ENVIRONMENTAL DIPLOMACY AND ECONOMIC DEVELOPMENT: THE IMPACT OF CLIMATE CHANGE ON AGRICULTURE IN KENYA, 1970-2010

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DECLARATION

This project is my original work and has not been submitted for examination in any other University.

..... 11/11/2011.....

Robert Kibor Kaci Date

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

..... 14/11/2011.....

Dr. Ibrahim Farah Date

DEDICATION

To my family, my lovely wife Rachael and our new born son Temoi. May they live in a clean and healthy environment.

ACKNOWLEDGEMENTS

To begin with, I want to thank the Almighty God for the good health and knowledge.

There are a number of people who have contributed to the completion of this work in different ways and through their moral and emotional support, they encouraged me to press on.

My sincere graditude goes to my supervisor Dr. Farah for his tireless effort in guiding me to accomplish this work. It took his dedication, cooperation and exceptional professional guidance for this work to be completed succesfully.

I am also very grateful to my parents, the late Augustine P. Kaei and Mary Kaei who tirelessly inculcated in me the value of education from a tender age. Dear dad, may your soul rest in eternal peace. Mum, may God grant you good health all the days of your life and shower you with his blessings always.

Special thanks goes to the University of Nairobi, Institute of Diplomacy and International Studies, lecturers, class mates and to all staff who made my studying much easier. Your assistance is highly appreciated.

My warm appreciation and love goes to my wife Rachael Kaei whose moral support and friendship enabled me accomplish this work. I extend the same appreciation to my siblings Celestine, Ashley and Joshua for their support.

Lastly, my earnest appreciation goes to my boss, Mr. Titus Karani who always granted me permission to attend my course. Finally, to all my interviewees who participated in this research. May the almighty God bless us this day and every other day.

To all of you I say *Kongoi Missing.*

Robert K. Kaei
Nairobi

ABSTRACT

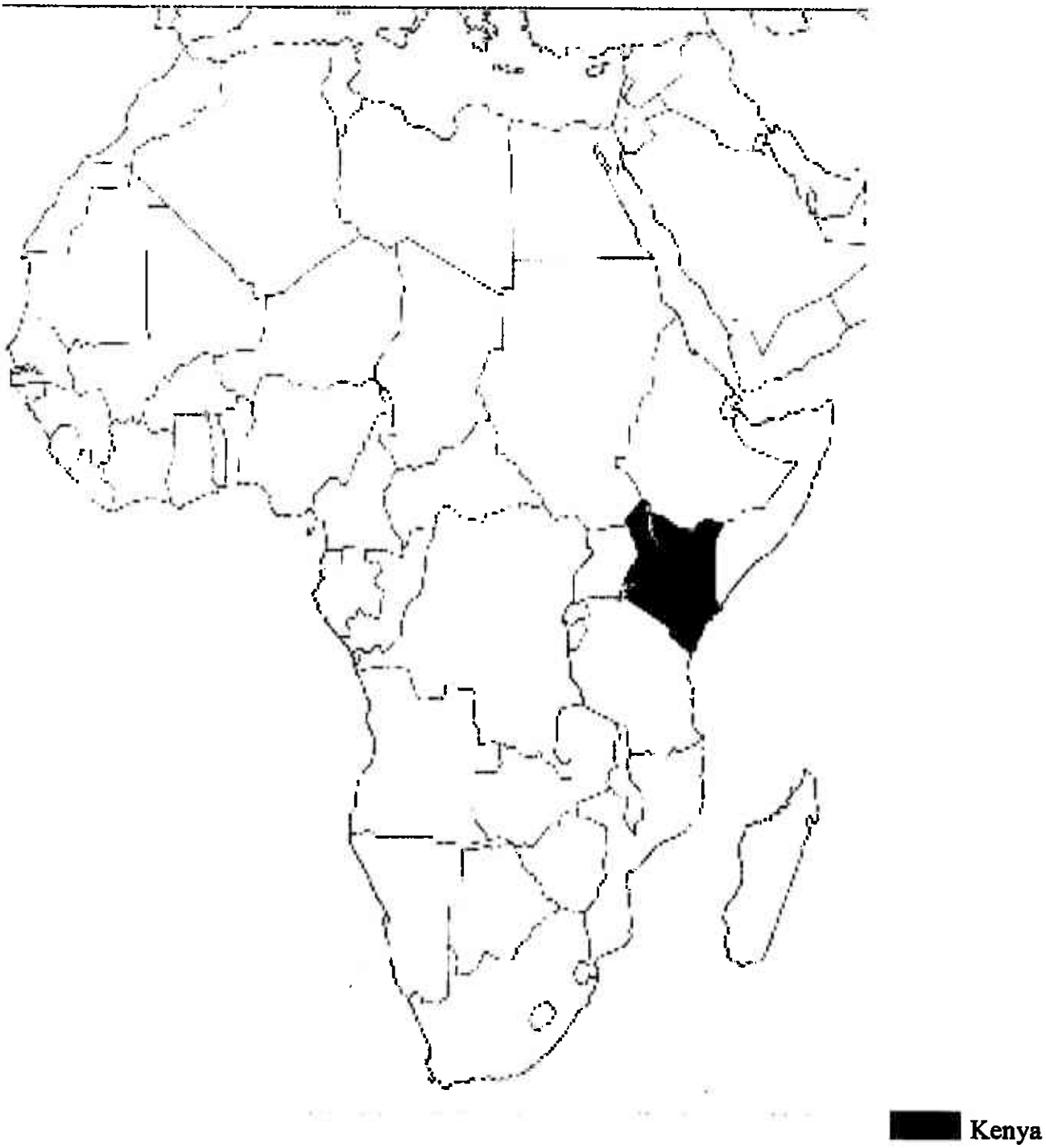
The significance of environmental diplomacy is becoming more elaborate by the day since environmental issues ranging from climate change, hazardous chemicals to biodiversity loss are affecting almost every aspect of policy making in the world. Environmental protection and sustainability remain paramount due to the complex and highly important reality of current environmental challenges that threaten human survival. Although efforts to counter and manage environmental problems anchor on international collaboration through international environmental governance involving many actors for example the emergence of United Nations Environmental Programme (UNEP) and other agencies, there seem to emerge other complex challenges in regard to environmental protection and sustainability most noticeably climate change. This study seeks to address the impact of climate change on agriculture in Kenya with a special focus on agriculture as the leading sector in the Kenyan economy in terms of its contribution to real Gross Domestic Product (GDP) from 1970 to the year 2010. The performance of the agricultural sector is determined by crop production which depends on a number of factors; most importantly country's endowment of soils and climate resources. Owing to the significant role agriculture plays in Kenya, economic development is largely dependent on the performance of agriculture. Indeed Kenya recorded the highest GDP of 7.8 per cent and 5.8 per cent in the national economy and agriculture respectively in the period between 1970 and 1974.The study indicates that agriculture contributes significantly to economic growth in Kenya by providing raw materials for industries, contributing to employment and providing food security. Sustainable agriculture is therefore critical in ensuring economic profitability, environmental stewardship and improved quality of life of the people of Kenya. The study establishes that like other environmental challenges, climate change is trasboundary in nature and requires concerted efforts from states, international organizations and non-states actors. Based on the theory of international cooperation, the study notes that environmental problems that lead to climate change require collective action of both state and non-state actors due to the anarchic nature of international system. The study further establishes that cooperation is motivated by a balance of absolute and relative gains and the extent of durability of such a cooperative arrangement. The study identifies possible ways of managing climate change in Kenya with regard to preserving ecosystems and biodiversity on one hand and adaptation on the other so as to enhance sustainable agriculture, hence economic development. This stems from the notion of international environmental governance through international negotiations that would cascade to the domestic level. Data for the study will be collected using content analysis, scientific analysis and interview methodologies.

LIST OF ABBREVIATIONS

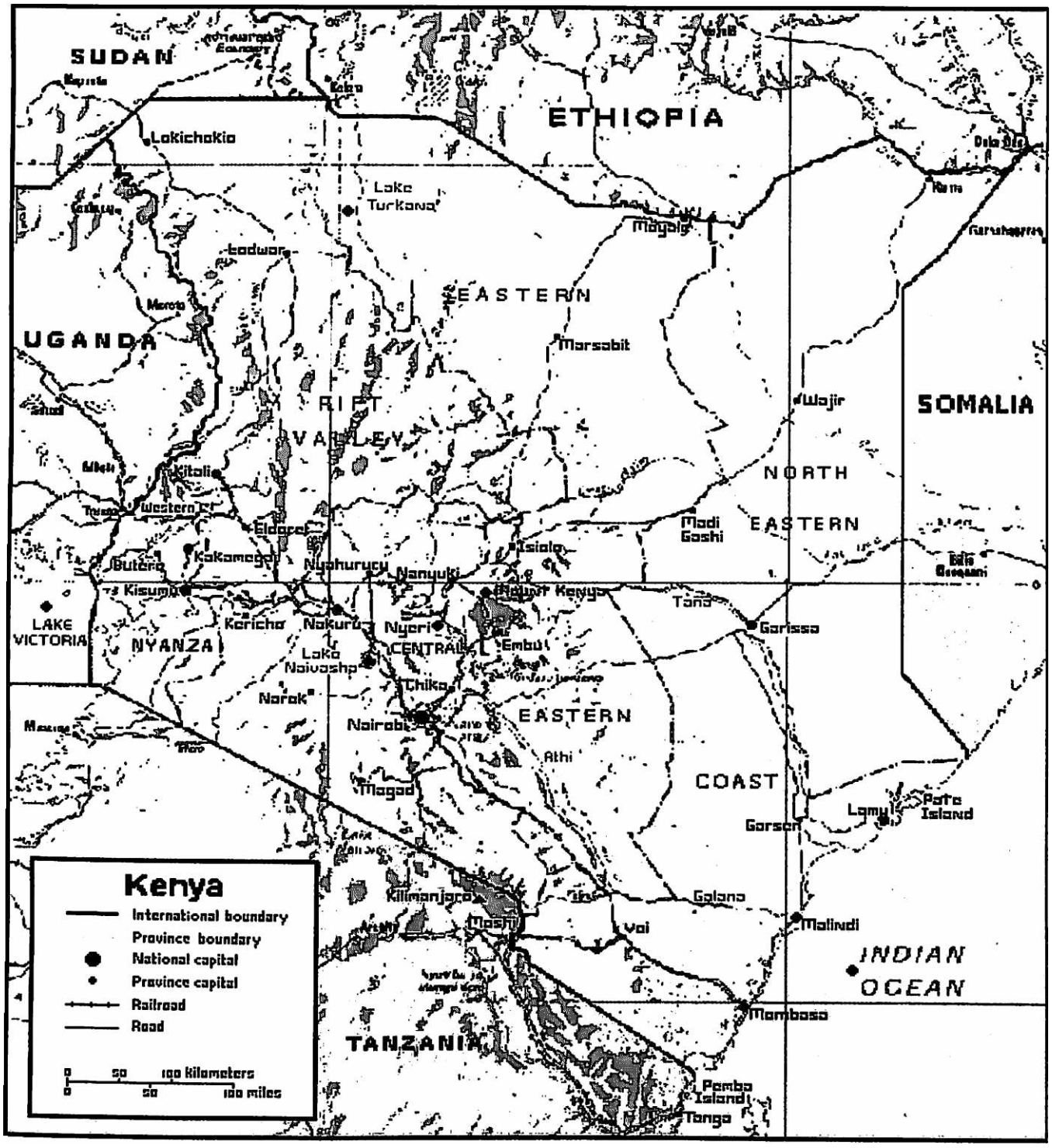
AgGDP	Agricultural Gross Domestic Product
ASALs	Arid and Semi-Arid Lands
CFCs	Chlorofluorocarbons
CH_4	Methane gas
CO	Carbon monoxide
CO_2	Carbon dioxide
COMESA	Common Market for Eastern and Southern Africa
COP	Conference of Parties
EAC	East African Community
EMCA	Environmental Management and Coordination Act
FSI	Foreign Service Institute
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMO	Genetically Modified Organisms
GoK	Government of Kenya
HCFCs	Hydro- Chlorofluorocarbons
HMPL	High Medium Potential Land
ICT	Information and Communication Technology
IDIS	Institute of Diplomacy and International Studies
IPCC	Intergovernmental Panel on Climate Change
ISS	Institute for Security Studies
ITCZ	Inter-Tropical Convergence Zone
KARI	Kenya Agricultural Research Institute
KFS	Kenya Forest Service
KM^2	Kilometres Squared
KMD	Kenya Meteorology Department
LCDs	Least Developed Countries
MDG	Millennium Development Goal
MEMR	Ministry of Environment and Mineral Resources

N_2O	Nitrous oxide
NCCRS	National Climate Change Response Strategy
NGO	Nongovernmental Organization
NIB	National Irrigation Board
O_3	Ozone
OH^-	Hydroxyl radicals
SEI	Stockholm Environment Institute
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization

TABLE OF CONTENTS

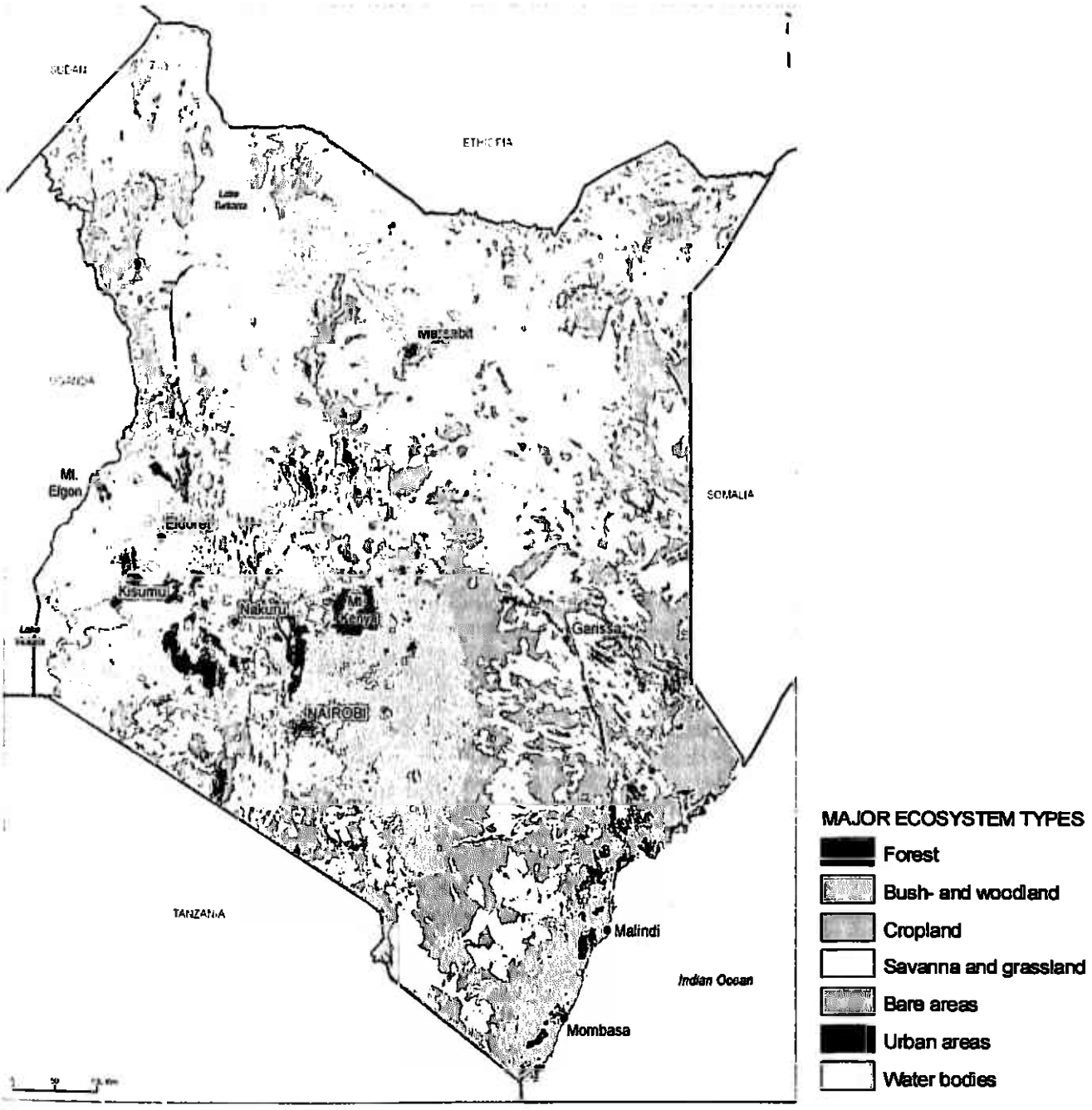


Map of Africa indicating where Kenya is situated
Source: Virtual Kenya, 2010.



Map of Kenya

Source: Government of Kenya, 2010.



Map of Kenya indicating Major Ecosystem types.
Source: Virtual Kenya, 2010.

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

Environmental diplomacy is a concept that refers to international environmental cooperation towards addressing global environmental problems that demand solutions which transgress national boundaries. In recent years, scientific warnings have been accumulating that the impacts on the environment of the enormous economic expansion and prosperity of the last half-century are beginning to upset delicate natural cycles upon which all life on earth depends.[1] Unprecedented growth in population, in consumption, and in use of land and other natural resources have had the unintended effect of bringing forth a new generation of environmental problems that are significantly different from those of the past, most notably climate change.

According to Hurrel issues like the economic development of the South, population growth, the spread of democracy, human rights and last but not least the looming global environmental crisis quickly became the focus of international agenda.[2] Toman observers that environment and development policy were put at the top of the international agenda in 1992, when the United Nations (UN) organized the earth Summit in Rio De Jenairo, one of the largest meetings of heads of state and government.[3] As observed by Susskind, on the agenda of national interest, security concerns normally come first, economic interest follow a close second and environmental questions are considered to be a rather remote issue which can be dropped if other seemingly more important issues are at stake.[4] In examining the factors of economic

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[1] R. Benedict, "Diplomacy for the Environment" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C: The Johns Hopkins University Press, 1998), pp. 3-11, p. 4.
[2] A. Hurrel and B. Kingsbury, *The International Politics of the Environment*, (Oxford: Claredon Press, 1992), p. 2.
[3] M. A. Toman, *Climate Change: Economics and Policy*, (Washington D.C: RFF Press, 2001), p. 99.
[4] L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements*, (Massachusetts: Cambridge University Press, 1994), p. 56.

development, Mansell and Wehn state that the scope of economic development includes the process and policies by which a state improves the welfare of its people through economic, political and social processes.[5]

1.1 Background of the Study

Economic development in Kenya is largely determined by agriculture which is characterized by provision of raw materials, labour force, food security and exportation of agricultural products. According to Kabubo-Mariara and Karanja Kenya's foreign exchange is largely derived from Tea, Coffee and other Horticultural exports. The study traces the origin of climate change debate starting as an international environmental and developmental challenge beginning with the 1972 Stockholm Declaration, the publication of the Brundtland Report in 1987 through to the formation of the Intergovernmental Panel on Climate Change (IPCC) in 1989, the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, and the establishment of the United Nations Framework Convention on Climate Change (UNFCCC). Since then, there have been a series of Conference of the Parties (COP) to the UNFCCC, which have produced international instruments on environment.

In Kenya, evidence of climate change dates back to the late 1960's but its effects were felt in the 1970's. The period under review in this study is 1970 to 2010, mainly because in the period between 1970 to 1974, Kenya recorded the highest GDP growth of 7.8 per cent and 5.8 per cent in national economy and agriculture respectively. Ever since both the national economy and agriculture have been on the decline with the worst GDP growth being recorded in the period between 2000 and 2004 of 1.7 per cent and 1.4 per cent in national economy and agriculture

[5] R. Mansell and U. Wehn, *Knowledge Societies: Information Technology for Sustainable Development*, (New York: Oxford University Press, 1998), p. 19.

respectively.[6] Climate change is cited as one of the reasons of such decline. The other basis for the period chosen is that proper review of climate change requires time because it does not occur overnight and a period of three decades is adequate enough to reflect the actual impact. According to the Ministry of Environment and Mineral Resources through the National Climate Change Response Strategy (NCCRS), the minimum (night time) and maximum (daytime) temperatures have been on an increasing trend. The minimum temperature has risen generally by 0.7 – 2.0 degrees Centigrade and the maximum by 0.2 – 1.3 degrees Centigrade, depending on the season and the region.[7] In areas near large water bodies, the maximum temperatures have risen much like in other areas but the minimum temperatures have either not changed or become slightly lower.

1.2 Statement of the Research Problem

The environmental challenges of which we have become more recently aware are quite different in scope. Environmental issues such as climate change, thinning of the stratospheric ozone layer, spread of dry lands and soil erosion, pollution of oceans and depletion of fish stocks, massive destruction of forests, widespread extinction of plant and animal species, persistent organic pollutants that spread their poison all over the globe among others represent a new kind of threat to human well-being.[8] Interrelationships among these apparently disparate issues exist in the form of common causal factors and physical, chemical and biological feedbacks. The global dimensions of the risks have awakened calls for more far-reaching solutions, for new levels of international cooperation. It has become evident that no nation or group of nations, however politically powerful or economically strong, can by themselves solve these planetary problems.

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[6] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture,* (2010), p. 3.
[7] GoK, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy,* 2010, p. 10.
[8] L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements,* Ibid, p. 56.

The initial conceptual problem posed in the international system lies within the traditional approach to statehood. Traditionally, a state would only be responsible in the international legal sense for breach of environmental standards. Shaw posits that this approach proved to be an inadequate framework of dealing with environmental challenges for a variety of reasons ranging from difficulties of proof to liability for lawful activities and the particular question of responsibility of non-offenders.[9] The concept of international cooperation is informed by the fact that environmental issues have to be tackled by states and non-state actors alike. However the state still bears the ultimate responsibility of implementing policies that would protect and preserve the environment.

Kenya's economy almost entirely depends on agriculture and predictable weather patterns. Cash crops such as tea, coffee and horticultural products are among the leading foreign exchange commodities. Agriculture is the source of raw materials for industries and employment and therefore plays a critical role in the country's national interest.[10] In the recent years, climate change has seriously impacted on agriculture in Kenya leading to drought and famine and eventually loss of lives and livestock.

1.3 Objectives of the Study

The overall objective of the study is to examine the impact of climate change on agriculture in Kenya with emphasis of the significance of environmental diplomacy. More specifically, the study aims to:

i. Assess the impact of climate change on agriculture in Kenya as the leading sector in Kenya 's economy;

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[9] M. Shaw, *International Law: Fourth Edition*, (Cambridge: Cambridge University Press, 1997), p. 586.
[10] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," *CEEPA Discussion Paper*, No. 12 (2006), pp. 7-10.

ii. Examine the relation between environment and development and the role of environmental diplomacy in tackling climate change;

iii. Investigate the various adaptation measures Kenya employs to counter the adverse effects of climate change on agriculture.

1.4 Literature Review

The literature on the linkage between environmental diplomacy and economic development on one hand and the impact of climate change on agriculture in Kenya on the other hand will be classified into five main themes. These themes centre on diplomacy for the environment, economic development of a state, international cooperation in managing climate change, adaptation to climate change and the role of agriculture in Kenya's economy. The theme of environmental diplomacy anchors on the traditional concept of diplomacy in international relations which concerns relations among sates on various global topical issues.

