

**UNIVERSITY OF NAIROBI**  
**INSTITUTE OF DIPLOMACY AND INTERNATIONAL STUDIES**

**THE IMPACT OF ENVIRONMENTAL FACTORS ON HUMAN SECURITY IN**  
**AFRICA: A CASE STUDY OF KENYA**

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**MANAGEMENT**

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## DECLARATION

I declare that this research project is my original work and has never been presented for any award in any other University.

Sign \_\_\_\_\_

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This project has been submitted for examination with my approval as the University of Nairobi supervisor.

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## **DEDICATION**

This study is dedicated to my family who have been a great source of inspiration to my education and without their sacrifice and support I would not have gone this far.

## **ACKNOWLEDGMENT**

I thank God for his kindness and mercy during this academic journey.

I would like to express my deepest gratitude to my supervisor, Prof. Maria Nzomo for her intellectual guidance, support and encouragement throughout this journey.

I would also like to thank my colleagues and classmates for their support.

## **ABSTRACT**

The connection between environmental concern and human security has attracted scholarly discourse lately. The developing world is bearing the brunt of climate change at a high scale that unless something is done to reverse the trend the human security of the inhabitants of these countries may not be guaranteed and hence the growing attention. Kenya, just like the other countries in the developing world has been affected by the consequences of climate change. The present study examined the impact of environmental factors on human security with a bias to the Mt. Kenya region in Kenya. The study was guided by three objectives; to examine how environmental degradation has contributed to human insecurity in Africa, to establish the effects of climate change on human security in Kenya, and to determine how the adverse effects of environmental degradation in Mt. Kenya can be mitigated and human security enhanced. The study was guided by Homer-Dixon's environmental resource scarcity theory in exploring how different environmental factors have affected the security of the inhabitants of the Mt. Kenya region (Nyeri sub-County). Using a mixed study research design, both qualitative and quantitative data was collected from the participants in the present study. The findings of the study reveal that environmental factors including environmental degradation have an impact on human security, in particular, it was found that environmental degradation affects and speeds up aging process, increases the likelihood of individuals being exposed to diseases, increases the possibility of being poisoned through food, denies human beings nutrients and access to healthy foods that are necessary for survival, creates an environment that may stress us and our loved ones and leads to a future in which the human race will live shorter lives. In Kenya, the study revealed that the dry and rainy seasons have been affected with the seasons either being too long/short and unpredictable. It was also noted that due to degradation, there is an increase in human-wildlife conflict. To mitigate the effects of consequences of environmental impacts on human security, the study revealed that Kenya has put strategy in place to help in addressing the adverse impacts of climate change (adaptation measures) and to tame global warming (mitigation measures). The study recommends that there should be initiatives to create awareness on environmental degradation and its' potential effects to enable the public to make right decisions in reference to the protection of the environment.

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## LIST OF ABBREVIATIONS

<b>CBO</b>	Community Based Organization
<b>EA</b>	Environmental Audit
<b>EIA</b>	Environmental Impact Assessment
<b>ENSO</b>	El Niño-Southern Oscillation
<b>FDP</b>	Forestry Development Plan
<b>FGD</b>	Focus Group Discussions
<b>GHG</b>	Green House Gas
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>ISDR</b>	International Strategy for Disaster Reduction
<b>LBDA</b>	Lake Basin Development Authority
<b>NGO</b>	Non-Governmental Organization
<b>NTFP</b>	Non-timber forest products
<b>SREX</b>	Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
<b>TARDA</b>	Tana & Athi River Development Authority
<b>UNDP</b>	United Nations Development Program
<b>UNEP</b>	United Nations Environment Programme

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to the study

Attainment of sustainable development cannot be without consideration of the environment, particularly in Africa. Environmental factors play significant role in shaping sustainable development. In exploring the nexus between human security and environmental factors it must be recognized the essence of the environment to the survival of human kind.

The idea of environmental security or integration of environmental issues and human security considerations has not attracted much discourse in the academic sphere. However, there is a recent trend of consideration of the fields in the international security debate. There is a section of both the environmentalist and security communities who view the integration of environmental security and human security with deep skepticism. From a general standpoint, it must be noted that the rationale for environmental security discourse is informed by the numerous changes that cumulatively mark the changes that have occurred in the post-Cold War period.

There is close ties on environment and safety of people in the society and this is illustrated by various factors. These factors include ozone depletion, desertification, drought, deforestation, failing water supplies, fisheries depletion, or land degradation among others. Literature is replete with examples of how these factors negatively affect human security.<sup>1</sup>

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<sup>1</sup> Brown, O., Hammill A., McLeman, R. (2007). "Climate change as the 'new' security threat: implications for Africa". *International Affairs*, 83(6), 1141-1154

The latest entrant to the environmental factor with the greatest potential for hampering human security is climate change. The effects of climate change to human security was indeed confirmed in the 2007 United Nations Security Council debate where the then British Foreign Secretary, Margaret Beckett alluded that climate change was a security matter with great magnitude.<sup>2</sup> Environmental dimensions have serious implications to all sectors in the society which affect people differently in all circles of life.

Besides the effects of climate variations and environmental degradation, many regions of the world, particularly the developing countries, Kenya is poverty stricken, a situation that exacerbates the effects of environmental impacts on human security. Predictions by the Christian Aid Organization reveal that millions of individuals have the possibility of dying because of environment related disasters, and with millions more forced to migrate in the 21<sup>st</sup> century.<sup>3</sup> In essence effects of environmental factors pose threats to the capacity of nations to guarantee the security of their populace. As a matter of fact, it is feared that lack of mitigating the effects of environmental dimensions may lead to widespread human security challenges.<sup>4</sup>

The factors jeopardizing peoples well being that are related to environment have continuously increased in Kenya and this can be shown by the unpredictable weather conditions that results to various calamities. It was reported temperatures in Kenya have averagely risen by 1.0 degrees

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<sup>2</sup> UN News, (2007). Security Council holds first-ever debate on impact of climate change on peace, security, hearing over 50 speakers. Security Council 5663rd Meeting April 17, 2007. Available at: <<http://www.un.org/News/Press/docs/2007/sc9000.doc.htm>>

<sup>3</sup> Copenhagen Accord, Copenhagen, December 2009. Also, *2010 UNEP Year Book*, UNEP, Nairobi, 2010. Chapter 4, p. 43.

<sup>4</sup>*Human Tide: A Real Migration Crisis*,

centigrade since 1960, and this is very likely to continue.<sup>5</sup> These extreme events have negative impacts on almost all sectors such as health, agriculture, livestock, environment, hydroelectric power generation and tourism.<sup>6</sup>

Environmental degradation and changes in climate in the Mt Kenya landscape are threatening the mountain that is the country's largest water tower. Glacier retreat on the mountains is causing problems for the local environment as there is less water flowing into the rivers and springs and the land is becoming drier and less productive. Elements of environmental degradation have far reaching effects on the farmers' well-being including food security, source of livelihood, and health among others. Degradation may also lead to more forest fires coupled with lower rates of vegetation regeneration. The other effect is migration of wild animals that could potentially worsen conflicts between wild life and animals.

Countries have thus developed interest in understanding environment related disasters whose impacts have ramifications on human security. As a response, efforts are being put in place by international, regional and local bodies to identify ways of mitigating the effects of environmental related catastrophes. The study aims to advance this quest by examining correlation of environment and safeness of human beings by suggesting possible mitigation measures.

## **1.2 Problem Statement**

Human security deficit in Africa continues to grow complex and it is becoming one of the greatest source of concern due to increased risk of interacting economic, social, political and environmental

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<sup>5</sup>Williams, and Funk, nd

<sup>6</sup> Ibid

factors. These challenges as a whole must be addressed to ensure human survival and enhanced livelihoods. Environmental factors such as degradation and climate change are some of the environmental changes that have the capacity to undermine human security by creating insecurities such as food shortages, diseases and conflict.

Human security depends upon the sustainable and comprehensive governance and management of the environment. However, studies done today have not directly linked the continuing deterioration of human security with the role of equally worsening question of degradation. This study therefore seeks to make an argument that a large part of the solution to the human security deficit on the continent depends on equal vigor in addressing the environmental question especially climate change.

### **1.3 Research Questions**

The study was based on the following questions;

- i) How has environmental degradation contributed to human insecurity in Africa?
- ii) What are the effects of climate change on human security in Kenya?
- iii) How can the adverse effects of environmental degradation in Kenya be mitigated and human security enhanced?

### **1.4 Research Objectives**

The Primary objective of this study was to study and analyze the role and impact of environmental factors on human security in Africa.



### **1.4.1 Specific objectives**

- i) To examine how environmental degradation has contributed to human insecurity in Africa.
- ii) To establish the effects of climate change on human security in Kenya.
- iii) To determine how the adverse impacts of environmental dilapidation in Kenya can be mitigated and human security enhanced.

## **1.5 Literature Review**

### **1.5.1 Concept of Human Security**

Traditionally, the idea of security was viewed in narrow terms with a state-centered focus. However, problems like chronic poverty, ethnic violence, terrorist attacks, epidemics, economic uncertainties, human rights violations, growing incidents of intra-state wars and issues of poor governance has continuously became of concern till to date. Human security involves examining the role of varied dimensions of security in the daily lives of individuals and communities instead of securing the state borders alone.<sup>7</sup>

The United Nations Development Program (UNDP) outlines food security, political security, economic security, health security, personal security, environmental security, and community security as challenges to human safety.<sup>8</sup> These factors are all associated with the social safety net of individuals; the lack of assurance to this safety net thus brings security challenges. Challenges post by these factors is multi-faceted and diverse but all are directed towards hampering the well-being of persons. For example, health security concerns a myriad of issues including water access,

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<sup>7</sup>Beebe, D. S., Kaldor, M. H. *The Ultimate Weapon is no Weapon: Human Security and the new rules of War and Peace*, (New York: Public Affairs, 2010), p. 5.

<sup>8</sup> Ibid

having safe habitation, health services access, and knowledge for living a healthy life among others.<sup>9</sup>

The scope of environmental security is broad touching of an array of factors including; enhancing water and sanitation, controlling the pollution of the air, environmental conservation through forestation, effective measures to curb natural calamities among others. Matters concerning societal safety are closely linked to the protection of culture, traditions as well as language. This includes the need to abolish discrimination on the basis of ethnicity, protection of indigenous communities and prevention of ethnic conflict. Political security touches on matters concerning the need for protection of human rights and general well-being of persons. The protection of citizens from government repressions also falls under this broad category.<sup>10</sup>

All dimensions of human security are interrelated in a complex way. For example, any threat to people's economic security can directly affect their food security, which consequently weakens health security. Likewise, any disturbance with political security can instantly harm personal security and indirectly lead to issues of food, economic, health or community security. The idea of human security is built on universalism and solidarity, where all individuals and communities have equal rights and opportunities and, share a common approach towards their responsibilities.<sup>11</sup>

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<sup>9</sup>New York: UNDP, 1994

<sup>10</sup> Ibid

<sup>11</sup>M. Ul Haq. 1994. *Imperatives of Human Security*, Rajiv Gandhi Institute for Contemporary Studies, RGICS Paper No, 17.

Some direct and indirect threats like, pressure on available resources as a result of increased number of people, unequal distribution of resources, cross border migration, income inequalities, inter and intra-state conflicts, religious and ethnic animosities, drug production and trafficking, environmental degradation, and international terrorism may arise to endanger human security within and among countries.

### **1.5.2 Understanding Threats and Vulnerabilities in Human Security**

As discussions of security concepts regularly interchange the words "threat" and "vulnerability," the concept of human security draws a line between threats and vulnerabilities. Threats are external causes of harm, with identifiable consequences that can be visible on the horizon, which requires an immediate or at least near-term, tangible response; on the other hand, vulnerabilities are a weakness or condition that might ultimately cause the kind of harm an unattended threat will cause.<sup>12</sup> A vulnerability can be both internal and external, which helps to locate regions and people at risk within the seven components identified in 1994 UNDP report. Vulnerability remains as an indicator, linked to related issues of threats but unfortunately, it does not assure adequate and appropriate response that needs to be taken who/ which are at risk.

Unlike threat, vulnerability is not always clearly identified and perceived, which results in compounding the risk. For example economic condition causes vulnerability like financial loss that compounds poverty, which is the ultimate risk or can be considered as double vulnerability. Thus, by not addressing the threat, it is impossible to respond to vulnerability, ultimately causing

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<sup>12</sup>Liotta, & Bilgin. (2014). Why Human Security? The case of resilience in the urban century. In Mary, & Owen, Routledge Handbook of Human Security (pp. 109-120). New York: Routledge.

double vulnerability. With the broad understanding of double vulnerability in human security, the related stakeholders can respond to the emerging risks in a structured manner.

### **1.5.3 The Linkage between Climate Change and Human Security**

Climate variations are the changes in the state of the climate that are identifiable by alterations in the means and inconsistency of its properties and that persists for an extended period that could extend to decades or longer. (IPCC, 2007). It can be caused by nature or human activities. Climate variability is a global issue, which exacerbate multiple problems for the humanity. It threatens human life, health, and property. Some regions are becoming warmer, drier, with increased desertification, and severe droughts due to of change in climatic conditions. While, others are receiving more than usual precipitation, leading to flash floods and storms.<sup>13</sup>

Climate change entails more than environment challenges hence requires to be looked in relation to the safety of people as well. Based on this, scholars have addressed diverse security issues within the climate change sphere. O'Brien and colleagues suggests that climate change poses complex challenges to human security. In the present times climate change affects a myriad of social issues. As such, its examination should encompass social issues such as poverty, inequality, conflicts, land degradation, growing incidents of food, diseases, and water insecurity.

The interplay of these issues can trigger conflicts within societies. Thus, the authors suggest that to address climate change, humans and communities need to be placed at the core of the issue and climate change needs to be addressed from the perspectives of human attitudes, human rights, morals and obligations. In particular, climate change poses multiple security stresses for the

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<sup>13</sup>*Forum 2009: Climate Change.*

developing and poorer states that are already struggling to deal with poverty reduction, hunger, disease control, and growing numbers of refugees.<sup>14</sup>

In a climate change conference in 2007, the then UK Foreign Secretary while giving his speech emphasized on the need to consider the security agenda while addressing climate change. He reiterated that climatic variations are a global concern hence if not addressed fatalities arise and states may also fail.<sup>15</sup> Such concerns question the efficacy of the existing core element of the concept of security to address the climate change crisis. Thus, ‘freedom from want and fear’ and ‘instilling dignity’ has been made parts of the fundamental concept of security and add to the basic idea of security to understand and protect people from threats like climate change.

