

UNIVERSITY OF NAIROBI
INSTITUTE OF DIPLOMACY AND INTERNATIONAL STUDIES
MA RESEARCH PROJECT

**FOREST CONSERVATION STRATEGIES TO MITIGATE THE
IMPACT OF CLIMATE CHANGE ON HUMAN SECURITY IN EAST
AFRICA: A CASE STUDY OF MOUNT KENYA FOREST**

BY

FREDRICK OGOMBE OKUMU

R50/5074/2017

SUPERVISOR: DR. SHAZIA A. CHAUDRY

**RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE AWARD OF A DEGREE OF MASTERS OF
ARTS IN INTERNATIONAL STUDIES, INSTITUTE OF DIPLOMACY AND
INTERNATIONAL STUDIES**

UNIVERSITY OF NAIROBI

DECEMBER, 2017

DECLARATION

I _____ declare that this project is entirely my own original composition. It has not been presented in any University and or College for examination purpose(s).

Signature..... Date.....

NAME: FREDRICK OGOMBE OKUMU

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

Signature..... Date.....

Dr. Shazia Chaudhry

DEDICATION

I dedicate this project to God Almighty my creator, my strong pillar, my source of inspiration, wisdom, knowledge and understanding. He has been the source of my strength throughout this program and on His wings only have I soared. I also dedicate this work to my loving wife who has encouraged me all the way and whose encouragement has made sure that I give it all it takes to finish that which I have started. To my children who have been affected in every way possible by this quest. Thank you. My love for you all can never be quantified. God bless you.

ACKNOWLEDGEMENT

I acknowledge my mentor and supervisor, for guiding me in identifying this project which would not have been completed without the help, cooperation and contribution of my supervisor, Dr. Shazia Chaudhry. I am happy to acknowledge all the academic and non-academic staff members of National Defence College for the discussions, valuable suggestions and contributions without which this project paper would not have accomplished.

The main acknowledgement is extended to my Chief Executive Officer- Mr. Emilio N. Mugo for having considered me for nomination to attend a security strategic course at Kenya National Defence College in KAREN. This course not only enabled me to share and interact with the senior security personnel both within Kenya and across the continent of Africa but also exposed me to Foreign Policies and International Relations of the other five regions; Asia Pacific, Europe, Middle East, Latin America and finally Africa.

I am indebted to the College Commandant Lt. General Ngondi, Senior Directing Staff Brig. Imanene and the college staff for ensuring that our one year stay at the college was very fulfilling and offering a conducive environment for the academic work. Last but not least, want to thank my dear wife –Benta for allowing me to be away for the course and also for the invaluable support she and the family extended to me during the entire period.

TABLE OF CONTENT

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
ABSTRACT	x
CHAPTER ONE: INTRODUCTION TO THE STUDY	1
1.1 Introduction	1
1.2 Statement of the Research Problem	3
1.3 Objectives of the Study	4
1.4 Literature Review	5
1.5 Justification of the Study.....	14
1.6 Theoretical Framework	16
1.7 Hypothesis of the Study	20
1.8 Research Methodology.....	21
1.9 Chapters of the Study	24
CHAPTER TWO: CLIMATE CHANGE AND HUMAN SECURITY IN EAST AFRICA.....	25
2.1 Introduction	25
2.2 Key Impacts of Climate Change in East Africa	27
2.3 Climate Change and Human Security	33
2.4 Mitigation and Adaptation to Climate Change	41
2.5 Conclusion.....	44
CHAPTER THREE: FOREST CONSERVATION MEASURES TO TACKLE CLIMATE CHANGE AND HUMAN SECURITY IN EAST AFRICA	45
3.1. Introduction	45
3.2. Forest Conservation and Human Security Issues	45
3.3. Forest Conservation Measures in Africa	49
3.4 Key Challenges to Forest Conservations Measures	54
3.5 Conclusion.....	55

CHAPTER FOUR: KEY ACTORS AND POLICY ACTIVELY INVOLVED IN FOREST CONSERVATION ACTIVITIES IN KENYA	57
4.1. Introduction	57
4.2 Links Between Climate Change and Human Security in Mount Kenya Forest Areas.....	64
4.3 The Forest Conservation Measures Adopted to Tackle Climate Change and Human Security Issues in East Africa, Especially in Mount Kenya Forest.....	69
4.4 Key Actors And Forest Conservation Activity in East Africa as Well as in Kenya	71
4.5 Conclusion.....	75
CHAPTER FIVE: SUMMARY OF KEY FINDINGS, CONCLUSION AND RECOMMENDATION	77
5.1 Introduction	77
5.2 Summary of Key Findings	77
5.3 Conclusion.....	81
5.4 Recommendations	83
BIBLIOGRAPHY	85
APPENDICES	90
Appendix 1: Questionnaire.....	90

LIST OF TABLES

Table 1: Age of Respondents	59
--	----

LIST OF FIGURES

Figure 1: Participant rate of response	58
Figure 2: Participant Gender	58
Figure 3: Education Level.....	59
Figure 4: Awareness Level	60

LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
IPCC	Intergovernmental Panel on Climate Change
OECD	Organisation for Economic Co-operation and Development
THC	Thermohaline Circulation
UNICEF	United Nations Children's Fund is a United Nations
USA	United States of America
NEMA	National Environmental Management Authority
KWS	Kenya Wildlife Service
KFS	Kenya Forest Service
KEPHIS	Kenya Plant Health Inspectorate Service
LATF	Lusaka Agreement Taskforce
UN	United Nations
NGO	Non-governmental Organizations

ABSTRACT

Forests, when sustainably managed, can have a central role in climate change mitigation and adaptation. Climate change continues to pose a challenge to nations and the world at large, with the resultant increase in drought, unpredictable rainfall patterns, and natural disasters such as floods and coastal storms will be disproportionately suffered by the vulnerable groups and the marginalized. The effects of climate change are complex requiring global, regional and national interventions. The general objective of the study is to establish forest conservation strategies to mitigate the impact of climate change and on human security in East Africa, using a case study of Mount Kenya forest. This study aims to add insightful writing to other scholarly publications on the difficulties and opportunities of forest protection in Kenya. Furthermore, this study expects to include any new information on issues to do with climate change in East Africa. The study will apply neo-realism theory. Realists trust that force is the money of universal legislative issues. Extraordinary forces, the principle on-screen characters in the realists' record, give careful consideration on how much financial and military force they have with respect to each other. The study applied case study as a research design to establish the climate change and human security issues using a case study of forest conservation. Case studies provide rich raw material for advancing theoretical ideas. Documents, observations, and interviews can all be sources of information for a case study. The study used interview methodology that is guided on the discussion themes and which was enhanced by taking notes. The study population was be respondents from, the National Environmental Management Authority (NEMA), the Kenya Wildlife Service (KWS), the Kenya Forest Service (KFS), the police office, the fisheries office, the Kenya Plant Health Inspectorate Service (KEPHIS), the Lusaka Agreement Taskforce (LATF), the United Nations (UN), nongovernmental organizations (NGO) and the communities, (community forest associations in the adjacent sub-counties) in the zones with high predominance of natural forest. Data analysis was done by use of descriptive statistics and document analysis. The researcher used qualitative data collected to make general statements on how categories or themes of data are related. The study outcomes have been presented in form of narrative, pie charts, bar graphs and frequency table.

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

The world today is characterized by a substantial increase in the use of carbon fuels as industrialization increases, leading to a drastic increase in greenhouse gas (GHG) emission into the World's atmosphere. The GHGs consist of among others methane, carbon dioxide and nitrogen dioxide, and cause a rise in increase in radiation into space.¹ Therefore the main manifestations of the climate change phenomenon include global warming, the melting of ice caps, temperature changes in land precipitation and increased carbon dioxide emission to the atmosphere.²

Climate change results in a range of effects that upset the overall balance of the environment, normal households' wellbeing, socio-economic features and a number of other related sectors, such as, agriculture, food, water resources, biodiversity, coastal zones and even shelter. Rising temperatures have caused substantial changes in the natural seasons during which crops grow and thrive, affecting food security, emergence of new vector borne diseases and their distribution thereby placing people generally within risk from ailments and disorders such as malaria and even dengue fever. Temperature increase is expected to so upset the weather balance that there could be severe acceleration of extinction rates for many of the species currently

¹ The Intergovernmental Panel on Climate Change [IPCC] report, (2007), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, p. 2.

² Meehl G A, Stocker T F, Collins W D, Friedlingstein P, Gaye A T, Gregory J M, Kitoh A, Knutti R, Murphy J M, Noda A, Raper S C B, Watterson I G, Weaver A J and Zhao Z-C, (2007), *Global Climate Projections. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA, p. 19.

existing within the habitats. (up to 30 per cent extinction for every 2° C temperature rise).³

Forests are among the largest contributors to the environmental security, playing critical ecological, in addition to social, cultural, as well as economic functions. Their contribution towards the growth of national in addition to local economies cannot be gainsaid as they help in income creation, with an assessment made signifying that forests contribute up to the level of 3.6 percent of Kenya's Gross Domestic Product (GDP). Woodlands additionally bolster most gainful and administration segments in the nation, especially farming, tourism, fisheries, domesticated animals, water, both domestic and industrial, and industry in general which adds from 33 to 39 percent of the state's GDP.⁴ Biomass constitutes almost 80 percent out of the observed vitality utilized as a part of the nation, while they additionally give an assortment of products, which bolster subsistence employments of numerous groups and communities.

Forest conditions, with regard to issues such as area, vitality, health and biodiversity and the general balance in the area will always be part of the areas affected by climate change, leading to increases, decreases and even stagnation in progression of the environment in the different areas, in the process endangering survival of certain and specific species and even forest communities in others. Limiting factors in all these events will include temperature, water availability or the lack of it thereof, seasonality changes all depending on among others, geographic area, climatic conditions as was

³ The Intergovernmental Panel on Climate Change [IPCC] report, (2007), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, p. 2.

⁴ Griggs, D. *et al.* (2013), *Sustainable development goals for people and planet*, *Nature*, Vol. 395, pp. 305-307.

originally, species diversity in addition to human activities.⁵ Some of the really common occurrences resulting from these changes include fires, diseases and insect pests whose prevailing intensity and frequency and intensity is expected to rise. Similarly, there is likely to be greater damage due to extreme weather conditions than previously witnessed, in the form of torrential rains, droughts as well as hurricanes.

Mount Kenya, which is Kenya's unchallenged most astounding mountain stands tall on the equator. A major part of the surface area of the mountain is covered by forest which is usually a suitable habitat for a wide variety of species creating rich biodiversity, as far as biological systems and species are concerned. Mount Kenya also assumes a very significant source of water catchment forming a major constituent of the five identified fundamental "water towers" within Kenya alongside the expansive Aberdare Ranges, in addition to Mau Complex, Cherang'ani Hills as well as Mount Elgon, giving a large portion of the Country's water. However, climate change poses insignificant threats to the unique ecosystems of the area.

1.2 Statement of the Research Problem

Forests form part of the frontline that is directly hit by the negative climate change consequences, being dependent on, and having a very intimate interaction with not only the environment but also with its resources. With vulnerable forest communities and societies already facing tough times because of scarcity, economic marginalization, land and resources loss and population growth, these difficulties are complicated by Climate change.

⁵ Op cit, p. 310.

The study aims to examine climate change associated threats and perils to the existence of mountain forest communities in East Africa, despite the fact that these people do not even emit GHGs. While the forest communities' existence is threatened, their survival is vital, and critical to the ecosystems in which they inhabit and the lands and territories in which they are active and are part and parcel of life in the area as a whole, thus they could assist in enhancing the resilience of the said ecosystems. The research seeks to answer; what is the linkage between climate change and human security in East Africa and especially in Mount Kenya forest areas? What are the forest management and conservation measures embraced to handle climate change and human security issues? Who are the key actors and stakeholders dealing with forest conservation in Kenya? What forest preservation strategists are in place in Mount Kenya?

1.3 Objectives of the Study

Generally, the study aims to assess and evaluate the forest conservation strategies that can alleviate the impact of climate change and human security in East Africa by using Mount Kenya forest community as a case study. The specific objectives include;

- i. To establish the linkages between human security and climate change impacts in East Africa
- ii. To determine the forest conservation measures used to tackle climate change and human security issues in East Africa, especially in Mount Kenya forest, Kenya.
- iii. To identify key actors and forest conservation activities in East Africa as well as around Mount Kenya.

1.4 Literature Review

1.4.1 Introduction

Notwithstanding, it is essential to note precisely how climate change will impact security.⁶ There is still unsteadiness about the definite topographical effect, rate and extent of climate change. The experiences of climate change as impacted on the social, cultural, political and physical frameworks in many areas of the world, are felt through changes in average conditions, in both temperature and precipitation among other weather elements in the long run, together with growth in power and sometimes recurrence of surges, dry seasons, storms, heat-waves and violent winds.

Aside from these short as well as long haul changes, which have been highly projected to take place with high levels of guarantee, there also exist fairly less clear and more unquantifiable dangers of high-effect occasions.⁷ These incorporate dissolving of icy masses and permafrost which is expected to create an augmentation of the worldwide ocean levels, breakdown of the Thermohaline Circulation (THC)⁸ thus generating noteworthy regional atmospheric changes in the northern half of the globe, and extensive shifts in the balance of Asian rainstorms (monsoon) and the El Nino Southern Oscillation (ENSO) marvel.⁹

⁶ Zerner, C. (2000). *Towards a broader vision of justice and nature conservation*. In: Zerner (Ed.). *People, Plants and Justice. The politics of nature conservation*. Columbia University Press, New York. pp. 3-20.

⁷ Zulu, C. (2004). *Problems with participatory mapping in forest management. A case of Handei Village Forest Reserve, East Usambara, Muheza, Tanzania*. M.Sc. Thesis (unpublished). ITC, Holland, p. 37.

⁸ Thermohaline circulation (THC) is a part of the large-scale ocean circulation that is driven by global density gradients created by surface heat and freshwater fluxes. The adjective *thermohaline* derives from thermo - referring to temperature and *-haline* referring to salt content, factors which together determine the density of sea water. Catherine, (2009), *Climate Change Science Compendium*, UNEP, p. 56.

⁹ Catherine, (2009), *Climate Change Science Compendium*, UNEP, p. 57.

1.4.2 Climate Change and Human security of the Mountain communities in East African Region

Human security alludes to a developing worldview for comprehending global and wholesome vulnerabilities in which the previously acknowledged customary thinking of national security as an assertiveness that placed the individual rather than the state as a whole as the major and principle concern in determining and defining security is challenged.¹⁰ The guiding principle in Human security is that the fundamental perspective of security should generally be people-focused for national, local and worldwide strength to be realized.

The violence on the international system arena appears to have lost appeal to players and can be said to have reached a long-term decline and thus effects of the big impact on security concerns to climate change has greatly reduced. On the other hand, the likelihood that climate change can potentially generate violent conflict was acknowledged in a number of documents within the Third schedule Assessment Reports from the International governmental Panel on Climate Change (IPCC), published in 2001 and the Fourth schedule of 2007.¹¹ The experiential search within literature on whether there actually is a relationship that directly links climate change with the different forms of conflict that have been witnessed in various major security related occurrences ranging from physical, human and environmental since then.

¹⁰ Leitzmann C, (2003). *Nutrition ecology: The contribution of vegetarian diets*. Am. J.Clinical Nutrition: 78 (3): pp. 657- 659.

¹¹ Ibid (2003), p. 689.

Buzan *et al.*, notes that security went through many progressive changes at the connectional point in the aftermath following the culmination of the Cold War. This is basically where the root cause of human security are to be found.¹² According to Buzan *et al.*, some of these changes involved addition of new non-military aspects of security, including climate issues, economic, demographic, information, health together with other genres that incorporated other players like non-state actors, such as communities, non-governmental organizations, local leaders, trend setters among other groups.¹³

The dwindling of ice caps on the East African Mountains of Kilimanjaro, Mount Kenya and Ruwenzori have a serious hydrological consequences on and around the three mentioned eco-systems.¹⁴ The negative effects can easily be felt both in the short term through increased amount of rainfall and high temperature ranges which cause natural calamities such as floods, hurricanes and landslides; as well as in the long-term, as evidence of gradual dilapidation is witnessed alongside environmental degradation.¹⁵

The connections between individuals, nature and economies are certain when taking a gander at ecological security and natural dangers as they identify with human security. Goals for security and advancement must go past endeavours to shield

¹² Buzan, Barry, Ole Waeve and Jaap de Wilde (1998), *Security: A New Framework for Analysis*, Lynne Rienner Publishers, London, p. 33.