The economic development of a state as a theme refers to a country's national interest and the fact that every state has a right to exploit their own resources pursuant to their own environmental and developmental policies.[11] Two important aspects emerge on economic development of a state with regard to environment; the first one being the responsibility of state to protect the environment and the second one being the adverse impacts of environmental challenges on economic development of a state. The latter refers to the constraints posed by environmental challenges on development in which the state has no control over, whereas the former involves the onus of the state to fulfill its obligation of protecting the environment while embarking on development.

[11] M. Shaw, *International Law: Fourth Edition*, Ibid, p. 589.

The theme of international cooperation in managing climate change focuses on the premise that climate change is a transboundary issue that requires collective action form both state and non-state actors due to the anarchic nature of international system. The ultimate goal should be establishment of coordinated policies on environmental governance for mutual benefit. On the theme of adaptation to climate change, discussions will revolve around building resilience to climate change through adjustments whether passive, reactive or anticipatory with the view of ameliorating adverse consequences associated with climate change. Regarding the role of agriculture in Kenya's economy, the theme creates a link between economic development and environment.[12] The two concepts are vital in the sense that, besides tourism, agriculture is dependent on predictable weather patterns which is the leading foreign exchange earner in Kenya.

1.4.1 Environmental Diplomacy

Environmental diplomacy can well be understood from the traditional role of diplomacy as a method of maintaining relations among states. Shaw examines diplomacy as an ancient institution through which communication between various parties, including negotiations between recognized agents was conducted.[13] Barston examines that diplomacy is the established method of international discourse or the art of managing international relations, chiefly by negotiation and is as old as the formation of the state, and its science has grown in tandem with changing and ever-evolving international relations.[14] Historically, it meant the conduct of official

[12] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," *CEEPA Discussion Paper*, No. 12 (2006), p. 19.
[13] M. Shaw, *International Law: Fourth Edition*, (Cambridge: Cambridge University Press, 1997), p. 523.
[14] R. Barston, *Modern diplomacy*, (London: Longman Publishers, 1988), p. 3.

relations between sovereign states, usually bilaterally through the medium of ambassadors and their staff.[15]

Waltz observes that in the twentieth century, diplomacy expanded to cover summit meetings and other international conferences, public and parliamentary diplomacy, the international activities of supranational and sub national entities, unofficial diplomacy by non-governmental elements, and the work of international civil servants.[16] This has prompted the diplomat to posses multi-disciplinary skills in addition to the traditional aspects of the art of diplomacy which include negotiation and mediation, knowledge of public international law and an understanding of international political and economic regimes. With different issues determining world affairs as a result of globalization, diplomacy has taken a great normative leap and the diplomat is often left to grapple with new thematic concerns like environmental diplomacy. O'Neill argues that the diplomatic agenda at bilateral and multilateral levels has seen a creation of documentation that has the subject of environmental protection as its basis.[17] Narain observes that as an integral component of international relations, environmental diplomacy has led to the formulation of over two hundred international environmental treaties now in place and numerous others that are under negotiation.[18] These treaties have generated a crowded schedule of international meetings that have made diplomats and non-governmental organizations and observers to busily shuttle around the world.

Despite the number of international environmental treaties, certain scholars and environmental activists observe that the condition of the biosphere is alarmingly continuing to deteriorate. O'Neill emphasizes that there is need to reconcile the notoriously slow pace of

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[15] G. Berridge, *Diplomacy: Theory and Practice*, (London: Prentice Hall Publishers, 1995), p. 24.
[16] K. Waltz, *Theory of International Politics*, (New York: McGraw-Hill, 1979), p. 197.
[17] K. O'Neill, *The Environment and International Relations*, (New York: Cambridge University Press, 2009), P. 34.
[18] S. Narain, "Environmental Diplomacy in an Unequal World" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C: The Johns Hopkins University Press, 1998), pp. 17-23, p. 17.

international environmental diplomacy with the growing urgency of global ecological decline.[19] She attributes the slow pace of environmental governance to the fact that environmental issues are increasingly intertwined with other more traditional areas of foreign relations, including trade and investment policies, development and human rights, and even military security.[20] Integrating environmental issues into these other spheres is often essential for solving the problems at hand. But this integration is often resisted by those who hold different world views, and who fear that environmental issues will overburden their agendas. Environmental diplomacy is also characterized by complex linkages between foreign and domestic policy and politics as examined by Carter.[21] This is most evident in the climate change context, where developed countries lead the in emissions of greenhouse gases which are harmful to the environment. According to Cali the connections between foreign and domestic policy inherent in environmental diplomacy bring new actors to the fore such as the business community which has become an active participant in international environmental negotiations.[22] It has the power to rally domestic support when it becomes convinced of the need for international action. The business community is regarded as the force behind the success of 1987 Montreal Protocol on Substances that Deplete the Ozone Layer.[23]

Successful environmental diplomacy therefore requires a cooperative and a multilateral approach in which the states, the business community and non-governmental organizations all need to devote a higher priority to international environmental issues in order to manage climate change and its adverse effects.

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[19] K. O'Neill, *The Environment and International Relations*, Ibid, p. 108.
[20] Ibid, p. 109.
[21] N. Carter, *The Politics of the Environment: Ideas, Activism, Policy*, (New York: Cambridge University Press, 2001), p. 213.
[22] B. cali, *International Law for International relations: Foundations for Interdisciplinary study*, (Oxford: Oxford University Press, 2009), p. 83.
[23] Ibid, p. 85.

1.4.2 Economic Development

Economic development emanates from the concept of national interest which refers to goals and ambitions of a country whether military economic or cultural. From this perspective, economic development can be viewed as one of the pillars of a country's national interest. The national interest of a state according to Morgenthau is multifaceted in the sense that it determines state's survival through pursuit of wealth, economic growth and power.[24] In that basis, economic development of a state is closely linked with sovereignty principle. Crawford examines that sovereignty of state is rooted in the Westphalia Treaty of 1648 which established the modern state system that endowed states with rights which include equality status, independence and absolute jurisdiction within its territories.[25] Waltz supports the argument by observing that sovereignty is the notion behind the cardinal rule of non-interference principle.[26] The contemporary international system is widely influenced by Westphalia Treaty of 1648 and as a matter of fact the Montevideo Convention on the Rights and Duties of states of 1933, expounded on the same principles as embodied in the former. Article one of the Montevideo Convention defines a state as consisting of four principles; a permanent population, a defined territory, government and capacity to enter into relations with other states.[27]

Shaw observers that states have a sovereign right to their own resources pursuant to their own environmental and developmental policies. However the same should be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.[28] The correct balance between development and environment protection is therefore vital, a challenge

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[24] H. Morgenthau and K. Thompson, *Politics Among Nations: The Struggle for Power and Peace, Sixth Edition,* (New York: Knopf, 1985), p. 57.
[25] J. Crawford, *The Creation of States in International Law, Second Edition,* (London: Claredon Press), pp. 32-36.
[26] K. Waltz, *Theory of International Politics*, (New York: McGraw-Hill, 1979), p. 26.
[27] See Article 2 of the Montevideo Convention on the Rights and Duties of States, 1933.
[28] M. Shaw, *International Law: Fourth Edition*, (Cambridge, Cambridge University Press, 1997), p. 591.

that is facing the international community because it touches on the principle of state sovereignty on one hand, and the need for international cooperation on the other. A country's economic development is related to its human development which encompasses among other things health, education, infrastructure, employment and industrialization. These factors are however closely related to economic growth so that development and growth often go together.

Different models of economic development indicate that growth rate of gross domestic product (GDP) depends positively on the national savings. However Anand and Ravallion argue that the saving rate will only determine the level of income but not the rate of growth.[29] Lucas places emphasis on technological change, innovation and knowledge in attaining sustainable economic development of a state. According to him, labour factor plays a critical role by predicting the flow of knowledge which eventually leads to successful increase in technology.[30]

1.4.3 Climate Change

Toman defines climate change as unpredictable weather patterns owing to human activity in altering the natural ecosystem occasioned by burning fossil fuels, industrial activities and deforestation among other activities.[31] Nelson explains that climate change has attracted a lot of attention in recent years as the key global concern posing a serious threat to the future prosperity of our planet.[32] He adds that life on earth is possible partly because some gases such as carbon dioxide (CO_2) and water vapour which naturally occur in the atmosphere of earth trap heat.[33] Mendelsohn and Dinar reiterate the same discussion by observing that CO_2 and water vapour

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[29] S. Anand and M. Ravallion, "Human Development in Poor Countries: On the Role of Private Incomes and Public Services," *The Journal of Economic Perspectives,* Vol. 1 No. 7, (1993), pp.133-150.
[30] R. Lucas, "On the Mechanics of Economic Development," *Journal of Monetary Economics,* Vol. 1 No. 22, (1988), pp. 3-42. p 6.
[31] M. A. Toman, *Climate Change: Economics and Policy*, (Washington D.C: RFF Press, 2001), p. 61.
[32] G. Nelson, *Climate Change: Impact on Agriculture and Costs of Adaptation*, (Washington D.C: IFPRI Press, 2009), p. 4.
[33] Ibid, p. 9.

help in trapping greenhouse gases (GHGs) and humans are greatly adding to the presence of GHGs by burning fossil fuels and industial emissions. They emphasize that anthropogenic GHG emissions trap too much sunlight and blocks outward radiation, hence contributing to the change of climate.[34]

Martens and Rotmans argue that intertwined with other global challenges such as poverty and population pressure, it is apparent that climate change requires concerted efforts from states and non-state actors.[35] Effective management of climate change according to Hurrel and Kingsbury will require accounting for the impacts of climate change on agriculture, disease patterns, and violent weather events, all of which particularly impact the poorest countries.[36] Dinar posits that climate change presents significant threats to the achievement of the Millennium Development Goals (MDGs) especially those related to eliminating poverty and hunger and promoting environmental sustainability. Empirical and scientific evidence points towards the disproportionate negative impact climate change will have on the poorest countries who, ironically, have contributed least to the problem.[37]

Climate change is expected to increase the frequency and intensity of severe weather events and poor countries lack the infrastructure necessary to respond adequately to such events. Diseases such as malaria are likely to have wider ranges, impacting more people in the poorest regions of developing states that are already most affected by such diseases. Changing rainfall patterns could devastate rain-fed agriculture on which so much of the population in developing countries depends to survive.

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[34] R. Mendelsohn and A. Dinar, *Climate Change and Agriculture: An Economic Analysis of Global Impacts, Adaptation and Distributional Effects*, (Cheltenham: Edward Elgar Press, 2009), p. 10.
[35] P. Martens and J. Rotmans, *Climate Change: An Integrated Perspective*, (Dordrecht: Kluwer Academic Publishers, 1999), p. 33.
[36] A. Hurrel and B. Kingsbury, *The International Politics of the Environment*, (Oxford: Claredon Press, 1992), p. 42.
[37] A. Dinar, *Climate Change and Agriculture in Africa: Impact Assessment and Adaptation Strategies*, (Trowbridge: Cromwell Press, 2008), pp. 12-14.

International cooperation relates to the requirement for the states to work together in dealing with transboundary environmental challenges. Shaw posits that in international law the concept is founded on general principles in which states are required to cooperate in dealing with pollution issues that transgress national boundaries.[38] Principle 24 of the Stockholm Declaration of 1972 notes that international matters concerning the protection and improvement of the environment should be handled in a co-operative spirit.[39] Principle 7 of the Rio Declaration of 1992 reiterates the same notion by stating that states shall co-operate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem.[40]

Simmons and Steinberg examine that the global challenges for environmental protection and a sustainable development have to be tackled not only on a local scale but also through transnational action. They further argue that effective international cooperation requires an international environmental legislation and international environmental law to implement the necessary conditions.[41]

On the basis of international law, international cooperation is to a large extent restricted to states as the main actors. With this kind of perspective the rationale behind international cooperation is likely to be defeated without incorporating non-state actors, more specifically non-governmental organizations and the business community. Oye attributes the notion of international cooperation to the anarchic nature of the international system by arguing that in the absence of a central governing authority international cooperation is inevitable.[42] Keohane,[43]

[38] M. Shaw, *International Law: Fourth Edition*, (Cambridge: Cambridge University Press, 1997), p. 602.
[39] See Principle 24 of the Stockholm Declaration of 1972.
[40] See Principle 7 of the Rio Declaration of 1992.
[41] B. Simmons and R. Steinberg, *International Law and International Relations*, (Cambridge, Cambridge University Press, 2006), pp. 215-217.
[42] K. Oye, *Cooperation under Anarchy*, (Princeton: Princeton University Press, 1986), pp. 1-24.
[43] R. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton: Princeton University Press, 1984), p. 31.

Milner,[44] and Stein[45] further the same argument by emphasizing that international cooperation is vital in the pursuit of safeguarding the future and prosperity of the planet by discussing and providing solutions to various global issues, among them environmental protection.

The response to extreme climate events which have had negative socio-economic impacts on almost all sectors including energy, health, agriculture, livestock and hydropower generation among others require the establishment of mechanisms that might enable states to adapt to climate variability. Falk observes that the UN system promotes and supports the development of national strategies on adaptation to address both short and long term needs, policy decisions and operational programmes on relevant sectors.[46]

Adaptation to climate change is one of the greatest challenges facing the world today and more so in the developing countries. Lobell and Burke examine that coupled with poverty, adaptation to climate change remains an uphill task in the achievement of sustainable economic growth. Improved technology transfer such as more reliable long-term weather forecasting will contribute to reducing current vulnerability of poor and food insecure rural households and will be critical to their ability to adapt to future changes.[47]

The potential for autonomous adaptation according to O'Neill depends on affordability of such measures which include changes in crops and crop varieties, improved water management and irrigation systems, and changes in planting schedules and tillage practices.[48] Most of these adaptation opportunities are being applied by farmers where there is access to the right information and tools. Carter adds that adaptation to climate change should include capacity

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[44] H. Milner, "International Theories of Cooperation among Nations: Strengths and Weakness," *World Politics* Vol. 3 No. 44, (1992), pp. 466-496, p. 468.
[45] A. Stein, *Why Nations Cooperate: Circumstance and Choice in International Relations* (Ithaca: Cornell University Press, 1990), p. 2.
[46] A. Falk et al, *The United Nations and a Just World Order*, (New York: West View Press, 1991), p. 20.
[47] D. Lobell and M. Burke, *Climate Change and Food Security: Adapting Agriculture to a Warmer World*, (Stanford: Springer Science+Business Media, 2010), p. 133.
[48] K. O'Neill, *The Environment and International Relations*, Ibid, p. 110.

building of local communities to manage water resources and increase resilience to droughts and floods. Management of water resources in itself is a solution to many environmental problems and not just climate change. [49]

1.4.4 The Impact of Climate Change on Agriculture in Kenya

Sustainable agricultural development is Kenya's major priority since agriculture is the engine of economic growth and it seems it will be the case in the foreseeable future. Tea, Coffee, Tourism and Horticulture are the leading sectors in foreign exchange in Kenya.[50] Although the expansion of agricultural export crops has been the most important factor in stimulating economic development, much agricultural activity is also directed towards providing food for domestic consumption. Kenya's agriculture is sufficiently diversified to produce nearly all of the nation's basic foodstuffs and also extends to neighboring countries.

The basic policy goals for the agricultural sector are to provide food security, raw materials for agro-industry, employment for the rising population and to generate foreign exchange earnings. Much of Kenya's population derive their livelihoods from small holding agriculture leading to degradation of the natural resource base which compromises future development.[51] The poorest people in Kenya live in rural areas and depend heavily on the natural resource base for their livelihoods. They are often trapped in chronic food insecurity and chronic poverty with poor financial and human capital endowments which limit their ability to invest efficiently to create wealth.

With the challenge of abject poverty on one hand and the challenge of climate change on the other, agricultural sector is in a precarious position. Agriculture in Kenya is largely rain fed

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[49] N. Carter, *The Politics of the Environment: Ideas, Activism, Policy*, Ibid, p. 98.
[50] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," *CEEPA Discussion Paper*, No. 12 (2006), p. 9.
[51] Ibid, p. 10.

and productivity mainly depends on agro-ecological factors such as temperature, soil characteristics and production input. Kabubo-Mariara and Karanja examine that climate change impacts vary based on locality, but the probability of disruption of Kenya's agricultural sector is very high.[52] Susskind observes that climate change arising from the build-up of greenhouse gases provides a profound challenge for the future of agricultural production.[53]

1.4.5 Literature Gap

The literature review on the role of environmental diplomacy and impact of climate change on agriculture in Kenya will reveal that there is a slow pace in international diplomacy with regard to the growing urgency of global ecological decline. Although environmental diplomacy seems clearly to have emerged as an integral component of international relations during cold war and gained prominence after cold war, the pace at which global ecological issues are handled is extremely slow. The numerous international environmental treaties now in place and others under negotiations have generated a crowded schedule of international meetings in which diplomats and non-governmental observers have found themselves shuttling around the world.[54] If success were measured by the number of treaties or the volume of diplomatic activity, it would look as though environmental diplomacy over the past few decades had been a spectacular. Yet as the number of treaties continues to climb, the condition of the biosphere is steadily deteriorating. O'Neill states that carbon dioxide levels and global temperatures are alarming, scientists are warning that we are in the midst of a period of mass extinction of species, fisheries are depleted worldwide, and water shortages are looming on every continent. She adds that there

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[52] Ibid, p. 12.
[53] L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements*, (Massachusetts: Cambridge University Press, 1994), p. 83.
[54] R. Eckersley, *The State and the Global Ecological Crisis*, (Cambridge, MIT Press, 2005), p. 103.

is a disconnect between the growing number of legal instruments and the deteriorating global environment.[55]

Many scholars attribute the slow pace of environmental diplomacy to a number of factors. Carter points out that the major challenge results from the fact that environmental issues are increasingly intertwined with other more traditional areas of foreign relations including development, trade and investment policies and human rights. He observes that integrating environmental issues into these other spheres is often essential for solving environmental problems.[56] According to Keohane the problem is posed by the fact that the existing environmental conventions deal with interrelated issues, yet their work is poorly coordinated, and requires initiatives that aim to ensure a cross-fertilization of information among the various efforts to implement environmental conventions within developing countries.[57] Eckersley posits that the North and the South are in conflict stemming from sharply differing levels of material consumption and concerns over how to equitably share the world's ecological space. Therefore, the world is negotiating not on global warming or emission reduction, but the principles on which the atmospheric space will be allocated and the modalities that will govern the global commons.[58]

The study takes note of the concern of the slowness in international diplomacy on ecological issues, a factor that is exacerbating climate change and its impact in developing countries. In view of all the arguments on climate change diplomacy, the study emphasizes that economic issues must be considered when dealing with environmental concerns. This leads us to

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[55] K. O'Neill, *The Environment and International Relations*, Ibid, p. 189.
[56] N. Carter, *The Politics of the Environment: Ideas, Activism, Policy*, (New York, Cambridge University Press, 2001), p. 261.
[57] R. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton: Princeton University Press, 1984), p. 74.
[58] R. Eckersley, *The State and the Global Ecological Crisis*, Ibid, p. 105.

the question of equity in regard to climate change without which there is no likelihood of achieving long lasting partnership in addressing global problems.

1.5 Justification of the Study

This study is academically important for it will identify and analyze the scope of environmental diplomacy in managing climate change and its challenges. There is need to develop a more expeditious and effective mechanism of addressing climate change since it is clear that the world shares a global common known as the atmosphere. Carter notes that environmental diplomacy refers to the negotiations on environmental issues that take place in conferences which have in most cases been organized and promoted by the UN, and about the finalizing of declarations, protocols and treaties that were agreed on and signed at the conclusion of these international events.[59] This argument however observes that large numbers among the civil society are voicing their fears that the results are too little too late and above all not binding as some states find the constraints to be too onerous.[60] The need to hasten the pace of addressing ecological decline is also supported by Susskind who states that successful environmental diplomacy requires a cooperative, multilateral approach.[61] This argument calls for all actors including states, non-governmental institutions, scientists and the business community to put ecological issues top on the list of priorities.

The study will contribute to the understanding of the significance of international cooperation in addressing ecological issues with emphasis on climate change. The study will narrow down to the impact of climate change on agriculture in Kenya while examining its economic impact as well. A link will be put between the slow pace of environmental diplomacy

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[59] N. Carter, *The Politics of the Environment: Ideas, Activism, Policy*, Ibid, p. 314.
[60] Ibid, p. 315.
[61] L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements*, (Massachusetts: Cambridge University Press, 1994), pp. 81-87.

and the rapid impact of climate change on agriculture. Importantly, there lacks studies done on the impact of climate change on agriculture in Kenya as the main source of economic development, and the fact that environmental diplomacy seems like a cause without concern. The study aims at filling this gap through analysis of environmental diplomacy and economic development in Kenya. This will be through examination of climate change impact on agriculture as the major source of economic development in Kenya.

On policy grounds, the study will benefit policy makers as they move towards addressing the impact of climate change on agriculture in Kenya and also by taking part in environmental diplomacy. This will include establishment of administrative arrangements for dissemination of information on the impact of climate change on agriculture to the general public, environment stakeholders, meteorological department and other government actors. The study will also contribute in designing measures to building resilience to climate change through adaptation by advising farmers on suitable farming methods to the ever changing weather patterns.

1.6 Theoretical Framework

This study will be guided by the theory of international cooperation. The theory involves the introduction of non-state actors, the study of norms and ideas and increased examination of the effectiveness or impact of international cooperation. Questions in the field have revolved around the emergence of cooperation, its motivations; absolute versus relative gains, and its extent and durability especially above and beyond the particular interests of states. Waltz observes that states would cooperate due to the existing anarchic international system characterized by a war

of all against all.[62] Milner defines international cooperation as the deliberate and coordinated adjustment of policies by states attempting to solve a mutual problem or achieve mutual gains.[63]

According to O'Neill, Balsiger and Van Deveer, the theory of international cooperation has devoted considerable attention to three substantive themes; non-state actors, transnational norms and ideas and regime effectiveness.[64] On the first theme, an increasing number of non-state actors are playing important roles in international cooperation, including international organizations, transnational social movements, private industry and epistemic communities.[65] Much of this work suggests an erosion of the authority of nation-states as the primary units of analysis at the international level. They argue that the emergence of shared transnational norms and ideas is important in generating lasting cooperation by influencing domestic politics.[66] They also note that the effects of cooperation are a growing concern especially in the field of international environmental politics in which a number of questions arise. These questions include how well states comply with agreements, what measures they undertake to implement them and to what extent the agreements or regimes actually resolve the problems.[67]

Hasenclever posits that cooperation can only be sustained by an international treaty if no country can gain by not being a party to it and no party can gain by not implementing it.[68] The argument observes that free riding must be deterred and compliance must be enforced. An agreement must therefore specify a strategy, a plan detailing what the parties should do, and the

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[62] K. Waltz, *Theory of International Politics*, (New York, McGraw-Hill, 1979), p. 14.
[63] H. Milner, "International Theories of Cooperation among Nations: Strengths and Weakness," *World Politics* Vol. 3 No. 44, (1992), pp. 466-496, p. 467.
[64] K. O'Neill et al. "Actors, Norms and Impact: Recent International Cooperation Theory and the Influence of the Agent-Structure Debate," *Annual Reviews,* Vol. 7 (2004), pp. 149-175, p. 150.
[65] Ibid, p. 156.
[66] Ibid, p. 160.
[67] Ibid, p. 164.
[68] A. Hasenclever et al. "Integrating Theories of International regimes," *Review of International Studies,* Vol. 1 No. 26, (2000), pp. 3-33, p 4.

strategy if obeyed must succeed in deterring free-riding and enforcing compliance.[69] Moreover, it must be in the interests of the parties actually to behave as the strategy demands. That is, the threat to reciprocate to harm a country that has deviated from the strategy must be credible.[70] This theory enables the researcher to illuminate on the impact of climate change on agriculture in Kenya and the extent to which international cooperation through environmental diplomacy would address the problem.

