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Global Climate Change: The Political Impact of Global Warming on Developing Countries. The Case Studies of Egypt and Oman

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**GLOBAL CLIMATE CHANGE:
THE POLITICAL IMPACT OF GLOBAL WARMING ON DEVELOPING
COUNTRIES
CASE STUDIES OF EGYPT AND OMAN**

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is approved in partial fulfillment of the requirements for the degree of

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Abstract

The discourse of climate change has become important in the field of political science, as well as in the policy-making community. Climate change has become a political phenomenon that has and will greatly impact political stability regionally and globally. Using the ecological security theory as a framework, I explored the relationship between climate change and political stability in developing countries.

This study utilizes both qualitative and quantitative analyses to investigate the relationship between climate change and its effects on political volatility in developing countries. Using regression models, the author examined all non-OECD countries (140 countries) and their relationship to political instability. The results indicate that the rise in food prices, climatic events (droughts, famines and extreme temperatures) and floods increased the probability of protests, riots and revolutions in developing countries.

Utilizing qualitative methods, the countries that are developed for case studies are Egypt and Oman. Using the ecological security theory as a basis, the results suggest that climate change, in fact, acts as a threat multiplier, which increase the likelihood of political instability. Global warming impacts variables like food, water, oil, rapid population growth, health, and diseases in the Middle East and North Africa. In conclusion, I suggests several policy implications the international community should implement to mitigate the impact of climate change.

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Last but not least, I want to thank my wife, Jiselle. Where do I begin? When I first had the idea of traveling 2,500 miles away to start my doctoral program, you were nothing but supportive. You are one of the most important people in my life and I thank God for you every day. Your positive attitude and constant beliefs in my goals is the reason why I am writing this now. I love you.

Dedication

I dedicate this dissertation in the loving memory of my father, who encouraged me to reach for my dreams.

Willie Thomas O'Neal

(February 6, 1946 – October 1, 2013)

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Chapter 1

Introduction

Climate change, while rooted in the atmospheric sciences, also raises political issues, issues of political stability, among others. For this reason, this topic has received serious attention by scholars in the hard sciences, social sciences and policymakers in the global community. Climate change is a global pandemic, it should be addressed collectively by both developed and developing countries.

This dissertation project focuses on the systematic political impacts of climate change. This project also focuses on domestic and international environmental policies that led to pervasive climate change. At the conclusion of this task, I explain some necessary policy changes needed in dealing with environmental problems in the future.

This research demonstrates that while many factors influence changes in the climate, human activities have become the dominant force in global warming. Technological developments in the last 100 years have contributed to today's changing climate. Climate change has made weather less predictable and has increased environmental degradation. Environmental degradation has historically impacted political stability. Variables like rapid population change, water and food scarcity, migration, energy and natural resources consumption are already causing problems and will continue to be impacted by climate change.

Internationally, most experts are in agreement on climate change. For the most part, the experts state that climate change is real. However, how strong is scientific consensus? Is everyone in agreement? There are still a few individuals (mostly in the

United States) who do not believe in the science behind global warming. In an attempt to address all concerns in this project, the author will briefly, in the introduction (and only in the introduction), talk about the consensus of climate change. If global warming is not real, this should be reflected in scientific journals, a stance that does not hold once the relevant literature has been examined.

Naomi Oreskes (2004) performed a study examining 928 abstracts in published refereed scientific journals between 1993 and 2003, with the keyword, 'climate change'. Out of the 928 papers, 75% either explicitly or implicitly have accepted the view that climate change is caused by man-made activities (Oreskes 2004). The other 25% dealt with methods or paleoclimate and took no position (Oreskes 2004). That means out of the 928 papers addressing climate change, none disagreed with the broad consensus (Oreskes 2004).

A follow-up study conducted by Cook et al. (2013) examined 11,944 climate abstracts from 1991 – 2011, using key words like 'climate change' and 'global warming'. Among the abstracts expressing a position on global warming, 97.1% endorsed the overall fact that humans are causing global warming (Cook et al. 2013). James Powell (2013) also examined peer-reviewed climate articles from 1991 – 2012, looking at over 13,950 articles and found only 24 rejected the consensus on global warming. If we are to believe that science thrives on dissenting ideas, then there should be a larger number of articles discrediting climate change if climate change is, indeed, a myth.

Climate change has impacted developing countries the hardest. Developing countries are currently dealing with problems like rapid population growth, water

scarcity, a depletion of natural resources, rising food prices and deforestation (Pirages 1997; Adger et al. 2003; Brown 2012). Climate change will continue to exacerbate these issues. Besides nuclear war, no other environmental problem has the potential scope for such widespread impact in the same way that global warming does (Gleick 1989; Pirages 1997). For that reason, this environmental threat is beginning to emerge as an international security issue. Adaption to global warming will become essential in reducing the risks of political instability.

Scholars in other social sciences have examined the link between climate change and crime. The *Journal of Environmental Economic and Management* published Ranson's (2014) article stating that climate change will not only impact the political sphere but more common categories of criminal behavior. Ranson (2014) used data covering a 30-year period, from the Uniform Crime Reporting (UCR) data, Global Historical Climatology Network Daily (GHCN-Daily) and National Climatic Data Center. According to his model, crime will rise significantly because of global climate change. "An additional 22,000 murders, 180,000 cases of rape and 1.2 million aggravated assaults will theoretically occur because of global warming" (Ranson 2014: 2).

A general theme throughout this work is environmental stability. But, what does that mean? A common definition is an environment's ability to resist large, rapid change in the sizes of its constituent populations (Holdren and Ehrlich 1974). The conceptual importance of stability is not a lack of change but the speed of change. Changes in the environment actually occur frequently but over an extended period of time. Ecosystems can deal with slow alterations, but not rapid disruptions. Rapid changes in the

environment place additional pressures on populations in those regions. The environment is unable to respond quickly enough to sustain man-made changes.

The population in the world is growing rapidly, mainly in Global South. Paul Ehrlich, a biologist from Stanford University, became well-known after he published his book, *The Population Bomb*, in 1968. The book sold over 2 million copies and Ehrlich helped put environmental issues, especially population change, in the public intellectual arena. Ehrlich (1968) said that it has been estimated that the human population in 8000 B.C. was about five million people. Throughout history, the world's population has doubled about every thousand years (Ehrlich 1968). The focus of rapid population growth today has been in developing countries. If the growth continues at this present rate, there will be a vast amount of people without vital resources.

However, not everything that Dr. Ehrlich's predicted came true. Even so, *The Population Bomb* did spark an important debate. Rapid population growth can lead to vast consumption of food, water and natural resources, which results in the mistreatment of the environment. When *The Population Bomb* was first written, there were about 3.5 billion people on the planet. Today, there are about 7.2 billion people.¹ With global warming adding additional pressure on the environment, this should be a vast concern for future populations.

¹ Peter Collins. Worldometers. 2014. "Real Time World Statistics".
www.worldometers.info/world

Can Traditional Theories in International Relations explain Climate Change?

Can traditional theories (realism, liberalism and constructivism) in international relations (IR) deal theoretically with climate change? Within IR, traditional theories typically have concentrated on static analysis, rather than the dynamic transformations and changes throughout the international system. These traditional perspectives ignore the impact that environmental relationships and evolutionary processes have on human relationships (Pirages and DeGeest 2004). This section poses this question: Can traditional theories in IR explain climate as an international security problem?

The purpose for this section is to first, examine the main themes in IR. It is important to give a theoretical breakdown of the major theories in international relations, and then attempt to explain why these major theories cannot explain or understand climate change in security terms. This analysis is fundamental for this thesis. First, it gives a thorough background of the major paradigms in our discipline. While the major paradigms in international relations have contributed greatly to political science, they fail to explain global warming. Since the end of the Cold War, states have launched new debates, focusing on non-traditional issues (Walt 1998). Hunger, unemployment and the environment have transitioned into international security issues. We need a theoretical model that explains the transformative essence of the environment. Even as traditional theories have advanced the field of IR, traditional theories are conceptually limited when attempting to think about climate change and security issues. It is important to call attention to these limitations, especially in terms of policy-making and governance.

Because of these limitations in traditional theories, the author proposes a less-traditional framework as the philosophical basis for this project. Thus, the second reason for the necessity of this critique is to approach this project through the lens of ecological security. Also, it explains why this thesis does not use any of these major theories. Climate change must be viewed as an international security issue. This section, in addition to explaining the rationale for using the ecological paradigm, also aids the thesis in developing a new theory. This section will give the reader a clearer vision of why this project is not utilizing the major theories of IR. Towards the end, the author attempts to communicate why these theories are inadequate in explaining a political phenomenon like climate change.

Realism

The primary concern of national security in the past was the preservation of dominance against an external threat (Caldwell and Williams 2012). In the traditional theory of security from a realist perspective, the state is considered the primary unit of analysis. Before the end of the Cold War, the primary risk to security was the threat of invasion by a hostile state (Caldwell and Williams 2012).

The realists' perspective in international relations has been shaped by the writings of authors like Thucydides, Machiavelli, Hobbes, and Rousseau (Doyle 1997).

Thucydides argued (in the *Melian Dialogue*) that, "The desire for power is natural within gods and men, the strong will do what they can and the weak suffer what they must"

(Thucydides 1954). This approach illustrates the point that world politics is characterized by the never-ending possibility of war.

Realists often portray themselves as being free of a particular viewpoint. However, there is a realist moral philosophy (Doyle 1997). Individuals should accept that national interests are the most important consideration for any nation, which is the one true guide to the formation of the public policy of states in the dangerous international system (Doyle 1997). The cycle of violence will continue far into the future and any hope for peace is not possible (Mearsheimer 2001).

However, it is important to note that not all realists agree on how security should be accomplished. Some scholars believe in the balance of power theory, which explains how two or more states coexist in a self-help system (Waltz 1979; 2001; Walt 1991; Chatterjee 2003). Others believe in an offensive realist state, where states cumulate arms (nuclear weapons) as rapidly as possible. Generally, realists believe that states attempt and strive with intent to preserve their interests. Power may not be an end goal, but achieving security is. Realists believe the ultimate aim of the state is to gain a position of dominant power.

Liberalism

In a critique of realism, liberalists argue that defining national security strictly in military terms is a false image of reality. Since the end of the Cold War, a new framework of security began to develop, challenging the traditional paradigm of realism.

Liberalism has been much more optimistic and enthusiastic about the possibility of cooperation and peace within the international community (Chatterjee 2003).

In the beginning, classical liberalists drew on the 17th century Lockean view of government as 'free individuals' (Doyle 1983; 1997). This view argues that in world politics, it is possible that the state of war can become the state of peace. The godfather of this framework, Immanuel Kant, states that liberalism is a stronger foundation for foreign affairs and security. Out of this context came the democratic peace theory (DPT). The DPT argues that liberal states are typically at peace with one another and that they are prone to make war with non-liberal states (Doyle 1983; 1970). Liberal democracies share liberal ideas and refrain from fighting each other (Owens 1994).

Like realism, not all liberalists agree on how security should be accomplished. One group of liberalists, the Neo-liberalists, argues that international relations act as a 'prisoners' dilemma' (Keohane 1984; Keohane and Axelrod 1985). This is a game-strategy based on reciprocity, which can yield higher payoffs. This game-theory analysis demonstrates that an arena like international relations has multiple member-states and institutions. Each state or organization plays a pivotal role in the international community. Neo-liberalists argue that two actors may or may not cooperate, depending on their national interests. In this game-strategy, it assumes the rational of all players involved.

Constructivism

Constructivists argue that anarchy in the international system is what states make of it (Wendt 1992; Hopf 1998). Constructivism offers alternative explanations for a number of the central themes in IR theory. In comparison with realism and liberalism, constructivism is more adapting conceptually. Constructivism is concerned about the social construction of knowledge and the social construction of the material and non-material world (Guzzini 2000: 174). This departs from the traditional sense (realism and liberalism) in which paradigms should be fluid concepts. Similarly like realist and liberalist scholars, constructivists are divided into different camps of thought.

Both conventional and critical constructivists tend to focus on different components of a theory: norms, identity, knowledge and culture (Katzenstein et al. 1996: 680). However, several constructivist scholars utilize a rationalist and positivist approach, where they use mainstream methodology to analyze political phenomena. Alternatively, critical constructivists focus on identity issues that include race, ethnicity, religion and sexuality (Katzenstein et al. 1998). These scholars reject the use of positivism and argue that constructivists are attempting to become like mainstream traditional theories in IR.

Alexander Wendt attempted to bridge the gap between the rationalist and critical constructivists. Power politics is not the result of anarchy structures but of the process of social learning (Wendt 1992; Hopf 1998). Institutions are a relatively stable set structure of identities, interests and functions as such. International politics is a social construct rather than strictly material (Baylis 2001). The structure of the international system

should not be material because structures are merely shared knowledge, which can also shape the motive of actors (Finnemore 1996).

Critiques of Realism, Liberalism and Constructivism

Should realism, liberalism and constructivism, in general, be considered non-relevant theories? The short-answer is no. This project is not attacking the traditional theories of international relations. From a theoretical point-of-view, these theories give strong analysis and a robust critique of international relations. However, with the threat of climate change, this project believes that traditional theories are unable to effectively address the ‘big questions’ or possess explanatory power in this particular sub-field. To formulate political policies on environment and what steps to take, one must start from an environmental perspective.

Realism examines international relations and considers them to be in a constant state of conflict. During the height of the Cold War, realism served as a strong analytical critique of international politics. Though the threat of nuclear war is still important, climate change is equally as destructive. Climate change will impact states collectively and has to be dealt with together as an international community. It will be in the best interest of developed countries to begin to assist and aid developing countries because of climate change’s catastrophic impact. This phenomenon goes beyond national interests or a balance of power. Global warming has changed the game. Climate change has transformed that which must be taken into account, shifting focus from *national interests* to *international interests*.

Liberalism describes the coexistence among the international community. Liberalists would argue for, and would be correct in articulating an organizational solution for climate change. Institutions like the United Nations (UN), World Meteorological Organization (WMO) and International Panel on Climate Change (IPCC) will play an important part in mitigating this phenomenon. These organizations are important in assisting developing countries in mitigation and adaptation policies.

However, the nature of climate change makes it difficult to address through a *prisoners' dilemma* type of relationship. If two countries do not cooperate on climate change, both will fail. If one country cooperates on climate change and another does not, both fail. If one country chooses not to help or assist another country because of limited resources, that country (not helping) is acknowledging its own self-destruction. With climate change, there are not multiple opportunities for countries to get ahead. Placing state (individual) interests before international (collective) interests will lead to destruction and continued political instability throughout the world.

Out of the three traditional theories, constructivism is more open and willing to adapt to theoretical change. However, it is still limited in understanding changes in the natural environment. Constructivism argues that the world is socially constructed. While this may be true, especially in terms of knowledge and political relations, the physical environment is not a social construct. Our exploitation of natural resources creates a real, material change. These changes in the natural environment will impact relations between countries. Rapid population growth, volatile food prices, water scarcity and high natural resource consumption are all very material. Climate change, though politically constructed, has very material consequences. Our environment was given to us by nature.

While our collective ideas have shaped the environment, nature is finite. While constructivists believe the international system is not material, the environment is very much real.

Goals of this Study

This study attempts to address the deficiencies in the literature by revealing multiple links between climate change and political instability. This dissertation has developed several research questions, formulated statistical models and conducted case studies that explain how climate change has increased political instability. Rapid demographic change, water scarcity, food prices, migration, energy, diseases and natural resource consumption are all heavily impacted by global climate change. As global warming continues to go unaddressed by the international community, these variables will further exacerbate and increase the likelihood of political instability.

This study attempts to develop a new theory: the ecological security framework. I explore this framework and its explanatory powers. This project will demonstrate that the ecological security theory could explain *why* political instability occurs in developing countries. Ideally, this theory attempts to be broad enough where it could be applied globally but specific enough where it addresses social, cultural and economic policy problems at the state-level. As global warming continues to go unchecked, it will act as a threat multiplier. It will put further pressure on already instable countries and increase the likelihood of conflict.

Harold and Margaret Sprout first pioneered the ecological approach to the field of international relations. This approach argues an evolutionary perspective in international relations. This theory does not exclude the theoretical findings by other approaches. Other traditional theories in international relations have transformed and vastly improved our field. However, in the study of climate change, the ecological paradigm has more explanatory power because of its framework and its approach to the natural environment.

Will climate change impact the world evenly? Global climate change will impact states differently, depending on their internal capacities. This study will argue that variables like rapid population growth, global food prices, diseases and climatic storms will impact developing countries the hardest.

The strength of a state's governmental institutions could determine its ability to adapt to climate change. Countries that possess political institutions that can acclimate will be able to endure the radical impact of changes in the weather, international food and energy prices and population growth. Governmental institutions within developed countries make those countries more adaptable into dealing with environmental or economic problems. States that do not possess strong institutions will be heavily affected by global warming. Developing countries that are very autocratic do not possess the capability to handle a rapidly changing population, or deal with food and water scarcity. This will be illustrated in the statistical model, measuring regime type and in the case studies.

The social sciences' literature that addresses climate change and political stability, focusing on its statistical link has just barely scratched the surface. In this study, the

author will first statistically examine all developing (non-OECD) countries. Additionally, I make statistical comparisons of climatic variables and political instability. Then, this thesis will examine individual case studies from the Middle East and North Africa: Egypt and Oman. By using both quantitative and qualitative research, this project attempts to examine the broad impact of climate change. Importantly, while developing countries will endure the heaviest impact of climate change, each country has diverse challenges in adapting to global warming.

Utilizing data from the Penn World Table, the World Bank, the Food Agricultural Organization (FAO), World Health Organization (WHO) and the International Disaster Dataset, the author attempts to add to the overall scholarship by examining climate-related variables and political stability in developing countries.

Chapter Breakdown

The second chapter of this dissertation project will discuss the theoretical framework of this project, the ecological paradigm. This chapter will discuss the ecological paradigm more in depth, examining how relationships form between states on an environmental level. This chapter will explore the ecological paradigm in the literature, the important concepts and the ecological security theory. This theory attempts to explain how the international community should see climate change and environmental degradation as an international security threat. The ecological security theory argues that changes in the stability of ecosystems will have social, economic and political

consequences, especially in developing countries. The author concludes with a short discussion of the future of international relations as a discipline.

Chapter 3 examines the climate change phenomenon. As argued in the beginning of this chapter, climate will pose one of the most potent challenges to international relations. This chapter gives an overview of climate change, looking at the actual science of global warming. The author examines the evolution of climate, beginning 125,000 years ago and continuing to the present day. There is also a brief discussion on the three plausible scenarios of climate change, outlined in the 2013 International Panel on Climate Change (IPCC) report.

The latter portion of the third chapter talks about the ecological impact of climate change and the anticipated results on the environment. This chapter explains several variables like natural disasters, droughts, rising sea level, migration and diseases. Global warming has gone through a securitization process. This process is when policy makers and prominent politicians turn a conventional issue into a security issue. The meat of the chapter looks at climate change and conflict as a threat multiplier. While it is difficult to empirically link climate change and the environment, climate change will put additional stress on environmental variables. Essentially, global warming has increased the likelihood of political instability.

Chapter 4 of this dissertation project is the methodology chapter. Using several different and diverse data sets, the author constructs a statistical model that measures the relationship between environmental variables (climate change) and political stability. To empirically measure changes in the climate is difficult because they occur over thousands

of years. This makes it very difficult to model statistically. However, in this project, the author measures climate change by its events: droughts, extreme temperatures, famines and/or floods. Theoretically, this study argues that climate change acts as a multiplier effect on already existing problems in the developing world. Statistically, this is demonstrated through the models.

Using the *Cross-National Time-Series Archive* by Arthur S. Banks, this model uses the dependent variables: protests, riots and revolutions. The information gathered is based on newspaper and online reports. Using these three variables, the author is able to measure three different kinds of instability.

This model utilizes variables from the Polity IV Project by Monty G. Marshall, Ted Robert Gurr and Keith Jagers, the World Bank, the World Health Organization (WHO), the International Disaster Dataset, the Food and Agricultural Organization (FAO) and the Penn World Tables. Pulling different variables from these datasets, the author constructed a time-series model, consisting of non-OECD countries (140 countries) with 2436 observations. In this chapter, the author articulates the reasoning for each variable used in this dissertation project. The latter portion of the chapter outlines the main hypotheses, analyzing several variables like food prices, population, refugees, energy and natural disasters.

Chapter 5 examines the results from the statistical model. According to the model, there is a statistically significant relationship between the proposed environmental variable and political stability. This chapter argues that rapid changes in environmental concepts increase the likelihood of political instability. This statistical model is broken

down into non-OECD countries and regional binary variables (Middle East and North Africa, sub-Saharan Africa, Latin America and the Caribbean, Eastern Asia, South Asia and Eastern Europe). The results also demonstrate that some regions are found to be statistically significant while others demonstrate no relationship between the environment and political instability (against the omitted variable). The latter portion of this chapter discusses the significance of the results in relation to each hypothesis.

Chapters 6 and 7 of this project explore two individual case studies: Egypt and Oman. In the beginning of these chapters, the author will give a historical analysis of Egypt and Oman, covering the social, economic, environmental and political histories of each country. Also, these chapters attempt to explain the reasoning for the choice of these particular countries and how important they are to the overall ecopolitical research. Using the ecological security theory, the author will explain how the environment has contributed to political instability in these countries. While both countries are different socially, politically, environmentally and economically, climate change has shaped the political past and present, and will continue to shape their political future or both countries. With the extreme interdependence of the international economy, the fates of countries in the Middle East and North Africa are tied to other developed and developing countries around the world.

The final chapter of this dissertation project will give policy suggestions that developed and developing countries must pursue to mitigate the effect of climate change and environmental degradation. In March 2014, the IPCC released a technical summary of the results entitled: *Climate Change 2014: Impacts, Adaptation and Vulnerability*. This summary addresses the report from the IPCC in 2013. The conclusion will examine this

report in depth and the overall recommendations made by climatologists around the world. The author will give empirical and analytical suggestions about building a global system of resiliency to climate change.

Chapter 2

The Ecological Paradigm

Using an ecological perspective means focusing on the relationships, social and nonsocial, among humans as well as non-humans. Communities have always been shaped by their access to natural resources, climatic patterns and technological innovation. Since humans require the earth and its resources for survival, they must be concerned with the condition of the environment.

Global leaders are beginning to recognize the finite nature of natural resources and the importance of environmental issues (Pirages 1978; Schultz 2001). Imminent threats to the ecosystems and political relationships demonstrate that we need a theory that can provide an important foundation in explaining climate change. Yet, an ecological viewpoint is not just about the environment. It examines interactions outside of environmental relationships as well (Sprout and Sprout 1971). The ecological approach moves beyond the standard security framework that repelling military assaults from enemy states (Pirages 1978, 1997), instead of the traditional theories in IR. The climate change phenomenon requires world leaders to use environmental and ethical considerations in their decision-making process.

The purpose of this chapter is to give an overview of the ecological paradigm. This chapter will then articulate important concepts within the ecological paradigm and explain the ecological security theory. The ecological security theory moves beyond the idea of preventing nuclear war. It is the balance between the human population and the four equilibriums. This is the theoretical basis of this dissertation project. Explaining each

individual concept is important to understanding this comprehensive theory. In conclusion, there will be a brief discussion of the direction of international relations.

The Ecological Paradigm

Ecology with a political or social meaning (ecopolitics) is a relatively established field in political science. Ecopolitics is a term that describes the cluster of economic, ecological and ethical issues that impact changes in perceptions in international relations (Ophuls 1977; Pirages 1978). The root of 'eco' is the Greek word *oikos*, means 'household' (Ophuls 1977). In Aristotle's work, *Politics*, Aristotle has defined politics as 'things concerning the community'. In this sense, ecopolitics can be interpreted as incorporates the environment with the community.

Like many sub-fields in political science, ecopolitics traverses many disciplines. Ecopolitics pulls from disciplines like sociology, anthropology, history, ecology and political science. Ecopolitics must be trans-disciplinary because individual disciplines alone are not enough to establish strong empirical foundations or tell the whole story (Maton 1993; Dauvergne 2005; Allen 2008). Essentially, an ecopolitical approach emphasizes the homeostatic and apolitical nature of human – environmental interactions (Catton 1980; see Adams 1990; Branyt 1997).

Fundamentally, ecopolitics attempts to study political changes and relationships between ecosystems and human beings. Ernst Haeckel, one of the founding fathers of ecology, defines ecology as 'the socio-economics of nature' (see Haeckel 1859; Ophuls

1977; Soderbaum 1998). Ecology has begun to engulf economics and politics. Political relationships are now determined by environmental conditions (Ophuls 1977).

Even before Haeckel and the advent of ecology, Charles Darwin was one of the first scientists to begin the dialogue about the importance of the environment (see Darwin 1871; Catton 1980). Drawing inspiration from the paper, *An Essay on the Principle of Population* (1798) written by Thomas Malthus, Darwin (1871) demonstrated the evolutionary interconnection of life, the interactions between diverse organisms and population growth. Darwin's scientific discovery demonstrated the interdependence between both plant and animal kingdoms. This connection was important in understanding political relationships in the world.

The field of global 'environmental politics' or 'political ecology' began to emerge in the late 1960s and early 1970s (Dauvergne 2005; Peet et al. 2011). Political scientists started to examine environmental regimes, institutions and transnational networks (Zurn 1998). The work of Garrett Hardin (1968), 'The Tragedy of the Commons' was one of the first papers to articulate environmental concerns and the impact of politics on the environment. Hardin (1968) argues that humans will need regulations on the environment and its resources to avoid future tragedies.

In that same time period of the late 1960s and early 1970s, sub-fields within social sciences like eco-economics and social ecology began to develop (Soderbaum 1998; Martinez-Alier 2002; Allen 2008). Environmental issues became important on the global agenda, culminating, in the international policy world, at the 1972 United Nations Conference on the Human Environment, held in Stockholm, Sweden (Dauvergne 2005).

This conference began the first international dialogue of global environmental problems. Political science research on the global environment continued expanding into the 1980s. The discipline began to closer examine environmental issues through a political lens.

What is the Ecological Paradigm?

The concept of the ecological paradigm transcends the framework of individual political interests because it is global in scope (Timoshenko 1989). The interconnectedness of the environment is not defined strictly by sovereignty or jurisdictional boundaries (Sprout and Sprout 1971; Ophuls 1977; Timoshenko 1989). Human share the earth with a vast diversity of animals, plants and microorganisms (The National Academies 2008), and the living and non-living parts of ecosystems are so intertwined that it is difficult to separate them (Ophuls 1977; also see Odum 1971). On the most basic level, interrelatedness is a balance or equilibrium within a system, in which the environment supplies the demands of species inhabiting that area. Everything within any ecosystem is related to all of the other elements of that ecosystem (Ophuls 1977; Dunlap 1980; Lundmark 2007). At the same time, changes in one ecosystem inherently affect other ecosystems, creating an even larger chain of interconnectedness. The system, which crosses national borders and limits of sovereignty, is responsible for all. Therefore, jurisdictional boundaries prove to be almost meaningless when discussing the environment.

The concept of the ecological paradigm is grounded in the inclusionist perspective. This perspective argues that the modification structures and expectations are

needed to order to maximize human satisfaction with minima resources (Sprout and Sprout 1971). This begins with the idea that human beings share an ecosystem with many other species and that human life and behavior are rooted in such an ecosystem (Pirages 1983; Runci and Cooper 2005). If there are major disruptions to the ecosystem, human behavior will also be disrupted, since changes in one part of the ecosystem necessarily cause changes in another part.

A byproduct of an ecosystem changes the compositions of that ecosystem. Any substantial change in one part of an ecosystem is nearly certain to produce significant, unsettling or sometimes severely disruptive consequences in other sectors (Sprout and Sprout 1971). A well-functioning ecosystem reuses materials with great efficiency, where there is almost no such thing as waste (Ophuls 1977). This explains why certain ecosystems can cope with fire, but not large doses of radiation or synthetic chemicals because no organic decomposer exists (Ophuls 1977).

Ecologists argue that waste is a man-made phenomenon, which corrupts the natural cycle (Ophuls 1977). Externalities, like pollution, can start locally but can stretch regionally and globally, creating waste where there was none before. Also, environmental degradation is not an unfortunate accident of the international economic system or capitalism, but its logical outcome (Peet et al. 2011). Scientists are still researching the idea of ‘ecosystem resilience’ – the ability of an ecosystem to withstand stresses like pollution or climate change (The National Academies 2008). With everything connected, unnatural intervention in ecosystems produces not just side effects; but impacts the conditions of the whole system (Ophuls 1977).

There is evidence that the earth *is* developing into a single ecological system (Boulding 1983). In the future of international relations, the environment should be viewed as a single ecosystem instead a group of isolated individual parts (Pirages 1978). The study of international relations should adopt a macro-political approach. Policy relevant strategies can be produced on the basis of their impact on the collective welfare of all mankind (Pirages 1983).

This theoretical approach to international relations is persuasive because it is anchored in survival-relevant and enduring evolutionary principles. An envirocentric analysis is imperative in demonstrating patterns between states in international relations. Given the scientific facts about climate change and environmental deterioration, it remains to be seen whether traditional frameworks can successfully explain environmental problems within the context of the present dominant social paradigms (Orr and Soroos 1979). Political scientists do not have to accept the dominance of the ‘political ecology or environmental politics’ framework but it is certain that the *commons* are both natural and inherently political (Vogler 2005).

As I will explain, this framework gives priority to physical ecological variables such as population growth, resources bases, climate change, and technology capabilities (Pirages 1983). These variables constrain human behavior and resource scarcity can restrict economic growth. This can lead to increased political instability and motivation by states to seek resources beyond the established limits of their sovereignty. Politically and culturally, communities in developing countries expect their governments to provide the basic means of living. States that are constrained by ecological factors will be unable

provide basic needs to its population. This will increase the likelihood of political instability.

The essence of the ecological crisis is its acceleration. We are making damaging changes in the biosphere in which life exists – land, water and atmosphere at a rapid pace (Sprout and Sprout 1971). Relations between populations are dictated by a multiplicity of ecological factors. Some authoritarian regimes in the Middle East and North Africa have lasted for decades but have recently been toppled; developing countries in sub-Saharan Africa are having trouble adapting to changes in the environment; countries in South Asia are facing difficulty responding to their local populations. This is because the environment has changed in these countries. This framework attempts to explain why and how environmental factors impact the internal political stability of developing countries.

Important concepts in Ecopolitics: Ecosystems

First, what is a system? In social and hard sciences, the concept of a system has been conceptualized in different ways. Most definitions of a system constitute: ‘a set, units or components, which are observed or inferred to interact or to be interrelated or interdependent with some principle, pattern or design’ (Sprout and Sprout 1971; Ophuls 1977). All systems have components and without them, it would be dysfunctional. Using this definition, the assumption of the existence of a system means there are limitations to that system. A system without limits would not be an ordered entity, but a place where anything could and would happen (Ophuls 1977: 33). A natural system is designed as a fine-tuned machine, able to respond and adapt with a gradually changing environment.