¹³ Buzan, Barry, Ole Waeve and Jaap de Wilde (1998), *Security: A New Framework for Analysis*, Lynne Rienner Publishers, London, p. 33.

¹⁴ Barr. J and Chander A, (2012), *Africa without glaciers*, UNEP, p. 2.

¹⁵ WHO, (2008). *Gender inequities in environmental health*. 25th Session of the European Environment and Health Committee. (EUR/5067874/151).

people from ecological dangers.¹⁶ They should likewise be founded on common sense strides to seize upon the open doors displayed by nature, in acknowledgment of its inborn quality, and its profound associations with people, social orders and economies.

As per a study organized by UNICEF at Innocenti Center, women and children, being the most exposed to danger, are critical when making decisions in climate change and human security plan. They are amongst the most defenseless populaces to climate change, and might be the worst casualties of its effects. In the meantime, they are capable heroes for change and can contribute fundamentally to the aggregate push to alleviate environmental change.¹⁷

Many years of experience has demonstrated that when devastated groups are left without any business alternatives that could bolster their economies, they quickly revert to the use of natural resources like minerals forests and oils for their immediate livelihoods. In times of war and displacements of communities, the refugees have turned to charcoal burning, illegal fuelwood collection and timber harvesting for their immediate use. Likewise, during military operations, some corrupt individuals have tended to rape the forest and any resources there in for their individual personal gain. Governments, while attempting to keep up peace and recapture a financial balance, regularly advance timber extraction and the change of forested area to farmland as a method for repaying previous soldiers, resettling refugees and producing truly necessary outside trade.

¹⁶Op.Cit.

¹⁷ Duraiappah A. (2004). *Exploring the Links- Human Well-Being, Poverty & Ecosystem Services*, UNEP/IISD, Nairobi, Kenya, p. 67.

The East African miombo woodlands and natural forests are very important for the people of the region, for the purposes of construction, wood energy as well as for the biodiversity, including many migratory bird species and other wildlife. The Tanzania's Eastern Arc mountains are also globally recognized by biologists for their richness in biodiversity and use for purposes of research.¹⁸ Mountain forests make up 30 percent of all normal woodland spread around the world. They're found on all mainland except for the Antarctic. They develop past a height of 500 meters.¹⁹ That area implies mountain woods comprise of trees that aren't found in lower-lying zones. The trees have adjusted to the cool atmosphere, substantial deluges and extreme daylight. In low-lying territories, they're pressed out by various tree species.

Mountain forests additionally assume an imperative part in the territorial atmosphere. They can assimilate water like a wipe. Tropical mountain woodlands specifically give back the gathered overwhelming deluges as water sources, streams and waterways in the environment, in this manner guaranteeing a uniform conveyance of water consistently and shielding the ground against landslides.²⁰

Meanwhile, the woodlands have a direct cooling impact as they moderate the temperature and reduce the speed of wind making for an adjusted provincial atmosphere. Mountain forests are home to a novel gathering of different plant species and wildlife species. They incorporate unequivocally specific species that cannot survive in low-lying territories.

¹⁸ Duraiappah A. (2004). *Exploring the Links- Human Well-Being, Poverty & Ecosystem Services*, UNEP/IISD, Nairobi, Kenya, p. 67.

¹⁹ Ibid, (2004), p. 70.

²⁰ Ibid, (2004), p. 89.

1.4.3 Climate Change Impact in Mountain Kenya Forests

Mountain forests are not only affected by climate change but also by human use. Individuals progressively utilize the forests to get firewood, graze cattle and even for tea and coffee plantations. Mountain forests are known to have rich minerals in the soil and through shifting cultivation there have been endangered and some species have become extinct in eastern Africa - in Tanzania, Rwanda, Burundi, Uganda, Malawi, Ethiopia, and Kenya.²¹

Frequently forests are esteemed just over the fleeting and fundamentally as wellsprings of timber. This undervaluation implies that the genuine expenses of deforestation and mangrove devastation are not considered in strategy choices that approve upland logging, shrimp ranch extension or beach front tourism advancement in a debacle inclined ranges.²² It is these long haul and difficult to-quality costs that get to be evident after common catastrophes and it is the neighborhood influenced individuals that are left to endure them.

Climate change is an inauspicious reality. Researchers let us know that the world is getting hotter by the day. Great climate wonders, for example, surges, dry spells, heat waves and twisters, experienced in various parts of our globe, are among the broad results of climate change, giving us a glance of more terrible negative effect that may

²¹ Duraiappah, A. *et al.* (2008). *Ecosystems and Disaster Risk Reduction. United Nations Environment Programme and Stockholm Resilience Center.* Background paper for: Global Assessment Report on Disaster Risk Reduction, pp. 55-56.

²² Drakenberg, O. *et al.* (2009). *Greening Development Planning: A Review of Country Case Studies for Making the Economic Case for Improved Management of Environment and Natural Resources,* OECD Environment Working Papers, No. 5, OECD publishing, Paris, France, p. 8.

occur sooner rather than later.²³ The inter-linkage observed as climate change is studied with human security is as clear as ever.

Concentrating on dangers disregards the naturally related open doors accessible to enhance human security. Securing and upgrading nature can have exceptionally constructive results for individuals' occupations, prosperity and open doors for satisfaction. While ecological corruption builds the potential for hardship, relocation and debilitation, biological community trustworthiness is liable to diminish vulnerabilities.

Kenya's Mountain woodlands are the major source of water on which the country depends. Presently, following quite a while of government-abetted misuse of these forests, another protection system of working with neighbouring communities through a structured institution called Community Forest Association has played a greater role in protection. Expelling unlawful pioneers has been moderate in spots, particularly where the refugees still have great political connections thereby encroaching on the forest for the purposes of cultivation and settlements. The most remarkable casualties have been individuals from the generally woodland abiding Ogiek tribe, who say their true blue rights have been disregarded.

Mount Kenya ranks second in height among the mountains located within the African continent. Formed as an old terminated well of lava, was amid its time of movement (3.1-2.6 million years back) thought to have ascended to 6,500 m. There are 12 remainder ice sheets on the mountain, all subsiding quickly, and four optional

²³ Op. Cit, p. 90.

pinnacles that sit at the leader of the U-molded ice valleys.²⁴ With its tough icy mass clad summits and forested center inclines, Mount Kenya is a standout amongst the most amazing scenes in East Africa. The advancement and environment of its afro-snow capped verdure give an extraordinary case of natural and organic procedures. Through Ngare Ndare Forest Reserve to Lewa Wildlife Conservancy, the property likewise fuses lower lying grand foothills and dry living spaces of high biodiversity, arranged in the natural move zone between the mountain biological community and the semi-bone-dry savanna meadows.²⁵ The zone likewise exists in the conventional relocating course of the African elephant populace.

The whole mountain is profoundly dismembered by valleys emanating from the pinnacles, which are to a great extent credited to icy disintegration. There are around 20 little lakes that fluctuate in size as well as various frosty moraine highlights that rise from between 3,950 m to 4,800 m above sea level. Of all the peaks on the mountain, the most outstanding are Batian (5,199 m) followed by Nelion (5,188 m).²⁶ There are 12 remainder ice sheets on the mountain, all subsiding quickly, and four optional peaks that sit at the leader of the U-formed frosty valleys.

With its tough ice sheet clad summits and forested center inclines, Mount Kenya is a standout amongst the most noteworthy scenes in East Africa. This setting is upgraded by the visual differentiation and assorted qualities of scenes made between the Kenyan Highlands and Mount Kenya approaching over the level, desiccated, field and

²⁴ Butler, Rhett A. (2009). *Local and National Consequences Loss of Local Climate Regulation.*, Brobus publisher, p. 17

²⁵ Ibid, (2009). P. 17.

²⁶ Duraiappah A. (2004). *Exploring The Links- Human Well-Being, Poverty & Ecosystem Services*, UNEP/IISD, Nairobi, Kenya, p. 67.

the smaller lush green fields of the Lewa Wildlife Conservancy expansion toward the north.²⁷

Kenya's central region, which hosts Mount Kenya, boasts of 11 valley glaciers, together forming an area covering 0.7 square kilometres, which arose from the effects of melting of the ice caps. In comparison, the second highest mountain in the world, Mount Kilimanjaro (5,895 meters), which is found in northern Tanzania possesses not just 16 glaciers but also 3 ice fields which are spread around the Kibo crater and together occupy an area covering roughly 5 square kilometres. The ice caps together with glaciers currently seen on Mount Kilimanjaro are just but isolated remnants that were left in a process which saw the extensive erosion of Kibo's ice cap where a number of outlet valley glaciers were found to extend to different numerous locations situated farther downslope. These were occurrences that were observed in late 1900's.²⁸

In addition, the communities living around the area, mostly comprising of the Kikuyu and Meru, regard Mount Kenya as a blessed and sacred mountain and thus utilize the mountain for conventional ceremonies like prayers, fasting during the time of calamities while taking into account the traditional conviction. This conviction contends that the God, who they call *Ngai* resides on the highest point of this particular mountain alongside his historically significant other, referred to as Mumbi. This study notes that East Africa's very survival, existence as well as development, particularly amongst mountain communities, are immensely threatened by the

²⁷ Op. Cit. P. 67.

²⁸ Department of Meteorology, University of Wisconsin, 1225 West Dayton Street, Madison, WI 53706, (1987), p. 3.

observed adverse impacts of the continuously occurring climate change and human security issues, and the victims of all these will be its population, the prevailing ecosystems and not to forget its unique biodiversity.

1.4.4 Knowledge Gaps

Based on the narrative as reviewed, the study notes that mountain diverse forested habitats are important for the conservation of biological diversity, catchment protection and habitat for wildlife some of which are either endemic or rare species of both animals and plant categories that face the real danger of global or regional existential threat, thus requiring maximum protection. In addition, the study notes that a number of mountain forest types have been described, whose altitudinal distribution varies around the mountain according to rainfall.

Based on the materials reviewed, a very large number of publications attempting to describe and predict climate change globally, regionally and specifically for Kenya have accumulated along considerable time frame. It is observed in the study that Mount Kenya forest local climate differs significantly from one side of the massif to the other due to prevailing seasonal winds and rain-shadow effects. In addition, the study notes that there were scanty studies and literature on climate change and human security impact on Mountain communities especially in the East African region.

1.5 Justification of the Study

This study aims to add to insightful writing to other scholarly publications on the difficulties and opportunities of Mountain forest in Kenya. Especially where the effects of climate change as a threat to the Mountain communities in East African region, has been ignored for quite some time now. Furthermore, this study expects to

generate new information on climate change activity in East Africa, particularly among mountain communities in Kenya.

Climate change has significantly been globally recognized as a serious problem giving clear indications that it can possibly be a cause of risk in as far as violent conflict is concerned, more so over access and use of natural resource. Climate change may expand the danger of savage clash between the upstream and downstream water resource users. At this point in time, exploration and research on climate change, looking at various angles indicates that it will progressively impact natural and social frameworks.²⁹

The study aims at identifying existing knowledge gaps, as scholars perceive that while there has been outstanding advancement in lessening climate change especially those affecting Mountain forests; there has been altogether less advances in addressing climate change issues exhaustively. Since, there was more forest cover on the base of Mt Kenya than there is today. Hence scholars believe that this must have contributed to a warming of the climate of the high peaks, thus attempts should be made to reverse this or slow it down.

Studies on the impacts of and the negative effects to climate change on human security and subsequently working out the mitigation and adaptation requires access to quality information. This study notes that changes in global climate, through higher temperature ranges, resulting in erratic and unprecedented patterns with regard to rainfall as well as more commonly experienced extreme weather patterns and physical conditions, may affect forest elements in diverse ways, among the elements in

²⁹ Duraiappah A. (2004). *Exploring The Links- Human Well-Being, Poverty & Ecosystem Services*, UNEP/IISD, Nairobi, Kenya, p. 67.

question being stress and compositional as well as structural and functional, in the process lessening the capability of the forests to provide like they have traditionally done, goods and services that are vital and essential to the surrounding societies and humanity as a whole. There is a general poor understanding of these effects, besides the developed countries opting not to sign the relevant multi-national environment agreements that lead to policy gaps, which need to be upscaled in order to enhance forest conservation strategies, social and global environmental issues at play to mitigate the impact of climate change and human security in Kenya.

1.6 Theoretical Framework

The study applies Ecological systems theory to examine forest conservation strategies to mitigate the impact of climate change and human security in East Africa using a case study of Mount Kenya forest.

Conceptualized and developed by Urie Bronfenbrenner, the ecological systems theory, is centered upon having the environment divided up into five separate levels, consisting of the microsystem, the mesosystem, the exosystem, the macrosystem, and the chronosystem. Among these five levels, the micro-system level refers to the stage which defines the closest level of a relationship in a person's interaction. At this level, there are direct interactions between biotic and abiotic factors,³⁰ and is therefore without a doubt the level that has the highest influence on a person.

This hypothesis uses the simile of a child's development in the context of the general systems of interactions or relationships prevailing in her overall environment. theory first defines the actual strata and levels of environment in question, and then goes on

³⁰ Bronfenbrenner, U. (1988). *Foreword*. In A. R. Pence (Ed.), *Ecological research with children and families: From concepts to methodology* (pp. ix-xix). New York: Teachers College Press.

to explain the complex effect and influence that each of the levels has on a child's development. Taking into consideration that among the major environments that fuel a child's development is his own biology, Bronfenbrenner's hypothesis name was recently changed to "*bio-ecological systems theory*".³¹ The theory works on the premise that just as a child's development is steered and fueled by interactions between its own biology such as natural growth and maturation, together with relations with the people around him such as family and community, and a change at any stage generates a ripple effect, in a similar way changes or any form of conflict experienced in any of the forest strata will also automatically create a ripple effect on the forest structure and tree species composition. This is similar, just the like the succession of natural vegetation that evolves from the herbs, through shrubs, pioneer tree species, and finally climaxing into natural forest.

Bronfenbrenner's ecological systems hypothesis lays more emphasis on quality of a child's environment. He contends that with the continued development of a child, ensuing interaction within the biotic and abiotic factors becomes more complicated. This complexity is an inevitable occurrence with a child's continued and gradual growth to maturity of physical and cognitive structures.³² Therefore a complex forest containing huge biological gene pools usually offers various products and services. Bronfenbrenner contended that the development of a person is driven by genetical characteristics, social interactions and the prevailing surrounding environment.

³¹ Bronfenbrenner, U., and Ceci, S. J. (1994). Nature-nurture reconceptualized in developmental perspective: A bio-ecological model. *Psychological Review*, 101(4), pp. 568-586.

³² Bronfenbrenner, U. (1995). The bioecological model from a life course perspective: Reflections of a participant observer. In P. Moen, G. H. Elder, & K. Luscher (Eds.), *Examining lives in context: Perspectives on the ecology of human development*. Washington, DC: American Psychological Association, pp. 599-618.

The microsystems layer of Bronfenbrenner's Ecological Model, is the smallest and closest of the contexts in a child's existence and consists of the surroundings in which the child lives and moves.³³ Similarly, within forests also there are various site indices, such as different soil types, topography, temperature range and rainfall pattern, will determine forest composition and structure. The child's microsystem constitutes in this case the social and the institutions he relates with directly. In this category we include family members, child care, peers as well as school teachers who have a direct social impact on the well-being of a child as he grows to maturity. For an older child, the play area, school, as well as religious institutions could be regarded to be within the micro-system. In other words, the microsystem grows as the child matures, as the level of interaction widens.

The microsystems exist within the mesosystems layer, which in this theory refers to interactions among members of microsystems. Such interactions include interactions and relations between neighbours and a child, parents and childcare providers, or different parents.³⁴ While not being involved directly with the mesosystems, a child is nonetheless affected by the social contacts and the environment in which he lives. Accordingly, climate change mitigation and adaptation efforts must provide linkages and be balanced with other national and local forest objectives.

The third layer is the ecosystems and it generally relates to the entire community that hosts a child and how it relates with or influences the child. People within the ecosystems layer can be mass media, extended family, family friends, neighbours,

³³ Bronfenbrenner, U. (1988). *Foreword*. In A. R. Pence (Ed.), *Ecological research with children and families: From concepts to methodology*. New York: Teachers College Press, pp. ix-xix.