1.7 Hypotheses

The study will test the following hypotheses;

1. Climate change can negatively affect agricultural productivity;
2. Environmental diplomacy can address the growing concern of global ecological decline;
3. The lack of effective institutional mechanisms and adequate technology of adapting to climate change can lead to low agricultural productivity.

1.8 Research Methodology

The study will rely on both primary and secondary sources of data to investigate the significance of environmental diplomacy on the environment and the impact of climate change on agriculture in Kenya. Primary data will be collected through the use of structured interview method. According to Kisilu and Tromp, structured interview method is a systematic interviewing technique which subjects every informant in a sample to the same stimuli.[71] The technique is favored because it is systematic, comprehensive, reliable, quantifiable and time saving. However,

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[69] Ibid, p. 6.
[70] Ibid, p. 7.
[71] D. Kisilu and D. Tromp, *Proposal and Thesis Writing: An Introduction*, (Nairobi, Pauline Publications Africa, 2006), p. 94.

the weaknesses of this method are rigidity and too much formality.[72] The weakness can be overcome by making as many choices in the questionnaire as possible, having open ended questions, following up to clarify issues, giving guidance to respondents to answer the questions freely and giving them adequate time.

Primary data will be collected from stakeholders in the environment sector, the agricultural sector and planning and development sector in Kenya. Also the researcher will interview officials from the Kenya Meteorology Department, National Environment Management Authority, environmental activists and non-governmental organizations in the Republic of Kenya to investigate the impact of climate change in Kenya. Data collection will be reinforced through analyses of the national legislations, policies and strategies and also the various international instruments on the environment.

The study will rely on secondary data including books, journals and publications on the emergence of environmental diplomacy and its connection to economic development. The information collected in both primary and secondary data sources will help in engaging with the debates that exist in environmental diplomacy and the concept of international cooperation. Importantly, the data will provide insights on the impact of climate change on agriculture in Kenya.

1.9 Chapters Outline

This study is structured into five chapters as provided hereunder;

- Chapter one: Introduction to the Study;
- Chapter Two: Environmental Diplomacy and Economic Development: An Overview;

[72] Ibid, p. 95.

- Chapter Three: Environmental Diplomacy and Economic Development: The Impact of Climate Change on Agriculture in Kenya, 1970-2010;
- Chapter Four: Environmental Diplomacy and Economic Development: A Critical Analysis;
- Chapter Five: Conclusions.

CHAPTER TWO

ENVIRONMENTAL DIPLOMACY AND ECONOMIC DEVELOPMENT: AN OVERVIEW

2.0 Introduction

The previous chapter established the basis of the study by setting the broad context of the research, examining the background of the study, the statement of the research problem, justification, theoretical framework, literature review of environmental diplomacy and economic development, hypotheses, research methodology. It captured the prime objective and rationale of the study.

This chapter seeks to provide an overview of environmental diplomacy and economic development by establishing whether the two entities are correlated. In that regard, the chapter seeks to examine the linkage between environmental diplomacy and economic development, agriculture as an economic activity and how climate change has affected agricultural productivity in Kenya. In the recent past, the nascent environmental movement was fully preoccupied with such essentially localized issues as urban air pollution, unsafe water supplies, and waste disposal. Although these problems are still relevant most particularly in developing and newly industrializing countries of the South, the environmental challenges which the world is facing today are different in scope. They range from climate change to thinning of the stratospheric ozone layer, spread of drylands and soil erosion, pollution of oceans and depletion of fish stocks, massive destruction of forests, widespread extinction of plant and animal species to persistent organic pollutants that spread poison all over the globe among other environmental issues. These global dimensions have awakened calls for more far-reaching solutions and new levels of international cooperation.

2.1 Environmental Diplomacy

The significance of environmental diplomacy involves efforts by states and other actors towards addressing ecological decline the world is experiencing. The role of non state actors in environmental diplomacy has been widely acknowledged due to their critical involvement in environmental problems. Christmann observes that multinational companies (MNCs) can self-regulate their environmental conduct by standardizing their environmental policies worldwide, thus reducing their ability to exploit cross-country differences in environmental regulations.[73] The importance of MNCs in environmental concerns is represented by *Keidanren's* citation contained in its environmental charter which signifies a new sense of alarm over the ecological situation:

> *"Today's environmental problems are too critical to be dealt with solely through measures to prevent industrial pollution. . . . Society itself must be fundamentally changed. We must radically revise various social and economic systems. . . . The task before us is not merely one of rethinking the problems caused by the pursuit of affluence in a culture that encourages mass consumption; we must also come to grips with the global problems of poverty and population increase. . . . People throughout the world must join hands to create new social and economic systems."*[74]

The above sentiments are also echoed by Kyocera environmental charter and Battery Association of Japan (BAJ) charter. Specifically the BAJ Charter in the introductory part states as follows:

> *"Today's environmental problems...are major factors that threaten the very existence of human beings. To approach these problems with any hope of*

[73] P. Christmann, "Multinational Companies and the Natural Environment: Determinants of Global Environmental Policy Standardization," *The Academy of Management Journal,* Vol. 47 No. 5, (2004), pp. 747-760, p. 748.
[74] Global Environmental Charter of Keidanren, 1991, Japan.

solving them, governments, corporations and people of each country need to play an equal role and join hands to promote continued improvements in the condition of the global environment."[75]

As a result, the past few years have witnessed a virtual explosion of multilateral negotiations aimed at addressing the new global environmental issues. These include the 1985 Vienna Convention on Protecting the Ozone Layer; the 1987 Montreal Protocol on Substances That Deplete the Ozone Layer; the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes; the establishment in 1991 of the Global Environment Facility; the 1992 UN Conference on Environment and Development; the 1992 UN Framework Convention on Climate Change; the 1992 Convention on Biological Diversity; the 1993 UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks; the 1994 UN Conference on Sustainable Development of Small Island Developing States; the 1994 UN Convention to Combat Decertification; the 1994 International Conference on Population and Development; the 1997 Kyoto Protocol on Climate Change; and numerous intergovernmental negotiations and working groups on such subjects as sustainable forest management, land and water resources, economic instruments, and biotechnology.[76]

2.1.1 Diplomatic Initiatives

These diplomatic initiatives have been as a result of an ongoing process of reporting and review of national policies and scientific evidence. Institutional frameworks, backed by permanent secretariats and expert groups, have been established in support of continuing negotiations that appraise and refine national commitments in light of changing knowledge and conditions.

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[75] Battery Association of Japan Charter, 1994, Japan.

[76] L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements*, (Massachusetts: Cambridge University Press, 1994), p. 36.

Benedict examines that environmental negotiations can be viewed as an evolving system of international governance of the environment.[77] Susskind posits that environmental diplomacy truly came of age at the 1992 UN Conference on Environment and Development (UNCED) in Rio de Janeiro.[78] Narain adds that UNCED, also known as the Earth Summit, was the largest gathering of heads of state ever held up to that time: nearly 180 nations participated, 118 at head-of-state level. In addition, there were dozens of United Nations and other intergovernmental organizations, plus thousands of observers representing hundreds of nongovernmental organizations and media sources from every part of the world.[79]

Weinber observes that paradoxically at Rio, the environment ministers themselves lost control over their own domain. Even as the environment captured global headlines for the first time over a sustained period, the subject matter itself became too important to be left to environmentalists. The forty chapters of Agenda 21, negotiated during two years of preparations for the Rio conference, covered nearly every realm of human experience. Foreign ministries increasingly took over the issue, while other parts of government notably finance, economics, science, energy, agriculture and development cooperation ministries hastened to buttress their own competence in environmental themes.[80] Christman reiterates the same by observing that special ambassadors were commissioned to coordinate and oversee the increasingly complicated

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[77] R. Benedict, "Diplomacy for the Environment" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C.: The Johns Hopkins University Press, 1998), pp. 3-11, p. 7.
[78] L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements*, Ibid, p. 38.
[79] S. Narain, "Environmental Diplomacy in an Unequal World" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C.: The Johns Hopkins University Press, 1998), pp. 17-23, p. 19.
[80] C. Weinber, "From Environmental Diplomacy to Environmentally Sound Diplomacy" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C.: The Johns Hopkins University Press, 1998), pp. 25-31, p. 26.

negotiations, which required expertise not only in traditional ecological subjects, but also in economics, finance, technology, and often arcane branches of science.[81]

As a consequence of the UNCED process, foreign offices and finance ministries could no longer dismiss environmental concerns as irrelevant to grander aspects of national policy. It became clear that everyone has a stake in the condition of the environment. Most countries have by now established national councils on sustainable development that brings together relevant ministries as well as local governments and citizens' groups. UNCED was not a culmination, but rather a milestone along a diplomatic pathway that began a decade earlier. In many ways, the road to Rio began with the initiation of negotiations in 1982 that led to the signing of the Montreal Protocol in 1987. The ozone protocol was the first international agreement to mandate worldwide preventative actions before any environmental harm had occurred. The treaty was designed to protect human health and the environment against future threats that were at the time largely still in the realm of unproven scientific theory. The accord contained unprecedented provisions that significantly influenced future environmental negotiations and that represented a change in international diplomacy.

2.2 Economic Development

Development has been understood since the Second World War (WW II) to involve economic growth, increases in per capita income and attainment of a standard of living equivalent to that of the industrialized countries. This conception of development has been questioned because it gives too little consideration to the non-material aspirations of people in developing countries. Mansell and Wehn argue that each country must reach its own consensus on the changing meaning of development which is much more widely recognized today that the social setting and

[81] P. Christmann, "Multinational Companies and the Natural Environment: Determinants of Global Environmental Policy Standardization," Ibid, p. 754.

people's capabilities are crucial to the development process.[82] Mikesell observes that knowledge and human capital are essential to all aspects of development. He states as follows;

> *"...the capacity to acquire and generate knowledge in all its forms including the recovery and upgrading of traditional knowledge, is perhaps the most important factor in the improvement of the human condition."*[83]

Information and communication technology (ICT) goods and services have contributed quite substantially to economic growth in many developed and newly industrialized countries. According to Pohjola, production of ICT goods can increase the overall economic growth of a country in two ways. First because the global demand for ICT goods is growing faster than demand for most other goods therefore serving as an engine for growth by its direct contribution to GDP and job creation. Second, because the production of ICT goods often involves the use of highly advanced manufacturing processes often generating higher labour productivity.[84]

The value of information and accumulated knowledge within developing countries is an important aspect of future growth potential. The use of ICTs in achieving development goals do not offer a magical potion that can be expected to provide a cure for the sick, to prevent environmental degradation or to create jobs. However, if these technologies can be combined with domestic and external human resources they can be instrumental in achieving major changes in the organisation of industrial activity and the conduct of everyday life in developing countries. If the changes are consistent with development goals, countries can gain advantages from ICTs and avoid the risks of exclusion and marginalization.

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[82] R. Mansell and U. Wehn, *Knowledge Societies: Information Technology for Sustainable Development*, (New York: Oxford University Press, 1998), p. 22.

[83] R. Mikesell, *Economic Development and the Environment: A Comparison of Sustainable Development with Conventional Development Economics*, (London: Routledge, 1995), p. 131.

[84] M. Pohjola, *Information Technology, Productivity and Economic Growth: International Evidence and Implications for Economic Development*, (New York: Oxford University Press, 2001), p. 214.

Gouldson and Roberts provide a detailed and accessible examination of the policies and practice associated with local and regional strategies for integrating economic developments and environmental management. Using the idea of ecological modernization, they consider how integrated approaches to policy might be developed and whether these integrated approaches enable economic and social activities to support rather than undermine the realization of environmental objectives.[85] Another important aspect in development is the fact of ascribing economic value to natural assets. We live in a real world in which natural assets are supported by a base resource which is the subject of competing forces. That base resource is land and its ecological characteristics. Competition for this resource will intensify as population unavoidably and irreversibly increases.

Pearce posits that whatever choice we make about land use involves a cost: If we develop the land, the cost is the forgone value of conservation. If we conserve the land, the cost is the forgone benefit of development. In both cases, those sacrifices involve offence to moral principles. Economic cost is not a matter of mere money, but a matter of rights and obligations and moral value too.[86] Vig and Axelrod examine that moral views surrounding development debate imply that conservation values are above or superior to those other values, which supposes a world of frustrated demands that sooner or later will destroy the resource. And this much has now been understood by the position conservation activists are taking who no longer speak of outright prohibition of land use, but speak of sustainable use.[87]

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[85] A. Gouldson and P. Roberts, *Integrating Environment and Economy: Strategies for Local and Regional Government,* (London: Routledge, 2000), p. 177.

[86] D. Pearce, *Economics and Environment: Ecological Economics and Sustainable Development,* (Massachusetts: Edward Elgar Publishers, 2000), pp. 25-26.

[87] N. Vig and R. Axelrod, *The Global Environment: Institutions, Law and Policy,* (London: Earthscan, 1999), p. 253.

Attaching economic value to environmental assets, and appropriating the value through markets and bargains, also has potentially immense scope for saving environmental assets. Herrick and Kindleberger advances the debate of attaching economic value to environment by acknowledging that all cost is opportunity cost and opportunity cost embodies potential rights and obligations. The argument states that we should target certain expenditures and direct them to conservation because those expenditures have lower value.[88]

2.2.1 Millennium Development Goals

For a long time, development debate has been regarded as niche politics, far removed from the supposedly more important fields of foreign and security policy. Gouldson and Roberts endorses that in an era of mutual dependencies, development cooperation must be central to the quest for a global system built on equity and stability. Because global poverty, state failure, the disintegration of societies and political and religious fundamentalism, are mutually reinforcing development spending especially to achieve the MDGs, is not charity but a prerequisite to safeguard our global future.[89]

In light of the Sachs[90] and Annan[91] reports, an international consensus on four development policy strategies to achieve the MDGs include direct poverty reduction and economic growth, more investment in development cooperation, good governance, and partnerships with fast-track countries. However, these approaches according to Sachs and Annan can only be successful in combination with effective environmental policies. Sachs observes that we fundamentally depend on natural systems and resources for our existence and development,

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[88] B. Herrick and C. Kindleberger, *Economic Development,* (New York: McGraw-Hill, 1983), p. 6.
[89] A. Gouldson and P. Roberts, *Integrating Environment and Economy,* Ibid, p. 179.
[90] J. Sachs, *The End of Poverty: Economic Possibilities for our Time,* (New York: Penguin Press, 2005), p. 96.
[91] K. Annan, In Larger Freedom: *Towards Development, Security and Human Rights for All,* (New York: UN Publications, 2005), p. 8.

and calls for coherence between environmental and development policy.[92] Annan on the other hand clearly identifies the problems associated with development to do with fragmented and weak global governance architecture in the environmental and development spheres.[93]

Both the Sachs and the Annan reports outline the key elements of a development strategy for the least developed countries (LDCs) which aims to create economic dynamism while directly contributing to improving the living conditions of the poorest. This is an innovative approach, for it helps to end the paralysing ideological dispute between the protagonists of basic needs strategies on the one hand and pure growth-oriented approaches, on the other. They argue that an MDG-oriented development policy must focus on three targets simultaneously:

It must make direct contributions to reducing poverty by improving the social situation and life chances of the poorest groups, thereby laying the foundations for future development. There is a general consensus that there are key levers which improve the social conditions of the poorest groups in the least developed countries in structural terms; these are guaranteed universal access to primary education and a high level of investment in the modernization, development and expansion of the educational system; accessible primary healthcare for all; and promoting equality and education for women and girls;

The policy must help to boost the productive capacities of poor groups. The focus here is on investment aimed at improving food security and stabilizing subsistence production. In urban centres, the priority is to upgrade slums and adopt strategies which improve productivity in the informal sector, thereby encouraging linkage with well-performing sectors of the formal economy;

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[92] J. Sachs, *The End of Poverty: Economic Possibilities for our Time*, Ibid, p. 103.
[93] K. Annan, In Larger Freedom: *Towards Development, Security and Human Rights for All*, Ibid, p. 9.

It must help to strengthen economic sectors which show major potential for growth by boosting their competitiveness and encouraging linkage with the 'economy of the poor'. Investment in human capital, innovation and technology transfer, and the establishment of efficient infrastructure (e.g. in the energy and transport sectors), including transborder infrastructure, are essential prerequisites to integrate the poorest developing countries into the global economy and enable them to share in greater global prosperity.

2.3 The Linkage between Environment and Development

The latter part of the twentieth century experienced environmental degradation which gained recognition as a fundamental challenge to the economic growth process in the world. However, environmental considerations have been established as determining factors for shaping economic development in the twenty first century. Such considerations include; population growth, rising use of nonrenewable resources, increase in energy use, dwindling resources and pollution among other factors. As a result, there is need for a different kind of economic analysis, one that addresses a global economy in which resource and environmental considerations are much more prominent than in the past.[94]

Herman observes that the concept of economics must consider the environment as fundamental to the productive process rather than approaching environmental questions as an afterthought which more often deals with the basic economic issues of production, employment and output growth.[95] As we are all aware, economic production has always depended on the environment, but the scale of economic activity varies from one country to another, therefore making it essential to integrate environment views and economics.

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[94] German Advisory Council on Global Change, *Development Needs Environmental Protection: Recommendations for the Mellenium+5 Summit,* (WBGU, 2005), p. 14.

[95] D. Herman, "Elements of Environmental Macroeconomics," in R. Costanza, ed., *Ecological Economics: The Science and Management of Sustainability,* (New York: Columbia University Press, 1991), p. 80.

Traditionally, the main goals of economic activity have been seen as increased production and rising per capita consumption. But in the contemporary times, these goals pose a threat to the environmental sustainability of our economic system, a fact that is attributed to increase in population and environmental pressures. Amartya examines that the effort to balance economic and environmental goals is addressed in the theory of sustainable development which refers to economic development that provides for human needs without undermining global ecosystems and depleting essential resources.[96] According to Hurrel and Kingsburry, sustainable development implies conservation and recycling of nonrenewable resources and renewable resources respectively and greater reliance on renewables.[97] Shaw posits that although states have a sovereign right to their own resources pursuant to their own environmental and developmental policies, the same should be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.[98]

The correct balance between development and environment protection is therefore vital, a challenge that is facing the international community because it touches on the principle of state sovereignty on one hand, and the need for international cooperation on the other. A country's economic development is related to its human development which encompasses among other things health, education, infrastructure, employment and industrialization.

In light of the interplay between environment and development, it is apparent that protection of the global environment is impossible without development policies. Equally, economic development gravely relies on environmental protection especially in the LDCs. In these countries, the majority of the poor population groups are directly dependent on the natural environment for their survival for example through subsistence farming. The poor are often

[96] S. Amartya, *Development as Freedom,* (New York: Knopf, 2000), p. 119.
[97] A. Hurrel and B. Kingsbury, *The International Politics of the Environment*, (Oxford: Claredon Press, 1992), p. 64.
[98] M. Shaw, *International Law: Fourth Edition*, (Cambridge, Cambridge University Press, 1997), p. 591.

forced to over-exploit the natural resources which form the basis of their livelihoods. This destructive exploitation causes irreversible damage to the natural environment bearing in mind that many of the still intact primary ecosystems are located in developing countries, and some of these countries are undergoing a phase of dynamic growth, resulting in a substantial increase in resource consumption. This not only intensifies the pressure on the remaining primeval forests and biodiversity, it also significantly increases GHG emissions. Sachs observes that in order to achieve global environmental targets under these conditions, the industrialized countries should be in close cooperation with the developing countries.[99]

Easterly argues that the West needs to face its own history of ineptitude and draw the proper conclusions, especially at a time when the question of ability to transplant Western institutions has become one of the most pressing issues in the world. Existing aid strategies, Easterly argues, provide neither accountability nor feedback. Without accountability for failures, he says, broken economic systems are never fixed. And without feedback from the poor who need the aid, no one in charge really understands exactly what trouble spots need fixing. True victories against poverty, he reveals, are most often achieved through indigenous, ground-level planning.[100]

One cannot talk about development and environment without making reference to MDGs. They emanated from the Millennium Summit held in New York in September 2000, where 189 UN member-states adopted the Millennium Declaration which ideologically was a build-up of the conference process of the 1990s. The Declaration, signed by 147 heads of states, substantially drew from the UN Secretary General Millennium Report which contained the MDGs. They embody the core content of the current development agenda of global governance

[99] J. Sachs, *The End of Poverty: Economic Possibilities for our Time*, Ibid, p. 13.
[100] W. Easterly, *The White Man's Burden: Why the West's Efforts to Aid the Rest Have Done so Much Ill and so Little Good*, (New York: Penguin Press, 2007), pp. 34-36.

and treated as the current framework of international development cooperation. Specifically, goals number seven and eight of MDGs contain the themes of environment and development. They provide for environmental sustainability and global partnership for development respectively. All countries and development agents have so far proven to comply with this framework which will remain valid until at least 2015, the target period for its implementation. Although not a legally binding instrument, nor even a formal UN resolution, the MDG framework has acquired a politically and morally compelling character.

Sachs states that a clearer definition of the environmental policy dimension of sustainability, taking account of the systemic interactions between poverty reduction and respect for the global environmental balance, is a key priority. He therefore recommends the reinforcement of the environmental policy dimension of the MDGs and the adoption of meaningful indicators in this context.[101] The establishment of quantitative targets and a fixed timetable will facilitate evaluation, thereby easing the way for the development of further political processes. Among other things, the environmental targets defined in the Plan of Implementation adopted at the World Summit on Sustainable Development (WSSD) in 2005 and those established by other multilateral environmental agreements could be incorporated into this process.

Anna observes that there is considerable ground to make up, especially in the climate field. The targets contained in the Kyoto Protocol are an important first step, but they cannot halt dangerous climate change. Far more ambitious emissions reduction targets must therefore be agreed.[102] Easterly attributes the success of environmental sustainability and development to a cross-sectoral, integrated approach in order to avert goal conflicts between poverty and

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[101] J. Sachs, *The End of Poverty: Economic Possibilities for our Time,* Ibid, p. 40.

[102] K. Annan, In Larger Freedom: *Towards Development, Security and Human Rights for All,* Ibid, p. 6.

environmental dimensions and to improve coherence. He argues that a longer timescale is required: the MDGs and the goals adopted by the WSSD are only the first important milestones.[103] The implementation of a global sustainability strategy must extend well beyond 2015 and driven forward in the coming years in conjunction with United Nations Environment Programme (UNEP) and United Nations Development Programme (UNDP).

