manifests

itself. For example, the environmental tension between agriculturalists and pastoralists. There is also fear, tension as well as social-economic based in one's ethnic background which is a security issue. Security activities like those of military do have opposing impact on the environment. This is for example use of their apparatus for example if they are nuclear in nature. This testing and dumping of these materials and apparatus and specifically if they are radio active in nature leads to the depletion of Ozone layer depletion.

As a matter of fact, Ozone is very vital for defending earth from ultra-violet rays. The implication here is that the depletion of it will release harmful radiations to earths and humanity has to suffer consequences of it like skin cancer. Land pollution increases the risks of hazardous material getting into the food chains, which cause bio magnification of the ultimate dangers of developing chronic diseases. Chemical emissions from factories directed to water bodies increase health risk exposure (Serdeczny, 2019). Pesticides and fertilizers from agriculture can get in food chains and also into a region's water system and pollute it. Most populations residing in the developing countries are profoundly affected by the degradation of the environment, and these unhealthy practices are primarily associated with; illness, mortality rates, and deaths.

CHAPTER FOUR

GOVERNMENT'S EFFORTS TO COUNTER ENVIRONMENTAL DEGRADATION IN THE MAU FOREST

4.1 Introduction

The promulgation of a new Constitution in 2010 offered renewed hope the creation of an enabling environment for tackling Kenya's environmental security challenges. The section presents counter degradation efforts adopted by Government of Kenya and International bodies.

4.1.1 Government's Efforts to Protect Mau Complex

Nabutola's, (2010) study provides an indictment of Kenya's supposed international legal obligations when it comes to her commitment to ensuring environmental security. When discussed in the backdrop of the depletion of the Mau Forest, it becomes clear that despite the numerous legal frameworks put in place, there is more that is needed than rules to check the degradation of the Mau. From Nabutola's (2010) study, it is evident that Kenya is a signatory to Agenda 21, The Rio Declaration on Environment and Development, The Statement of Principles on Forests, The Framework Convention on Climate Change and The Convention on Biological Diversity. Kenya's legal framework incorporates the 2005 Forests Act which is;

> *AN ACT of Parliament to provide for the establishment, development and sustainable management, including conservation and rational utilization of forest resources for the socio-economic development of the country: Recognizing that forests play a vital role in the stabilization of soils and groundwater, thereby supporting the conduct of reliable agricultural activity, and that they play a crucial role in protecting water catchments in Kenya and moderating climate by absorbing greenhouse gases; AND further recognizing that forests provide the primary locus of Kenya's biological diversity and a significant habitat for wildlife; AND Acknowledging that forests are the primary source of domestic fuelwood for the Kenyan people, and that they provide essential raw materials for wood-based industries and a variety of nonwood forest products; AND WHEREAS Kenya is*

> *committed to the inter-sectoral development and sustainable use of forestry resources and is committed under international conventions and other agreements to promote the sustainable management, conservation and utilization of forests and biological diversity (*Kweyu *et al*., 2019*).*

This Act laid a firm foundation in managing Kenya's forest cover through such initiatives as public-private partnerships, concessions, licenses, and contracts that ensure joint approaches in conservation while at the same time guaranteeing an inoffensive use of the resources lying in the forests.

Constitution of Kenya acknowledges the role played by her environment in protecting her heritage and guaranteeing sustainable livelihoods for future generations. It is also quite telling that Chapters 60-72 of this Constitution are dedicated to issues of land and environment. From these articles in Chapter Five, it can be deduced that Kenya embarked on reversing the many years of environmental mismanagement (Langat *et al*., 2018).

Later in 2009, the political wing moved in to save the Mau, and only then were there some efforts made by politicians and the government to save part of the Mau forest. Some people were evicted as those who held title deeds returned them to the Ministry of lands. This confirms the argument that through various techniques of persuasion and distraction, policymakers may be able to sustain a perception of legitimacy even in the face of environmentally induced economic decline as upheld by Mitchell and Edward Muller.

The Kenyan coalition government to my opinion somehow influenced the reclamation of the Mau because there is a major role in shaping a society's response to social stress. For example, while analyzing variance in the effects of the depression on European societies in the 1930s, Ekkart Zimmermann and Thomas Saalfeld emphasize the explanatory power of coalitions

between politically powerful groups such as agrarian classes, labor, the bourgeoisie/ business class, and the state.

There is need for the Kenyan people to change their perceptions of corrupt politicians, who had acquired their wealth from looting public goods Duguma *et al.,* (2019 in his study on the role of law in the conservation of forest resources and forest management puts forward the biocentric and ecocentric viewpoint whereby the former recommends that in environmental protection, plants and animals ought to have rights which are equal to those of humans, coexisting with mankind and deserving of security in a similar fashion as humans. Duguma *et al.*, (2019) further fronts the ecocentric approach which adopts a holistic approach to the environment and holds that "plants have an intrinsic right to the protection which is independent of the uses to which they are put to by animals and human beings." (Kweyu *et al*., 2019).