³⁴ *Ibid*, p. xixi.

workplaces, and various public services such as legal, health and social welfare services. This analogy is similar to the floral succession through which a tree climaxes from a seedling through sapling to maturity under physical interactions with other undergrowth vegetation and other dominant tree species that provide shading effects for maximum tree growth. While a child never directly makes contact, his development and socialization are affected and influenced by literally all the systems,³⁵ since the ecosystems affect the people in the child's growth cycle. For instance, if a parent goes to work or loses his job, whatever happens to the family as a result of this change will impact on the child's life. Similarly, in the forest structure, when there is a unnatural phenomenon such as fires, pests, extreme temperatures, landslides and other, will affect composition of forests.

The macrosystems, which is the outermost layer, encompasses attitudes and ideologies, values, laws and customs of a particular culture or subculture. The model portrays the very complex nature in the way systems interact and relate, and also brings home the point that the subject, who is the child actively participates in his life and is not a mere passive recipient of the happenings in her life.³⁶ The direct interactions of the child within the microsystems together with the effects caused by the interaction make an impact both ways. People affect the child, and in the same way the child influences them. Since life is forever dynamic, the subject who is the child, as well as the systems, and prevailing environments will always have varying issues. In conclusion, the study believes that increased interdependence between the

³⁵ Bronfenbrenner, U. (2005). On the nature of bioecological theory and research. In U. Bronfenbrenner (Ed.), *Making human beings human: Bioecological perspectives on human development*. Thousand Oaks, CA: Sage Publications, pp. 1-15.

³⁶ Bronfenbrenner, U. (1988). *Foreword*. In A. R. Pence (Ed.), *Ecological research with children and families: From concepts to methodology* (pp. ix-xix). New York: Teachers College Press.

forests and other physical conditions, will help in determining the conservation strategy approaches and policy guidelines to sustainably conserve and manage the forest, and can only be possible if there is dependence between states across East Africa adopting policy.

Without a doubt forests together with their products naturally have very significant and effective ways of mitigation the several harmful effects of GHG emissions. Among the many ways they accomplish this is by being a “sink” which is able to absorb emissions and keep large amounts of carbon away from circulation for a significantly long time. Forests may also be engaged for adaptation strategies which are important in necessary in helping communities to live with unending, and inevitable changes expected within the natural resource base which is so critical in the sustenance of livelihoods for a majority of the community. Sustainable forest management therefore must be taken seriously and this should be reflected in any policy or action programme which is set with the aim of tackling the growing and continuing global concern on the effect and impact of climate change in the East Africa.

1.7 Hypothesis of the Study

- i. There is a positive interaction between human security and climate change in East Africa.
- ii. The forest conservation measures adopted to tackle climate change in Kenya are disjointed and not adequately coordinated amongst the stakeholders.
- iii. There is weak implementation of forest conservation policies and Climate Change in Kenya.

1.8 Research Methodology

1.8.1 Research Design

The research design applied in this study is the case study to help in establishing climate change and human security issues in East Africa, using a case study of Mount Kenya forest. Case studies are regularly done in the subject's real-world situation, which gives researchers a good outlook of what they are actually like. Case studies have the advantage of being able to provide rich and practical raw material which can be used to advance and explain theoretical ideas. Other useful sources of information for a study include documents, making observations, and interviews.

The study used both quantitative and qualitative research approaches within a given stage of the study or within two of the stages of the research process and through examining the relevant physical conditions of the eco-system. Combining both qualitative and quantitative data is useful and more reliable since the assessment is enhanced as the inadequacies of one of the types of data are able to be balanced by the strengths of another.

1.8.2 Data Collection

This included desktop review of the existing scholarly materials for secondary data and focused questionnaire tool for all the primary data. In addition, scheduled interview guides will be to guide on the discussion themes and this were enhanced by taking notes.

An interview administered questionnaire is one data collection instrument which is used to collect and record any data that will help a researcher make a conclusion about any phenomenon. It comprises mostly a rundown of direct queries or inquiries, to be answered. It also incorporates specific and clear directions on how to answer

together with space for respondents to answer or regulatory points of interest. The questionnaire distinctly indicates the reason for the targets of the examination, with distinct clarity right from the beginning how the research data and the discoveries will be utilized. Respondents also ought to understand the motivation that is driving the examination if and wherever conceivable, and need to be told how and when they will get some sort of feedback on the discoveries.

The target population were mainly from the relevant work institutions whose the objective populace were workers of these establishments, for example, the National Environmental Management Authority (NEMA), the Kenya Wildlife Service (KWS), the Kenya Forest Service (KFS), the police office, the fisheries office, the Kenya Plant Health Inspectorate Service (KEPHIS), the Lusaka Agreement Taskforce (LATF), the United Nations (UN), and non-governmental associations (NGO) and the Communities, (community forest associations in the adjacent sub-counties) in the zones with high predominance of natural change.

1.8.3 Data Analysis

An interview guide was administered to the key respondents and their profiles were captured so as to give a picture of their understanding of their background and input towards the study. After collection of the questionnaires and group discussion results, the large quantity of raw data collected needs to be systematically organized to facilitate analysis.

The analysis of data was done by using descriptive statistics and document analysis was done. The researcher will use qualitative data collected to make general statements on how categories or themes of data are related. The main steps in the data analysis involved - data organization, creating (identifying) categories, themes and

patterns, analysing information and interpreting them. The data was analysed by the use of Content and or Document analysis, through a literature review and reviewing reports available on environmental crime and injustices.

Field analysts are frequently intrigued by concentrating on compelling or degenerate cases. This refers to those cases which are different and fail to fit as among those that are consistent with the expected and usual mentalities and practices. In considering the so called freak or unusual cases, specialists do get to pick up a deeper and wider understanding of the much more general ways of conduct. Purposive examination commonly happens in these instances.³⁷

To give an illustration, when an analyst wishes to understand more about understudies within the highest point among the performers of their class, he may wish to test the understudies who fit within the "highest point of the class" group. The respondents must then be purposively chosen because they meet that required specific trademark.³⁸ Purposive examining is generally extremely valuable in circumstances when a specific sample is quickly required.

1.8.4 Data presentation

The study outcomes were finally presented in form of narrative, pie charts, bar graphs and frequency table.

³⁷ Neuman, L. (2003). *Social research methods; Qualitative and quantative approaches.* (5th ed). Boston: Allyn and Bacon.

³⁸ Ibid.

1.9 Chapters of the Study

Chapter 1: Introduction to the study

Chapter 2: Linkage between Climate Change and Human Security in East Africa

Chapter 3: Forest Conservation Measures to Tackle Climate Change and Human Security Issues in East Africa

Chapter 4: Key Actors and Policy Actively Involved Forest Conservation Activities Kenya

Chapter 5: Summary of Findings, Conclusion and Recommendation

CHAPTER TWO

CLIMATE CHANGE AND HUMAN SECURITY IN EAST AFRICA

2.1 Introduction

This chapter endeavours to review climate change links and relates with human security in East Africa, with a specific concern on overall climatic variation issues and climate change mitigation, plus adaption mechanism.

Change in climate is becoming more and more an everlasting item of discussion at nearly all forums engaged in deliberating on environmental policy formulation. This is a very telling indication or evidence that what is observed as the impact of change in climate is a major actor in influencing and determining development track and balancing of power within not just the global but also national political economy.³⁹ According to observations, climatic revolution challenges highly surpass the capability of states working in individual capacity to fully and effectively resolve. It is a shared developmental and security problem whose implications can only be best studied and their solutions determined and resolved through teamwork at numerous levels; through mutual aid committed to building inclusive transnational tactics that will manage stable settlement of the populace, through sharing innovative approaches towards adaptation, governing shared resources and managing insecurity.

There are several and inevitable changes that are associated with Climate change, for instance, propagation of Sahara desert as a result of attendant desertification, reduced precipitation, decimating droughts, growing temperature, extreme storms in addition to regular flash floods. There has also been observed melting of snow caps on Mount

³⁹ Griggs, D. *et al.* (2013), *Sustainable development goals for people and planet*, *Nature*, Vol. 395, pp. 305-307.

Kenya as well as Mount Kilimanjaro, a rising sea level, inevitably causing substantial and recurrent variations to daily occurrences and activities, thus affecting ordinary lives.⁴⁰ This kind of Climatic impact are grounds for insecurity, presently creating differences in a number of areas including Northern-east Uganda, Sudan and Kenya. Looking at Africa's history where ethnic, in some areas natural resource as well as interstate disagreement have been seen to occur, the continent is considered to be extremely disposed to this newly emerging security threat that is climate-induced.⁴¹ Regardless of being least responsible and accountable for GHGs emission in the global context, it will endure the severest impacts of variation in climatic conditions.⁴² Climate change is a threat to security, and is packaged in that manner today in addition to its obvious place as an environmental issue. Fossil energy use contributes highly to global warming. Simultaneously, energy plays a primary role in development as an irreplaceable resource and thus in their endeavour to grow industrially, developing countries have no choice but to enhance their energy obligations.⁴³

⁴⁰ Dominique, K. (2014), *Policy and Governance Responses to the Water-Energy Nexus Challenge, Presentation at the 2014 UN-Water Annual International Zaragoza Conference on "Preparing for World Water Day 2014: Partnerships for improving water and energy access, efficiency and sustainability"*, 13 January, Zaragoza.

⁴¹ King, M. (2013), *Green Growth and Poverty Reduction: Policy Coherence for Pro-poor Growth, OECD Development Co-operation Working Papers*, No. 14, OECD, Paris.

⁴² UNSDSN (United Nations Sustainable Development Solutions Network) (2013), *Draft SDSN Report for Public Consultation, May 2013*, UNSDSN, Paris.

⁴³ King, M. (2013), *Green Growth and Poverty Reduction: Policy Coherence for Pro-poor Growth, OECD Development Co-operation Working Papers*, No. 14, OECD, Paris.

The study by the UN shows that, there are three various characteristics to the security threat posed by change in climate. First, change in climate could intensify land-use conflicts and provoke environmental migration by enraging existing environmental disaster, such as drought, shortage of water and soil degradation.

In addition, rising temperatures and rainfall variability may contribute to deprivation of reaching human wants thereby undermining people's livelihoods, especially in developing countries. Change in climate has a devastating effect to the local economies to adapt to changing environmental conditions and bolster the trend towards general instability because of competition for the scarce natural resources that already exists in many communities and states, particularly in weak economy states with poorly performing institutions and way of ruling.

2.2 Key Impacts of Climate Change in East Africa

Climate Change can be described as a lasting modification of the information of weather patterns and characteristics (including averages and ranges). For instance, it could manifest as variation surrounding the patterns in relation to average values both occurring and expected for temperature as well as for precipitation measured at a specific location and period or season through-out preceding decades. During 1990s through to the commencement of the new millennium the atmosphere has been recorded to be warmer all over the East Africa region and on the global instrumental temperature record as from middle 20th century.⁴⁴

⁴⁴ Ibid.

Human activities through pollution and deforestation has effects on the climatic system, and the anthropogenic release of green-house gases which are currently the highest in history of manhood. Current climatic changes have had pervasive impacts on natural systems and on humans. In recent times, change in climate has piloted to an influence on biological and hominid systems across the sphere. Effects are due to witnessed rise in temperatures and rainfall variability both in strength and patterns, whether caused by negative human activities like shift in cultivation, contamination and cutting down of trees or over utilization of cultural resources in countries that are not stable and these provide an indicator of sensitivity in not just human systems but also natural systems as far as changes in climate are concerned. In some regions, diverse models predict different trends in the expectations for dry and wet extremes. However, other regions, confirm clear drifts for instance anticipated increasing droughts and floods within Tana delta and East Africa respectively.⁴⁵

The climate change phenomenon creates challenges that are considerable for development. Regardless of the qualms within lasting climate forecasts, there is a crucial need to scrutinize the social and environmental systems, as well as the economically precious resources that pose challenges to climate change.⁴⁶ There is observed evidence that the most normal systems are the ones that suffer the effects of climatic variation most brutally. In most regions, deviations in rainfall amounts and patterns, or rising tides, tender snow and frost are playing a role in the changing

⁴⁵ IPCC (Intergovernmental Panel on Climate Change). (2014). *Climate Change Synthesis Report*. Summary for Policymakers. Cambridge University Press, Cambridge, p. 6.

⁴⁶ Kurukulasuriya, P., Mendelsohn, R., Hassan, R., Benhin, J., Deressa, T., Diop, M., Eid, H.M., Yerfi Fosu, K., Gbetibouo, G., Jain, S., Mahamadou, A., Mano, R., Kabubo-Mariara, J., El-Marsafawy, S., Molua, E., Ouda, S., Ouedraogo, M., Sene, I., Maddison, D., Seo, N. and Dinar, A. 2006. *Will African Agriculture Survive Climate Change?* The World Bank Economic Review, p. 22.

hydrological series, with effects such as availability of water resources in terms of quantity and quality. Several biotic species both earthly and aquatic have migrated to different geographical areas and different topography, seasonal activities, migration patterns, abundances and species interactions and its adoption to external climatic conditions (high confidence).⁴⁷

Some effects on human activities both social and physical have also been attributed to change in climate which has got a distinct effect different from other factors like cultural, governmental and economical on the humankind. It is noted in the study that the projected climatic changes for East Africa if mitigation measures are not quickly undertaken, there is a possibility the future of increasingly scarce water resources, decrease in agricultural production, encroaching deserts on southern hemisphere and the collapse of infrastructure like roads due to abnormally heavy rains and flooding. Such effects if they occur, could undermine population movements and raise tensions over dwindling strategic resources. In such a case, change in climate could be a factor that would raise tension among the neighbouring communities and tilts fragile states towards socio-economic and governmental turmoil and potentially total collapse. This is either in reality or perception a ‘threat multiplier’ which increases concerns due to water scarcity, loss of biodiversity and food insecurity making the situation more complicated and obstinate.

⁴⁷ IPCC (Intergovernmental Panel on Climate Change). (2014). *Climate Change Synthesis Report. Summary for Policymakers*. Op. Cit.

Africa as a region in the world has borne the highest impacts of change in climate due to her large dependence on natural resources by their relatively poor citizenry. The problem is further intensified by deprivation of economic development, internal conflicts, widespread poverty, diseases and refugees which make African countries among the exposed to the consequence of climatic revolution. Effects of climatic variation can potentially weaken if not outright reversing the growth achieved on enhancing of the socio-economic, cultural and overall well-being of the inhabitants of East Africa. It is approximated that the claim for basics which include food, drinking water and water for other uses as well as pasture for livestock will double two-decades from this point forward.⁴⁸ The climate change challenges can be observed as in the case of the North-West part of Uganda, North-Eastern parts of Kenya and among the communities like the Maasai.

Intense susceptibility and poor mitigation capacity and capability within East African localities have been found to have a correlation with factors which include inability or limited ability to effectively adapt socially, economically; as well as weak institutions, below mean revenue and hardships, together with deprivation of safety nets. To illustrate this, East Africa, specifically Kenya is considered highly affected by global warming due to the fact that there have already been identified experiences of high temperature ranges in addition to precipitation that is variable, and below the expected levels. In addition, most of East Africa economies depend nearly entirely on agriculture, mining together with service industries therefore the adoption of modern

⁴⁸ IPCC (Intergovernmental Panel on Climate Change). (2014). *Climate Change Synthesis Report. Summary for Policymakers*. Cambridge University Press, Cambridge, p. 6.

technology is low.⁴⁹ Climate change and climate variability (or unpredictability) are challenges that confront many East African countries. Climate change has also caused frost among tea growing areas in Kenya, especially in Kericho and Mount Kenya regions such as Kirinyaga and Nyeri, and that lowers the tea production. The other impact of climate change is the continued loss of ice cap in Mount Kenya and Mount Kilimanjaro, which leads to reduced water flow in the rivers and loss of biodiversity.

Perhaps, uncertainties as far as predictability, intensity, and precipitation frequency are concerned could be regarded as the most common and most potentially overwhelming effects of climatic change within East Africa.⁵⁰ Differences in expected rainfall may finally affect both availability and accessibility of water and subsequently cause a reduction in the production of agricultural products and eventual food shortages. The continental climate consists of seven separate eco-zones. Different ecosystems ranging from ASAL (Arid and Semi-arid Lands) to central African rainforests all the way to the (now disappearing) ice capped Mount Kenya and Kilimanjaro is a reflection of reality as a result of the climate change impact which has been found to cut across administrative boundaries.