An ecosystem is individuals, populations and organisms interacting in the environment dictated by a series of patterns (Sprout and Sprout 1971; Ophuls 1977; Pirages 1983). In addition, an ecosystem is composed of the total array of plant and animal species in an environment as well as the externalities, which cycle throughout the system (Pirages 1983; Ehrlich 1989; The National Academies 2008). To fully function, humans depend on the ecosystem for maintenance of an environment, which is the basis of civilization (Ehrlich 1989).

At the most basic level, all populations share one ecosphere, which is recognized to be relatively finite and fragile (Pirages 1978: 38). However, there are regional sub-ecosystems. For instance, northern African, the Middle East and the Arabian Gulf could be considered three distinct regional sub-ecosystems. These sub-ecosystems have a combination of different climatic characteristics (The National Academies 2008; also see Walter 1968). These characteristics are influenced by social, political and cultural differences.

A nation cannot 'opt' out of its ecosystem. Individual countries are confined to their environment and the resources they provide. Each country bears a responsibility to that system. Without ecosystems, there would be no soil to support plants, microorganisms and animals that depend on life (The National Academies 2008). Nature is balanced, highly interdependent, complex and can be easily vulnerable to human interference (Dunlap et al. 2000), which means that disruption to nature is disruption to human behavior.

Ecosystems provide services that are central to ecological security. If we are to move toward a more ecologically secure world, we will have to learn how to integrate ecological factors within our economic, political and cultural foundations (Dunlap et al. 2000; Cousins 2005).

Populations

Unfortunately, *Homo sapiens* lack an adequate understanding of the complex interdependence that exists among ecosystems. Therefore, another important concept in understanding the ecological framework is the human populations and its growth dynamics. Population change is one of the principal trends shaping the ecopolitical agenda (Sprout and Sprout 1971; Pirages 1978, 1983; Orr and Soroos 1979). A population has typically been defined as ‘any species with a dynamic system of interacting individuals that are potentially capable of interbreeding with each other’ (Sprout and Sprout 1971; Pirages 1978, 1983; Pirages and DeGeest 2004). Human populations are governed by the same rules as other species. Species cannot survive if they use up their resources given by the ecosystem.

Populations depend on the natural environment for social, political and economic goals. Relationships between states have long been defined by their access to natural resources as well as, the accessibility and distribution of those resources. Naturally, some countries have, historically, been generously endowed with resources, while other countries have been limited in their supply.

Homo sapiens have spent much of their evolutionary history living in small and isolated units (Pirages 1983; Pirages and DeGeest 2004). *Homo sapiens* have constantly responded to the ecological changes and transformations of their ecosystem. For much of human history, the movements and survival of *Homo sapiens* were determined by the local availability of food and other natural resources (Pirages and DeGeest 2004).

It is important to note that *Homo sapiens* are not exceptional creatures. Humans are an important part of an ecosystem (The National Academies 2008) but just a *part* of the overall system. Lundmark (2007) has described this idea of human exceptionalism as anthropocentrism, the idea that ‘humans are seen as separated from nature and more worthy than other organisms’ (33). Because of this anthropocentric belief, *Homo sapiens* have often been seen adapting nature to human ends, rather than *Homo sapiens* to the natural environment adapt to our needs, has led to humankind being by far the most destructive of the many species that inhabit the earth (Sprout and Sprout 1971).

Populations must realize that we are not exempt from ecological principles, environmental influences and its constraints (Catton and Dunlap 1980; Dunlap and Catton 1994; Dunlap et al. 2000). Humans and the rest of nature are interconnected and interrelated in terms of their mutual long-term interests and welfare (Lundmark 2007).

The physical limitation of the ecosphere and the impact of these limits on future economic and political stability are now recognized as raising a new agenda of concerns (Ophuls 1977; Catton 1980; Pirages 1983, 1997, 2007). At present, the world population is growing very rapidly (Catton and Dunlap 1980; Allen 2008; Brown 2012). The world

human population is over 7 billion people today, with predictions of 9 billion by 2050² (Brown 2012). The world's population is growing about 2% each year, but this growth is unevenly distributed (Pirages 1978; Brown 2012). Rapid population growth is primarily taking place in the Global South or developing countries. Countries with the highest current and projected fertility rates are all in Africa, the Middle East and Asia (Runci and Cooper 2005). This increase in population, combined with the resources demands of industrial growth will place enormous burdens on global ecosystems (Pirages and DeGeest 2004: 2, 113).

Rapid growth in population and the accompanying resource consumption has received due attention from the international community. The greater the concentration of a population and/or the higher the level of industrial technology available to a population, the more extensive the environmental deterioration (Sprout and Sprout 1971; Fadel et al. 2003). Overuse of the environment by rapid population growth reduces its carry capacity (Catton 1980). In the past, human populations have tended to grow in size until they approached the natural carrying capacity of the land. Then, the population stabilized at an equilibrium point slightly below the maximum (Pirages 1978; Pirages and DeGeest 2004). In the contemporary moment, the stabilization is not occurring, instead, populations continue to grow, even after the carry capacity of the land has been reached. In developing countries, populations are continually expanding and will continue to rapidly grow, putting further pressure on the land.

² The United States and the World Population Clock. 2014. "The United States Census Bureau." <http://www.census.gov/popclock/>

Population growth can also increase the likelihood of large-scale migration, whether from rural to urban or from one country to another. The Nile Delta is one of the most densely populated areas of the world and it extremely vulnerable to sea-level rise (Brown et al. 2007: 1146). The majority of Egypt's 80 million people live along the Nile River. If the Nile River is unable to provide resources to this population that is has been providing for centuries, people will migrate for survival.

At the same time, this migration and rapid urbanization is creating 'megacities'. In densely populated countries, there is little available land or economic opportunity for rapidly growing numbers of restive young people (Pirages and DeGeest 2004) leading many of them to move to the city in search of work. This lack of opportunity and move to the cities has created 'youth bugles' in regions like the Middle East and North Africa (Urdal 2006). In these densely populated areas, governments must provide basic services for tens of millions of people. As mentioned in the first chapters, in most developing countries, populations have a certain level of expectations from its government to provide social and economic services. If their government is unable to fulfill this level of expectation, this increases the likelihood of political instability. Thus, these large cohorts of young people moving to the cities make countries more susceptible to conflict because of institutional crowding and strain on the environment. While megacities are recognized as an important problem in most developing countries, however, there has been no general agreement on the actions that should be taken to curb their further growth (Pirages 1978: 60).

Natural Resources

Natural resources are one of the most important concepts in linking human populations and ecosystems (Sprout and Sprout 1971). A resource is anything needed by an organism, populations or ecosystem (Pirages 1983, 1997). Natural resources are essential to the activities of all populations (Pirages 1978). It is used for energy, food and dictates political relationships. Typically, natural resources have little intrinsic economic value but become valuable only when they are used to create finished products (Pirages 1978).

The major consumers of raw materials have been industrialized or developed nations. Western countries in the past have dominated the markets for raw materials with large multinational corporations (Orr and Soroos 1979) and have greatly benefited from the dominance. The abundance of natural resources in the United States has been prominent in the development of American industrial power (Catton and Dunlap 1980). Increasingly high levels of resource consumption and the discharge of pollutants have been sustaining the comfortable, middle-class life style of the developed world (Soroos 1979).

With natural resources, one must distinguish between renewable and nonrenewable resources. Renewable resources like fertile land, fisheries, and forests can be replenished in short periods of time (Soroos 1979). The nonrenewable riches of the planet like natural gas and oil are limited; when we have used the available resources, we must wait centuries for those resources to be replenished, unlike renewable resources. People rely upon these resources to satisfy their material and economic needs (Soroos

1979). Historically, human populations have been reliant on these limited nonrenewable resources, rather than renewable resources for economic and political advancement. This current level of usage is unsustainable. We will need a reduction of human dominance over the world's natural resources to survive in the future (Catton 1980).

The insufficiency of resources to meet the demand for these resources is one of the main presuppositions of economic theory (Sprout & Sprout 1971). The world population is dependent on natural resources for social, political and economic survival. In the long term, the finite nature of petroleum and natural gas will become a burgeoning problem for the world economy. Overpopulation can only be maintained by a massive depletion of Earth's natural resources (Ehrlich 1989). With rate of depletion of natural resources, technological advancements are needed to feed the rest of mankind.

Food

Food is another important concept in ecopolitics. The world is now transitioning from an era of food abundance, to one of food scarcity (Brown 2012). The right to food is one of the most consistently mentioned in international human rights documents, but it is also the one most frequently violated (Food and Agricultural Organization 1999). Food security has typically been defined as 'a situation in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life' (International Food Policy Research Institute 2002; Cohen 2005). The fundamental fact about food is that it requires good agricultural land, which is in fixed supply (Ophuls 1977).

In the past, geologists discovered that fertile farmland is often sacrificed to meet the growing demands of urbanization (Ehrlich et al. 1993: 7). There is evidence that food shortages led to the downfall of earlier civilizations like the Sumerians and Mayans as early as 4000 BC. These two civilizations declined because they moved along an agricultural path that was environmentally unsustainable (Brown 2012). Like the Sumerians and Mayans, we are mismanaging our environment by desertification, increasing drought and food yields (Brown 2012). Also, we are changing the weather with global warming.

The food problem is a natural resource problem. The world's annual agricultural productivity is dependent upon the use of energy-intensive production (Pirages 1978). Arable land is one of the most important factors in food production and weather conditions impact production. Climatic factors determine length of seasons, rainfall patterns and where crops can be grown (Pirages 1978). Any major changes in the climate severely disrupt food production, food prices and economic stability.

Because food production is so precarious and weather-reliant, the production of grain, the world's basic food, is often unable to meet the demands of the world population. Only a handful of countries can produce enough grain to feed their populations and still have to enough to export (Brown and Halweil 1998: 15). The total amount of grain available for export is about equal to the total import demand. With growing populations and changing climatic conditions, this will no longer be the case. Over the next several years, mandates will drastically increase in grain-poor areas like the Middle East and North Africa. Domestic policies and changes in the climate will have negative impacts in the world food economy for years to come.

There is a relationship between poverty and food insecurity. Today, about 1.2 billion people live on less than \$1 a day. Violent conflict contributes to hunger but hunger can also contribute to violence conflict. When resources are scarce and perceptions of economic injustice are widespread; violence outbreaks occurred as in Central America in the 1970s and 1980s or Rwanda in 1994 (Cohen 2005: 89). Rising food prices can have a major impact on the socio-political stability of developing countries. As grain prices doubled from 2007 to mid-2008, food protests and riots broke out in many Third World countries (Brown 2012). Those riots were directly influenced because of the rise in grain prices.

In the future, food could be used as a weapon by governments in an attempt to control its population. Food production in the less industrialized countries is expected to barely keep ahead of population growth (Brown 2012). This is especially true in resources-poor areas with fragile soils, irregular rainfall, relatively high population concentration and growth rates and stagnant agricultural productivity (Ehrlich 1989; Cohen 2005). Crop production will need to increase drastically in developing countries to meet with the population expectations.

Water

Water, unique when compared to other resources, is the prerequisite for all life forms on earth (Wolf 1998; Wolf et al. 2005; Conca 2005; Sneddon et al. 2010; Brown 2012). It is used to fuel all facets of society from its biology to the global economic

system (Conca 2005; Wolf et al. 2005). There only are there no substitutes for water, but the world needs vast amounts of it to produce food and energy (Brown 2012).

About 98 percent of the world's water is saline and found in the world's oceans and seas. Much of the other two percent of the world's freshwater is locked in glaciers and permanent snow cover in the Arctic (Pirages & DeGeest 2004). About 1% of the world's water is available for human consumption. Freshwater is needed for activities like food, energy, transportation, waste disposal, industrial development and human health (Gleick 1993; Conca 2005). Typically, a human being needs between two and five liters of freshwater to day to survive (Libiszewski 1995). Freshwater is used not only for drinking but also as a large part of the economic development in developing countries. Empirical evidence demonstrates that domestic water is needed to help move people out of poverty (Grey and Sadoff 2007; Hunter et al. 2010; also see MacDonald et al. 2012), state-level cases in sub-Saharan Africa, Eastern Europe and Latin America.

Water is needed for agriculture, which is traditionally the largest source of food and revenue in developing countries (Conca 2005). Agricultural productivity is based on the availability of water, which is governed by climate (Ophuls 1977). Seventy percent of the world water use is for irrigation (Brown 2012), in large part because rain-fed agricultural is very sensitive to the weather, especially the timing and length of a rainy season, the total amount of rain received and the severity of storms (Gleick 1989: 337). Changes in water supply can potentially have devastating implications (Wit and Stankiewicz 2007: 1917). Climate change due to pollution will further increase water scarcity by reducing the availability of useable freshwater (Yang et al. 2003) and increase desert-like temperature conditions (Beadle 1972). The crux of the water problem is that

dependable stream flow in many parts of the world is not great enough to meet the projected needs of those dependent on the streams (Pirages 1978: 93). This can develop into the concept of water stress.

Water stress has been defined as ‘water availability of less than 1,700 cubic meters per person per year’ (Conca 2005: 65). Water stress is the scarcity of water in an arid and semi-arid environment (Falkenmark 1989). This can lead to intense political pressures. Populations in the Middle East and North Africa are competing for very limited supply of water (Pirages 1997; Pirages and DeGeest 2004). Egypt relies almost totally on the Nile River for irrigation water (Pirages and DeGeest 2004; Brown 2012), leaving the country and its population extremely vulnerable to drought conditions along the Nile and its tributaries.

By the 2020s, it is projected that between 374 and 661 million additional people in the Global South will experience water stress (Arnell 2007). Today, more than 1 billion people still lack access to safe drinking water and 2 billion people lack access to basic sanitation services (Pirages 2007). In the future, the world will face substantial challenges to water infrastructures and services in the developing world (Vorosmarty et al. 2000; Pirages and DeGeest 2004).

Energy

Energy has been defined as ‘the capacity or the ability to do work’ (Rowlands 2005; also see Bridge 2011) and is an important resource because it is used to create or transform other vital resources (Pirages and DeGeest 2004; Bridge 2011). Because fossil

fuels have provided much of the energy supplies that created the abundance of the Industrial Revolution (Pirages and DeGeest 2004; Pirages 2007), energy from fossil fuels has been essential to economic development (Ophuls 1977; Pirages and DeGeest 2004; Pirages and Cousins 2005). However, the current global trends demonstrate that our consumption of energy is unsustainable (Rowlands 2005; Pirages 2007).

Access to oil, natural gas and coal has not only closely been related to economic growth (Pirages and Cousins 2005) but developing countries are continuing utilizing traditional means of energy to industrialize. In China and India, about 75% of its current energy use comes from coal (Conley and Phillips 2005). This has enormous impacts on the environment. In the future, there will be an imbalance on the demand and the availability of most energy resources.

The bulk of world petroleum reserves remain concentrated in only a few countries in the Middle East. The five Middle Eastern countries with the largest reserves controls nearly two-thirds of the world total (Pirages and DeGeest 2004; Conley and Phillips 2005). Increased competition among larger and more diversified oil companies has made the market much more complex than in the past (Pirages and Cousins 2005: 11). Future issues of energy will be geopolitical and economic in nature, with Middle Eastern oil being a crucial present and future security concern (Pirages 2007).

Fossil fuels are in a limited supply. Importantly, oil and coal are finite resources. Within the next two or three decades, the world may witness a decline in the production of oil and gas, with negative consequences for the economic, political and social relationships (Cook and Boes 2005). Today, the majority of oil-producing nations are

seeing reduced output (Heinberg 2011). BP's Statistical Review of World Energy reported declines in 27 of the 51 oil-producing nations (Heinberg 2011). Economists are predicting a 'peak oil' dilemma, where the world may have only a couple of decades of huge oil production.

Are we heading towards energy scarcity? Energy adaptation needs to reduce vulnerability to its supply, especially to foreign oil' (Conley and Phillips 2005: 107-108). Developed and developing countries need to begin diversifying energy fuels and technologies. The United States has been weaning itself of fossil fuels. The European Union have enacted progressive legislation dealing with climate change. This will enhance environmental health and build regional interdependence (Conley and Phillips 2005). Failure to do so could result in an energy crisis, an energy crisis that every American would understand as an empty gas tank and flaccid fuel lines (Bridge 2011).

The world must move away from fossil fuels as its primary means of energy. Not only are the oil reserves being rapidly depleted, but also the earth's natural systems are unable to absorb the impact of fossil-fuel usage. In the attempt to solve energy problem by substituting one fossil fuel for another, it's creating severe air pollution and acid rain. This is changing the earth's climate with potentially disastrous implications (Catton and Dunlap 1980; also see Ehrlich and Ehrlich 1972), like scarcity in food supply and human health problems. This will have dire consequences for future populations (Cook and Boes 2005).

Technology

The environment has a symbiotic relationship with technology. Technology is an important aspect in developing an ecological perspective. It is a force that has changed the relationships of human populations with other species and with other supporting ecosystems (Pirages 1983). Modern technological advancements have made us dependent on vanishing resources (Catton 1980). New technologies have not only created an increased demand of natural resources, but also changed the dynamic of the environment. Many developed countries have nearly exhausted their deposits of natural resources found within their territorial limits because of technological advancement (Pirages 1978). A problem is that all activities we label as 'development' tend to have positive and negative subtractions and additions to natural ecosystems (Ophuls 1977: 24).

Technology has been modifying human relationships with the environment by creating by-products that can destroy important links in life sustaining ecosystems (Pirages 1983; Pirages and DeGeest 2004). Technological innovation is a semi-autonomous force that impacts both kinds of evolutions (Pirages and DeGeest 2004: 21). Radical changes in the environment have been largely man-made. Advances in technology have interacted with and altered the environment.

Technology has played a significant role in defining relationships between nations. This relationship has transformed the living standards, cultures and relationships among people and societies (Pirages and DeGeest 2004). The combination of natural resources and technology can explain relationships between states. Technology creates

the demands for natural resources and natural resources receive their full value. This value is important in cultivating relationships among nations.

Interactions from rapidly changing technologies have begun to change with existing societies, institutions and value systems (Pirages and DeGeest 2004). Economic globalization is closely tied to ecological globalization (Pirages and DeGeest 2004). Technological innovation is transforming the world, once composed of thousands of different societies into one global system (Pirages and DeGeest 2004: 18). However, some scholars that argued this create ecological imperialism. This is where pollution is destroying the ecosystems in poorer countries in order to maintain high consumptions levels in richer ones (Pirages and DeGeest 2004: 8).

Technological innovation, demographic shifts and environmental change are identified as driving forces altering the ecological equilibrium (Pirages and DeGeest 2004: 4). This can create discontinuities in evolutionary processes. This can be seen as destabilizing to ecosystems and has political and economic consequences. Technological innovation beginning during the industrial revolution has largely explained climate change.

In summary, in examining each individual variable, the author believes population growth, food production and its prices will become the most important issues to developing countries in the future. Currently, at least half of the world's population is either undernourished or malnourished. We have seen the evidence of populations in countries revolting because of rising food prices. Large populations have more mouths to feed. This impacts the entire global economy.

If global food prices doubled, citizens within the United States would not be directly impacted by it. If global food prices double tomorrow, the citizens of Egypt will be directly impacted by rapid changes in the market. Grain production is already going down in Syria and Iraq but the largest food bubble is occurring in India and China (Mackintosh 2011). Volatility in food prices because of climate change and individual policy changes will impact developing countries.

Ecological Security Theory

Can the ecological framework become a dominant paradigm? Kuhn (1962) argued that a paradigm is a 'set of assumptions'. A paradigm has to meet three conditions: it must provide a metatheory, be accepted by a community of practitioners and have a body of successful practice (Kuhn 1962; Ritzer 1975; Catton 1980; Perterse 1998). Ritzer (1975) argued that a paradigm is a fundamental image of the subject matter within a science. It subsumes and defines interrelates theories, methods and instruments that exist within it (Ritzer 1975: 7).

Is it possible to have a paradigm shift within political science? An ecological framework could be seen as a possible unifying paradigm, offering the environment as acceptable starting point for inquiry (Kuhn 1962; Pirages 1983, 1997). The importance of this shift is that it would measure the revolution of an intellectual framework (Perterse 1998). Political science as a discipline is not in a vacuum. Our discipline has a symbiotic relationship with all sciences, even the hard sciences. The climatic sciences should alter

our image or vision of international relations. Climate change has created an unprecedented impact on the environment and these changes influence human relations.

Paradigm shifts tend to be more dramatic in hard sciences than social sciences. Paradigm shifts in social sciences typically do not negate previous theories but challenge their relevance. So again, the question is, are traditional theories in international relations no longer applicable? No. Traditional theories in international relations could still explain political behavior. However, these theories may not be dynamic enough to explain change in political behavior due to the environment.

Science is defined as 'true', 'objective' and 'value-neutral' (Soderbaum 1998). The discussion about whether or not the ecological framework could become a dominant paradigm should be founded on epistemological and ontological understandings. Epistemology deals with the acquisition of knowledge. Ontology addresses the underlying causes and structures of that knowledge (Forsyth 2003). Our formulation of knowledge is not only about its accumulation but whether or not it is accepted. There is ample, empirical evidence to suggest that climate change is occurring. However, accepting that as proof requires the acceptance by social scientists of that accumulation of knowledge, thereby allowing them to conclude that climate change is, in fact, a reality (Forsyth 2003). If we accept the scientific facts of climate change, then we must accept the high probability and scientific likelihood that this has the potential of being the greatest security threat to human populations.

Ecological security is based on an ecosystemic approach and regards environmental degradation as the primary threat to the survival of human civilization

(Timoshenko 1990). This framework does not exclude the importance of culture and institutions but heighten the importance of *homeostasis* of the ecological factors within the global system (Pirages 1978, 1997, 2007; Catton and Dunlap 1980; Dunlap 1980). This approach has a broader conception of threats to human beings. It moves beyond preparations to repel military assaults from enemy states (Timoshenko 1990; Pirages 1997) instead concerned with preventing destruction to the environment, which impacts human survival.

Patterns of political behavior, relationships among individuals, groups and nations as a whole are derived from diverse ecological sources (Sprout and Sprout 1971). This ecological security framework attempts to conceptualize the relationship between the ecological factors and politics. Disruptions to ecological variables increase the likelihood of political conflict. This framework explains that the ecological resources are fragile and we are subject to ecological laws (Catton and Dunlap 1980). Climate change impacts food, water, energy and population. Similarly, breaking laws (like within the criminal justice system) has consequences.

The idea of survival is based on the idea of values, while the precondition for having any values at all rather than as a prime value itself (Ophuls 1977). A basic human instinct is individual survival *and* the survival of the larger community, which means that we, as humans, are hard-wired to consider the effects of our actions not only on ourselves but also a broader portion of the population. Empirical research demonstrates that we are destroying the earth. We need to view international relations through an ecological lens. Noble intentions and a modicum of ecological information will not suffice (Catton 1980). An understanding of future political problems of climate change requires a truly

ecological perspective. Therefore, politics *must* rest on an ecological foundation (Ophuls 1977; Pirages 1983, 2007).

Traditionally, the term security has meant the effort to protect a population and territory against organized force while advancing states interest through competitive behavior (Pirages and DeGeest 2004: 19). However, we need to incorporate humanitarian and environmental concerns to the security agenda (Pirages and DeGeest 2004). Challenges to security could stem from the environmental impact on societies (Pirages and DeGeest 2004). There has been a history of security concerns dealing with rapid population growth, food and water scarcity, poverty and environmental deterioration (Pirages 1983, 1997). Thinking of security in multidimensional terms allows us to get away from prioritizing military issues that have been central to the agenda of traditional international relations (Tickner 1992).

This study argues that political behavior is impacted by ecological factors. Similarly, regional instability impacts the international economic system. Ideally, the study of international relations should be systematic, flexible and fluid, where policy approaches can adapt. The rapidly changing environment is a security risk to human populations throughout the world, but in the developed countries.

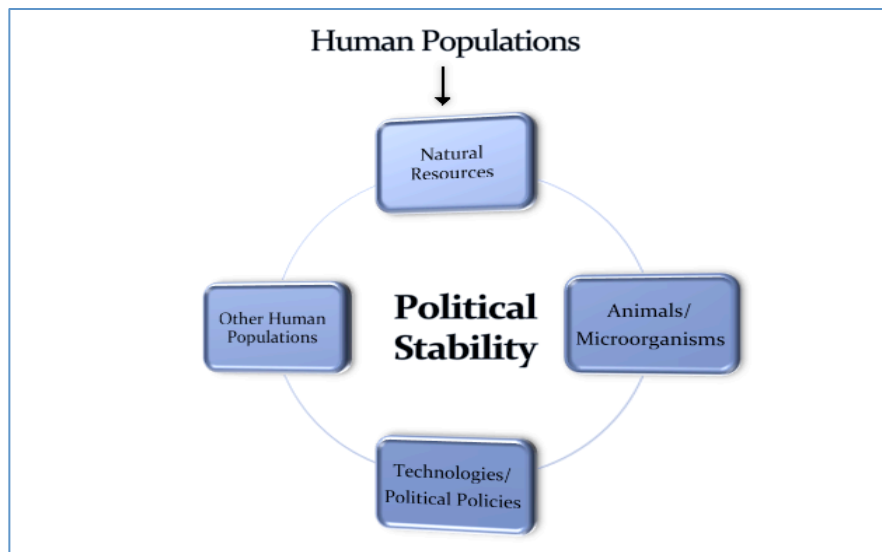
Ecological security argues the preservation of **four** dynamic equilibrium or balances:

- Populations relationship between natural resources and nature's ability to provide resources;
- Populations relationship between the size and demands of human populations and those of other animals;
- Populations relationship between new technologies and political policies;

- And a population relationship between the growing resource demands of other populations and the ability to manage potential conflicts over them (Pirages 1997, 2004; Pirages and DeGeest 2004; Pirages and Cousins 2005).

Significant disruptions in any of these four equilibriums will have social, economic and political consequences. According to Figure 2.1, the likelihood of instability increases whenever any of these equilibriums is disturbed, either by changes in human behavior or changes in the environment (Pirages and Cousins 2005; Pirages 2007). The concept of interconnectedness or globalization has made the environment even more complex and very sensitive to any disruptions.

Figure 2.1: Ecological Security Theory



Source(s): Pirages and Cousins 2001.

Ecological security is strengthened when the need for resources and environmental services can be met without damaging sustaining natural systems (Pirages and DeGeest 2004). Preventing cross-border environmental damage is the most important principle of ecological security (Timoshenko 1989). The ecological security framework is a useful way of thinking about the predicaments of the world's various populations. Human activities are producing unprecedented changes in the global ecosystem and these changes are creating significant consequences for human societies (Dunlap and Catton 1994).

Conclusion – What is the Outlook of International Relations?

Political scientists need to become more future-focused. This means adopting dynamic theories and strategies that measure impending problems (Orr and Soroos 1979). Political scientists should continue to construct a new ecological paradigm that unites nature and society and possesses full understanding that the priority should be given to nature (Ehrlich 1989; Grendstad 2007). The discipline of international relations needs to be more *international*.

Demonstrated by the 2008 world recession, the global economic system is highly interconnected. So too is the global ecosystem. Regional environmental problems cannot be understood in isolation from a global political and economic context because they are created there (Branyt 1997). Social phenomena occur within and are shaped by a complex, interrelated network of factors that spans multiple variables domains and levels of analysis (Maton 1993). Resource scarcity has increased opportunity for revolutions or

social movements throughout the developing world. Social movements are often groups of people attempting some form of political change. These disruptions can impact the international economic system. Changes to the environment or natural resources should be approached through a framework that possesses openness to human adaptation and an acknowledgment of a rapidly changing environment that is also highly reliant on/highly interconnected with a number of other factors and actors.

Environmental problems facing the Third World were constructed from international political and economic forces (Branyt 1997). Scarcity is enlarging the gap between rich and poor and developed and undeveloped countries. These problems will only be exacerbated in the future. Rapid growth of populations in developing countries may lead to serious problems for future generations, potentially in the form of widespread starvation, resource shortages, high rates of inflation, industrial collapse, political instability and other forms of physical violence (Soroos 1979).

Creating institutions that address the relevant demographic, environmental, technological sources of disequilibrium among societies can strengthen security. This will alleviate potential quarrels before they are transformed into protracted social conflicts (Pirages and DeGeest 2004). Since control over nature resources has now become a source of power (Pirages 1978), the international community must establish regulations before it's too late.

According to the United Nations Environment Programme (UNEP) Report on the State of the Environment, the most alarming ecological crisis is climate change (Timoshenko 1990). To examine the political implications of climate change in developing countries, an environmentally focused analysis is imperative in making

empirical generalizations. The next chapter will discuss in depth the science behind climate change and its ecological and political implications.

Chapter 3

The Challenges of Climate Change

Climate change has and will be one of the most complex challenges in international relations. Future policy decisions will not be based on a simple choice concerning a high-growth or high-carbon world but a question of whether to preserve the planet for future generations (World Bank Development Report 2010). Multiple international organizations are dedicated to understanding the complexities of this phenomenon.

As early as 1998, two organizations, the United Nations Environmental Programme and the World Meteorological Association (WMO) began to take up of the fight against climate change, establishing the Intergovernmental Panel on Climate Change (IPCC) (IPCC 2007; 2013; Park 2005). Made up of prominent climatologists around the world, the mission of the IPCC has been to assess the scientific, environmental and socioeconomic impacts of climate change (Park 2005). The IPCC gives a report, the largest scientific review of climate change, every five years (Downing et al. 1997; Kjellen and Wallenstein 2012). It's important to note that the IPCC does not give specific policy recommendations but informs policy makers with the facts and scientific data gathered from peer-reviewed journals.

In the beginning of this chapter, there will be a discussion of the science behind climate change. From there, the author will take up the ecological and political impacts of climate change, describing the true importance of climate change (to political scientists) and natural events, such as disasters, droughts, the rise of sea level, diseases and

migration, events that have been exacerbated by global warming over the last 25 years.³ In the latter portion of this chapter, there will be a discussion of the early history of climate change in the social sciences, the securitization process, and how climate change is a threat multiplier. Finally, the author gives briefly examines the future outlook of global warming. Continuing down the current path will have negative ramifications for this planet. The global community must collectively solve the problem of climate change.

The Science of Climate Change

Simply, climate is the distribution of the weather average. The climatic system is a complex, interactive system consisting of the atmosphere, land surface, snow, ice, oceans, and living things (Parks 2005; Treut et al. 2007; World bank Development Report 2010). Since the cold periods in Holocene age (about 12,700 years ago) to the Anthropogenic age (about 2,000 years ago), we are able to statistically determine average weather conditions (Brauch and Scheffran 2012). Scientists are able to calculate the average temperature from more than 100,000 years ago and make accurate predictions on its mean. Climate change, then, is a significant variation in these averages. According to the IPCC, climate change is a ‘change in the state of climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer’ (IPCC 2007; 2013).

Around 125,000 years ago, the average global temperature was only about 1°C higher than it is today (Perch-Nielsen 2004; Parenti 2011). The Holocene era began with

³ Throughout this project, the author uses ‘climate change’ and ‘global warming’ interchangeably.

the end of the glacial period more than 12,000 years ago. During the last Interglacial Period (about 129,000 to 116,000 years ago), the peak global warmth was not more than 2°C. This was the pre-industrial temperature. During this time, the peak global annual sea surface temperature was about 0.7°C (IPCC 2013: 15). The temperature enabled the onset of major human progress and the development of advanced civilizations in the Mediterranean, China, India and Mesoamerica (Ehrlich and Holdren 1974; Brauch and Scheffran 2012).