2.4 Climate Change

The physics and chemistry of the earth's atmosphere largely determines our climate. Although the atmosphere seems like a huge reservoir capable of absorbing almost limitless quantities of our industrial emissions, it is really only a thin film. The earth's atmosphere is layered such that in the lower atmosphere, temperature decreases within increasing altitude which is crucial for sustaining life and the planet. Because cold dense air on top of warm less dense air is unstable, the layer is fairly turbulent and well mixed. During the past, humans as a result of burning coal, oil and gas and clearing forests, have greatly changed the chemical composition of this thin atmospheric layer. These changes have far reacting consequences for the climate of the earth, the ecosystems that are sustained by our climate and our own human health and economy.

A thin layer of mixed gases surrounds the earth. The green house gases namely carbon dioxide (CO_2), methane gas (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs) and ozone (O_3) although less than 0.1 per cent of the atmospheric volume, have a profound influence on the earth's climate. These gases, most importantly CO_2 and CH_4 allow sunlight to penetrate, but trap outgoing heat. A large quantity of heat received in the tropics, is redistributed to higher latitudes by major atmospheric and oceanic currents. During the past years, human activities have led to an exponential growth in green house gas emissions. These activities include extracting and

[103] W. Easterly, *The White Man's Burden*, Ibid, p. 37.

burning fossilized carbon (coal, oil and gas or fuel), forest clearing and burning, wetland rice cultivation, livestock rearing, solid waste land filling and nitrogen fertilization of agriculture. The results have been a major increase in the concentrations of green house gases (GHGs).

2.4.1 Causes of Climate Change

Historically, GHG concentrations in the earth's atmosphere have undergone natural changes over time and those changes have been closely followed by changes in climate. Warmer periods are associated with higher atmospheric GHG concentrations and cooler periods with lower GHG concentrations. Recent human induced changes in atmospheric chemistry have occurred over decades. When referring to post industrial era, scientist generally use the term climate change. Defined by UNFCCC, climate change is a change of climate that is attributed directly or indirectly to human activity that alter the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.[104]

According to Hardy, human activities generate several different GHG that contribute to climatic change. To determine the individual and cumulative effects of these gases on the earth's climate, there is need to examine their total quantity, their natural and human sources to the atmosphere, their rates of loss to natural sinks, their past and projected rates of increase and their individual and cumulative heating capacity.[105] Water vapour traps heat in the atmosphere and makes the greatest contribution to the GHG effect. Its level in the atmosphere is not directly the result of human activities. However because warmer air can hold more water vapour, an increase in the earth's temperature resulting from other GHGs produces a positive feedback, that is more warming meaning more water vapour in the atmosphere which in turn contributes to

[104] Article 1 Paragraph 2 of the United Nations Framework Convention on Climate Change.
[105] J.T. Hardy, *Climate Change: Causes, Effects and Solutions,* (West Sussex: John Wiley & Sons Ltd., 2003), p. 11.

further warming. CO_2 is a natural component of the atmosphere and is very biologically reactive. It can be reduced to organic carbon biomass through photosyntheticup take in plants through biological oxidation (respiration), converted back to gaseous CO_2 and turned to the atmosphere.[106]

Letcher observes that major natural sources to the atmosphere are animal respiration microbial breakdown of dead organic matter and soil carbon, and ocean to atmosphere exchange known as flux. These natural cycles maintained the atmospheric concentration of CO_2 for several thousand years prior to industrialization in the mid nineteenth century.[107] Kininmonth states that during the past one hundred and fifty years, and especially during the last few decades, humans have greatly increased the concentration of atmospheric CO_2. Huge reservoirs of carbon stored for millions of years as fossilized organic carbon (coal, oil and gas) in the earth's crust, have been removed and burned for fuel.[108] Burroughs reiterates the same by observing that when carbon fuels burn, they combine with atmospheric oxygen to produce carbon dioxide which enters the atmosphere. Globally, more than 80 per cent of human CO_2 emissions come from transportation and industrial sources.[109] The remaining 20 per cent comes primarily from deforestation and biomass burning. A forest stores about a hundred tons of carbon per acre, and about half the worlds forest was destroyed in the last half of the twentieth century.[110]

In regard to GHGs, Lovejoy and Hannah examine that natural wetland soils, swamps and some coastal sediments release significant quantities of CH_4 to the atmosphere. The same is produced by the microbial breakdown of organic matter in the absence of oxygen and while in

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[106] Ibid p 17

[107] T. Letcher, *Climate Change: Observed Impacts on Planet Earth,* (Oxford: Elsevier Publishers, 2009), p. 5.

[108] W. Kininmonth, *Climate Change: A Natural Hazard,* (Essex: Multi-science Publishers, 2004), p. 127.

[109] W. Burroughs, *Climate Change: A Multidisciplinary Approach,* (Cambridge: Cambridge University Press, 2007), p. 36.

[110] Ibid, p. 39.

the atmosphere, it can combine with hydroxyl radicals (OH^-) to form carbon monoxide (CO). About half the current CH_4 emissions are from the anthropogenic (human produced) sources. These sources include livestock production (incomplete digestion of food), wetland rice cultivation, solid waste landfills, coal, oil and gas production. However global emissions rates appear variable and are difficult to quantify exactly.[111]

In the same regard, Burroughs observes that nitrous oxide (N_2O) originates from the microbial breakdown of agricultural fertilizers, fossil and fuel combustion, biomass burning and coal combustion which makes a significant contribution to the overall global warming.[112] Similarly, Chlorofluorocarbons (CFCs) and hydro-chlorofluorocarbons (HCFCs) are a relatively inert class of manufactured industrial compounds containing carbon, fluorine and chlorine atoms. They are used as coolants in refrigerators and air conditioners, foam insulation, aerosols sprays and industrial cleaning solvents. These compounds escape to the atmosphere where they destroy the stratospheric ozone layer that shields the earth from harmful ultra violet radiation.[113] Hardy attributes their role in the ozone depletion which led to the first comprehensive international environmental treaty, the Montreal Protocol, to phase the use of CFCs. However CFCs and HCFCs are also GHGs. Although they are involved in the destruction of the stratospheric ozone layer, which leads to some cooling, they still make an overall positive contribution to green house warming.[114]

Gaan posits in addition to CO_2, CH_4, N_2O and CFCs, Tropospheric ozone (O_3) motor vehicle emissions are the major source of the GHG. Vehicle combustion hydrocarbons and nitrogen oxides undergo a photochemical reaction to produce a hazy air pollution condition

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[111] T. E. Lovejoy and L. J. Hannah, *Climate Change and Biodiversity,* (Yale: Yale University Press, 2005), p. 15.
[112] Burroughs, *Climate Change: A Multidisciplinary Approach,* Ibid, p. 41.
[113] Ibid, p. 44.
[114] J.T. Hardy, *Climate Change: Causes, Effects and Solutions,* Ibid, p. 18.

known as smog with high concentrations of O_3.[115] Aerosols on the other hand are small microscopic particles resulting from fossil fuel and biomass combustion that smell. They are formed largely from sulfur, a constituent of some fuels, particularly some high sulfur coal and oil. Sulfate aerosols increase the acidity of the atmosphere and form acid rain. They also reflect solar energy over a broad board, including the infrared and thus have negative radioactive forcing or cooling effect in the atmosphere.[116] Natural sources of aerosols such as volcanic emptiors can also inject particles into the atmosphere resulting in temporary global-scale cooling events, lasting months to several years.

Therefore climate change according to Letcher, is a long term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It may be a change in the average weather conditions or a change in the distribution of weather events with respect to an average. Climate change may be limited to a specific region, or may occur across the whole earth.[117] Burroughs offers the most general definition of climate change as a change in the statistical properties of the climate system when considered over periods of decades or longer, regardless of cause. Accordingly, fluctuations on periods shorter than a few decades, such as El Niño, do not represent climate change.[118]

Factors that can shape climate are climate forcings. These include such processes as variations in solar radiation, deviations in the earth's orbit, mountain-building and continental drift, and changes in GHG concentrations. There are a variety of feedbacks that can either amplify or diminish the initial forcing. Some parts of the climate system, such as the oceans and ice caps, respond slowly in reaction to climate forcing because of their large mass. Therefore, the

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[115] N. Gaan, *Climate Change and International Politics*, (Delhi: Kalpaz Publications, 2008) p 47
[116] Ibid, p. 52.
[117] T. Letcher, *Climate Change: Observed Impacts on Planet Earth*, Ibid, p. 7.
[118] W. Burroughs, *Climate Change: A Multidisciplinary Approach*, Ibid, p, 3.

climate system can take centuries or longer to fully respond to new external forcings. Science has made enormous inroads in understanding climate change and its causes, and is beginning to help develop a strong understanding of current and potential impacts that will affect people today and in coming decades. This understanding is crucial because it allows decision makers to place climate change in the context of other large challenges facing the world.

Nevertheless, there is a strong, credible body of evidence, based on multiple lines of research, documenting that climate is changing and that these changes are in large part caused by human activities. While much remains to be learned, the core phenomenon, scientific questions, and hypotheses have been examined thoroughly and have stood firm in the face of serious scientific debate and careful evaluation of alternative explanations. Consequently, the debate is shifting onto ways to reduce further human impact and to find ways to adapt to change that has already occurred and is anticipated to occur in the future. Of most concern in these anthropogenic factors is the increase in CO_2 levels due to emissions from fossil fuel combustion, followed by aerosols and cement manufacture. Other factors, including land use, ozone depletion, animal agriculture and deforestation, are also of concern in the roles they play both separately and in conjunction with other factors in affecting climate and measures of climate variables.

Barr observes that over the course of millions of years, the motion of tectonic plates reconfigures global land and ocean areas and generates topography. This can affect both global and local patterns of climate and atmosphere due to ocean circulation.[119] The position of the continents determines the geometry of the oceans and therefore influences patterns of ocean circulation.[120] The locations of the seas are important in controlling the transfer of heat and moisture across the globe, and therefore crucial in determining global climate. The size of

[119] G. Barr, *Climate Change: Is the World in Danger?*, (Portsmouth: Heinemann Publishers, 2007), p. 11.
[120] Ibid, p. 14.

continents is important in the sense that the stabilizing effect of the oceans on temperature through yearly temperature variations are generally lower in coastal areas than they are inland. In the same regard Kininmonth posits that slight variations in earth's orbit lead to changes in the seasonal distribution of sunlight reaching the earth's surface and how it is distributed across the globe.[121]

Volcanism also contributes to climate forcing which is a process of conveying material from the crust and mantle of the earth to its surface. Volcanic eruptions, geysers, and hot springs, are examples of volcanic processes which release gases and/or particulates into the atmosphere. Eruptions large enough according to Letcher that affect climate, occur on average several times per century, and cause cooling by partially blocking the transmission of solar radiation to the earth's surface for a period of a few years. Much larger eruptions, known as large igneous provinces, occur only a few times every hundred million years, but may cause global warming and mass extinctions.[122] Volcanoes are also part of the extended carbon cycle. Over very long geological time periods, they release carbon dioxide from the earth's crust and mantle, counteracting the uptake by sedimentary rocks and other geological CO_2 sinks.[123] According to Victor, however, estimates are that human activities generate one hundred to three hundred times the amount of carbon dioxide emitted by volcanoes.[124]

In Hardy's view the ocean is a fundamental part of the climate system and short-term fluctuations such as the El Niño-Southern Oscillation, the Pacific Decadal Oscillation, the North Atlantic Oscillation and the Arctic Oscillation represent climate variability rather than climate change. On longer time scales, alterations to ocean processes such as thermohaline circulation

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[121] W. Kininmonth, *Climate Change: A Natural Hazard,* Ibid, p. 55.
[122] T. Letcher, *Climate Change: Observed Impacts on Planet Earth,* Ibid, p. 82.
[123] Ibid, p. 83.
[124] D. Victor, *Climate Change: Debating America's Policy Options,* (New York: Council of Foreign Relations, 2004), p. 130.

play a key role in redistributing heat by carrying out a very slow and extremely deep movement of water, and the long-term redistribution of heat in the world's oceans.[125]

2.4.2 Evidence of Climate Change

Evidence for climatic change is taken from a variety of sources that can be used to reconstruct past climates. Reasonably complete global records of surface temperature are available beginning from the mid-late nineteenth century. For earlier periods, climatic changes were inferred from changes in proxies, indicators that reflect climate, such as vegetation, ice cores, dendrochronology, sea level change, and glacial geology. Climate change in the recent past may be detected by corresponding changes in settlement and agricultural patterns. Archaeological evidence, oral history and historical documents can offer insights into past changes in the climate. Climate change effects have been linked to the collapse of various civilisations.

Glaciers are considered among the most sensitive indicators of climate change. Their size is determined by a mass balance between snow input and melt output. As temperatures warm, glaciers retreat unless snow precipitation increases to make up for the additional melt; the converse is also true. Burroughs states that glaciers grow and shrink due both to natural variability and external forcings. Variability in temperature, precipitation and englacial and subglacial hydrology can strongly determine the evolution of a glacier in a particular season.[126] In the same breadth, Hardy examines that one must average over a decadal or longer time-scale

[125] J.T. Hardy, *Climate Change: Causes, Effects and Solutions,* Ibid, p. 45.
[126] W. Burroughs, *Climate Change: A Multidisciplinary Approach,* Ibid, p. 217.

and over a many individual glaciers to smooth out the local short-term variability and obtain a glacier history that is related to climate.[127]

Rarieya advances that a change in the type, distribution and coverage of vegetation may occur given a change in the climate. In any given scenario, a mild change in climate may result in increased precipitation and warmth, resulting in improved plant growth and the subsequent sequestration of airborne CO_2. Larger, faster or more radical changes, however, may result in vegetation stress, rapid plant loss and desertification in certain circumstances.[128] The observed wide spread warming of the atmosphere and ocean, together with ice mass loss, support the conclusion that it is extremely unlikely that the global climate change can be explained without external forcing, and very likely that it is not due to unknown natural causes alone. Anthropogenic forcing is also likely to have contributed to changes in wind patterns as well, affecting extra-tropical storm tracks and temperature patterns in both hemispheres. Temperature of the most extreme hot nights, cold nights and cold days are likely to have increased.

IPCC has projected future changes in climate based on the evidence observed attributed to global warming, ice mass loss and loss in vegetation cover. According to IPCC, for the next two decades a warming of about 0.2 degrees Celsius per decade is projected for a range of emission scenarios. Even if the concentrations of all GHGs and aerosols had been kept constant, a further warming of about 0.1 degrees Celsius per decade would be expected and continued GHGs emissions at or above current rates would cause further warming and induce many changes in the global climate system during the twenty first century that could be very likely larger than those observed during the twentieth century.

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[127] J.T. Hardy, *Climate Change: Causes, Effects and Solutions,* Ibid, p. 46.

[128] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya,* (New York: Rensselaer Polytechnic Institute, 2007), p. 69.

IPCC also projects that snow cover will contract. There will be wide spread increases in thaw depth over most permafrost regions and that the glaciers on Mt. Kilimanjaro and Mt. Kenya may be gone by the year twenty twenty. Likewise sea ice will shrink in both the Arctic and the Antarctic. Arctic late-summer sea ice will disappear almost entirely by the latter part of the twenty first century and it is very likely that hot extremes, heat waves and heavy precipitation events will continue to become more frequent.

2.4.3 Responding to Climate Change

The response to extreme climate events which have had negative socio-economic impacts on almost all sectors including energy, health, agriculture, livestock and hydropower generation among others require the establishment of mechanisms that might enable states to adapt to climate variability. Falk observes that the UN system promotes and supports the development of national strategies on adaptation to address both short and long term needs, policy decisions and operational programmes on relevant sectors.[129] Adaptation to climate change is one of the greatest challenges facing the world today and more so in the developing countries. Lobell and Burke examine that coupled with poverty, adaptation to climate change remains an uphill task in the achievement of sustainable economic growth. Improved technology transfer such as more reliable long-term weather forecasting will contribute to reducing current vulnerability of poor and food insecure rural households and will be critical to their ability to adapt to future changes.[130]

The potential for autonomous adaptation according to O'Neill depends on affordability of such measures which include changes in crops and crop varieties, improved water management

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[129] A. Falk et al, *The United Nations and a Just World Order*, (New York: West View Press, 1991), p. 20.
[130] D. Lobell and M. Burke, *Climate Change and Food Security: Adapting Agriculture to a Warmer World*, (Stanford: Springer Science+Business Media, 2010), p. 133.

and irrigation systems, and changes in planting schedules and tillage practices.[131] Most of these adaptation opportunities are being applied by farmers where there is access to the right information and tools. Carter adds that adaptation to climate change should include capacity building of local communities to manage water resources and increase resilience to droughts and floods.[132] Citing econometric analyses used to study the sensitivity of GDP to climate change, Gaan observes that results show that about a half of all the countries have significant climate effects. Precipitation extremes have the most important climate effect on economic growth.[133] He adds that climate risk management focuses on current pressing issues while factoring in projected changes in climate.[134]

Protection against climate hazards is therefore essential according Mendelsohn and Dinar, and interventions that provide benefits regardless of climate changes and reduce current climate vulnerabilities are a first step in adaptation. Climate risk management according to him requires countries to invest in climate information systems and early warning systems, diversification of crops and livelihoods, transportation and storage, market development and financial risk transfer.[135] According to Victor, adaptation planning must be based on an understanding of climate impacts. Uncertainty of future projections requires a climate risk management approach, and managing current variability is the foundation of adaptation. Noting that most current efforts are ad hoc and fragmented, his main recommendation is that

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[131] K. O'Neill, *The Environment and International Relations*, (New York: Cambridge University Press, 2009), p. 110.
[132] N. Carter, *The Politics of the Environment: Ideas, Activism, Policy*, (New York: Cambridge University Press, 2001), p. 213.
[133] N. Gaan, *Climate Change and International Politics*, Ibid, p. 59.
[134] Ibid, p. 60.
[135] R. Mendelsohn and A. Dinar, *Climate Change and Agriculture: An Economic Analysis of Global Impacts, Adaptation and Distributional Effects*, (Cheltenham: Edward Elgar Press, 2009), p. 116,

governments should mainstream climate change risk assessment into all aspects of policy planning.[136]

2.5 The Agricultural Sector in Kenya

Agriculture is still a mainstay of the Kenyan economy, sitting alongside tourism as one of the top earners of foreign exchange. While urban growth continues to benefit from rural to urban migration, most of the Kenyan population is still rural and some 75 per cent of the population engages in agriculture to some extent. However, on-farm crop production is a declining source of household income, a common trend in developing countries. Rarieya observes that agriculture as a portion of GDP is not insignificant whereas livestock production is central to livelihoods and food security in the arid and semi-arid lands (ASALs).[137]

For the majority of the poor in Kenya, agriculture is a main livelihood strategy. About half of the population of Kenya is below the poverty line, while only 5 per cent of the national income is held by the poorest that make up 20 per cent of the population and nearly half of the national income is held by the richest equally making up 20 per cent of the population.[138] The dominant farm type is a smallholding, 0.9 hectares (ha) being the average size presently.[139] Protection of watersheds, control of soil erosion, maintenance of wetlands, protection of natural forests and biodiversity, supporting natural wildlife are all common development objectives that entail some contribution from agriculture. Pilot schemes on payment for ecological services and community carbon sequestration have shown considerable promise. Weather-related hazards already present a serious threat to agriculture. These will be potentially exacerbated by a mix of

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[136] D. Victor, *Climate Change: Debating America's Policy Options*, Ibid, p. 156.
[137] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya*, Ibid, p. 63.
[138] Stockholm Environment Institute, *Economics of Climate Change in Kenya*, (Oxford, 2009), p. 23.
[139] Ibid, p. 23.

climate and socio-economic change. However, the prediction of these effects is extremely complex.

Sustainable agricultural development is Kenya's major priority since agriculture is the engine of economic growth and it seems it will be the case in the foreseeable future. Tea, Coffee, Tourism and Horticulture are the leading sectors in foreign exchange in Kenya.[140] Although the expansion of agricultural export crops has been the most important factor in stimulating economic development, much agricultural activity is also directed towards providing food for domestic consumption. Kenya's agriculture is sufficiently diversified to produce nearly all of the nation's basic foodstuffs and also extend to neighboring countries.

The basic policy goals for the agricultural sector are to provide food security, raw materials for agro-industry, employment for the rising population and to generate foreign exchange earnings. Much of Kenya's population derive their livelihoods from small holding agriculture leading to degradation of the natural resource base which compromises future development.[141] The poorest people in Kenya live in rural areas and depend heavily on the natural resource base for their livelihoods. They are often trapped in chronic food insecurity and chronic poverty with poor financial and human capital endowments which limit their ability to invest efficiently to create wealth. With the challenge of abject poverty on one hand and the challenge of climate change on the other, agricultural sector is in a precarious position. Agriculture in Kenya is largely rain fed and productivity mainly depends on agro-ecological factors such as temperature, soil characteristics and production input. Kabubo-Mariara and

[140] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," *CEEPA Discussion Paper,* No. 12 (2006), p. 9.
[141] Ibid, p. 10.

Karanja examine that climate change impacts vary based on locality, but the probability of disruption of Kenya's agricultural sector is very high.[142]

2.6 Conclusions

Agriculture is a very sensitive sector that is highly affected by and susceptible to climate change, both positively and negatively. Temperature and other climatic changes affect yield and growing season and there is also a potentially direct fertilisation effect. Given much of Kenyan agriculture is currently rain-fed, there are also potentially wide ranging effects from the potential changes in precipitation. Moreover, there are a number of complex interactions with other factors, inter alia, extreme events (heat, floods, and droughts), pests and diseases, water availability for irrigation, which will affect the sector. In face of this complexity it is impossible to predict future climate change impacts in Kenya. The arid and semi-arid lands that cover a greater percentage of Kenya, have long experienced water shortages and drought due to unreliable and poorly distributed rains. Smallholder farmers in these regions are used to coping with variable conditions, but the weather has become even more unpredictable putting lives and livelihoods at greater risk. Climate change is likely to lead to significant declines in rainfall and river flows in many parts of Kenya, particularly its arid and semi-arid regions. This additional stress further threatens the water and lands upon which smallholder farmers rely for their livelihoods, health and well-being.

[142] Ibid, p. 12.

CHAPTER THREE

ENVIRONMENTAL DIPLOMACY AND ECONOMIC DEVELOPMENT: THE IMPACT OF CLIMATE CHANGE ON AGRICULTURE IN KENYA, 1970-2010

3.0 Introduction

Chapter two addressed the relationship between environmental diplomacy and economic development with emphasis on climate change affects on agriculture in Kenya. It examined that the existing environmental challenges are mainly intertwined with developmental factors thus creating a linkage between the environment and development. The pursuit of strategic management of environmental concerns therefore requires integration of both environmental and economic strategies.

This chapter is the case study which examines the impact of climate change on agriculture in Kenya from 1970-2010. The decline in national economy in the mid 1970's was attributed to the decline of agricultural productivity in the same decade. This came in the wake of environmental diplomacy efforts all over the world, most notably Stockholm Declaration of 1972, with the aim of protecting and preserving the environment. This chapter will therefore examine the value of agriculture in Kenya, climate change effects on agricultural productivity, economic costs of climate change and management of climate change in Kenya.