It is imperative though that the international institutions responsible for implementing environmental maintenance and justifiable management administration because of, direction and complement the implementation of all lawful mechanisms and policies that mitigate against climate change across her member countries. For instance, any

⁴⁹ Kurukulasuriya, P., Mendelsohn, R., Hassan, R., Benhin, J., Deressa, T., Diop, M., Eid, H.M., Yerfi Fosu, K., Gbetibouo, G., Jain, S., Mahamadou, A., Mano, R., Kabubo-Mariara, J., El-Marsafawy, S., Molua, E., Ouda, S., Ouedraogo, M., Sene, I., Maddison, D., Seo, N. and Dinar, A. 2006. *Will African Agriculture Survive Climate Change?* The World Bank Economic Review, p. 22.

⁵⁰ Root, T.L., J.T. Price, K.R. Hall, S.H. Schneider, C. Rosenzweig, and J.A. Pounds. 2003. *Fingerprints of global warming on wild animals and plants.* Nature 421: pp. 57-60.

activities carried out among the Karamojong communities in Uganda directly affects the Turkana and Pokot pastoral communities in Kenya, the Nuer in Sudan and the Oromos from Ethiopia. These negative activities that impact on natural forest and vegetation have had a direct effect among the communities mention above that have led to scarcity of pasture, resulting in poverty owing to the hostile climate change.

Latest studies have brought out the fact that increasing temperatures of the lake surfaces and the melting of the ice on Mount Kenya caps, and high sea tides in the Indian Ocean more so at the southwestern part, in addition to yearly climatic changes, that is, El Niño/Southern Oscillation (ENSO) could be a major player in influencing rainfall within the East Africa regimes. They are also thought to correlate to rainfall variations within and across parts of the equatorial rainfall forests of Kakamega and the extreme forests in Tanzania-Uganda.⁵¹ This can be witnessed in frequent floods in Budalangi area of Busia County, there are also prolonged dry spells in the North Eastern region of Kenya, and other areas of Ukambani.

The big water bodies' presence coupled with diverse altitudes and topography results in a variety of climatic conditions in Eastern Africa, beginning from humid tropical climate besides the sea areas to arid shallow areas of hilly landscape across Kenya, Tanzania and Ethiopia. Similarly, the existence of Indian Ocean in the vicinity together with Lake Victoria, Lake Natron and Lake Tanganyika, coupled with the existence of mountains like Kilimanjaro, Elgon, Cherangani ranges and Kenya all contribute in inducing localized climatic patterns in the region.⁵²

⁵¹ Rowe, D.P. (2001). *Tele-connections between the tropical Pacific and the Sahel*. Quarterly Journal of the Royal Meteorological Society 127: pp. 1683-1706.

⁵² KNMI. (2006). *Climate change in Africa. Changes in extreme weather under global warming*, Royal Netherlands Institute of Meteorology, p. 7.

In conclusion, climate change in East Africa is viewed as a major cause of conflicts and tensions that impacts negatively among the pastoral communities fighting for equitable access to resources and therefore poses major threats to human security, environmental as well as developmental challenges that have always plagued Africa. These effects are either worsened or on the other hand moderated by the prevailing fundamental conditions of resource management, poverty and governance, both at national and regional levels. The existing policies, legal framework and designed programs, can go a long way to mitigate against climate change in addition to other environmental stresses which trigger conflict if they are effectively implemented at macro-level. The climate change intervention on mitigation and adaptation may take into consideration the existing political, social and economic tensions, and avoid activities that may worsen them. The existing difference that determines whether there be security rather than insecurity, or stability as opposed to instability can only be decided by two broad factors, which are the ability for the communities through the state to make effective adjustment to the given changes (institutional capacity), and the response by individuals, societies, communities as well as the government to the challenges that arise (responses).

2.3 Climate Change and Human Security

High inhabitant's growth rate in East Africa especially among the communities around Mount Kenya is increasingly exerting pressure on access and equitable use of resources especially amid the upstream and the downstream communities. There has been perennial conflicts amongst the sedentary farmers and pastoral communities (The Samburus, Turkana and the Borana) who during the dry seasons invade the

private farmlands and government forests in hunt of pastures. These conflicts have in most cases resulted into loss of human life and livestock at times escalating into a flexible tribal civil strife. Furthermore, constant conflict between downstream water resource users and upstream large-scale farmers who abstract large amount of water for horticultural irrigation has been present thereby denying the downstream users enough water resources. The perils of human induced climate change due to unwanted destruction of forests have been the main contributor to the disappearance of water springs, loss of rare medicinal tree species and biodiversity thereby exposing the local communities to un-ending ailments that would otherwise have treated.⁵³ Climate change has been discussed in international and national forums both by scientists and leaders in the political and social sphere as possibly ‘the paramount concern in the world right now, which can very well fit in the category of ‘weapon of mass destruction’. Some countries have gone ahead and securitized climate change as a phenomenal issue which requires tackling by all citizenry.

For effective resolution of climate change issues, the political players together with Multi-National Agencies have to collectively sign and implement all procedures, treaties and conventions that could collectively reduce the outcomes of climatic variation. Shifts in human attitude towards environmental conservations should be tackled at the national level and individual level so that environmental conservation becomes everybody’s responsibility. For instance, those concerned with resource use, conservation, lifestyle, wealth and reducing poverty levels. In addition, large and

⁵³ Smit, B. and J. Wandel. “*Adaptation, adaptive capacity, and vulnerability.*” Global Environmental Change vol. 16 (2006): pp. 282-292.

home industries, business societies and individuals have to participate.⁵⁴ So as to understand the level of magnitude climate change causes, a modern term that is employed to describe such environmental care as ‘sustainability’ should be embraced by all.

2.3.1 Food Security Issues

The problem of rising temperatures coupled with reduced and more erratic rainfall patterns is projected to render more than 240 million people within the continent in water stress at intense levels by 2020. The worst projected areas are likely to be the Northern, Eastern as well as the Western parts of Africa, which may experience an expected extreme reduction in potable water of up to 50 percent by the year 2050.⁵⁵

With the present trend, Northern parts of East Africa which have previously suffered unbearable drought may worsen to more unbearable levels by the time the 20th-century come to a close. Sixty-five percent of the African populace is highly dependent on rain-fed agriculture for its very livelihood and should a slight shift take place in rainfall distribution or temperature, it could end up tragically.⁵⁶ The shared effects caused by climate variations as well as population dynamics lead to an anticipated rise in food insecurity, environmental deprivation, and hardship. The African Institute for Development Policy (AFIDEP) and Population Action International (PAI) carried out some research starting February to July 2012 with the aim of evaluating the background that can enable the integration of rapid growth in

⁵⁴ IPCC (Intergovernmental Panel on Climate Change). (2014). *Climate Change Synthesis Report*. Summary for Policymakers. Cambridge University Press, Cambridge, p. 6.

⁵⁵ UN (2013d), Millennium Development Goals Report, UN, New York.

⁵⁶ Ibid.

population concerns as well as climate variations effects in development of Kenya tactics and policies.⁵⁷

2.3.2 Climate Change and Human Health

Climate change brings about flooding effects, and through which water pounds become breeding areas for mosquitoes and other disease-causing pathogens, such as the Miombo woodlands in central parts of Tanzania, the Tana river Delta basin within Kenya is prone to mosquitoes, and lake Kioga in Uganda has a lot of flooding effect that cause mosquito manifestations and the Yala swamps in Siaya and Busia County has high incidences of waterborne diseases.

The IPCC discloses that exposure to extreme heat, often catalyses the multiplication of potentially death causing illnesses for instance elevated temperatures, heat cramps, stroke and heat exhaustion. In East Africa mean temperature gets warmer during daytime and extremely cold in ASAL regions and scientists preparing to receive more intense and frequent heat waves in coming days.⁵⁸ Yet this response can also present significant opportunities.

Climate change effects results to a prolonged drought that leads to water scarcity that leading to human beings walking long distances in search of water and hence weakening their immune system. Lack of water has a direct effect on the growth of plants and production of food leading to malnourishment and hunger among the humans. In converse, too much water leads to more stagnant water bodies that are

⁵⁷ IPCC (Intergovernmental Panel on Climate Change). (2014). *Climate Change Synthesis Report. Summary for Policymakers*. Cambridge University Press, Cambridge, p. 6.

⁵⁸ IPCC (Intergovernmental Panel on Climate Change). (2014). *Climate Change Synthesis Report. Summary for Policymakers*. Cambridge University Press, Cambridge, p. 6.

breeding grounds for vector borne diseases similar bilharzia, dysentery and malaria which weaken humans for example leading to death.

Variation in climate possibly also result to increased desertification, accelerating to starvation, issues of proper hygiene among other changes. In fact, until mid-century, proposed climatic change will influence the health of humans mainly by worsening health problems that by now exist (high confidence). In the 2100 era, change in climate is possible to lead to intensification of ill-health globally and especially in countries that are developing, as correlated to boundaries without change in climate (high confidence).⁵⁹ Co-benefits and unfavourable impacts of alleviation could affect completion of other goals such as those parallel to the health of human, food security, biodiversity, access of energy, equitable sustenance of development and livelihoods.⁶⁰

Climatic change will lead to variability of the physical range and cyclic occasions of a variety of infectious diseases – in addition to vector-borne contamination like dengue fever and malaria, together with infections that are food-borne like salmonellosis most of which climax during summer seasons.⁶¹ Temperature increases resulting from gas pollution are broadening to the extent whereby the said diseases which include dengue fever and malaria thrive.

⁵⁹ Turner, B., R.E. Kasperson, P.A. Matson, J. McCarthy, R. Corell, L. Christensen, N. Eckley, J.X. Kasperson, A. Luers, M.L. Martello, C. Polsky, A. Pulsipher, and A. Schiller. “A framework for vulnerability analysis in sustainability science.” *Proceedings of the National Academy of Sciences* vol. 100 (2003): pp. 8074-8079.

⁶⁰ *Ibid*, p. 8080.

⁶¹ UN (2013d), Millennium Development Goals Report, UN, New York.

2.3.3 Climate Change and Livelihood Issues

Parts of East Africa have experienced a decrease in yearly rainfall, some areas receiving as low as 150mm per annum to 600mm per annum continuously for the past 10 years. There have been long and extended drought periods beginning from mid 1960s to 1992, when average annual rainfall dropped to a high of 27 per cent.⁶² Moreover, an upsurge of warmer temperatures is anticipated both with regard to intensity and regularity of tremendous weather occurrences for the region, with the end result expected to be rain storms and extensive flooding events.

Climate models forecast yearly increases in the levels of rains falling during periods when there is intense precipitation; rainfall variability causes long drought periods, thus affecting the people livelihood. Thus because of reduced rainfall and increased temperatures, affects the production of agricultural crops, it also reduces the available pasture, leading to livestock loss. The climate change phenomenon also reduces water flows within streams, thus making agriculture impossible. Rise in heat reduces the production capacity of marine life including fish stocks. This study notes that too much rainfall reduces the distribution of agricultural crops, harmfully influencing human livelihood.

Deforestation on Mount Kenya forest has highly affected the capacity to generate hydroelectric power to very low levels, has led to escalated water shortages as well as high rise in temperature ranges causing a dislocation of many people downstream throughout the wet periods. People in Eastern Africa, who only 6 per cent rely on irrigation agriculture have been incapable to adopt to these effects of high rainfall

⁶² UN (2013a): *A Life of dignity for all, Report of the Secretary General*, United Nations, New York.

variability.⁶³ An example is seen in Chogoria within Mount Kenya, in addition there has been dwindling of water reservoirs in Kiambere, Masinga and Kindaruma dams in both Embu and Machakos counties in Kenya. With the aim to adjust to climatic variation, there is a critical need to achieve food diversification in order to maintain good health, modernize agricultural production, expand irrigation programs, and open up another supply of energy like wind, solar, in order to reduce overreliance on forest.

2.3.4. Climate Change and Political Security

Conflict arise due to lack of pasture and the competition for watering points, and these scramble leads to political conflicts, and even armed conflicts. For instance, there is common raiding of farmlands by pastoralist, resulting in political tensions.

Pastoral communities lose a lot of animals, thus making it difficult for the government of the day to fully compensate them, resulting into a form of political tension. Further reduction of agriculture productivity inevitably causes food unavailability with the resultant effects of high levels of food insecurity, which is made even more dire by the ineffective food supply to areas that need it leading to increase of food prices. By 2080, people in excess of 125 million mainly residing in poor nations are expected to suffer hunger risk due to low production and escalating price of agro-crops because of the effects of climate change.⁶⁴ Food scarcity has been a main contributor to political violence in most of the developing nations which suffer food scarcity as it was witnessed nearly in nations whose citizens demonstrated while rioting for food causing political violence in 2008 as a consequence of high food prices.

⁶³ UN (2013d), Millennium Development Goals Report, UN, New York.

⁶⁴ Wigley, T.M.L. “*The climate change commitment.*” Science vol. 307 (2005): pp. 1766-1769.

Vision 2030 which is Kenya's development recognizes that high rate of populace evolution and rapid urbanization is a major dispute to the overall countries development. Although environmental conservation and management was one of the key action points in the social pillar, climate change, which was not given any limelight within the vision 2030 document however, was incorporated in the Second Medium Term Plan for the Vision's 2013-2017 plan. With establishment of climate change country's reaction mechanisms, Kenya has produced extraordinary advancement in establishing a multi-sectoral strategy and organized agenda for harmonizing climatic change effects. The 2010 National Climate Change Response Strategy (NCCRS) however, encourages determined attempts by other government sectors to address issues on climate with specific reference to population dynamics.

2.3.5. Climate Change and Personal Security

The usual interactions between population dynamics and climatic variation risks have the potential to have serious complications for the human being within his ecological environment. Climatic change and population changes are increasingly causing human habitats in Kenyans to be more environmentally unsound; in addition to causing a decline in productivity of agricultural and fish products.

This study reveals that when there is extreme poverty due to climate change, these can enhance crime levels, such as theft, burglary, prostitution and the rest for people to survive. Climate change leads to conflict in resources which leads to the competition for water points, stemming in loss of existence and belongings. Climatic variations can also initiate flooding which lead to losses existence and estate.

Study observes that due to stiff topography, climate change leads to landslides which affect the agricultural lands, and even resulting in serious loss of property and human life. The lack of natural resources results in increased migration of people, and this distorted the socio-cultural fabric, leading to increased tension among the involved communities and this may possibly result in tribal skirmishes.

Intense population evolution places increased demands on ecological reserves which include land, some of it being forest land, and water, thus contributing to the degradation of environment and consequently weakening economic growth. Many Kenyans rely heavily on natural resources, ecological systems and therefore are highly exposed or vulnerable to climatic change effects. Unpredictable weather conditions like has been lately common with rainfall, rapid erosion of soil and extreme hot weather have contributed in a large way to crop failure and the observed continuing decline of land for agriculture.⁶⁵ The rapid population growth in Kenya for instance among the central highland communities, have migrated to some drier parts of Laikipia, Narock and Kajiado Counties in Kenya, thereby fuelling nervousness amid the pastoralists and sedentary farmers.

2.4 Mitigation and Adaptation to Climate Change

This study notes that the idea of alleviation potential has been evolved to evaluate the scale of carbon(IV)oxide gas depletion that may possibly be made, corresponding to pollution guideline, for a given level of carbon price (articulated in cost per unit of carbon(IV)oxide equivalent pollutions dodged). Alleviation possibility is further distinguished with regards to market and economic potential. Mitigation likelihood is approximated using numerous varieties of tactics.

⁶⁵ Ibid.

Adjustment and alleviation are corresponding approach for controlling and reducing the climatic threats. Considerable decrease in pollution over the following years can lessen climate, boost prediction for efficient adjustments, lower the expenses and challenges of alleviation in prolonged period and take part to climate-resilient pathways for sustainable development.

Valuable decision-making to put a boundary on climatic changes and its impact can be well-versed by an outstretched range of analytical approaches for gauging likely risks and benefits, recognizing the significance of supremacy, ethical proportions, equity, value verdict, financial assessments and varied observation and responses to risk and uncertainty.