The earth's climate has never been at a standstill. For the past 2.7 million years, it has shown a pattern of alternating between long ice ages and shorter interglacial periods. This system has been governed by cycles of the Earth's orbit around the sun (IPCC 2007; McNeill 2008: 26). The last ice age was about 120,000 years ago and since then, the global climate had changed slowly until the industrial age. Climatologists argue that during the Industrial Revolution is where human behavior begun to change the environment. Since then, global average of greenhouse gases (GHGs) concentration has increased drastically (Pirages 1996; Ruth 2005; IPCC 2007, 2013; Allen et al. 2010; World Bank Development Report 2010; Brown 2012).

The earth's climate is partly regulated by the presence of these greenhouse gases and particles in the atmosphere. The main GHGs are water vapors, carbon dioxide (CO₂), methane, nitrous oxide and chlorofluorocarbons (CFCs). Each possesses different chemical and physical properties, including concentration in the atmosphere (Ruth 2005). Out of the GHGs, CO₂ does the greatest impact to the environment. CO₂ has increased from a pre-industrial value of about 280 ppm to 379 ppm, since 2005 (IPCC 2007; Bodansky 2010; World Bank Development Report 2010). However, each gas has a

different capacity to upset the radiation balance, which is called *climate forcing* (Ruth 2005).

These gases help control Earth's temperature; GHGs in the atmosphere allow the sunlight to enter and absorb heat radiation. It is penetrated by short-wave radiation and trap the long-wave radiation reflected back from the earth (Ruth 2005). This is the greenhouse effect. Greenhouse gases (GHGs) in the atmosphere allow the sunlight to enter and absorb heat radiation. GHGs warm Earth's surface by impeding the escape of infrared (heat) energy into space (World Bank Development Report 2010).

Without this, the world's average temperature would be about 33°C or 91°F. This process allows life on earth to exist. Climate organizations like the IPCC and WMO, estimate the future of climate change by the amount of GHGs in the atmosphere, based on the 1961 – 1990 average (Hulme and Viner 1996; Conway and Hulme 1996; Ruth 2005; Wallbott 2012).

With the ground absorbing more heat radiation, snow and ice has been melting at unprecedented rates. This cycle is self-reinforcing because as melting reveals the darker land and water surfaces that were beneath the snow and ice, the darker surfaces have absorbing more of the Sun's heat causing more warming, which in turn leads to more melting (Treut et al. 2007). This is called '*ice-albedo feedback*'. This amplifies global warming. The rising level of greenhouse gases in the atmosphere is changing the climate on our planet.

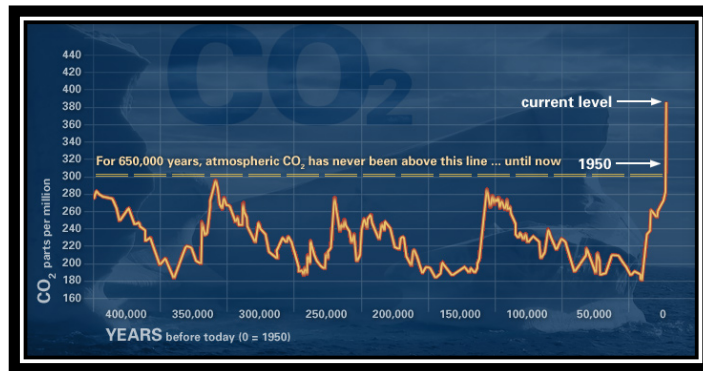
The change of the climate has also occurred though natural processes. Climate change is taking place due to 'natural internal developments, external forcing, and

persistent anthropogenic changes in the composition of the atmosphere or in land use' (IPCC 2012). Solar forcing and volcanic eruptions have the two dominant natural contributors to global climate change during the industrial era (IPCC 2013). However, the atmospheric concentration of carbon dioxide and other trace gases has been increasing at historic levels due to unnatural mechanisms. This comes from the combustion of fossil fuels, industrial activities and deforestation (Gleick 1989). This is solely human activity. Human actions have changed and continue to change the Earth's surface and atmospheric temperature (IPCC 2013).

Using those amounts, climatologists are predicting a rise in temperature for the global weather from 1.4°C to 5.8°C by 2100 (Schlesinger and Mitchel 1985; Karl and Riebsame 1989; Treut et al. 2007; Campbell and Parthemore 2008; Fuerth 2008; Gullede 2008; Woolsey 2008; Allen et al. 2010; Bodansky 2010; World Bank Development Report 2010). Atmospheric CO₂ will increase from the current concentration of 370ppm to about 500 ppm by 2100 (Houghton et al. 1997; Gullede 2008). This will dramatically increase the average global temperature in the next century.

The impacts of CO₂ released into the atmosphere will be felt for decades, even millennia (Allen et al. 2010; World Bank Development Report 2010). According to Table 3.1, the rise of CO₂ is at historic levels. A return to a 'safe level' is statistically unlikely for years to come. The combustion of coal, oil and natural gas contributes to about 80% of the CO₂ emitted annually (World Bank Development Report 2010). The use of these energy sources has not slowed down enough to make a difference.

Table 3.1: Carbon Dioxide Levels



Source(s): National Aeronautics and Space Administration (NASA)

Three Plausible Scenarios of Climate Change

First, modeling climate change must assume a level of unpredictability. Scientific predictions on climate change are based on the scientific method. This objective analysis attempts to reduce biases and/or political influences in its scientific findings.

The WMO and IPCC use global circulation models (GCMs) to make mathematical predictions of climate. These are comprehensive, global, three-dimensional models, which are calculated through supercomputers (Perch-Nielsen 2004; IPCC 2013). They measure the magnitude of climate change based on different variables, like food production and sea level (Parry et al. 1999). These mathematical simulations are based on physical laws of long-term atmospheric conditions (Edwards 1999). Regional climate models (RCMs) make predictions on climate locally and are used primarily for policy-making⁴.

⁴ The World Meteorological Organization. 2014. "Climate Models". http://www.wmo.int/pages/themes/climate/climate_models.php

The IPCC's 2013 report has outlined the potential impacts of climate change into three scenarios: *expected* climate change, *severe* climate change and *catastrophic* climate change (Gulledge 2008). Scientists generally agree that climate change is *going* to happen and our future actions to prevent it might not make a difference in the end. However, if climate change can be mitigated, there might be different scenarios that could unfold.

The IPCC defines a scenario as a 'coherent, internally consistent and plausible description of a possible future state of the world' (IPCC 2008; 2013; Gulledge 2008). Scenarios are not predictions or forecasts but are alternative images without ascribed likelihood of how the future might unfold (Gulledge 2008).

The first scenario is the likelihood of the *expected* outcome of climate change. In this scenario, by 2040 the average global temperature will rise 1.3°C (2.3°F) above the 1990 average (Gulledge 2008). This is the best-case scenario. In this instance, the global community will have taken the necessary steps to alleviate changes of the climate. Climate quotas will have been achieved and the international community would be on the right track in terms of combating this global problem.

The second scenario demonstrates the likelihood of the *severe* consequences of climate change. Although the warming of 2.6°C (4.5°F) seems highly unlikely on a thirty-year time scale (Gulledge 2008; IPCC 2013), scientists predict that this could be the world's climate in the next 65 years. In this scenario, climate change will cause the Greenland and West Antarctic ice sheets to become unstable. The disintegration of the West Antarctic Ice Sheet would have drastic effects on regional weather patterns (IPCC

2007; 2013). Four to six meters (13 to 20 feet) of fresh water will be dumped into the oceans (Gulledge 2008). This scenario is likely if the international community does not take the necessary steps in the next 50 years.

The third scenario is based on *catastrophic* consequences of climate change. Doubling an IPCC projection 5.6°C (10.1°F) warming would occur by 2095, relative to the 1990 average (Gulledge 2008). Mountain glaciers will be virtually nonexistent and the annual snowpack will be dramatically reduced. It might seriously affect regions where large human populations have traditionally relied on glaciers and annual snowfall for water supply (Gulledge 2008). Millions of gallons of freshwater would be dumped into our oceans. This could completely shut down the ocean thermohaline circulation (IPCC 2007; 2013). This would drastically impact the climate in North America and Western Europe. In this scenario, the current GHGs are not only maintained, but have vastly increased.

The Ecological Impacts of Climate Change

The physical impacts of future climate change will result in ‘collapses of ecosystems, biodiversity loss, changing the timing of growing seasons, coastal erosion and aquifer salinization, permafrost thaw, ocean acidification and shifting ranges for pests and diseases’ (World Bank Development Report 2012: 76).

As the climate begins to change, we are likely to start experiencing a higher statistical probability of fluctuation in the weather. Ecosystems have already begun to experience increases in the frequency and severity of extreme droughts, hot extremes and

heat waves (Ruth 2005; Allen et al. 2010). Heat fluctuations throughout the atmosphere and oceans, combined with changes in the reflectivity of the earth's surface will have an effect on the frequency and severity of climate events around the globe (Ruth 2005; Morrison et al. 2009). As the earth's average temperature has increased, recent weather phenomena have become more frequent and intense (e.g., heat waves and heavy downpours), while others have become less frequent and intense (e.g., extreme cold event) (Trent et al. 2007: 122). As the climate continues to change, what is currently happening will continue to unfold at a greater extent.

Downfalls of civilizations in the past can be credited to changes in the climate and/or environmental degradation. Overgrazing and poor cultivation practices have contributed to the expansion of the Sahara Desert and destroyed large pasturelands in the American Southwest (Holdren and Ehrlich 1974). The Rajasthan desert in India is believed to be partly a product of population pressure (Holdren and Ehrlich 1974). Preindustrial men deforested much of Europe and Asia. Research indicates that the Mayan civilization in Central America collapsed due to over-cultivation of the soil (Holdren and Ehrlich 1974: 284). The Irish potato famine has been a good example of the collapse of a simple agricultural ecosystem.

Increases in high intensity precipitation events are expected in many regions around the world. The number of wet spells will increase at mid and high latitude places in the winter, while the frequency of summer droughts will increase in many interior continental locations (IPCC 2001). There has been about a 2 – 4 percentage increase in the frequency of heavy precipitation events in the North hemisphere in the last half of the twentieth century (Ruth 2005).

In warmer or tropical environment, climate change may result in more intense rainfall events between prolonged dry periods, as well as reduced or more variable resources for irrigation (Rosegrant and Cline 2003). Climate change has made rainfall less predictable, with farmers in developing countries confused and unable to cultivate their goods (Nkuepo 2012).

Millions living in densely populated coastal areas and/or island nations may lose their homes due to the rising of sea levels (World Bank Development Report 2010). In other regions, climate change will reduce availability and access to freshwater (Xenopoulos et al. 2005). Climate change will likely affect the volume and timing of river flows and groundwater recharge (Arnell 2004).

The impact of the environmental changes has caused political instability. In the next section, the author will examine the natural events, which have been impacted by global warming. While the individual person cannot distinguish between the mean temperatures from year-to-year, natural events are a more palpable measure of climate change have and will continue to impact political stability in developing countries.

Natural disasters

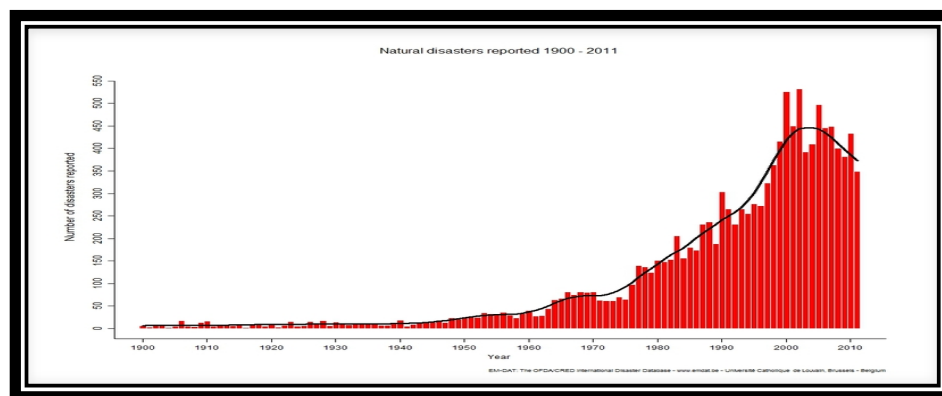
Natural disasters are fairly common events, however the frequency and strength of their occurrence has been increasing over time according to Table 3.2 (Guha and Sapir 2004; Cavallo and Noy 2010). Extreme weather conditions will lead to more serious natural disasters. The IPCC (2013) projects a sharp rise in extreme weather events in the near future (Guha and Sapir 2004; Gullett 2008; Wallbott 2012). Population growth,

urbanization and the instability of developing countries will increase the number of people who are vulnerable to natural disasters and environmental emergencies (Guha and Sapir 2004: 13).

Natural disasters are natural phenomenon resulting in general disruption, destruction, loss of life and livelihood and injury (International Decade Natural Disaster Reduction 1992). There are different types of natural disasters like earthquakes, floods, hurricanes, tsunamis, landslides, avalanches, typhoons, volcanic eruptions and droughts.

The impact of natural disasters has typically been measured in human casualties and destruction, in terms of lives lost or homes destroyed (Guha and Sapir 2004). From 1992 to 2011, more than 530,000 people died as a direct consequence from almost 15,000 natural diseases (Harmeling and Eckstein 2013).

Table 3.2: Number of Disasters

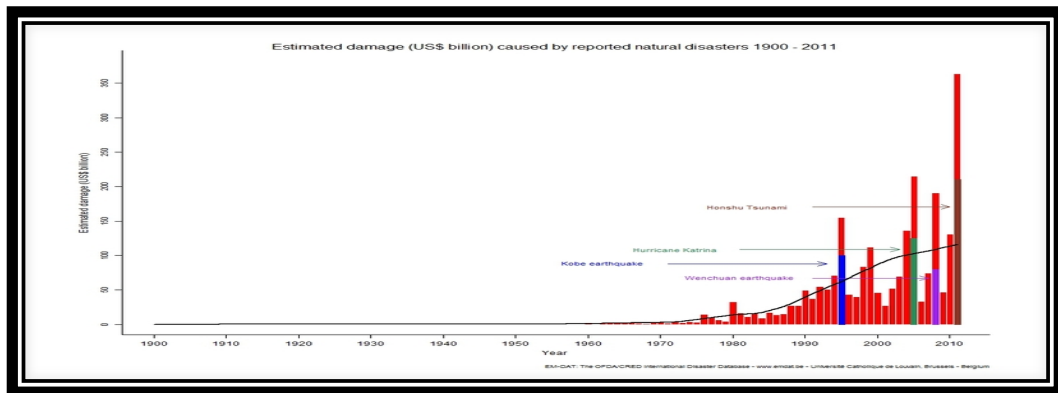


Source(s): The International Disaster Database, 2014.

Developing countries have suffered \$35 billion (USD) dollars a year in damages from natural disasters (Mirza 2003). This has resulted in damages more than \$1.68 trillion (USD) dollars worldwide (Harmeling and Eckstein 2013). According to Table 3.3, the world is on an unprecedented track for damages resulting from natural disasters. The rising damages for developed and developing countries are at historic levels. Major natural disasters like Hurricane Katrina and the Honshu Tsunami have cost billions of dollars and thousands of lives.

Countries that lack strong governmental institutions increase the likelihood of political instability in developing countries faced with expensive natural disasters. Poor infrastructure and weak disaster adaption combined with historical and socio-economic factors make these countries more vulnerability to natural disasters.

Table 3.3: Natural Disaster Damage



Source(s): The International Disaster Database, 2014.

According to the Munich Reinsurance Company, the year 2008 was the third worst year on record for natural disasters, costing the United States over \$200 billion dollars in damages.⁵ Researchers are also discovering that wildfires are occurring at a higher rate since the turn of the 21st century as opposed to the previous 25-year time period.⁶ It is difficult to say empirically say that the rise in natural disasters is directly related to global warming. However, extreme weather events exceeding historical averages should be expected as a general consequence of climate change (Gulledge 2008).

Warming temperatures are allowing strong storms to get even stronger (Cavallo and Noy 2010). Some research argues that climate change might not implicitly mean more storms but more intense and deadly storms. The intensity of storms has been increasing over the Gulf of Mexico and in the Caribbean Sea, where ocean temperatures are warmest. Scientists have recently observed stronger hurricanes and tropical storms in the Latin America and Caribbean region (Jagger and Elsner 2010). Similarly, an increase in ocean temperatures over the Atlantic Ocean has caused hurricanes to get stronger (Jagger and Elsner 2010).

In the future, super storms will be more frequent. Several studies argue that as global sea surface temperature rises, hurricanes may become more intense. Also, the range of hurricanes will increase from the north and south on the ‘hurricane belt’

⁵ The National Category Service. 2008. “The World Map of Natural Disasters.” <http://www.munichre.com/en/homepage/default.aspx>

⁶ Elizabeth Ferris, Daniel Patz and Chareen Stark. 2011. “The Year of Recurring Disaster”. There were 156 wildfires between 2000 and 2011. This amounted to about 780 deaths. Although many do not consider wildfires as natural disasters, the destructive nature of wildfires and its occurrence may change this.

(Webster et al. 2005; Cavallo and Noy 2010). Developing countries will be those most impacted by these super storms. Children and women are particularly vulnerable during disasters. Eight-five percent of the deaths during disasters are women and children (Mirza 2003).

Droughts and Desertification

Droughts have a long history of producing damage and deaths. Longer periods of drought and famine have contributed to the sudden collapse of advanced civilizations throughout history (Hillel and Rosenzweig 2005; Brauch and Scheffran 2012). Drought is a ‘natural hazard with the greatest spatial and temporal extent, as a protracted decrease in precipitation, which can occur in any region’ (Kassas 1994; Le Houerou 1995; Sternberg 2011). In the early twentieth century, the deadliest droughts occurred in China from 1928 to 1931, and again in 1936 and in 1941, resulting in between two million to five million deaths on each occasion (McNeill 2008; Webersik 2010).

Over the past 25 years, droughts have been occurring more frequently (World Development Report 2010). Semi-arid regions in developing countries are already marginalized from environmental degradation. In the future, those semi-arid regions may be soon uninhabitable due to small decreases in precipitation or water-runoff (Gulledge 2008). If a dry region becomes drier and warmer, the decreased water availability will be exacerbated by an increased water demand (Doll 2002).

Climate change will increase water stress in parts of the developing world. Research indicates that water runoff will drastically decrease due to global warming

(Arnell 2004). In 1997, approximately a third of the world's population was living in countries deemed to be suffering from water stress (Arnell 2004). Today, one to two billion people may no longer have enough water to meet their dietary needs (World Development Report 2010). Drought is creating desert-like conditions, which is impacting access to water for number populations.

Desertification is the process by which an area becomes (or is made to become) desert-like (Kassas 1994; Kepner et al. 2003; Hillel and Rosenzweig 2005). This process is also called land degradation. The difference between drought and desertification is drought is relative to the normal or statistical average. Desertification results from land abuse alone, which can be caused without drought (Le Houerou 1995). Desertification is a worldwide phenomenon estimated to affect 40 million km² or approximately one-third of the Earth's surface area. Also, it impacts more than 1 billion people in over 110 countries (Kepner et al. 2003: 3). Desertification can hinder efforts for sustainable development. Also, it introduces new threats to human health, ecosystems and national economies (Koyro, Ahmad and Geissler 2012). This environmental degradation can lead to famines.

However, importantly, desertification is man-made. Consensus in the international community is that the Sahara was greener in the past than it is today (Claussen et al. 2003; Verstraete et al. 2008). Currently, the Sahel and Mediterranean regions have seen more intense droughts, which have led to increased desertification (World Bank Development Report 2010). The devastating consequences of drought, desertification and water scarcity will be felt all over the world (Koyro, Ahmad and Geissler 2012). Developed countries are also seeing the results from desertification.

Australian said that persistent drought had slashed predictions of winter harvests by nearly 40% or four million tons (Heinberg 2011: 38).

In 1977, a United Nations Conference on Desertification (UNCOD) was convened in Nairobi (Le Houerou 1995; Giannini, Biasutti and Verstraete 2008). This is where the participating countries codified a definition for desertification and confirmed it at the Earth Summit on Environmental and Development held in Rio de Janeiro in 1992 (Le Houerou 1995). Out of Rio de Janeiro, the United Nations Convention to Combat Desertification (UNCCD) in 1994 was formed. The objective was twofold: to combat desertification and mitigate the effects of drought (Brauch 2003).

Sea Level Rise

Rising sea levels will be one of the greatest dangers to developing countries (Parenti 2011). Increased temperatures will lead to the melting of fresh water in the Arctic, the Andes and the Himalayas (Webersik 2010; IPCC 2013), thereby causing global sea levels to increase 25 years. Glaciers and large ice sheets will turn from solid into liquid (Gulledge 2008; IPCC 2013). For instance, the massive ice sheet in Greenland has begun melting for the first time in history in July 2012⁷ contributing even more water to the world's oceans. Climatologists argue that the Antarctic Ice Sheet has been losing ice at an unprecedented rate during the last two decades (IPCC 2013). On the whole, mountain glaciers and snow cover have declined on average in both hemispheres, which is contributing to the rise of the sea level (Ruth 2005; IPCC 2007). If the flow of these ice

⁷ The Associate Press. 2013. "Greenland Massive Sheet Melting."

streams accelerates without an increase in snow deposition on the glaciers or ice sheets, sea levels will rise (Gulledge 2008; Cavallo and Noy 2010).

Additional, empirical observations are showing that oceans have been absorbing more than 80 percent of the heat from the sun. This is contributing to the expansion of the seawater, which is drastically causing the sea level to rise (Ruth 2005; IPCC 2007; Gulledge 2008). Land collapsing from mining, natural gas and ground water extraction has significantly sped up the effects of the sea level growth (Ruth 2005) and impacting food production. Most climatologists predict that the sea level will rise from 15cm to 95cm by 2100 (Houghton et al. 1997; Ruth 2005).

Like the causes, the consequences from a rise in sea level are several. Sea level increases will affect food security in developing countries. Significant fertile deltas will become largely uncultivable because of inundation of water and more frequent and intense storms (Burke 2008). About one-third of the world's population lives within 60 kilometers (about 17 miles) of a coastline (Campbell and Parthemore 2008). Theoretically, there could be a major refugee crisis if the widespread sea level rises predictions are correct. Sea level rise due to climate change could displace hundreds of millions of people in developing countries (Campbell and Parthemore 2008). According to the UN's World Food Program (WFP), catastrophic floods (Heinberg 2011: 38) have impacted 57 countries (29 in Africa, 19 in Asia and 9 in Latin America).

In 2010, it was reported that the Marshall Islands would eventually disappear because of rising sea levels.⁸ The United Nations is struggling to devise a legal framework because a nation has never disappeared due to environmental factors. If a country's land becomes inhabitable because of global warming, what would happen to their economic rights, citizenship and sovereignty? Where would they go? The next section addresses some of these challenges.

Migration

Environmental change (both natural and manmade) is a recognized cause of migration while migration has also become a cause of environmental change (Brauch 2003). Climate change will impact the lives of millions of people who will be forced to migrate leaving their villages and cities to seek refuge in other parts of the world (Biermann and Boas 2012). Migration is defined as the 'geographic movement of people across a specific boundary for the purpose of establishing a new permanent or semi-permanent residence' (Perch-Nielsen 2004: 16). In 1990, the IPCC predicted that the 'gravest effects of climate change may be those on human migration' (Perch-Nielsen 2004; Parenti 2011). Columbia University's Center for International Earth Science Information Network (IESIN) predicts that 700 million to a billion climate refugees will be on the move by 2050 (Webersik 2010; Parenti 2011).

The terms environmental refugees, environmental migrants and environmentally induced migration have starting becoming more frequent in social science literature. The

⁸ Lindsay Christ. 2010. "Marshall Islands: Marshall Islands Disappearing Due to Global Warming?" *The Long Island Press*.

term ‘environmental refugee’ was first suggested by Lester Brown (1976) and has been used by social scientists since. However, international laws have not recognized a person’s right in becoming a refugee due to climatic factors. Refugees are legally defined as ‘people persecuted for racial, nationality, religious or political reasons’ by the United Nations (Perch-Nielsen 2004). Currently, there are no legal protections for refugees created by the environmental factors.

The main agency in the United Nations system for the protection of refugees is the *United Nations High Commissioner for Refugees* (UNHCR). Currently, the current legal regime relating to refugees provides only marginal protection. But again, there is no specific mandate concerning climate refugees (Biermann and Boas 2012). Climate migrants or environmental refugees caused by tropical cyclones, associated floods and landslides, droughts, and sea-level rise could trigger competitions over land with violent outcomes in the receiving country or region (Webersik 2010: 67).

Perhaps the modern era’s first climate refugees were the 500,000 Bangladeshis, who were left homeless when half of Bhola Island flooded in 2005 (Parenti 2011: 7). Scientists argue that Bangladesh may lose up to 20% of its land by 2030 as a result of flooding.⁹ Many developing countries in the world have similar land composition to that of Bangladesh. With many countries barely above sea level, the world will begin to experience vast amounts of environmental refugees in the near future.

⁹ Emily Wax. 2007. “In Flood-Prone Bangladesh, a Future That Floats.” *The Washington Post*.

Diseases

Climate change will have an impact on human health in the immediate future. The World Health Organization (WHO) projects that the number of deaths linked to climate change could exceed 300,000 a year by 2030 (Podesta and Ogden 2008). Scientists and experts within the United Nations expect changes in the climate to multiply the number of human health illnesses and death (Eckstein 2010: 420) in the developing countries. The WHO acknowledges that global warming may bring some localized benefits like fewer winter deaths and increased food production in particular regions around the world.¹⁰ However, the overall damage from climate change will vastly outweigh the good.

Climatic conditions have strongly affected water-borne diseases and diseases transmitting through insects, snails or other cold-blooded animals.¹¹ The increase of diseases will inevitably generate disputes between nations over the movement of people due to globalization (Podesta and Ogden 2008). In countries with weak or nondemocratic governments, there is an increased risk of instability that could lead to civil war or toppling of the government altogether (Podesta and Ogden 2008).

One of the consequences of climate change is rapidly spreading malaria. Transmitted by Anopheles mosquitoes, malaria kills almost one million people every year in developing countries.¹² Research performed on climate change and diseases

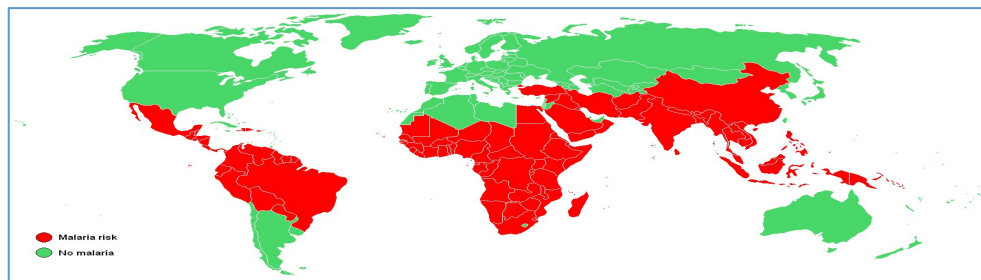
¹⁰ World Health Organization. 2014. "Climate Change and Health."

¹¹ See note 10 above.

¹² See note 10 above.

empirically discovered empirical evidence for a connection between temperature increases and malaria. According to Figure 3.1, malaria is mostly impacting developing countries. However, the rise of temperatures by in the year 2100 will increase the risks of reintroducing malaria into non-malarial areas like Australia, the United States and Southern Europe (Martens et al.: 463).

Figure 3.1: Microbiology Transmissions



Source(s): Emily Lewis and Charlotte Didlake. 2010.

West Nile Virus (WNV) is a vector-borne pathogen. WNV transmission is multifactorial. However, increases in summer temperatures are important when evaluating the risk of WNV transmission (Paz et al. 2012). Climate is one of the several factors that influenced the distribution of vectorborne and zoonotic diseases like the West Nile Virus, Malaria and Lyme disease (Paz et al. 2012). 2010 was one of the warmest years ever recorded since the beginning of instrumental climate records in 1850 (Paz 2012). That summer, the air temperature was significantly higher than normal, which vastly increased the risk for WNV (Paz 2012). There were 1,021 documented cases of WNV in 2010¹³ as

¹³ Christian Noroqvist. 2010. "1,021 Cases of West Nile Virus in 2010 in USA, Says CDC Report". *The Center for Disease Control*. The document cases were in US states and District of Columbia, where Arizona had the highest incidence 1.6 per 100,000 populations.

compared to a limited number of cases in the previous year. Those numbers have remained high since 2010 with 712 in 2011 documented cases and in 2012 and 5,674 cases of WNV in 2012.¹⁴

The relationship between climate change and diseases works in other ways as well and is not merely a question of an increase in mosquitoes. An increase in the intensity of rain events will intensify soil erosion, thereby increasing the volume of suspended solids in lakes and reservoirs. This will result in greater amounts of pathogens and other dissolved pollutants living in water (Eckstein 2010), elements that can easily cause humans and other animals to become ill.

Another disease that has been surviving longer because of a warming climate has been Ebola. Ebola has an incubation period of five to ten days, is highly contagious and deadly in most cases if not treated (Razvan Paraschiv 2012). It is extremely difficult to diagnose the early stages of Ebola with as the early signs of symptoms – high fever, diarrhea and muscle pains (Hewlett and Hewlett 2008). The mortality rate for this virus is about 90 percent (Hewlett and Hewlett 2008). In the case of Ebola fever, victims are infected with multiple symptoms like bleedings, disruptive digestive tract, lungs and eyes (Razvan Paraschiv 2012).

Humans can contract Ebola through rodents, bats and/or insects. When in contact, humans can become infected if these animals or organisms carry the virus (Razvan Paraschiv 2012). It can also be transmitted through direct contact with the blood,

¹⁴ Centers for Disease Control and Prevention. 2014, ArboNET, Arboviral Disease Branch.

secretions or organs of infected persons (Hewlett and Hewlett 2008). Currently, there are still no antiviral drugs that have been comprehensively used to cure Ebola.

How does climate change impact Ebola? Food scarcity is one of the many outcomes of the rapid spread of Ebola in a climate-changing environment. Populations in developing countries are continually relying on bushmeat, which they consume without knowing that it is infected with the virus. Bushmeat is meat mainly from non-domesticated animals (like bats, gators, monkeys, etc.). These animals carry numerous diseases, including the Ebola virus. Climate change impacts not only the weather, but also contributes to the spread of diseases. There is a currently outbreak of Ebola in sub-Saharan Africa today, where many people are dying from this infectious disease. Climate change mixed with globalization is helping to spread this disease like wildfire. Diseases are just one of the ecological consequences of climate change, which can impact international security.