It is predicted that in the periods 2030-2060, the global mean temperatures will rise from 2 to 5 degrees centigrade. These rising temperatures will have severe negative impacts on sustainability of the environmental resources such as fresh water supplies, fisheries, forests, and arable land. This will consequently depress economic wellbeing and development of the affected communities.<sup>16</sup> The Intergovernmental Panel on Climate Change (IPCC) reports and the Stern’s review identify major threats to water supply, agriculture sector, health, and industry<sup>17</sup>. Studies affirmed that some regions of the developing world would be hardest hit where climate change will multiply with existing conditions and may overburden the adaptive capacities of governments leading to various state security problems.<sup>18</sup>

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<sup>14</sup> Annan, K. In: *Forum 2009: Climate Change, The Anatomy of a Silent Crisis*

<sup>15</sup> Vogel, B. “Climate change creates security challenge ‘more complex than Cold War’,” *Janes.com*(2007)

<sup>16</sup> *Climate Change 2013*.

<sup>17</sup> *Climate Change 2013*.

<sup>18</sup> A. Miljkovic, *Environmental Impacts on Human Security and the Potential of Conflict*, Report prepared for Sciences Po Lille, France, 2008.

Reoccurring and prolonged drought cycles, changes in the precipitation patterns, salinization of river deltas, desertification, and weakening of ecosystems are potential threats to food and health particularly in the developing world. Sustainable development is greatly affected by environmental degradation through actions like desertification. Likewise, the effect of environmental degradation affects several aspects of human security.

In Kalahari Desert, for instance, aridity is increasing with climate change. Likewise, the Sahara desert has already spread out as much as 1000 km to the south. Compound effects of these changes are growing acts of violence in the Sahelian region of Africa.<sup>19</sup> For instance, the Darfur conflict has been found to have elements of environment as potential driving factors (UNEP, 2007).<sup>20</sup>

Miguel et al, the possibility of conflict increased by fifty percent when the precipitation was low in the region.<sup>21</sup> Likewise, human security and conflict in the Darfur area of Sudan Republic has significant links to climate change. Consequently, a combination of longer periods of drought, overgrazing in the arid and semi-arid areas led to land degradation and increased desertification. The worst impacts of the situation were violence escalation and insecurity in Darfur.<sup>22</sup>

Other scholarly discussions demonstrate that climate change led disasters that undermine human security as every year multitudes need to move from their homes. There are predictions that with the change in the climate, the number of refugees will hike in future because progressive changes

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<sup>19</sup>Parry et al., 2007: *Impacts, Adaptation and Vulnerability*, , Contribution to the Fourth Assessment Report for IPCC, Cambridge University Press, 2007, p, 223.

<sup>20</sup>UNEP, 2007.

<sup>21</sup>Miguel, E. Satyanath, S. Sergenti, E. Economic shocks and Civil Conflict: An Instrumental Variables Approach", *Journal of Political Economy*, 112 : 4, 2004, In: W. Maathai, *The Challenge for Africa*

<sup>22</sup>UNEP, 2012.

in weather pattern will force local communities to move to the nearby towns to look for new shelters and livelihoods. This will overburden the urban areas by putting extra pressure on the available infrastructure. Water scarcity will be a major problem in Asia, Latin America and many parts of Africa. Furthermore, millions of people will die due to floods, famine, diseases, and droughts, leading to increased violence and wars.<sup>23</sup>

Kenya's achievement of vision 2030 is greatly hampered by climate variability. Being a country in the third world, the country's vulnerability to climate variability is not in doubt. If the developments in climate variability are not upturned, then the situation is bound to get worse in the coming years. In many areas, frequent droughts during the rainy season are being experienced while other regions experience severe floods during the short rains. These climatic hazards end up jeopardizing the wellbeing of people as well as effective development in the society. This has resulted into the increased spread of communicable and non-communicable diseases.

The extent of damage of climate change remains unknown. However, it is certain that climate change enhances the challenges of calamities and continuous changes in the environment.<sup>24</sup> The IPCC Fourth Assessment Report (AR4) from 2007 confirmed the science of anthropogenic climate change and its implications on humankind. Citizens and states are both faced with unavoidable challenges of climate change that put human security at stake. Ultimately, the changes in climate threaten both the survival and dignity of people. As the human consequences of climate change

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<sup>23</sup> Environmental Degradation Triggers Tensions and Conflict in Sudan", UNEP, Geneva, June 2007. Retrieved on line 12 April 2019

<sup>24</sup>ELIAMEP. (2008). Gender, Climate Change and Human Security. Athens.

can be multiple, it is crucial to adopt an integrated approach to understand political, social, and environmental implications.

#### **1.5.4 Link between Environmental Degradation and Human Security**

Environmental degradation refers to the decline in natural environment through the natural and human activities. It involves using up or damaging natural resources faster than nature can restore them. International Strategy for Disaster Reduction (ISDR) indicates that environmental degradation reduces the socioeconomic and ecological impacts of the environment.<sup>25</sup> Environmental degradation takes diverse forms, ranging from degraded arable land and fresh water supplies to pollution and destruction of ecosystems. In Africa, environmental degradation is on the increase and is manifested in the form of deforestation, loss of biodiversity and climate change all of which have a negative impact on the fragile state of human security in the African continent. This study mainly focuses on deforestation and its impacts on human security.

The conservation of forests contributes a great deal to the overall human security. The reverse of which would mean that more soil erosion are likely, high vulnerability in case of flood, the pollination functions that are essential to farmers are affected. Forests destruction will thus risk human's quality of life and the existence of other species will be undermined as well.<sup>26</sup>

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<sup>25</sup>ISDR, 2004

<sup>26</sup>Schmink, M., Wood, C. Contested Frontiers in Amazonia. Columbia University Press, New York. (1992)



Africa has particularly suffered from high deforestation with high incidences of uncontrolled development. In retrospect, the security of the continent is at risk due to Africa's over reliance on forest related resources for her survival both in terms of source of food and energy.<sup>27</sup>The high rate of deforestation in Africa accounts for the release of nearly 1.6 billion tons of GHG into the atmosphere.<sup>28</sup> Unless the trend is put on check, Africa will potentially get warmer, subsequently the drier regions in Africa will be severely affected.<sup>29</sup> The associated negative consequence of the increase in temperature negatively affects human health of persons as well as potentially exacerbates the already dire situation of high malnutrition and incidences of water related diseases.<sup>30</sup> Further, these trends will mean that areas that were free of malaria risks becoming suitable for malarial transmission by 2080.<sup>31</sup>

Kenya is at a greater risk than other countries in Africa because it has less forest cover relatively. Despite this less coverage, Kenya has suffered a loss of over 6% of its forest cover in the last decade.<sup>32</sup> The loss is blamed on the fact that most rural homes use fuel wood as a source of energy while nearly 80% of urban population relies on charcoal for cooking. Loss of forests thus poses a great risk to a number of economic sectors in Kenya including food security, and tourism among others.

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<sup>27</sup> FAO.(2010).

<sup>28</sup> Ibid

<sup>29</sup> Pouliot, M., Thorsten, T., Obiri, B.D. & Ouedraogo, B. (2012). Deforestation and the Limited Contribution of Forests to Rural Livelihoods in West Africa: Evidence from Burkina Faso and Ghana.

<sup>30</sup> Parry et al., 2007, pp. 9–10.

<sup>31</sup>B IDEA (2000:268)

<sup>32</sup>FAO 2010. Rome: FAO

About 75% of Kenyans rely on agriculture for survival and demand of arable land has led to the destruction of forests of forests as people migrate in search of land and other resources. Forests, which serve as sinks for carbon dioxide accounted for only 1.7% of Kenya's total land area. This is against the international benchmark of 10% according to the NCCRS (NCCRS 2010). Deforestation is thus gradually leading into desertification, as people continuously strive to derive their livelihoods from these diminishing resources.

Dramatic population increase especially in high agricultural potential areas like the Mt Kenya has led to increased demand for land for farming and building settlements. This has had a pronounced and severe impact on the natural environment and consequently, on the climate, both locally and globally.

### **1.5.5 Poverty and Human Security**

The current literature establishes that the world population is 7 billion and at the year 2050, it will hit 8 billion. In this regard about 2.8 billion live in absolute poverty with an additional 1.5 billion living in substandard standards.<sup>33</sup> As a matter of fact, there is no reduction of relative poverty but on the other hand, increases in the gap amongst the haves and have not and this can be reflected in the global arena just like in the local level.<sup>34</sup>

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<sup>33</sup> UN 2016

<sup>34</sup> Chambers, R., "Sustainable Rural livelihoods: a strategy for people, environment and development." Institute of Development Studies paper no 7 Sussex, UK: 2000.

The poor's subsistence sources of income are usually rain fed farming, herding, fishing, or tourist industries. Climate change elevates poverty level by destroying the sources of livelihoods of the poor.<sup>35</sup> For instance, frequent drought cycles and flash floods often kill the livestock and reduce the crop yields. Likewise, increased acidity of the oceans damages the coral reefs and fish stocks. In future, such negative impacts of climate change may ruin the tourist industries and the livelihoods where people rely on these sources for their incomes.

Reoccurring and prolonged drought cycles, changes in the precipitation patterns, salinization of river deltas, desertification, and weakening of ecosystems are potential threats to food and health security in many countries of Africa, Asia, and Latin America. The nations living in poor conditions, which are particularly dependent on renewable resources such as fisheries and agricultural production, will be exposed to hunger and malnutrition.

### **1.6 Gaps in the Literature**

The above presented literature review identifies that the subject of environmental degradation, climate change and human security has been researched on widely, albeit independently. This research thus seeks to link all concepts and discuss them in a single document.

Despite the existence of global, regional and national climate change mitigation and adaptation policies, Kenya still faces environmental problems ranging from deforestation and climate change which are growing rapidly. This study recognized the need to mainstream climatic variations in both local and international level by examining the effects of deforestation and climatic shifts on

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<sup>35</sup> *75Forum 2009*

the safety of human particularly Mt. Kenya surroundings. This advances climate change and human security policy dialogue for sustainable development especially for the mountain communities, especially in Kenya

## **1.7 Hypotheses**

Ho: Deforestation does not affect human security

H1: Deforestation affects human security

Ho: Climate change affects human security

## **1.8 Justification of the Study**

### **1.8.1 Academic Justification**

The study will provide material that can be utilized by other researchers who will be researching on the same theme or any other that may be related. It will also shed light on other areas that need further research on matters that pertain to the environment and human security. The findings of this research will be used by academicians to compare findings by other researchers in the field of environmental related conflicts. Other researchers can also pursue the areas of study that will be recommended in chapter five.

### **1.8.2 Policy Justification**

In the policy circles, the study will contribute to the design of better policies on environmental degradation and climate change mitigation and adaptation for addressing human security issues. This will help address the disconnect that exists between public policy and people's actions which continue to hurt conservation efforts.

## **1.9 Theoretical Framework**

This study will use Homer-Dixon's environmental resource scarcity theory. Since the 1990s, the environmental scarcity theory has been widely used in the field of international studies especially to explain the events of natural/environmental resource scarcities and the human impacts. In relation to environment and security, Homer-Dixon pioneered the idea of renewable resource/environmental scarcity theory. The basic notion of this theory was formulated on the broad idea of environmental destruction which has the potential to lead to the reduction in the distribution of essential wealth or assets. These scarcities, he noted, commonly affect communities in developing countries whose population highly relies on these resources.

To develop the theory of environmental scarcity, Homer-Dixon studied a number of cases in South Africa, Pakistan, and Mexico. His findings revealed that human populations are compelled to migrate to more environmentally secure areas when subjected to depletion of essential resources such as land and water among others. The situation of depleted resources catalyzed poverty, insecurity, ethnic animosities and spread of violence.<sup>36</sup> Homer-Dixon argues that environmental scarcity occurs in three ways: demand-induced scarcity whereby a rapid population growth and increased consumption leads to greater demand of resources. Supply-induced scarcity is whereby there is a decrease in the availability of resources for consumption and structural scarcity is caused by an unjust or skewed distribution of a key resource. According to him, the three are mutually exclusive and often occur simultaneously.

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<sup>36</sup> Homer-Dixon, & Percival, 1995.

Homer-Dixon's theory of environmental scarcity best complements the environmental degradation-human security research and particularly in the case study of the Mt. Kenya which has undergone continuous degradation that threatens the human security of forest adjacent communities and the whole nation. Therefore, Homer Dixon's environmental resource scarcity theory best captures the issues and complements key themes of the study.

## **1.10 Methodology of the Research**

Research methodology entails a systematic and theoretical analysis of methods that are used in a field of study.

### **1.10.1 Research Design**

This study employed a mixed study design whereby both qualitative and quantitative researches were used in data collection. The design was deemed suitable for this study because neither the quantitative approach nor the qualitative approach would give comprehensive explanations of the impact of environmental factors on human security.

### **1.10.2 Area of Study**

This study was conducted in Mount Kenya region and its environment. The Mount Kenya landscape was important because it has evidence of significant climate change impacts which will add pressure on the landscape and its unique natural resource, which is already being degraded by uncontrolled use and exploitation. Mount Kenya landscape is experiencing highly variable rainfall patterns, invasive species and new pests, flash floods and frost. Significantly affecting the livelihoods of the communities is the erratic and unreliable rainfall pattern.

### **1.10.3 Validity and Reliability**

Conducting a pilot study helped in building the validity of questionnaires and interview schedules, quantitative approaches such as descriptive surveys elicit content validity.<sup>37</sup>The response of the participants in the pilot informed a study that has varying questions in response to the different profile of the survey sample. Additionally, the study ensured that questionnaires and interviews gather the intended data as per the objective of the research to achieve reliability.

The researcher ensured that the information analyzed from the different respondents showed consistency. The consistency of the information prevented the study from presenting diverging or general statements about the impact of environmental factors on human security in Kenya. Additionally, the study drew conclusions in the most accurate and complete way but in line with the results of the study. The approach promoted the validity of the research. The research collected adequate information to prevent errors that led to poor reliability and validity.

### **1.10.4 Data Collection Procedures**

Both primary and secondary data was collected for this study.

#### **a) Primary Data**

Primary data was collected with the aid of semi-structured and unstructured interviews directed to various organization heads of NGOs, CBOs, County government, working to conserve the environment in the Mt. Kenya region. Purposive sampling was used to select the interviewees, based on their skills and expertise. This sampling technique is employed because it brings results that are more accurate.

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<sup>37</sup> Ibid., 189.

Focus Group Discussions (FGDs) was also be part of qualitative data collection approaches used. Focus Group Discussions was used to gain insight on the communities understanding of environmental degradation and climate change. Focus groups consisted of various community members living near the Mt. Kenya forest. The members of these groups were selected on the basis of age, gender and skills to share their experiences and opinions on the given topics of discussion. Questions asked during the discussions were semi structured and open-ended.

#### **b) Secondary Data**

Secondary data for this study was collected from the library, journals, academia, reports and on-line sources in the fields of international relations, human security, and environmental studies.