‘Adaptation’ is a wide hypothesis typically involving a mechanism of adjustment to last and, perfectly, thrive despite changing circumstances. As far as climatic change is concerned, adjustment takes place through alteration to minimise susceptibility or enhance the ability to be flexible to climate change, both observed and expected, and entails modifications in processes, perceptions, custom and functions. Adjustments can take place at different scales, from institutionally-driven, ‘top-down’ policies nationwide to adjustments and decisions at the level of individual households.⁶⁶

This study further notes that some of the mitigation activities include reduction of carbon emissions through the reducing the fire usage during agricultural preparation. So as to further mitigate it is very crucial to cut down charcoal burning, reduce clearing of vegetation.

⁶⁶ King, M. (2013), Green Growth and Poverty Reduction: Policy Coherence for Pro-poor Growth, OECD Development Co-operation Working Papers, No. 14, OECD, Paris.

Activities carried out are currently the main reason of fluctuations on composition of atmosphere of the earth and the primary driver for coming climatic changes (IPCC, 2007; IPCC 2014). The trend of long-term emission of harmful gasses and greenhouse effect is primarily a forced climate change initiated by increased atmospheric gases that are human-made, mainly carbon dioxide. The latest science indicates that a substantial decline in emissions is essential to even out climate and block possibly dreadful impacts on the most susceptible, on coming generation and on biodiversity. Rapid and enormous emissions reductions are necessary to recondition the energy balance within the Earth and prevent where possible, the anticipated ocean heat uptake. Emissions of lofty fossil fuel have been depicted as an “act of extraordinary intergenerational injustice” with current understanding of the outcomes.⁶⁷

So as to mitigate change of climate country wide, the council ought to work strictly with other international organization through signing and enforcing intercontinental contract and etiquettes that are aimed at reducing climate change. The issues of enhancing carbon credit mechanism can encourage those who cultivate to sell trees.

Regarding to change in climate alleviation, the management should encourage conservation, regeneration of natural forest and enhancement rooting, and increased protection and surveillance regions around the areas. Moreover, there must be an enabling legal framework that encourages community participation in the protection of natural resources, so as to constantly conserve water and other reserves for themselves and for coming lineage. The government should enforce a national campaign that encourages all citizens to have at least over ten percent tree cover. The set of rules for the destruction of the environment should be very strict and very

⁶⁷ Ibid.

expensive, to put off residents from cutting down trees and or destroying the environment.

Policies that control the production of agricultural products and management or conservation are more of use when both adaptation and alleviation are involved. Other alleviation alternative in the AFOLU sector (such as soil and forest carbon stocks) may be susceptible to change in climate (medium evidence, high agreement). When implemented sustainably, actions taken to reduce the depravity of forests and emissions caused by clearing of forests.⁶⁸

2.5 Conclusion

This study notes that importance of change in climate phenomenon is upon a set of development goals that are capable of being maintained without exhausting natural resources. While there has been some little progress in ensuring this goal is met, novel global as well as local challenges continue to derail the development expected and ecological accumulation to date. Change in climate in East Africa together with unprecedented degradation of ecosystem and environmental services has been seen to intensify risks and reduce opportunities, especially among the poor and vulnerable people. The constant growing of capital, information and technological services all fuel a population increase globally leading to certain implications with regard to patterns and styles of production and consumption. The extent, determination and resolution of global environmental complications necessitate the need for constant combined efforts among states and other stakeholders to successfully solve solutions and achieve internationally desired and set objectives.

⁶⁸ Metcalf G. E. (2009). *Cost Containment in Climate Change Policy: Alternative Approaches to Mitigating Price Volatility*. University of Virginia Tax Law Review.

CHAPTER THREE

FOREST CONSERVATION MEASURES TO TACKLE CLIMATE CHANGE AND HUMAN SECURITY IN EAST AFRICA

3.1. Introduction

This chapter discusses forest conservation measures to tackle climate change and human security issues in East Africa.

3.2. Forest Conservation and Human Security Issues

Forests and woodlands occupy an estimated 650 million ha or 21.8 per cent of the land area in Africa (FAO 2005).⁶⁹ This study notes that Eastern African coastal forest eco-region is recognised as one of Africa's centres of species endemism, and is distributed over three countries (Somalia, Kenya, and Tanzania). Most is found in Kenya, Tanzania and Mozambique, which form our focal region. The coastal forests are fragmented, small and surrounded by poor communities that have a high demand for land and forest resources. Although mountain and coastal forests have significant cultural and traditional values for local communities, they do not receive adequate support from the relevant government authorities and international conservation institutions.

Forests provide a wide array of environmental resources, some of which can be successfully commercialized, increasing financial benefits. Environmental services from forests also have a lot of use.⁷⁰ The Human Dimension provides an overview of

⁶⁹ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

⁷⁰ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

the value of environmental goods-and services and their role in supporting livelihoods.

Forests play an important role in carbon sequestration, and by investing in forest development and conservation countries can benefit from carbon trading. A number of corporate institutions in Europe are already benefiting from carbon trading by investing in tree planting in some parts of East Africa. Carbon trading also offers opportunities for indigenous companies and in particular Small and medium enterprises.⁷¹

The mode of the linkages between the environment and human security has been debated for years. However, it is recognized that a clean, healthy and functional environment is integral to the enjoyment of human security, including the rights to life, health, food and an acceptable standard of living. This recognition is brought forth by the international community through multilateral environmental agreements (MEAs) prohibiting illegal trade in wildlife, preserving biodiversity and marine and terrestrial habitats, reducing trans-boundary pollution, and preventing behaviours that harm the planet and its residents.⁷²

It is argued that environmental protection protects human security. At the same time, adherence to human security-such as those that ensure public access to information and participation in decision making, contributes to more just decisions about the utilization and protection of environmental resources, and protects against the potential for abuse under the auspices of environmental action.⁷³ Thus the

⁷¹ Ibid

⁷² Ibid

⁷³ Ibid

incorporation of human security principles would strengthen domestic laws and MEAs as they contribute to the ongoing realization of human security.

The mandate to take immediate action to reduce the greenhouse gas emissions that contribute to global climate change as well as institute measures that reduce vulnerability and increase climate change impacts resilience is clear. Yet, some of the responses to climate change among them both mitigation and adaptation activities, may also interfere with human security, as has been the case for a number of hydroelectric and bio-fuel projects undertaken, in part, to reduce global greenhouse gas emissions.⁷⁴ It is critical that human security is given due consideration as the world endeavours to address the increased problem of climate change.

Over the last decade the international community has arrived at a clear consensus on all of these issues. Yet, while United Nations agencies and national governments have explicitly acknowledged that climate change and responses to it can impair human security, there has been less agreement on the responsibilities of governments and private actors to address this problem, respectively.⁷⁵

The market for environmental services from forests is experiencing rapid growth around the world, often facilitated by national and regional policies as well as international conventions and agreements. Segments of the society able and willing to pay for these services are creating opportunities for forest owners. Markets for carbon sequestration have been adopted in Uganda, Tanzania, Malawi and Rwanda.⁷⁶

⁷⁴ Ibid

⁷⁵ Ibid

⁷⁶ Ibid

The increasing demand for nature-based recreation has induced a dynamic private sector involvement in the management of game reserves and parks in Kenya, Tanzania and Uganda. Many nature-based tourism and ecotourism activities revolve around forests, establishing a strong cause-and effect relationship between ecotourism development and forest use.

Ecotourism provides a means by which people can use forests and wildlife, without extracting resources enhanced livelihood security. However, as forests and woodlands are declining, mainly driven by increased wood fuel collection, conversion of forest land to agricultural land, illegal and poorly regulated timber extraction, conflicts, increased urbanization and industrialization, these opportunities are diminishing. Africa's forests and woodlands receded faster than the global average between 1990 and 2000; deforestation averaged 0.8 per cent in Africa, as compared to the world average of 0.2 per cent. Policy, legal, institutional, technical and economic constraints have undermined wider adoption of sustainable forest management as well as limited opportunities for development.

One major constraint is that Africa has not been able to tap the potential of its wealth of raw materials and traditional knowledge to invest in processing. This continues to undermine opportunities for employment and livelihood generation.

With increasing private sector involvement, including foreign-based companies, there is a good opportunity for governments to develop viable partnerships with the communities and civil societies in the protection of traditional rights of forest-adjacent communities, including equitable sharing of benefits from forest resources to promote livelihood security and ensure of forest and woodland resources are used sustainably. This is consistent with the provisions and obligations of the Convention

on Biological Diversity (CBD).⁷⁷ Additionally, it is essential that there is be increased investment in the development of micro- and SMEs if people are to have the opportunity to depart from subsistence-based livelihoods.

Human resources development, particularly in form of professional training, has not been sufficient to meet the needs associated with sustainable management and enhancing development opportunities. Investment in forest-related education is a significant challenge. From 1993 to 2002, while the number of forestry bachelor degrees awarded has been increasing steadily, that of post-graduate degrees has declined significantly (FAO, RIFFEAC and UICN 2003).⁷⁸ Certificate-level forestry training has essentially disappeared. International partnerships can play a major role in addressing this problem. One option is to increase the opportunity for East African scholars to study in developed countries.

3.3 Forest Conservation Measures in Africa

Forests and woodlands in Africa can be assigned into nine general categories including tropical rain forests, tropical moist forests, tropical dry forests, tropical shrubs, tropical mountain forest, subtropical humid forests, subtropical dry forests, subtropical mountain forests and plantations. Mangrove forests cover 3 390 107 ha. Only 32.5 million ha of forests and woodlands, or five per cent of the total forest area, are formally protected.⁷⁹

⁷⁷ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

⁷⁸ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

⁷⁹ Ibid.

This study notes that forest conservation measures in the case of Kenya has been through encouragement of protection for natural regeneration, where the ecosystem is left undisturbed and the wildings successfully grow into a virgin forest area.⁸⁰ The other conservation measures are through reservation and restocking of forest in the national parks and games reserves as sanctuaries, where the ecosystem is purely left undisturbed, and no utilization is permitted within those protected areas.

Forests and woodlands are important contributors to the long-term social and economic development goals under the New Partnership for Africa's Development (NEPAD) as well as play a significant role in achieving the Millennium Development Goals (MDGs) and its targets.⁸¹ They provide food, energy, timber and non-timber forest products (NTFPs) in addition to being important contributors to wealth and health at the household, community, national, sub-regional, regional or even global level.

The concept of forest community participation in natural forest conservation around Mount Kenya, has widely been used where the local communities are allowed to plant annual crops, as they tend for the growing tree crops, as well as protecting against forest destruction and illegal logging. Other measures are the enhancement of the legal framework of the ten percent tree cover on farms, is aimed at encouraging the community to be self sufficient in wood biomass for their energy requirements, thereby reducing pressure on the few remaining indigenous forests.

⁸⁰ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

⁸¹ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

As charcoal increasingly becomes an important tradable commodity, there is an opportunity for governments to recognize and regularize its production by instituting long-term plans for sustainable production, as well as creating a supportive legal and economic framework for micro- and small and medium enterprises (SMEs) development.⁸² Increasing efficiency and ensuring that the development of this sector does not accelerate deforestation requires appropriate policy and legislative interventions.

Forests and woodland not only provide mainstream products like timber and wood fuel but also support other services and activities such as ecotourism, crafts industry, traditional medicine, pharmaceuticals and also bush meat. These too play a significant part in enhancing household incomes. For example, in 1995 it was estimated that 2.9 million people (530 000 households) living within 5 km of closed canopy forest depended on forests to provide timber and NTFPs in Kenya.⁸³ The woodcarving industry in Kenya, for example, worth US\$8.21 million supported over 80,000 people and over 400,000 indirectly. There is scope for building on the potential of these resources to contribute to livelihoods and development through, for example, increased partnerships and improved opportunities for local people to engage in these activities.

The production of gums and resins, medicinal plants, honey and beeswax, and bush meat, from forests and woodlands makes a considerable contribution to the national economies, though not quantified. Sudan, for instance, is the biggest producer of

⁸² FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

⁸³ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

gums and resins in the world, commanding over eighty per cent of global production.⁸⁴

Another forest conservation measure is the enrichment planting in highly degraded areas and other fragile ecosystems that are more prone to illegal grazing and fire burning. In Kenya analysts have posited several pathways by which climate factors could contribute to political conflicts. Increased demand, driven by economic development and/or population growth, or declining supply, driven by environmental change or overexploitation, could create scarcities of key natural resources, generating competition between affected communities or countries.

Research indicates that there are many attempts taken by private forest entities. For example, the TIST (The International Small Group Tree planting program) programme and COMPACT (Community Management of Protected Areas Conservation Programme) project support the local community in tree planting. The issue of micro-hydroelectric projects within Chogoria and Chuka areas, for the community forest association members, and the electric fence project.

Community awareness through the CFS, that encourage group based discussions, so as to discourage the fires. Encourage farmers to write proposals to UNDP that support income generating activities, some have fish ponds – so as the increase food security. Some are in the api-culture and rabbit keeping. Ndima, Kimunye, Thumaiata and Imenti tea factories have come up with micro-financing schemes through which the give farmer some loans to enhance their income from COMPACT and WWF (World

⁸⁴ FAO (2003d). *State of the World's Forests 2003*. Food and Agriculture Organization of the United Nations, Rome.

Wide Fund for Nature) Nanyuki area, Mount Kenya East Conservation Project (MKEP)

This study notes that encroachment, illegal logging, grazing and poaching of wild animals persist in these areas. Agricultural expansion and overgrazing are increasingly becoming problems and major causes of loss of woody vegetation cover, especially in Eastern, Southern and Western Africa. Given the high dependence on agriculture, there is growing pressure to increase the area under agriculture to meet the food requirements of the growing population.

Africa recognizes the immense value of its forests and has mainstreamed forests in its development agenda, the NEPAD. The NEPAD Environment Action Plan (NEPAD-EAP) locates forests and woodlands in Programme Area 6: Trans-boundary conservation or management of natural resources, which emphasizes the protection and sustainable management of Africa's forest resources.

It is estimated that the change in forest cover in Eastern Africa is 0.51 per cent per year. There is, however, considerable variation between countries, with Burundi experiencing a decline of 9 per cent compared with 2 per cent in Uganda. At the current deforestation rates, and if sustainable forest management practices are not promptly adopted, forests and woodlands may degrade rapidly by 2020. There is, however, no reliable data on the extent of sustainably managed forests and woodlands.

Forests are a vital resource. Their effective utilization is important and should be based on equitable sharing of benefits, costs and knowledge. Forests are a source of wealth that can be realized through sustainable harvesting of timber and non-timber

products, tourism and ecotourism, and carbon trading. Forests also provide catchment protection, in addition to being reservoirs for biodiversity. The forest watershed catchment value for Uganda, for example, has been calculated to be US\$13.2 million per year. There is potential to enhance community benefits through joint forest management. Joint forest management and forest user groups increase community participation and help achieve economic growth.

The extent of concerns about forest deterioration is reflected in the launch of substantial forestation and reforestation programmes and the various measures taken recently to protect and increase forest areas. Forest lands are being demarcated in all the countries, and new forest reserves have been declared in some countries like Sudan as a result of mounting awareness and interest in conservation. Managing forests on a sustainable basis is being pursued in a regional context.

Many governments acknowledge the potential value and opportunity that forests and woodlands bring to improving livelihoods, particularly in rural areas, and are increasingly recognizing that secure tenure is an important aspect of this. Several countries have initiated reforms to support local communities, including the empowerment of local bodies and communities to manage communal resources through a process of decentralization and devolution of administrative powers and responsibilities.

3.4 Key Challenges to Forest Conservations Measures

Key challenge to forest conservation has been wild fires. This happens when the local forest community are preparing their farm lands for cultivation, occasionally the fires spared to the forest resulting in serious destruction, and these has been common in areas such as Narumoru, Gathiuru and Ontulili.

Another challenge to forest conservation measures is the introduction of invasive tree species, where farmers use *Lantana kamara*, which hampers the growth of other tree crops, and this is most common in areas such as Chogoria, Irangi and Ruthumbi forest blocks of Mount Kenya.

The other key challenge is the destruction of trees by wild animals, where some trees that are palatable to elephants, such as *Pinus patulla* and *Cuppressus lustanica* are often destroyed by various animals, and thereby hampering conservation measures, and furthermore the increases number of wild animals in the forest may harm forest rangers, making patrolling difficult. These same animals destroy the newly planted tree species.