4.1.2 International Bodies on Intervention Mechanism

The Food and Agricultural Organization identifies various strategies among them the conserving or growing the forest area through the inhibition of deforestation and degradation as well as in the enhancement of afforestation and reforestation programs (Duguma *et al.,* 2019). According to FAO, this can be achieved mainly through planting, tree improvement, fertilization, uneven-aged stand management. Other ways advanced are in agroforestry maintaining and or increasing the landscape-level carbon density using forest conservation, longer forest rotations, proactive fire management, and protection against insects.

The focus can also be extended to areas adjacent to the forest area by incorporating them in tree planting exercises and fuel substitution using forest-derived biomass to substitute products with high fossil fuel requirements and increasing the use of biomass-derived energy to replace fossil

fuels. These FAO recommendations are intended for domestication by governments the world over. This study undertakes to examine how the Mau is being reclaimed through such measures, taking cognizance of the current dire situation in the Mau.

One other way highlighted in existing literature as a plausible way of mitigating the effects of the environmental degradation of the Mau is to intensify massive civic education among citizens on the role played by ecosystems in guaranteeing human security and ensuring sustainable development. This is well captured in Nabutola's (2010) study. Both of these studies recognize the critical role played by information in changing the perceptions of the people to engender a culture of conservation.

Mutai, (2016) puts forward the option of environmental diplomacy, in engaging not just local actors but international actors who are in one way or another affected by this environmental degradation. This multisectoral approach to charting the way forward is fronted as a way of ensuring the successful domestication and implementation of international laws as codified. This inclusivity, Chemutai observes is necessary to ensure local ownership and legitimatization of these laws passed. She further concurs with the arguments put forward by Chebii who had centralized the role of judge. She states that due to the urgency of the matter, the earlier consensus is built, the sooner that concerted approaches will be put in place to hasten ameliorative efforts.

The establishment of the Kenya Forest Service is touted by Gichora *et al.,* (2011) as an excellent institution-building measure that has proved to be an effective watchdog in guarding against illegal forest encroachments and logging while at the same time proactively engaging communities in reforestation exercises. Gichora *et al.,* (2011) identify the Reducing Emissions

from Deforestation and Forest Degradation program while actualized in Tsavo and Rukinga Reserve be replicated in Mau to link all the adjoining forests to create a solid block of forests.

This study observed that whereas the government has elaborate plans aimed at establishing working regimes to check environmental degradation, there is usually a lack of political will to ensure successful implementation. Vision 2030, Kenya's blueprint identifies the Social Pillar as anchored on the conservation of the environment, with a target of restoring Kenya's forest cover to the 10% international threshold (Mutai, 2016). An examination of how Kenya has proceeded to implement these projects suffices, thus this study.

Kenya and other east-African nations must own treaties and conventions of efforts ratified by ensuring that the protocols adopted to curb environmental degradation and security are domesticated and enforceable at all levels of governance. It is also important for the treasury to be willing to commit the financial resources necessary for implementation of such treaties and conventions where also political good will is required. It is also key to note that despite the challenges faced by the growing population as a result of environmental degradation, prosecution of culprits of environment must face the full force of law (Mutai, 2016).

There is inadequate capacity in terms of intervention and personnel to deal with environmental degradation and security. This it is important to increase budgetary allocation for training both at county and national levels. Establishment of national and county center of excellence in environmental training could ensure that the training dose not impose unnecessarily high costs on national government. The international community through UN should assist to build capacity of regional state to meet their environmental security requirements.

Since local solutions are likely to be more effective and sustainable, providing regional state with more and better coordinated assistance to build their capacity for environmental security and operation would constitute a very important step forward (Gichora *et al.*, (2011). Most studies have indicated that weak institutions have failed the nation. The current study will be different in that it will comprehensively assess the effect of environmental degradation on human security by using both qualitative and quantitative data.

CHAPTER FIVE

DATA ANALYSIS, INTERPRETATION AND PRESENTATION

5.1 Introduction

This chapter present findings on the nature of environmental degradation and its impact on human security in the Mau Forest, as per the study objectives. It presented the demographic characteristics of the respondents, which include age, gender, and education are also presented.

5.2 Questionnaire Return Rate

Table 4.2 ***: Response Rate***

Frequency		**Percentage**
Completed	23	46%
Not completed	27	54%
Total	50	**100.0%**

The study targeted 50 Mau residents who have stayed there for than 10 years and understand triggers of conflicts among communities. Whereby 23 participants responded to the questions representing 46% response rate as shown in Table 4.1 above. According to National Research Council (2013) a response rate of 20% of the sample population is sufficient for reliable estimates.

5.3 Demographic Characteristics of the Respondents

This section presents the demographic characteristics of the respondents. The characteristics were gender, age, and education level.