#### **1.10.5 Data Analysis**

Both qualitative and quantitative techniques were employed in analysing the data collected during this study. While social sciences statistical package was used to analyse the quantitative data, an in-depth content analysis was employed in the analysis of the quantitative data. The emerging themes have been used in making inferences and in drawing conclusions.

#### **1.10.6 Ethical Considerations**

The researcher sought research approval from the University of Nairobi and the National Council of Science, Technology and Innovation (NACOSTI) as necessitated by research on human beings. On the ground, the researcher ensured permission was granted from the local administration and consent was also sought from the respondents before interviews were conducted. All the information obtained was solely used for writing the report of the study and not for any other purpose.



### **1.11 Scope and Limitation of the Study**

This study is mainly geared towards analyzing the nexus between environmental related issues and human security in Africa. However, it is only limited to addressing the impact of deforestation and climate change on human security and thus other environmental concerns such as ozone depletion, land degradation and pollution have not been discussed in depth. Further, the study has only focused on the Mt. Kenya region and not the whole of Kenya.

### **1.12 Chapter Outline**

Chapter One: Introduction to the study and includes the background, the statement of problem, objectives, literature review, hypothesis, rationale of the research, theoretical framework, methods, and sources of data collection and arrangement of chapters.

Chapter Two: Environmental degradation as a threat to human security in Africa.

Chapter Three: Effects of climate change on human security in Kenya.

Chapter Four: How to mitigate environmental degradation and enhance human security in Kenya.

Chapter Five: Data presentation and analysis.

Chapter Six: Conclusion and recommendations.

## **CHAPTER TWO**

### **ENVIRONMENTAL DEGRADATION AS A THREAT TO HUMAN SECURITY IN AFRICA**

#### **2.0 Introduction**

The survival of the human species is highly dependent on environmental well-being. To meet his need, human beings extract environmental resources. With the human population expanding rapidly, more pressure is piled on the environment. As a result, man is extracting the environmental resources at an unsustainable rate resulting in human insecurities stemming from a myriad of environmental factors. These insecurities have manifested in the form of famine, hunger, and water scarcity, conflict over natural resources, extreme temperatures and increase in pathogenic diseases. With a rapidly rising human population, there is depletion of environmental resources, destruction of the environment and extinction of certain wildlife species, consequently, man's ability to meet their need is enormously strained. The overdependence of humans' on the environment to meet their need is a recipe for conflict as everyone struggles to get their share. As people struggle for these resources, communities are pitched against each other and an inequality in the distribution and ownership of the resources. Environmental factors, such as poor soils among others lead to food insecurity. Consequently, people are exposed to nutritional diseases.

Human activities, particularly post the industrial revolution have led to a great length of environmental degradation. Due to these activities, there has been degradation and depletion of natural resources. Such activities have led environmental factors to significantly increase human insecurity in the last few decades. As a result, there has been a growing interest on the subject of environmental protection both in the academia and to the practitioners. Environmental factors have thus been recognized as a contributor to human insecurity.

The security of human being are jeopardized in many ways through shortage of environmental resources. As a result, the environment, from where the human nature draw their livelihood, has turned and become a threat to the survival of the human species due to the actions of the very humans. Environmental factors can thus be a threat to not only individuals but to a national and global scale as well. Some of the environmental factors that have posed threats to the survival of the human kind include; climate variability, land degradation, factors relating to water quality and quantity, the distribution and management of natural resources among others. These factors may by themselves lead to conflict or cause other insecurities such as poverty, infectious diseases and migrations among others. In light of the potential consequences of environmental degradation to human security, it is imperative that the environment is well managed to ensure the security of the human kind.<sup>38</sup>

## **2.1 The challenge of environmental degradation**

The population of the world is growing at an alarming speed. It is estimated that by the year 2025, the world's population will hit 8.1 billion and to a further 10.9 billion by 2100.<sup>39</sup> As a result, the developing world, especially Africa where the rate of population increase is highest has special responsibilities in the containment of environmental degradation.<sup>40</sup> While claims have been made on the world's capacity to host over 50 billion persons, the burden of environmental degradation and for keeping the environment habitable for humans remains central to environmentalists. In Africa, the major environmental challenges that must be addressed to ensure human security

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<sup>38</sup>UN, 2004.

<sup>39</sup>UNFPA, 2013

<sup>40</sup>Barbier, E, 1997.

include soil erosion, the depletion and degradation of tropical forests, air and water pollution, fuel wood shortage, reduction in biological diversity or genetic erosion, and extinction of species.<sup>41</sup>

The situation of environmental challenge in Africa is exacerbated by globalization, particularly economic globalization that has led to a great change in the global economic structure due to the ideological and political victories that the world's free economies have had. Consequently, there has been an introduction of an international division of labor that has seen Africa rendered to be a source of cheap labor.<sup>42</sup> In light of the challenges, Africa and other developing countries have resorted to investing in regional integration to put the pressure of globalization on check and as a way of avoiding marginalization. Unfortunately, these efforts have prioritized economic development without putting into consideration environment concerns.<sup>43</sup>

In Africa, the enclosure of land and knowledge has posed a great challenge to the environment beginning from the time capitalism emerged and the wave of European enclosure movement. The commodification of environmental factors (land, ocean and atmosphere) was also as a result of the emergence of capitalism. The main concern of capitalism was the expansion and incorporation of raw material resources and opportunities for more profits. Commodification of natural resources resulting from capitalism was a great contribution to the challenges the human kind is facing today. Under the power of capital, enclosure has yielded the taking advantage of knowledge and land that has occasioned the stronger getting more land than the weaker in the society. Under these circumstances, suffice is to say that the owners created monopoly of knowledge through patterns that restrict other people to use common knowledge. These kind of enclosure have gone beyond

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<sup>41</sup> Buzan and Wæver, 1998.

<sup>42</sup>McMichael, 2000.

<sup>43</sup>Zhang, 2001

the existing inequities and thereby creating societal and environmental degradation.<sup>44</sup> The majority whose land would have moved to the powerful few, will in turn have their security in respect of the benefits that may accrue from land ownership be at threat.

Kenya, exemplifies a great example of the enclosure movement. After the country becoming a British protectorate, the economic structure of the country changed and has never been the same. Before the enclosure, there had not been individual ownership, the inhabitants of the country practiced nomadic and sedentary economic structure. During that earlier time, major conflicts of resources was unheard of, instead every member of the community aspired to protect natural resources and the environment at large. The coming of the colonizer transformed and linked Kenya's economy to capitalism.

Colonization saw the emergence of inequalities, with the European settlers taking big chunks of fertile land leaving the natives to become peasants and laborers' and with no economic independence. Upon independence, the natives were given an opportunity to regain control of their land but at a fee. The scene is replicated in almost every country on Africa, who went to an enclosure system that created different classes. A small elite class which controlled resources and the African laborers on the other side. While the elites fought for control of resources, less attention was paid to conservation of the environment. The disadvantaged group in scramble for the scarce resources have brought about environmental problems among them desertification and deforestations among others.

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<sup>44</sup> Miller, 2001

Notwithstanding the fact that countries in Africa just like their counterparts in developed world have equal legal opportunity in negotiations and United Nations' (UN) gives them support in airing their issues. Africa still faces disenfranchisements in pushing for sustainable environmental development. While Africa is generally accepted in policy making tables in international spheres, it lacks enforcement ability on an array of issues including environmental issues.<sup>45</sup>

The contribution of the increase in population on the degradation of the environment in developing nations, and particularly in Africa was recognized by the United Nation's Brundtland Commission.<sup>46</sup> Considering that majority of Africa's poor live in rural areas and are highly dependent on agriculture as a source of their livelihood, their security would greatly be hampered by the degradation of the environment. The effect is two way, the activities and actions of these rural dwellers harm the environment and the effect on the environment leads to deploring security to them.<sup>47</sup>

## **2.2 The Threat of Environmental Degradation on Human Security**

Among the causes of ecological degeneration is climate change. Therefore, most of the climatic instigated insecurity threats can also be as a result of environmental degradation. As the environment loses its capacity to support life, then the living conditions of the people in such a situation are bound to move to better environments in an attempt to avoid the poor conditions. As noted earlier, loss of fertility, therefore, reduces agriculture production. For example, the Northern part of Darfur, Sudan top soil was depleted because of desertification making people to move away

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<sup>45</sup> Fisher, & Green, 2004.

<sup>46</sup> Chatterjee, & Finger, (1994).

<sup>47</sup>Bulte, Soest, (2001). Environmental Degradation in Developing Countries: Households and the (reverse) Environmental Kuznets Curve. *Journal of Development Economics*, 65,(1) , 225-235

from north towards south for the search of arable land, and as a result, this led to conflicts over access and distribution of resources.<sup>48</sup>

According to Krause,<sup>49</sup> environmental degradation indirectly causes national and international wars as these factors interact more with the more direct aspects, therefore, intensifying the drifts that already exist. Refugee problems may aggravate conflict between two neighboring nations. Some environmental conditions, such as pollution and depletion of natural resources cause an acute risk to security.<sup>50</sup> Such degradations predispose individuals to strife; a good example being the security unrest that occurred in Haiti in 2008.

According to the United States Agency for International Development (USAID), the country got into violent protest due to the destruction of her forests. Statistics indicate that in 2008, only 1.5% of the nation was forested compared to 60% in 1923.<sup>51</sup> As a result of industrialization, the developing countries have lost most of their forest, and only one-fifth of the world forest remains intact.<sup>52</sup>

The high rate of deforestation and increased progress towards industrialization leads to more accumulation of GHGs such as CO<sub>2</sub> that could have otherwise reduced through the process of photosynthesis. The resulting condition is global warming which sees rises in sea level. Many people get displaced as a result of flooding, storms, cyclones, and typhoons which are accelerated

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<sup>48</sup> Theisen, O.M., Gleditsch, N.P. and Buhaug, H., 2013. Climatic change, 117(3), pp.613-625.

<sup>49</sup> Krause, J., 2014.

<sup>50</sup> Adger, , Pulhin, Barnett, J., Dabelko, Hovelsrud, Levy, M., Oswald Spring, U. and Vogel, C.H., 2014. Human security. Cambridge University Press.

<sup>51</sup> Aviles, L.A., 2016.

<sup>52</sup> Schomers, S. and Matzdorf, B., 2013.

by global warming causing loss of lives and disorder in the country and its neighbors through the refugee.

Environmental degradation causes the loss of biodiversity due to overexploitation and pollution of the available resource. There is increased pressure on the scarce resources as equal sharing becomes a problem creating strife among the communities that share the resources. The problem could extend to other countries. Africa is replete with examples of insecurities stemming from environmental degradation, the case of Rwanda for instance is one such example in which the conflicts of the 1990s were as a result of multiple factors but key among them was rapid population expansion, land shortage and inequality, land degradation among others.<sup>53</sup>

Availability of food is a key determinant of how secure people are, the reliability/unreliability of which will determine the extent of security/insecurity in a given jurisdiction. Food security is a function of multiple environmental factors including availability and distribution of water, land to the populace among others. With environmental degradation the security of food cannot be guaranteed. This affects biodiversity and consequently, all these hamper food security and in turn threaten human security.

Due to environmental degradation, majority of Africa's poor are not food secure, in turn, there is a high rate of migration of individuals from their native lands to places that can still produce good farm yields. The process of migration is not clean of resistance and the immigrants increase the strain to natural resources in the places they move to. The potential competition for these resources

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<sup>53</sup> Renner, 1996



with the native dwellers is a recipe for conflicts as has been witnessed in the Sahel region in Africa where farmers and herders have had continuous conflict over scarce productive land more so with the increasing desertification. Similar conflicts have been witnessed in northern Nigeria, Kenya, and in Sudan's Darfur region where scarcity of resources has caused conflict.<sup>54</sup>

Climate variability has contribute immensely to ecological degeneration, consequently, climate instigated insecurity cannot be divorced from environmental degradation. Intense environmental degradation affects the environments ability to support life, as a result, individuals' livelihoods in the affected areas is negatively impacted hence the desire to move to new and better environments where support to their living conditions by the environment is guaranteed. Due to environmental degradation, say through soil erosion, the fertility of individuals' agricultural land is reduced and thus low farm yield. With decreased farm yield the food security of the populace is affected hence the possibility of migration as a coping strategy. Such a scene was played in the Northern part of Darfur, Sudan where due to human activity (desertification) the topsoil was eroded, consequently, majority of the residents migrated from the North towards the South in search of arable land. The security of the host community and for those that had moved was affected as there was a subsequent struggle over resources resulting to conflicts.<sup>55</sup>

That climate degradation cause conflict is not a disputed fact. Krause,<sup>56</sup> opine that there is evidence to suggest that environmental degradation has both direct and indirect relationship with wars not only at a local but at an international level as well. He further elucidates that this relationship is

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<sup>54</sup> Stoddard, "Scarce, Degraded Land Is Spark for Africa Conflict," Yahoo News, 22 July 2006.

<sup>55</sup> Theisen, and Buhaug, 2013.

<sup>56</sup> Krause, 2014.

strengthened by the interaction of environmental degradation factors with livelihood aspects and thereby intensifying already existing drifts. A case in point is a situation where the movement of environmental refugees aggravates conflict between two neighboring nations and thereby predisposing persons to strife like was the case of the 2008 unrest in Haiti.<sup>57</sup> The unrest in Haiti is noted to have stemmed from environmental degradation after destruction of forests.<sup>58</sup> Similar experiences were witnessed in the 1990s Rwanda's conflict where among the many factors that led to the conflict was environmental degradation that exacerbated the difference between opposing elites and the subsequent civil war.<sup>59</sup> Yet again in Chiapas, Mexico's southernmost state where the 1994 uprising was accounted for by environmental degradation related factors like deforestation and scramble over arable land

Activities on the environment by human beings such as the installation of industry promotes GHGs such as CO<sup>2</sup> and this further have negative implications on human security. With an increased GHGs, there is global warming that leads to a rise in sea level. With such a rise, human security is further affected as the rise leads to more flooding, storms, cyclones, and typhoons.<sup>60</sup> Among the concerns in the environment-security-conflict nexus are energy, food security, availability of water and infectious disease.

The security of people is highly informed by the ability of the people to access adequate food supply. Food security is directly associated with environmental factors including availability of land, availability of water, land degradation among others. The greatest contributors to threat to

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<sup>57</sup> Adger, Pulhin, Barnett, Dabelko, Hovelsrud, Levy, Oswald Spring, and Vogel, 2014.

<sup>58</sup> Aviles, 2016.

<sup>59</sup> Renner, 1996.

<sup>60</sup> Ibid

food security are climate change and biodiversity loss. Reports by the U.N. Food and Agriculture Organization indicate that hunger and chronic nutrient deficiencies is a major issue affecting nearly over two billion people. The report further indicate that about 1.4 billion people live in poor habitation, and that among these are about 500 million living in arid regions with others having to put up in areas with poor quality soils and are forced to cultivate steep slopes and fragile ecosystems. The productivity of such poor quality soils is poor and as such people in such areas are compelled to move in such of better dwelling places.