In addition, some local authorities have often used forest as dumping sites for waste disposal, such as in Upper Imenti in Meru, and Chehe forest block in Nyeri. Another challenge is pest and diseases that defoliate some tree species, and thereby destroy the forest.

Human beings also pose a serious threat to forest conservation through illegal logging, poaching and, human encroachment illegal cultivation, especially in steep areas. This can be mitigated though education, and provision of an alternative source of livelihood.

3.5 Conclusion

Forests and woodlands are the key source of fuel for the majority of the households. While this is an opportunity, it is also directly linked to the main threats: deforestation and declining forest quality. Throughout the sub-region, the rate of off-take is higher

than the natural regeneration capacity of the forest. There is very little investment in forestation and reforestation.

The natural environment provides human beings and the communities in which we live with the resources humans need to achieve lives of dignity and well-being – clean air to breathe; food to eat; clean water to drink; fuels for energy; protection from storms, floods, fires and drought; disease control and climate regulation; and places to congregate for aesthetic, recreational and spiritual enjoyment. These environmental endowments, frequently referred to as ecosystem services—are at once essential to core survival and vital to human flourishing.

CHAPTER FOUR
KEY ACTORS AND POLICY ACTIVELY INVOLVED IN FOREST
CONSERVATION ACTIVITIES IN KENYA

4.1. Introduction

The previous chapter reviewed the linkage between climate change and human security in East Africa, with specific interest on overall climate change issues, mitigation and adaptation mechanisms. The chapter also examines key actors and the policy outline that is used in forest conservation and management in Kenya. This chapter presented the outcome of the study of the data collected during the research study. The collected data was sorted and analysed using document and thematic analysis techniques, based on the emerging issues (contents) under study. The study results were presented in form of charts, graphs and tables.

The chapter is alienated into seven sections, covering introduction, summary of the respondents' profile, the association between climate change and human security within East Africa, a case study of Mount Kenya forest, forest protection methods adopted to deal with climate change and human security issues in East Africa, especially in Mount Kenya forest ecosystem, this chapter also provide information on the key actors in forest conservation in East Africa as well as in Kenya.

This chapter aims at contributing to effective policy making informed by provision of deeper understanding on the physical composition changes in Mountain forest. In addition, this research seeks to contribute to action oriented climate alleviation by governments, forest managers, relevant agencies, communities, actors and stakeholders in East Africa.

4.1.1 Study Response

4.1.1.1 Participant Response

The participants were obtained from the 100% (30) key participants initially targeted.

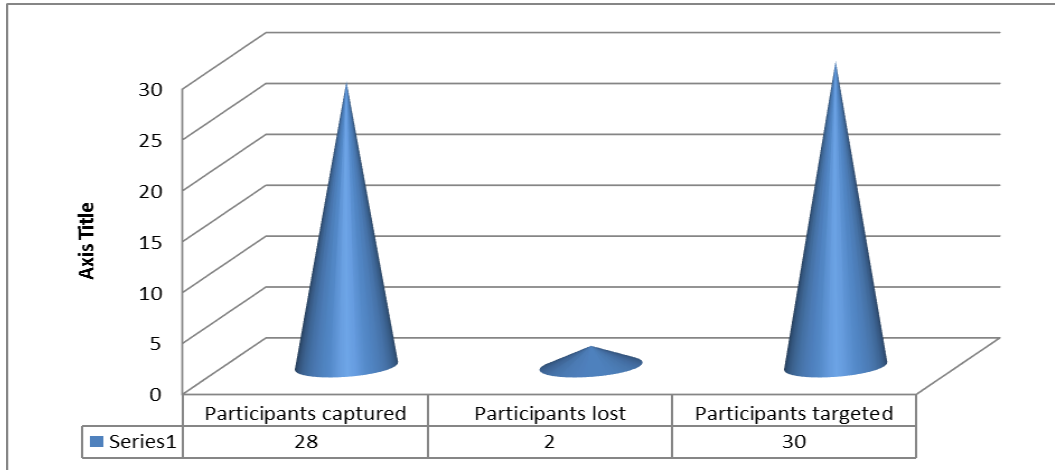


Figure 1: **Participant rate of response**

(Source. Authors own Research)

Figure 1 shows that the study was about to successfully capture 28 (95%) of the respondents, out of a total of 30 (100%), this number of participants ensured that the sample size remained as close to the original size as possible.

4.1.1.2 Gender

The study found the participant gender as shown in Figure 2.

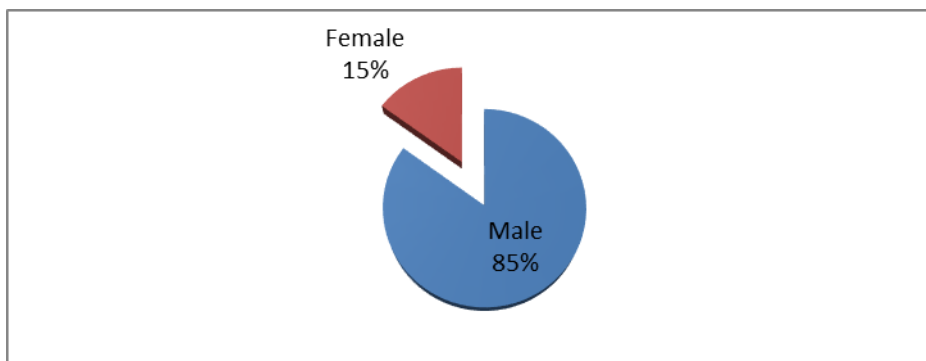


Figure 2: **Participant Gender**

(Source. Authors own Research)

Figure 2 on the gender of participants was males (85%) and females (15%) respectively. The study therefore found that there were more males in this area than females – making it a male dominated discipline.

4.1.1.3 Age of participants

The informants gave their age, as shown in table 1.

Table 1: Age of Respondents

Age	Frequency	Percent (%)
Below 30	5	18
30-39	8	28
40-49	10	34
50-59	7	20
Total	30	100

The participant age group in years was as below 40-49 (34%), 30-39 (28%), 50-59 (20%) and below 30 (18%) respectively.

4.1.1.4 Education Level

The participants indicated their education as shown in Figure 3.

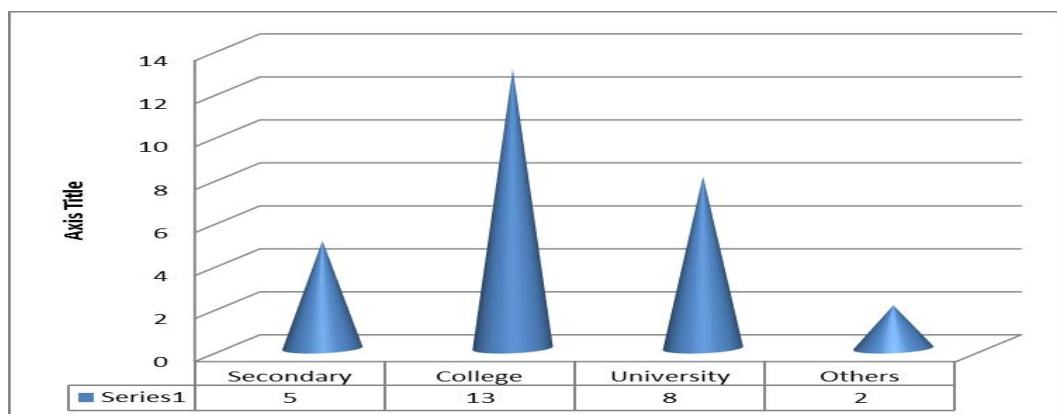


Figure 3: Education Level

(Source. Authors own Research)

The Figure 3 shows that majority of the participants education level was college (13), university (8), secondary (5) and others (2) respectively.

4.1.1.5 Knowledge of the Concepts Under Research

The respondents were asked to indicate their awareness of climate change in East Africa.

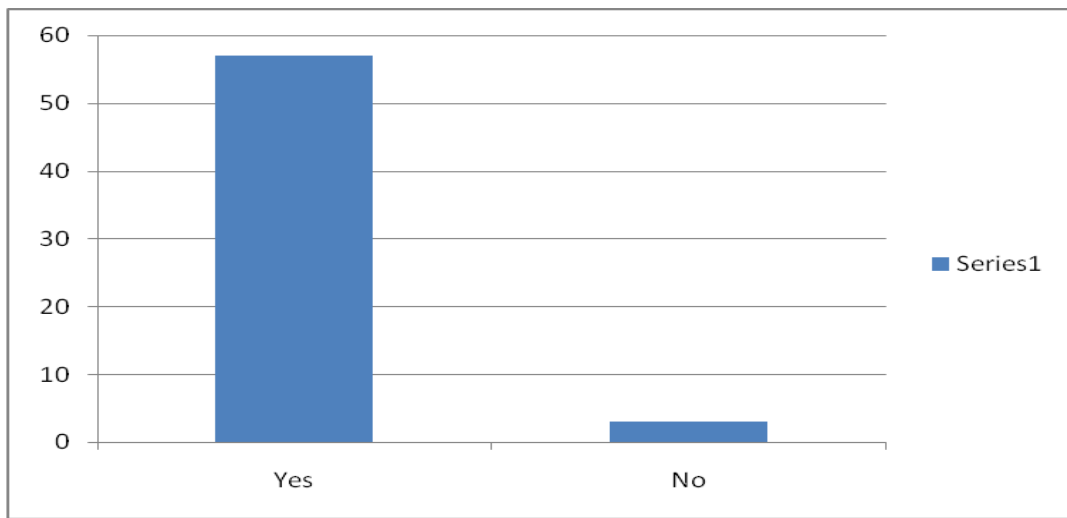


Figure 4: Awareness Level

(Source. Authors own Research)

The figure 4 indicates that 57 (98%) of the respondents were very much aware of the concept of forest conservation strategies to mitigate the impact of climate change and human security;

4.1.1.6 Linkage of the Concepts Under Research

The concepts considered in this study for the respondents to articulate included; climate change and human security, conservation measures adopted to tackle climate change and mountain forests.

The study found that (93%) of the respondents appreciated climate change concept. Most (99%) appreciated the fact that climate change inevitably creates new and varied challenges to nation-states and have the potential to significantly shape conditions of policies related to not just human security, but also national security. Physical aspects of climate change, such as melting of ice caps in Mount Kenya, extreme conditions like flooding, desertification, and hydrologic cycle disruptions which pose major challenges to vital transport, water, and energy infrastructure.⁸⁵

Some forest blocks are experiencing major challenges, like proliferation of invasive species, dumping of solid waste, and illegal logging. The dwindling of the springs and other water within the forest ecosystem could result in the reduction of water flows in the rivers, which has the potential to heighten rivalry within the pastoral communities and resident farmers. The presence of institutions, such as Kenya Forest Service, National Museum of Kenya, Kenya Forest Research Institute and National Environment and Management Authority, working with and through recognised communities can help in reversing the increasing climate change effect(s).

The majority of the participants (89%) stated that several pathways by which climatic factors could contribute to socio-economic conflicts and competition to access of resources. Increased demand, driven by population growth or economic development, or declining supply, driven by overexploitation or environmental degradation, could create scarcities of key natural resources, generating competition between affected countries or communities.⁸⁶

⁸⁵ Targeted group question and answer session

⁸⁶ Researchers own observation

Conversely, the abundance in certain areas of highly valuable natural resources such as forest, rivers, and wildlife and water ponds may render these areas a target for contending powers, whether neighbouring nations or domestic insurgents, seeking to exploit the resources for revenue.⁸⁷ Finally, severe and chronic environmental pressures such as landslides, fires, or sudden acute disasters such as floods, may displace communities from one region into another, straining local capacities and possibly sparking conflict between the affected communities. In addition, the emergence of unique pests and disease which were not prevalent may also occur on that region.

Environmental degradation, discriminatory and inequitable access by the indigenous and resident communities to natural resources and the trans-boundary relocation either real or perceived of hazardous materials may create conflict and present risks to national security and human health.⁸⁸ Though the risks posed to human security by anticipated environmental change have not been eliminated, the level of utilization and pollution in the current contemporary, ultra high-energy use has triggered extreme reduction in the national primary forest cover; biodiversity losses; land degradation; reduction in fish stocks; and water scarcity as well as creating high incidences of water pollution. The environmental changes so experienced are global in nature being ubiquitous and also considering that pollutants which include not only greenhouse gases but also radioactive waste know no boundaries with their effects leading to global consequences.

⁸⁷ Responses from the interview

⁸⁸ Interviews

Human security and conflict as a consequence of climate change have been seen to evolve to the extent of constituting a recognized, acknowledged and serious component in climate change debates, and are subsequently being addressed in several and diverse ranges of fora through reports, changes in policy and meetings.⁸⁹

The multifaceted connection between processes of environmental change and outcomes across both space and time brings in a new angle to the concept of human security, an angle that raises questions about both equity as well as sustainability.

Pollution across borders, for instance, can create sour relations in neighbouring communities, especially if they normally share a given resource base. Health risks as well as involuntary migration as communities' search for scarce water and pasture; unfair distribution and access to land resources, obsolete pesticides especially when they reach uncontrolled levels, radioactive waste and the relocation of other forms of hazardous substances are all causes of threats to peace and stability.⁹⁰ In the recent past, environmental offences have usually been classified as misdemeanours, rather than felonies. Environmental crime is a growing concern, considering that such offences play a big role in the survival or otherwise extinction of a number of vulnerable wildlife species, as a result impacting significantly on the balance and the biological integrity of the planet.⁹¹

On a positive note, common problems especially those linked to natural resource utilization unite people bringing them together to work towards a common identified goal. Therefore the community forest association as a concept through which the

⁸⁹ Group discussions

⁹⁰ Question and answer session

⁹¹ Ibid.

government has brought together different local communities having user rights which has brought environmental cooperation, that currently acts as a practical means to successfully prevent conflicts and at the same time promote peace between the involved communities and societies.⁹² Ultimately, securing human well-being depends upon protecting the environment from human pressures; that is, safeguarding the natural resources and ecological systems that sustain us all forms of life from over-exploitation by humans.

Currently in Kenya, when it comes to environmental crime, public disclosure of enforcement information is poor across various statutes and under various responsible institutions. Although steps toward more open governance are being taken, these have not yet taken root in the environmental enforcement realm. The deficiencies available enforcement information and conflicting legal frameworks on the management of natural resources and lack of proactive data disclosure undermine citizen participation in environmental enforcement. Kenyans deserve a comprehensive, online environmental enforcement and compliance database so that they might find out what is, and is not, happening in their communities, and this has inspired the researcher to get full facts on the environmental crime in Kenya.

4.2 Links Between Climate Change and Human Security in Mount Kenya Forest Areas

Climate change is today viewed in light of security as opposed to seeing it only in light of being an environmental issue. Among the many contributors to global warming is the growing energy consumption, which is inevitable as energy is a key

⁹² Environmental Crime: The Criminal Justice System's Role in Protecting the Environment by Yingyi Situ, David Emmons Published by Sage Publications, (1999).

resource in industrialisation and development. Developing countries in particular are continually seeking to develop more and consequently have increasing energy requirements. The increasing energy demand therefore calls for formulation and development of policies that seek to mitigate climate change effects. To achieve this, such policies should target the reduction of hydrocarbon energy use, reducing carbon emissions thus gain the net effect of increasing economic growth, reducing poverty and saving further climate change effects.

This study found that the transition from fossil fuels to low-carbon or renewable energy sources is a very dear undertaking and would be quite prohibitive for poor economies. Efforts therefore for climate change mitigation within the developing countries, which may include reducing energy use, will most likely lead to further human insecurity, increased poverty and worsening food security situation.

This study revealed that the sub-Saharan African economy hinges heavily on agriculture, which is extremely at risk with regard to climate change. This has triggered immense interest in determining and analysing climate change impact on agriculture. Further, the East Africa has an immensely high percentage of malnourished populace compared to the rest of the globe, with many of its inhabitants existing with chronic hunger. Considering the impact that climate change has on agriculture and food production the state of affairs could worsen, as crops, livestock and farmers are gradually pushed out of their livelihood niches. Similarly, severe effects such as increased frequency and severity of floods, proliferation of invasive species and prolonged droughts may aggravate the state of affairs.