3.1 The Value of Agriculture in Kenya

Kenya has a complex existing climate, with wide variations across the country and with very strong seasonality. Average temperatures show strong differences between the narrow coastal strip, the arid and semi arid lands (ASALs) and the temperate highland plateau. Rainfall is particularly variable and the annual cycle is bimodal, with two wet seasons: the long rains from March to May which contributes more than 70 per cent of annual rainfall and the short rains

from October to December which contributes less than 20 per cent. The two wet seasons arise from the Inter-Tropical Convergence Zone (ITCZ) moving northwards and retreating southwards respectively.[143]

Overall, there are significant inter-annual and spatial variation in the strength and timing of these rains, though the variability is highest in the ASAL areas. The western highlands and coastal areas also receive significant rainfall during June to September. There are complex patterns of climate variability, which are due to many factors, notably the El Niño Southern Oscillation events, also sea surface temperatures in the Indian and Atlantic Oceans. El Niño is associated with anomalously wet conditions during the short rains while La Niña conditions are associated with unusually dry conditions such as drought. In Kenya the 1997/1998 El Niño and the 1999/2000 La Niña episodes were the most severe in the past half century according to Kenya Agricultural Research Institute (KARI).[144]

The agricultural sector is critically important to Kenya, both in terms of social and economic development. As stated in the previous chapter, around 75 per cent of Kenyans depend directly on agriculture for their livelihoods and production ranges from small-scale subsistence farming to large-scale export industries. Agriculture contributes to about 50 per cent of Kenya's total export value, approximately 21 per cent of its total GDP and provision of over 45 per cent of the annual Government budget.[145] Agricultural activity is highly sensitive to climate change, largely because it depends on biodiversity and ecosystems. Sufficient freshwater supplies, fertile soil, the right balance of predators and pollinators, air temperature and average weather conditions all contribute to continuing agricultural productivity.

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[143] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya,* (New York: Rensselaer Polytechnic Institute, 2007), p. 63.

[144] KARI, *Environmental and Social Management Framework,* East Africa Agricultural Productivity Project, 2009, p. 4.

[145] Stockholm Environment Institute, *Economics of Climate Change in Kenya,* (Oxford, 2009), p. 23.

Human interventions, such as excessive extraction of natural resources, forest clearance for pasture or cropland, large-scale monocropping and use of chemical fertilizers and pesticides, have resulted in biodiversity losses. These can ultimately damage an ecosystem's capacity to adapt naturally to changes in the climate, thus loss in fertility and an increased risk of exposure to new pest, and diseases. Drought is one of the most serious hazards for Africa's agricultural sector Kenya included, and according to Clements, by 2100 regions of ASAL are expected to expand by five to 5-8 per cent, or sixty to ninety million hectares, resulting in agricultural losses of GDP in African countries in general.[146] The report further states that a reduction in land suitable for rain-fed agriculture and crop production is also expected, although it takes note of the fact that climate adaptation could reduce such effects.

The importance of rain-fed agriculture in Kenya varies depending with regions, and is most significant in Central, Rift-Valley, Western and Nyanza Provinces. Some parts of Eastern and Coast Provinces also depend on rain for agriculture. The impact on maize is of particular concern in Rift-Valley and Western Provinces, while decreases in wheat yields in Rift-Valley Province could increase famine. Kenya's leading cash crops such as Coffee and Tea, which are planted in Central and Rift-Valley Provinces, are the most susceptible to climate change impacts. In contrast, increased temperatures and rainfall changes in certain areas could lead to longer growing seasons and increased agricultural production.[147] Stuart and Adams observe that the net balance in cereal production potential is expected to be negative, with up to 40 per cent of sub-Saharan African countries set to lose substantial shares of their agricultural resources due to climate change.[148]

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[146] R. Clements, *The Economic Cost of Climate Change in Africa,* (Nairobi: PACJA, 2009), p. 9.
[147] IPCC Report, Working Group I to the Fourth Assessment Report, (Geneva, 2007)
[148] S. Stuart and J. Adams, *Biodiversity in Sub-Saharan Africa and its Islands: Conservation, Management and Sustainable Use,* (Oxford: Information Press, 1990), p. 16.

In Kenya, sea level rise resulting from saltwater intrusion into inland freshwater supplies could impact on the farming of mangoes, cashew nuts and coconuts in the Coast Province.[149] Kenya's poorest people live in rural areas and depend mostly on agriculture for food and income. These people are the most vulnerable to hunger, as well as dependence on food imports and food aid caused by deteriorating farming conditions. In the Northern part of Kenya people depend on livestock, a slight warming from average global temperatures could benefit some small-scale farmers in some areas who keep goats and sheep as they are more heat tolerant than other species. By contrast, the same temperature rise could reduce the income of large-scale livestock farmers dependent on non heat tolerant cattle and as ecosystems shift from savannah to forest small-scale livestock farmers will suffer losses due to climate change.[150] This is as a result of farmers lacking the information, skills and technology necessary to change animal stock to more suitable and adaptable species, or to shift from livestock to crop production. Following the projection by the Ministry of Agriculture, cereal production and livestock rearing are more prone to climate change. Due to the increase in demand for cereal (mostly maize and wheat) and meat (livestock) in Kenya, climate change impacts on cereal production and livestock rearing will therefore pose a serious challenge to the future food security of millions of Kenyans.[151] This in itself poses a severe threat to Kenya's ability to cope with and respond to other expected impacts of climate change.

The greatest challenge facing Kenya today is poverty reduction and the achievement of sustained economic growth for national development. Agriculture in Kenya is the engine for this economic growth and will remain so in the foreseeable future. Consequently sustainable

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[149] Ibid, p. 112.
[150] M. Dakoh, "Agriculture and Biodiversity Conservation in Africa Through Indigenous Knowledge" in J. Lemons et al, *Conserving Biodiversity in Arid Regions: Best Practices in Developing Nations,* (Massachusetts: Kluwer Academic Publishers, 2003), p. 73.
[151] KARI, *Environmental and Social Management Framework,* Ibid, p. 7.

agricultural development is the country's major priority. The main policy goals for the agricultural sector are to provide food security, raw materials for agro-industry, employment for the rising population and to generate foreign exchange earnings. Pressures are being exerted on agriculture to feed the rising population, provide employment to rural labour force, provide raw materials to industry and earn foreign exchange for the country. Much of Kenya's population derives their livelihoods from small holding agriculture. Lack of markets and the very small size of land holdings lead to degradation of the natural resource base which compromises future development.

The root cause of environmental degradation in the country according to Rarieya is the grinding poverty in rural areas. She adds that the poorest people in Kenya live in rural areas and depend heavily on the natural resource base for their livelihoods, and these people are often trapped in chronic food insecurity and chronic poverty. They have poor financial and human capital endowments, which limit their ability to invest efficiently to create wealth and climb out of poverty. [152] Kabubo-Mariara and Karanja reiterate the same point by examining that in the short term, as agricultural productivity declines, the incentive to mine natural resources to sustain their livelihoods makes sense. They further argue that over the longer term, the interaction of the biophysical factors of their environment and the economic context leads to a downward spiral.[153] As land degrades, more marginal land is brought into cultivation, and with poor results returns to labour become poor as well thus limited generation of wealth. Owing to such circumstances investment in the resources that sustain farming, such as soils and water, is not possible and resources degrade further. The farmers move on to even more marginal land and the cycle begins

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[152] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya,* Ibid. p. 74.

[153] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," *CEEPA Discussion Paper,* No. 12 (2006), p. 17.

again, with even poorer results. Ultimately this spiral leads to a situation where the farmer is trapped in chronic poverty and has few options for improving his or her situation. This process also leads to loss of biodiversity including many endemic species.

The ASALS that cover approximately 84 percent of Kenya have long experienced water shortages and drought due to unreliable and poorly distributed rains. Smallholder farmers in these regions are used to coping with variable conditions, but the weather has become even more unpredictable recently putting lives and livelihoods at greater risk. Climate change as observed by Stockholm Environment Institute (SEI) will likely make matters worse as it is projected to lead to significant declines in rainfall and river flows in many parts of Kenya, particularly its arid and semi-arid regions.[154] This additional stress further threatens the water and lands upon which smallholder farmers rely for their livelihoods, health and well-being. Therefore identifying and implementing policies, processes and technologies to sustainably develop an agricultural sector resilient to current climate variability and long-term climate change is very vital and necessary.

3.2 Agriculture and Climate Change

According to Kabubo-Mariara and Karanja, Kenya has a total land area of fifty seven million six hundred thousand hectares (ha) that is 57.6 million ha. Out of this, only nine million four hundred hectares (9.4 million ha) are High to Medium Potential Land (HMPL) accounting for about 16 per cent of the total land area. The ASALS cover over forty eight million hectares (48 million ha), accounting for about eighty 84 per cent of the total land area of Kenya. Of the 9.4 million ha of HMPL, 1.1 million ha are occupied by game parks, 2.8 million ha are cropland, 2.8 million ha are grazing land for dairy, 2 million ha are forested and 0.5 million ha are covered by urban centres, homesteads and other infrastructures. 9 million ha of the ASALs can support some

[154] Stockholm Environment Institute, *Economics of Climate Change in Kenya,* (Oxford, 2009), p. 16.

form of agriculture while 15 million ha is just adequate for raising livestock and the remaining 24 million ha is dry and suitable for nomadic pastoralism.[155] Most importantly is that the HMPL has the potential to be the breadbasket of Kenya. However, productivity in these areas is declining despite the growing demand for food and other agricultural products.

Marred by shortcomings attributed to productivity, these fertile areas have fallen short of providing food security for Kenya. Soil erosion, loss of soil fertility, water scarcity, flooding and loss of biodiversity are some of the major factors that hinder productivity and are increasing in all areas. Due to population pressure in the HMPL, sub-division of land has resulted in small uneconomic farm sizes, which cannot be run sustainably.

Agriculture continues to be the leading sector in the Kenyan economy in terms of its contribution to real GDP. As provided in the National Climate Change Response Strategy (NCCRS) in the Ministry of Environment and Mineral Resources (MEMR) in Kenya, agriculture contributed 36.6 per cent of GDP in the period between 1964–74, 33.2 per cent in 1974–79, 29.8 per cent in 1980–89, 26.5 per cent in 1990–95, 24.5 per cent in 1996–2000, 19 per cent in 2001-2005 and 26 per cent in 2006-2010. It is further advanced in the same report that only 12 per cent of Kenya is considered high potential for farming or intensive livestock production. A further 5.5 per cent which is classified as medium potential mainly supports livestock, especially sheep and goats. Only 60 per cent of this high and medium potential land is devoted to crops to include maize, coffee, tea and horticultural crops among others, while the remaining 40 per cent is used for grazing and forests.[156] In quantifying the impact of agriculture, it is always necessary to calculate the net revenue which is defined by Kabubo-Mariara and Karanja as gross revenue less

[155] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," Ibid, p. 5.
[156] GoK, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy*, (2010), p. 8.

all total variable costs, costs of hired labor, farm tools, machinery, fertilizers and pesticides. Costs of household labor are not netted due to difficulties of accurate measurement while household wage rates for adults and children have are captured as independent variables.[157]

On average about 90 per cent of all Kenyans are engaged in farming. Most of the household level variables have a significant impact on crop revenue. Large farm size may be associated with higher productivity. Main and secondary occupation of household head, religion of household head and average number of years of education of the household members are positively correlated with net crop revenue. Household size, introduced as a proxy for household labor, has a positive and significant impact on net crop revenue.[158] Generally irrigation has a large positive impact on crop revenue in Kenya since agriculture mostly relies on rainfall.

The study by the Ministry of Agriculture in Kenya reveals that marginal impacts occasioned by temperatures during the wet season are positive, but temperatures during dry season have larger negative impacts on net crop revenue. High temperatures during dry season are harmful to crop production while high temperatures during wet season are beneficial. This is justified by the fact that temperatures during dry season facilitate the planting period followed by formative crop growth. Temperatures during wet season on the other hand enhances crop ripening and maturing.[159] Increased precipitation increases productivity where increase in rainfall would lead to increase in net crop revenue. According to Clements, there is a projection that medium and low potential zones in Kenya will bear the brunt of global warming and losses are estimated to be up to United States dollar 178 per hectare by the year 2030 for these zones compared to losses of only United States dollar 32 for high potential zones and United States

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[157] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," Ibid, p. 21.

[158] Ibid, p. 22.

[159] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture,* (2010), p. 25.

dollar 117 for the whole country.[160] This is the intensity of agriculture in regard to sensitivity to global warming and precipitation.

3.3 The Effects of Climate Change on Agricultural Productivity

In Kenya, where agriculture is largely rainfed, productivity depends largely on agro-ecological factors and in particular on rainfall. Other factors such as temperature, soil characteristics and the use of production input factors such as fertilizers and chemicals are also important for determining agricultural output. Climate change arising from the build-up of greenhouse gases provides a profound challenge for the future of agricultural production. Climate change impacts will vary based on locality, but the probability of disruption of Kenya's agricultural sector is very high. Predictions are not sufficiently detailed at this point to provide secure guidance for adaptation strategies. A number of modelling exercises suggest that the highlands of Kenya are likely to get wetter, while the ASALs are likely to get drier. One thing we can say with relative certainty is that the climate is likely to become more variable. Kenya can expect more droughts and more floods than it has seen in the past, and planning for this situation is wise. KARI identifies a number of impacts and their implications for the changes likely to be experienced in the future in Kenya:

To begin with, a decrease in rainfall in the ASALs would increase the total area of the country under arid conditions. This has the potential of disrupting agro-pastoral production systems and cause severe food insecurity in the event of droughts that would create water stress for both crops and livestock. Desertification would be intensified as vegetation cover deteriorates and soil erosion accelerates. A rise in temperature associated with increase in rainfall amounts in

[160] R. Clements, *The Economic Cost of Climate Change in Africa*, Ibid, p. 32.

pastoral lands would have positive effect on pastures, hence livestock conditions and arable crops in the same localities;

Secondly, in the high potential areas, a rise of temperatures without corresponding increase in rainfall may predispose agriculture to increased levels of pests. Crop fecundity could decline requiring the development of new crop varieties;

Thirdly, a corresponding increase in rainfall in the high potential areas would, however, have mixed results linked to landslides on steep slopes, floods, increased maturation period for crops, increased incidence of fungal diseases in crops such as maize, beans and potatoes. In the coastal areas, it is predicted that climate change would cause loss of biodiversity, siltation and salinization of agricultural land and change time of harvest.[161]

In Kenya, the adverse impacts of climate change are compounded by local environmental degradation (illegal encroachments and settlements, logging and livestock grazing), which have among other factors, further aggravated deforestation and land degradation. Forest cover in Kenya for instance, has fallen from 12 per cent in the 1970s to less than 2 per cent at present. This has considerably affected the ability of Kenya's five main Water Towers to act as water catchments for major rivers and lakes, which are the main sources of water for daily consumption in rural and urban areas.[162] Thus, the impacts of climate change, compounded by local environmental degradation, are profound. As mentioned above, Kenya has a landmass of about 57.6 million ha of which only 16 per cent is arable while 84 per cent consists of ASALs. Due to climate change and other human factors, desertification that is the extent of arid and semi-arid land, is increasing. In regard to decreased rainfall, "there is the potential of disruption

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[161] KARI, *Environmental and Social Management Framework*, Ibid, p. 14.
[162] W. Newmark, *Conserving Biodiversity in East African Forests: A Study of the Eastern Arc Mountains*, (New York: Springer Science+Business Media, 2002), p. 5.

in agricultural and pastoral production systems that would result to severe food insecurity in the event of droughts creating water stress for both crops and livestock."[163]

Kenya's natural resources, in particular its rich flora and fauna are among the country's most valuable natural assets. Climate change now threatens this rich biodiversity and species loss has been observed, while in some places, the number of indigenous and important species has tremendously dwindled. Kenya's rangelands support millions of pastoralists and agro-pastoralists who travel long distances in search of pasture and water for their cattle. Receding rangelands threaten the very basis of the livelihood and the way of life of the pastoralists.

The Kenyan coastline is characterized by a rich diversity, including fish, coral reefs and mangrove forests. But the Kenyan coast is one of the most vulnerable to sea level rise in the world. It is estimated that about 17 per cent of Mombasa or 4600 ha of land area will be submerged with a sea level rise of only 0.3 metres.[164] Kenya is a water-scarce country and the natural endowment of renewable freshwater is low, water resources are unevenly distributed in both time and space. Climate change will worsen this already precarious situation according to Clements as it affects the main hydrological components namely; precipitation and runoff. This will alter the spatial and temporal availability of water resources.[165]

3.4 Addressing Climate Change

Serious droughts have occurred in the last four consecutive years. Major rivers show severe reduced volumes during droughts, and many seasonal ones completely dry up. The consequent crop failures in 2009 for instance, placed an estimated 10 million Kenyans or one fourth of the entire population at risk of malnutrition, hunger and starvation. Droughts reduce the production

[163] Interview with Dennis Cheruiyot, Kenya Meteorological Department, Nairobi, 18th July, 2011.
[164] R. Clements, *The Economic Cost of Climate Change in Africa*, Ibid, p. 36.
[165] Ibid, p. 37.

of not only staple food crops such as maize but also other major crops such as tea, sugarcane and wheat. This increases imports (maize, wheat and sugar) and reduces exports (tea and coffee), weakening the country's balance of payments. According to Rarieya, diseases such as malaria, cholera, ebola, lyme disease, plague, tuberculosis, sleeping sickness, yellow fever and Rift Valley fever are expected to spread as temperatures rise and precipitation patterns change. In addition, during floods, diseases such as typhoid, amoeba, cholera and bilharzia reach epidemic levels and such disease outbreaks will further burden the already stretched public health infrastructure.

Population displacement and migration from climate disaster-prone areas such as drought prone northern Kenya and sea-level rise in the coastal region are expected to increase due to climate change. It is expected that most of those on the move will be from rural areas heading towards urban agglomerations where assistance, income opportunities and infrastructure may be perceived to be more accessible and readily available.[166] This will create an enormous social, health, infrastructural and management challenge for cities, subjecting them to unplanned population growth. In regard to managing climate change, Wangeci observed that "no nation or groups of nations, however politically or economically robust, could unilaterally resolve the planetary environmental problems."[167]

Global warming is likely to disrupt and even destroy some of the tourist attractions such as the snow-caps of Mt. Kenya, the coastal rainforests and fragile marine ecosystems. While coral reefs are bleaching and the number of flamingoes in Lake Nakuru and Lake Baringo is diminishing due to diminishing water levels of the lakes. The great migration of the wildebeest across the Mara River is under threat as the river's flow is reducing as well. Further, climate

[166] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya,* Ibid, p. 78.
[167] Interview with Ann Wangeci, Lecturer United States International University, Nairobi, 12th July, 2011.

change is exacerbating human-wildlife conflicts. Pastoralists in search of pasture and water have encroached into game parks, chasing wildlife away from their natural habitats. Drought has also pushed wild animals closer to waterholes and vegetation near to human settlements.[168]

Along the coastline, some of the popular beaches could eventually disappear as the sea level rises. Already, hotels along the Kenyan coastline have been forced to construct sea walls to protect against increasingly strong sea tides. All these do and will continue to impact negatively on Kenya's tourism sector.[169] Changes in ocean circulation are predicted to lead to loss of certain fish populations or establishment of new ones. Temperature change may also result in changes of upwelling patterns, which might impact on fish spawning period and success of larvae, thereby altering the entire life cycle and size of fish population

Rarieya observes that climate change will also affect Kenya's energy supply due to the fact that hydropower potential has dramatically reduced during the past 20 years following the destruction of water catchment areas.[170] As observed by Omambia, "climate change is likely to worsen the situation as it will result in prolonged droughts which will see water levels in the generating dams recede further."[171] The country currently relies on hydropower for nearly 70% of its electricity. Further, extreme weather events such as rainstorms will destroy the energy generation and distribution systems.[172] Torrential rains accompanied by floods can also destroy roads, bridges, railway lines and other transportation and communication infrastructure. This has been experienced in the past following the damage caused by the 1997/1998 El-Niño rains to the

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[168] KARI, *Environmental and Social Management Framework*, Ibid, p. 16.
[169] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture*, Ibid, p. 26.
[170] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya*, Ibid, p. 136.
[171] Interview with Ann Omambia, NEMA, Nairobi, 9th August, 2011.
[172] KARI, *Environmental and Social Management Framework*, Ibid, p. 17.

country's transport and telecommunication infrastructure which was estimated at one billion US Dollars. In addition, rising temperatures will cause warping of rail-tracks.[173]

The direct and indirect impacts of climate change are already being felt across Kenya and there is a high possibility of increasingly severe changes in the future, according to Kenya Meteorology Department (KMD), unless unprecedented measures are taken to reduce emissions of GHGs.[174] Natural disasters associated with climate variability and change have in the past cost huge losses. Kenya's ability to cope with the impacts of climate change is compounded by many factors including poverty, weak institutions, poor infrastructure, inadequate information, poor access to financial resources, low management capabilities, armed conflicts due to a scramble for diminishing environmental resources and high interest rates. It is vital that policies and measures for adaptation to and mitigation against climate change are put in place across all the sectors in order to minimize the impending climate change catastrophe.

3.4.1 Adaptation and Mitigation

Adaptation to climate is the process through which people reduce the adverse effects of climate on their health and well-being, and take advantage of the opportunities that their climatic environment provides. It involves adjustments to enhance the viability of social and economic activities and to reduce their vulnerability to climate, including its current variability and extreme events as well as longer-term climate change. According to Smit, the term adaptation means any adjustment, whether passive, reactive or anticipatory, that is proposed as a means for ameliorating the anticipated adverse consequences associated with climate change.[175] He adds

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[173] GoK, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy*, (2010), p. 10.

[174] Ibid, p. 11.

[175] B. Smit et al. "An Anatomy of Adaptation to Climate Change and Variability," *Climate Change*, Vol. 45 (2000), pp. 223-251, p. 225.

that adaptation to climate change includes all adjustments in behaviour or economic structure that reduce the vulnerability of society to changes in the climate system and adaptability refers to the degree to which adjustments are possible in practices, processes or structures of systems to projected or actual changes of climate. It can be spontaneous or planned, and can be carried out in response to or in anticipation of change in conditions.[176]

Dinar also discusses various typologies and distinctions related to the process of adaptation, observing that according to some of the typologies considered, adaptation can be planned or spontaneous; passive, reactive or anticipatory.[177] In that regard, planned and anticipatory adaptations that are undertaken by governments or non-governmental organizations (NGOs) as a policy initiative are those that require the most attention as opposed to those that are autonomous and/or mainly reactive. Though, as argued by Dixon, the distinction between autonomous and planned adaptation may be blurred in practice. The evaluation of adaptations according to him must address the best adaptation options and also what adaptations are likely in various settings.[178]

According to the IPCC Fourth Assessment Report, adaptation has the potential to reduce adverse impacts of climate change and to enhance beneficial impacts, but will incur costs and will not prevent all damages. Furthermore, human and natural systems will, to some extent, adapt autonomously and that planned adaptation can supplement autonomous adaptation. However, options and incentives are greater for adaptation of human systems than for adaptation to protect natural systems.[179]

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[176] Ibid, p. 226.
[177] A. Dinar et al, *Climate Change and Agriculture in Africa: Impact Assessment and Adaptation Strategies*, (Trowbridge: Cromwell Press, 2008), p. 12.
[178] G. Dixon, "The Impact of Climate Change and Global Change on Crop Production", in T. Letcher, *Climate Change: Observed Impacts on Planet Earth*, (Oxford: Elsevier Publishers, 2009), p. 320.
[179] IPCC Report, Working Group I to the Fourth Assessment Report, (Geneva, 2007), p. 9.