Food insecurity outcomes are varied with some turn out to be violent. Incidences of protracted conflict have been recorded in the Sahel region in Africa with farmers competing over scarce land, more so with an increase in desertification. Such related conflicts have also been witnessed in Kenya, Nigeria and Sudan. While the conflicts are disguised as ethnic and political, the underlying contributors to the conflicts are struggle over scarce resources.<sup>61</sup>

From the review, suffice is to say that there is a complex and intertwined relationship between the environment and population. This relationship is mediated by a number of factors including culture, political and socioeconomic factors among others. There is also a significant level of dependence between the environment and the population, degradation of the environment thus significantly affects the security of the population.<sup>62</sup> The relationship between the environment and the population is unclear considering the scope of the relationship be it short term, long-term, global or even local.

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<sup>61</sup> Stoddard, 2005.

<sup>62</sup> Shaw, Paul. 1992

The environmental challenges that lead to scarcity of food water and the subsequent effect on health undermine the populations' livelihood and thereby overwhelming the coping ability of communities. Such challenges ay also cause conflict when communities set themselves against each other as competition over scarce resources increase.<sup>63</sup> Besides environmental degradation undermining the livelihood of populations, it also sets ground for an increase in natural disasters.

### **2.3 Summary**

This chapter has highlighted the relationship between environmental factors and human security. It has reviewed literature that has shown that the well-being of individuals is highly dependent on environmental factors. The chapter has also shown that unless the environment is protected, the security of individuals is not guaranteed, as such actions by individuals should be checked, failure of which will lead to unbearable consequences. The chapter has highlighted how environmental degradation threatens human security in terms of availability of food, human habitation and availability of water among others. Environmental factors have been found to cause migration in extreme cases and in line with Homer-Dixon this may lead to conflict as migrants scramble for natural resources with the host communities.

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<sup>63</sup> Connell, nd

## CHAPTER THREE

### CLIMATE CHANGE AS A HUMAN SECURITY THREAT IN KENYA

#### 3.0 Introduction

This chapter reviews previous studies on the effects of climate change on human security in Kenya. The chapter highlights the different risks arising from climate change to communities and individuals including the livelihoods, political stability and culture. The chapter shows the efforts that have been used in addressing the nexus between climate variability and human security.<sup>64</sup>

The nexus between climate variability and environmental resource scarcity, water, land, food security and migration will also be addressed. The correlation between these factors and human security is highlighted.

Cognizance is made to the fact that human security is not only a pressing issue in Kenya but one that has attracted the concern of scholars and practitioners alike on a global front. As such, persons affected by climate change are literally spread across the globe.<sup>65</sup> However, research suggests that the suffering of individuals as a result of the impact of climate change is likely to be felt more in the developing world, particularly in Africa.<sup>66</sup> It is important to note at this point that the interaction of climate change and security has not been without contention, with suggestions that these interaction have not paid due attention to the human security aspect but has been biased in favor

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<sup>64</sup>Sygna, L., K. O'Brien, and J. Wolf (eds.), 2013.

<sup>65</sup>Pietsch, J. and I. McAllister, 2010.

<sup>66</sup>Berrang-Ford, Ford, and Paterson, 2011: Are we adapting to climate change? *Global Environmental Change*, 21, 25-33.

of the response of the state in as far as mitigation and adaptation abilities are concerned.<sup>67</sup> In light of these none or little attention, the chapter is thus a significant contribution to knowledge on the nexus between climate change and human security in Kenya.<sup>68</sup>

### **3.1 The Nexus between Climate Change and Environmental Resource Scarcities and the Potential Effect on Human Security**

The fact that environmental resources have a relationship with human security is undisputed. These resources include croplands, minerals, fisheries, forests among others. All these resources play a significant role in the survival of the human life. Depletion and degradation of any of these resources results in environmental scarcity occasioned by an imbalance between the supply and demand of the resource. The depletion and degradation of these resources occurs courtesy of human activities and population growth.<sup>69</sup>

With the projection of a rise in population to about 10 million by 2050<sup>70</sup> the growth will potentially affect developing states like Kenya.<sup>71</sup> The growth in population will definitely increase the demand in resources. Besides these, the affluence of the developed world on developing world that has seen the demands of receding resources where the developed world seek for resources from developing countries all pile pressure on the scarce resources.

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<sup>67</sup>Oels, 2013: Rendering climate change governable by risk: from probability to contingency. *Geoforum*, 45, 17-29.

<sup>68</sup> Oswald Spring, Ú., 2012: Can health be securitized? *Human Evolution*, 27(1-3), 21- 29.

<sup>69</sup> D. W. Joak, 2014

<sup>70</sup> UNDESA, *World Population Prospects: The 2008 Revision*, (New York: United Nations, 2008).

<sup>71</sup> Ibid

### **3.2 The Nexus between Climate Change and Water and Potential Effect on Human Security**

All living creatures require water for their survival. Water resources are thus critical in nearly all sectors of production. With a constantly growing population, the demand for water is bound to grow. Most countries in Africa rely on rivers as the largest source of fresh water. Deforestation and pollution affects the availability and quality of river water.<sup>72</sup> The situation is worse in the sub-Saharan Africa where only about 22 percent of the population have an access to clean water. Water pollution is an issue that can potentially lead to spread of water borne diseases and this affects the human health.<sup>73</sup>

Considering that majority of Africa rely on rivers for fresh water, climate change that alters rainfall patterns threaten the availability of fresh water.<sup>74</sup> An increase in temperature will intensify evaporation and consequently reducing the amount of available water.<sup>75</sup> With the effect on water availability, coupled with a rise in population the potential for conflicts erupting as societies scramble for the available water resources is high. Reduction in water will also mean that farm yields will be considerably reduced and this will affect food security.

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<sup>72</sup> Homer-Dixon, *Environment, Scarcity and Violence*, (Princeton: Princeton University Press, 1999), pp. 8-9.

<sup>73</sup> Tatlock, 2006.

<sup>74</sup> Mwangi, "Climate Change, Hydro-politics and Security in Lesotho" In: D. A. Mwiturubani and Jo-Ansie van Wyk, *Climate Change and Natural Resources Conflicts in Africa*, Institute for Security Studies, Monograph no. 170, 2010, pp. 45-47.

<sup>75</sup> *Water for Food, Water for Life*. 2007.

Statistics indicate that there is constantly a diminishing effect on water resources due to climate change effects and huge population globally still have challenges of water<sup>76</sup>. Both fresh water streams and underground water is affected by for example a rise in sea level, as a result available fresh water for multiple uses will be affected.<sup>77</sup> With a rise in sea level, those in the coastal regions are the most affected with a potential loss of nearly 50% of fresh water supply as salty-water intrude into underground fresh water.<sup>78</sup>

Many countries around the world are incapable of providing enough supply of fresh water, as such citizens are usually compelled to scramble for fresh water. As societies scramble for scarce resources like water, chances of economic instabilities increasing are likely at the same time, there will be an increase in poor health, inadequate hygiene and food insecurity which are all critical pillars to human security.<sup>79</sup> In regions where water resources are shared, the potential for water conflicts is high if there is a risk of water shortage that will affect storage. Africa is one such region in which scarcity of water can potentially cause conflict. The history of Africa is replete with examples of water related conflicts; riparian states in the Kunene, Zambezi, Limpopo, Orange, and Nile Basins have all recorded water conflicts in the past.<sup>80</sup> While conflicts have been recorded in these regions, it may not be said categorically that these conflicts were as a result of water, however, water helped to exacerbate the prevailing tensions already in the structure.<sup>81</sup>

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<sup>76</sup> J. Rockstrom et al., "Future Water Availability for Global Food Production: The Potential of Green Water for Increasing Resilience to Global Change," *Water Resources*, 45, 2009.

<sup>77</sup> C. Miller, „Climate Change Impacts on Water“, National Center for Atmospheric Research, 2009.

<sup>78</sup> R. J. Nicholls et al, 2007, pp. 315-356.

<sup>79</sup>M. Falkenmark, "The Massive Scarcity Now Threatening Africa: Why Isn't it being Addressed?" *Ambio*, Volume 18, No. 2, 1989/90.

<sup>80</sup> O. Brown and A. Crawford, 2009, p. 15.

<sup>81</sup> Ibid



The conflicts between Senegal and Mauritania are linked to the waters of Senegal River that is shared in Senegal, Mali and Mauritania. In these countries, there has been a persistence of drought that has led to the death of thousands as violence have been employed as people struggle for accessing water resources.<sup>82</sup> The risk of water conflicts is further exacerbated by the absence of formal rules or treaties over the division of water resources.<sup>83</sup> With evidence that majority of global international basins lack any cooperative management framework, it is apparent that the risk of conflict is likely.

### **3.3 The Nexus between Climate Change and Land and their Potential Effect on Human Security**

Nearly 30% of the earth's surface is dry land while the rest is water. Of the 30% only 11% is arable and the rest unsuitable for crop productivity.<sup>84</sup> Africa is the second largest continent with a total land area of 20.4 per cent of the earth but only a small area is exploited, much remains unexploited for agricultural production. It is evident that majority of Africa is highly dependent on agricultural production and as such vulnerable to climatic change. Climate change has significantly affected land productivity and thereby subjected the livelihood of many people in Africa at a risk.<sup>85</sup>

Scientific models have predicted that dry land will be remarkable be affected by reduced rainfall in the present century. Evidence suggests that dry lands in many parts of the world is experiencing more than average warming.<sup>86</sup> With climate change the dry lands in the Sub Saharan Africa will

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<sup>82</sup> S. A. Algamal, 2011, pp. 19-21.

<sup>83</sup> O. Mwangi, „State Centrism, Legal Pluralism and Management of Water resources in Kenya“, *Lesotho Law Journal* 16(1), 2006, pp. 93-94.

<sup>84</sup> D. Moyo, *Winner Takes All*, (London: Penguin Group, 2012), p. 28.

<sup>85</sup> Ramankutty et al., 11(5), 2002, pp. 377-392.

<sup>86</sup> Williams et al., 1996), p. 270.

potentially expand and consequently reducing available arable.<sup>87</sup> Available arable land has also been affected by soil erosion due to an increase in rainfall in Africa this had had a serious effect on the crop yields that have considerably reduced. At the same time, many farmers in Africa have had poor farming practices that have seen a depletion of nutrients and subsequently leading to land degradation, all these have negative consequences to human security.

Land degradation has also had a negative effect on marine ecosystem in many small islands and coastal areas. The marine ecosystem is a source of livelihood to many inhabitants living in the shorelines. Studies reveal that as a result of climate change, there has been a rise in sea levels, more coastal erosions, storms and frequent floods in the shoreline affecting the livelihood and development of the African coastal areas and islands.<sup>88</sup>

### **3.4 Climate Change and Food Security**

Food security is essential determinant to human survival. It entails not only the availability but access, consistency and utilization of food as well. Food security is threatened by an increased concentration of greenhouse gas emission. For example, an increase in the levels of carbon dioxide leads to warming and changes in rainfall patterns which have a direct consequent in food production and its availability.<sup>89</sup> The impact of climate change on food production varies from region to region. Statistics indicate that climate change will put pressure on food production and livelihood sources.

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<sup>87</sup> Land and Climate Change: The Role of Sustainable Land Management for Climate Change Adaptation and Mitigation in Sub Saharan Africa, Issue Paper, April 2009, p. 6.

<sup>88</sup> E. C. F. Bird. *Submerging Coasts*: 1993, pp. 147-152.

<sup>89</sup> Parry et al, 2004, pp. 53-67.

Land productivity has also been significantly affected by the long term changes in the land use and land cover. In turn, subsistence farmers' incomes have been greatly reduced particularly on rural areas. At the same time, the lack of resources reduces access to food, and in the wake of climate change the situation is worse. Lack of food may also increase the chances of citizen revolting against governments and further putting the security of individuals at a risk. From the historical evidence, violent conflicts arise when small minority of the affluent is still satisfied and unaffected by the food crisis while greater number of population is hungry.<sup>90</sup>

### **3.5 Potential Pathways from Climate Change to Migration as a security issue**

The link between climate change and human migration is well established. Studies have demonstrated that climate shocks in the short-run displaces population and disrupts individuals' places of residence and economies. Overtime as individuals move to new places there occurs a permanent migration.<sup>91</sup> The IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) concurs with the view that extreme climate change will result in migrations as the levels of displacements would be more over time.

Literature further suggests that migration victims, moving as a consequent of climate change do not always intend to move permanently, but move as a temporary measure and will attempt to go back to their original place soon as they deem that the situation has improved. Climate change displacements have been recorded in many parts of the world. In 2010, floods in Pakistan led to

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<sup>90</sup> R. Schubert et al, *Climate Change as a Security Risk*, German Advisory Council on Global Change, (London and Sterling: Earthscan, 2008).

<sup>91</sup> Ibid

displacement of a big number of individuals across a wide area.<sup>92</sup> The nature of migration, [permanent/temporary], is informed by the structural and economic causes of the vulnerabilities of the affected group. This was true in the case of the New Orleans, after Hurricane Katrina where individuals who were economically disadvantaged have not returned after the displacement.<sup>93</sup> The slow rate of return is noted by Fussell and colleagues<sup>94</sup> who noted that the rate of return in the aftermath of Hurricane Katrina was slow partly due to the fact that the affected families had suffered a great housing damage. Displacement thus affects human security in a number of ways including, shelter, health, economic power among others leading to a chronic insecurity syndrome.<sup>95</sup> In addition, there are gender differences in displacements with women bearing the greatest brunt of extreme climatic events.<sup>96</sup>

Climate shock is thus not only associated with migration but with immobility as well. Climate shocks can potentially change the economic structures of families and thus shaping the victims overall abilities to cope with the adverse effects of climate change. The available structural systems may also inform the extent of vulnerabilities and the after effects. In countries with early warning systems for example, the effect of extreme climate shocks may not be as much as in places with no such systems. In the Honduras, where there was no early warning system earlier on, the effects

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<sup>92</sup>Gaurav, Sinha, Panda, 2011. The flood of 2010 in Pakistan: a perspective analysis using remote sensing data. *Natural Hazards*, 59(3), 1815- 1826.

<sup>93</sup>Mutter, J. 2010: Disasters widen the rich-poor gap, *Nature*, 466, 1042

<sup>94</sup> Fussell, E., N. Sastry, and M. Van Landingham, 2010.

<sup>95</sup>Hori, M. and Schafer, 2010: Social costs of displacement in Louisiana after Hurricanes Katrina and Rita. *Population and Environment*, 31(1-3), 64-86.