Climate Change's Global Perspective

Social scientists began researching climate change as a sub-field towards the end of the 1970s (Brauch and Scheffran 2012). Paul Ehrlich (1968) and Lester Brown (1987) are some of the early scholars to articulate human impacts on a fragile environment. Brown (1987) argued that the change in climate could impact environmental variables like wheat and corn. This is where he coined the term, 'geo-politics of food' (1977; 2012). One of the most prominent scholars on environmental-conflict studies, Thomas Homer-Dixon (1991; 1994; 1999) has argued that rapid changes in the environment will

drastically impact populations in developing countries. Research conducted by various environmental scholars has focused on the connection between conflict and climate (Homer-Dixon 1999; Webersik 2010). The overall research has pushed the international community to develop organizations to better understand this phenomenon.

Since the international climate change negotiations began in 1991 under the United Nations Framework Convention on Climate Change (UNFCCC), the climate change regime has developed into several phases: Kyoto Protocol (1992), the elaboration of the Kyoto Protocol (1997) and the Copenhagen conference (2009) (Bodansky 2010). Most countries have taken part in these negotiations, with some of the meetings leading to binding legal obligations to reduce carbon emissions. In 2010, the Cancun agreements established acceptable levels of global warming below 2°C or 1.5°C (Karthan and Erickson 2011). The next set of negotiations is due to take place in 2014 in Peru.

However, the scientific research on climate change has not always been conducted in the most positive light. 'Climategate' is an international event/affairs in which a number of emails between climate scientists from Great Britain and the United States were released without authorization (Leiserowitz et al. 2013). These scientists were accused of fabricating climatic data to augment the importance of climate change. Committees who looked into these allegations found little evidence of fraud or misconduct. However, Climategate has had a political impact on public opinion, especially in the United States (Leiserowitz et al. 2013). Nevertheless, climate change consistently remains an important issue within American policy-making circles and the international community.

Climate change in social sciences has continually grown over the past 30 years. Scholars explain that our climate is interconnected with populations. Our actions will necessarily have unintended consequences. Often, the total effect of behavior is not equal to the sum of individual actions (Park 2005). No country will be immune from global environmental change (Rowland 2005). While climate change models suffer from a degree of uncertainty, their conclusions are overwhelmingly consistent: climate change is occurring and will impact political, social and economic factors around the world.

Securitization of Climate Change & Environmental Degradation

The international community since the end of the Cold War paid attention to the security implications of climate change and environmental degradation (Brown et al. 2007). Political leaders have argued that adapting to global warming will become important to reduce the risks of conflict (Gleick 1989). In the future, climate change needs to be central to any definition of national security (Campbell and Parthemore 2008).

At its most basic level, security has been defined as ‘assurances people have that they will continue to enjoy those things that are most important to their survival and well-being’ (Barnett 2001; Brauch 2003). More importantly, security is a societal value or a political goal (Brauch and Scheffran 2012). This means that security objectives can change. While security can be objective, it is subjective in nature. Subjectively, security is what actors make of it (Brauch and Scheffran 2012).

One of the first people to systematically argue that climate change is a security issue was Richard Falk (Barnett 2001). He outlined what he called *The First of Ecological Politics*. This is the inverse relationship between the interval of time available for adaptive change and the likelihood and intensity of violent conflict, trauma and coercion (Barnett 2001).

The *Copenhagen school* added to this conversation and developed the theory of securitization. They argued for an expanded security agenda in the global community (Raleigh and Urdal 2007; Rothe 2012; Kurtz 2012). This new agenda attempts to move beyond traditional variables of security. Future concerns about the environment, food, water and large-scale migration fueled pushed the debate on the securitization of climate change (Scheffran, Link and Schilling 2012; Karafoulidis 2012). But, more importantly, how was climate change securitized?

The *Copenhagen school* articulated the idea that security does not just exist, but is intentionally constructed (Buzan, Waever and de Wilde 1998; Kurtz 2012; Rorbaek 2012). A ‘securitizing move’ is statements that depict a certain reference object of reality as a security threat for another. Importantly, the audience has to be convinced of the object’s threat for the ‘securitizing move’ to succeed (Buzan, Waever and de Wilde 1998: 2; Kurtz 2012). However, securitizing an issue or accepting a securitization move is always a “political choice’ (Buzan, Waever and de Wilde 1998: 29). In the field of security, government officials are the most active players (Rothe 2012). While social scientists can help push the securitization of an issue, to a largely extent, political leaders must sell the idea.

Oftentimes, political leaders have been central to the securitization of climate change. In 2004, the British government's chief scientist, Sir David King, argued that climate change is a far greater threat to the world's stability than transnational terrorism (Brown et al. 2007: 1142). At the African Union Summit in 2007, Yoweri Museveni, now former president of Uganda argued that climate change is an '*act of aggression*' by the developed world (Brown et al. 2007: 1142). More than 50 countries in the United Nations General Assembly agreed that it was appropriate to discuss of impact of climate change through the Security Council (UNSC) (Brown et al. 2007; Kurtz 2012).

In 2007, there was a major turning point in the securitization of climate change. The IPCC released its Fourth Assessment Report (AR₄). The report pointed to the massive impacts that global warming will have on political, social and economic arenas. This securitization of climate change also reached traditional securitizing actors, like national defense ministers, military establishments and the intelligence community (Brauch and Scheffran 2012; Gaast and Begg 2012).

After the publication of the IPCC report in 2001, the UNSC addressed climate change as an international security issue for the first time in 2007. The UN General Assembly held a special thematic debate on the called, "Climate Change as a Global Challenge" (Brauch and Scheffran 2012). The key issues were, first, bringing countries together to discuss the scientific evidence of climate change and secondly, the different roles various parties (private sector or nongovernmental organizations – NGOs) can play in combating this concern. Developed countries wanted to fund special projects in developing countries to improve adaption and reduce the heighten risk of conflict.

However, the evidence demonstrates that conflict relating to climate change is already occurring. Additional resources are needed to mitigate the destruction of climate change.

Conflict and the Environment

In the next fifty years, climate change will be one of the most imminent threats to global security, especially in developing countries (Adger et al. 2003; Brown et al. 2007; World Bank Development Report 2010). In 2003, policymakers from the Pentagon labeled climate change as, ‘the mother of all security problems’ (Brown et al. 2007: 1142). President George W. Bush’s Ambassador to the United Nations warned that eco-conflicts would soon become a major problem in North-South tensions (Campbell and Parthemore 2008).

Conflict has been defined as “a contest between two or more actors over scarce and sought-after material and/or immaterial goods” (Brauch and Scheffran 2012: 3). In this situation, parties pursue contradictory aims or means. As previously stated, defense strategists and policy-makers have raised alarms about the impact that climate change will have on energy, food shortages and existing socio-economic problems in the developing world (Gaast and Begg 2012).

There have been numerous studies conducted examining the correlation between conflict and climate change. Several quantitative and qualitative studies have tested hypotheses on the relationship between climatic variables (temperature and precipitation) and conflict-related variables (number of armed conflicts and casualties) (Gaast and Begg 2012; Scheffran, Link and Schilling 2012). The results have been inconsistent. Some

studies found that climate change directly leads to conflict by measuring levels of CO₂ emissions but others have argued that there is not a strong relationship between climate change and conflict.

The challenge of statistical research on a sub-field like climate change in political science is a lack of data or the difficulty of measuring a variable like global warming. The climate is not weather. It is tough to measure a variable that is measured over decades or even centuries. However, some recent studies have found statistical correlations between the changing temperature and the frequency of war (Tol and Wagner 2010). However, some scientists argue that finding statistical significance of climate change and war is hard-pressed because as the temperature has risen in the past decade, wars have decreased. While in the future, global warming may exclusively impact political stability, it presently acts as a threat multiplier.

Climate Change is Threat Multiplier

Climate change should be regarded as a threat multiplier. What does this mean? Using this idea the idea of a threat multiplier as a foundation, existing tensions will be aggravated and new conflicts generated (Eckstein 2010; Wallbott 2012; Johnstone and Mazo 2013). Examining climate change as a threat multiplier is a useful way of thinking about climate change and conflict more broadly (Werrell and Femia 2013). It is less likely that environmental degradation, resources scarcity and population pressures alone will act as a sufficient factor to trigger internal or even intrastate wars in developing

countries (Webersik 2010), but if we think about those things as increasing the likelihood of conflict, their role in diverse conflicts become more reasonable.

A report published by *Christian Aid*, which was signed by 11 retired U.S. generals and admirals argues that climate change is a threat multiplier for instability in most volatile regions of the world (Webersik 2010: 16). Also, the letter states that there should be a better conceptualization (dependent variables – DV) for climate change and conflict. Civil or inter-state war may be important variables to express instability but political protests or civic uprising can do just as much harm to a world economy as a war.

Currently, countries in the Global South will be vastly impacted by climate change, not just by creating new conflicts but re-igniting old ones. Environmental scarcity is rarely the sole or sufficient cause of large migration, poverty or violence. Typically, it always joins with other economic, political and social factors to produce negative effects (Wallbott 2012: 228). Presently, the impact of climate change on food prices, sectarian violence and political instability have acted as an aggravating factor rather than the principal cause of the revolutions and political conflict (Johnstone and Mazo 2013).

Conclusion – Is there hope?

The world's economy needs methods to cope with the changing regime of weather extremes (Adger et al. 2003). The global warming threat will result in chain reactions in the transformation of water and natural resources, populations, food systems and marine ecosystems (Adger et al. 2003). The million-dollar questions are, will the

world make the necessary sacrifices to save the planet? What will happen to developing countries? Are we already seeing a taste of political instability from the Global South?

Warming will have a big impact on developing countries, especially in regard to their growth and development. Developing countries are the most vulnerable to climate change and weather variability. The poorest countries in the world will need the most help in adapting to the changing climate (World Bank Development Report 2010).

Looking at climate change, there will be winners and losers. Winners are considered countries, regions and/or social groups that are likely to benefit from the process of climate change (O'Brien and Leichensko 2000). Russia and Canada is a prime example Poor countries will continue to bear the burden of climate change damages, whereas the rich are likely to benefit from it (Mendelson, Dinar and Williams 2006). There needs to be collective leadership from the international community (both developed and developing countries) to combat this issue.

Importantly, no one country can solve the problem of climate change. It also cannot be solved from a Hobbesian security perspective (Brauch 2003). Institutions are important in addressing climate change (like liberalism articulates), but it cannot be examined through a prisoner's dilemma framework. It requires long-term cooperation from all levels of government and people: local, state and federal and international. The environment, while shaped by human consumption, is very much material. States must share knowledge between scientists and practitioners using traditional, local and advanced technological capabilities (Brauch 2003) in an attempt to solve this problem.

Chapter 4

Methodology and Data

After examining the ecological security theory and the environmental and political impacts of climate change, this chapter wishes to address the political impact of global warming empirically through quantitative methods. Specifically with this topic, it is difficult to quantify. Climate occurs over thousands of years. A question this project attempts to address is: Can climate change be measured statistically and generally, should mixed methods be the preferred approach in social science research?

Quantitative purists maintain that social science research should be strictly objective and measurable (Johnson and Onwuegbuzie 2004). They argue that research should not be tainted by the subjectivity of the author. Yet, qualitative purists reject positivism as a viable research method (Johnson and Onwuegbuzie 2004). They argue concepts like political instability (or climate) cannot be simply evaluated by numbers through a regression model.

Both arguments have validity. However, both techniques could provide value in an attempt to be fully comprehensive in political science research. When applicable, mixed methods ought to be the preferred approach. Research methodologies should be determined by which method best to answer the research question. If both methods can add value in answering the research question, both methods should be applied.

In this chapter, the author will explain the quantitative methods used to measure the relationship between climate change and political instability. The author focuses on

140 non-OECD countries in a large n-size model. In Chapters 6 and 7 of this dissertation, I use qualitative case studies: Egypt and Oman for supplementary analysis. For this project, using both methods give this task more creditability.

This chapter explains the model employed in this study. It examines statistical relationships among natural disasters, climate change, environmental degradation and political stability. This paper constructs a cross-sectional time series model for all non-OECD countries from the *Global Report (2011): Conflict, Governance and State Fragility* from 1995-2012. The year 1995 was chosen as the starting point because it is well within the post-Cold War period (which, has been argued in the literature beginning in either 1990 or 1991). It gives this research an overall foundation to begin.

The countries used in this project were taken from The *Center for Systemic Peace* (CSP). The CSP is a non-profit organization that was founded in 1997 (Marshall and Cole 2009). Much of the research from this organization was taken from the Polity IV project. Different aspects of the Polity IV project have become the most widely used data resources for studying regime change, political instability and the effects of regime authority and political stability.¹⁵

As stated previously, this model uses non-OECD countries for the sample, in the post-Cold War. In December 1960, about 20 countries originally signed the Convention on the Organization of Economic Cooperation and Development (OECD).¹⁶ At the time

¹⁵ Monty Marshall and Ted Robert Gurr. 2014. "Polity IV Project: Political regime Characteristics and Transitions, 1800-2013".

¹⁶ The Organization for Economic Co-Operation and Development. 2014. <http://www.oecd.org/about/membersandpartners/>

the OECD was created, there were 18 European countries, plus the United States and Canada. Since then, 14 countries have become members of this organization throughout different periods of time. For that reason, this model has unbalanced panels (i.e., a different number of “country/year” observations for each panel). In an attempt to be as comprehensive as possible, if a country joined the OECD in the year 1996, they were completely left out of the model because of single-year unit.¹⁷

This chapter will first review the dependent variables used in this model. Then, it examines the measures used for independent and control variables. Throughout these discussions, the author gives empirical and theoretical justifications for the use of the control and the independent variables. Furthermore, there is a review of the statistical methodology of this model and the hypotheses that will be tested. Finally, there will be a brief conclusion. The following chapter will then discuss the result of the multiple regression models.

Dependent Variables

This model uses three dependent variables from the Cross-National Time-Series Archive (CNTS). Arthur S. Banks launched this project in 1968 at the State University of New York in Binghamton. Using variables from the Domestic Conflict Event Data within the CNTS, the data are coded using information from *The New York Times*, ranging from 1919-2012. Importantly, because the data are based on newspaper and online news

¹⁷ Countries like Hungary, South Korea and Poland were completely left out of the model because having joined the OECD in 1996. Since an analysis of one year wouldn't improve the model, the author left these states out.

report, they possess inherent bias geographically. The decision to classify an event as domestic or not was subjectively determined by the coders of this project.¹⁸

The first dependent variable, **riots**, was measured by any violent demonstration or clash of more than 100 citizens involving the use of physical force (Rummel 1968). The second dependent variable, anti-government demonstrations or **protests**, was measured as any peaceful public gathering of at least 100 people for the primary purpose of displaying or voicing their opposition to government policies or authority, excluding demonstrating of a distinctly anti-foreign nature (Rummel 1968). The third variable, **revolutions**, is measured by any illegal or forced change in the top government elite or by any attempt to such a change or any successful or unsuccessful armed rebellion whose aim is independence from the central government (Rummel 1968). Because of these variables were measured within the CNTS, the riots and protests variables are a type of count data, and the models for riots and protest were estimated using statistical methods for cross-sectional time-series count-data estimation. The revolution data are binary (0/1) and are estimated with a different method. There will be more about this in the next chapter.

Another dependent variable the author attempted to use, but was unsuccessful was the Fragility Matrix. Fragility is defined as ‘the quality of being easily broken or damaged’ (Marshall and Cole 2011). For this variable, a decrease in state fragility is an increase in societal-system resiliency (Marshall and Cole 2011). This means, larger or higher values of fragility are associated with lower levels of systematic well-being (0

¹⁸ As an example, the Israel-Palestinian conflict was not coded as a domestic conflict. The contents of these segments and results should be used for macro-analysis. The author executes this interpretation.

means political stable and 25 means high levels of political instability). However, due to the extremely high level of serial correlation in the data and the fact that all methods to control for serial correlation proved to be unsuccessful, the study was unable to use the fragility measure in any models.¹⁹

Independent and Control Variables

The first explanatory/control variable in this study measures political regime characteristics and transitions. This variable comes from the *Polity IV Project* by Monty Marshall, Ted Gurr and Keith Jagers (2013). This is the most widely used resource for monitoring regime change and studying the effects of regime authority (Marshall, Gurr and Jagers 2013). The **polity** variable is computed by subtracting the autocracy score (-10) from the democratic score (+10). Thus, the resulting unified polity scale ranges from +10 (strongly democratic) to -10 (strongly autocratic) (Marshall, Gurr and Jagers 2013). This variable is an attempt to provide a convenient avenue for examining general regime effects in analyses. Although the dependent variable has a component of the polity data within its measure, this independent variable and the dependent variable are not highly

¹⁹ The author attempted several different strategies to deal with the serial correlation with the SFI variable. Because the nature of the model, the author also attempted to turn the SFI variable into a categorical-ordinal variable but the model still had heavy serial correlation. Unfortunately, the author did not see a viable way to use the variable without skewing the results. In an attempt to use the best practice for statistical methods, the author elected to leave out this variable.

correlated with each other.²⁰ Consisted with the dependent variables, the years used from this variable are from 1995-2012.

From the variable above, it is possible to generate two distinct variables for democracy and autocracy. One possible variable, democracy, is measured from 0 – 10. Higher values are associated with more democratic governance. A second possible variable, autocracy, is also measures scaled from 0 – 10, where higher values are associated with more autocratic governance. Due to high correlation between the democracy and autocracy variables, the author elected to use the **polity** variable in all trials.²¹

This model includes a measure for **ethnic fractionalization**. Different cultural characteristics or differences with a country may also impact political stability with that country. The ethnic fractionalization data was obtained from Alesina, et al. (2003). Importantly, the values of ethnic fractionalization are slowly changing. Following the convention in the prior literature, the same values of ethnic fractionalization are employed for all years for each country (1995-2012). Previous studies (Alesina, et al. 2003; Fearon and Laitin 2003) have demonstrated that ethnic fractionalization increases political instability.

This model also used several covariates from the World Bank database to control for common influences on political conflict and stability. First, the author used Gross

²⁰ Running a correlation test through STATA, the correlation score is -0.3148. This demonstrates non-correlated relationship. The data are negatively related, but the strength of the relationships is within levels of tolerance.

²¹ After running a correlation command in STATA, the democracy and autocracy was .9242. The decision was made to just use the polity variable.

Domestic Product (GDP) Purchasing Power Parity (PPP) from the Penn World Table. This variable derived growth rates from domestic absorption, at 2005 constant prices. However, the Penn World Table only has GDP PPP available for 1995–2010. Since two years were missing for all 140 countries, this model decided to use the World Bank’s GDP PPP. While the World Bank has a similar variable for GDP PPP, it is in international dollars, not U.S. dollars. Therefore, the author converted the World Bank’s GDP PPP to 2005 prices mathematically, then ran a correlation between World Bank’s and Penn World Table’s GDP PPP. Since the Penn World Table’s GDP PPP and the World Bank’s GDP PPP were highly correlated, the author used the **World’s Bank GDP PPP** for this model.²²

Using data from the previous variable, the author constructed the variable, **Change in GDP**. This measures the annual percent change from the current year relative to the prior year. This variable is a standard measure of growth and may also serve as a proxy for employment within an economy and overall health of a country’s economic and overall economic strength.

This model also includes the variable, **urban population**. This variable refers to the percentage of people living in urban areas as defined by each nation’s statistical offices.²³ This variable is constructed by using the World Bank population and the urban

²² Running the correlation, the two variables (World Bank’s GDP and Penn World Tables GDP) were correlated at 0.9250. Because of this high correlation, the author elected to go with the World Bank’s GDP PPP.

²³ World Bank Data. 2014. “Urban Population”. There is no variable available for environmental refugees.

population ratios from the United Nations Urbanization Prospects (UNUP).²⁴ This variable theoretically measures the implication of growing urban population in developing countries. Thus, the greater the degree of urbanization, the higher the risk of political instability.

Next, several covariates for refugee flows were considered. This is important for examining how internal and/or external migration might have an impact on political stability. Refugees are people who are recognized as refugees under the 1951 Convention Relating to the Status of Refugees or its 1967 Protocol, the 1969 Organization of African Unity Convention Governing the Specific Aspects of Refugee Problems in Africa.²⁵ This model uses two measures for refugees: original country and territory of asylum. The first, **original country** refers to the nationality or country of citizen of the claimant exiting the country. **Territory of asylum** refers to refugees and their final destination. This way, this model would be able to measure and then compare and contrast whether there is a higher likelihood of political instability in countries where people are leaving or countries that are receiving refugees. With both variables, the author used the number of refugees divided by the population of that country, multiplied by a hundred. It was expressed in this equation:

$$= (A1/A2)*100$$

This study also examines **unemployment** within developing countries.

Unemployment refers to the share of the labor force that is without work but available for

²⁴ See note 23 above.

²⁵ The World Bank Data. 2014. "Refugee Population by Country or Territory of Origin."

and seeking employment.²⁶ This estimate has been retrieved from the International Labor Organization (ILO). Consistent with the prior literature, higher unemployment rates, stemming from rapid population growth can lead to higher levels of political instability, all things being equal.

Using the variable on annual food prices, this model also employs a covariate for **food price change**. This variable captures the combination of the two variables: domestic food price volatility and domestic food prices. It measures the annual change in the annual food price index. Specially, it measures the change from the current year relative to the prior year. This variable was generated by the food data from the Food and Agricultural Organization.

To address the potential impact of natural phenomenon, this model uses *The International Disaster Database: Center for Research on the Epidemiology of Disasters* (EM-DAT, CRED). This database systematically collects data on disasters occurrences within each country. This data is helpful because it provides information on the human impact of disasters, such as the number of people killed, injured or affected and the type of disaster most common in a given country.²⁷ EM-DAT provides disaster-related economic damage estimates and disaster-specific international aid contributions.²⁸

²⁶ The World Bank Data. 2014. “Unemployment, Total (% of total labor force – model ILO estimate)”.

²⁷ EM-DAT. 2014. *The International Disaster Database, Centre for Research on the Epidemiology of Disaster*.

²⁸ See note 27 above.

The information on the natural disaster profile is measured by a certain set of criteria. At least one of the criteria needed to be fulfilled:

- 10 or more people reported killed;
- 100 people reported affected by the disaster;
- A call for international assistance;
- Declaration of a state of emergency.²⁹

The **EM-DAT** database is broken down into five main categories: geophysical, meteorological, biological, climatological and hydrological. Geophysical deals with events originating from the solid earth. The meteorological category is events caused by short-lived/small to meso-scale atmospheric processes.³⁰ The biological category is defined as disasters caused by the exposure of living organisms to germs and toxic substances.³¹

The two groupings used in this model are the hydrological and climatology categories. The hydrological category is events caused by deviations in the normal water cycle and/or of bodies of water caused by wind set-up.³² From this category, the model uses the variable, '**floods**'. Floods have been defined as either by general river floods,

²⁹ EM-DAT. 2014. The International Disaster Database; Climatological Disaster Profile.

³⁰ EM-DAT. 2014. The International Disaster Database; Classification of Disasters.

³¹ EM-DAT. 2014. The International Disaster Database; Hydrological Classification.

³² See note 31 above.

flash floods or storm surge/coastal floods. This variable is calculated as the number of flood per year in a given country from 1995-2012.

The **climatological** variable is events caused by long-lived/meso to macro scale processes (in the spectrum from intra-seasonal to multi-decadal climate variability). In an attempting to measure the impact of climate change, this variable takes into account the long-time impact to the environment, due to climate change and environmental degradation. While this model only measures between the years of 1995-2012, this variable accounts for the longevity of events, which transpire due to the long-term effects of climate change. The climatological variable is made up for several events: extreme temperatures, droughts, famines and wild fires. This variable is calculated by the number of these natural events in each year, in the sample.

In examining each sub-group event of natural disasters (hydrological and climatologist), it is not important whether a natural disaster simply occurs. Natural disasters occur annually in every country in the world. More importantly, the model wishes to discover and measure whether disasters occur beyond the mean (or the average). Thus, an increase beyond the mean in which they occur, will impacts political stability.

To model this, the author calculates the mean of all the natural disaster variables and discovers the average.³³ Then, the author standardizes the variable from the mean. In order to standardize a variable, the mean is subtracted from each individual observation, which then results in a mean of zero. Next, one takes the difference between individual

³³ In STATA, the author uses the standardized variable, which has been rescaled to count for this.

observations and the mean for the covariate and divides by the standard deviation, which yields a standard deviation of one. This can be expressed by this equation:

$$\mathbf{X \text{ (new variable)} = (X-M) / SD}$$

Using this method, the model seeks to discover whether natural disasters occurring greater than the mean increase the likelihood of protests, riots or revolutions. In the model, the author also compares and contrasts the environmental variables with its lags (one year). This will test whether the political effects of natural disasters are immediate or occur over time. Hence, the environmental variables (floods and climatic events) are tested in real time and lagged a year.

Region variables have been included to capture regional variance. The regions that have been created are the Middle East and North Africa (MENA), sub-Saharan Africa (SSA), Latin America and the Caribbean³⁴, South Asia, East Asia and Europe. Each region is calculated as a binary variable. The appendix lists how each country was classified.

Statistical Methodology

As mentioned previously, the data is constructed in a multiple regression model. The descriptive statistics for the dependent and independent variables will be found in the appendix. As noted, the first two models on protests and riots include count data.

³⁴ Instead separating Latin American the Caribbean, the author decided to combine them since there weren't many countries in the Caribbean. Also, since the Caribbean and Latin America share historical and social heritage, combining them would add depth to the research.

Because preliminary testing indicated that the count data for protests and riots showed overdispersion (i.e., variance larger than the mean of the variable), the models were estimated with negative binomial regression (Cameron and Trivedi 2013). In addition, the protest and count data showed indications of strong serial correlation. To address this issue, the author followed the advice of Cameron and Trivedi (2013: 281) and Hill, Rothchild and Cameron (1998) and included the natural log of the lagged depended variables (protests, riots) in each specification. An additive constant of 0.5 was added to all zero values (because there is no log of zero). The use of count data for the lagged dependent variable requires a log transformation. This is represented by the equation:

$$\ln (y_{i, t-1} + c)$$

Finally, to control for within-country association of error terms, the models were specific with standard errors clustered by country.

The data for the revolution model is binary. Once again, the revolution data exhibited a high degree of serial correlation. As Beck, Katz and Tucker (1998) have noted, one way of addressing this problem with pooled cross-sectional time-series binary measures is to create three equally spaced cubic splines, which are then estimated with the regression.³⁵ In addition, the revolution model is estimated with robust errors, clustered by country, to address within-country association of the error terms.

To assess multicollinearity, a variance inflation factor (VIF) test was used. This required treating the data as continuous and running an OLS regression. The protest model had a mean score of 2.32. The riot model had a mean score of 2.46. The revolution

³⁵ In separate trials, a ‘spell’ variable was also generated to create time dummies for the model; this did not yield an improvement over the cubic splines.

model had a mean score of 2.49. All VIF scores are well within tolerance. Summed residuals of all the models were analyzed to check for unit effect that may be exhibiting a strong effect in the model. None of the summed residual was more than double times the mean of the dependent variable, which suggests the model did not need to model for fixed effects.

The argument of this dissertation is that environmental degradation, natural disasters and climate change increases political instability in developing states. Therefore, this model will only investigate states that are not members of the OECD. Although there is some debate about whether certain countries should justly be in the OECD (like Mexico³⁶ or Greece), the author decided to be uniform and used all countries outside of this organization. As mentioned earlier, states were given membership at different times at the OECD. If a state entered the organization in 1996, it was completely left out of the model because it would have only had one-year data point.

Hypotheses

There are several hypotheses are introduced and tested in this study. As the literature demonstrates, there is a clear theoretical link that can be made between political instability, protests, riots and/or revolution and environmental degradation, natural disasters and/or food prices. However, because the nature of environmental degradation and climate change, there are empirical gaps in the literature. Many studies do not test individual environmental events produced in this study. Importantly, political instability

³⁶ There is some debate whether Mexico should be a part of the OECD because of its relatively low GDP per capita in comparison to other OECD countries.

is being defined by three dependent variables: protests, riots and revolutions. This study will do so in attempt to add to the scholarship and push the discipline forward. The ecological security theory predicts that greater environmental degradation and natural disasters, the higher probability of political instability in developing countries.

Hypothesis One: As polity levels increases, the probability of protests, riots and revolutions decreases.

Hypothesis Two: Higher levels of ethnic fractionalization lead to a higher probabilities of riots, protests, and revolutions.

An increase in population will escalate the likelihood of political instability in developing countries. The unemployment variable is linked to the rapid population. Empirically, rapid populations fight for resources and jobs, which can increase instability. An influx in refugees in neighboring countries has the potential to cause instability. Furthermore, citizens and non-citizens will be competing and using energy resources in higher levels, which are already scarce in most places in the developing world.

Hypothesis Three: An increase in urban population (as a share of total population) in developing countries is positively associated with higher levels of riots/protests/revolutions.

Hypothesis Four: Higher levels of unemployment increase the likelihood of riots, protests, and revolutions.

Hypothesis Five: High levels of refugees from another country of origin and asylum seekers are associated with increased chances of riots, protests, or revolutions.

The literature demonstrates that food supply and food prices will be impacted by environmental degradation, especially in developing countries. Larger populations will demand (from their government) fairer and more reasonable food prices. A sharp rise in these prices will increase the likelihood of political instability. Conflict will increase over state resources, between the population and outside populations (refugees). This hypothesis addresses the percentage change in food prices to instability.

Hypothesis Six: Countries with rapid increases in annual food prices are more likely to experience riots, protests or revolutions.

The next set of hypotheses is related to the natural disasters variables. First, an increase in floods can lead to higher levels of political instability within a population. The lack of governmental resources allocated during the rapid onset of floods will lead to higher protests, riots, and revolutions. Therefore, higher levels of floods (more than the statistically mean) should be associated with higher levels of political instability. Droughts, famines, wild fires and storms that occur in developing countries (more than the statistically mean) will increase competition for state resources between populations, refugees and ethnic groups. This struggle over resources will produce higher levels of instability.

Hypothesis Seven: Volatility in hydrological-related events (general river floods, flash floods or storm surge/coastal floods) will increase the likelihood of riots, protests, and revolutions.

Hypothesis Eight: Volatility in climatological events (droughts, famines, extreme temperatures and wildfire) will increase the likelihood of riots, protests, and revolutions.

The last set of hypotheses is related to region. These binary variables have been included to try to capture shared societal norms and common historical experiences.

Hypothesis Nine: States in the Middle East and North Africa will have higher levels of riots/protests/revolutions due to population growth and more food insecurity.

Hypothesis Ten: States located in Eastern and Southern Europe will have higher levels of riots/protests/revolutions due to weak democratic systems and markets.

Hypothesis Eleven: States in Latin America and the Caribbean will have higher levels of riots, protests, and revolutions due to the number of natural disasters and weak food markets.

Hypothesis Twelve: States in Sub-Saharan Africa will have higher levels of riots, protests, and revolutions due to a history of colonization (ethnic divide) and the number of droughts.

Hypothesis Thirteen: States in South Asia will have higher levels of riots, protests, and revolutions due to the number of natural disasters like floods and tsunamis.

Hypothesis Fourteen: States in eastern Asia will have a higher level of riots, protests, and revolutions due to the growth of their urban population.

Qualitative Methodology

Like mentioned, qualitative research gives additional depth to this research project. In this dissertation, I utilized two case studies: Egypt and Oman. The decision to add case studies were developed was made for several reasons. First, the use of a case study favors the analyses of data in its natural setting. Unlike multiple regression models, case studies are able to take into account regional and cultural norms, past historical events, descriptive statistics and outside disciplinary perspectives.