In the Mount Kenyan region, rainfall has become less predictable, more erratic, and high temperature ranges, which in most cases lead to retarded growth and total failure of agricultural crops. The drought cycles in cyclical droughts are shortening and increasing in frequency. Lately one drought cycle has taken place every two or three years from the previous eight to ten years. Such changes have an immense impact on agricultural production, livestock keeping, water supply and hydropower generation.

This study also noted that in recent years therefore, international relations scholars as well as other fields are conceiving security much more broadly, from the previously acknowledged state-centric approach to national security to human security, which encompasses all aspects of the individual and human well-being. This perception of global security makes a connection between such issues as melting ice caps and carbon emissions to poverty, equity, and conflict.⁹³

This study determined that although it is now acknowledged that the security dimension of climate change is more glaring and evident than ever, the issue has not been seriously perceived and is not being adequately addressed by the international climate regime. It also lacks the appropriate legal backing or force. On a brighter note, countries, organizations and various studies and reports continue to bring the issue to fore, and some states have taken steps to change their national policies in an effort to accommodate these new and novel concerns and threats. As these threats multiply and continue to be more diverse and the planet continues to increase in temperature, the security concerns will gradually get to be more international and transcend borders, and climate change will require concerted and joined international response.

⁹³ Environmental Crime: The Criminal Justice System's Role in Protecting the Environment By Yingyi Situ, David Emmons Published by Sage Publications, (2010).

Climate change has been identified and acknowledged as a major threat to mountain communities within Mount Kenya. Indeed, Africa is the continent that is most susceptible and will therefore be affected most negatively by climate change as a result of its combined weak areas, most especially its economies which rely heavily on the climate, and where most countries have the least capacity to adapt. This study further found that human security and environmental protection are reciprocally dependent. On the one hand, natural resources depletion destabilizes livelihoods, increases vulnerability to disasters and positions human security at risk. On the other, improper democratic governance manifesting as violent conflicts, inappropriate or inadequate policy frameworks, inequity, and political instability lead to the mismanagement of natural resources and the maladministration of justice.

This study noted that climate change risks to human security in mountain areas warrant further investigation. There is a need for more comprehensive evidence, collected across multiple locations, and over long durations, to build and test theories about relationships between climate change and livelihoods, culture, migration, and conflict. Meeting this need requires analysis of the sensitivity of diverse livelihood systems to climate change; and the effects of cultural, economic, and political changes on the vulnerability and adaptability of livelihoods.

Tension among pastoral communities living in arid and semi-arid cross border areas in northern Kenya, southern Ethiopia and southern Sudan is associated with competition over pasture and water access, in addition to livestock raiding and the existence of large number of small arms. In these regions, variability in rainfall patterns both within the year and inter annually causes pastoral mobility as the herders continually seek better areas for pastures and water fall back grazing areas, which

they themselves have designated. Mobility is also determined by inter-community relations, the often changing land tenure arrangements and conflict, sometimes leading to overgrazing of rangeland that has already been used excessively. The study found that competition over community forest resources located across national borders are common causes of sporadic pastoralist tensions and conflicts and which are aiding to reduce security especially on the North-Western part of Mount Kenya. While competition for resources may appear to be the natural cause, pastoral conflict is also fuelled by lack of good enabling institutions as well as external influence. The drastic reduction of rain is as well as its recent erratic nature is a strong pointer that effective institutional governance can play a pivotal role in the equitable use of natural resources such as forests and pastoral land. This is because it has been found that pastoralists fight more when the resources are scarce, leading to life loss and the disruption of livelihoods.

The study found that other than the socio-economic fragility within most communities, violent conflict continues to prevail in the North Western part the Mountain areas. In a number of Counties, like Samburu, Laikipia, and Turkana increased violent conflict is the most telling indication of cumulative effects of climate change. The study found that conflict was not caused by socio-cultural differences, but was rather caused mainly by water and pasture scarcity due to climate change. In any conflict situation, the handling of the situation is very important and these should be addressed effectively by the institutions and policies in place.

The study singled out that Eastern African Mountain and in particular Mount Kenya forest are important and should be sustained for its richness in biodiversity. It is also one of Africa's centres of endemism, but with intense threats to the survival of forest

habitats in the area. Threats to Mountain Kenya Forests are primarily associated to conversion to farms, settlement, fragmentation and ineffective or unintegrated policies, coupled with inadequate management structures. Forest destruction trends are impacting negatively on a wide range of terrestrial resources in the main areas that were under study.

4.3 The Forest Conservation Measures Adopted to Tackle Climate Change and Human Security Issues in East Africa, Especially in Mount Kenya Forest

The forests are shaped by climate, soil, types, topography, and human activities. Changes in the above-mentioned factors therefore as well as temperature and precipitation regimes can dramatically affect forests composition, structure and distribution nationwide. Likewise, forests have a direct influence on the climate.

This study notes that the variation in temperature is the factor most cited in causing increases in the concentration of GHGs such as atmospheric CO₂ among other gases in the atmosphere, which are the most culpable in causing climate change. To mitigate climate change it is important to reduce emissions and atmospheric concentrations of GHGs. Some of the methods of achieving this include improving efficiency and conservation of energy through the use of cleaner energy sources, utilisation of forests to reduce concentrations thus addressing climate change. The use of forests is not only unique among the known remedies, but also reliable since they not only prevent and reduce GHG emissions but at the same time provide other essential environmental and social benefits, such as clean water provision, wildlife habitat, recreation, forest products, among other values and uses. Climate change affects the ecology of forests in myriad ways, creating negative consequences in the extent to which the affected forests are able to mitigate global warming.

This study endeavours to identify mitigating options involving Kenya forests in climate change mitigation and critically examines the existing policies relating to forests' role in climate change. The study also recommends measures to achieve effective climate change mitigation by the utilising forests, through effective forest management, by the use of carbon-trading markets, and bio-based renewable energy.

The study found that most third world countries will bear the heaviest brunt as a result of climate change effects considering the high levels of poverty and subsequent and almost full reliance on agriculture accompanied by natural resources for economic wellbeing. In addition, these economies can barely come up with the money to pay for the cost of climate change management and mitigation. Planting, protecting and managing forests is as earlier outlined, a vital element in the global climate change response, as efforts to mitigate and adapt are implemented.

For the success of these proposals however, it is necessary to engage and actively involve all stakeholders, particularly those living within and around earmarked land for reforestation in obtaining relevant land-use change proposals in the endeavour to formulate and implement the relevant policies and programmes. One acknowledged and relatively successful and efficient way of achieving conservation outcomes has been to provide incentives for communities living within and adjacent to forest ecosystems by compensating and rewarding the people concerned for whichever ecosystem services they may offer to achieve conservation. End users too, for example timber concessionaries and others such as local farmers, can also be considered for compensation to avoid deforestation thus limiting GHG emissions and mitigating climate change impacts.

This brings to fore the need to answer to the question on who is the actual owner of the vegetation and trees growing or mature forests within Africa. Considering that the countries likely to be the hardest hit by climate-induced changes and related negative effects, are the relatively poor countries which include the regions in East Africa it would be fair for the global response to the climate change to seriously consider including a comprehensive and reliable funding mechanism and compensation platform by the rich states who apparently are responsible for the highest level of pollution and GHG emissions to countries whose emissions have been low over the years.

4.4 Key Actors And Forest Conservation Activity in East Africa as Well as in Kenya

The study observes that it is challenging to get information to local communities that are often in remote areas. Local organizations are better placed to deliver information and training to local communities, but they also require tools that are appropriate for community audiences and skills in training design and delivery. This manual is part of a collaboration between international conservationists and local partners. The goal is to build a resource of local trainers and training tools that can help to expand learning to local communities, bringing key information that is presented in ways that work well for community learners. Skilled local trainers can help get essential information about climate change to local communities more quickly and be more readily available for follow-up training activities.

The study found that for the enhancement of forest management the CFA, KFS and other stakeholders had already embarked on the development and preparation of a management plan. The study found that *Gathiuru* Forrest station on 14th April 2010

the Participatory Forest Management Plan was reviewed in 2015 (PFMP) (2015-2019) and approved, with the signing of a Forest Management Agreement taking place one year later. The agreement has thus enabled implementation of the community forest association with the plan being used as a source for soliciting donor funding. These have been used to ensure some user rights agreements receive adequate support. The Participatory Forest Management Plan was reviewed in 2015 and is currently in force up to 2019.

In addition, the study found that in *Gathiuru* area of Mount Kenya, the cohesiveness, dedication, commitment and the good working relationship of the CFA with the Station manager have been the key factors in the successes experienced in forest protection, conservation and livelihood improvement for the community. Over the period the PFMP has been in place, (which is due for review 2018), the *Gathiuru* community has recorded a lot of benefits accrued from the forest in line with the user rights stipulated in the forest management Agreement. Some of the key areas that the community have accrued benefits from include: beekeeping, grazing of livestock, wood collection, ecotourism, silvi-cultural activities and contracts water abstraction. The communities have also benefited from Plantation Establishment and Livelihood Improvement Scheme (PELIS). Over a period of 4 years, the community has earned a total Ksh 756,000,000 and has been able to establish a total of 916 ha of exotic Plantation and rehabilitated 150ha of mixed indigenous species.

This study indicated that cases of illegal activities have also reduced tremendously after the involvement of community forest scouts who are well trained in patrols and policing within the forest boundaries. This tremendous achievement could not have been possible were it not for the financial support by Green Zones Support Project

(GZDSP) funded by African development bank through Kenya Forest Service, funding of the key forestry programmes by KFS and support of other institutions like Laikipia Wildlife Forum.

This study further found that since recommendation on human centred approach to sustainable development by the World Commission on Environment and Development (WCED, 1987), efforts towards sustainable development have been globally sustained. The new approach to environmental improvement has assisted in integrating the environmental dimensions of poverty into local development planning and implementation.

The study identified that in Kenya; a paradigm shift has been adopted and embraced with regard to forest management based on the realization that there is a need to involve a wider range of stakeholders in order to achieve significant contributions towards sustainable management of forests. The shift in forestry resource management from “protection through command and control system with minimal participation of other stakeholders” (PFM Guidelines Revised Version, 2006), to Participatory Forest Management, is aimed to (a) preserve biodiversity while at the same time enhancing people’s livelihoods and (b) ensure the sustainable use of our forests so that present and future generations benefit. The PFM approach has been designed in line with provisions by the Forest Act 2005 and the recently enacted Forest Conservation and Management Act 2016 in ensuring the involvement of not just the local communities but also other stakeholders in efficiently managing forest resources.

Collaboration between the forest community and KFS in the management of Gathiuru Forest has kicked off and is growing with time. The formation of user groups and introduction of PELIS have been vital ingredients in jumpstarting the partnership. The recognized local institution under the Forests Act 2005 is the Gathiuru Community Forest Association, which comprises of two CBOs, namely Gathiuru North and Gathiuru South CBOs. Under the two CBOs are affiliated user groups which include grazers, bee keepers, water projects, fish farming, firewood collectors, herbal medicine, quarrying, eco-tourism, silvi-culture (pruning and thinning) and PELIS, timber traders, and research groups. The main products accessed from the Forest through the user groups include firewood, pasture and water. The main activities of the CFA revolve around forest rehabilitation through planting mainly under PELIS. The CFA also runs two tree nurseries through the Njoguini and Kabendera Youth Groups. Apart from the KFS, the CFA also works in collaboration with other groups, the major ones being the MKEPP and Green Belt Movement.

The CFA members at the moment number 4,000, broken down into 1,500 men and 2,500 women. This membership has been picked from two community based organizations around Gathiuru Forest Station practically named as Northern CBO and Southern CBO. In addition, the CFA has developed an organo-structure that is functional and that ensures that all genders are well represented. At the top of the organogram is a Chairman who heads the association and is the overall in charge. The Chairman is aided by two CBO chairmen who together form an extremely vibrant force which boasts the required unity of command that has the capacity to transform the CFA to a state of the art organization. The CFA has so far had tremendous

positive impacts on the livelihoods of its members as a result of the KFS/CFA partnership.

4.5 Conclusion

The study found that there will always be increased demands on resources and particularly in developing states, the demand will be more emphasized on the natural resources, which include land, forests and water. The rapid growth also inevitably aggravates forest degradation with the consequent effect of lower and undermined economic growth. A large number of Kenyans rely wholly or partly on natural resources thus rendering them highly susceptible to climate change effects. Some of the effects of climate change which include erratic and reduced rainfall, droughts, floods, longer than expected dry spells, cold spells in the extreme, landslides, mudslides and heat waves have resulted in crop failure and a reduction in land for agriculture.

The level and capacity for hydroelectric power generation has also greatly reduced, water shortages escalated, inevitable deforestation taken place, all leading to the displacement and migration of many people. Communities are incapable or unwilling to adapt to some of these effects; take for instance irrigation as an adaptation. It is noted that agricultural land under irrigation adds to about four per cent only. In order to effectively adapt to climate change, a number of measures need to be adopted urgently including diversification of food crops, expansion of irrigation programs, and, in general, modernization of agricultural production, exploration of alternative sources of energy so as to reduce deforestation.

The study therefore concludes that the interactions between population dynamics and these climate change risks can potentially have far-reaching ramifications for human and environmental well-being. Because of climate and population change, more Kenyans are settling in fragile ecosystems; agricultural productivity and fish production are declining; and Kenyans' livelihoods are at risk.

CHAPTER FIVE
SUMMARY OF KEY FINDINGS, CONCLUSION AND
RECOMMENDATION

5.1 Introduction

This section will review the connection amid climate change and human security in East Africa, with a specific interest on overall climate change issues and climate change mitigation, plus adaption mechanism in Mount Kenya forest ecosystems.

5.2 Summary of Key Findings

The study observes that East Africa pays a high price for the unpredictable weather patterns and climate change effects. In order to address effectively the clearly identified interaction between climate change and agricultural activities there is a need for enacting a complex set of policy strategies. Policies that are relevant and crucial in addressing livelihood issues, considering a number of population of East Africa farmers rely significantly on agriculture not just for food, additionally as a source of living to the farmer. Climate change has a great effect on agricultural production directly through high temperatures ranges and rainfall variability since most farmers depends on rain fed agriculture for crops production with minimal irrigation, more inconsistent and irregular rainfall patterns coupled with high temperature ranges.

This study revealed that the agenda in most policy-making forums almost permanently includes climate change. This is an indicator of how prominently and significantly climate change has now taken a center stage in shaping and influencing the global, regional and national development trajectory besides power balance within

the international economies. Climate change has a difference from natural climate variability because it is caused by human activities which for a large part are involved in altering the natural composition of species diversity in the ecosystem. Climate change is closely associated with natural changes, such as the increasing spread of desert towards the South of Sub Sahara, the growing rise in temperature, the occurrence of stronger storms and more frequently occurring flash floods. It also includes the unprecedented melting of the snow-caps of Mount Kenya and Kilimanjaro, a rising sea level and significant changes to the pattern of daily lives.

In East African region, it has been observed that desertification is a cause of clashes between herders and not only farmers but also fellow herders as they compete for the minimized arable land. In the most recent times, Climate-related effects of this nature have been reported to cause violent conflicts in Laikipia, Samburu, Tana river, Kitui and other parts and ASAL regions in Kenya. Combined with a history of ethnic, natural resource and inter-county conflicts, Kenya is perceived to be highly vulnerable to this new climate-induced security threat. Despite being one of the countries, just like other African countries, that are the least responsible for global GHGs emissions, which are the main cause of depletion of ozone layer contributing to climate change, Kenya will continue to suffer the effects of a changing climate most severely.

The study established climate change effects are generally caused by a wide-ranging, and varying phenomenon, such as illegal logging. Unchecked logging contributes in a very large magnitude to deforestation, vital livelihoods deprivation among forest communities, ecological problems among them flooding. The activities that have been found to be significant in increasing the negative effects of climate change include illicit trade involving ozone depleting substances which then contribute significantly

to the thinning of the ozone layer, leading to consequences such as human health problems for instance skin cancer and cataracts. Illegal fishing causes direct losses to the national revenues; indirect economic losses in the form of loss of employment for those employed in fisheries and other industries as well as other activities within the supply chain; There are also unsustainable and serious impacts on target and fragile species within the ecosystem. Similarly, socio-economic impacts in the form of reduction of people's livelihood and food security are other direct impacts of climate change. Soil and water contamination from illegal hazardous waste dumping are potentially damaging to the ecosystems, negatively affecting human health.