5.3.1 Gender

The Figure below presents participants gender. Majority of respondents were female followed closely by male. The gender was necessary for this study as an indicator of representations of the research findings across gender composition. According to Tannenbaum, Greaves & Graham (2016) sex and gender are important in decision-making in the community hence there is need to consider them in research studies.

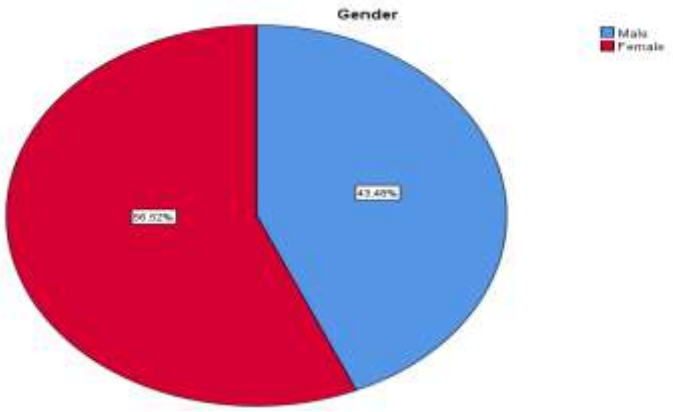

Figure 5.1: ***Gender***

Source: Researcher, (2019)

5.3.2 Age of Respondents

The study also sought to determine the age composition of the respondents. As represented in table 5.1, majority were aged between 15 and 34 years, followed by those aged between 35 and 44 years while the least indicated that they were 45 years and above. The age composition was relevant in this study as an indicator of awareness of the issue of environmental degradation in correspondence with age. This shows that in these communities the respondents were well distributed in terms of age.

Table 5.3: Age of Respondents

	Frequency	Percent
25-34	9	39.1%
35-44	9	39.1%
45 and Above	5	21.7%
Total	23	100.0%

Source: Researcher, (2019)

5.3.3 Level of Education

The researcher sought to determine respondent's education level. As shown in Table 5.4 below the majority of the respondents, were holders of a certificate of secondary education, followed by graduates. Some of the respondents were certificate holders. Those who have attained diploma holders were found to be less. This education level is closely linked to the type of livelihood that the pastoral household head pursues.

Table 5.4: ***Education Level***

	Frequency	Percent
Secondary	8	34.8%
Degree	6	26.1%
Certificate	5	21.7%
Diploma	4	17.4%
Total	23	100.0%

Source: Researcher, (2019)

5.4 Trends and Causes of Environmental Degradation in the Mau Forest in Kenya

5.4.1 Concerns of Environmental Degradation

The study sought to investigate the various forms of environmental degradation in the study area. The participants were asked to indicate environmental destruction activities that are carried out in their area. Their responses are as presented in the Table below. Majority of respondents indicated that depletion of natural forest was the most common source of environmental degradation in Mau. Some indicated that poor waste management and disposal, climate change and claiming pollution of rivers and seas equally is their primary concern as a challenge to their environment. These findings go hand in hand with the study done by Chandry, (2014) who noted that significant degradation of forest reserves in Kenya is attributed to logging and clearance of forest for settlements.

Table 5.5: ***General Environmental Concern***

	Frequency	Percent
Climate change	4	17.4%
Pollution of rivers and seas	4	17.4%
Littering	3	13.0%
poor waste management and disposal	4	17.4%
Depleting natural forest	8	34.8%
Total	23	100.0%

Source: Researcher, (2019)

5.4.2 Pollution of Seas and Rivers

The study also sought to understand whether the pollution of rivers directly affected the respondents and their families. The results indicated that majority of the respondents are affected by contamination of rivers and seas, while other reported that they are not affected by the pollution of rivers and seas. Danjuma, Mohammed and Daura, (2014) in their study revealed that pollution of seas and rivers have a significant effect of human health. The results of Reed about environmental degradation indicated that land degradation, deforestation, desertification, loss of biodiversity, land, water and air pollution, climate change, sea-level rise, and ozone depletion are the major causes of environmental degradation (Danjuma, Mohammed & Daura, 2014).

Table 5.6: ***Pollution of Seas and Rivers***

	Frequency	Percent
Yes	13	56.5%
No	9	39.1%
Don't Know	1	4.3%
Total	23	100.0%

Source: Researcher, (2019)

5.4.3 Flooding Experience

The researcher sought to know if the respondents had an experience of flooding in their homes or gardens. It was found out that most respondents have ever experienced flooding in their homes or gardens while others have never experienced flooding in their homes or gardens as presented in Table 5.7. UNFCCC, 2015), in their study indicated that just like droughts, floods are a periodic occurrence in Kenya and are mostly characterized by varying spatial-temporal designs. Floods are ordinarily connected with an abnormally wet weather system in a region where the amount of precipitation received generally surpasses the enduring average. Just like droughts, floods are experienced mostly in semi-arid and arid parts of Kenya. In reference to this, the word El Niño is tantamount to floods.