Secondly, I am examining climate change's impact on political instability in developing countries by focusing on the Middle East and North Africa. This region been impacted by global warming but limited research has focused particularly on this area. By focusing on these two countries (Egypt and Oman), I would be able to add to this burgeoning research field and introduce some robust results. Lastly, I decided on Egypt and Oman because their distinctive outcomes. In the past 15 years, both countries have experienced political instability but had extremely different effects. By choosing these cases, I provided useful variations on the dimensions of theoretical interests (Seawright and Gerring 2008).

The methods that I am using to compare each case study are the pattern-match building logic. The technique is typically accompanied by a detailed explanation of how and why an event occurred. With pattern matching, theory is very important. The

identification of theory must be based on both the consistent of the theory with social science knowledge and with the experiences and conjectures of with the phenomenon (Trochim 1985: 586). The sources I am utilizing are archival records, primary sources, secondary sources and descriptive statistics.

Conclusion

This chapter has discussed the data and methods that will be used to test the hypotheses presented in this study. As discussed, an effort was made to capture some of the variables used in the limited prior research on the impact of environmental degradation and climate change political stability. Also, the models attempt to add to the overall literature by controlling for a number of common influences on political stability. Examining the model outlined in this chapter, this study anticipates that rapid population growth (urbanization), food prices and natural disasters will have an impact on political stability. Also, regionally, the author anticipates vast differences between territories. The next chapter will provide a detailed explanation of the various statistically regressions utilized to test these hypotheses.

Chapter 5

Results and Analysis

In this chapter, the results from the three multiple regression models (protests, riots, revolutions) will be analyzed. In the first part of the chapter, the results from each model will be discussed individually. After this, generalizations and inferences will be made about each hypothesis by examining systematic relationships between the environment and political instability.

Importantly, as explained in the previous chapter, due to the level of serial correlation in the dependent variable the State Fragility Index (SFI), it could not be used. Also, due to serial autocorrelation in the data for protests and riots, this study estimated each model with a (logged) lagged dependent variable.³⁷ The coefficient for the lagged dependent variables is statistically significant. This successfully controlled for serial correlation in the models. After adjusting for the effects of serial correlation, the results show that several independent variables play a factor in the relationship between the environment and political instability.

Protest Model

The first model to be examined is the Protest model (Table 5.1). In this model, climatic events (standard deviation) and food price change are the main independent variables of interest. It should be mentioned again that with climatic events, the measure

³⁷ Cameron and Trivedi (2013) provide justification for this method.

Table 5.1: The Protest Model³⁸

	Coefficients	Standard Errors	z	p< z	95% Conf. Interval	
Protest, Lagged (Logged)	0.4746124***	0.067572	7.02	0.00	0.3421736	0.6070511
Gross Domestic Product (GDP) (Log)	0.0380425	0.0895438	0.42	0.671	-.13746	0.2135451
Percentage Change in GDP	-1.261212***	0.3572862	-3.53	0.00	-1.96148	-.5609437
Food Price Change	3.915358**	1.677445	2.33	0.02	0.6276266	7.203089
Refugees, Lagged (Origin Country)	-.0885991	0.0592321	-1.50	0.135	-.204692	0.0274937
Refugees, Lagged (New Territory)	-.0091112	0.0194103	-0.47	0.639	-.0471547	0.0289324
Polity	0.0054614	0.012742	0.43	0.668	-.0195125	0.0304353
Ethnic Linguistic Fractionalization	0.364785	0.3857963	0.95	0.344	-.391362	1.120932
Urban Population	-.0039435	0.0062984	-0.63	0.531	-.0162881	0.0084011
Climatic Events (Standard Deviation)	-.0892829	0.0906352	-0.99	0.325	-.2669246	0.0883589
Climatic Events, Lagged (Standard Deviation)	0.1514378*	0.086402	1.75	0.08	-.0178871	0.3208027
The Middle East and North Africa	-.1097467	0.2880488	-0.38	0.703	-.674312	0.4548187
Sub-Saharan Africa	-.7798665***	0.2741517	-2.84	0.004	-1.317194	-.242539
Latin America and the Caribbean	0.6078104**	0.2718834	2.24	0.025	0.0749288	1.140692
South Asia	0.0971392	0.2758467	0.35	0.73	-.4435104	0.6377888
East Asia	0.3986871	0.5816591	0.69	0.493	-.7413438	1.538718
Constant	-1.35331	0.5501687	-2.47	0.014	-2.436642	-.2800199
Wald chi-squared,	144.45					
Prob > chi-squared	0.00					
Observations	1528					
Groups	96					
Prob >chibar2	0.00					

*=p<0.1, **=p<0.05, ***=p<0.01

³⁸ Europe is the omitted reference category.

represents droughts, famines, extreme temperatures and wild fires. We begin with a discussion of the controls, and then move to a summary of the main covariates of interests. As one can see in the model, the coefficient for the lagged dependent variable is positive and (as expected) highly statistically significant in this model ($p < 0.01$). This suggests a strong association in the year-to-year count of protests. In other words, protests in the previous year predict protests in the following year.

The next independent variable is food price change. The coefficient is positive and statistically significant in the model. As a reminder, this is the change in the index of this current year relative to the prior year. As expected, growth in food prices from one year to the next increases the probability of protests. There are several studies that have documented the impact of climate change and environmental degradation on food supply and price changes. This finding indirectly supports that hypothesis. However, the coefficients for ethnic fractionalization, urban population, and both refugee covariates are not significant.

Although the coefficient for the standard deviation of climatic events (droughts, famines, extreme temperatures and wild fires) in the current year is not significant, the coefficient for the lag of the standard deviation of climatic events (i.e., the standard deviation in the prior year) is positive and significant. This suggests that large variability in climate in the prior year increases the probability of protests in the current year. This finding suggests that climate variability in the prior year may disrupt food supply in the following year, making protests more likely. The model indicates that overall climatic occurrences increase the likelihood of protests in the following year.

Although the coefficient for total GDP is not significant, the coefficient for percentage change of GDP is negative and statistically significant in the model ($p < 0.01$). In other words, the higher the annual percentage change in GDP growth, the lower the probability of protests. This suggests that countries with higher levels of growth tend to have fewer protests and less instability than countries with low or negative growth. This could be due to the effects of growth on employment. Higher growth leads to more employment, which reduces economic grievances associated with protests.

Examining the regional dummy variables, although the coefficient for sub-Saharan Africa is significant, it has an unexpected negative sign. This suggests that in relationship to the omitted reference, Europe, protests are less likely across sub-Saharan Africa. Population could explain this result. Sub-Saharan African countries, on average, do not have large urban populations. Therefore, since protests typically occur in large urban cities, the negative results may be due to lower levels of urbanization. The regional variable for Latin America and the Caribbean is positive and significant. This suggests that protests are more likely in Latin America and the Caribbean than the states in the omitted category (Europe). The coefficients for the Middle East and North Africa, South Asia and East Asia are not significant in the model.

Overall, the model is highly significant, as suggested by the Wald Chi-square. Also, the likelihood ratio tests (compared with the chi-squared) indicate that we can be highly confident that the use of the pooled estimator was appropriate for these data.

Table 5.2: The Riots' Model³⁹

	Coefficients	Standard Errors	z	p< z	95% Conf. Interval	
Riots, Lagged (Logged)	0.529775***	0.0926054	5.72	0.00	0.3482718	0.7112782
Gross Domestic Product (GDP)	0.0000696***	0.0000226	3.08	0.002	0.0000252	0.0001139
Percentage Change in GDP	-1.335698***	0.4150887	-3.22	0.001	-2.149257	-0.5221392
Food Price Change	4.150348***	1.550012	2.68	0.007	1.11238	7.188317
Ethnic Linguistic Fractionalization	1.853065***	0.5855033	3.16	0.002	0.7055	3.000631
Polity	-0.0213258	0.0159717	-1.34	0.182	-0.0526298	0.0099782
Floods (Standard Deviation)	-0.0389895	0.0569541	-0.68	0.494	-0.1506175	0.0726386
Floods, Lagged (Standard Deviation)	0.1006613*	0.0528285	1.91	0.057	-0.0028807	0.2042032
The Middle East and North Africa	0.0086268	0.432007	0.02	0.984	-0.8380791	0.8553326
Sub-Saharan Africa	-0.445825	0.3932923	-1.13	0.257	-1.216671	0.3250062
Latin America and the Caribbean	0.8151798*	0.42402641	1.92	0.055	-0.0159808	1.64634
South Asia	0.9213868**	0.4002641	2.3	0.021	0.1368836	1.70589
East Asia	0.5661609	0.6427249	0.88	0.38	-0.6935568	1.825879
Constant	-1.778116	0.393532	-4.52	0.00	-2.549544	-1.006687
Wald chi-squared, Prob > chi-squared	118.78 0.00					
Observations	1391					
Groups	87					
Prob >chibar2	0.00					

*=p<0.1, **=p<0.05, ***=p<0.01

³⁹ Europe is the omitted reference category.

The Riots' Model

Examining the environmental variables, the coefficient for the standard deviation of floods is not significant. However, the lag of the standard deviation of floods (i.e., the standard deviation of floods in the prior year) is positive and significant. Large variability in floods in the prior year increases the probability of riots in the current year. Similar in the protests' model, environmental variables do not impact the population instantaneously, but rather have a lagged effect. This could be related to the effect of displacing populations (internal and external migration from flooding, which has been well-researched), as well as effect on food supply. If flooding is displacing one ethnic group (living on one geographic area) and forcing them to move in close proximity to a rival group within the country, which increases riots and overall political instability. The literature from ethnic fractionalization is consistent with this interpretation. By contrast, the coefficient for polity is not significant. Regime type has no clear effect on riots, maybe because this type of instability is unplanned and episodic.

Consistent with the protest model, the coefficient for the lagged (and logged) dependent variable is positive and significant ($p < 0.01$). This suggests a strong association in the year-to-year count of riots in the model. Again, this coefficient is addressing the effects of temporal dependence in the data and assists with controlling for serial correlation. The coefficient for the total GDP is positive and significant. This indicates that riots tend to occur in countries with higher wealth, all things equal. Similar to the protests' model, the coefficient for the annual change in GDP (this year relative to prior year) is negative and significant ($p < 0.01$). This indicates annual economic growth reduces the probability of riots. There has been literature illuminating this result, in that

relative deprivation under conditions of rapid growth may be lower in some circumstances. Under those conditions, this lowers the likelihood of rioting under conditions of economic growth. Unfortunately, because unemployment data and other measures of relative deprivations are missing for many years in developing countries, the model is unable to test for this specific claim.

Similarly with the protest model, the coefficient for annual change in food price is positive and highly significant ($p < 0.01$). Growth in food prices from one year to the next increases the probability of protests. The consistency and strength of this result from this model and from the protests' model points to indirect evidence of climate change impacting both riots and protests. Since research has pointed out that climate change directly impacts agriculture and food prices, these results provides base for the thesis's central claim.

Unlike the last model, the coefficient for ethnic fractionalization is significant ($p < 0.01$). Adjusting for the effects of other covariates in the model, ethnic divisions increase the probability of riots. This research has been well established, especially studies pertaining to sub-Saharan Africa.

In the regional dummy variables, the coefficients for Latin America and the Caribbean and South Asia were positive and significant. In comparison to the reference, Europe, riots have been more likely in these regions. Although many economic problems occurred in Latin America and South Asia during the past 25 years, it is also worth noting that several devastating storms and rising sea levels have also occurred in these regions as well. South Asia, in particular, has been confronted with natural disasters, forcing a great

deal of regional migration that has resulted in political tensions. We elaborate more on this point in the conclusion. Finally, the coefficients for the Middle East and North Africa, sub-Saharan Africa and East Asia were not significant.

The overall model is highly significant, as suggest by the Wald Chi-square. Also, the likelihood ratio test confirms that we can be highly confident in the pooled estimator for this data and model are appropriate versus regular negative binominal regression.

The Revolution Model

Revolution is a binary (0/1) variable. Beck, Katz and Tucker (1998) argue binary data in cross-sectional time-series may be viewed as an example of “grouped duration data”. As discussed in Chapter 4, the methods that we have used to address serial correlation in the other models (protests and riots) will not work with binary data. Therefore, we will not be able to use a lagged dependent variable as with count or continuous data. Following Beck, Katz, and Tuckers (1998), one of the ways we addressed this issue to use cubic splines.⁴⁰ In addition, in this model, the author estimated the *logit* model with robust standards errors, clustered by each country.

The coefficient of climatic events lagged (droughts, famines, extreme temperatures and wildfires) is positive and significant ($p < 0.01$). This result supports the original thesis in this study. Climatic events increase the likelihood of revolutions in developing countries. Along with the other statistically significant coefficients in the

⁴⁰ Another method is using a spell counter to create a series of time dummy variables. After running both models, the results favor the cubic splines.

Table 5.3: The Revolution Model⁴¹

	Coefficients	Robust Standard Errors	z	p < z	95% Conf. Interval	
Food Price Change	2.441463	5.400567	0.45	0.651	-8.143454	13.02638
Percentage Change in GDP	-0.02056356	0.7777382	-0.26	0.791	-1.729974	1.318703
Ethnic Linguistic Fractionalization	1.919631***	0.7420159	2.59	0.01	0.4653067	3.373955
Polity	0.0338623	0.0292425	1.16	0.247	-0.023452	0.0911766
Unemployment	0.0695021***	0.0269174	2.58	0.01	0.016745	0.1222593
Refugees (Original Land)	0.1542299***	0.0430052	3.59	0.00	0.0699413	0.2385186
Climatic Events, Lagged (Standard Deviation)	0.3305452***	0.1116538	2.96	0.003	0.1117077	0.5493827
The Middle East and North Africa	1.854157***	0.7087588	2.62	0.009	0.4650149	3.243298
Sub-Saharan Africa	0.756487	0.5895018	1.28	0.199	-0.3989153	1.911889
Latin America and the Caribbean	2.177043***	0.6816383	3.19	0.001	0.8410567	3.51303
South Asia	2.774987***	0.7043307	3.94	0.00	1.394524	4.155449
Europe	1.90248***	0.6848433	2.78	0.005	0.5602122	3.244748
Spline1	0.1566007	0.0486107	3.22	0.001	0.0613255	0.2518756
Spline2	-0.0699995	0.0269034	-2.60	0.009	-0.1227293	-0.0172697
Spline3	0.0162825	0.0102543	1.59	0.112	-0.0038155	0.036306
Constant	-4.470517	0.824611	-5.42	0.00	-6.086725	-2.854309
Wald chi-squared, Prob > chi-squared	76.55	0.00				
Observations	774					
Groups	79					
Pseudo R2	0.2916					

*=p<0.1, **=p<0.05, ***=p<0.01

⁴¹ East Asia is the omitted reference category. Reference country changed because the data (country) drastically reduced with the Europe's category.

model, this is an interesting model for analysis. This result will be discussed further in conjunction with the other two models.

The coefficient for ethnic fractionalization, as expected, is positive and highly significant ($p < 0.01$). Ethnic divisions increase the probability of revolutions in developing countries. Climate change could increase this when populations migrate in search for scarce resources where other populations live. The coefficient for food price change and percentage change in GDP were, however, not significant.

The coefficient for unemployment was positive and highly significant ($p < 0.01$). The result argues that higher unemployment increases the probability of revolution. As this thesis highlights, youth unemployment has become a big issue in the developing world, especially in the Middle East and North Africa. The widespread unemployment will increase the likelihood of revolutions in the future. Although some scholars have hypothesized that closed political regimes force opposition groups to resort to use of political violence, the results of the models, as measured by the coefficient for polity was not significant.

The coefficient for refugee flow (original land) is positive and significant ($p < 0.01$). As mentioned earlier, research has demonstrated that natural disasters like drought, famine and floods can cause internal or international migration. The results argue that increased refugee flows can increase the likelihood of revolutions in developing countries. Refugee flow within a country also increases the chance of instability (revolutions).

Examining the regional dummy variables, the coefficients for Middle East and North Africa, Latin America and the Caribbean, South Asia and Europe are all positive and statistically significant relationship to the omitted category (East Asia, which had the fewest observations of revolution). The regional dummy, sub-Saharan Africa was not significant in the model. These results will be discussed further.

Summarizing the Results

Having discussed the results for each model, it is possible to make comparisons across the different models. The table below lists the findings for various covariates across the three models. The table shows the number of times a covariate was statistically significant (by the level of significance). The author will also review the hypotheses from the previous chapter. This project will use these results to determine whether the statistical findings lend support to each hypothesis.

Hypothesis One: Stronger levels of polity are associated with lower probability of protests, riots, and revolutions.

Hypothesis Two: Higher levels of ethnic fractionalization will lead to higher probabilities of protests, riots, and revolutions.

After reviewing the results from the statistical models, this study rejects hypothesis one and finds support for hypothesis two. Ethnic linguistic fractionalization was statistically significant in two models, riots and revolutions. This finding

Table 5.4: Summary of Statistical Significance, by Covariate

Levels of Significance	p< 0.10	p<0.05	p<0.01	Total
Protests (Log)	0	0	1	1
Riots (Log)	0	0	1	1
Gross Domestic Product (GDP) Log	0	0	1	1
Percentage Change in GDP	0	0	2	2
Food Price Change	0	1	1	2
Refugees, Lagged (Origin Country)	0	0	1	1
Refugees, Lagged (New Territory)	0	0	0	0
Polity	0	0	0	0
Ethnic Linguistic Fractionalization	0	0	2	2
Urban Population	0	0	0	0
Unemployment	0	0	1	1
Climatic Events (Standard Deviation)	0	0	0	0
Climatic Events, Lagged (Standard Deviation)	1	0	1	2
Floods (Standard Deviation)	0	0	0	0
Floods, Lagged (Standard Deviation)	1	0	0	1
The Middle East and North Africa	0	0	1	1
Sub-Saharan Africa	0	0	1	1
Latin America and the Caribbean	1	1	1	3
South Asia	0	1	1	2
East Asia	0	0	0	0
Europe	0	0	1	0

demonstrates that ethnic linguistic fractionalization within a society increases the likelihood of riots and revolutions. There is evidence (in sub-Saharan Africa) that fractionalization within a culture or society causes rifts within that region. While ethnic linguistic can provide a basic of identities in developing countries, often, these diverse characteristics can lead to conflict between groups, especially over resources like food and land.

Environmental degradation and climate change will increase the competition of scarce resources between ethnic groups. Populations will continue to migrate to find resources when earthquakes, floods, droughts or famine damage its regional ecosystem. This may pit ethnic groups against each other for scarce resources from the environment and/or government. As the results indicate, this can lead to riots and potential revolutions.

Hypothesis Three: An increase in urban population (as a share of total population) in developing countries is positively associated with the probability or protests, riots and revolution.

Hypothesis Four: Higher levels of unemployment increase the likelihood of protests, riots and revolution.

Hypothesis Five: High levels of refugees from another country of origin and asylum seekers are associated with increased chances of protests, riots and revolution.

Based on the results of this study, the results do not provide support for hypothesis three. The percentage of urban population is not statistically related to

protests, riots and revolutions. This result is interesting, yet measurability may have been a problem in this model. Like climate change, it is difficult to statistically estimate the precise effect of urbanization. Growth in population should be broken down into different categories. In the next decade, youth bulges will be the most concern in developing countries. Youth bulges are becoming robust in the Middle East and North Africa, South Asia and Latin America. However, future studies may be able to obtain a better breakdown of population data by age group over long periods of time, which will allow for better examination of youth bugles hypothesis.

The results from the revolutions' model support hypothesis four. There is a positive and significant relationship between unemployment and revolutions. The results were insignificant for protests and riots. This reveals that unemployment is a contributing factor for revolutions in developing countries. Unemployment, wages and urban population are theoretically related. A fixed number of jobs with a steadily increasing population will result in higher unemployment. The case studies of Egypt and Oman (next chapter) both point to this phenomenon.

Unfortunately, many developing countries do not report unemployment figures annually. Moreover, the large number of individuals who tend to work in the so-called informal economy make estimation of unemployment difficult in many developing countries. Hopefully, future research could obtain better data for these regions, which would provide for more accurate results.

The results from the revolution model also lends support hypothesis five. However, the results were not robust, as demonstrated for the null findings in the protests

and riots models. Country of origin was positive and significant (revolution model) and territory of origin was not significant in any model. Again, country of origin generally refers to the nationality or country of citizenship of claimant. Territory of asylum is the destination of migration.

Refugees are increasing in number across the developing world. The results demonstrate that refugees who are leaving their home country increase the likelihood of revolutions. This finding largely makes sense. During internal political conflicts, large numbers of people leave their country to seek safety. This suggests the possibility of endogeneity between refugee flows and revolutions. However, conversely, people may not only be escaping political conflict but also searching for resources within their country due to environmental degradation, climate change, and resource scarcity. People will become refugees in their own country, searching for food. In this case, the underlying factors (climate change) that contribute to population displacement are also potentially worsening resource competition and conflict, with combined effects on revolution. In future studies, hopefully there could be a more refined examination of the impact of migration flows and internal displacement. There should be categories of political, religious, ethnic and soon, environmental refugees. The United Nations should start recognizing the environment as a new trigger of migration. There is evidence of this in South Asia, particularly Bangladesh, how the rises of water levels are forcing populations to move and find new different land.

Indeed, in a linear model, (which is justifiable, because the data are continuous) with refugeeterritory and the DV, the coefficient for the lagged standard deviation of climate change on refugeeterritory is highly significant ($p < .001$), after adjusting for other

influences, including the economy (growth) and ethnic fractionalization. So, this provides further statistical evidence that climate change a background cause of internal displacement, and once displacement occurs, it leads to further political unrest.

Hypothesis Six: Countries with rapid increase in annual food prices are more likely to experience protests, riots, or revolution.

Based upon the findings of this study, the data supports hypothesis six. The growth of food prices increases the likelihood for riots and protests. The coefficients in each model consistently demonstrate that food prices are one of the potential sources of political conflict. These results are important to the literature dealing with climate change. As this research project has suggested, climate change will have indirect effects on social, cultural and economic variables. Food prices are a driving factor of instability in developing countries. Climate change will continue to exacerbate food prices in the future. Goods are typically measured (comparatively speaking) by the consumer price index. This measures a basket of goods and the purchasing power of an individual. Independently of the rising demand for food due to improved incomes in some countries, global warming is creating higher variability in food production, resulting in national and regional shortages. In this context, food prices tend to appreciate rapidly. In the future, this has potential to be a big problem. If populations are not provided with adequate supplies of food at affordable prices, this will increase the likelihood of riots and protests. As we have already seen, the Arab Spring in the Middle East and North Africa could be credited partly to the impact of rising prices on food.

Hypothesis Seven: Volatility in hydrological-related events (general river floods, flash floods or storms surge/coastal floods) will increase the likelihood of protests, riots and revolution.

Hypothesis Eight: Volatility in climatological events (droughts, famines, extreme temperatures and wildfires) will increase the likelihood of protests, riots and revolution.

The results of the models provide support for hypothesis seven. In the riots model, the coefficient for floods (lagged) is positive and statistically significant. This effect argues that the impact of floods on riots is felt in the following year rather than the year in which the flood occurs. This is likely due to the ineffectiveness of government's policies to provide resources to their populations after natural disasters. Sometimes, populations will have go through an extended period of time without basic services like food, water and sanitation. In addition, if floods destroy crops, this is likely to produce shortages in food in the following year. Instability like riots would likely occur to protest the lack of food and escalating prices due to shortages.

Although it is beyond the scope of this study to provide a thorough statistical analysis of this question, it is worth noting that a simple linear regression model of the annual change of food process shows that the coefficients for lagged standard deviation of floods is positive and significant ($p < .05$), after controlling for other influences such as the annual change in GDP.

Climate change is likely going to exacerbate floods in the future. The melting of the polar ice caps in the Arctic will dump millions and millions of gallons of freshwater in the oceans. This will completely change the dynamic of the coastlines around the

world. Since populations in developing countries are primarily located on coastlines or large bodies of water, they will be directly affected. This will increase riots and political instability in the future.

The results of the model also support hypothesis eight. One of the main independent variables for this study, climatic events (droughts, famine, wild fires and extreme temperature) was found statistically significant in two out of the three possible models. More importantly, the results demonstrate that climatic events are significant after being lagged a year. Similarly to floods, the political impact of climatic events is experienced a year later. The inefficiency of the government's response to these natural disasters, along with the lagged impact of these events on employment and food prices increased the likelihood of protests and revolutions the following year.

The model tells us that the actual events of droughts or famine do not impact a population in that current year. However, the political impact, in terms of instability occurs the following year, is suggested by the data. Similar to floods, the population starts protesting or demanding for a systemic governmental change because of the regime inability to respond effectively to natural disasters.

As the earth continues to warm, with global average temperature predicting to rise to 2.0°C in the next 25 years, there will be more droughts, famines and extreme temperatures across the world. Droughts are already occurring at an unprecedented rate in various regions around the planet. Due to environmental degradation, famines are becoming more common in northern Africa and sub-Saharan Africa. In the next decades, droughts and famines might possibly increase the chances of protests and revolutions.

Hypothesis Nine: States in the Middle East and North Africa will have higher levels of riots/protests/revolutions due to population growth and a history of autocratic rule.

Hypothesis Ten: States in South Asia will have higher levels of riots/protests/revolutions due to the number of natural disasters like floods and tsunamis.

Hypothesis Eleven: States in Latin America and Caribbean will have higher levels of riots/protests/revolutions due to the number of natural disasters.

Hypothesis Twelve: States in sub-Saharan Africa will have higher levels of riots/protests/revolutions due to a history of colonization and the number of droughts.

Hypothesis Thirteen: States in located in eastern and southern Europe will have higher levels of riots/protests/revolutions due to weak democratic systems and markets.

Hypothesis Fourteen: States in Eastern Asia will have a higher level of riots/protests/revolutions due to the growth of their urban population.

Based upon the findings of this study, the data provides support for hypotheses nine through thirteen. Hypothesis fourteen was not found as statistically significant in any models. Regional characteristics do play an influencing role on the behavior and norms that develop within political systems. The nature of the environment gives evidence to this. While the global environment is interconnected, each region has distinct characteristics within their own ecosystems. Because of this, climate change will affect each region differently. The Middle East and North Africa will be in greater risk of

droughts than countries in South or East Asia. These regional distinctions will be explored more in depth in the next two chapters (Egypt and Oman).

Analysis of Table 5.4 shows that the Middle East and North Africa was positive and significant in 1 out of the 3 total models (the revolution model). The Middle East and North Africa has a long history of political instability. With the recent ‘Arab Spring’, this region has gone through several regime changes. Although the models do not directly tests the causes of revolutions in the Middle East and North Africa, one may conjecture that food price, droughts and unemployment all played an important role in the rise of revolutions.

South Asia was significant in two out of the possible three models. South Asia was significant in the models for riots and revolutions. This result is interesting due to the fact that East Asia was not significant in any of the three models. There are many countries in South Asia that possess numerous of islands. Because of this, South Asia is a greater risk of being affected by rising sea levels and floods. Also, global food prices have an immense impact on the populations in this region. The staple food in South Asia is rice, and the price of rice is subjected to the global economic market. In 2008, despite the onset of worldwide recession, the price for rice rose exponentially for part of the year. This caused political instability like riots and led to some revolutions.

Latin America and the Caribbean was the only region that was statistically significant in all three models (protests, riots and revolutions). This result is interesting because Latin America and Caribbean is becoming the *perfect storm* in regards to climate change and environmental degradation. There has been a rapid rise in population growth

in this region. Populations in Latin America rely heavily on farmers and agricultural production for income and economic growth. Climate change threatens the economic future in Latin America and the Caribbean. The Caribbean faces rising sea levels and flooding which has the potential to displace populations. Hurricanes in this region are developing more rapidly, at a more intense rate. Haiti is an example of the devastation that natural disasters can do to a country. While natural disasters can create political problems, it also can exacerbate them. The inefficiency of the Haitian government was exposed during the earthquake in 2010.

Sub-Saharan Africa was significant in only one out of the three possible models. This region has a deep history of being effected by past droughts and famines. The data and research suggest that this will occur in greater numbers in the future. Rising food prices has also impacted populations in the sub-Saharan Africa. Similar to other developing regions in the world (like South Asia and the Middle East and North Africa), populations in sub-Saharan Africa has conducted riots and protests concerning food prices and unemployment. Like Latin America, the populations in this region primarily use agricultural means primarily for income and their survival. Climate change and environmental degradation will intensify conflict in sub-Saharan Africa.

Europe was the omitted reference in two models, and was only included in the model on revolution. Southern European countries that are located along the Mediterranean Sea have the potential to be impacted by climate change. Rising sea levels and food production will be become burgeoning issues to populations in this region. More about this will be discussed next chapter. Since this region was used a reference category in this model, greater research needs to be done in this area. For the future, it

might be possible that OECD countries could be used as a reference category instead of non-OECD developing countries.

Conclusion

The three statistical models from the chapter (protests, riots and revolutions) demonstrate that environmental variables are statistically related to higher levels of political instability. This confirms the main theoretical expectations of this study. This research project finds that food prices, percentage change in GDP, refugees, climatic events, floods and unemployment are all associated with higher levels of instability. Climate change will continue to multiply the impact of political instability. The following chapters (six and seven) will explore the political impact that climate change had on Egypt and Oman.

Chapter 6

The Arab Republic of Egypt

This chapter examines the impact global warming has had on Egypt and concerns for the future. This chapter will highlight the importance of political, cultural, economic and religious structures in Egypt and its relationship with climate change. The heart of this chapter focuses on Egypt's political stability, specifically, how climate change has unbalanced the equilibriums (outlined in the ecological security theory), which have contributed to political instability. By applying this structure, this chapter wishes to address these questions: Did any climatic events contribute to political instability in Egypt? Did the relationship between the Egyptian population and consumption of natural resources help trigger political volatility? Did rapid population growth or diseases increase instability in Egypt?

Throughout Egypt's history, it has participated in many international conflicts and external wars between different nations. Also, Egypt had many internal conflicts, including very recent coup d'états and regime changes. The Egyptian people have experienced two system changes in the last four years: a revolution in 2011 and a coup d'état in 2013. This chapter also wishes to address: Did environmental policies (or lack thereof) increase the likelihood of regime change in Egypt?

The previous chapter examined statistical results of the impact of climate-related events relative to political stability in developing countries. The empirical results demonstrated that environmental factors and climate change-related events led to political

instability in developing countries. The different dependent variables (riots, protests and revolutions) indicate that climatic events increased political volatility.

This country-level analysis gives a distinct, descriptive and meticulous breakdown of exactly how environmental degradation, climate change event, and public policy impacted political stability in Egypt. Specifically, this chapter will examine environmental variables like food, climate, population or water and its impact on the people of Egypt and its government, especially in the last 15 years. Also, this chapter generalizes challenges that Egypt will confront in the future, due to climate change.

This chapter does not suggest that the environment or climate change alone increases political instability. It illustrates that many variables: unemployment, rapid population growth, environmental degradation, climate change and political policies increased conflict in Egypt. Environmental variables, along with political policies and religious motivations played an important part of political volatility in Egypt.