The propensity of systems to adapt is influenced by certain system characteristics that have been called determinants of adaptation. These include terms such as sensitivity, vulnerability, resilience, susceptibility and adaptive capacity, among others. The occurrence as well as the nature of adaptation is influenced by the above mentioned factors. As pointed out by Hardy, there is some overlap in the concepts captured in these terms and that sensitivity, vulnerability and adaptability capture the broad concepts.[180] Definitions adopted by the IPCC on the determinants of adaptation are provided hereunder;

Sensitivity is regarded as the degree to which a system is affected by, or responsive to, climate stimuli, while vulnerability is the degree to which a system is susceptible to injury, damage or harm. Resilience refers to the degree to which a system rebounds, recoups or recovers from a stimulus whereas responsiveness regards the degree to which a system reacts to stimulus. Adaptive capacity is the potential or capability of a system to adapt to climatic stimuli, and adaptability is the ability, competency or capacity of a system to adapt to climatic stimuli.[181]

Adaptation is often the result of interactions between climatic and other factors. Adaptations vary not only with respect to their climatic stimuli but also with respect to other non-climate conditions known as intervening conditions, which serve to influence the sensitivity of systems and the nature of their adjustments. In this context, Smit observes that a series of droughts may have similar impacts on crop yields in two regions, but differing economic and institutional arrangements in the two regions may well result in quite different impacts on farmers and hence in quite different adaptive responses, both in the short and long terms.[182] Dixon highlights the relationship between a changed climate system and impacts on human

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[180] J.T. Hardy, *Climate Change: Causes, Effects and Solutions*, (West Sussex: John Wiley & Sons Ltd., 2003), p. 206.

[181] IPCC Report, Ibid, p. 14.

[182] B. Smit et al. "An Anatomy of Adaptation to Climate Change and Variability," Ibid, p. 231.

systems by observing that they are not necessarily linear. He furthers his argument by stating that human agencies and institutions can play a crucial role in minimizing the adverse impacts of climate change and seizing opportunities resulting from such impacts.[183] In particular, the role of adaptation is crucial for assessments of potential impacts of climate change.

In Kenya, adaptation measures include the prevention, tolerance or sharing of losses, changes in land use or activities, changes of location and restoration. Adaptation measures on the impact of agricultural productivity include provision of downscaled weather information and farm inputs, water harvesting such as building of sand dams for irrigation, protection of natural resource base (soil and water conservation techniques) and research and dissemination of superior crops which are drought tolerant, salt-tolerant, pest and disease resistant. In regard to ensuring availability of water, adaptive measures have been realized through the construction of dams and water pans, protection of water towers, river banks, and water bodies, de-silting of riverbeds and dams, municipal water recycling facilities, building capacity for water quality improvement and awareness campaign to promote water efficiency measures.[184]

According to the National Irrigation Board (NIB) of Kenya, interventions in the water sector will have to adapt the integrated approach to water resource management and utilization. This is imbedded in the Integrated River Basin and Large- Water Bodies-based Natural Resource Management Programme of the six regional basin-based institutions to include the Tana and Athi River Development Authority and the Lake Basin Development Authority among others.[185]

The concept of adaptation in climate change cannot exhaustively be addressed without mentioning mitigation. Mitigation refers to efforts that seek to prevent or slow down the increase

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[183] G. Dixon, "The Impact of Climate Change and Global Change on Crop Production", Ibid, p. 323.
[184] GoK, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy*, Ibid, p. 14.
[185] GoK, National Irrigation Board Development Plan, (2010).

of atmospheric GHG concentrations by limiting current and future emissions and enhancing potential sinks for GHGs.[186] In Kenya, the sectors associated with high emissions include forestry a fact attributed to forests logging and land use change, energy, agriculture and transport.[187] The GHG emission trend in Kenya during the last 20 years has been on the increase. Mitigation interventions include projects of the Kenya Forest Service (KFS) such as National Forest Programme and Miti Mingi Maisha Bora campaign. The Ministry of Energy on the other hand has a programme known as the Green Energy Development alongside other interventions in the transport and agricultural sectors.[188] In the agricultural sector, mitigation measures include appropriate use of biotechnologies which increase food production per unit area while simultaneously limiting GHG emissions, proper management of agricultural waste especially by using manure to produce biogas and promotion of agroforestry especially tree-based intercropping.[189]

3.4.2 The Issue of Governance

An analysis of existing environmental policy and legal framework currently in place to guide climate change activities in Kenya has revealed that Kenya currently has no policies or laws that deal directly and explicitly with climate change. The only policy that has attempted to address climate change to some extent is the draft National Environmental Policy of 2008. The same is true of the legislative framework, with the national environmental law, the Environmental Management and Coordination Act (EMCA, 1999), only having certain provisions relevant to mitigation of climate change, but not effectively addressing several aspects of the problem.

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[186] B. Smit et al. "An Anatomy of Adaptation to Climate Change and Variability," Ibid, p. 232.
[187] GoK, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy*, Ibid, p. 15.
[188] Ibid, p. 17.
[189] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture*, Ibid, p. 26.

The Strategy therefore recommends that a comprehensive climate change policy and related legislation be put in place. This could be achieved by either reviewing and updating the clauses on climate change in the draft National Environmental Policy or developing a completely new climate change policy. This should be followed by a review of existing laws (in particular, the EMCA) to make them climate change responsive and/or enactment of a new and comprehensive climate change law. However, the Strategy recommends that a new climate change legislation be enacted, a process that could run concurrently with formulation of a climate change policy.[190]

In addition, the Strategy has established that institutions currently in place to govern climate change affairs are inadequate. It has consequently recommended that a dedicated and adequately funded Climate Change Secretariat be established within the Ministry of Environment and Mineral Resources to oversee climate change issues including the implementation of the adaptation and mitigation programmes and the other aspects of the National Climate Change Response Strategy. The Secretariat, including the proposed structures within it, should be anchored on the provisions of the new climate change laws to be enacted.[191]

Further and in relation to climate change governance, it is recommended that the National Climate Change Activities Coordinating Committee should continue to perform its current advisory capacity. It is further proposed that MEMR establishes a National Climate Change Steering Committee to help it gather and collate input and advice from key climate change stakeholders for its use in the coordination of Kenya's climate change activities.[192] The Climate Change Secretariat to be established at MEMR will provide secretarial functions for the two

[190]GoK, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy*, (2010), p. 16.
[191] Ibid, p. 18.
[192] Ibid, p. 18.

committees while the Climate Change Coordination Unit at the Office of the Prime Minister should continue to provide high-level political support to climate change activities in Kenya.[193]

Research in the agricultural sector is very important as it will provide data and information on the impact of climate change on agriculture as well as causes, effects and solutions. Research areas include the development of superior (drought-tolerant, fast-maturing, disease and pest-resistant) crop varieties and countrywide assessments to determine regional vulnerability of the sector to climate change elements. The strengthening of research in vaccines against priority livestock diseases and inoculants for improving soil nitrogen as well as phosphorous in acid soils are vital in enhancing agricultural productivity. Intertwined with the forestry sector, research areas entail evaluating the potential for remunerating natural resource users for natural forests conservation and restoration with funds from carbon markets, developing technologies to rehabilitate naturally degraded areas or those cleared for charcoal burning and validation as well as integration of indigenous knowledge.

3.6 Conclusions

From the findings in this chapter, change in climate affects agricultural productivity. Similarly, increased temperatures during wet seasons increases net crop revenue, while increased temperatures during dry seasons decreases such net crop revenue, while increased precipitation increases net crop revenue. According to the findings, long-term changes in temperatures and precipitation will have a substantial impact on net revenue, and that the impact will be more pronounced in medium and low potential zones than in high potential zones. The latter are expected to receive some marginal gains from mild temperature increases, holding precipitation constant. Diversification through changing the crop is the most common adaptation measure,

[193] Ibid, p. 19.

particularly in high potential zones, while water conservation, irrigation and shading vis a vis sheltering of crops are the main adaptation measures in drier regions. These results imply that adaptation to climate change in Kenya is important if households are to counter the expected impacts of long-term climate change.

CHAPTER FOUR

ENVIRONMENTAL DIPLOMACY AND ECONOMIC DEVELOPMENT: A CRITICAL ANALYSIS

4.0 Introduction

The previous chapter discussed the impacts of climate change on agriculture in Kenya. Agriculture in Kenya is referred to as the back bone of economy and decline in agricultural productivity implies direct decline in economy. One of the major findings of chapter three is the decline in agricultural productivity in Kenya from 1970-2010 due to climate change effects. The chapter highlighted that overwhelming majority of the people of Kenya depend on the natural resource base for survival. It further examined adaptation and mitigation measures to climate change as well as governance to climate change.

This chapter provides an analysis of the impacts of climate change on agricultural productivity in Kenya from 1972 to 2010. It builds on the climate change analysis captured in the previous chapter and also incorporates findings from both primary and secondary data. The chapter comprises several sub-sections with the first one providing a summary of conclusions drawn from the preceding chapters. The subsequent sub-sections provide an analysis of the impact of climate change on agricultural productivity in Kenya since 1972 to 2010, the significance of agriculture in economic development in Kenya and the relevance of environmental diplomacy in Kenya.

4.1 The Relationship between Agriculture and Economic Development

In Kenya, growth of the national economy is highly correlated to growth and development in agriculture. In the first two decades after independence, the agricultural sector, and in turn the national economy, recorded the most impressive growth in sub Saharan Africa at average rates of 6 per cent per annum for agriculture and 7 per cent for the national economy. During this period,

small-scale agriculture grew rapidly as the population rallied around the call by the first president of the republic Mzee Jomo Kenyata of rudini mashambani (return to the farms). This growth was spurred by expansion because there was ample land and better use of technology. Moreover, agricultural extension and research were supported by the Government.

Agriculture, the mainstay of Kenya's economy, currently contributes 26 per cent of the GDP directly and another 25 per cent indirectly. The sector also accounts for 65 per cent of Kenya's total exports and provides more than 18 per cent of formal employment whereas more than 70 per cent of informal employment is in the rural areas.[194] The agricultural sector comprises four main subsectors namely crop production, livestock production, aquaculture and forestry. Crop production comprises of industrial crops, food crops and horticulture while livestock production comprises of dairy, beef, sheep and goat, poultry, pig and apiculture industries. Aquaculture involves fish industry whereas forestry involves conservation of the environment, expanding tree cover and adoption of agroforestry. The agricultural sector employs such factors of production as land, water and farmer institutions (cooperatives, associations). Industrial crops contribute 17 per cnent of the Agricultural Gross Domestic Product (AgGDP) and 55 per cent of agricultural exports. Horticulture has recorded a remarkable export-driven growth in the past 5 years and is now the largest subsector, contributing 33 per cent of the AgGDP and 38 per cent of export earnings. Food crops contribute 32 per cent of the AgGDP but only 0.5 per cnet of exports, while the livestock subsector contributes 17 per cent of the AgGDP and 7 per cent of exports[195]. Livestock and fisheries subsectors have huge potential for growth that has not been exploited.

[194] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture*, (2010), p. 3.
[195] GoK, Report by the Ministry of Agriculture, *Agricultural Sector Development Strategy*, (2010), p. 15.

The Government has also established and supported many agricultural institutions such as farmer cooperatives and those for agricultural inputs, marketing, credit and agro processing. Budgetary allocation to the agricultural sector for the last four decades has been at an average of 13 per cent of the national budget despite the same being unsustainable. Specifically agricultural sector recorded an impressive average annual growth rate of 3.5 per cent between 1980 and 1990 which in the subsequent decade reduced to 1.3 per cent. According to the Ministry of Agriculture, Kenya compared badly, between 1990 and 2000, with Tanzania, Uganda, China, India and Vietnam at average annual growth rates of 3.2 per cent, 3.7 per cent, 4.1 per cent, 3.2 per cent and 4.8 per cent respectively, which had all been performing badly in the previous decades.[196] The main reasons for this decline were low investment in the sector, mismanagement, virtual collapse of agricultural institutions and, more importantly, negligence of agricultural extension and research. It was also during this period that the government of Kenya was implementing structural adjustment programmes prescribed by the Breton Woods institutions, which encouraged poorly sequenced privatization in the sector leading to low investment with budgetary allocation declining to as low as 2 per cent or less in the agricultural sector.[197]

By 2005, the decline in growth started to reverse when the average growth rate picked up to 2.4 per cent owing to governments efforts to increase investment in the agricultural sector by reviving agricultural extension and other institutions. The revival rate was gradual with emphasis being exerted more on the increase of budgetary allocation in agriculture and other investments generally. Indeed by 2006, an average of 4.5 per cent budgetary allocation of the national budget was apportioned to the agricultural sector. According to the Ministry of Agriculture of Kenya, the gains that had been realized by 2006 were set back by the violence following the 2007

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[196] Ibid, p. 17.

[197] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture,* Ibid, p. 10.

general elections, the crises caused by escalating global food and fuel prices of 2008, and the financial crises of 2008/09 to the extent that the agricultural sector reflected a negative 2.5 per cent in 2008.[198]

As observed in the previous chapter, land is the most important resource in agricultural production in Kenya and limited availability of productive land is a major constraint to increased agricultural production. Kenya has an area of about 587,000 kilometres squared (km^2) out of which 11,000 km^2 is water. Of the remaining 576,000 km^2 landmass, only about 16 per cent is of high and medium agricultural potential with adequate and reliable rainfall. This potentially arable land is dominated by commercial agriculture with cropland occupying 31 per cent, grazing land 30 per cent, and forests 22 per cent. Game parks, urban centres, markets, homesteads and infrastructure make up the remaining 17 per cent. The 84 per cent ASAL is not suitable for rain-fed farming due to low and erratic rainfall, though there is limited cultivation of some crops.[199] The ASALs are used as rangelands by ranchers and pastoralists. The Report of the Ministry of Agriculture examines that agricultural growth must be led by intensification and substitution towards more high-value products, and expansion of the cultivated area through irrigation.[200]

Though it is recognized that the natural environment is the basis of all production, continued degradation of the environment and natural resources constitutes a major challenge to economic development. Increasing population, changing patterns of human settlement, expansion of urban environments, unsustainable land-use systems and industrialization all pose serious threats to the environment across the country. Kabubo-Mariara and Karanja observe that until towards the last decade of twentieth century, environmental management was largely viewed as unrelated to economic development. This contributed to unsustainable development

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[198] Ibid, p. 4.
[199] Stockholm Environment Institute, *Economics of Climate Change in Kenya,* (Oxford, 2009), p. 16.
[200] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture,* Ibid, p. 12.

patterns through accelerated land degradation from deforestation, desertification, soil degradation, loss of biodiversity, climate change and industrial pollution.[201] As a result the large section of the population that depends on the natural resource base for survival have since been trapped in poverty.

Kenya's agriculture is mainly rainfed and is entirely dependent on the bimodal rainfall in most parts of the country. The performance of rainfed agriculture varies due to the diverse agro-climatic zones. In the humid, high-altitude areas productivity as well as predictability of a good crop is high. However, the population density in these areas has increased and land has been subdivided into such small sizes that it is becoming uneconomical for farm enterprises. According to Rarieya, land subdivision should be restricted and farm enterprises should be intensified in order to mitigate the problem subdivision of land to very small sizes.[202]

Rarieya further observes that in the medium altitude and moderate-rainfall areas, arable rainfed farming is moderately suitable. However, there is a relatively high risk of crop failure due to increased frequency of dry spells and an uneven rainfall distribution. Better selection of crops, adoption of improved technologies and better crop husbandry is required for purposes of increasing productivity in these areas.[203] Droughts are frequent in ASALS and crops fail in one out of every three seasons. Most of the area is rangeland suitable for ranching and pastoralism. Farm enterprises comprise mixed crops and livestock. While there is ample land, farmers tend to grow crops that are not suitable for this rainfall regime or for the soils. These areas require better planning, careful selection of farm enterprises and greater investment in infrastructure. The Ministry of Agriculture in its report states that the Government has made effort to harmonize and

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[201] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," *CEEPA Discussion Paper*, No. 12 (2006), p. 19.

[202] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya*, (New York: Rensselaer Polytechnic Institute, 2007) p 68

[203] Ibid, p. 101.

prioritize the development of ASALs through the establishment of the Ministry of Development of Northern Kenya.[204]

As reported by the Ministry of Agriculture, Kenya is classified as one of the water-deficient countries in the world. Water resources are unevenly distributed in space and time with about 56 per cent of all the country's water resources being Lake Victoria basin.[205] Water availability is scarce although there are water basins especially emanating from the highlands. Consequently, the country's irrigation-based farming is still limited. Irrigation agriculture in Kenya is carried out mainly in irrigation schemes and in large-scale irrigation of crops such as rice and coffee. Individual farmers have developed their own systems of irrigation especially for export crops such as horticulture. Large commercial farms account for 40 per cent of irrigated land, smallholder farmers 42 per cent, and Government-managed schemes 18 per cent.[206]

The Ministry of Agriculture in its report states that, with a national average rainfall of 400 mm, the country should be able to harvest and store adequate water for agriculture and other uses. Groundwater resources that can be exploited for agriculture need to be assessed and quantified.[207] More land can be reclaimed for crop cultivation by developing irrigation infrastructure in the ASALs. It is estimated that intensified irrigation can increase agricultural productivity fourfold and, depending on the crops, incomes can be multiplied 10 times.[208]

4.2 The Impact of Climate Change on Agricultural Productivity

In the past the environmental debate had essentially been dominated by localized issues such as air pollution, unsafe water supplies and waste disposal. Problems such as climate change,

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[204] GoK,Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy,* (2010), p. 4.
[205] GoK, Report by the Ministry of Agriculture, *Economic Review of Agriculture,* Ibid, p. 11.
[206] GoK, National Irrigation Board Development Plan, 2010.
[207] Ibid, p. 11.
[208] Ibid, p. 12.

depletion of the stratospheric ozone layer, desertification, ocean pollution, the wanton destruction of forests, the extinction of flora and fauna, and the spread of persistent and poisonous organic pollutants across the globe, represent a new kind of threat to humankind and to global prosperity in general. Like many countries, Kenya has also found itself in a position of ensuring protection of the environment and addressing ecological decline. This is due to the adverse effects of climate change on all sectors of development ranging from agriculture to tourism. The adaptation and mitigation measures are vital in order to manage the impact of climate change.

As pointed out in the previous chapters of the study, environmental problems are transboundary in nature, and more specifically climate change is a global phenomenon that requires calls for concerted efforts of all actors, states and non-states alike. Indeed it was observed by O'Neill that actions of one state may affect another state irrespective of the distance.[209] Nelson also reiterates the same fact by stating that the most affected in such scenario are the developing countries because they lack proper capacity to address environmental problems.[210] This is the point where Keohane[211] and Oye[212] advance their argument that international cooperation is vital in the pursuit of safeguarding the future and prosperity of the planet by discussing and providing solutions to various global issues, among them environmental protection.

Kenya has been in the forefront of the implementation of new diplomatic initiatives geared towards promoting sustainable environmental policies and activities both in the region

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[209] K. O'Neill, *The Environment and International Relations*, (New York: Cambridge University Press, 2009), p. 36.
[210] G. Nelson, *Climate Change: Impact on Agriculture and Costs of Adaptation*, (Washington D.C: IFPRI Press, 2009), p. 61.
[211] R. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton: Princeton University Press, 1984), p. 32.
[212] K. Oye, *Cooperation under Anarchy*, (Princeton: Princeton University Press, 1986), pp. 3-20.

and beyond. On the topic of climate change, a report by the Ministry of Foreign Affairs examines that Kenya being a signatory to the Kyoto Protocol, is committed to ensuring that GHG emissions are substantially reduced and also to embrace practicable and adoptable measures against the negative effects of climate change.[213] Mbugua observes that the wanton destruction of forests in Kenya has contributed immensely to global warming.[214] Mogaka on the other hand calls for collective responsibility to protect forests in order to avert increased temperatures of the earth's surface and associated threats, such as skin diseases, greater incidence of floods and hurricanes, the loss of biodiversity, the bleaching of coastal coral reefs and the transformation of seasonal weather patterns.[215] In relation to the preventing destruction of forests, Mbugua examines that protection of forests is very necessary to Kenyan people since most people depend on agriculture in various ways citing food security, employment and raw materials as examples.[216]

As reported by the Ministry of Environment and Mineral Resources, Kenya is keen to ensure that the six major water-generating regions, namely Mount Kenya, Mount Elgon, the Aberdare Ranges, the Mau forest complex, the Cherangani Hills and Mount Kilimanjaro, are accorded maximum protection from human interference.[217] The report further points out that Mt. Kenya is strategic to Kenya's economic development and is home to some 882 plant species, 81 of which are endemic to the area. The Aberdare Ranges on the other hand are home to the black rhino, which is classified as a critically endangered species in the International Union for

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[213] GoK, Report by the Ministry of Foreign Affairs, *Environmental Diplomacy and Human Security,* (2008), p. 8.
[214] D. Mbugua, "The Forest Revenue System and Government Expenditure on Forestry in Kenya," *Food and Agriculture OrganiZation Working Paper on Financing Sustainable Forest Management,* Vol. 11 (2003), p, 12.
[215] H. Mogaka et al, *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resource Development and Management,* (Washington D.C.: The World Bank, 2006), pp. 65-72.
[216] D. Mbugua, "The Forest Revenue System and Government Expenditure on Forestry in Kenya," Ibid, p. 18.
[217] Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy: Executive Brief,* (GoK, 2010), p. 9.

Conservation of Nature Red Data List of Species. According to the same report, The Mau forest complex represents the only remaining near-continuous block of indigenous mountain forest in East Africa. This forest is very important for the conservation of bird life and key to the tourism sectors of Kenya and Tanzania.[218] Newmark posits that the trans-boundary nature of natural resources demands that countries should cooperate and harmonize their foreign policies on environmental issues.[219]

The impact of climate change in Kenya arising from the build-up of GHGs provides a profound challenge for the future of agricultural production. Decrease of rainfall in the ASALs is one impact that has led to the increase of the total area of the country under arid conditions. Rerieya furthers the same argument by stating that desertification is attributed to decrease in rainfall which is a fact contributed by climate change. She states that desertification has intensified thus leading to deteroriation in vegetation cover and the acceleration of soil erosion.[220]

According to KARI, increase in rainfall in the high potential areas resulted to landslides on steep slopes, floods, increased maturation period for crops, increased incidence of fungal diseases in crops such as maize, beans and potatoes.[221] All these effects are attributed to climate change, however such increase of rainfall is useful in ASALs.