Table 5.7: ***Flooding Experience***

	Frequency	Percent
Yes	13	56.5%
No	9	39.1%
Don't Know	1	4.3%
Total	23	100.0%

Source: Researcher, (2019)

5.3.4 Changing Weather Patterns

The respondents were further tasked to explain if they were generally aware of changing weather patterns. The response indicated that most respondents were aware of the changing climatic patterns while some were not aware of changing climatic patterns as presented in the Table below. This contradicts the findings by Ngaira, 2008) who revealed that most communities in marginalized areas are not aware of climate variation and weather patterns. Due to the

occurrence of succeeding floods in the country and them being received in equal shock, it shows that the awareness did not trigger aspects of readiness as well as preparedness among Kenyans.

Table 5.8: ***Changing Weather Patterns***

	Frequency	Percent
Yes	21	91.3%
No	1	4.3%
Don't Know	1	4.3%
Total	23	100.0%

Source: Researcher, (2019)

5.5 Causes of Environmental Degradation in the Mau Forest in Kenya

The study sought to find out the response to the causes of environmental degradation in Kenya. The findings in Table 5.9 indicated that majority learned about ecological degradation roughly 3-5 years ago. Others learned about the concept of environmental degradation ten years ago and less than 1 year ago. GoK, (2012) stated that low level of Environmental Degradation awareness among most Kenyans in confounded by low education level. According to Tierney (2006), although education is often associated with income and poverty, its relationship with environmental degradation is still not well grasped. Members who are better educated are likely to have amassed wealth over time hence have the means to act upon hazard warning and preparedness information on time thereby cushioning themselves against adverse impacts from hazards

Table 5.9: ***Awareness of Degradation***

	Frequency	Percent
less than one year ago	2	8.7%
Roughly 3-5 years	14	60.9%
Approximately 10 years ago	5	21.7%
Not sure	2	8.7%
Total	23	100.0%

Source: Researcher, (2019)

5.5.1 Climate Change Awareness

The respondents were asked about their awareness about climate change. Most respondents were well conversant with climate change, while the some were not aware of climate change. The findings are represented in the Figure below.

Mutimba *et al*., (2010) indicated that awareness of climate variability at community level is still low and farmers have been found to have a problem in differentiating between impacts arising from climate variability and problems caused by local environmental degradation. Lack of resident's awareness influences negatively on their adoption of appropriate adaptive technologies.

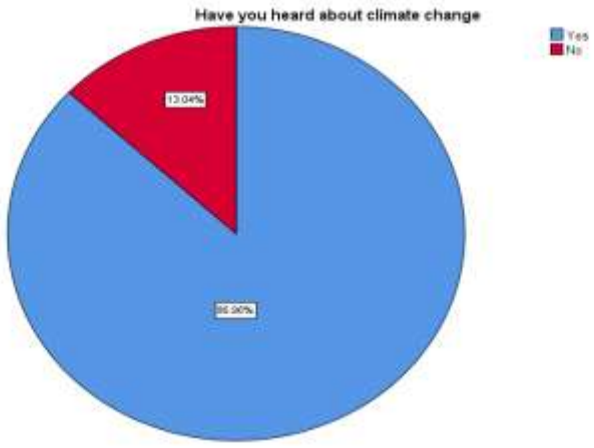

Figure 5.2: ***Climate Change Awareness*** Source: Researcher, (2019)

5.5.2 Major Causes of Environmental Degradation

The research sought to determine the major causes of environmental degradation. Most respondents pointed out land clearance and deforestation as the leading cause of environmental degradation. However, some believed that depletion of soil nutrients has led to environmental degradation as individuals engage in deforestation to create new lands for cultivations. Others respondents alluded to climate change and poor farming practices as the sole reasons for environmental degradations. The findings go hand in hand with conclusion made by Lal, (2015) who stated that deforestation and encroachment into the forests are visible where negative effects are being felt significantly. This means that forests are important ecosystem and acting on the role of water towers and there is environmental conflict induced disasters associated with this. Lal, (2015) revealed that without any prejudice environmental degradation is caused by deforestation, inadequate of water and its contamination, different forms of pollutions, degradation of land and loss of its biodiversity as some of the challenges that confront the developing nations as a result of environmental degradation.