<sup>96</sup> Hunter and David, 2011

of Hurricane Mitch of the 1990,<sup>97</sup> were devastating but a decade later, the situation had improved when an early warning system was put in place.<sup>98</sup>

It must be pointed out that migration may seem to be a quick fix in the event of a climate shock, its cost may be a hindrance to families that may opt for it. For example, in the event that livestock is involved, the cost is disruptive and as such families will only resort to it as a last option.<sup>99</sup> Migration was noted as the last choice for families in eight Australian settlements that were experiencing long-term droughts.<sup>100</sup> Further evidence were revealed in a study by Marshall and colleagues<sup>101</sup> that revealed that the attachment individuals have with their homes makes them reluctant to opt for migration unless in a very severe situation. However, climate has proved to have extreme effects that do not leave the victims with the option of deciding whether or not to move but simply to move. In the event of movement, the economic life of many families are affected and thus having implications on their security.<sup>102</sup>

Migration outcomes are also affected by the abilities of individuals to access resources necessary for the migration.<sup>103</sup> There is thus a direct correlation between vulnerability and mobility, in which case an individual's capability to migrate will greatly inform their vulnerability extent to climate shocks. In Kenya, communities in rural areas are more affected because their capabilities are

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<sup>97</sup>McSweeney, and Coomes, 2011.

<sup>98</sup>Villagrán de León, 2009.. Springer-Verlag Berlin Heidelberg, Germany, pp. 1147-1158.

<sup>99</sup>McLeman, R., 2009.

<sup>100</sup>Hurlimann, A. and S. Dolnicar, 2011.

<sup>101</sup> Marshall, N.A., S.E. Park, W.N. Adger, K. Brown, and S.M. Howden, 2012

<sup>102</sup> McLeman and Hunter (2010)

<sup>103</sup> Black, R., N.W. Arnell, W.N. Adger, D. Thomas, and A. Geddes, 2013.

constrained by an array of factors including poverty.<sup>104</sup> Migration is thus seen as an emergency response and as such creates conditions of debt and thereby increasing the victim's vulnerability.<sup>105</sup>

While climate change has been proven to increase the chances of displacements and subsequent population migration, certain evidence suggests the contrary. In the pastoral system, longer distance migrations are reduce by drought.<sup>106</sup> A study by Henry and colleagues showed that long drought increased internal migrations in Bukina Faso but reduced long-distance and cross boarder migrations. The results were found to be informed by the fact that long-distance and cross boarder migrations are cost effective and as such are only possibly when favourable conditions are available to the residents. Wealthier households were thus found to engage in long-distance and cross-border migrations more often. The economic conditions are therefore significant element in one's migration capability.<sup>107</sup>

Notwithstanding, households' capabilities to migrate, the overarching truth is that as individuals migrate, there are higher chances of them being exposed to hazardous climatic conditions as they move to their new destinations.<sup>108</sup> Evidence suggests that immigrants are usually more vulnerable in their new environments as they may not have adapted well to the prevailing conditions in their new destinations. The immigrants may not be aware of the best spots in their new destinations that do not expose them to more vulnerabilities in the event of climatic shocks in their new

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<sup>104</sup> Ibid

<sup>105</sup> Warner, K. and T.Afifi, 2013.

<sup>106</sup> Sánchez-Cohen, I., Ú. Oswald Spring, G. Díaz Padilla, J. Cerano Paredes, M.A. Inzunza Ibarra, R. López López, and J. Villanueva Díaz, 2013: Forced migration, climate change, mitigation and adaptive policies in Mexico: some functional relationships. *International Migration*, 51, 53-72.

<sup>107</sup> Smith, and Black, 2012.

<sup>108</sup> Black et al., 2011b

destination.<sup>109</sup> Previous evidence have shown this tendency where migrants in Buenos Aires, Lagos, Mumbai, and Dakar lived in more climatic vulnerable spots than those that had lived in those locations for a longer period.<sup>110</sup>

### **3.6 Climate Change and Armed Conflict**

The relationship between climate change and armed conflict has attracted scholarly discourse in the recent past. Studies exploring the relationship have been conducted with a use of different methodologies.<sup>111</sup>

Findings by DeMenocal<sup>112</sup> reveal that majority of changes in climate patterns have in the past coincided with the collapse of civilizations (powerful) for example the Anasazi, the Akkadian, Classic Maya, Mochica, and Tiwanaku empires. The factors behind such coincidences have however not been researched by the previous studies. The studies have however revealed that there is an association between climate change and major political changes. The lack of clarity of the association between these variables means that the findings cannot be applied in real world situation. Caution should therefore be taken in making conclusions on the association of climate change and the fall of political powers.<sup>113</sup>

Contemporary researches on this relationship have put emphasis on intrastate conflicts. The present study has highlighted long-term effects of environmental degradation on human security. The reviewed literature has shown that majority of previous studies that have focused on a similar

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<sup>109</sup> McMichael et al., 2012

<sup>110</sup> Mehrotra, Rosenzweig, and Solecki, 2011.

<sup>111</sup> Themnér, and Wallenstein, 2012

<sup>112</sup> DeMenocal, 2001.

<sup>113</sup> Butzer, , 2012.

relationship emphasized on the short-term effects of environmental degradation on human security.<sup>114</sup> The findings of the previous studies reveal a weak association between environmental degradation and human security.<sup>115</sup>

Much of these studies have examined these association in relation to Africa and have used satellite enhanced data. A global focus on the relationship has used data for a longer period, and in countries that have had climate related calamities. The findings of this study are supported by findings of Raleigh and Kniveton that shows the correlation of conflicts and climate.<sup>116</sup>

Literature reveals a growing trend in studies focusing on the association of climate change and non-state conflict. Evidence show that there is an association between environmental degradation in a resource dependent contributes to localized violent conflict.<sup>117</sup> Climate related conflicts directly affect human security.<sup>118</sup> The risk of local wars is exacerbated by environmental degradation, for instance by the agricultural productivity of a country that rely heavily on agriculture for its economy to be affected by environmental degradation it would mean that the well-being of the populace in these countries will be affected negatively.<sup>119</sup> The economic shocks<sup>120</sup> that result from effects of climate degradation would mean that a number of elements of human livelihood including health, security, and food among others will be affected.<sup>121</sup>

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<sup>114</sup> Theisen, 2012.

<sup>115</sup> Theisen, Gleditsch, and Buhaug, 2013.

<sup>116</sup>Raleigh, Kniveton, 2012: Come rain or shine: an analysis of conflict and climate variability in East Africa. *Journal of Peace Research*, 49(1), 51-64.

<sup>117</sup> Raleigh and Kniveton, 2012

<sup>118</sup> Bergholt, and Lujala, 2012.

<sup>119</sup> Eboli, Parrado, and Roson, 2010.

<sup>120</sup> Bergholt and Lujala, 2012

<sup>121</sup> Ibid



### **3.7 Summary**

The chapter has demonstrated how climate change exacerbates the vulnerabilities of individuals and families to climate shocks. In particular, the chapter has shown that environmental scarcity may be worsened by climate change. As a result, as families and communities scramble for these resources, it may be a source of conflict, at the same time the environmental ability to act as a source of livelihood to these communities will be negatively affected. Consequently, the food security of the affected communities is not assured. The chapter has also demonstrated that climate change affects water both in terms of availability and salinity. A rise in sea level has been shown to affect the salinity of water and thereby affect its usage to the humans and thus their security is at risk, at the same time rainfall patterns are affected by climate change, the security communities that rely on rainfall for their agricultural activities are effectively affected by the changing patterns.

## **CHAPTER FOUR**

### **MITIGATING ENVIRONMENTAL DEGRADATION AND ENHANCING HUMAN SECURITY IN KENYA**

#### **4.0 Introduction**

The mechanisms for addressing human security have the sole objective of reducing the vulnerabilities that result from environmental degradation.<sup>122</sup> An examination of attempted interventions for addressing human insecurity reveals that the livelihood of individuals can be enhanced through adaptive approaches to the effects of climate change.<sup>123</sup> In as far as human security is related to the environment, ways of enhancing the security must focus on addressing the potential impacts of environmental degradation for the promotion of conservation of the environment. The issues that have been addressed in Kenya touch on areas of arable land, crop yields, and natural hazards considering that the effects of environmental degradation are unevenly distributed and affects developing countries like Kenya more because of its reliance on economic sectors that are dependent on climate variability such as fisheries, agriculture, and forestry.<sup>124</sup> This chapter highlights some of the mechanisms that have been taken to address human insecurity in Kenya.

#### **4.1 Institutional Instruments**

Institutional changes can take any shape including the creation of new institutions, restructuring of existing institutions, the enactment of new laws, and imposition of new taxes among others.

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<sup>122</sup>Deligiannis, 2012: The evolution of environment-conflict research: toward a livelihood framework. *Global Environmental Politics*, 12(1), 78-100.

<sup>123</sup>Dercon, 2004: *Insurance against Poverty*. Oxford, UK and New York, NY, USA, 465 pp.

<sup>124</sup> Reid, H. and Swiderska, K., 2008.

While such institutional changes may be promising, their operationalization may take long for the desired results to be realized. The institutional approach of enhancing human security are best suited for long-term structural problems, they are thus most effective as preventive measures.

Kenya for a long time did not have institutionalized structures for addressing environmental governance issues. The country has however, had sectoral laws that aim at promotion of environmental conservation. The existing sectoral laws were not effective *to* protect and conserve environmental concerns because they were not holistic. Consequently, laws strictly had no stipulations on the rights of individuals to clean environments; the duty of the state in the protection of the environment, and the need for the environment to be conserved for its ecological and intrinsic worth. In like of the deficiencies of the sectoral laws, a law for the coordination and management of the environment [the Environmental Management and Coordination Act] was enacted to be the key reference point for the harmonization of the diverse sectoral laws and for the improvement of environmental management in Kenya.<sup>125</sup> Section 3 of the Act provides for the rights of the individuals by speaking to the entitlement of a person to a clean and healthy environment, it also provides that the individual while with these rights to be responsible for safeguarding the surrounding.

Enforcement of these laws addressed certain issues relating to *locus standi* that have been cited as setbacks in the litigation of environmental disputes.<sup>126</sup>In some instances, courts have been used in invoking individuals to sue the government against destruction of the environment as disguise for

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<sup>125</sup> Act No. 8 of 1999

<sup>126</sup> Ibid, Section 3 (4).

championing public interest when that is not the case.<sup>127</sup> Enactment of the law is a huge stride towards promotion and fulfillment of environmental rights in Kenya. Together with the achievements brought about by the Act, the promulgation of the Kenya's 2010 constitution further saw the issue of environmental rights constitutionalised.<sup>128</sup>

The constitution now guarantees every Kenyan a right to a clean and healthy environment unlike was the case previously under the Act where it was just a statutory right.<sup>129</sup> Further the protection of the environment is equally guaranteed by the constitution and the subsequent enforcement is enhanced through equitable justice to all citizens as well as the assignment of courts special roles in the protection of environmental right.<sup>130</sup>

Constitutionalisations of the need for cleaner as well as healthier surrounding promise further environment safeguard through wide range of both legal and extra legal actions. Such actions may provide impetus for strong legislation that may bolster the implementation of the prevailing environmental laws and policies. In addition, such actions may also fill existing gaps in environmental legislation.<sup>131</sup>

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<sup>127</sup> *Maathai v. Kenya Media Trust Limited* Civil Case 5403 of 1989.

<sup>128</sup> Okidi. C.O., "Concept, Function and Structure of Environmental Law", in C.O Okidi, P. Kameri - Mbote and Migai Aketch (eds.), *Environmental Governance in Kenya; Implementing the Framework Law*, (East African Educational Publishers, 2008)

<sup>129</sup> *Ibid.*, Article 42

<sup>130</sup> Environment and Land Court, Act No. 11 of 2011.

<sup>131</sup> Boyd, nd

## 4.2 Environmental Protection

Kenya has also taken other steps in the quest for the protection and guaranteeing a clean and safe environment by adhering to precautionary and preventive measures provided for both by the constitution and in other international instruments. Because the measures are accepted universally, by virtue of Article 2 (5) and (6) of Kenya's constitution, they become part of Kenya's law. International law, notably Principle 15 of the Rio Declaration emphasizes for the need for the application of precautionary principles in the protection of the environment. In which case, no justification can be given by a state for not taking precautionary measures in protecting the environment.

Kenya's 2010 constitution obligates the government to protect the environment, and work towards the achievement and maintenance of at least 10% of land area in Kenya to be under tree cover. At the same governments have a duty for not only recognizing but for the conservation of native knowledge of communities' genetic assets and biodiversity, at the same time the state must endeavour to eliminate actions that put the environment at risk? As a response, the government has put in place measures that demand for Environmental Impact Assessment (EIA), Environmental Audit (EA) and monitoring of the environment.<sup>132</sup>In so doing, the country thus puts precautionary measures for any likely environmental harm. The government must thus pursue such policies in order for advancing citizenry cleaner and healthier environment.

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<sup>132</sup> Ibid

Kenya still faces the challenge of guaranteeing every citizen the liberty to a clean and healthy environment, which calls for several measures in the public and private sectors. First, a number of environment sensitive organizations have endeavored to create awareness on environmental rights and obligations so as to enable the public to be conscious of the right and to know the measures they need to put in place as a measure of respecting and protecting the environment besides holding the government accountable for not protecting the environment.

It is only when the citizens are aware of the rights they have that they can demand for them and enjoy those rights, so by creation of awareness, the efforts towards achieving a clean and healthy environment are bound to yield fruits as the citizenry will challenge the institutions charged with the responsibility of enforcing the precautionary principle.<sup>133</sup> Awareness must thus be created to enable citizens learn their rights and the available frameworks under which violations of these rights can be addressed. Additionally, the awareness is essential if any meaningful participation of the citizens in the protection and conservation of the environment are to be achieved.<sup>134</sup>

The need for cleaner and healthier surrounding as stipulated in the law has put the person at the forefront. While it guarantees a safe and healthy environment for the person, it fails to oblige the very person to play his/her part in the environmental conservation and protection effort both for today's benefit and the future generations.<sup>135</sup>

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<sup>133</sup> B. Kiromba nd

<sup>134</sup> Article 69 (1) (d) of the Constitution

<sup>135</sup> Article 42.