Kenya's natural resources, in particular its rich flora and fauna are among the country's most valuable natural assets. The impact of climate change has threatened this rich biodiversity and loss of species has occurred. The number of indigenous and important species has

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[218] Ibid, pp. 7-11.
[219] W. Newmark, *Conserving Biodiversity in East African Forests: A Study of the Eastern Arc Mountains,* (New York: Springer Science+Business Media, 2002), pp. 5-14.
[220] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya,* Ibid, p. 69.
[221] KARI, *Environmental and Social Management Framework,* East Africa Agricultural Productivity Project, 2009, pp. 4-6.

tremendously dwindled in some places as a result of climate change. Clements posits that Kenyan coastline is one of the most vulnerable to sea level rise in the world. He states that climate change can greatly affect the Kenyan coastal line which is characterized by a rich diversity such as fish, coral reefs and mangrove forests.[222]

4.3 Relevance of Environmental Diplomacy

As observed in chapter two, the significance of environmental diplomacy involves efforts by states and other actors towards addressing ecological decline in the world. This has been occasioned by multilateral negotiations aimed at addressing the new global environmental issues, and most states have included the agenda of environmental diplomacy in their foreign policies. Seemingly, Kenya's foreign policy has been influenced by the new phenomenon that now characterizes international diplomacy. In its navigation of the international system, Kenya has applied a range of foreign policy strategies, among them the diplomacy of conflict management and economic diplomacy, in its engagement with regional economic regimes such as the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). The Minister for Foreign Affairs, Mr. Wetangula observed that Kenya has employed other forms of diplomatic engagement, better understood as foreign policy's soft power tools, which have been very effective tools. In the application of these various foreign policy instruments, the environment has become a consistent standard.[223]

The Institute for Security Studies (ISS) examines that, as part of Kenya's engagement as a legitimate third party or mediator in protracted conflicts in countries such as Somalia and Sudan, the mediation variables has to contend with cut across contestation for natural resources

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[222] R. Clements, *The Economic Cost of Climate Change in Africa,* (Nairobi: PACJA, 2009), p. 17.

[223] Moses Wetangula in his opening remarks in a Workshop by the Ministry of Foreign Affairs, *Environmental Diplomacy and Human Security,* Nairobi, 31st October 2008.

by the different protagonists.[224] Environmental conflict management is therefore a major component of the country's diplomatic efforts. This is evident through Kenya's participation in trade rounds and regional economic blocs, such as the World Trade Organization (WTO), environmental issues ranging from sustainable development to Genetically Modified Organisms (GMO) and bio-piracy have become topics for debate and negotiation. The same applies to the implications of climate change discussed at the Kyoto rounds. In essence, the environmental diplomacy pillar is intertwined with all other pillars that define Kenya's foreign policy.

Official diplomacy or track-one diplomacy has been the bedrock of career diplomats in regard to the shaping of a country's foreign policy. On the other hand however, unofficial diplomacy, referred to as track-two diplomacy, has been incorporated in the wider meaning of diplomacy. Regarded as an art and a science it has also embraced the disciplines of other actors who, to some extent at least, shape international debates and thus have a foreign policy role. The scope and nature of their operations mainly fall outside government and intergovernmental organizations' operations. Susskind posits that in environmental diplomacy, as exemplified by environmental negotiation processes, both official and unofficial entities have capabilities that are symbiotic in nature. He furthers the argument by giving the example that research community feeds into policy decision-making processes.[225]

As reported by the Ministry for Foreign Affairs, Kenya has an effective diplomatic engagement in the region, a fact that is attributed to the work of the Foreign Service Institute (FSI), which has produced negotiators and diplomats. The Institute for Security Studies (ISS) has the comparative advantage of being one of Africa's few think tanks that seeks to conceptualize the debates on international relations and human security in Africa. One of its goals is

[224] Institute for Security Studies, *African Security Review*, Vol. 20 No. 1 (2010).
[225] L. Susskind, *Environmental Diplomacy: Negotiating More Effective Global Agreements*, (Massachusetts: Cambridge University Press, 1994), p. 52-57.

collaborative security to enhance Africa's capacity to engage in human security debates, which incorporates environmental security.[226] Through its Environmental Security Programme, ISS seeks to capacitate African governments so that they are in a position to engage constructively in international and regional environmental processes. The collaboration between the FSI and ISS is a reflection of the symbiotic diplomacy that Kenya seeks to espouse in its foreign policy and diplomatic engagements.[227]

The report by the Ministry for Foreign Affairs examines that, in response to the demands of a dynamic and complex international diplomatic arena, the FSI has offered intensive and tailor-made training for newly recruited Foreign Service personnel and newly appointed ambassadors. It has also provided in-service training for officers at all levels. The institute has also undertaken policy analysis research and it has realized that the learning of new skills and the acquisition of new knowledge are vital to diplomats.[228] It has collaborated with institutions such as the National Defence College, the University of Nairobi, the Academy of the National Security Intelligence Service and the United States International University, Kenya. All the courses and events offered in these institutions are geared towards the practical aspects of diplomacy. With regard to diplomacy for the environment, the University of Nairobi through the Institute of Diplomacy and International Studies (IDIS) introduced a course on Environmental Diplomacy which has been taught since 2009/2010 academic year.[229]

4.4 Other Issues

Agriculture in Kenya is the main mandate of the Ministry of Agriculture. However, other ministries such as the Ministry of Environment and Mineral Resources, Ministry of Lands and

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[226] GoK, Report by the Ministry of Foreign Affairs, *Environmental Diplomacy and Human Security,* (2008), p. 9.
[227] Ibid, p. 10.
[228] Ibid, p. 10.
[229] University of Nairobi, IDIS Academic Calendar, 2009/2010.

Ministry of Foreign Affairs may at times have to work hand in hand with the Ministry of Agriculture on policy issues. Since agriculture majorly contributes to the economic development of Kenya, the Government of Kenya (GoK) has developed a strategy for economic recovery. The decline in economic growth was evident in the previous chapter and a number of factors including decline in agricultural productivity contributed to such decline. Through economic recovery strategy, the GoK emphasizes economic growth and creation of wealth and employment as means of eradicating poverty and achieving food security.[230] The strategy identifies agriculture as the leading productive sector for economic recovery and also takes cognizance of the fact that revival of agricultural institutions and investment in agricultural research and extension are critical and essential for sustainable economic growth.

According to the same report, the GoK developed and launched the strategy for recovery of agriculture in 2004 with the aim of transforming Kenya's agriculture into a profitable, commercially-oriented and internationally and regionally competitive economic activity that provides high-quality, gainful employment to Kenyans.[231] The same objective is to be achieved within the framework of improved agricultural productivity and farm incomes, while conserving the land resource base and the environment. As regards the enhancement of agricultural productivity, Ngaira observes that a paradigm shift from subsistence agriculture to agriculture as a business that is profitable and commercially oriented should be adopted. This will assist in reducing poverty because it is the most important economic activity the poor in the rural areas rely on for a livelihood.[232] He further observes that in promoting agriculture as a commercial business, it has emerged that marketing and associated infrastructure is critical. Cooperative

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[230] GoK, Report by the Ministry of Agriculture, *Agricultural Sector Development Strategy: 2010-2020,* (2010), p. 7.
[231] Ibid, p. 3.
[232] J. Ngaira, "Challenges of Water Resource Management and Food Production in Changing Climate in Kenya," *Journal of Geography and Regional Planning*, Vol. 2 No. 4, (2009), pp. 79-103, p. 83.

societies that deal with marketing of farmers produce need to be revived and made efficient and effective. Other marketing infrastructure, such as wholesale and retail markets need to be established across the country.[233]

The strategy in addressing the need to increase production, concentrates in reviving agricultural institutions that provide services to Kenyan people. Institutions that were on the verge of collapse and have since been revived are the Kenya Meat Commission, the Kenya Cooperative Creameries, the Kenya Seed Company, the Agricultural Finance Corporation, and the Agricultural Development Corporation. Institutions that were considered moribund and dysfunctional, such as research and extension services with their subcentres, training centres and tractor hire are now vibrant and providing services to farmers.[234]

Rarieya[235], Kabubo-Maria and Karanja[236] observe that, the impact of climate change and external factors such as high cost of inputs, crop yields on smallholder farms have affected agricultural productivity. However the strategy for revival of agriculture has employed better technology transfer and extension services to increase production. As a result, the strategy examines that the average yield of maize has increased from 1500 to 3000 tonnes per hectare in the past decade.[237] Furthermore, the yield for medium and large-scale farmers has increased by a higher margin due to use of high-yielding varieties and better agronomic practices. The other approach of enhancing productivity in agriculture by the GoK has been the Development of policies and legislation. According to the report by the Ministry of Agriculture, over 15 policies and 6 pieces of legislation have been developed so far and are being implemented. They include,

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[233] Ibid, p. 87.
[234] GoK, Report by the Ministry of Agriculture, Ibid, p. 17.
[235] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya,* Ibid, p. 6.
[236] J. Kabubo-Mariara and F. Karanja, "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," Ibid, p. 9.
[237] GoK, Report by the Ministry of Agriculture, Ibid, p. 13.

inter alia, the Seed Policy, the Food Security and Nutrition Policy, the National Dairy Development Policy, the National Agricultural Sector Extension Policy, the Cotton Act 2006 and the Cooperatives Policy.[238]

4.5 Conclusions

Achieving the ultimate objective of environmental diplomacy and economic development by addressing climate change requires technological innovation and the rapid and widespread transfer and implementation of technologies and know-how for mitigation of greenhouse gas (GHG) emissions as well as technologies for adaptation to climate change. GHG emissions greatly impact on the environment. Kenya depends on natural environment for economic development through agriculture and tourism among other sectors which are vulnerable to climate change. Current climate variability puts huge stress on agriculture, particularly in the smallholder sub-sector. By and large, the anticipated effects of climate change need to be factored into poverty reduction strategies and rural development strategies. Of all of the human enterprises, agriculture is the most dependent on the climate. Adaptation and mitigation strategies should not be separate from other planning processes in Kenya for sustainable solutions to be achieved. Mainstreaming climate change planning into other planning processes is the key to successful adaptation and limiting the negative effects of climate change.

[238] Ibid, p. 20.

CHAPTER FIVE

CONCLUSIONS

5.0 Summary

The previous chapter provided an analysis of the impact of climate change on agricultural productivity in Kenya. The analysis focused on a three decade period, that is 1970 to 2010, by examining the climate change effects within that period. The chapter also provided an analysis of the relationship between agriculture and economy by establishing that economic growth in Kenya is dependent on agricultural growth. In the same line, in taking cognizance of the importance of agriculture in Kenya, it examined the significance of managing environmental concerns through environmental diplomacy.

This chapter synthesizes the findings of the study within the framework of objectives sets and hypotheses developed. It provides a summary of the study, tests the hypotheses and answers the question on whether the objectives were met.

The first chapter dealt with the background of the study, statement of the research problem, objectives, reviewed the available literature, set objectives and hypotheses. It further provided a theorctical frame work for purposes of guiding the study. The framework is anchored on the need to establish and support diplomatic initiatives and global environmental efforts as an evolving system of international governance for the environment.

Chapter two provided an overview of environmental diplomacy and economic development by establishing a relationship between the two entities. The linkage between environment and development revealed a close correlation and that pursuit of economic growth must consider environmental aspects. The chapter also established agriculture as major economic activity in Kenya.

Chapter three examined the impact of climate change on agriculture in Kenya during the period between 1970 to 2010. It also highlighted the relevance of agriculture in Kenya as an economic activity. This was evident through the decline experienced in agriculture in 1980's and 1990's which were attributed to climate change. During the same period a decline in economic growth was recorded.

Chapter four provided a critical analysis of the impact of climate change on agricultural productivity in Kenya from 1970-2010. It also provided the analysis that economic development in Kenya is dependent on agricultural productivity, and further analyzed that agriculture, of all human enterprises is the most dependent on the climate.

5.1 Key Findings

The study explored environmental diplomacy and economic development by examining agriculture as a major economic activity in Kenya and how the same has been impacted by climate change in the past three decades (1970-2010). The study further indicates that development and environment go hand in hand and that effective economic development anchors on environmental safeguarding. The study revealed that indeed climate change affected agricultural productivity between 1970 and 2010. In the early 1970's Kenya had recorded the highest GDP since independence in both agriculture and national economy. The decline in economic growth towards the end of 1970's to 1980's through to 1990's was attributed to climate variability which greatly affected agricultural productivity.

The other key finding from the study is the dependence of Kenyan people on agriculture. This over reliance on agriculture is explained by the fact that over 75 per cent of Kenyans engage in agriculture in one way or another. In the same regard, agriculture linked to economic development through earning foreign exchange for Kenya, proving raw materials for industries,

providing food security and also providing employment both formal and informal to the Kenyan people.

Poverty also emerged as another finding in the study. This is explained by the above finding on over reliance on agriculture by Kenyan people. Most notably, the poor people engage in agriculture for survival and in so doing they strain the little resources. Closely interrelated with the foregoing is the dependence of agriculture on climate and specifically favourable climate. Whereas climate change has negatively affected agricultural productivity, human activities are also attributed to environmental decline through clearing of forests, burning of fossils and fuels among other activities. As a result, rise in GHG emissions has been recorded contributing to climate change experienced all over the world.

Another key finding and vital to the management of climate change is environmental diplomacy. The continuing environment negotiations and diplomatic initiatives are vital for international environmental governance since no state on its own however powerful, politically or financially or both, can manage climate change on its own. The transboundary nature of climate change indicates that a state that has not contributed to environmental degradation might find itself grappling with effects of climate change as occasioned by another state.

5.2 Recommendations

On the strength of research findings, and the assessment of agriculture as the main economic activity which is susceptible to climate change, several recommendations are advanced as follows;

To begin with, there is need to mainstream climate change responsive activities in programmes and projects by the GoK through its various ministries. Such responsive activities to climate change will provide information to farmers and land users in general about climate

change effects. Rarieya observes that in achieving this objective, most line ministries particularly those offering development and infrastructural services should develop climate change response programmes and projects.[239]

Secondly, given the importance of adaptation to climate change, it is recommended that the Kenyan government should create a multistakeholder National Adaptation Facility for mobilising resources for adaptation activities.[240] This is very important as it will bring together government ministries and departments that offer environmental, developmental and infrastructural services with the aim of addressing climate change impacts. Such collaboration is the tool for forging strategic partnerships between the government and non-state actors. This will in the long run promote a low carbon economy and climate change resilient production system in Kenya.

Thirdly, Kenya should establish and fund local technological centres that can be used to develop, advance and disseminate local technologies. Such centres can be used for educational purposes, promoting sustainable agricultural practices and enhance the growth of indigenous small and medium enterprises (SMEs).[241] The notion behind this recommendation is that technological centres will be accessible by small farmers who exceed three quarter of Kenya's population.

The fourth recommendation regards environmental governance through policy and legislation. Kenya's need to develop a suitable climate change response strategy including a suitable climate change governance framework is imminent.[242] The same should stem from both

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[239] J. Rarieya, *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya.* (New York: Rensselaer Polytechnic Institute, 2007), p. 109.
[240] GoK, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy*, (2010), p. 79.
[241] Stockholm Environment Institute, *Economics of Climate Change in Kenya,* (Oxford, 2009), p. 16.
[242] GoK, Report by the Ministry of Environment and Mineral Resources, Ibid, p. 87.

the realities of the negative impacts of climate change and from obligations placed upon it by the UNFCCC and Kyoto Protocol. This will be the ultimate strategy used to address climate change problems that have already affected many people in Kenya, especially ASALs.

The fifth recommendation is on the need to focus more energy and resources on agriculture as the major economic activity in Kenya. Ngaira observes that as an important sector to the country's economy and one of the sectors most vulnerable to climate change, there is need to scale up research in agriculture in areas that respond to climate change including undertaking countrywide assessments to determine regional vulnerability of the sector to climate change elements.[243]

Sixth, there is need to reconcile the notoriously slow pace of international diplomacy with the growing urgency of global ecological decline. This will require grappling with the distinctive characteristics of environmental diplomacy and adapting attitudes and strategies accordingly.[244] All the diplomatic efforts and initiatives geared towards addressing ecological decline in the world should focus more on climate change which poses serious threats in future, especially in developing countries.

Last but not least, the fact that environmental issues are increasingly intertwined with other more traditional areas of foreign relations, including trade and investment policies, development, human rights and even military security, it is important for these other areas of foreign relations to embed environmental issues in their strategies. Integrating environmental issues into these other spheres is often essential for solving the problems at hand and achieving a

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[243] J. Ngaira, "Challenges of Water Resource Management and Food Production in Changing Climate in Kenya," *Journal of Geography and Regional Planning*, Vol. 2 No. 4, (2009), pp. 79-103, p. 92.

[244] H. French, "Reconciling International Diplomacy with the Growing Concern of Ecological Decline" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C: The Johns Hopkins University Press, 1998), pp. 13-16, p. 13.

long lasting solution to environmental problems. Towards this end linkages between foreign and domestic policies should be created.

BIBLIOGRAPHY

Amartya, S. *Development as Freedom,* (New York: Knopf, 2000)

Anand, S. and Ravallion, M. "Human Development in Poor Countries: On the Role of Private Incomes and Public Services," *The Journal of Economic Perspectives,* Vol. 1 No. 7, (1993), pp.133-150.

Ann Omambia, NEMA, Nairobi, 9th August, 2011

Ann Wangeci, Lecturer United States International University, Nairobi, 12th July, 2011

Annan, K. *In Larger Freedom: Towards Development, Security and Human Rights for All,* (New York: UN Publications, 2005)

Article 1 Paragraph 2 of the United Nations Framework Convention on Climate Change.

Article 2 of the Montevideo Convention on the Rights and Duties of States, 1933

Background Paper by UN, "Addressing Climate Change: The United Nations and the World at Work," 2008

Barr, G. *Climate Change: Is the World in Danger?,* (Portsmouth: Heinemann Publishers, 2007)

Barston, R. *Modern diplomacy,* (London: Longman Publishers, 1988)

Battery Association of Japan Charter, 1994, Japan

Benedict, R. "Diplomacy for the Environment" in AICGS Conference Report, *Environmental Diplomacy,* (Washington, D.C.: The Johns Hopkins University Press, 1998) pp 3-11

Berridge, G. *Diplomacy: Theory and Practice,* (London: Prentice Hall Publishers, 1995)

Burroughs, W. *Climate Change: A Multidisciplinary Approach,* (Cambridge: Cambridge University Press, 2007)

Cali, B. *International Law for International Relations: Foundations for Interdisciplinary Study,* (Oxford: Oxford University Press, 2009)

Carter, N. *The Politics of the Environment: Ideas, Activism, Policy,* (New York, Cambridge University Press, 2001)

Christmann, P. "Multinational Companies and the Natural Environment: Determinants of Global Environmental Policy Standardization," *The Academy of Management Journal,* Vol. 47 No. 5, (2004), pp. 747-760.

Clements, R. *The Economic Cost of Climate Change in Africa,* (Nairobi: PACJA, 2009)

Crawford, J. *The Creation of States in International Law, Second Edition,* (London, Claredon Press)

Dakoh, M. "Agriculture and Biodiversity Conservation in Africa Through Indigenous Knowledge" in J. Lemons et al, *Conserving Biodiversity in Arid Regions: Best Practices in Developing Nations,* (Massachusetts: Kluwer Academic Publishers, 2003)

Dennis Cheruiyot, Kenya Meteorological Department, Nairobi, 18th July, 2011

Dinar, A. et al, *Climate Change and Agriculture in Africa: Impact Assessment and Adaptation Strategies,* (Trowbridge: Cromwell Press, 2008)

Dixon, G. "The Impact of Climate Change and Global Change on Crop Production", in T. Letcher, *Climate Change: Observed Impacts on Planet Earth,* (Oxford: Elsevier Publishers, 2009)

Easterly, W. *The White Man's Burden: Why the West's Efforts to Aid the Rest Have Done so Much Ill and so Little Good,* (New York: Penguin Press, 2007)

Eckersley. R. *The State and the Global Ecological Crisis,* (Cambridge, MIT Press, 2005)
Falk, A. et al, *The United Nations and a Just World Order*, (New York: West View Press, 1991)
French, H. "Reconciling International Diplomacy with the Growing Concern of Ecological Decline" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C: The Johns Hopkins University Press, 1998), pp. 13-16.
Gaan, N. *Climate Change and International Politics,* (Delhi: Kalpaz Publications, 2008)
German Advisory Council on Global Change, *Development Needs Environmental Protection: Recommendations for the Mellenium+5 Summit,* (WBGU, 2005)
Global Environmental Charter of Keidanren, 1991, Japan
Gouldson, A. and Roberts, P. *Integrating Environment and Economy: Strategies for Local and Regional Government,* (London: Routledge, 2000)
Government of Kenya, National Irrigation Board Development Plan, (2010)
Government of Kenya, Report by the Ministry of Agriculture, *Agricultural Sector Development Strategy: 2010-2020,* (2010)
Government of Kenya, Report by the Ministry of Agriculture, *Economic Review of Agriculture,* (2010)
Government of Kenya, Report by the Ministry of Environment and Mineral Resources, *National Climate Change Response Strategy,* (2010)
GoK, Report by the Ministry of Foreign Affairs, *Environmental Diplomacy and Human Security,* (2008)
Hardy, J.T. *Climate Change: Causes, Effects and Solutions,* (West Sussex: John Wiley & Sons Ltd., 2003)
Hasenclever, A. et al. "Integrating Theories of International regimes," *Review of International Studies,* Vol. 1 No. 26, (2000), pp. 3-33.
Herman, D. "Elements of Environmental Macroeconomics," in R. Costanza, ed., *Ecological Economics: The Science and Management of Sustainability,* (New York: Columbia University Press, 1991)
Herrick, B. and Kindleberger, C. *Economic Development,* (New York: McGraw-Hill, 1983) p 6
Hurrel, A. and Kingsbury, B. *The International Politics of the Environment*, (Oxford: Claredon Press, 1992)
Institute for Security Studies, *African Security Review*, Vol. 20 No. 1 (2010)
IPCC Report, Working Group I to the Fourth Assessment Report, (Geneva, 2007)
Kabubo-Mariara, J. and Karanja, F. "The Economic Impact of Climate Change on Kenyan Crop Agriculture: Ricardian Approach," *CEEPA Discussion Paper,* No. 12 (2006)
KARI, *Environmental and Social Management Framework,* East Africa Agricultural Productivity Project, 2009
Keohane, R. *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton: Princeton University Press, 1984)
Kininmonth, W. *Climate Change: A Natural Hazard,* (Essex: Multi-science Publishers, 2004)
Kisilu, D. and Tromp, D. *Proposal and Thesis Writing: An Introduction*, (Nairobi, Pauline Publications Africa, 2006)
Letcher, T. *Climate Change: Observed Impacts on Planet Earth,* (Oxford: Elsevier Publishers,

2009)
Lobell, D. and Burke, M. Climate Change and Food Security: Adapting Agriculture to a Warmer World, (Stanford: Springer Science+Business Media, 2010)
Lovejoy, T. E. and Hannah, L. J. *Climate Change and Biodiversity,* (Yale: Yale University Press, 2005)
Lucas, R. "On the Mechanics of Economic Development," *Journal of Monetary Economics,* Vol. 1 No. 22, (1988), pp. 3-42.
Mansell, R. and When, U. *Knowledge Societies: Information Technology for Sustainable Development*, (New York: Oxford University Press, 1998)
Martens, P. and Rotmans, J. *Climate Change: An Integrated Perspective*, (Dordrecht: Kluwer Academic Publishers, 1999)
Mbugua, D. "The Forest Revenue System and Government Expenditure on Forestry in Kenya," *Food and Agriculture OrganiZation Working Paper on Financing Sustainable Forest Management,* Vol. 11 (2003)
Mendelsohn, R. and Dinar, A. *Climate Change and Agriculture: An Economic Analysis of Global Impacts, Adaptation and Distributional Effects*, (Cheltenham: Edward Elgar Press, 2009)
Mikesell, R. *Economic Development and the Environment: A Comparison of Sustainable Development with Conventional Development Economics,* (London: Routledge, 1995)
Milner, H. "International Theories of Cooperation among Nations: Strengths and Weakness," *World Politics* Vol. 3 No. 44, (1992), pp. 466-496.
Mogaka, H. et al, *Climate Variability and Water Resource Degradation in Kenya: Improving Water Resource Development and Management,* (Washington D.C.: The World Bank, 2006)
Morgenthau, H. and Thompson, K. *Politics Among Nations: The Struggle for Power and Peace, Sixth Edition,* (New York, Knopf, 1985)
Narain, S. "Environmental Diplomacy in an Unequal World" in AICGS Conference Report, *Environmental Diplomacy*, (Washington, D.C.: The Johns Hopkins University Press, 1998), pp. 17-23.
Nelson, G. *Climate Change: Impact on Agriculture and Costs of Adaptation*, (Washington D.C: IFPRI Press, 2009)
Newmark, W. *Conserving Biodiversity in East African Forests: A Study of the Eastern Arc Mountains,* (New York: Springer Science+Business Media, 2002)
Ngaira, J. "Challenges of Water Resource Management and Food Production in Changing Climate in Kenya," *Journal of Geography and Regional Planning*, Vol. 2 No. 4, (2009), pp. 79-103.
O'Neill, K. et al. "Actors, Norms and Impact: Recent International Cooperation Theory and the Influence of the Agent-Structure Debate," *Annual Reviews,* Vol. 7, (2004), pp. 149-175.
O'Neill, K. *The Environment and International Relations*, (New York, Cambridge University Press, 2009)
Oye, K. *Cooperation under Anarchy,* (Princeton: Princeton University Press, 1986)
Pearce, D. *Economics and Environment: Ecological Economics and Sustainable Development,* (Massachusetts: Edward Elgar Publishers, 2000)
Pohjola, M. *Information Technology, Productivity and Economic Growth: International*

Evidence and Implications for Economic Development, (New York: Oxford University Press, 2001)

Principle 7 of the Rio Declaration of 1992

Principle 24 of the Stockholm Declaration of 1972

Rarieya, J. *Environmental Degradation, Food Security and Climate Change: An STS Perspectives on Sustainable Development in Western Kenya,* (New York: Rensselaer Polytechnic Institute, 2007)

Sachs, J. *The End of Poverty: Economic Possibilities for our Time,* (New York: Penguin Press, 2005)

Shaw, M. *International Law: Fourth Edition,* (Cambridge, Cambridge University Press, 1997)

Simmons, B. and Steinberg, R. *International Law and International Relations,* (Cambridge, Cambridge University Press, 2006)

Smit, B. et al. "An Anatomy of Adaptation to Climate Change and Variability," *Climate Change,* Vol. 45 (2000), pp. 223-251.