Table 5.10: ***Causes of Environmental Degradation in the Mau Forest in Kenya***

	Frequency	Percent
Climate change	3	13.0%
Land clearance and deforestation	8	34.8%
Depletion of soil nutrients	6	26.1%
Poor farming practices	3	13.0%
Overgrazing	1	4.3%
Water pollution	2	8.7%
Total	23	100.0%

Source: Researcher, (2019)

5.5.3 Importance of Environmental Degradation Awareness

The respondents were asked about the importance of environmental degradation issue. Majority of the respondents claimed it is essential while some claim it is quite essential, and the remaining think of ecological degradation as not important at all. Glantz, (2019) established that environment degradation awareness is important in minimizing conflicts and promoting peaceful coexistence. Such people have expressed the need for disarmament and the government tightening security in the region and to protect the vulnerable people engaging in peace initiatives and conflict resolution.

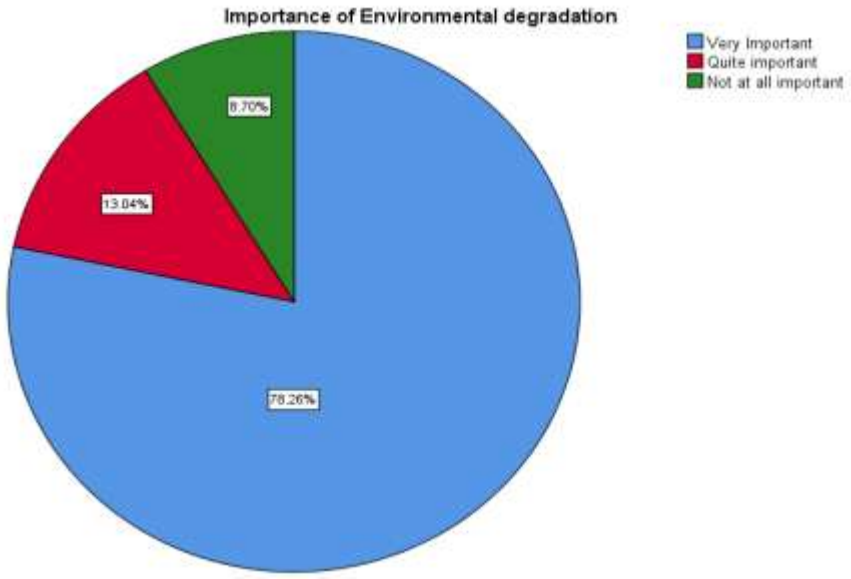

Figure 5.3: ***Environmental Degradation Awareness***

Source: Researcher, (2019)

5.5.4 Human activity on Environmental Degradation

The study sought to assess the level in which human activities influence environmental degradation. All the respondents at agreed that social activities are the sole reason for environmental degradation in the Mau. Ng'ambi, Dzanja and Mwase (2015) undertook a study on identifying the determinants of environmental degradation in rural households of Chitwekere Extension Planning Area (EPA) in Lilongwe District. Findings suggest that landholding size, education, access to external support, household size and Income Generating Activities (IGA) were the most relevant factors in measuring eenvironmental degradation.

5.5.5 Environmental Degradation and Human Security

Respondents were asked to comment on the effect of environmental degradation on their livelihood. The response depicted that most respondents claimed that ecological degradation affects them personally, while others stated that it doesn't affect them at all. According to a study by Floyd, (2008) environmental security is key to human safety. In her research, she found out that a lack of balance in the ecological environment leading to diminished water bodies poses a danger to human life. The study of Nabutola, (2010) further emphasizes the consequences of environmental degradation on social security with the collapse of wildlife tourism due to the diminishing water levels as e result of depletion of the Mau ecosystem. Moreover, this has sometimes led to conflict as communities compete over scarce resources. Conflicts of this nature were observed in the area bordering Nakuru and Narok counties in 2015

Table 5.11: ***Degradation and Human Security***

	Frequency	Percent
Yes	20	87.0%
No	3	13.0%
Total	23	100.0%

Source: Researcher, (2019)

5.5.6 Effects of Environmental Degradation

Respondents were asked to give their response to the effects of degradation in their natural habitats. Most participants indicated that air pollution is the main element affecting environmental degradation due to unclean air. Other respondents attributed the effects to water-borne diseases as an outcome of environmental degradation, while the least attributed environmental degradation to prolonged droughts.

Based on this finding the climate variation has an adverse impact on air pollution. The climatic changes have an impact soil erosion rates and soil moisture, both of which are important for crop yields. This finding contradicts the one done by Shaw, (1983) critical stages for high temperature injury include seedling emergence in most crops, slicking and tussling in corn.