The protection of the environment is not just for sustaining the ecology, it is as well important for people's survival. While the protection of the environment could just be for the sake of the environment, the overall benefit is usually for human beings for a foreseeable future. Article 69 of the Kenya's constitution provides for the protection of the national heritage for the protection of human beings and society as a whole. Article 70 of the constitution provides for the protection of the environment and for the need for any corrective measures to be taken against persons causing harm to the environment.<sup>136</sup>

An attempt to apportion specific responsibilities to individuals while not done under Article 69 that obligates actions towards the protection of the environment is made in Section 3 of the Environmental Management and Coordination Act<sup>137</sup> which stipulates that individuals not only have a right to a clean and healthy environment but also have a duty to safeguard and enhance the environment.<sup>138</sup> However, it is imperative to note that while EMCA imposes such duties on the individual the constitution does not categorically pose such duties and this implies a challenge to the conservation and protection of the environment as it suggests that the duty is a preserve of the state. Considering that individuals play a key role in environmental degradation, there is thus a need to have them bear responsibilities. Scholars opine that for there to be an effective environmental protection mechanism, duties must be laid to the stakeholders of the right. The laying of the duty to the individuals is justified by the belief that the individuals actions contribute to environmental harm.<sup>139</sup>

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<sup>136</sup> Article 70 (2) (a) and (b)

<sup>137</sup> Act No. 8 of 1999

<sup>138</sup> Ibid

<sup>139</sup> Phillippe Cullet, "Definition of an Environmental Right in a Human Rights Context"

The judiciary has an enormous duty in regards to the realization of a clean and healthy environment and for the safeguarding of the environment. The pronouncements of the judiciary should be reflective of the protection of the rights individuals have in as far as a clean and healthy environment is concerned.<sup>140</sup>

### **4.3 Direct Controls and Regulation**

Kenya has put direct control and regulatory measures in a bid to enhance human security. Some of these measures include quantity quotas that restricts the quantity of trees that can be fell at any one particular time; seasonal restrictions that bars individuals from felling of trees for a given period; safe minimum standards that speak to safe ways of utilizing natural resources among others. These controls though aimed at the protection of the environment have the overall benefit of the enhancement of human security. Failure of adherence to these measures may result in environmental degradation that has a direct relationship with the well-being of individuals. These measures are part of the preventive initiatives that the government is undertaking in order to safeguard the environment.<sup>141</sup>

The traditional approach in the enforcement of the direct controls and regulations as implemented in Kenya is through governmental orders and/or judiciary pronouncements. In other situations, this has been achieved through the enforcement of the law by prosecuting individuals who violate the legal provisions on the protection and conservation of the environment. The approach of direct control and regulation has proved costly though and may not survive in isolation of other measures. For effectiveness, the approach should be employed as a complementary measure to market-based

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<sup>140</sup> Act No. 19 of 2011

<sup>141</sup> Ibid



approaches like taxes and emission charges that have proved effective. Despite its shortcomings, regulations and controls are still the prime instruments used to address environmental challenges in several countries, including Kenya.

#### **4.4. Environmental Standards**

These are generally agreed rules and regulations put in place to ensure that agreed levels of environmental protection are adhered to. These regulations could touch many environmental aspects including accepted levels of discharges of waste into streams. Environmental standards are usually preventive measures whose goal is to deter the distraction of the environment. The standards are contextual meaning different regions could have different environmental standards. In light of the understanding that environmental standards are not universal, Kenya has taken contextual measures that have taken national priorities, available resources and policy objectives. The standards are usually subject to revisions with the developments including social, economic, and technological advancements in the management of environmental issues.

Kenya's environmental standards are weak and do not comprehensively address the issue of environmental damage. Legislation in Kenya is comprehensive and have yielded certain regulations such as the requirement of environmental impact assessment before any development is initiated. However, the enforcement of these regulations is weak. The country thus have a responsibility of putting standards in place to ensure the environment is protected, subsequently assuring the security of its citizens.<sup>142</sup>

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<sup>142</sup>Paavola, J. and Adger. N.W. (2006). 'Fair adaptation to climate change', *Ecological Economics*, Vol. 56, No. 4, pp. 594-609

#### **4.5 Economic Instruments**

Economic instruments are generally preventing and have an effect on the cost and choice of actions taken in addressing environmental concerns. In light of these, a country will use the available economic instruments optimally to achieve the maximum benefits to its citizenry. The economic instruments are instrumental in bringing equality to the society by bridging the gap between the private and social costs. The economic instruments are usually market based because their workings is grounded on signals from the market in encouraging socially better decisions.<sup>143</sup>

#### **4.6 Technological Measures**

Technological measures can be put in place to act as both curative and preventive measure. Environmental problems are however not addressed by technical solutions have since they stem from human behavior. Such behavior could take various forms like water pollution, land degradation among others. In light of such behavior, the government has put policies in place to regulate the chemical levels in fertilizer to help control land degradation, this policies also encourage farmers to use organic manure. The government has also promoted the use of micro irrigation technologies such as sprinklers to address water logging resulting from excessive irrigation.<sup>144</sup> On the same vein, Kenya has taken measures to address air pollution by putting temporary ban on use of charcoal; the government imposes temporary bans from time to time. This is a precautionary measure against an increased use of fossil fuels. Instead, individuals are encouraged to go green by use of for example solar energy, biogas etc.<sup>145</sup>

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<sup>143</sup> Dell, M., Jones, B.F. and Olken, B.A. (2009),

<sup>144</sup> Badjeck, M., E. Allison, A. Halls, and N. Dulvy, 2010: Impacts of climate variability and change on fishery-based livelihoods. *Marine Policy*, 34(3), 375-383.

<sup>145</sup> Ibid

The other technical measure that Kenya has adopted is the application of watershed management approach, the approach has help to optimize use of land, water and other resources in rain-fed agricultural areas. Kenyans have taken the management initiative positively and many farmers are using small water harvesting apparatus such as percolation tanks, check dams, underground dykes, and recharge tube wells could be used for recharging depleting groundwater aquifers and preventing their degradation.<sup>146</sup>

#### **4.7 Summary**

The chapter has showcased the different mechanisms that have been used in Kenya to address the effects of climate change on human security. The chapter has highlighted how the environment has been constitutionalized in Kenya and thus allowing for institutionalization and regulation of environmental issues with a view of protecting the environment for the good of human existence. The chapter has also demonstrate that efforts have been made that have yielded Acts of parliament and the birth of institutions like NEMA with the sole agenda of sustainable use of resources to allow for the future generations to satisfy their needs with the very natural resources. Among the measures discussed are environmental protection measures that the country has undertaken in this regard, direct control and regulation to ensure that natural resources are not overexploited and standards have also been put in place to check the quality of manufacturing and to ensure that pollution is put under control. The chapter concludes that Kenya is on the right track in as far as taking steps to enhance human security is concerned. There is still much to be done but the direction taken is promising.

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<sup>146</sup> Ibid

## **CHAPTER FIVE**

### **DATA PRESENTATION AND ANALYSIS**

#### **5.0 Introduction**

In this chapter, discussions of findings is presented. The data considered was gathered from respondents' through qualitative and quantitative approaches. The qualitative data was gathered by means of FGDs and key informant interviews. The data has been analysed in accordance to the objectives of the study. From the analysis and discussion, valid inferences and conclusions have been made.

#### **5.1 Environmental Degradation**

The perceptions of the residents on environmental degradation were imperative because it is only then that its impact on human security could be ascertained. The following section is a presentation of the findings.

##### **5.1.1 Perception on environmental degradation**

The study sought to establish the understanding of environmental degradation by the respondents. The study revealed that majority of the respondents had a challenge defining the concept. However, on a further probe, it was established that the respondents had a general feel of what the concept is that environmental degradation is the process by which the various elements of the environment becomes of lower quality. The respondents went further and gave examples of what according to them symbolized environmental degradation. It was revealed that particularly, to the residents, environmental degradation meant refers to an ecosystem, a plot of land, a lake, or any entity, which has lost; in part or in whole; the ability to host life. Anything that affects the 'life' of the entity in a

negative manner: toxic chemicals (gaseous, liquid, solid or semi-solid), heavy metals, plastic, or even a naturally occurring substance in excess: is a pollutant and causes environmental degradation.

From the study, it was revealed that most pollutants in small amounts are not going to degrade the environment. This is the reason why a small amount of a polluting substance (such as untreated sewage) may not cause permanent environmental degradation or may not cause any degradation. It becomes a problem when the substance in question is more than what can be safely absorbed by the environment. Plastic is a pollutant because it kills any living being that eats it, prevents water from being absorbed by the soil, and leaches out toxins that kill most micro-organisms and cause cancer in others. Carbon dioxide in the oceans is becoming a pollutant. This is because too much of it causes acidification (carbonic acid is formed when carbon dioxide and water are mixed) that kills marine life. The excerpt below shows the views of a discussant:

Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems; habitat destruction; the extinction of wildlife; and pollution. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable. Source: Key Informant

In your own thinking what factors do you think facilitate environmental degradation?

The study sought to establish the factors that facilitate environmental degradation. The study revealed that a number of factors act to cause environmental degradation. Key among the factors

was revealed to be the increase in human population and the increasing need to satisfy their needs.

This is evidenced in the excerpts below:

People need homes, food, and water, we demand to have a large variety of entertainment, places to work or learn in transportation so that we can get to places of entertainment, educational facilities or work easily, as well as technology to make work, learning and home chores easily and to entertain us. All of these needs and wants require the use of lots of land, resources like, metal and other material obtained through mining (fossile fule, gems, minerals, etc), water, fire, etc.

In yet another interview, the above views were corroborated:

Our needs and wants create environmental degradation (impacts), such as salinity, soil erosion, habitat destruction (this leads to species (both animals and plant) numbers reducing until they become so low that they are classified as being threatened, endangered, or extinct), pollution (our rubbish, greenhouse gasses, chemical spills, etc), and the reduction of vial water from habitats that require it such as floodplains and wetlands.

Politics was also mentioned to play a role in causing environmental degradation. This was noted to mostly happen in cases where a country with natural resources (fossil fuel, water, money, aid, medicine, etc). Where leaders and those close to them abuse power to for example remove vast amounts of trees for farming and to sell the timber. The soil will only sustain the production of food for a period of time before its fertility gets depleted and needs to be replenished artificially. This leads to more land being turned into agriculture, while the previous land (which had been agricultural land) becomes urban. Business people from other countries (particularly from first world countries coming to third world countries) come in and set up large farms (to farm for tea, coffee, cocoa, etc), or other businesses. They do this because there is not the level of regulations and restrictions in the poorer countries in relation to the environment. Some of the reasons for this is that the poorer countries governments are also more usually more concerned with health care, education, protecting their people from warfare, to effectively police such policies even if they did

exist, or are simply too poor financially (owe money to first world countries) to give financial incentives, purchase necessary equipment, to address the issues.

### **5.1.2 Perception on population and future dangers**

The study sought to establish what potential dangers climate change pose to the future of the community. The findings reveal that there are a number of dangers that are likely to occur if the rate at which climate change is altering the living conditions of the populace is not contained. It was noted that while the community boasts of its serene environment, friendly weather and natural abundances owing to it being located between two major water towers of Mt Kenya and Aberdare ranges, environmental degradation that has seen a continued encroachment and destruction of these two towers expose the community to the negative impacts of climate change including in terms of food production and water access. The respondents felt that unless measures are taken in addressing environmental degradation, the food security and water availability in the region would be negatively impacted in the future. It was also found that due to climate change, the long and short rains in the region are no longer predictable.

### **5.1.3 Effects of degradation of the environment on the future generations**

The study sought to establish the effects of environmental degradation on the future generations. The findings of the study revealed that from the current events (populace are currently food insecure owing to the season failure, a fourth in a row, and further compounded by a drop in livestock yields, income and loss in casual engagements), it is predictable that the future generations would not have it any better because the population keeps increasing and more damage

is being done to the environment hence a continued experience of the negative consequences of environmental degradation.

## **5.2 Climate change**

### **5.2.1 Perception on climate change**

The study sought to establish the community's knowledge and awareness of climate change. The findings revealed that majority of the respondents were aware of the climate change. In the interviews, it was clear that the rainfall is no longer reliable and its highly unpredictable nature frustrates the community members who depend on it for crop and livestock farming. Further, it was revealed that the rainfall patterns have also been affected leading to delays in the onset of the long rains (MAM). These rains were also reported to have shrunk – starting end of March and ending in early May. Short rains (OND) were perceived to have become heavier and of late extending way into January. From the key informants, it was reported that in the past, the rainfall seasons were clear and distinct but today it has become highly variable and unpredictable. This is evidenced by the excerpt below:

I have lived in this community for close to sixty five years and surely there is change in the rainfall pattern. In the olden days, rainfall would come from March to May at the beginning of March precisely, today, the begin of rain season delays sometimes to the end of March and stops abruptly at any time, in some years we don't get rains at all.

**Source:** Key informant

The findings further revealed that there was an increase in invasive pests and diseases for both crops and livestock due to an increase in strength and speed of wind in the neighboring community Narumoru. It was also revealed that population increase has resulted in fragmentation of land. This they pointed was due to adherence to cultural values that every son had a right to inherit land from the father. In which case, size was not a consideration in allocation of land, subdivision must



happen for all sons to get a piece from their father. Land fragmentation has been associated with decline in agricultural production leaving communities vulnerable to malnutrition and acute food insecurity, this finding is consistent with other studies by Musambayi<sup>147</sup> and Obonyo<sup>148</sup> and colleagues who further looked at the attitudes of the farmers on land fragmentation and revealed that majority of the farmers oppose land fragmentation practice

The study also revealed that the dry seasons have also become frequent and longer due to massive tree felling. The discussants revealed that in the yester years, the climate was ‘good’ because the trees and the forests were intact. Slowly the community cleared the forests to give way for settlement and agricultural activities an act that has rendered the area vulnerable to climate variability and change. This finding is supported by other research done in the area and neighbouring county for especially Macharia and colleagues<sup>149</sup>, Huho and Kosonei<sup>150</sup> and Ojwang and colleagues<sup>151</sup> who however noted that the massive expansion of agriculture into the arid and semi-arid land and use of unsustainable farming practices often accelerate environmental degradation.

The study also revealed that due to climate change, there is an increase in human wildlife conflict. From the FGDs it was reported that due to deforestation, wildlife (baboons and monkeys) move from the forest to destroy crops and harass women and children at the same time. The agropastoral community reported that these animals raid their farms throughout the year.

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<sup>147</sup> Musambayi, N., (2013).

<sup>148</sup>Obonyo, V., Otieno, C. and Ang`awa, F. (2016). Land Fragmentation and Food Security in Ugunja Sub-County, Siaya County, Kenya. *American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)*, 19(1): 53-73.

<sup>149</sup>Macharia, P.N., Lugadiru, J., Wakori, S., Ng`ang`a, L.W. and Thurania, E. (2009). Perception and Adaptation measures to climate change and variability by immigrant communities in semi-arid regions of Nyeri and Laikipia East Districts. *African Crop Science Journal*, Vol. 20, Issue Supplements 2, pp 287 – 296.

<sup>150</sup> Huho, J. and Kosonei, R. (2013).

<sup>151</sup> Ojwang, G.O., Agatsiva, J., and Situma, C. (2010).