In the beginning of this chapter, there will be a brief discussion on the Mediterranean region. Any environmental analysis conducted on Egypt must give an ecological regional perspective of the Mediterranean. This will give a better understanding of Egypt's future. This discussion illustrates the importance of the Mediterranean Sea as a source of energy, food and water for all people in this region.

Next, there will be a brief discussion on the history of Egypt and an examination of its political structures and current form of government. The objective of this is to enlighten the autocratic nature of Egypt's government and question whether it can be compatible with environmental policies, especially for climate change.

In the breakdown of the rest of this chapter, the author utilizes the ecological security theory. This framework outlines the four equilibriums and its relationships to the Egyptian (human) population:

1. The Egyptian population and its natural resources and nature's ability to provide for it;
2. The Egyptian population and pathogenic microorganisms, diseases and other animals;
3. The Egyptian population and its new technologies and political policies;
4. The Egyptian population and other human populations.

This chapter attempts to demonstrate how this theory can explain political behavior and political instability in Egypt. Disruptions to any of these four equilibriums will have added social, economic and political consequences. Organizing this chapter in this itemized framework is essential for future replication studies within or outside the Middle Eastern region.

Finally, this chapter will conclude by examining the future for the population in Egypt and its government. With two revolutions in the last four years and the recent election of former military general, Abdel Fattah el-Sisi, Egypt is still going through vast political changes. The conclusion articulates the need of policy changes to address the 'international elephant in the room', climate change. Egypt must make important changes if it wishes to effectively mitigate the impacts of climate change and further political instability in the future.

The Mediterranean Region

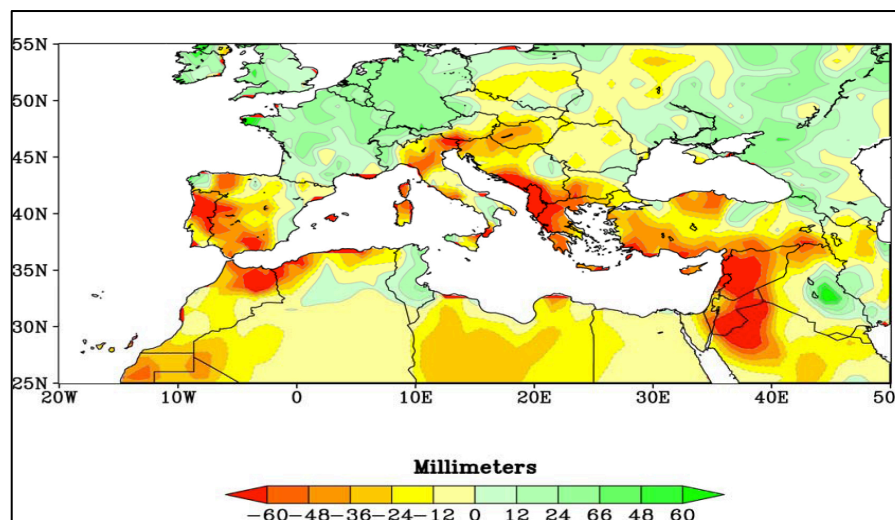
The Mediterranean region has and will continue to experience great difficulty because of climate change. This region is one of the many examples in the developing world where the combination of climate change, internal and external migration, and global food prices multiplies pressures on governments (Werz and Hoffman 2013). Climate change has already altered the landscape of the Mediterranean and North Africa. One of the most prominent environmental changes in the Mediterranean region in the past 10,000 years has been the transition of northern Africa, which was a green Sahara, now the world's largest desert (Kropelin et al. 2008).

Countries that share a border with the Mediterranean Sea are: Spain, Portugal, France, Monaco, Italy, Slovenia, Malta, Bosnia-Herzegovina, Croatia, Montenegro, Albania, Greece, Turkey, Cyprus, Lebanon, Syria, Palestine, Libya, Tunisia, Algeria, Morocco and Egypt. At the crossroads of three continents, the Mediterranean Sea joins countries with different levels of economic and social development (Sullivan and Jones 2008). The natural resources provided by the Mediterranean Sea were abundant and as a result many civilizations had extensive and extraordinary histories of development. The cultivation of advanced civilizations and the utilization of land for expansion during the Holocene era led to unprecedented economic progress (Mercuri, Sadori and Ollero 2011; Robert et al. 2011). The Mediterranean Sea cultivated the empires of the Phoenicians, Romans and Egyptians, which lasted for centuries.

The Mediterranean climate can generally be defined as hot and dry in the summer and heavy precipitation in the winter. However, global warming is changing this. The

Mediterranean region has statistically started to dry out – and will continue to suffer a reduction in precipitation with longer bouts of dry spells between rain events (Conte, Sorani and Piervitali 2002; Eckstein 2010). According to Figure 6.1, the satellite image of drying around the Mediterranean Sea. The red demonstrates current drying out that countries around the Mediterranean have been experiencing between 1971 and 2010.⁴²

Figure 6.1: The Mediterranean Sea



Source(s): National Oceanic and Atmospheric Administration

The abnormality of rainfall is causing violent downpours in the whole Mediterranean basin, which have been bringing on sudden and catastrophic floods (McNeill 1992; Benoit and Comeau 2005). In 2003, the summer monsoon season in northern Africa was the strongest it ever been in the history of the region (Claussen et al. 2003).

⁴² National Oceanic and Atmospheric Administration; Human-caused climate change a major factor in more frequent Mediterranean droughts.

However, the greatest threat of climate change is to the developing countries in the southern Mediterranean (North Africa). Specifically, since the beginning of the 20th century, the annual rainfall for countries in North Africa has greatly decreased (Branch 2012). As the populations in North Africa continue to grow, they will require an increased amount of water for health and industrial needs. Availability of water per person along the Mediterranean Sea has declined because of rapid population growth, overuse of land, and climate change (Lopez-Bermudez and Garcia-Gomez 2003; Branch 2012).

North African countries like Algeria and Morocco argue that drought and desertification are threatening their fertile croplands (Brown 2012). Algerian president, Abdeaziz Bouteflika, argued that Algeria is losing 100,000 acres each year to desertification (Brown 2012: 53). The Moroccan government has expressed concern that the rising sea levels have impacted its agricultural industry on the coast. These conditions will lead to continued food scarcity, agricultural failure and increased famine across northern Africa (Forsyth 2003). As mentioned in Chapter 5, scarcity of food has been identified as a potential trigger for conflict for developing countries (Brown et al. 2007), particularly in North Africa.

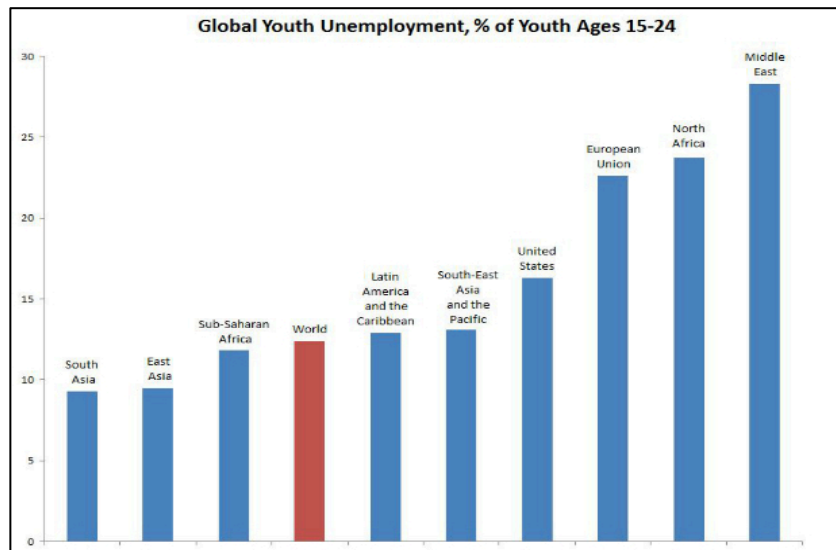
In general, some of the largest environmental impacts to countries along the Mediterranean will be deforestation, intensive grazing, flooding, droughts, fires, population growth, and infrastructure development (Mercuri, Sadori and Ollero 2011). The National Intelligence Council (NIC) states that because of the ecological and socioeconomic characteristics of the Mediterranean countries, the shock of climate change will be more severe than other regions in the world (Brauch 2012: 767).

Populations in the Mediterranean Region

The population of the coastal cities of the Mediterranean region has grown from 25 million to 70 million between 1950 and 2000 (Brauch 2012). It is projected to rise to 90 million by 2025 (Brauch 2012). In 2025, 3 out of every 4 Mediterranean natives will live in urban areas (Benoit and Comeau 2005).

Population growth has increased unemployment in this region. In North Africa, unemployment has grown faster than any other region in the world. Several factors (including population growth) have contributed to high unemployment in North Africa like slow growth in the public employment, privatization, and agricultural modernization (Benoit and Comeau 2005: 7). In 2003, 30 percent of young people were out of work, which was a record in comparison with other major regions (Benoit and Comeau 2005). According to the Table 6.1, in 2012, the Middle East and North Africa had the highest youth unemployment rates in the world.

Table 6.1: Global Youth Unemployment, 2012



Source(s): Isobel Coleman, Data from International Labor Organization

In the most advanced economies, individuals with higher levels of education are less likely to be unemployed. However, in North Africa, this is showing the reverse effect. Research demonstrates it is harder to find a job after completing education in countries like Egypt and Morocco.⁴³ An educated person who cannot find a job after years of education will become disenfranchised. As this chapter demonstrates, marginalization can cause political conflict.

Because of the environmental impact on the Mediterranean Region, this will have added challenges for these populations. These conflict-prone regions (the Middle East and North Africa) will face harsher consequences than the Gulf economies (Kumetat 2012) because of the level of population growth. The following section will give a detailed analysis of the history of Egypt.

Brief Historical Background of Egypt

The Arab Republic of Egypt has one of the longest and most recorded histories of any modern state in the world today. Dating back as one of the earliest documented civilizations in the world, the Egyptian people can trace their progression to ‘Before the Common/Current/Christian Era’ (BCE). The religious text from the three major faiths (Christianity, Islam, Judaism) mentions Egypt as an important country throughout history.

⁴³ International Labour Office. 2013. “Global Employment Trends for Youth”.

Egypt's political power in the Middle East and North Africa has largely been influential and significant. Headquarters of the Arab League is located in Egypt's capital city, Cairo. Egyptian culture has influenced most social, cultural and linguistic themes in the Islamic world. Egypt has regularly been regarded a leader in the Muslim world with music, films and television.

Egypt is located in the northeast corner of North Africa, between Libya and the Gaza Strip. The Sinai Peninsula, which is apart of Egypt, is located on the Asian continent. To the east of Egypt is Israel and the Red Sea and to the south, it shares its borders with Sudan. Egypt shares a long coastline (like mentioned earlier) with the Mediterranean Sea. The total area of Egypt is about 101,450 square miles, or about two and a half times the size of Ohio (Wendel 1890). However, the cultivated and settled areas only constitute about 3.5 percent of Egypt's total land area.⁴⁴ Most of Egypt's total land mass is uninhabited desert.

In June 1953, the monarchy as a governmental system was formally ended and a "republic" was declared (Sullivan and Jones 2008). Throughout Egypt's history, whether calculated over the last 7,000 years or even the past 200 years, the country has been characterized by strongmen (pharaohs, emperors, colonial warlords and military men) (Sullivan and Jones 2008). In the twentieth-century, three military leaders have been important in the domestic, regional and international roles in Egypt: Gamal Abdel-Nasser, Anwar Sadat and Hosni Mubarak (Sullivan and Jones 2008).

⁴⁴ Encyclopedia of the Nations. 2014. "Egypt- Location, size, and extent".

Gamal Abdel-Nasser helped to formally end Britain's occupation of Egypt with the first president of Egypt, Mohammad Naguib (Sullivan and Jones 2008). After internal disagreements, Nasser 'forcefully' replaced Naguib to become the second President of Egypt in 1956 (Sullivan and Jones 2008). During his governance, Nasser introduced many land reforms and wealth redistribution programs. Nasser first introduced the idea of 'Arab socialism' (Sullivan and Jones 2008: 8). This ideology promoted the public ownership of the modern sectors like finance, business and trade (Hansen 1975). Nasser suffered several downfalls; the most prominent was the defeat by Israel in the Six-Day War of June 1967. This ended his immense popularity in Egypt and likely led to his demise. He died of a heart attack in September 1970 (Sullivan and Jones 2008).

Anwar Sadat, Nasser's vice president, assumed the presidency in 1970 after Nasser's death. Sadat encouraged the development of Islamic student associations to offset the still-dominant pro-Nasser (leftist) student movements (Sullivan and Jones 2008). Sadat never had a strong commitment to any particular ideology, unlike his predecessor. Sadat was much more pragmatist rather than an ideologue. Even facing opposition from the Egyptian population, Sadat made peace with Israel, mostly for pragmatic reasons. Seen as a very unpopular move, Anwar Sadat was shot and killed by Khalid Islambouli during an October 6th parade (Sullivan and Jones 2008).

Hosni Mubarak, whom Sadat appointed as vice president in 1975, assumed the presidency. Another military man, Mubarak occupied the presidency in Egypt for over 40 years. While initially claiming he would honor the constitution, Mubarak corrupted the constitution to further his own power (Sullivan and Jones 2008). He passed several series of amendment packages, disguised as democratic measures (Sullivan and Jones 2008:

10). These amendment packages further corroded freedom in Egypt. Mubarak's presidency ended in Egypt with the January 2011 revolution. As protests and riots began all across Egypt, President Mubarak was forced to resign. Mubarak is currently being held in prison by the Egyptian government for the heavy crackdown of protests in the beginning of the revolution.

Currently, the population in Egypt is about 86,895,099 and ranked 16th (in terms of numbers) in the world.⁴⁵ About 90 percent of this population follows the Islamic faith. Coptic Orthodox Christians represent approximately 10 percent of the remaining population (Mahmood 2012). The majority of Muslims living in Egypt are from the Sunni sect. Egypt (like most countries in North Africa) has a sizeable racial population, from the Berbers to the Nubians (Batrawi 1945). For Muslims, the *Qur'an* (believed to be a revelation from God), the *Sunnah* (a historical record of the Prophet Muhammad's sayings and deeds) and *ijma* (the consensus of opinion reached by the early Muslim scholars) are the primary and secondary sources of Islamic principles (Rice 2006: 379).

Early in Egypt's history, the writing was purely *hieroglyphical* (Wendel 1890). This gradually changed from hieroglyphics to Modern Standard Arabic (MSA). MSA is the official language of Egypt. Like every Middle Eastern and North African country, the Arabic spoken in Egypt is not purely classical. The Egyptian dialect is the main language spoken between Egyptians but MSA (classical Arabic) is still taught at schools and universities. While every country has a distinct dialect, people in Arab countries understand Egyptian dialect because of its prominent position in Arab politics.

⁴⁵ Central Intelligence Agency. 2014. "The World Factbook, Egypt."

Government Structures (Autocratic)

The Arab Republic of Egypt is officially listed as a democratic system. In reality, Egypt's governmental structures represent an authoritarian system since Nasser (Sullivan and Jones 2008). In the last 5 years, Egypt has gone through 2 radical regime changes, where the previous president was forcefully ousted out of office. Currently, the Egyptian government is still showing signs of being very fragile and highly repressive.

The Egyptian Republic has 26 governorates (districts, each with its own governor) – all appointed by the president (Sullivan and Jones 2008). There are three branches of government – the executive, the legislative and the judiciary (Sullivan and Jones 2008). The president appoints a prime minister, which is the head of government, as well as a cabinet and council of ministers (Sullivan and Jones 2008). Within Egypt, the president wields powers similar to a king or sultan.

Egypt has a bicameral legislature comprised of the *Majlis al-Sha'b* (People's Assembly) with 454 seats (Sullivan and Jones 2008). 444 are elected by popular vote and the president appoints 10 and members serve five-year terms. The *Majlis al-Shura* (Consultative Assembly or Shura Council) has 264 seats (Sullivan and Jones 2008). 176 are elected by popular vote, 88 are appointed by the president, and members serve six-year terms (Sullivan and Jones 2008). The 26 governorates are divided into 222 electoral districts, with the smallest having 2 districts and the largest having 25 (the city of Cairo) (Sullivan and Jones 2008).

The judicial branch has historically possessed a degree of independence from both the legislative and executive branches. The Supreme Constitutional Court is the highest

court in Egypt. Egyptian law is based on a combination of civil and Islamic (*shari'a*) law (Sharif 1999). In accordance with Islamic (*shari'a*) rules in the past, each of these courts has consisted of a single judge (Sharif 1999). After the 1952 revolution and Egypt became a republic, this changed. Multiple judges now sit and hear cases. The main characteristics of judicial power in Egypt are its independence, specializations and distribution among many judicial bodies (Sharif 1999).

The Egyptian armed forces is one of the largest and most powerful in the world, ranking 13th.⁴⁶ Recruitment for men in the military is mandatory when they reach the military service age. Egypt's army is the backbone of its military, comprised of 310,000 with an additional 375,000 reservists (Sullivan and Jones 2008). The Egyptian military has played a very important role in the last 60 years. The current president, Al-Sisi, was the former head of the Intelligence service in the Egyptian military. He was installed as Defense Minister by former ousted president, Mohammed Morsi. In the last 60 years, all but one (Mohammed Morsi) of the Egypt's presidents came from the military.

Autocratic Government = Weak Policies?

Is the type of government important in stimulating effective environmental policies, specifically on climate change? The research argues that yes, the specific type of government (democratic, autocratic, totalitarian, etc.) is important in determining whether environmental policies will be legislated. Historically, developed countries are and have been more willing to engage in environmental protections and successful strategies than

⁴⁶ Global Fire Power. 2014. "Egyptian's Military Strength".

developing countries? Why? Studies have demonstrated a positive relationship between level of democracy and the toughness of environmental policies (see, Congleton 1992; Li 2006; Fredriksson and Wollscheid 2007).

Autocracies have more lax environmental policies than democracies for numerous of reasons. First, in the executive branch, the elite in autocracies are typically more educated than the public. Because of this, autocratic regimes censor information flow about the environment and its decision-making is more autonomous than that of a democratic government (Li 2006: 937). Secondly, sovereign developing countries are going to go at different speeds in regards to environmental protection (Walter and Ugelow 1979). Because of major current issues like population growth, food prices or conflict, environmental policies may not have long term planning for global warming.

While Egypt has three branches of government, supreme power rests in the president. The legislative and judicial branch can do little if the president wanted to change a particular law or a certain policy. The judicial branch in autocracies also acts inversely than democratic systems. Autocratic judicial systems typically do not protect the interests or the victims of climate change (Drosdowski 2006) but safeguard the interests of the privileged. Because of recent coup d'états and instability in Egypt, climate change policies may not be at the top of their list of things to address for the future.

The relationship between individuals and government officials is very delicate in autocratic regimes (Adger et al. 2003). Democracies are more responsive to the environmental needs of the public than are autocracies (Li 2006). The government in Egypt is most likely concerned with consolidating its power and preventing another

revolution than climate change policies. This will be difficult for the future. Developing countries like Egypt will be forced to make difficult decisions on dealing with global warming.

Autocratic governments in developing countries normally make decisions on environmental policies for the short-term. They are less responsive to the public, which usually are the people who push for environmental regulations. The lack of understanding and volatility by the Egyptian government will slow Egypt's progress in environmental laws and regulations to climate change. The lack of environmental policies has hurt developing countries, in general but Egypt specifically in planning for climate change.

Consumption of Natural Resources

In the *Qur'an*, the environment is mentioned as important and vital to human life. For that reason, many Islamic scholars have deduced that, to live in peace, there must be peace with the environment. "A just society, one in which human relate to each other and to God as they should, will be one in which environmental problems will not exist" (Rice 2006: 379). Some social scientists argue that it is surprising that the environmental movement in the Middle East, particularly in Egypt, has rarely made use of the environmental ethics of the Islamic (shari'a) law (Hamed 2005; Rice 2006).

In the early Holocene period in history, Egypt and northern Sudan were considered much wetter and had less dry conditions (Nicoll 2003: 565). However, towards the end of the Holocene era, the climate in Egypt has changed from a nature-dominated to a human-dominated Earth system (Roberts et al. 2011). As mentioned

earlier, the Sahara Desert is the largest desert on the African continent. The desert expands across numerous countries from West Sahara to Eritrea. The size of the Sahara Desert is roughly the size of the United States of America and considered one of the hottest deserts on Earth. These conditions have made farming, agriculture and cultivation nearly impossible in Egypt.

In Egypt, there have also been widespread droughts occurring at interval times in history. During these precise periods of droughts, the Dark Ages of Ancient History grew (Bell 1971). During the reign of Amenemhet I, he established limits on each districts access to water (Bell 1971). In the beginning of his reign was the beginning of the First Dark Age in Egypt. The time of the Dark Ages in Egypt is consistent with severe droughts from about 2180 to 2130 BC and 2000 to 1990 BC. The crisis during this time was not a failure of local rainfall, which was already at a very low level, but a severe failure of the annual floods of the Nile River (Bell 1971). The Nile River has historically been important to the Egyptian population. The populations of Egypt will need the Nile for its survival.

The Nile River

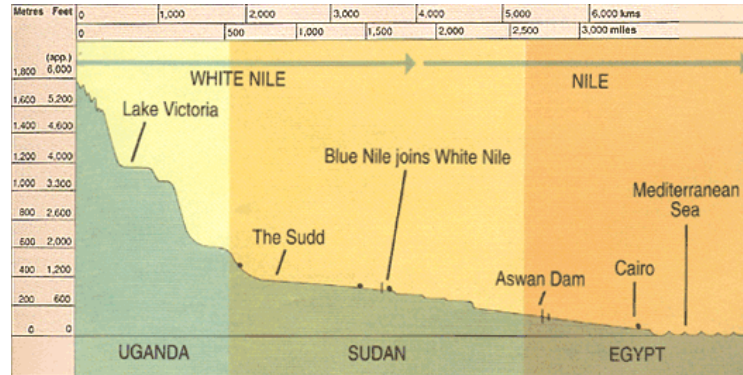
Egyptians speak proudly of their country as being the “Gift of the Nile”. They argue that without the Nile River, ‘there would be no Egypt, no civilization and no history’ (Sullivan and Jones 2008: 123). Providing 97 percent of Egypt’s water supply, the Nile River is viewed as ‘the source of Egyptian life’ (Sullivan and Jones 2008). A

country that is located in the desert, the Egyptian people rely on the Nile for water, food and commerce.

The Nile is the longest international river system in the world. The Nile flows from south to north with a catchment basin covering approximately 10% of the African continent (Fadel et al. 2003: 108). Along the Nile River is also home to almost 20% of African population (Beyene, Lettenmaier and Kabat 2010) and serves as their main resource for life. The Nile River flows about 6700 km through eleven countries before reaching the Mediterranean Sea (Beyene, Lettenmaier and Kabat 2010: 436). The eleven states that serve as riparian hosts are Egypt, Sudan, South Sudan, Ethiopia, Eritrea, Tanzania, Uganda, Burundi, Rwanda, Democratic Republic of Congo and Kenya (Sullivan and Jones 2008; Buontempo et al. 2011).

The Nile River rests above this Nile Basin, which is a complex hydrologic system. It drains an area of roughly 3 million km², which provides freshwater to millions of people in the region (Conway and Hulme 1996). According to Figure 6.2, the Nile River has three tributaries that form this body of water: the Blue Nile, the White Nile and the Atbara. It starts from Lake Victoria in Uganda and flows from south to north, through Egypt and to the Mediterranean Sea. The flow of the Blue Nile is strongly seasonal because its runoff is primarily driven by monsoon precipitation (Conway and Hulme 1996).

Figure 6.2: Height of the Nile River in Different Countries



Source(s): MBarron Production

In contrast with most countries in the Arabian Peninsula or North Africa, Egypt is well endowed with renewable water resources. Almost the entire population of Egypt lives along the Nile River Delta and they are dependent on its water resources for health and economic capital (Branch 2003). This river is important for all the economies of eastern and northeastern Africa (Buontempo et al. 2011). Egypt, Sudan and South Sudan are the three major users of this river, but all countries benefit from this rich natural resource (Beyene, Lettenmaier and Kabat 2010).

The IPCC have conducted multiple Global Climate Models (GCMs) analyses examining the Nile River in reference to climate change predictions (Hulme 1992; Yates and Strzepek 1998; Conway et al. 2007; Setegn et al. 2014). In these GCMs models, the stream flow of the Nile has shown shrinkages. Simulations reveal the average of all 11 GCMs conducted on the Nile River indicates that the stream flow is expected to decline in 2040.

Streamflow is one of the hydrological components that are greatly influenced by climate and land use changes (Setegn et al. 2004). Several scientists have determined there have been changes in precipitation and temperature on the streamflow of the Nile River (Conway and Hulme 1993; Beyene, Lettenmaier and Kabat 2010). This is the result of both precipitation declines and increased population demands (Beyene, Lettenmaier and Kabat 2010). The risk of climate change to the Nile region will be exacerbated by their low adaptive capacity; the high levels of poverty, poor access to existing water supplies and sanitation and the low efficiency of water use (Buontempo et al. 2011: 765).

Rapid population growth and climate change is putting additional pressures on the Egyptian population in relationship with the Nile River. Like mentioned before, out of the 86 million people in Egypt about 80 million are concentrated along the Nile River (Sullivan and Jones 2008). In 25 years, this population will grow and there will not be much water to go around. Egypt is already classified as a 'water scarce country'. Its per capita share of water is forecasted to decline to 'about 500m³/cap/year by the year 2025 because of climate change' (Sullivan and Jones 2008). Population growth will increase the demand for natural resources from the Nile, especially among the ten Nile River countries (Beyene, Lettenmaier and Kabat 2010: 434).

Because of the importance of the Nile River, multiple Egyptian leaders have talked about going to war over water. Former president Anwar Sadat said, "The only matter that could take Egypt to war again is water" (Sullivan and Jones 2008). Boutros Boutros Ghali, former Egyptian government minister said, 'The next war in our region will be over the waters of the Nile, not politics' (Sullivan and Jones 2008).

To combat climate change, several governments along the Nile River are securing its national interests along this resource. Ethiopia has plans to build a dam along the Nile, which will be used for hydropower. It will produce 6,000 megawatts of electricity and stand 170 meters high and 1,800 meters wide; making it the biggest on the African continent.⁴⁷ Many countries along the Nile (including Egypt) object to this. The new dam has potential to reduce streamflow down the Nile. Before being toppled in office, former president, Mohammed Morsi said in June 2013, “All options including military intervention were on the table if Ethiopia continues to develop dams on the Nile River”.⁴⁸ Since the Egyptian government views the Nile as a matter of national security, they will take all necessary means to protect its share of the Nile and its interests.

Food Security

In most developing countries, governments have subsidized the food industry. The low costs of food allow individual families to purchase goods at a better rate at the market. This is referred to as the Consumer Price Index (CPI). This is the price an average consumer can acquire a basket of goods and/or services in a given country.⁴⁹ Leading up to the 1960s, Egypt was self-sufficient in food (Galal 2002). When Nasser was president, it was his objective to ensure that the price of food was accessible to all

⁴⁷ Barry Malone. 2014. “Next on Egypt’s to-do: Ethiopia and the Nile”, *Al Jazeera*.

⁴⁸ Cam McGrath. 2014. “Nile River Dam Threatens War Between Egypt and Ethiopia”. *Common Dreams*.

⁴⁹ The World Bank Data. 2014. “Consumer Price Index (2010 = 100)”

Egyptians (Gutner 1999). Throughout this time, Egypt’s subsidization of wheat and bread was a powerful symbol of the social contract between the Egyptian government and its population (Gutner 1999: 3).

Since the 1970s and 80s, countries in the Middle East cannot grow enough in food from renewable water resources anymore (Woertz 2013). Because of this, most countries in this region import food. Egypt is the largest wheat importer in the world (9.8 million metric tons in 2010) (Sternberg 2010). In the summer of 2010, Russia, one of Egypt’s main wheat sources, banned exports due to potential domestic shortages (Sternberg 2012). According to the Table 6.2, Egypt’s prices in wheat drastically increased between the years: 2005 – 2010. In this time of transition, the rise of food prices was too much for the government to subsidize in its traditional amount. The government attempted to drive some of the food prices on the citizens in Egypt. Populations in developing countries (especially Egypt) started spending large amounts of their individual income on basic food (Abbott 2009; Ghosh 2009). In most of the violent protests in Egypt, subsidy reductions were rescinded but more moderate price increases were ultimately implemented within months of the riots (Gunter 1999).

Table 6.2: Egypt’s Food Prices in Wheat, 2005-2010.

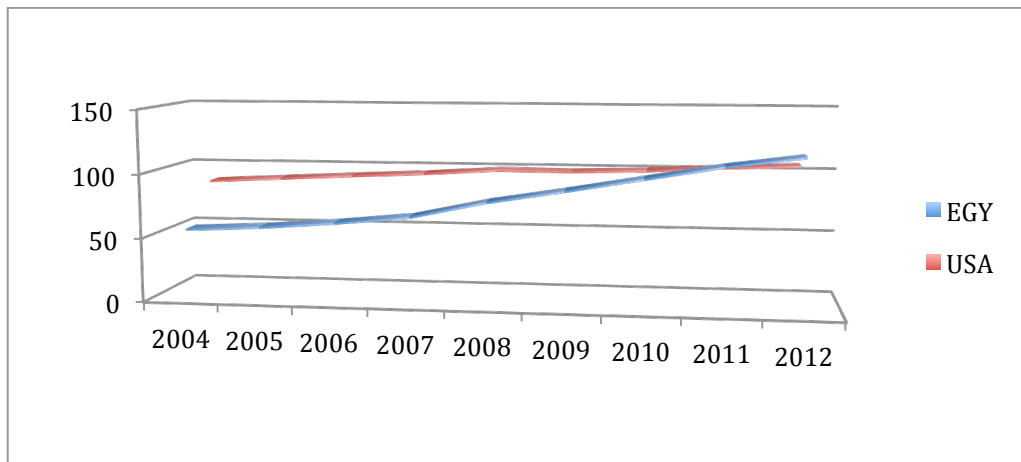
2005	2006	2007	2008	2009	2010
193.8	196.6	204.2	469.9	291.2	322.6

Source(s): Food and Agriculture Organization

Not only food, but also the price of goods started to change. According to Table 6.3, Egypt’s CPI rose drastically from 2004 to 2012, in comparison to the United States.

The rise in CPI drastically changed the economic market in Egypt. The rising price in food and goods diminished the purchasing power of urban classes and led to protests in several cities of the region (Woertz 2013). This sharp volatility in the economy helped exacerbate the rise of protests and revolutions in Egypt in the last five years.

Table 6.3: Consumer Price Index – Egypt and the U.S.A.



Source(s): The World Bank Data, 2014.

Hosni Mubarak, who was wildly corrupt, resigned from the presidency in 2011 largely due to food riots. These demonstrations in the developing world (coined: the Arab Spring) started in Tunisia and impacted more than 20 countries in the Middle East, North Africa, sub-Saharan Africa and Asia. Interestingly, this historic event began over the attempted sell of food. A man, Mohammed Bouazizi, lit himself on fire in objection after police harassed him for not having a permit to sell fruits at his fruit stand. The Arab awakening was not only driven by political and economic stresses, but environmental, demographic and climatic concerns as well (Friedman 2012).