Table 5.12: ***Effects of Environmental Degradation***

	Frequency	Percent
water pollution	5	21.7%
water borne diseases	6	26.1%
Air pollution	8	34.8%
Prolong Droughts	4	17.4%
Total	23	100.0%

Source: Researcher, (2019)

5.5.8 Effect of Climate Change on Human Security

The study sought to find out the effects of changing climate conditions on human security. Majority of the total respondents, alluded to famine as the main threat to social security as a consequence of climate change. The others said poverty as the primary outcome of changing climatic conditions. The different percentages claimed diseases and food insecurity as the results of changing the climate. Floyd, (2008) the transforming forces and processes of cultural, institutional and economic integration, when combined with emerging trends such as increasing population density, HIV/AIDS, urban expansion and environmental degradation, triggers insecurity and conflict within pastoral communities. Chikati, (2018) reported that during drought period there is an increase in internal and external conflicts due to resource use and territorial conflicts. Internal conflicts result from individuals stealing livestock for sale or to slaughter for food. They also arise when herders of more wealthy members of the clan or family accumulate more livestock to themselves contrary from what was agreed. Resource use and territorial conflicts occur when members of one community trespasses on territories of other community and use their pasture and water resources during drought episodes.

Table 5.13: ***Climate Change and Human Security***

	Frequency	Percent
Poverty	7	30.4%
famine	9	39.1%
food insecurity	4	17.4%
Poor waste Management	2	8.7%
diseases	1	4.3%
Total	23	100.0%

Source: Researcher, (2019)

5.6 Measures to Counter Human Insecurities in the Mau Forest in Kenya due to Environmental Degradation

The study sought to understand the concerns by government, citizens, non-governmental organizations, county authority, and other interested parties on the degradation issues in Mau forest. Respondents were tasked to give their views on the strategies that could be employed to counter environmental degradation in the Mau Complex. The responses were as follows; most respondents believed that protection of the forest from human encroachment was the ideal measure of avoiding degradation of the Mau water towers, others thought that planting more trees could be the most appropriate measure to counter the degradation effect of the Mau water tower.

Finally, others suggested sensitization and awareness of the need to safeguard our natural resources through public education as the most appropriate measure to counter environmental degradation at the Mau water towers. This finding is consistent with Chikati, (2018) findings, which indicated little knowledge about the importance of environmental protection among citizens and thus the need for intensive massive civic education among the citizens. Moreover, the results of Nabutola, (2010) indicated the importance of communicating the culture of conservation among the citizens through public education.

However, these findings are inconsistent with Gichora *et al*., (2011) who lauded the government establishment of the Kenya Forest Service as an excellent institution-building measure that has proved to be an effective watchdog in guarding against illegal forest encroachments and logging while at the same time proactively engaging communities in reforestation exercises. According to Gichora *et al*., (2011), a high percentage of causal issues to environmental degradation is

human activities relating to factors such as overgrazing, logging, land clearance, and deforestation, among others.

Table 5.14: ***Control Measures***

	Frequency	Percent
Protection from human encroachment	4	17.4%
Planting more trees	8	34.8%
sensitization and awareness	11	47.8%
Total	23	100.0%

Source: Researcher, (2019)

5.6.1 Environmental Protection Initiatives

The study further seeks to understand the perception of the individuals on the responsible authorities to safeguard the degradation of the environment in the Mau complex. Respondents felt it was the sole responsibility of the national government to spearhead the conservation of natural resource such as the forest in its territories. Others thought about the county governments being the most appropriate authorities to tackle issues of environmental degradation.

Environmental organizations such as NEMA, KWS, and KFS. Further, majority of the respondents agreed that citizens of Kenya have a responsibility of ensuring there are sensitive to matters. According to Boitt, (2016), the rise in conflicts cannot be taken simply as turbulence resulting from regime transitions. National government do involve authority struggles as opposed to traditional territorial or geopolitical dimensions. Connor, (2015) noted that the government has played an imperative role in reclamation process of MAU. Its role has helped in ending conflict and ensure that communities co-exists.

Table 5.15: ***Responsible Authority***

	Frequency	Percent
National government	2	8.7%
County government	1	4.3%
Environmental organizations	4	17.4%
Citizens/individuals	16	69.6%
Total	23	100.0%

Source: Researcher, (2019)

5.6.2 Public Involvement in Combating Environmental Degradation

The research sought to understand the level of involvement of individuals in combating environmental degradation. This approach was explicitly relevant to give an understanding of the perceived responsibility towards countering ecological degradation by the government. Most respondents were neutral towards the perceived government commitment towards countering environmental degradation. This could be a clear indicator that the government efforts towards conservation of the natural forest are minimal. However, some respondents are aware of the government commitments towards countering environmental degradation in the Mau.

On the issues of government incentives towards conservation of the environment, the majority of the respondents agreed strongly. This means that the government has been actively involving the citizens in the conservation of the natural forest by giving incentives to them. Respondents were tasked to give their opinion on whether the national government should delegate environmental protection to counties. The majority agreed that the counties could be in an excellent position to protect the environment from degradation.

The other respondents were either in disagreement or neutral about this question. This finding resonates with the little awareness of the respondents on the government commitments towards

countering environmental degradation in the Mau. There was a mixed reaction on the issue of whether the government should or should not be involved in the protection of the environment as depicted in Table 5.16. Most respondents, agreed that the government should not be partied with the protection of the environment. The government of Kenyan from 2009 intensified the rehabilitation and conservation of Mau complex so as to restore the degraded environment.