Stein, A. *Why Nations Cooperate: Circumstance and Choice in International Relations* (Ithaca: Cornell University Press, 1990)

Stockholm Environment Institute, *Economics of Climate Change in Kenya,* (Oxford, 2009)

Stuart, S. and Adams, J. *Biodiversity in Sub-Saharan Africa and its Islands: Conservation, Management and Sustainable Use.* (Oxford: Information Press, 1990)

Susskind, L. *Environmental Diplomacy: Negotiating More Effective Global Agreements,* (Massachusetts: Cambridge University Press, 1994)

Toman, M. A. *Climate Change: Economics and Policy,* (Washington D.C: RFF Press, 2001)

University of Nairobi, IDIS Academic Calendar, 2009/2010.

Victor, D. *Climate Change: Debating America's Policy Options,* (New York: Council of Foreign Relations, 2004)

Vig, N. and Axelrod, R. *The Global Environment: Institutions, Law and Policy,* (London: Earthscan, 1999)

Waltz, K. *Theory of International Politics,* (New York, McGraw-Hill, 1979)

Weinber, C. "From Environmental Diplomacy to Environmentally Sound Diplomacy" in AICGS Conference Report, *Environmental Diplomacy,* (Washington, D.C.: The Johns Hopkins University Press, 1998), pp. 25-31.

Appendix I: Structured Interview Questions to all Respondents

Dear respondent,

This research is meant for academic purpose. It will try to find out the impact of climate change on agriculture as an economic activity in Kenya from 1970 to 2010.

You are kindly requested to answer all the questions honestly and precisely as possible. All responses you give to the questions will be treated with utmost confidentiality. Kindly write your details in the spaces provided below. **DO NOT** write your name on this questionnaire. Please fill in all the answers and information in the spaces provided.

General Information

Date of interview.....

Name of the organization.....

Position.....

Education.....

Gender.....

Age.....

Province of Origin.....

Section One: Agriculture in Kenya

1. Kenya's agriculture has been regarded as the engine of the economy. In your own opinion, what role does agriculture play in the economic development of Kenya?.....

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2. What factors have made agriculture the major economic activity in Kenya?.....

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3. Is there decline in agricultural productivity since 1970 to date? Yes☐ No☐
Kindly support your answer above by examining the factors of productivity.....

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4. How does climate contribute to agricultural productivity in Kenya?.....

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5. To what extent has the government facilitated sustainable agriculture in Kenya?.....

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6. In your own opinion, how do you think sustainable agriculture can be achieved?.....

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7. What is the level of reliance on agriculture by Kenyan people?.....

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8. Do you rely on agriculture as a source of income and livelihood? Yes ☐ No ☐
Kindly explain.....

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Section Two: Climate Change

1. What are the impacts of climate change on agriculture in Kenya?.....

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2. Do you think the adverse effects of climate change can be countered?.....

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3. In your own opinion, what are the major factors that have contributed to climate change in Kenya since 1970 to 2010?.....

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4. In your own opinion, do you think climate change affects economic development in Kenya?

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5. Do you think the government had adequate capacity to handle climate change effects in the period between 1970 to 2010? Yes ☐ No ☐

Kindly give your reasons.....

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6. Do you think Kenya is well equipped to manage climate change? Yes☐ No☐
Kindly explain.....

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7. What are the government efforts in managing climate change and its effects in Kenya?.....

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8. In your own opinion, what adaptation measures should be employed in managing climate change?.....

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9. In your own opinion, what mitigation measures should be employed in managing climate change?.....

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Section Three: Environmental Diplomacy

1. In your own opinion, what do you think is the origin of environmental diplomacy?.....

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2. What is the relationship between environmental diplomacy and climate change?.....

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3. Do you think environmental diplomacy has played a role in addressing global climate change?

Yes ☐ No ☐

Kindly explain.....

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4. In your own opinion, what challenges have been encountered in the pursuit of environmental diplomacy?.....

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5. Does Kenya have any framework on environmental diplomacy? Yes☐ No☐

Kindly explain.....

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6. Which area/s in agriculture have been greatly impacted by climate change in Kenya?

Crop Production ☐ Livestock Production ☐ Aquaculture ☐

Kindly give your reasons.....

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Thank you for your time and cooperation.

Appendix II: Trends in Agricultural and Economic Growth in Kenya, 1970-2010.

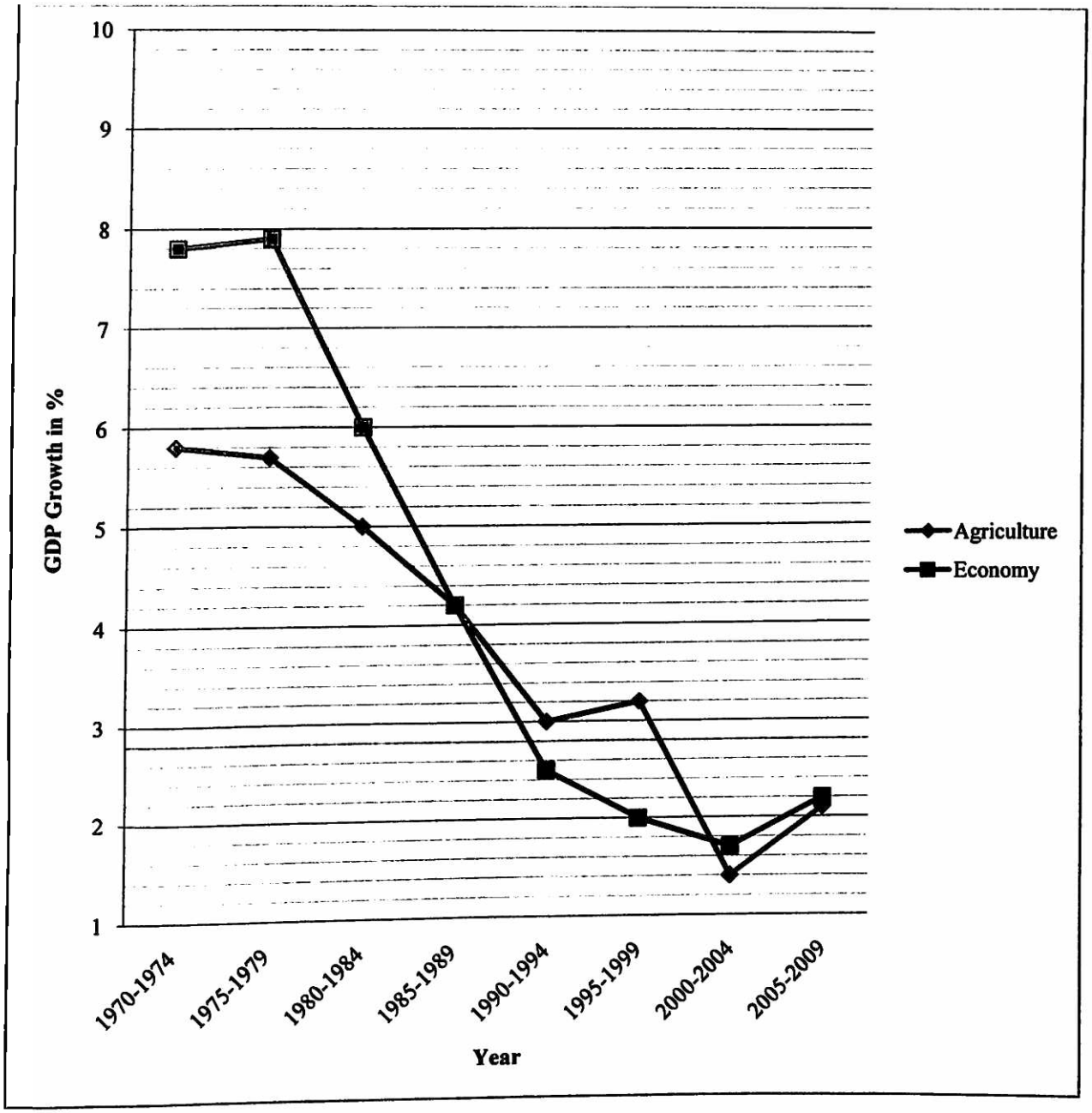

Figure 1: **Trends in Agricultural and Economic Growth (1970-2010).**

Courtesy of GoK, Agricultural Sector Development Strategy, (2010), p. 2.

Appendix III: Distribution of Agricultural Land in Kenya.

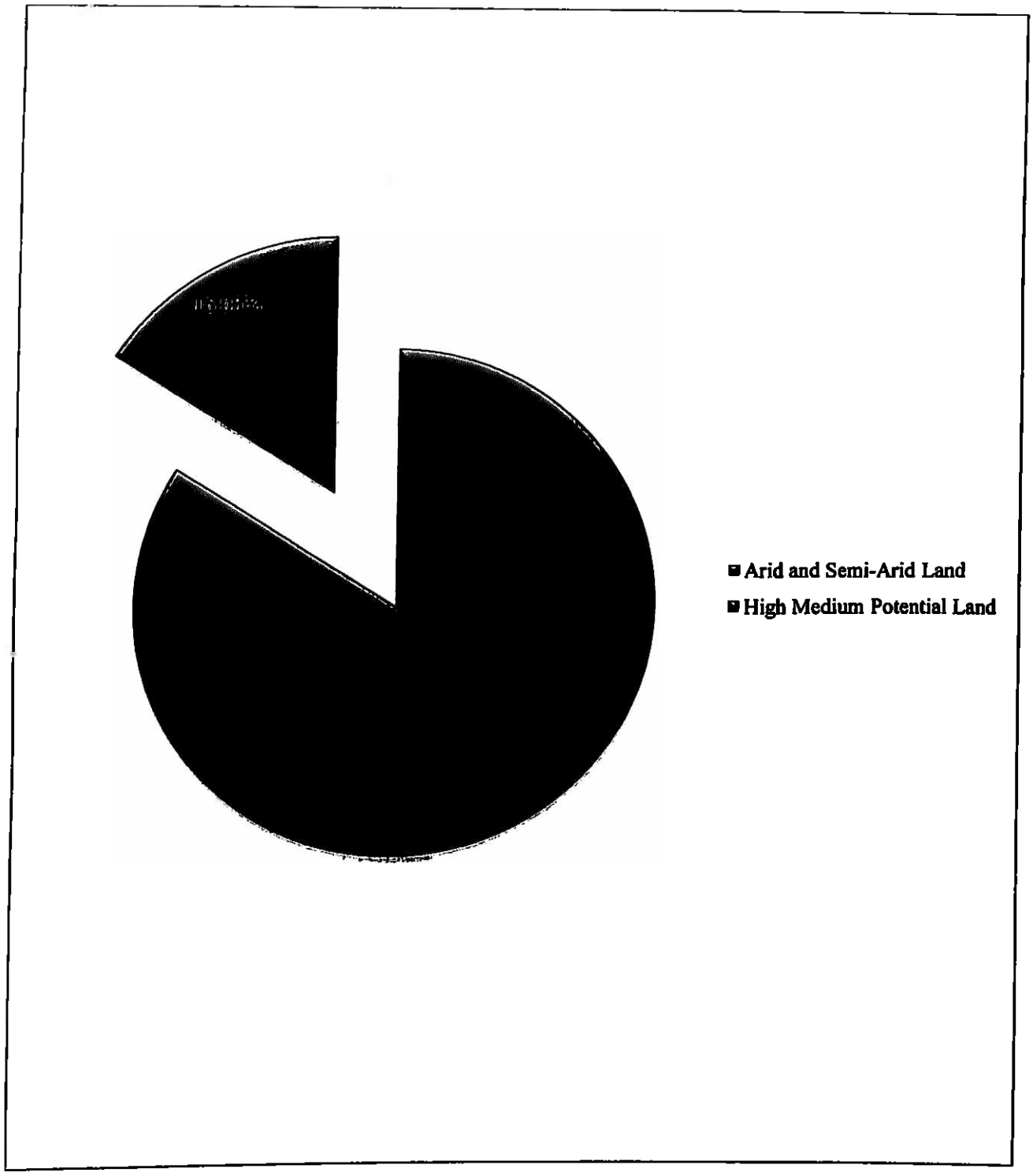

Figure 2: **Distribution of Agricultural Land in Kenya.**

Courtesy of GoK, Economic Review of Agriculture, (2010), p. 5.

Appendix IV: Distribution of Decline in Agricultural Productivity in Kenya from 1970-2010.

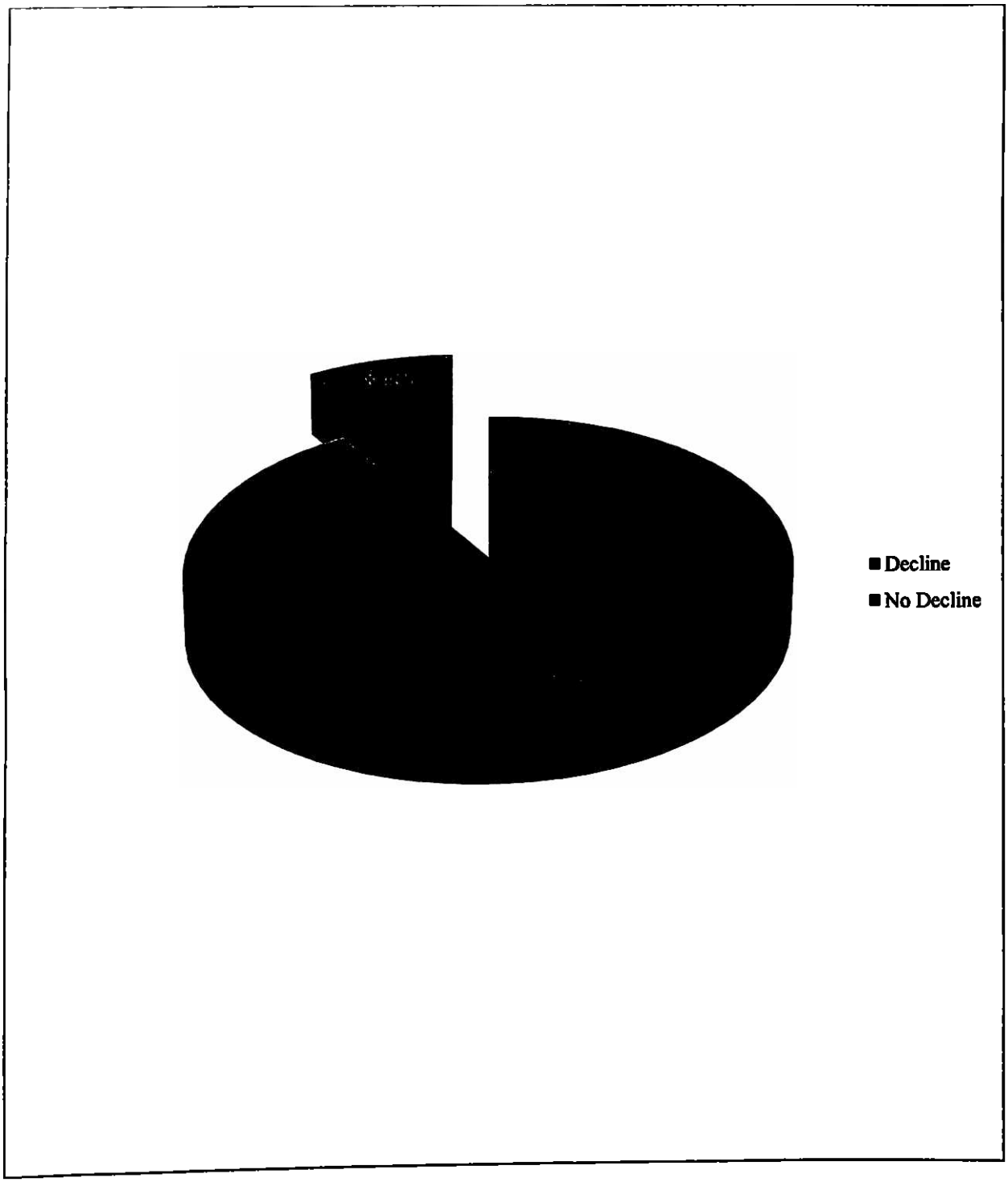

Figure 3: **Distribution of Decline in Agricultural Productivity in Kenya from 1970-2010.**

Data Collected through Questionnaires under this study.

Appendix V: Distribution of Reliance on Agriculture by Kenyan People.

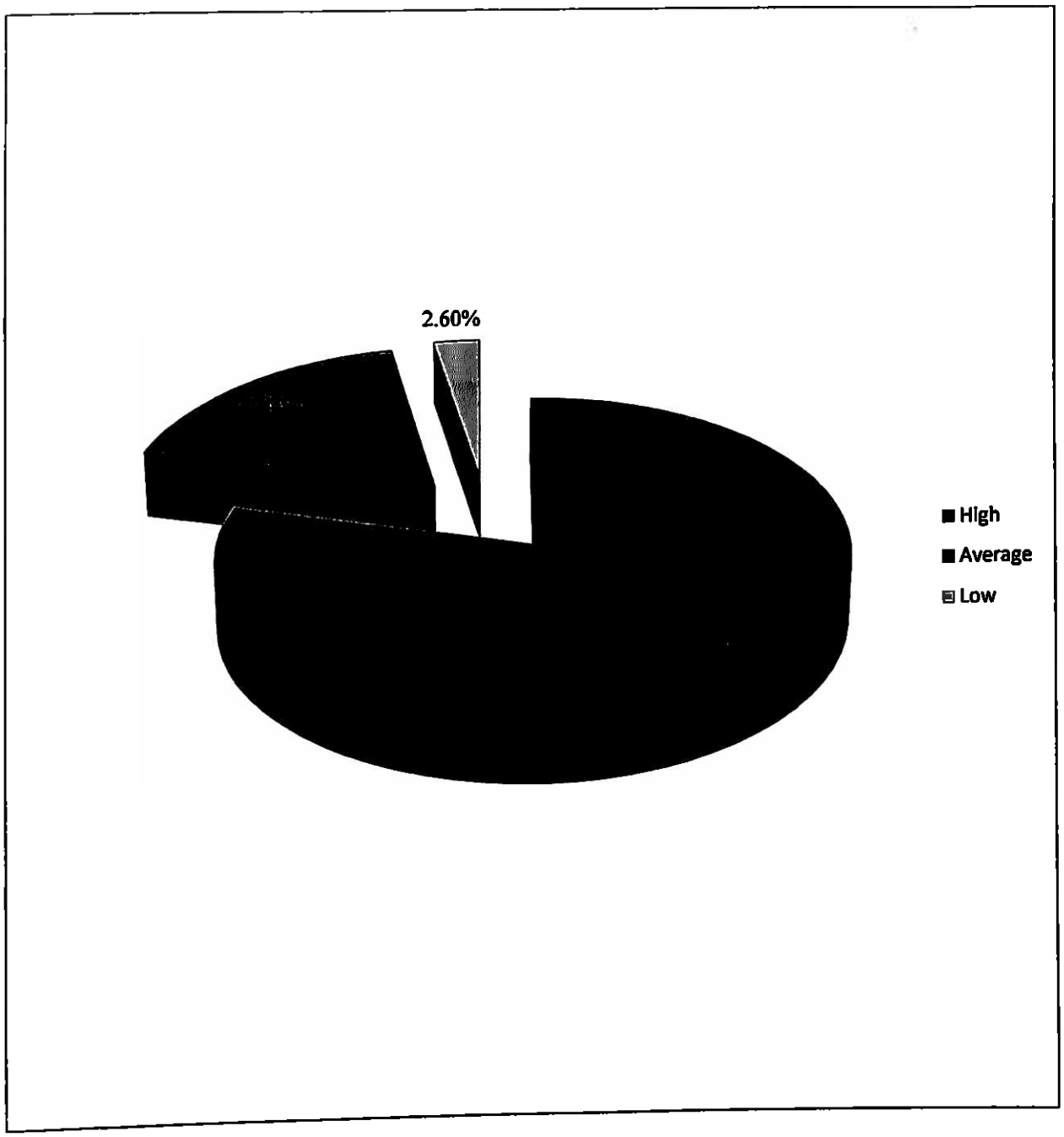

Figure 4: **Distribution of Reliance on Agriculture by Kenyans.**

Data collected through Questionnaires under this study.