Besides Egypt, protests and riots in the developing world had an environmental undertone. From 2006-2011, 60% of Syria's land experienced one of the worst droughts and most severe set of crops failures in its history (Friedman 2012). Tunisia, Morocco and Algeria experienced some of the lowest rainfall to date. Countries in South Asia like Bangladesh have witnessed unprecedented flooding and internal migration.

A common thread in this uprising and others around the Middle East and North Africa was political grievances and economic concerns. Demonstrations in Egypt were organized and grew to around 20,000 participants (Dalacoura 2012). Riots around the country, the occupation of Cairo's Tahrir Square were followed by worker strikes all around the country (Dalacoura 2012). Egypt's protests and riots were also driven by worker strikes, occupations and industrial actions in both the private and public sector (Bush 2008: 125). The strikes and riots demanded better wages to cover the increased costs of basic foods (Bush 2008). Like wheat, meat prices rose 33% and chicken prices rose 146% (Bush 2008: 125). The food riots in Egypt exposed underlying socio-political issues in Egypt. Climate change inflamed traditional problems in Egypt that were already present.

The Population's Relationship with Animals and Microorganisms

There are various types of diseases and microorganisms that have impacted the Egyptian population. The Rife Valley Fever (RVF) is a viral disease that has been infecting humans and animals. It is a global public health concern because of its ecological plasticity, adaptivity and potential to spread in temperate climate (Drake,

Hassan and Beier 2013: 251). The warming of the climate has made RVF more potent in different locations in Egypt.

RVF transmissions typically occur through the bite of an infected mosquito or direct contact with a body fluid of infected animals during slaughter (Drake, Hassan and Beier 2013). Typically, this disease was limited to sub-Saharan Africa but has become a big problem in northeastern Africa, specifically Egypt. Climate change is creating conditions in which diseases are enduring and spreading to places that they could not previously survive.

RVF in Egypt has been vastly unstable, with several sporadic outbreaks throughout the years. This occurs only when the pathogen is introduced under the right entomologic and hydrologic conditions (Drake, Hassan and Beier 2013). Research indicates that the sudden appearance or a surge in quantity of water is associated with outbreaks (Drake, Hassan and Beier 2013). In certain areas in Egypt, floods have become a major problem. A series of successive high floods occurring in the years 1999-2000, 2000-2001 and 2001-2002 may have contributed to the 2003 RVF epidemic (Drake, Hassan and Beier 2013: 256).

The RVF outbreaks in areas of unstable transmissions are not only influenced by natural and socioeconomic phenomena but is also complicated by a country's political agenda and vigilance of its health systems (Drake, Hassan and Beier 2013: 257). Egypt's healthcare system would be unable to care for millions of people that RVF could potentially infect along the Nile River.

Hepatitis C Virus (HCV) has also been a growing problem in Egypt. Globally, 1 out of every 50 people has been infected with HCV. Egypt is ranked number one in the world, with a reported case rate of 14.9% (about 1 out of every 6) (Mohamoud and Raddad 2012; Shibl, Senok, Memish 2012). It is estimated that approximately 100,000-500,000 new infections occur annually in Egypt (Shibl, Senok, Memish 2012). With globalization, these sizable numbers are also impacting neighboring countries like Sudan and Libya.

Majority of the cases of HCV in Egypt has been because of unsanitary practices in medical facilities.⁵⁰ In 2008, the Ministry of Health and Population launched several programs for tackling HCV. However, these programs are not cheap. Programs to combat HCV consume about 20 percent of Egypt's annual health budget.⁵¹ Even with the added programs, the number of HCV cases is still growing. Statistics has not shown a decline in HCV over the last two decades. HCV transmissions are still holding steady while Egypt's population has nearly doubled in the past two – three decades (Mohamoud and Raddad 2012). Like with the previous mentioned diseases, climate change is creating 'dream' conditions for HCV to live.⁵² The transmission of this disease and future epidemics will be intensified because of global warming.

⁵⁰ Maria Golia. 2014. "Fighting Hepatitis C in Egypt." *The Middle East Institute*.

⁵¹ See note 50 above.

⁵² The World Health Organization. 2014. "Climate Change and Human Health – Risks and Responses".

Technology Link with the Egyptian Population

Information communication technology is becoming more widespread in the world, with everyone from adults to children having computers and cell phones. There is considerable debate concerning the impact of communication tools – like the Internet and mobile phones – on political engagement (Dunn 2011: 15). Technologies are quickly changing in the world. Social networks are becoming core systems that create stronger ties of weakly linked individuals, which can spread discontent into a mass movement (Lim 2012).

Social media usage among the young population in Egypt is high. More than 60% of the households in Cairo have Internet (Lim 2012). Facebook is considered the second most accessed website in Egypt after Google (Lim 2012). There are more Facebook users throughout the Egyptian population than newspaper readers (Lim 2012: 235). However, social media is just one part of a new system of political communication technology that has evolved in North Africa and the Middle East. 24/7 media stations in the Middle East like Al-Jazeera, Al-Arabiya and local media outlets have completely flooded the market.

Right before the protests and riots in Egypt, the government began shutting down several information networks. First, the government shut down *content* (which is information traveling through media and grounded, non-aggregate social networks), followed by *general platforms* (Facebook and Twitter) and then *communication infrastructure* (mobile telephones and Internet services) (Dunn 2011: 16).

Within the region, Iran and Saudi Arabia have developed advanced bureaucratic infrastructures that filter Internet content (Dunn 2011). In China, the Internet is heavily

monitored and its government has placed communication restrictions on its population. The Egyptian government have traditionally had limited involvement with the Internet (Dunn 2011). The new constraints by the government on its communication network caused anger and outrage from the public.

On January 25, 2011, the Egyptian government shut down the Internet, mainly barring social networks: Facebook and Twitter. The five-day Internet blackout had an impact on the *apolitical* segment of the society (Dunn 2011). The business community, the most educated and the wealthiest of Egyptian society was theoretically ‘cut off from the world’ (Dunn 2011). These sections of the society who were not interested in the protests and food riots in Egypt became attentive. This shutdown turned the *apolitical* into *political* actors.

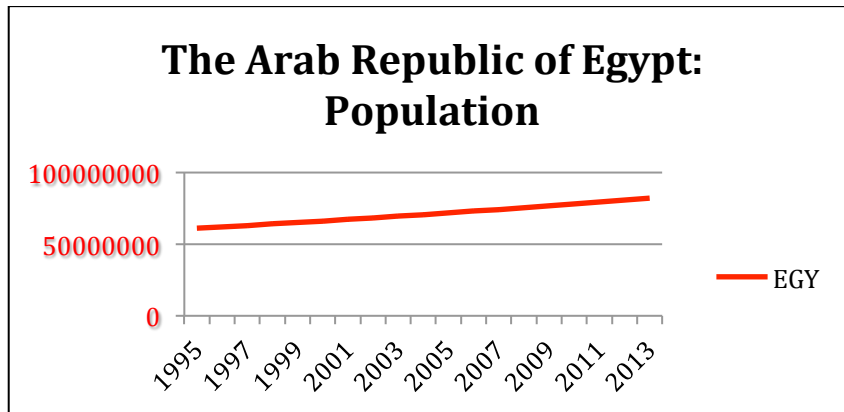
Arguably social media, particularly Facebook and Twitter played an important part in the political protests in Egypt. Participation in the protests that led up to the Egyptian revolution was associated with particular patterns of media use (Tufekci and Wilson 2012). The relationship with populations and technologies are growing interdependent. The right to the Internet and access to social networks are becoming a ‘human right’. Mass connection by the population to the Internet is beginning to liberate societies.⁵³

⁵³ Importantly, as the Internet can liberate societies, it can also repress. Case examples are Iran, China and Saudi Arabia.

Resource Demands from a Growing Population

With a population over 86 million people, Egypt is considered the most populous country in the Middle East (Lim 2012). Its capital city, Cairo, has over 15 million people living in its urban area (Rice 2006). Of the 86 million, young people (ages 15 – 29) make up about one-third of the country’s total population (Lim 2012). According to the Table 6.4, the population in Egypt has been steadily rising for the last 13 years. The population projections predict Egypt will not slow down, but will continue growing. In the next 25 years, the population could topple over 100 million people.

Table 6.4: Population Growth in Egypt



Source(s): The World Bank Data, 2014

As a result its rapid population growth, Egypt is the most vulnerable out of all the Middle Eastern states to increases in sea level (followed closely by the United Arab Emirates and Qatar) (Sowers, Vengoash and Weinthal 2009: 608). According to Table 6.5, there has been a considerable amount of deaths from floods in Egypt. Growing

concerns of these natural disasters in Egypt are impacting over 250,000 people. This number is expected to exponentially rise in the next 25 years.

Table 6.5: Total Floods in Egypt since 1954

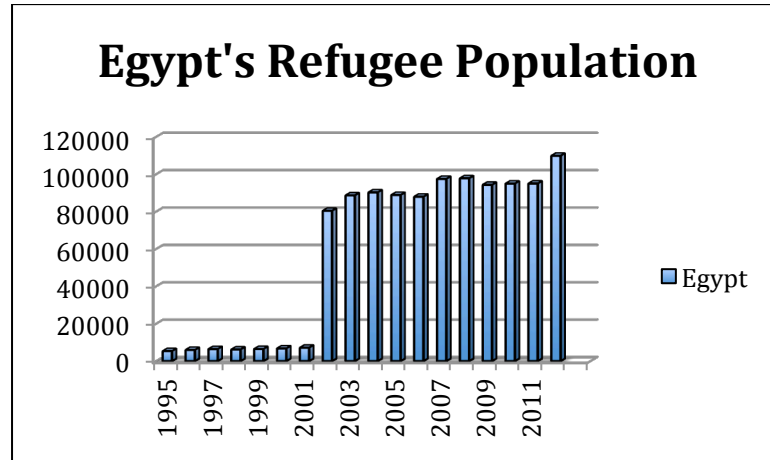
Occurrence	Death	Injured	Affected	Homeless	Total Affected	Total damage
12	734	78	181,220	53,200	234,498	155,000

Source(s): EM-DAT, The International Database

At the end of 2001, according to the UN High Commissioner for Refugees, there were about 18,946 refugees in Egypt, with the majority coming from Sudan (UNCR 2001). According to Table 6.6, currently, there are over 110,000 refugees in Egypt. Present conflicts in that region (between North and South Sudan, between Israel and Palestine), will result in the number of refugees severely increasing. Refugees in Egypt often find themselves revictimized by both Egyptian security services and ordinary Egyptians (Sullivan and Jones 2008).

Internal refugees are also occurring within Egypt, with populations moving to get away from floods and other natural events. Families, where they have been located for hundreds of years are moving to find resources. The conflict over resources will increase because of newly arriving refugees.

Table 6.6: Egypt's Refugee Population



Source(s): The World Bank Data, Refugees

Conclusion

Different variables like climate change, environmental degradation, rapid demographic change, unemployment and food insecurity contributed to instability in Egypt. While climate change was significant in contributing to instability in Egypt, it is important to note that it only played a part. It was a culmination of these variables that increased the likelihood of instability.

In reality, while all these factors played a part, they were not equal in contributing to instability in Egypt. I believe food insecurity played the biggest role in volatility in the Middle East, primary in Egypt. As research abundantly demonstrates, climate change increased and will continue to intensify food insecurity throughout the developing world. Food insecurity is an agriculture but also an economic issue. Food shortages distort the global economy, which contributes to unpredictability in the market. This unpredictability can cause riots and even revolutions. Bread protests and food riots have

often precipitated political and social change throughout history, examining the French and Russian Revolutions (Sternberg 2012: 523). Again, political instability does not occur in a vacuum. Climate change, nor poverty, food insecurity, demographic change alone predicts volatility but the amalgamation of these factors. As this research points out, climate change is now one of these factors that increase the probability of political instability and conflict.

Currently, there is a new president of Egypt. The Egyptian people elected Abdel Fattah el-Sisi as 6th president of Egypt. Sisi was a defense minister in the government, but led an army-led ousting of former president Mohammad Morsi. He was declared Egypt's president on June 3, 2014 after winning 96.9% of the vote in the presidential election.⁵⁴

People consider el-Sisi as the '*guardian of the people's will*' or the next coming of Nasser. Unlike most Middle Eastern leaders in power, he uses dialect language (instead of formal Modern Standard Arabic) in passionate speeches to address the country.⁵⁵ Unlike the last president, el-Sisi has and wants a close relationship with the U.S. government. This relationship is important for future concerns Egypt will face.

To combat challenges confronting Egypt, the United States should maintain its economic support for the Egyptian government and its population. However, this support should be much more diverse, not simply military aid. Egypt needs to push for constitutional reforms, 'open-up' its economy, its political communication space and importantly, partner with other regional countries. This will allow its civil society, the

⁵⁴ Al-Jazeera. June 2014. "Profile: Abdel Fattah el-Sisi."

⁵⁵ See note 54 above.

media and opposition parties to operate within the bounds of the law and within their rights (Sullivan and Jones 2008).

Egyptian research scientists have been investigating the impacts of climate change but their results are taken with a grain of salt (Sowers, Vengosh and Weinthal 2009). Several climate researchers in Cairo have found that international collaborations involving the use of satellite imagery to analyze the impact of climate change were rejected by the military on national security grounds (Sowers, Vengosh and Weinthal 2009). The Egyptian government needs to take seriously the impact on climate change. There is a need of more valuable research in this country and region.

However, there are ways that Egypt is improving. One of the largest tinned food manufactures underwent an eco-audit and introduced measures to reduce energy consumption (Chabason 2005). Implementing water consumption hydrometer monitors vastly reduced water consumption in the urban areas. The savings made in water, steam and energy made it possible to reduce discharges a little less than three years (Chabason 2005).

Egypt has also developed a participative approach to the management of irrigation and modernization of technology in the irrigated areas of the Nile valley (Chabason 2005). The technology is based on modern equipment and bottom-up irrigation management, which improve irrigation for this area. Organizations like the Arab Water Council (founded in 2004) are starting to take a leadership role, disseminating new norms of water management (Sowers, Vengosh and Weinthal 2009).

Most countries in the Middle East and North Africa have concentrated the bulk of their resources to large-scale supply side projects such as desalination, dam construction, inter-basin water transfers, tapping fossil groundwater aquifers and importing virtual water. In the next chapter, countries in the Gulf, particularly Oman, has taken advantage of this burgeoning technology.

Finally, population growth, desertification, drought, floods and food economics are not hard security threats. They cannot be solved from a Hobbesian security perspective but they require a long-term cooperation among scientists and practitioners. Collectively, countries like Egypt must use traditional, local and advanced technological knowledge to adapt to climate change (Brauch 2003). Broad, long term planning is important for Egypt to ‘weather the storm’ of climate change.

Chapter 7

The Sultanate of Oman

This chapter will examine the impact that the environment has and will continue to have on the political, cultural, economic and religious structures in Oman. The main body of this chapter will focus on Oman's political stability. The unbalanced of different concepts (the Ecological Security Theory) has contributed to political instability in this country. Similar to the last chapter, this section will attempt to address these individual questions: Did environmental factors, including consumption of natural resources, contribute to the political instability in Oman? Did technology and/or diseases intensify political instability? How have climate change and/or environmental degradation coupled with rapid population growth increased political instability in the Omani population?

Having lived in different cities in the Sultanate of Oman for about 6 months, I was very fortunate in conducting dissertation research. Given that, I have a unique perspective on Oman. Although most of my research was data-driven, I was able to speak to many Omanis (in Arabic) about the politics and future of their country. Hopefully, my unique perspective will bring depth to this research.

Unlike most countries in the Middle East and North Africa, Oman has not participated in many international conflicts nor had numerous internal rebellions. Compared to most countries in this region, Oman has been considered one of the most stable. The State Fragility Index (SFI) measures political stability on a scale from: 0 (very stable) to 25 (very volatile) (Marshall and Cole 2011). According to the SFI, in the last 15 years, Oman has been averaging about a 5 on the stability scale, where countries like

Egypt have been averaging about 14 (Marshall and Cole 2011). While Oman has been relatively stable, it has experienced recent volatility with protests and riots. This chapter also wishes to address the question: The instability that Oman has experienced in the last 3 – 5 years: was climate change a factor?

In the same fashion, this chapter will give a descriptive and a thorough breakdown of how environmental degradation and climatic events have impacted stability in Oman. Specifically, this chapter will explore variables like food, rapid population growth, water and oil and its impact on the relationship between the people of Oman and its government. Like Egypt, Oman faces similar challenges with unemployment, rapid population growth, environmental degradation and climate change. However unlike Egypt, Oman is considered an oil-rich country. This important resource plays a big part in the present and future stability of this country.

In the beginning of this chapter, I will give a brief discussion on the Arabian Peninsula. A systematic analysis on Oman must examine and offer an ecological economic perspective of this region. A regional consideration gives a richer understanding of the importance that the Arabian Peninsula plays as a source of economic trade and energy. Collectively, Arab countries in the peninsula have demonstrated interests in tackling future climate problems. In the following section, there will be a brief discussion on the history of Oman, its political structures and current form of government. Similarly to Egypt, Oman has an autocratic government. However, all of the governmental powers in Oman rest with one person, Sultan Qaboos. The author will speak on Omani autocratic government and its hindrance to environmental policies.

The author will use the ecological theory as a framework for the rest of this chapter. Using the four equilibriums (see last chapter for itemization), this framework will explore the relationships between environmental variables and the Omani population. This theory attempts to explain political behavior and political choices. Disruption in one of these equilibriums can lead to additional social, economic and political consequences.

The conclusion of this chapter will examine future challenges for Oman. The current Sultan of Oman, Qaboos bin Said al-Said has been ruling Oman for over 40 years. Currently in his 70s, Sultan Qaboos has no heir to the throne. The next 10 years will be a very critical point in Omani history. The concluding section will attempt to answer: Will the Omani population accept the next Sultan of Oman? Will the next ruler continue the necessary economic changes to combat global warming?

The Arabian Peninsula

The Arabian Peninsula is the world's largest peninsula. Located in western Asia, it has an estimated total area of 1,060,000 square miles and has sand covering at least 300,000 square miles (Holm 1960). It borders the Persian Gulf and the Red Sea (Shibl, Senok, Memish 2012). The countries that make up the Arabian Peninsula are Bahrain, Kuwait, Qatar, the United Arab Emirates (UAE), Yemen, Saudi Arabia and Oman (Shibl, Senok and Memish 2012). East of the Arabian Peninsula is the Strait of Hormuz. The Strait of Hormuz is vital for the travel of oil. Much of the world's oil passes through the Strait of Hormuz and it has been strategically important for the world.

In 1981, Oman, along with Saudi Arabia, Kuwait, Bahrain, Qatar and the UAE formed the Gulf Cooperation Council (GCC). It was founded on regional cooperation on bilateral and multilateral levels that has developed over the last 14 – 15 years (Rizvi 1982: 29). The GCC was created as a political and economic union to respond to the threat posed to the Arabian Peninsula during the Iran-Iraq War from 1980-88 (Qureshi 1982; Lefebvre 2009; Colombo 2012). Recently, GCC have been discussing future plans of expansion. A state also located on the Gulf, Yemen, is considering membership. Countries like Morocco and Jordan have shown interests in joining.

The institutional structure of the GCC consists of the Supreme Council, which consists of the heads of each state (Rizvi 1982). They agree upon a Secretariat, headed by a Secretary General, who is appointed by the Supreme Council (Rizvi 1982). The Secretariat is based in Riyadh, Saudi Arabia (Rizvi 1982).

In the beginning, the GCC states hoped a strong foundation on economic unity would lead to political, economic and military cooperation in the future (Qureshi 1982: 89). Many countries, including Oman, favored linking the Gulf security system to that of the West (Qureshi 1982). In the early stages, some disagreed with this strategy. However, recent history has indicated otherwise, with the United States having numerous military bases in the Gulf (the largest in Bahrain – U.S. Naval Fifth Fleet). The GCC, made up of all Arab monarchies, also decided cooperation is needed to balance out the growing threat from the Islamic Republic of Iran.

Climate Change

In December 2008, former United Kingdom Secretary of Defense, John Hutton argued that climate change is one of the new security threats to the GCC, along with the proliferation of weapons of mass destruction and the rise of terrorist havens (Kumetat 2012: 380). Climate change impacts the Gulf in several ways. This section points out the impact global warming will have on the countries in the Gulf, collectively.

GCC countries are ranked as some of the highest per capita CO₂ emitters in the world (Kumetat 2012). Due to mass economic development, many countries in the Gulf, particularly Oman and UAE, have built hundreds of factories to produce goods. The years of building factories and desalinations plants, plus rapid economic growth have produced more CO₂, which has put considerable pressure on the environment.

The impacts of climate change on the Gulf region are presently visible. The IPCC has also forecasted a decrease in precipitation with a projected temperature rise of 1.8°C by 2040. This will make most of the Gulf unfit for agriculture and uninhabitable for large immigrant populations (Kumetat 2012). This rise in temperature means an increase in water demand. In this region, freshwater levels have been falling and there has been increasing salinity in seawater (Raouf 2008).

Natural disasters in the Gulf region are different than other regions around the world. Hurricanes and tornados occur frequently in other parts of the world, but are not common in the Arabian Peninsula. Hazards like earthquakes, droughts, tsunamis, tidal waves, and volcanic eruptions have created serious problems in the Gulf (Kumar 2013: 157). Sand and dust storms are also very common in the Arabian Peninsula. Dust storms

in northern Africa, the Middle East and Asia put 200-5,000 million tons of mineral dust into the Earth's atmosphere every year (Kumar 2013: 168).

Much of the impact of climate change on the Arabian Peninsula will pressure its pockets. The economic impact from global warming in the Gulf countries will be more severe as they depend on revenues from oil, gas, and food exports (Raouf 2008: 2). This income enables the governments to cater to their populations.

Populations in the Gulf

The decline of natural resources like food and oil is exacerbated by the Gulf's rapid population growth. The GCC countries will face a multitude of traditional environmental challenges such as desertification, biodiversity loss, pollution in marine and coastal areas, air pollution and water scarcity and quality due to climate change (Raouf 2008). The additional pressure of rapid population growth will worsen this future crisis.

The population in the currently GCC state has grown more than eight times during the last 50 years (Kapiszewski 2006). In 1950, the population was about four million but expanded to about 40 million in 2006, which marks one of the highest rates of the population growth in the world (Kapiszewski 2006: 3). By 2020, the GCC population is expected to reach about 53.3 million, a 30% increase over the level in 2000 (The Economist Intelligence Unit, 2010).

No other region in the world is so directly and continually reliant upon such high ratios of foreign labor (Forstenlechner and Rutledge 2011). Since the discovery of oil the GCC, which lacks a local workforce, have been employing a large expatriate labor force (Kapiszewski 2006). In Qatar, the UAE and Kuwait, foreigners constituted the majority of the population (Kapiszewski 2006). In the UAE, foreign workers accounted for over 80% of the total population (Kapiszewski 2006: 3). In comparing the UAE to Oman, foreign workers only represent about 20% of its total population, relatively low proportion to the population in contrast (Kapiszewski 2006).

Water

Water in the Arabian Peninsula is already very scarce. Water scarcity will be intensified by the lack of resources and unprecedented population growth rates (Spiess 2012). Domestic water use in the Gulf is currently about six times the natural renewal rate (Kumetat 2012). The next 10 years will see a rising water demand, as the GCC's expanding middle class adopts an increasingly water-intensive lifestyle (The Economist Intelligence Unit, 2010). This consumption of water is unsustainable. The concern for the Gulf is not *if* they will run out of water, but *when*.

Sea level will become a future concern in the Gulf. If sea level rises, natural and man-made islands in the region will disappear. Countries like Bahrain could potentially lose up to 15 kilometers of coastline (Raouf 2008; Kumetat 2012). This can endanger reclaimed islands and the buildings in the coastal areas of the Lower Gulf, especially in the UAE (Kumetat 2012). Land reclaiming is creating land over a body of water.

Economic projects like this are occurring rapidly in the Gulf. With thousands of people living in these areas, rising sea levels could be disastrous in the future.

Food

Food is a burgeoning security problem for all developing countries, especially in the Arabian Peninsula. Arid environments in the Gulf have already created an imbalance in self-sustained agriculture. International food programs like Food and Agricultural Organization (FAO) and United Nations World Food Program (WFP) have the daunting task of undertaking food security issues. With climate change and rapid population growth, countries in the Gulf face important future challenges.

When food prices spiked in 2008, several Gulf States introduced price controls (Spiess 2012; Woertz 2013). This included food subsidies and caps on rent increase, as well as public sectors pay rises to offset the impact of rising food prices on their citizens (Spiess 2012; Woertz 2013). Gulf countries reacted with four different responses to the food crisis: “Countries increased subsidies and public sector wages to implement price controls, they increased strategic storage of basic food items, and they introduced water saving technologies in domestic agricultural and phased out water intensive crops” (Woertz 2013: 9). Although these short fixes mitigated the volatility in the food market, it did not solve the food problem in the Gulf.

Currently, wheat and rice constitute around 40% of caloric consumption in the GCC countries (Woertz 2013). Food imports are projected to grow to drastically by 2020 (The Economist Intelligence Unit, 2010). According to Table 7.1, GCC food imports are

poised to grow. In 2007, GCC countries paid \$18.1 billion dollars for food. In 2020, it is projected that the total cost of food imports for the GCC countries will top around \$53.1 billion dollars.

Table 7.1: GCC's Food Imports

Hungry GCC Food Import, US\$ bn 2007-2020														
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bahrain	0.5	0.7	0.7	0.7	0.8	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5	1.6
Kuwait	1.7	2.3	2.2	2.3	2.5	2.7	3	3.4	3.6	3.9	4.2	4.6	4.9	5.3
Oman	1.3	2.1	1.7	2.1	2.1	2.3	2.4	2.9	3.3	3.1	3.5	3.9	4.3	4.8
Qatar	0.9	1.4	1.2	1.3	1.3	1.4	1.6	1.9	2.1	2.3	2.5	2.8	3.1	3.3
Saudi Arabia	12	16.7	15.9	16.8	17.9	19	20.3	21.7	24.5	27.2	29	30.9	33	35.2
UAE	2.6	3.8	3.4	3.6	3.8	4.1	4.4	5.1	5.5	5.5	6.6	7.2	7.8	8.4
GCC Total	18.1	25.7	24.1	24.1	27.2	27.2	29.5	33.7	36.3	36.6	42.6	45.6	49.3	53.1

Source(s): The Economist Intelligence Unit, 2010

Saudi Arabia has announced that it will completely phase out domestic wheat production in 2016 (Kumetat 2012). What does this mean? Saudi Arabia will start to completely rely on imports for wheat consumption. Even now, the countries in the Gulf region depend heavily on food imports (up to 90%) to feed the fast growing population (Harmeling and Eckstein 2013). Gulf countries are exploring projects outside of the region because of domestic food security concerns to target staple crops like rice, wheat and sugar (Woertz 2013).

Climate change and environmental degradation will continue to impact the Arabian Peninsula. The Arab monarchies will have important challenges in dealing with their populations, due to recent protests and riots in the Middle East and North Africa. When the oil runs out, countries in the GCC will have a difficult time paying off their population.

Historical Background – The Sultanate of Oman

With an area of approximately 312,500 km², Oman borders northwest and west by the UAE and Saudi Arabia and in the southwest by Yemen (Kwarteng, Dorvlo and Kumar 2008: 606). In size, Oman is considered the third largest land area on the Arabian Peninsula (O'Reilly 1998). Muscat, the capital of Oman, extends from Seeb in the North to the Quariyat region in the south and along its coast (Charabi and Bakhit 2010). Geographically, Oman is located on the southeast corner of the Arabian Peninsula.

Oman is relatively a small country in terms of population, with nearly 3.5 million people (O'Reilly 1998; Common 2011). Population in Oman is considered very diverse. Many Omanis originate from East Africa or Baluchistan (Common 2011). Like all countries in the Middle East and North Africa, the official language in Oman is Modern Standard Arabic. Similar to all other countries in the region, the local language is Omani dialect. However, there are many languages spoken in Oman like English, Baluchi, Urdu and Indian dialects.⁵⁶

Qaboos Bin Said al-Said was born in Salalah in the Dhofar region in November 1940 (Alhaj 2000; Common 2011). He was the only son of the late Sultan, Said bin Taymour and eighth in the direct line of the al-Said dynasty (Alhaj 2000). The al-Said dynasty was founded in 1744 by Sultan Imam Ahmed bin al-Said (Alhaj 2000; Common 2011). Qaboos's father, Sultan Said bin Taymour kept Oman a closed and backward society. Throughout this time, economic development was very limited and Oman had an isolationist foreign policy.

⁵⁶ The Central Intelligence Agency. 2014: The World Factbook, Oman.

Like mentioned previous, the interior of Oman (the Imamate) and Muscat (the Sultanate) has a long history of being politically divided (Common 2011: 216). Qaboos assumed the Omani throne on July 24, 1970, in a palace coup directed against his father, who later died in exile in London (O'Reilly 1998; Alhaj 2000; Power 2012). Qaboos never set foot in his country's capital, Muscat, before becoming sultan (Peterson 2013). One of the objectives of Qaboos when he came to power was the unification of Oman. Once Sultan Qaboos came to power, he centralized power in Oman. In 1971, after the unification of the country, Oman joined many international organizations like the United Nations and the Arab League (Lefebvre 2009).

Like most countries in the Middle East and North Africa, Omani culture is defined by its faith. *Ibadhism* is the dominant sect of Islam found in Oman. Ibadis identify themselves as Muslim but are neither Sunni nor Shia (Lefebvre 2009). Ibadhism began as an offshoot of the Khatijite sect, which opposed the succession to the Prophet Mohammed (Lefebvre 2009). Ibadhism partly accounts for Oman's distinctive character in the Arabian Gulf by its collectivist approach to international relations (Common 2011).

Unlike other sects, Ibadhism is found in very few locations outside Oman, mainly parts of north and eastern Africa (O'Reilly 1998; Common 2011). Ibadhi imams in Oman have exercised significant influence in political affairs throughout the history of the country (Alhaj 2000; Common 2011). About 70% of Omanis come from the Ibadhi sect of Islam, with Sunni Islam having the second majority in Oman.⁵⁷ Unlike Ibadhis, Sunnis in Oman are not a homogenous group. They belong to different schools of jurisprudence (Al-Haj 1996) and range from many different countries.

⁵⁷ See note 56 above.

Government Structure (Sultanistic)

Some of the first research studies on modern Oman began in the 1970s, when the country underwent a robust modernization (Wippel 2013). During this time, the Omani population began to benefit from the oil boom at the time and when Sultan Qaboos overthrew his father (Al-Haj 1996; Wippel 2013). However, Oman has been attempting to modernize its political institutions and introduce some forms of political participation (Al-Haj 1996; Peterson 2013).