Table 5.16: ***Environmental Protection***

Government commitment to counter Environmental degradation	**Frequency**	**Percentage**
Agree strongly	7	30.4%
Neither agree nor disagree	11	47.8%
Disagree	1	4.3%
Disagree strongly	4	17.4%
Government incentives to protect Environment		
Agree	5	21.7%
Agree strongly	13	56.5%
Disagree	3	13.0%
Disagree strongly	2	8.7%
Government to delegate Environmental protection to counties		
Agree	13	56.5%
Agree strongly	2	8.7%
Neither agree nor disagree	3	13.0%
Disagree	2	8.7%
Disagree strongly	3	13.0%
The government should not be involved in environmental issues		
Agree	8	34.8%

Agree strongly	4	17.4%
Neither agree nor disagree	2	8.7%
Disagree	7	30.4%
Disagree strongly	2	8.7%

Source: Researcher, (2019)

CHAPTER SIX

DISCUSSIONS OF THE FINDINGS, RECOMMENDATIONS, AND CONCLUSIONS

6.1 Summary

6.1.1 Trends and Causes of Environmental Degradation in the Mau Forest in Kenya

The study sought to understand the major concerns of environmental degradation in the Mau region in Kenya. We found out that depletion of natural forest was the most common source of environmental degradation in the Mau. The study also found out that the pollution of rivers and seas directly affects the livelihood of the individuals. This is resonated by the findings that most of the respondents over the years have experienced flooding's in their homes and gardens.

According to this study, majority of the respondents attributed Changing weather patterns as a reason for climate change, which is one of the major causes of environmental degradation. The research found out that most of the respondents learned about environmental degradation. However, even with such prior knowledge, the effects of environmental degradation persist. The respondents pointed out that land clearance and deforestation as the leading cause of environmental degradation. Consequently, depletion of soil nutrients due to deforestation to create new lands for cultivations, climate change, and poor farming practices, overgrazing, and water pollution were found to be other common causes of environmental degradations.

6.1.2 Impact of Environmental Degradation on Human Security in the Mau Forest in Kenya

The main concern, as indicated in the responses attributed to air pollution as the main threat to human security due to unclean air caused by deforestation. Other respondents claimed prolonged drought and water-borne diseases as other hazards to human life. Moreover, the study alluded the effects of changing the climate on social security. Most respondents claimed the impact of climate change as the main threat to social security, causing natural calamities such as famine, poverty, and diseases.

6.1.3 Government Measures on Countering Human Insecurities due to Environmental Degradation in the Mau Forest in Kenya

The study sought to understand the concerns by government, citizens, non-governmental organizations, county authority, and other interested parties as far as environmental degradation and its mitigation in the Mau region is concerned. The respondents were requested to give their views on the strategies that could be employed to counter ecological degradation in the Mau Complex. Majority of the respondents suggested sensitization and awareness as the most appropriate measure.

The study further seeks to understand the perception of the individuals on the responsible authorities to safeguard the degradation of the environment in the Mau complex. Majority of the respondents believed it is the responsibility of Kenyan citizens to tackle environmental degradation issues. However, the contributions of other agencies, such as NEMA, KWS, and KFS, are also encouraged to combat environmental degradation. Furthermore, the respondents indicated that the government had been actively involved in the conservation of the natural forest by giving incentives to them.

The study found out that, respondents opted that the national government should delegate environmental protection to the County Governments. The majority agreed that the provinces could be in an excellent position to protect the environment from degradation. This finding resonates with the little awareness of the respondents on the government commitments towards countering environmental degradation in the Mau.

6.2 Conclusion

The focus of the study was on the trends and causes of environmental degradation in Mau Forest Kenya, the impact of environmental degradation on human security in the Mau Forest in Kenya, and measures explored to counter human insecurities as a result of ecological degradation in Mau Forest in Kenya. The increase in the human population, type of land use, and the scarcity of natural resources has contributed to the misuse and overexploitation of the Mau catchment area.

The key findings indicated that land clearance and deforestation for settlement and farming is the critical issue that has led to the degradation of the catchment areas of Mau forest. There was an indication that, climate change which has been adversely contributed by the destruction of natural water catchment. This was found to have posed severe human insecurity through unclean air, diseases, and flooding, drought and food shortages.

The study also shows that there is a great havoc caused by the infiltration of people in the forest and especially reduction of water resource due to the deforestation and agricultural practices coupled with human settlements. It is for this reason that the Kenyan citizens from all over the country had voiced their outcry to save the Mau. The diminishing of available resources such as forests, grasslands, rangeland, water, and wetlands also aggravates conflicts over resources.