### 5.2.2 Global Effects of climatic changes

The study sought to establish the major climate change felt globally. Reports on climate changes all over the world present a worrying trend on the rate of this change and the resultant effects. An evaluation of the fourth report by the IPCC revealed that the global temperature for the last twelve years, that is from 1995 to 2006 shows that eleven of these years have experienced the warmest temperatures since 1885.<sup>152</sup> Further, the IPCC report of 2007 estimates a temperature rise of 1.1-6.4°C by the year 2100.<sup>153</sup> As a result of climate change, about 3,852 natural catastrophes have claimed the lives of more than 780,000 persons while affecting more than two billion people as property of more than \$960 billion has been lost in the process.<sup>154</sup> These disasters are predicted to double up in the next 10 to 15 years compounding to the risks that the world is to suffer if the high rate of climate change is not controlled. Also, there are changes in sea-levels and human environments that have been presented in geological reports over the past years

The rapid rising of the water level in the oceans and seas results from the melting of land ice and mountain glaciers. One of the conclusions of the IPCC report is the emission of GHG, Carbon dioxide, methane, Nitrogen (IV) oxide, the hydro fluorocarbons, Sulphur hexafluoride and Perfluorocarbons. These are the driving force of climate change as the gases trap the radiated solar energy from the earth's surface which makes the earth surface warm.<sup>155</sup> As the emission of these

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<sup>152</sup>Matyasovszky, I. and Ljungqvist, F.C., 2013.

<sup>153</sup>Banu, S., Hu, W., Guo, Y., Hurst, C. and Tong, S., 2014. Projecting the impact of climate change on dengue transmission in Dhaka, Bangladesh. *Environment international*, 63, pp.137-142. Kates, R.W., Travis, W.R. and Wilbanks, T.J., 2012.

<sup>154</sup>Duran, S., Ergun, Ö., Keskinocak, P. and Swann, J.L., 2013. Humanitarian logistics: advanced purchasing and pre-positioning of relief items. In *Handbook of global logistics* (pp. 447-462). Springer, New York, NY.

<sup>155</sup>Dodo, M.K., 2014.

gases increases, there is a growth in the earth's temperatures which enhances global warming and its effects.

In fact, the sea-level has been increasing at a proportion of about 1.7bmm/year over the past one hundred years, which is evidence for global climate change.<sup>156</sup> Moreover, the shrinking of the glacier volume as a result of the warming temperature on the earth's surface shows the far-reaching effect of climate variability. Reports indicate that the northern hemisphere snow has sharply retreated whereby the most significant declines have been observed during summer and spring seasons.<sup>157</sup>

The recent mass migration is evidence of environmental degradation as a result of extreme environmental events, such as droughts and storms. When there is a gradual deterioration of the environment, mass displacement is bound to occur as many of them move to look for safer and better places for survival. For example, between 1979 and 2008, an estimated number of 1.6 billion people suffered from droughts as other 718 million were hit by storms.<sup>158</sup> Other slow-onset phenomena, such as reduced soil fertility, desertification, and coastal erosion bring about mass migration. The forms as mentioned earlier of environmental degradation impact the available livelihood patterns of production triggering various types of movement.

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<sup>156</sup>Williams, S.J., 2013. Sea-level rise implications for coastal regions. *Journal of Coastal Research*, 63(sp1), pp.184-196.

<sup>157</sup>Lamb, H.H., 2013. *Climate: Present, Past and Future (Routledge Revivals): Volume 1: Fundamentals and Climate Now*. Routledge.

<sup>158</sup>Laczko, F. and Piguat, E., 2014.

### **5.3 Climate Change Effects in Africa**

The study sought to establish the effects of climate change in the African states with specific focus on Kenya. The findings revealed that there are a number of climate change effects in Africa, some of the main effects include drought and flooding, food security, human health and development among others.

#### **5.3.1 Effects on drought and flooding**

The effects of environmental degradation on human security cannot be overemphasized. The effects of environmental degradation such as drought impacts negatively of the food security of individuals particularly in the developing countries like Kenya.<sup>159</sup> Reports by Emergency Events Database (EM-DAT) reveal that a great number of people in Africa have adversely been affected by drought. Kenya like many other countries in Africa has also experienced incidences of drought particularly over 1991-2008 affecting over 35 million individuals. The vulnerability of East Africa to drought is exacerbated by this regions overdependence on rain-fed agriculture. Feyssa and Gameda<sup>160</sup> corroborate the trends of EM-DAT by revealing that the effects of environmental degradation are more intense in countries with high dependence on rain-fed agriculture. The droughts in Africa are expected to increase the size of dry lands by the year 2100. This expansion has the potential of increasing losses in the agricultural sectors of between 0.4-7% of gross domestic product (GDP) in Northern, Western Central and Southern Africa.<sup>161</sup>

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<sup>159</sup>IPCC (2007b). Working Group II 4th Assessment Report. Cambridge University Press, Cambridge.

<sup>160</sup> Feyssa, Gameda (2015).

<sup>161</sup> IPCC, 2007

Besides droughts, environmental degradation have resulted in extreme flooding. Different regions experience varying degrees of rainfall, thus flooding in these regions also vary.<sup>162</sup> The northern, southern and horn of Africa are majorly arid or semi-arid. Flooding in arid or semi-arid has the potential of resulting in deaths and injuries to the residents of these regions. Flooding also leads to higher incidences of water-borne diseases. Reports by European Commissions Joint Research Center, Institute for Environment and Sustainability (2010) indicate that over one million were affected by floods across Africa. The effects of flooding like droughts thus have a direct connection with the well-being of the affected.

### **5.3.2 Food security**

The potential for environmental degradation affecting agricultural productivity is not disputed. In consideration of the fact that the productivity of agriculture is a function of climate, a change in climate will mean plant and animal production will be affected.<sup>163</sup> As indicated in section 5.3.1 above, an increasing trend of frequency of floods and droughts potentially affects food production. Food security will thus not be assured when there is elements of either drought or floods.<sup>164</sup> Losses in agricultural productivity resulting from a rise in global temperatures have been reported.<sup>165</sup> The effects of climate change can thus not just be considered as environmental problems but are also concerns that affect a countries sustainable development.

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<sup>162</sup>Conwa G (2009). The Science of Climate Change in South Africa: Impacts and Adaptation, Grantham Institute for Climate Change Discussion Paper No. 1.

<sup>163</sup> Shongwe, Masuku, Manyatsi (2014).

<sup>164</sup> Kumsa, Jones (2010).

<sup>165</sup> Ibid

Sub-Saharan Africa (SSA) is noted to be the region with greatly affected by climate change,<sup>166</sup> at the same time, it is also said that the region is potentially the most food-insecure.<sup>167</sup> Environmental degradation has thus exacerbated the effects of climate change factors on the food security of the region and Kenya in particular.<sup>168</sup> In Nyeri County, majority of farmers are small-holders with high dependence on rain-fed agriculture, as such, farmers are vulnerable to the effects of environmental degradation. Other than the effects on crop production, environmental degradation also affect livestock's production.

Because of the effect of environmental degradation on agricultural production, the food security of the residents in Nyeri County has been affected.<sup>169</sup> The overdependence of individuals in many parts in Africa means that a slight effect on climatic change will cause adverse impacts of food sustainability amongst the people.

### **5.3.3 Effects of Climate Change on Agricultural Productivity**

The study sought to establish the impact of climate change on agricultural productivity. The following section highlights the findings.

### **5.3.4 Impact on Livestock Farming**

The study sought to establish whether climate change has had an impact on livestock farming in Nyeri County. The findings revealed that livestock production has been greatly affected in the last

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<sup>166</sup> Barr R., Fankhauser S, Hamilton, K (2010). Adaptation investment: A resource allocation framework. *Mitig. Adapt. Strateg. Glob. Change* 15(8):843-858.

<sup>167</sup> Thomton PK, Jones PG, Ericksen PJ, Challinor AJ (2011).

<sup>168</sup> Tetteh EM, Opareh NO, Ampadu R, Antwid KB (2014). Impact of Climate Change: Views and Perceptions of Policy Makers on Smallholder Agriculture in Ghana, *Int. J. Sci.: Basic Appl. Res.* 13(1):79-89

<sup>169</sup> Kumssa and Jones, 2010

ten years in the County. The majorities (51% and 41%) of the respondents strongly agree and agree respectively that livestock feeds have reduced in the last ten years, only 3% of the respondents strongly disagree with the fact that livestock feeds have reduced in the same period. The study further revealed that 48% of the respondents strongly agreed that there is reduction in the livestock produce, 17% of the respondents also agree that they have witnesses a reduction in livestock production over the same period. Only a small percentage of the respondents felt that there has not been a reduction in livestock productivity in the last ten years in Nyeri County. The findings are presented in table 5.1 below

**Table 5.1: Livestock productivity**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly Agree</b>	<b>Agree</b>
Over the last ten years, there has been a reduction of livestock feeds (pasture)	3	4	1	51	41
Over the last ten years, I have witnessed a reduction in livestock production	13	13	9	48	17

### **5.3.5 Impact on Cropping Pattern**

The study sought to establish whether climate change has had an impact on cropping pattern in Nyeri County. The findings revealed that majority (42%) of the respondents strongly agreed that they had witnessed a loss in crop yields in the last ten years followed by 33% who agree that there has been a loss in crop yields in the same period. About 15% of the respondents felt that there has not been a loss in crop yield in the same period. On whether farming pattern is to be shifted because of flooding, the study revealed mixed opinions suggesting that the farming styles were changed but not specifically as a result of floods because floods happen when they have already employed

a given cropping pattern. On the same vein, the study revealed that many farmers have changed their cropping patterns due to droughts, with 38% of the respondents strongly indicating that droughts have made them change their cropping patterns. The study further revealed that in the same periods more farmers have had to use more pesticides with 33% strongly agreeing to the fact. The findings imply that the changing farming styles have been occasioned by climate change. The findings are presented in table 5.2 below.

**Table 5.2: Cropping Pattern**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly Agree</b>	<b>Agree</b>
I have witnessed a loss in crop yields in the last ten years	9	11	2	42	33
I have had to change the cropping pattern in the last ten years due to floods	25	24	1	27	23
I have had to change the cropping pattern in the last ten years due to droughts	14	13	8	38	27
I have had to use more pesticides in the last ten years	15	21	2	33	29

### **5.3.6 Impact on Land productivity**

The study sought to establish whether climate change has had an impact on land productivity in Nyeri County. The study revealed that majority (47%) of the respondents strongly agree that in the last ten years, Nyeri County has had a reduction in crop yield. This was followed by 33% of the respondents who agree that there has been a reduction in crop yield over the same period. Only 9% of the respondent strongly disagree with the fact that crop yield has reduced in the sub-county over the same period. The study also revealed that over the same period, there has been an increase



in the use of fertilizer to enhance productivity with the majority (48%) strongly agreeing that they have increase the use of fertilizer and only 7% strongly disagreeing to have an increase in the use of fertilizer to enhance crop yield. Further, the study revealed that there has been an increase in soil erosion over the last ten years in Nyeri County with 40% of the respondents strongly agreeing that soil erosion has been on the rise. The findings imply that climate change has affected land productivity in the sub-county. An increase in soil erosion for example imply that fertile soil is washed away leading to a reduction in crop yield hence the need an increased usage of fertilizer to enhance land productivity. Table 5.3 below shows the results

**Table 5.3: Land productivity**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly Agree</b>	<b>Agree</b>
Over the last ten years there has been a reduction in crop yield	12	8	2	47	33
Over the last ten years there has been an increase in the use of fertilizer to enhance productivity	5	8	1	49	37
There has been an increase in soil erosion over the last ten years	6	22	1	40	31

### **5.3.7 Impact on Grain sufficiency**

The study sought to establish whether climate change has had an impact on grain sufficiency in Nyeri County. The study revealed that majority (46%) of the respondents opined that over the last ten years, there has been a reduction in grain production in Nyeri County. This was followed by 32% of the respondents who agree that they have witnessed a reduction in grain production over the same period. Only 13% of the respondents strongly disagreed that they have witnessed a

reduction in grain production over the same period. The reduction in grain production can be attributed to climatic change in the county. The study also revealed about 45% of the respondents strongly agree that over the same period, there has been an increase in food prices implying that food production has been negatively affected. On a further probe, the effect on food type was noted to be severe with about 43% of the respondents strongly agreeing that certain food types have been extinct over the same period. The findings are presented in table 5.4 below

**Table 5.4: Grain sufficiency**

	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Strongly Agree</b>	<b>Agree</b>
Over the last ten years, there has been a reduction in grain production	13	8	1	46	32
The food prices have increased over the last ten years	12	14	1	41	33
Over the last ten years, some food types have been extinct due to climatic change	10	9	2	45	24
Over the last ten years, we have been forced to eat alternative food types	6	11	1	43	39

### **5.3.8 Impact on human health**

The study sought to establish the impact of climate change on the human health. The findings reveal that 90% of the respondents revealed that climate change may cause excess rains that may provide good breeding grounds for mosquitoes which will in turn cause malaria. At the same time, 89% of the respondents opined that during floods, there is spread of waterborne diseases while

78% are of the opinion that incase of droughts, individuals would suffer from malnutrition. The findings are presented in figure 5.1 below

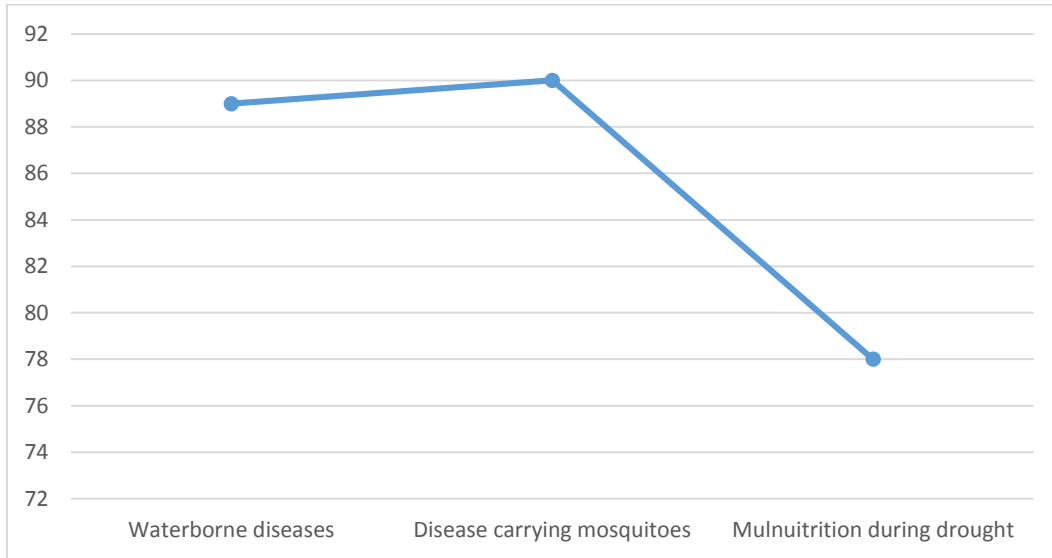
Environmental degradation may also result in water scarcity in times of drought and water related diseases in times of flood. Reports by the United Nations Economic Commission for Africa (UNECA) show that there is an increase in disease incidences in Africa due to climate change.<sup>170</sup> The revelation of the UNECA paints a picture indicating that Africa is the most prone continent to climate change related health problems. The susceptibility of Africa stems from the high poverty levels and the weakness of institutional structures to deal with health challenges posed by climate change.