The study revealed that many climate change challenges are enhanced when operations are driven by loosely and informally organized networks of persons or cartels whose specialist knowledge revolves around thorough knowledge of the area in which they work but lack in subject knowledge and have often been overtaken by regulations. Activities are organized to address informal unity and reciprocity as opposed to expert and journalistic organization which is more focused. In a sense, there lacks a central office to direct the functions and the work of the members involved. Indeed, a single mafia-type organization might be more inclined to exercise restraint in the exploitation of the endangered animals, flora and fauna compared to the small competing enterprises embroiled in the cut-throat to the interest of the public good. In the whole set up, there exist complicated networks of interaction linking raw materials and producers to customers through a network of supplier relationships with the involvement of other key factors such as professionals, government agencies, private sector and local consumers.

The research identified a combination with existing contemporary uncertainties caused by various social, political, economic and environmental factors that cause change in climate may be a risk factor in the increase of conflict and instability, particularly when poor governance is at play. Despite these risks however efforts on prioritisation of adaptation and mitigation to climate change by addressing climate-related tension, violent conflict and security challenges wholesomely and comprehensively are still a mirage.

The research found that Counties in Kenya may have the capability to respond to and mitigate adverse climate change consequences in various of ways. Unfortunately, the debate so far focuses on the seemingly urgent need to create a security 'hook' from which climate change negotiations can be hanged, with little achievement being realised. Counties in general have little voice or muscle in negotiating possible solutions although they are hardest hit by global warming despite generating almost negligible amounts of greenhouse gases.

The study endeavours to determine the connecting lines between climate change, governance and security threats in Counties, in addition to analysing the response of other players in the international arena in the formulation of climate change policies aimed at ensuring security and preventing future conflict. It also makes an effort to analyse available policy options and recommends mitigating measures that may be used to counter the perceived and real effects of climate change on Communities living in Mount Kenya.

5.3 Conclusion

In conclusion, the research identifies that human security and environmental conservation are mutually dependent. Depletion of natural resources weakens livelihoods, intensifies vulnerability to disaster and places human security at risk on the one hand, while on the other hand, democratic governance weaknesses, namely violent conflict, inappropriate or inadequate policy frameworks and political instability cause mismanagement of natural resources and justice maladministration. The study attempted to offer an understanding of the forces that widely cause environmental and political instability, while emphasizing on East Africa and in particular, Mount Kenya region.

The study further concludes that the effect of climate change has connections with insecurity (conflict) and governance, economic, societal and political development with particular reference to any given County within the Mount Kenya region. Threats as a result of climate change including insufficient and rainfall variability, coupled with rising temperatures, are some of the environmental variables that affect human livelihoods. These variables range widely, from severe droughts to resource scarcity and of intensified land use and also include tension and conflict. In states where there are limited capacities, weak or non-existent institutional and governance structures, these factors have the potential to trigger conflict and create instability and untold suffering.

Additionally, conflict can be triggered by new and novel environmental conditions that may stem from climate change related events, such as a rise in the sea level besides extreme weather events. Further, uncertainty concerning the intensity of climate change may cause indecisiveness leading to irreversible global consequences.

As a solution, it is imperative to apply the precautionary principle of taking action all the time despite the fact that the probability of the impact of change in climate may be assumed to be low. In mineral-rich countries, there has been found to exist a connecting link between natural resources exploitation, arms flow and conflict perpetuation and sustenance. Arms control may contribute in reducing both the illegal exploitation of resources and conflicts partly financed by resource revenue.

The study concludes that in mountain areas of East Africa, climate change challenges have been further exacerbated by human activities, particularly industrial activities. This problem is not only found in developing countries, but they manifest more profoundly and more evidently since the enforcement of regulations is poor owing to poor remuneration of officials and bureaucrats, weaker civil society, with transnational companies offering inward investment being more powerful. License allocation for resource exploitation is often used for mobilizing wealth to reward political allies and engender patronage.

Some environmental crimes, especially that relating to industrial activities such as logging, cannot be easily disguised and most probably relies heavily on corruption. While an individual may benefit from an environmental crime, there is overall environmental damage to society which as a whole is not usually aware of its victimization. Regulators therefore, lacking adequate knowledge, may fail to set the required levels of enforcement effort and restitution. Regulatory institutions may even assume that because such problems are not directly quantifiable, they are not significant.

Fighting change in climate is critical to realizing Vision 2030, a vision developed with the goal of impacting on people's livelihoods, poverty reduction and attaining human

security. The vision will be adjudged successful once the people are seen to enjoy human security and live in a good, conducive environment. Other key indicators of an achieved Vision 2030 include sustainable resource utilization and availability in adequate quantities and acceptable quality. It has also been observed that there is a rise in environmental crimes and these needs to be addressed by policy and legislation which ensures that local communities form the principal beneficiaries of the resources within their locality so that they value and deliberately protect them.

In addition, environmental crimes can be effectively addressed by enhancing the capacity of environmental law enforcement institutions, agencies and officials by enhancing resource allocation and training to address gaps which include; inadequate knowledge of climate change phenomenon, creating harmony within sectoral environmental laws, improving knowledge on environmental crimes among the police and judiciary, inadequate investigation and prosecution skills among enforcement personnel, insufficient cooperation and networking skills and opportunities among agencies, and lack of enhanced knowledge of international environmental agreements and their domestication/implementation in the country.

5.4 Recommendations

Undertaking of thematic studies on climate change issues: There is a need to undertake further research in the various sectors so as to determine the actual levels of the crimes listed and identify all the relevant crimes that need to be addressed. Among the Key areas where research needs to be further undertaken include areas addressing crimes relating to hazardous wastes, where information is minimal and non-authoritative, more so more so dumping and transportation of waste. In snaring, bush meat trade and illegal logging information available is very minimal and further

research is recommended. For ease in awarding penalties, a monetary value should be determined for economic crimes and further studies conducted in the key sectors identified broadly in this study.

Formulating an environmental communication strategy: A communication strategy on environmental crimes that addresses both internal (among the key players) and external (targeting the media, politicians and technocrats, private sector and local communities) players is critical. There is need therefore to formulate an appropriate communication strategy for use and to eliminate any form of ambiguity in communicating environmental crime issues. Awareness and sensitization campaigns on the nature, extent and status of the crimes committed on environmental related issues, especially among local communities, learning institutions, are critical in order to buy support from stakeholders. These people's support, especially the local communities is critical in the fight against environmental crimes.

Capacity building of civic authorities: Most environmental crimes are committed in areas under the jurisdiction of civic authorities, most of which lack capacity to prevent such crimes. They lack technical environmental departments that can detect, enforce and even collect and collate data on environmental crimes. A capacity building assessment of key civic authorities needs to be undertaken and a prioritized programme designed for the authorities that require training in order to build capacity to ensure environmental crime is dealt with.

BIBLIOGRAPHY

- Akech, M. (2006). The environment and law report in Kenya. Kenya Law Reports, (Environment & Land) xiv, Nairobi.
- Barr, J. and Chander A, (2012), *Africa without glaciers*, UNEP.
- Bauder & Harald, (2006). *Labor Movement: How Migration Regulates Labor Markets*, New York: Oxford University Press.
- Bronfenbrenner, U. (1988). *Foreword. In A. R. Pence (Ed.), Ecological research with children and families: From concepts to methodology* (pp. ix-xix). New York: Teachers College Press.
- Butler, Rhett A. (2009). *Local and National Consequences Loss of Local Climate Regulation*. Brobus publisher.
- Buzan, Barry, Ole Waeve and Jaap de Wilde (1998). *Security: A New Framework for Analysis*. Lynne Rienner Publishers: London.
- Catherine, (2009). *Climate Change Science Compendium*. UNEP.
- Department of Meteorology, University of Wisconsin, 1225 West Dayton Street, Madison, WI 53706, (1987).
- Dominique, K. (2014), *Policy and Governance Responses to the Water-Energy Nexus Challenge, Presentation at the 2014 UN-Water Annual International Zaragoza Conference on "Preparing for World Water Day 2014: Partnerships for improving water and energy access, efficiency and sustainability"*, 13 January, Zaragoza.

- Drakenberg, O. *et al.* (2009). *Greening Development Planning: A Review of Country Case Studies for Making the Economic Case for Improved Management of Environment and Natural Resources*, OECD Environment Working Papers, No. 5, OECD publishing. Paris: France.
- Duraiappah A. (2004). *Exploring the Links- Human Well-Being, Poverty & Ecosystem Services*, UNEP/IISD, Nairobi, Kenya.
- Environmental Crime: The Criminal Justice System's Role in Protecting the Environment by Yingyi Situ, David Emmons Published by Sage Publications, (1999).
- FAO (Food and Agriculture Organization), 2006. *The state of food insecurity in the world, 2006: Eradicating world hunger, taking stock 10 years after the World Food Summit*. Rome: FAO.
- Ghatge N.S. (2012). Impact of supplementation on nutritional status of malnourished preschool children. *Food Science Res. J.*, 3(1), pp. 47-51.
- Griggs, D. *et al.* (2013), Sustainable Development Goals for People and Planet. *Nature*, Vol. 395, pp. 305-307.
- IPCC (Intergovernmental Panel on Climate Change). (2014). *Climate Change Synthesis Report*. Summary for Policymakers. Cambridge University Press: Cambridge.
- IPCC report, (2007), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M.

Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press: Cambridge, United Kingdom and New York: NY, USA.

King, M. (2013). *Green Growth and Poverty Reduction: Policy Coherence for Pro-poor Growth, OECD Development Co-operation Working Papers*, No. 14, OECD, Paris.

KNMI. (2006). *Climate change in Africa. Changes in Extreme Weather Under Global Warming*. Royal Netherlands Institute of Meteorology.

Kurukulasuriya, P., Mendelsohn, R., Hassan, R., Benhin, J., Deressa, T., Diop, M., Eid, H.M., Yerfi Fosu, Leitzmann C, (2003). Nutrition ecology: The contribution of Vegetarian Diets. *Am. J. Clinical Nutrition*, 78 (3): pp. 657-659.

Meehl G A, Stocker T F, Collins W D, Friedlingstein P, Gaye A T, Gregory J M, Kitoh A, Knutti R, Murphy J M, Noda A, Raper S C B, Watterson I G, Weaver A J and Zhao Z-C, (2007), *Global Climate Projections. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA.

Metcalf G. E. (2009). *Cost Containment in Climate Change Policy: Alternative Approaches to Mitigating Price Volatility*. University of Virginia Tax Law Review.

Neuman, L. (2003). *Social research methods; Qualitative and Quantitative Approaches*, (5th ed). Boston: Allyn and Bacon.

Root, T.L., J.T. Price, K.R. Hall, S.H. Schneider, C. Rosenzweig, and J.A. Pounds. (2003). Fingerprints of Global Warming on Wild Animals and Plants. *Nature*, 421: pp. 57-60.

Rowe, D.P. (2001). Tele-connections between the Tropical Pacific and the Sahel. *Quarterly Journal of the Royal Meteorological Society* 127: pp. 1683-1706.

Smit, B. and J. Wandel. "Adaptation, adaptive capacity, and vulnerability." *Global Environmental Change* vol. 16 (2006): pp. 282-292.

The Intergovernmental Panel on Climate Change [IPCC] report, (2007), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller]. Cambridge University Press: Cambridge, United Kingdom and New York: NY, USA.

Thermohaline circulation (THC) is a part of the large-scale ocean circulation that is driven by global density gradients created by surface heat and freshwater fluxes. The adjective *thermohaline* derives from thermo - referring to temperature and *-haline* referring to salt content, factors which together determine the density of sea water. Catherine, (2009), *Climate Change Science Compendium*, UNEP.

Turner, B., R.E. Kasperson, P.A. Matson, J. McCarthy, R. Corell, L. Christensen, N. Eckley, J.X. Kasperson, A. Luers, M.L. Martello, C. Polsky, A. Pulsipher, and A. Schiller. "A framework for vulnerability analysis in sustainability science."

Proceedings of the National Academy of Sciences vol. 100 (2003): pp. 8074-8079.

UN (2013a): *A Life of Dignity for All: Report of the Secretary General*. United Nations: New York.

UN (2013d). Millennium Development Goals Report. UN: New York.

UNSDSN (United Nations Sustainable Development Solutions Network) (2013). *Draft SDSN Report for Public Consultation, May 2013*. UNSDSN: Paris.

WHO, (2008). *Gender inequities in environmental health*. 25th Session of the European Environment and Health Committee. (EUR/5067874/151).

Wigley, T.M.L. (2005). "The climate Change Commitment." *Science* vol. 307 pp. 1766-1769.

Zerner, C. (2000). *Towards a Broader Vision of Justice and Nature Conservation*. In: Zerner (Ed.). *People, Plants and Justice. The politics of nature conservation*. Columbia University Press, New York.

Zulu, C. (2004). *Problems with Participatory Mapping in Forest Management. A Case of Handei Village Forest Reserve, East Usambara, Muheza, Tanzania*. M.Sc. Thesis (unpublished). ITC: Holland.

APPENDICES

Appendix 1: Questionnaire

Introduction

The study aims to establish the climate change and human security issues around the Mount Kenya forest areas.

Instructions

This study is purely for academic purposes only. It is my request that you please give a verbal consent to be a participant in this study - before beginning anything. Please fill in the questionnaire appropriately. Thank you for taking time to participate in this research. The personal information section is optional.

Part A: Personal Information

1. Participant's
age?.....
2. Gender?.....
3. Occupation?.....
4. Ministry?.....
5. Designation?.....
6. Duration in office?.....
7. Familiar with the concept of Climate change?.....

Part B: Climate change and human security issues around the Mount Kenya forest areas.

Please rate the following statements on climate change and human security issues around the Mount Kenya forest areas and give your main reason (justification).

Rare: Where 1 = Very much; 2 = Moderate; 3 = A little; 4 = Not at all, respectively.

8. How do mountain forest communities utilize the forest under different climate conditions, such as in dry seasons or wet seasons?

.....
.....

9. What are the dominant vegetation types during those seasons?

.....
.....
.....

10. How does change in weather patterns affect the forest communities' cultural and social use of the forest?

.....
.....

11. How do mountain forest communities interact with other neighbouring communities in different types of weather patterns?

.....
.....

12. What changes have Forest Mountain communities observed in forest composition and structure, in the last twenty years? Please mention them in detail?

.....
.....

How do the activities of other stakeholders within the region, affect the climate change within the mountain region?

.....
.....

13. In the recent years are there any activities that have ignited conflicts, as a result of resource use among the respective communities with the area? And if yes, how have they been handled?

Rate.....

Reasons.....

.....
.....

14. There are many manifestations of Climate change phenomenon in East Africa today?

Rate.....

Reasons.....

.....
.....

15. That there is a linkage between climate change and human security in East Africa?

Rate.....

Reasons.....

.....

.....

16. There are various forest conservation measures adopted to tackle climate change and human security issues in East Africa. Kenya?

Rate.....

Reasons.....

.....

.....

17. There are key actors actively involved forest conservation activities in East Africa especially in Kenya?

Rate.....

Reasons.....

.....

.....

18. There are different policy issues involved forest conservation activities in East Africa especially in Kenya?

Rate.....

Reasons.....

.....

.....
.....

19. In recent times, have there been any changes in water volumes, within the mountain region)? If any, what are the main causes?

.....
.....

20. Climate change has had an effect on various aspects of human security?

Rate.....

Reasons.....

.....
.....

21. That Climate change is distinct from natural climate variability since it results from human activities that alter the composition of the earth's atmosphere?

Rate.....

Reasons.....

.....
.....

22. That Climate change has caused many impacts around the Mount Kenya forest areas?

Rate.....

Reasons.....

.....

.....
.....

23. Climate change is today being recast as a security threat, rather than being just an environmental issue around the Mount Kenya forest areas?

Rate.....

Reasons.....

.....
.....

24. The challenges climate change poses for development are considerable?

Rate.....

Reasons.....

.....
.....

25. There are various mitigations and adaptations to climate change in East Africa?

Rate.....

Reasons.....

.....
.....

26. Those effective responses to climate change in East Africa require a management framework?

Rate.....

Reasons.....

.....

.....

27. That the importance of climate change phenomenon is upon a set of sustainable development goals?

Rate.....

Reasons.....

.....

.....

28. Final remarks?

.....

.....

.....

.....

.....

THANK YOU