We found little involvement of the government in combating the degradation effects of human activities on the natural environment. Consequently, the respondents preferred the county governments to be delegated the role of environmental conservation. Furthermore, the involvement of international agencies and non-governmental organizations for environmental protection were applauded due to the political participation of the government on resettling landless communities in the forest reserves. The other negative impacts arising from human activities noted were; forest excision, farming, and settlement in the catchment area, overgrazing, and logging. Consequently, this leads to siltation due to erosion and rivers drying up downstream during the dry season affecting the park.

6.3 Recommendations

From the study findings, the researcher recommends several initiatives to alleviate the effects posed by environmental degradation on human security in the Mau Forest region. Firstly, there is the need to improve the environmental management of Mau catchment through reforestation, rehabilitation of degraded areas, implementation of sound pollution control methods, and controlled re-settlement.

The government should put in place a clear land policy, with clear protection measures to forests to ensure that the same encroachments do not occur again. On the hand, the government should strengthen the institutions to ensure that upon any encroachments, they are dealt with ardently by both the government officials guarding the forest, the Foresters and even the Courts of law by imposing heft penalties which would deter any law breaking.

The government should deal with corrupt government officers, politicians sternly as corruption has contributed largely to loss of government money that could otherwise be used to develop infrastructure and social amenities for its citizens. The encroachment has also led to loss of revenue from tourism. Since the Maasai Mau region has rivers that flow towards the Mara river which is home to one of the wonders of the world in the name of Wildebeests migration.

6.4 Suggested Areas for Further Studies

The researcher suggested further studies on the role of the private sector in combating human insecurities as a result of environmental degradation in the Mau Forest and ways in which to reclaim the Mau region.

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LIST OF APPENDICES

APPENDIX I: QUESTIONNAIRE

The Threat of Environmental Degradation to Human Security in Kenya: A Case of the Diminishing Water Resources in Mau Forest

The main objective of this study was to discuss the threats of environmental degradation on human security in Africa with a focus on the diminishing water reserves of Mau Forest in Kenya.

SECTION A: BIO DATA

Tick or Fill Where Appropriate:

a) Name {optional} _____
b) Gender: {Male or Female} _____
   Please tick where it applies
c) Age: 18-24 [] 25-34 [] 35-44 [] 45 and above []
d) Marital Status_____
e) Highest Level of Education_____

SECTION B: CAUSES OF ENVIRONMENTAL DEGRADATION IN THE MAU FOREST IN KENYA

1. What are the economic activities that you involve yourself in?
2. What are some of the environmental destruction activities that are carried out in your area?

---

3. Human beings are the main agents of environmental degradation in your area?

   Yes [ ]

   No [ ]

4. If **YES**, briefly describe?

   ---

5. If No, briefly describe other agents?

   ---

6. Causes of environmental degradation in Mau Forest

Likert scale (S.A –Strongly Agree, A-Agree, N-Neutral, D-Disagree, S.D-Strongly Disagree)

	S.A	A	N	D	S. D
Inland forest cover loss/ depletion					
Land use change. (e.g., catchment zone)					
Forests encroachment					
Deforestation					
Industrialization (Setting up of industries)					

SECTION C: THE IMPACT OF ENVIRONMENTAL DEGRADATION ON HUMAN SECURITY IN THE MAU FOREST IN KENYA

7. Environmental degradation is a threat to human security?

   Yes [ ]

   NO [ ]

8. Impact of environmental degradation on human security in Mau region in Kenya.

	S.A	A	N	D	S.D
Low agricultural production during droughts					
Reduced livestock pastures, water thus reducing livestock production					
Infestation/ outbreaks of livestock diseases.					
Changing trends for fresh produce Production					
Trans-boundary conflicts due to competition for a trans boundary resources, e.g. water and pasture, number of people displaced/ livestock loss					
Epidemic (diseases) during excess and low rainfall e.g. malaria, avian flu, cholera, malnutrition					
Increased human wildlife conflict due to scarce resources and competition for natural resources					
Reduced aquatic and marine plants (food for fish)					

9. The government has implemented the following initiatives to counter human threats due to environmental degradation in the Mau Forest in Kenya.

ENVIRONMENTAL INITIATIVES	S.A	A	N	S.D	D
Promotion of environmental education					
Activities by local governments and citizens' groups					
Scientific and technological contributions in conservation of Natural environment (e.g Use of charcoal as a by-product of other materials and not trees)					
Greenhouse gas prevention measure					
Conservation of biodiversity					

10. Do you know of any initiative by the government of Kenya to address human insecurity as a result of environmental degradation?
    Yes [ ]
    NO [ ]
11. If yes? Briefly name them:

APPENDIX II: CONSENT LETTER

APPENDIX III: NACOSTI

Environmental

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7	Submitted to University of Nairobi Student Paper	<1%
8	Submitted to University of Southampton Student Paper	<1%
9	"Building Local Capacity and Creating Awareness in Conserving the Mau Forest and	<1%