In Kenya, there is the challenge of Malaria which is associated with climate variability. The same is true to other parts in Africa like Zimbabwe where malaria epidemics was associated climate change caused by El Nino. From the review it is clear that environmental degradation adversely affects human health.

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<sup>170</sup> UNECA (2011).

**Figure 5.1: Effects of climate change on human health**



#### **5.4 Effects of climate change in the Mt. Kenya region**

The study sought to establish the effects of climate change in the Mt. Kenya region. The findings reveal that climate change has had some visible and huge impacts to the region. The most pronounced was noted to be the reduction in glacier cover atop Mount Kenya peaks. The consequence of which has been a reduced recharge to the rivers that originate from the mountain. The reduction of glacier cover coupled with human activities in the region has a compounding effects on both livestock and crop yields. Thus, the food security of the region today cannot be compared to the yester years. It was also revealed that there have been incidences of relocation from in Arid and Semi-Arid Lands (Asals) within the region as communities seek for alternate fallback plans to mitigate the unpredictability of weather conditions to self and livelihoods.

#### **5.4.1 Climate change as a threat to people's security and survival**

The study sought to establish whether climate change threaten people's security and survival. The study revealed that considering that the major livelihood activity of the residents in the community is crop and livestock farming, a change in climate would have a significant impact on their livelihoods. The findings revealed that due to the increased climatic events such as droughts, frostbites, invasive crops and pests, and unreliable weather patterns, the agropastoral community has experienced increase in crop failure and loss of livestock due to lack of fodder and strained water resources. This is because this community depends on the traditional free range grazing system which is highly susceptible to climate variability and highly affected by the current land fragmentation in the area. The study shows that agriculture is one of the significantly impacted sectors by climate variability and change.

Further the study revealed that climate change has adversely affected the livelihood resources of the community. It was reported that drought had a direct effect on natural resources, financial resources as well as some social resources like the agriculture commercial groups because the livelihood activities to use these resources often depend on the quantity, quality and general output of water (rainfall), land, trees, crops and livestock. The findings are consistent with research done by IPCC which shows that climate has a direct influence on crop growth and yields through its impact on the various physiological processes which in turn affects communities' livelihoods. It was reported that temperature and rainfall affect the farmer planting time, germination and maturity of the crops as well as the amount of yields that is harvested. The increase and/or

reduction in rainfall and temperature affect the growth of crops as well as their characteristics. This finding is consistent with findings by Herrero and colleagues.<sup>171</sup>

The community reported high incidences of invasive diseases and pests for both crops and livestock. These diseases and pests cause harm, destruction and even death to livestock. Through the FGDs, it was reported that the strong and speedy winds that blow from the Northeast (direction of Laikipia County) of the area always carry with it invasive diseases and pests. The migration of the Maasai pastoralists from the neighboring Laikipia County in search of greener pastures during dry seasons was also associated with the increase of these diseases and pests especially for animals. The discussants noted the most common livestock diseases in the area are; East Coast Fever (ECF), anaplasmosis (*ndigana*), nagana, mastitis, pneumonia especially for calves, goats and sheep and *mucoïd enteritis* a bacteria disease affecting rabbits. These diseases are severe and often cause death of livestock. Livestock pests that were noted include; ticks, tse tse flies and intestinal worms.

The study also revealed that due to climate change, they were affected by frosts and cold bites. A frost is defined as the occurrence of a cold air of below 2<sup>0</sup>C especially during clear, cold and still nights. Through information shared by the key informants, frost was reported to damage crops at any development stage with severe damages occurring during flowering/ fruit development stage. The FGDs established that frost damage all types of plants including napier grass, rhodes grass, maize, beans, trees, cabbage and irish potatoes. In this study, the key informants from the agricultural sector reported that frost affects the health of plants by damaging their leaves, fruits and flowers and eventually causing death of plants. The findings on frost damage supports the

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<sup>171</sup> Herrero, and colleagues. 2010

research done across the Abardare and Mt. Kenya region that revealed that 38.4% of the area is at risk of being hit by frost and that the month of April, May, October and November show high occurrence rate of frostbites.<sup>172</sup> This paints a grim picture for farmers because these months are the most critical for crop production in the area.

### **5.5 Measures undertaken in terms of climate change institutions, regimes and policies in both national and international arena**

In response to effects of environment degradation, Kenya has initiated mechanisms aimed at addressing the effects of such degradations. These measures have broadly been categorized as adaptive and mitigation measures. The adaptive measures are geared towards reduction of human activities that have enhanced global warming while the mitigation measures are geared towards strengthening of institutional structures in key sectors including health and agriculture among others. Among the adaptive measures that Kenya has undertaken are preventive initiatives like putting a limit in tree felling, change in land related activities to avoid soil erosion among others.

As regards mitigation measures, Kenya has for example made structural changes in the health sector by the recruitment of nearly 24000 with an aim of strengthening the sector across the country. Strengthening of the health sector has been a significant move in addressing the human security issues that arise from the effects of environmental degradation. The government has also made structural reforms in the agricultural sector where weather information is now provided to the populace in good time, this has helped in farmers planning for water harvesting, addressing potential soil erosion by construction of sand dams, farmers have also been trained on techniques

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<sup>172</sup> Kotikot, S., and Onywere, S. (2015). Application of GIS and remote sensing techniques in frost risk mapping for mitigating agricultural losses in the Aberdare ecosystem, Kenya. *Geocarto International*, 30:1, 104-121

aimed at the protection of natural resource base, the government has further invested in agricultural research that has yielded new crop varieties that are resistance to harsh climatic conditions, resistant to diseases as well as tolerant to salt.

Governments have initiated water reform initiatives that have seen more dams and water pans constructed. Policies have also been put in place that advocate for the conservation of water bodies and water towers, among the initiatives undertaken are riverbed de-siltation, recycling of water, empowerment of communities with an aim of improving water quality and promotion of water efficiency measures. The water intervention measures have had to integrate water management and utilization through private-public partnership approaches. Such efforts have yielded multi-sectoral programmes integrating that have River Basin and Large Water Bodies-based Natural Resource Management for various regions.

Structural reforms have also been initiated in the fisheries sector whereby country-wide maps have been drawn illustrative of areas requiring shore protection measures; developing financing mechanisms using non-consumptive options for supporting marine ecosystem research and development; and encouraging a coastal and watershed- basin management approach linking land-use practices to marine and fisheries resource conservation.

The government has also taken measures aimed at the strengthening of the livestock/pastoralism sector that has seen the development of livestock insurance schemes, introduction of livestock breeds that can tolerate the effects of climate change, livestock vaccination campaigns, promotion of climate smart cropping among the pastoralist communities among others.



There has been a number of infrastructure development initiatives particularly in the transport sector. The government has put measures in place to ensure that the developed infrastructure is climate proof. The government has done this by use of advanced technologies like GIS in the determination of appropriate sites for infrastructure development.

Specifically, Kenya has taken a number of mitigation measure such as the initiation of forestry development plan, emphasis on the development of green energy and a multiple others in the agriculture and transport sectors. The forestry development plan outlines an ambitious plan to have a great improvement in forest cover by the involvement of non-state actors such as schools and women groups in the championing of tree planting initiatives. In support of these tree planting initiative the government has pledged support by means of providing water.

Other initiatives include taking advantage of Kenya's abundant renewable energy resources. The government has thus invested in geothermal energy that has seen the construction of steam reserves of up to 7000 MW. Kenya's north-eastern part has Class I wind and is thus suitable for the generation of wind power. The arid parts of the country also have long sunshine for the better part of the year making them ideal for the utilization of solar energy. In terms of biofuels, Kenya has suitable land for the growth of sugarcane, sweet sorghum, Jatropha and other nonfood crops that are known for the production of biofuels. It is upon the government to optimize these potentials and effectively contribute to the reduction of global GHGs as well as its unhealthy reliance on imported fossil fuels. In light of these potentials, the country has taken steps by allocating funds for the development of these sectors.

## **CHAPTER SIX**

### **SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION**

#### **6.0 Introduction**

The chapter draws the summary, conclusion and recommendations based on the study objectives and findings

#### **6.1 Summary of Findings**

##### **6.1.1 Contribution of Environmental Degradation to Human Insecurity**

From the findings, it was evident that environmental degradation has a number of impacts on human security. It was pointed that in a short term the impacts may be invisible, however, long-term, environmental degradation affects and speeds up aging process, increases the likelihood of individuals being exposed to diseases, increases the possibility of being poisoned through food, denies human beings nutrients and access to healthy foods that are necessary for survival, creates an environment that may stress us and our loved ones and leads to a future in which the human race will live shorter lives.

It was further revealed that from the current events (populace are currently food insecure owing to the season failure, a fourth in a row, and further compounded by a drop in livestock yields, income and loss in casual engagements), it is predictable that the future generations would not have it any better because the population keeps increasing and more damage is being done to the environment hence a continued experience of the negative consequences of environmental degradation.

### **6.1.2 Effects of Environmental Degradation in Kenya**

From the findings, it is evident that environmental degradation has had adverse effects in Kenya. It was pointed that the dry and rainy seasons have been affected with the seasons either being too long/short and unpredictable. It was also noted that due to degradation, there is an increase in human-wildlife conflict. Kenya being reliant on rain-fed agriculture has born great consequences of environmental degradation, the long dry seasons has seen poor farm produce and this affects the food security of the populace. The study further revealed that due to the increased climatic events such as droughts, frostbites, invasive crops and pests, and unreliable weather patterns, the agropastoral community has experienced increase in crop failure and loss of livestock due to lack of fodder and strained water resources.

### **6.1.3 Mitigating the Effects of Environmental Degradation in Kenya**

In regards to mitigation measures for enhancing human security, the study revealed that the country has put strategy in place to help in addressing the adverse impacts of climate change (adaptation measures) and to tame global warming (mitigation measures). The adaptation measures include the prevention, tolerance or sharing of losses, changes in land use or activities, changes of location, and restoration. It was further revealed that adaptation measures have been taken in various sectors including, water, fisheries, forestry and livestock among others.

## **6.2 Conclusion**

From the findings of this study, it can be concluded that Kenya is human security has been adversely affected by environmental degradation and will be further undermined unless measures are taken to address these impacts. Environmental degradation will expose people to sudden loss

of crops, agricultural land and water resources. A gradually changing climate – with regard to temperature and sea level rise - will give the same result but a longer term. This means that one would expect both sudden downturns and achronic decrease in human security as a consequence of environmental degradation. The most direct impact of climate change will be on the environment. Ecological system, including agricultural land, natural resources and biodiversity are affected and this will, in turn, impact the economic, food and health security. Vulnerability, interpreted as human insecurity, is as a consequence high in the Mt. Kenya region.

The study identified water resources agriculture, infrastructure, livelihoods, and human health as specifically sensitive to environmental degradation in the Mt. Kenya region. Due to poverty, insufficient education, weak government safety-nets and a low overall health status, the ability to withstand the impacts of climate variations in the short-term is low. So is the adaptation capacity in the long-term, further exacerbating the vulnerability to environmental degradation? To overcome vulnerability adaptation is necessary. There are already adaptation measures implemented to lower the vulnerability, but there is an urgent need for further adaptation to be initiated. Such measures must be taken on both local and national level and must include both technical and organizational measures. An important task is also to acquire, and to disseminate, new relevant knowledge about the local climate change impacts.

### **6.3 Recommendations**

The study recommends that for human security to be assured there is need for the respect and implementation of international treaties relating to the protection of the environment. The study further recommends that there should be initiatives to create awareness on environmental

degradation and its' potential effects to enable the public to make right decisions in reference to the protection of the environment. Mitigation measures should also be put in place to help address the adverse effects of environmental degradation.

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## APPENDIX I: INTERVIEW GUIDE

### Demographic Information

1. Name (optional) \_\_\_\_\_
2. Gender Male  Female
3. Name of your organization \_\_\_\_\_

### Environmental degradation

4. How do you perceive environmental degradation?
5. In your own thinking what factors do you think facilitate environmental degradation?
6. What is your understanding on the current population of the area and do you foresee any danger in the near future?
7. What effect do you think the degradation of the environment in this region would have on the future generations?
8. What are some of the effects of environmental degradation on human security in this region? (food, cultural, health)

### Effects of climate change on cropping pattern (Please tick appropriately, where

SD= Strongly disagree      D = Disagree      N= Neutral      A= Agree      SA= Strongly Agree

<b>Cropping pattern</b>					
I have witnessed a loss in crop yields in the last ten years					
I have had to change the cropping pattern in the last ten years due to floods					
I have had to change the cropping pattern in the last ten years due to droughts					
I have had to use more pesticides in the last ten years					

### Climate change

9. How do you perceive climate change?
10. What major climatic changes are being felt globally?
11. Has climate change affected Africa generally and Kenya particularly?

12. How has climate change affected the Mt. Kenya region particularly?
13. Does climate change threaten people's security and survival?
14. In what way does climate change threaten people's security and survival (probe: economic, food, health, political instability, tourism)?

**Effects of climate change on land productivity (Please tick appropriately, where**

SD= Strongly disagree      D = Disagree      N= Neutral      A= Agree      SA= Strongly Agree

<b>Land productivity</b>					
Over the last ten years there has been a reduction in crop yield					
Over the last ten years there has been an increase in the use of fertilizer to enhance productivity					
There has been an increase in soil erosion over the last ten years					


**Mitigation measures**

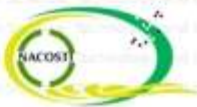
16. What key measures have been undertaken in terms of climate change institutions, regimes and policies at global, regional sub-regional and national levels?
17. Has the Government of Kenya undertaken any specific steps to deal with the impacts of climate change?
18. What is the outcome of these policies in terms of implementation, monitoring, and evaluation?

## **APPENDIX II: FGD GUIDE**

1. Have you witnessed or are you aware of changes in this region due to climate change?
2. If so, how do these impact the forest and the population that rely on it?
3. Have you noticed any significant change in the forest cover in Mt Kenya over the years?
4. What are the consequences of forest destruction?
5. Any change in the rainfall?
6. Has agricultural production been affected by these changes?
7. What are the current assessments of the potential losses to agriculture due to deforestation?
8. In your opinion, has deforestation in Mt. Kenya been a source of conflict?
9. Do you believe there are currently any tensions that may result in wider spread of conflict?
10. What role does the local governance structures have that could mitigate or influence environmental degradation?


**APPENDIX III: RESEARCH PERMIT**

  
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## **APPENDIX IV: ANTIPLAGIRISM REPORT**