Oman is a Sultanistic regime, which the sultan retains ultimate authority on everything important: from foreign to domestic issues (Alhaj 2000; Common 2011). There is little social or political pluralism and political parties are completely banned in Oman (Common 2011). Sultanistic regimes can often endure a long time (Chehabi and Linz 1998: 38) because of the status of the ruler. The status of the Sultan in Oman is equated to the divine legitimation of earlier European Kings (Peterson 2005). Like mentioned, tribalism is also incorporated into the state, characterized by clientelistic relationships with the royal family (Common 2011: 217).

The political participation experience in Oman has taken place in three stages: State Consultative Council (SCC), the Oman's Consultative Council (OCC) and lastly and the most current, *Majlis al-Shura* or Oman Council (Alhaj 2000).

The SCC was originally comprised of 45 members including the chairman (Al-Haj 1996). The membership of the SCC included 17 members representing the government, 17 representing the Omani *wilayat* (provinces or states) (Al-Haj 1996). Also, it was made up of 11 members representing the private business sector (Al-Haj

1996). The SCC was primarily an advisory mechanism, established by the Sultan when he came to power (Al-Haj 1996). In 1983, the Sultan increased the number of SCC members to 55 with the *wilayat* representatives increased to 25 (Al-Haj 1996: 561).

In November 1990, Sultan created a new council, the Omani Consultative Council (OCC) (Al-Haj 1996). The OCC was based on the SCC, was established in November 1981 by a decree issued by Sultan Qaboos (Al-Haj 1996). The new OCC represented the 59 *wilayat* of Oman and a chairman (Al-Haj 1996: 562). The Deputy Prime Minister for Legal Affairs, from a list of three candidates indirectly selected in caucuses held in the *wilayat*, in which hundreds of leading citizens participated (Al-Haj 1996). The OCC was first established because Sultan Qaboos wanted to rally the tribes and other leading segments of Omani society behind his efforts to modernize political, economic and social institutions (Al-Haj 1996: 564).

The development of the *Majlis al-Shura* is one of the most important institutional processes in Oman's political participation history (Jones and Ridout 2005: 384). The elections of 2003 were the first since the establishment of *Majlis al-Shura* in 1991 (Jones and Ridout 2005; Powers 2012). Political participation would be universal adult suffrage. Members of this council are encouraged to think of themselves (Jones and Ridout 2005) but truthfully, this council acts more as a think tank than governing body. Sultan Qaboos wanted the *Majlis al-Shura* to be another mechanism, which local interests can be represented (Jones and Ridout 2005).

Within the *Majlis al-Shura*, there are two bodies: the Shura Council and the State council (SC) (Alhaj 2000). Sultan Qaboos appoints members to the SC (Alhaj 2000). The

SC is a form of representative body established to match the British's House of Lords or the U.S. Senate (Alhaj 2000). Through political participation is very young in Oman, this process may become important in the future once Sultan Qaboos is not in power anymore.

Unlike Egypt, the Omani military has not played a big role in its country's history. In Oman, there is no conscription for military service.⁵⁸ However, Oman remains a very strategic country because of its location in the Arabian Peninsula and its control of the western side of the Strait of Hormuz. The Royal Army of Oman (*al-Quwwat al-Jaaesh al-Sultanat Oman*) is the main body of its military, with its sole purpose of protecting the sultanate (Alhaj 2000).

Dictatorial Regime = Weak Environmental Policies?

It is important to note that the two councils in Oman have absolutely no legislative power. Sultan Qaboos holds widespread power in Oman. He alone makes domestic, foreign and economic policies. Even the Al-Said family, which Sultan Qaboos belongs too in Oman, is not involved in major political decisions unlike political families in the Gulf like the Al-Saud family in Saudi Arabia or the Al-Khalifa family in Bahrain.

Research demonstrates that environmental advocacy has typically begun with citizens. Closed autocratic regimes normally do not respect individual rights of the citizens (Drosdowski 2006). Autocratic governments lack of reliable for potential solutions to environmental problems (Drosdowski 2006). Statistics has typically shown

⁵⁸ See note 56 above.

that higher levels of democracy leads to less CO₂ emissions per capita, less Nitrogen Oxide (NO) emissions per capita, less organic pollution in water, lower deforestation rates, and less land degradation (Li 2006: 953). Autocratic governments tend not to environmentally plan for the future.

Effective environmental protection requires both economic and political reforms (Barrett and Graddy 2000). Without democratic reforms, autocratic governments do not have the means to make true environmental reforms. In democracies people can express their environmental preferences better, these preferences will be honored or addressed better by policy-makers and this should translate into stronger revealed environmental commitment (Neumayer 2002). While Oman has the *Majlis al-Shura*, this organization has no legislative power. They could only make recommendations; total legislative, judicial and executive powers lies with the sultan.

Promotion of freedoms will, in many cases, lead to improvements in environmental quality (Barrett and Graddy 2000). Finding suggests that a spread of democracy around the world will lead to enhance environmental commitment worldwide (Neumayer 2002). Democracies citizens are better informed about environmental problems (freedom of press) and can better express their environmental concerns and demands (freedom of speech), which will facilitate an organization of environmental interests (freedom of association) (Neumayer 2002: 4).

The Omani youth are becoming more educated. In similar countries in the Gulf like Saudi Arabia and Kuwait, Omani families are sending their youth overseas to Europe or the United States get educated. Regarding environmental issues, this will be important

in the future. Youths are becoming more sophisticated on environmental, economic and political issues. This will be a concern for Omani authoritarian government in the future because these issues will have to be taken seriously.

Consumption of Natural Resources

Earlier studies on the Arabian Peninsula, during the Holocene period, suggest that 9000 years ago, the ecosystem could have supported enough vegetation and contained sufficient moisture to maintain inhabitants (Radies et al. 2005). The present-day climate in Oman is telling a much different story. Much of the climate in this region has been hyper-arid, the average precipitation less than 100 mm per year (Radies et al. 2005; Kwarteng, Dorvlo and Kumar 2008). The average temperature in Oman during the summer is between 32°C and 48°C (Kwarteng, Dorvlo and Kumar 2008). On its hotter days, Oman could reach 55°C, which is about 131°F. Arable land in Oman is about 0.1% and the rest of the 99% cannot sustain vegetation.⁵⁹

Oman has been fortunate to be endowed with abundance of natural resources, which has enabled its rapid economic development in the early 1970s. Crude oil and gas has been the most important hard currency earner for Oman since 1967, with oil producing about 880,000 gallons per day in 1995 (Al-Ismaily and Probert 1997). Like other Gulf countries, the political might in Oman has been made possible by oil revenue, which allowed the centralization of state power (Common 2011).

⁵⁹ See note 56 above.

Oil and Gas

While Oman has a large percentage of oil, it cannot rely on its oil income to maintain their widespread expenses for the future (O'Reilly 1999; Katz 2004). Oman's proven oil reserves are estimated (in January 2010) at about 5.5 billion barrels, ranking Oman twenty-fifth in the world (Lefebvre 2009). In 2013, Oman produced 343.8 million barrels of crude oil, an average of 941.9 thousand barrels per day.⁶⁰ According to Table 7.2, since 2009, Oman has been increasing oil production and exports each year. For Oman, this is ecologically but as important, economically unsustainable. Oman's level of oil production cannot sustain its government, not support its population in the next 25 years.

Table 7.2: Oil Production and Exports

Oil Production & Exports				
Year	Production	(Million Barrels) % Change	Exports	% Change
2009	296.6	7.1	242.9	12.1
2010	315.6	6.4	271.8	11.9
2011	323.0	2.3	269.4	-0.9
2012	336.2	4.1	279.8	3.9
2013	343.8	2.3	304.2	8.7

Source: Ministry of Oil and Gas & National Center for Statistics and Information

Source(s): The Omani Ministry of Oil and Gas Center for Statistics and Information

The chief organization concerned with the extraction of fossil fuels in Oman is Petroleum Development Oman (PDO). It is jointly owned by the Omani Government and

⁶⁰ The Omani Ministry of Oil and Gas Center for Statistics and Information. 2014.

Royal Dutch/Shell. It was first established in 1937 as the Petroleum Concession (Oman) (Al-Ismaily and Probert 1997: 294). The Omani government owns about 60% of the shares of PDO and Royal Dutch/Shell owns about 34% of the company (Katz 2004). PDO produces 90% of the oil in Oman (Katz 2004). PDO is also the largest generator of electric power in Oman after the Government (Al-Ismaily and Probert 1997). PDO generates electric power for its own consumption in the oil fields and their associated administrative centers (Al-Ismaily and Probert 1997).

Oman is a net exporter numerous items: ranging from of agricultural products, crops like dates and petroleum products, but mainly crude oil (Al-Ismaily and Probert 1998b). Omani oil has been mostly exported to Asian countries, like China, Japan, South Korea, India and Taiwan. According to Table 7.3, bulk of its oil exports has been to China. In 2013, China received about 180.8 million barrels of oil from Oman. Because of Oman’s location and proximity to the Indian Ocean and the Asian continent, many countries in this region has benefited from Omani crude oil.

Table 7.3: Countries of Omani Oil Exports

Country of Destination	Direction of Oil Exports (Million Barrels)				
	2009	2010	2011	2012	2013
China	77.6	111.3	122.8	140.1	180.8
Japan	40.6	37.9	27.5	38.2	29.3
Korea, South	25.2	17.7	20.5	10.9	4.7
India	26.9	38.1	33.5	5.2	13.2
Taiwan	17.3	12.1	9.6	33.4	27.4
Thailand	32.7	28.8	21.7	19.0	17.1
Singapore	4.1	10.3	9.6	19.9	13.5
Others	19.2	13.9	21.6	7.1	18.3
Total	242.9	271.8	269.4	279.8	304.2

Source: Ministry of Oil and Gas

Source(s): The Omani Ministry of Oil and Gas Center for Statistics and Information

The Omani economy has also benefited from the fact that world oil prices have been relatively high for the last five years (Katz 2004). While Oman is not a member of Organization of Petroleum Exporting Countries (OPEC), their oil prices are reflective on global trends and decisions by OPEC and non-OPEC members. Oman's GDP grew, on average by approximately 47% annually, between 1975 and 1979 (Al-Ismaily and Probert 1998). This growth was mainly because of petroleum-prices in the world market (Al-Ismaily and Probert 1998; Lefebvre 2009). Oil revenues have enabled the Omani government to embark on ambitious programs of social and economic improvements (Al-Ismaily and Probert 1997). Oil revenue provides the vast total of public services in Oman (Common 2011).

Gas fields in Oman are also being developed for the Government by PDO. Oman's proven natural gas resource, estimated in Jan 2008 at 849.5 billion cubic feet (BCF) (Lefebvre 2009). This ranks Oman twenty-ninth in the world in terms of gas reserves. The major user of natural gas in Oman is the Ministry of Electricity and Water. Natural gas is used for electric-power generation and desalination of seawater (Al-Ismaily and Probert 1997). In comparison to most countries in the region, Oman possesses and produces a small amount of natural gas but this valuable resource could become a bigger part of Oman's economic future.

Examining Oman's relationship with these resources, its economy is overly dependent on oil and gas revenues. Oil and gas account for about 48.6% of its total Gross Domestic Product (GDP) in 2009 (Al-Badi, Malik and Gastli 2009). In 2013, Oman's GDP grew 2.8% (US \$79.8 billion dollars) and oil and gas accounted for about 49.7% of

the total GDP.⁶¹ The Sultanate's main problem is easy to identify: its oil reserves are decreasing while its population is increasing (Katz 2004). Oil is a finite resource. Eventually, it will run out.

Oman's present reserves and the expected rate of consumption, oil in this country is expected to be completely exhausted by 2064 (Al-Ismaily and Probert 1997; O'Reilly 1998; Lefebvre 2009). This number could be reached much earlier if major natural gas projects advance (Al-Ismaily and Probert 1997). The need for economic diversification will become even more pressing for Oman with its oil reserves expected to diminish over the next couple of decades (Common 2011).

One of the side effects of oil wealth has been the creation a new educated social group in Oman. Many Omanis are started to get educated in Western countries in European Union or the United States. This educated society is more diversely educated and more politically aware (Alhaj 2000). Natural resources like oil have made this possible for the Omani government to pay and support Omani students' studies overseas. This has become a quasi-social contract between the Omani government and its population. The long-term economic, educational and environmental plan in Oman is in serious trouble without oil wealth. The Omani population will start demanding for changes, not only their social and educational measures but political means are not met.

Currently, oil and gas plays an important part in Oman. It acts as a stabilizer and destabilizer, which, in reality, oil revenue most likely saved Sultan Qaboos from the fate of former, President Mubarak. Income from oil prices allowed the Omani government to

⁶¹ See note 60 above.

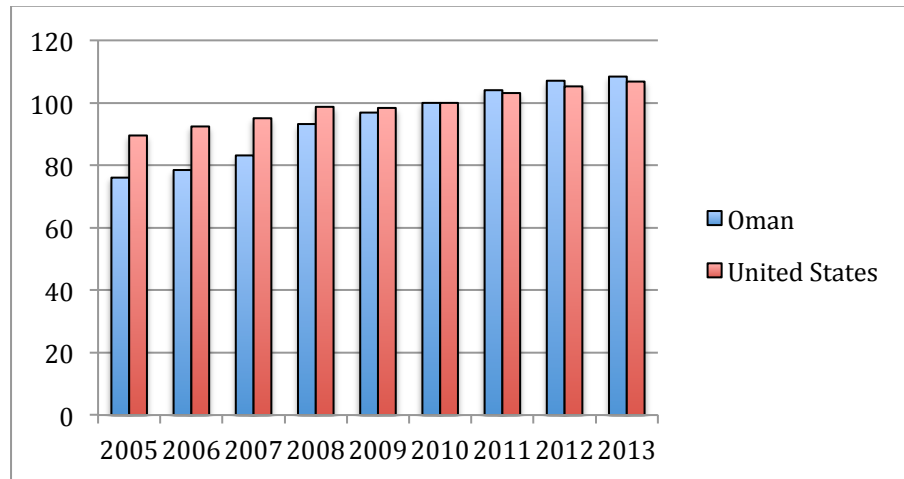
make concessions like added jobs (stabilized unemployment), an increase of wages and the vast increase in social welfare spending. In Egypt, oil and gas account for less than 10% of its annual GDP. Like mentioned, oil accounts for almost 50% of its annual GDP in Oman. Having an abundantly economic-rich resource like oil was primarily one of the main mitigating factors why there was not a regime change in Oman. Unlike Oman, Egypt did not have a deep well of cash to dip into to control its population.

While this natural resource contributed to Sultan Qaboos continued reign, it is also destabilizing. Some scholars have labeled this as a resource curse (Ross 1999). This is the theory where governments gain most of their revenues from external sources, like oil, they are freed from the need to levy domestic taxes and become less accountable to the citizens they govern (Ross 1999: 312). Oil revenue makes adding jobs and increasing wages possible and continually keeps the government in power and resumes suppression of its citizens.

Food

Agriculture in Oman has concentrated in highly dispersed areas along the Batina coastal strip between Muscat and Sohar (Woertz 2013) but has experienced a surge in food prices because of climate change. According to Table 7.4, the price of goods in Oman has vastly increased in the last 9 years. In the last couple of years, an Omani citizen (in comparison) has been paying more for a basket of goods than the average American citizen. This burgeoning problem concerning food prices has led to protests and riots in Oman.

Table 7.4: Consumer Index Prices – Oman and the U.S.A.



Source(s): The World Bank Data, Consumer Index Prices

In January 2011, a small number of people began protesting in Oman about the rising prices of basic goods and corruption (Worrall 2012). Hundreds of people ended up outside the Housing Ministry to demand either: higher wages (to pay for the goods) and/or lower prices for food and goods (Worrall 2012). The rising cost of food may have become divorced from globalization, oil prices and the wider economic climate (Worrall 2012). The social contract, rerouted in religious tradition, the population has with its government is depended (like Egypt on subsidizing food. With rising of global food prices, protests and riots will become more frequent in the future in Oman.

After these protests, Oman has tried to reinvent its food security strategy. Most countries in the Gulf (especially Saudi Arabia) have already developed systems of food storages outside the Arabian Peninsula (Woertz 2013). Food storage in Oman was widespread before the global food crisis but only covered three to four months of stable foods (Woertz 2013). In 2010, storage capacity was only increased to one year for rice,

six months for edible oils, milk, and sugar and three to five months for wheat (Woertz 2013: 215). Having these food storages, Oman was able to mitigate some of these food price tensions (unlike Egypt). However, this was a quick fix. Oman needs to plan long-term strategies to prevent a major food crisis and political instability in the future.

Water

Groundwater is the primary source of water for irrigation in the Sultanate of Oman. However like most countries in the Arabian Peninsula, Oman does not receive ample rainfall to sustain agriculture. The mean rainfall on the coast of Oman is about 125 mm/year while potential evapotranspiration is about 20 times higher (Stanger 1984). The rapid rise of farms and the total cultivated area in Oman since the 1970s has led to a corresponding increase in the demand for water (Al-Ismaily and Probert 1998).

The annual-mean rainfall in Oman varies from locations. In central Oman, it receives less than 50mm per year (Al-Ismaily and Probert 1998). Over the northern mountains, it could receive as much as 300mm per year (Al-Ismaily and Probert 1998). Most precipitation in Oman occurs in the form of rainfall: however, isolated hailstorms and snow occur on rare occasions in the mountains of Jabal Al-Akdar (Al-Ismaily and Probert 1998: 132).

Omani farmers have used two main techniques for centuries to extract water: individual wells and community shared *falaj* systems (Dostal 1972; Al-Marshudi 2007; Kwarteng, Dorvlo and Kumar 2008). *Falaj* systems were developed to move water from the mountains to fertile *wadis* (valley) and farming areas in the interior (Al-Ismaily and

Probert 1998; Al-Marshudi 2007). This system has been carrying water throughout Oman in hard reaching places. These systems have been used in Oman for more than 2000 years. The *falaj* system is also a religious concept, in how the water is distributed among the population, in a fair and equitable manner (Al-Marshudi 2007: 72).

Falaj water system remains under the regulation of traditional Islamic and local customs in Oman (Al-Marshudi 2007). Traditional Muslim law refers to customs and religious considerations, rather than written codes in reference to water management (Al-Marshudi 2007). Three major sources of legislative oversight that have established acceptable water rights in the Sultanate are: customary law, Islamic law (*shari'a*) and tribal power (Al-Marshudi 2007: 74). Oman has a lot of mountains, hundreds of springs and *falajs* that carry water down from the mountains.

Catastrophic floods and prolonged periods of drought are the main 'water' challenges facing the Omani population (Al-Ismaily and Probert 1998). The water problem has been compounded as the results of the rapid economic development, the extraction of crude oil, climate change and a rapidly growing population (Al-Ismaily and Probert 1998). Oman's arid climate, compounded with global warming is making water increasingly scarce.

Events like severe droughts and increased desertification has been damaging the *falaj* irrigations systems and creating a need for continued maintenance (Al-Marshudi 2007). The Omani drought in 1973-74 sent a signal to the villagers to establish the *falaj* management committee (FMC) (Al-Marshudi 2007). This established the market for

water allocation to generate income to cover maintenance costs (Al-Marshudi 2007: 72). In the future, droughts and economic costs will vastly increase due to climate change.

Population Relationship with Animals and Microorganisms

Multiple countries in the Arabian Peninsula, including Oman, are battling the Middle East Respiratory Syndrome (MERS). MERS is a viral respiratory illness, which was first reported in Saudi Arabia in 2012.⁶² Coming from the same family or strain of Severe Acute Respiratory Syndrome (SARS), this disease can also cause infection in humans and animals.⁶³ About 30% of people who have been confirmed in contracting this infection have died.⁶⁴ As of April 2014, the number of reported cases of MERS worldwide is 333 with about 107 deaths (Nowotny and Kolodziejek 2014). Most cases have been within Saudi Arabia but with the entire Gulf experiencing incidents.

Humans acquiring MERS in Oman have primarily been from camels. From camel samples taken in Oman, the people who have been infected possessed the same strain from camels (Nowotny and Kolodziejek 2014). Currently, there are travel warnings from Western countries for those planning to travel in the Gulf (specifically Oman). This will become a bigger problem around Hajj. Hajj is the annual pilgrimage to Mecca (in Saudi Arabia) by Muslims. As one of the 5 pillars of Islam, Muslims must make the trip (if their

⁶² The National Center for Immunization and Respiratory Diseases, Division of Viral Diseases, July 2014.

⁶³ The World Health Organization. 2014. "Global Alert and Response (GAR): Coronavirus Infections".

⁶⁴ See note 63 above.

financially able to) at least once in their lives. Millions of people from all over the world travel to the Arabian Gulf during this time. This will increase the potential spread of MERS. Climate change is fundamentally linked to globalization. There are few isolated borders in the world today. Globally, higher temperatures will increase the incubation period for diseases and viral infections.

In the GCC countries, expatriate workers have been contracting a high percentage of Tuberculosis (TB) (Shibl, Senok and Memish 2012). Parallel strains of TB in Oman are additionally found on the Indian subcontinent (Shibl, Senok and Memish 2012: 1069). The Omani government is struggling to invest high amounts of money into fighting TB. Healthcare workers in Oman recently advocated early detection and treatment of TB (Shibl, Senok and Memish 2012), but this is not cheap. The Omani government must invest millions of dollars in fighting diseases that are surviving longer because of climate change. The changing of the climate is affecting human health, where diseases like TB and MERS exists longer in ideal climatic conditions.

Relationship to Technology

Oman's technological development over the last 40 years has been swift and remarkable (Common 2011). In the past, Internet and Facebook penetration in Oman was very low but have grown quickly in recent years. As of December 2011, there are 1,741,804 Internet users, which accounted for over 57% of the population (Worrall 2012). This compares with Internet rates of 26% in Bahrain, 30% in Jordan and 53% in UAE (Worrall 2012: 236). These numbers are likely much higher now.

Sultan Qaboos and the Omani government are attempting to use information technology to communicate with its citizens. The *Majlis al-Shura* established its own YouTube channel in 2012 (Power 2012). On its YouTube channel, the *Majlis al-Shura* uploads their television broadcasts of parliamentary sessions (Power 2012). This has increased citizen interests and activism in political deliberations and has overall increased political participation in local elections (Power 2012).

The Omani government has also attempted to use advanced technology to solve their water scarcity problems. During the 1970s, the government of Oman began constructing several desalination plants (Mohammed and Sajwani 1998). Desalination can be achieved by either multi-stage or vapor compression distillation or (reverse osmosis or electrodiaysis) membrane technologies (Al-Ismaily and Probert 1998: 133). In 2005, the Sultanate of Oman has developed 43 desalination plants across the country (Prathapar et al. 2005). In Oman, the desalination plants produce a partial amount of drinking water for the population (Raouf 2008), which is the main source of domestic water in Oman (Kwarteng, Dorvlo and Kumar 2008).

Social media technology played an important role with the Arab protests in 2011. The youth of Oman, like everywhere else in the world, are not more than an arm's length away from their mobile phones (Worrell 2012). Many Omanis was inspired by the revolutionary events in the Middle East and North Africa like in Tunisia and Egypt (Bahrain, Egypt and Tunisia) (Worrell 2012). Social media technology is serving as a mechanism to connect people but more importantly, connect people grievances. By connecting people who share similar religious, cultural or oppressive problems, people

become more empathic to their plight. During the protests and riots, Omani citizens organized using social media sites like Facebook and Twitter.

Resource Demands from a Growing Population

Unlike most countries (Egypt, Iran or Saudi Arabia) in the Middle East and North Africa, Oman receives very little press coverage. Comparatively in the region, Oman has been relatively stable since the 1970s. However in the last couple of years, the Sultanate of Oman has experienced very difficult challenges that are likely to get worse in coming years due to population growth (Katz 2004).

Oman has one of the highest population growth rates in the world, estimated at around 3.5% a year (Power 2012). According to the Population Reference Bureau, the Omani population is expected to reach four million in 2025 (Katz 2004). The birth rate in Oman is about 2.3% annually, which means the population is doubling every 30 years (Al-Ismaily and Probert 1997: 292). The majority of the population lives along the coast of the country, between the Al-Batina region and the Muscat Governorate is more than 55% of the total population (Al-Ismaily and Probert 1997).

Omani nationals constitute about 73% of the population with the rest being foreign workers and their families (Al-Ismaily and Probert 1997: 291). Foreign workers represent almost 30% of the population but they are about 90% of the private sector.⁶⁵ To deal with the rising population, the Omani government is looking to reduce the number of

⁶⁵ Courtney Trenwith. 2014. "Oman to reduce expats to 33% of population" *Arabian Business*.

expatriate population by 6% or 200,000 people.⁶⁶ The majority of foreign workers in Oman have been living in the country for more than 20 years. Since it is very difficult to gain citizenship in Oman, this will become a burgeoning conflict once foreign workers began losing their jobs.

The Omani government will face a youth bulge from its population in the future. More and more young people are beginning to enter the workforce and facing difficulty in finding jobs. The Sultanate has a difficult task of creating sufficient private-sector jobs to absorb these new entrants, while being aware of the dangers of a bloated public sector (Worrall 2012: 102). More than 54% of the Omani population is under the age of 15 and nearly 66% is under the age of 20 years old (Al-Ismaily and Probert 1997; Powers 2012). The youth unemployment rate in Oman is estimated about 20% (Worrall 2012).⁶⁷ It is estimated that the number entering the job market each year will increase by 212% by 2025 (Power 2012: 21). The Omani economy will need to find 700,000 new jobs during this time for youths (Power 2012). Given that Oman's youth population is rapidly growing and its petroleum reserves are much lower than previously estimated, the sultanate will face a serious economic crisis in the next 10 to 15 years if oil prices plummet (Katz 2004).

The Arab Spring in Oman has been largely forgotten. Unlike Egypt, the protests and riots in Oman did not represent a threat to the regime and was largely brought under control just after a couple of days (Worrall 2012; Peterson 2013). During the protests and

⁶⁶ See note 65 above.

⁶⁷ This number is an estimate because the Omani government does not have numbers on unemployment for their population.

riots, police fired rubber bullets and tear gas at the demonstrators (Worrall 2012). Gathered at the Globe Roundabout, the protests led to the death of at least one person (Worrall 2012: 100). The occupation of Globe Roundabout was imitation of Tariq Square in Cairo (Peterson 2013). At the same time in the southern part of the country, the city of Salalah, more than 3,000 protested against food prices, corruption, and jobs with the number of protesters peaking as high as 10,000 (Worrall 2012).

Interestingly enough, unlike Egypt, overthrowing the government was not a demand from the protesters in Oman (Power 2012; Peterson 2013). The protests were largely about unemployment, wages, reduction of foreign workers, corruption and lack of resources. Unemployment, due to a large number of people entering the workforce was a key issue during the protests in Oman. In March 2011, it was estimated that as high as 70% of Omanis in the private sector was earning less than the minimum wage (200 *rials* a month) (Worrall 2012). During this time, a number of teachers staged a protest against higher pension contributions and for larger allowances for water, food, electricity and housing (Worrall 2012).

Sultan Qaboos promised to make changes by firing key ministers in the government and to create 50,000 new jobs (Powers 2012; Peterson 2013). He also promised additional powers to the *Majlis al-Shura*, which will be more accountable to the public (Powers 2012). He also introduced unemployment benefits. Unfortunately, this backfired. Many Omani citizens had begun quitting their private-sector positions in order to benefit from the newly introduced unemployment benefits by the Sultan, which are higher than the previous minimum wages (Forstenlechner and Rutledge 2011: 26).

The rapid growth of population in Oman is increasing the likelihood of political instability. If the Omani government is unable to provide Omani citizens with decent jobs, this will increase the likelihood more protests and riots. If more than 50% of the youth population is out of work, this would cause an abundant amount of political problems for the Omani government and for Sultan Qaboos. In next decade, thousands more educated young men and women will begin looking for occupations that pay decent salaries (O'Reilly 1998).

Conclusion

Oman must make several changes to ensure continued economic development and to mitigate climate change. Oman must also make internal transformations to achieve greater energy and political stability. While Oman is much further ahead than other countries in the Middle East and North Africa, the rate of oil consumption in Oman will politically, socially and economically cripple the government if vast changes are not made.

First, Oman must reduce the rate of extraction of oil and natural gas (Al-Ismaily and Probert 1997). Oman must immediately begin diversifying its economic sector, where 50% of its total revenue (GDP) must not be completely based on oil production. Oman has great potential for solar energy. Solar thermal power plants can be built in Oman and produce substantial amounts of power (Al-Badi, Malik and Gastli 2009). Since solar power is a renewable source of energy, this would cleanly provide electricity to millions of Omani citizens.

Another possible renewable source of energy is wind. The potential of harnessing wind energy has long been realized in Oman, however, because of the high cost of harnessing this energy, this resource has been slow in receiving acceptance (Suleiman et al. 2000). Oman could use wind technology to increase and diversify its energy sector.

A major problem in researching developing countries is the lack of data. Oman and other developing countries lack accurate data and information about the potential use of renewable energies (Al-Badi, Malik and Gastli 2009). Better data would provide better assessments and projections on future projects in Oman.

What will happen to Oman when Sultan Qaboos passes away? Sultan Qaboos was the only son of his father and he has no children (Peterson 2013; Katz 2004). Sultan Qaboos has not verbally named an heir to the throne once he dies. Today, Sultan Qaboos is 73 years of age and has ruled Oman for over 40 years (Peterson 2013). The constitution of Oman states that the Ruling Family Council shall meet within three days of the throne falling vacant and determine the successor to the throne (O'Reilly 1998: 83). If they are unable to agree, Sultan Qaboos has wrote a name in two envelopes, located in two separate parts of the country, naming his successor. What if the Omani people do not accept his replacement?

Oman is a country where the monarch has not been overthrown in over 40 years (Katz 2004). Like stated previously, during the height of the protests, the Omani population did not demand for Sultan Qaboos to step down. However, the al-Said dynasty, as a ruling institution is weaker because Sultan Qaboos has concentrated much power in his own hand and shared less with his relatives (Katz 2004). Sultan Qaboos has

not allowed anybody else in the al-Said family to acquire significant administrative experience or responsibility. When someone does succeed Sultan Qaboos, he may not be accepted from the people based on experience.

The theoretical foundation of Ibadhism is in conflict with Omani autocratic history. Most Ibadhi scholars argue that power should not be in the hands of a single person (Common 2011). Scholars believe that tribal balance and group participation are very important (Common 2011). Oman still remains a tribal nation. Every Omani is classified by the state as a member of a tribe (Peterson 2013). With a highly educated society and this philosophical and religious foundation, Oman may face higher levels of instability in the future.

Chapter 8

Conclusion and Policy Implications

This study has demonstrated that climate change is a threat multiplier, which increases political instability in developing countries. The ecological security theory (Chapter 2) has articulated that disruptions in the four equilibriums will increase political volatility. This theory referenced population growth, food prices and policies, the impact of natural disasters, diseases and technology on populations as triggers to political instability. As this research demonstrates, climate change (Chapter 3) has largely been created by human mechanisms. Rapid industrializations and the use of non-renewable energies (like oil and/gas) has increase CO₂ in the atmosphere. This has altered the climate, which has had adverse effects on regional and local weather patterns. These weather patterns have increased the occurrence of natural disasters. These natural events have put additional pressures on already fragile governments and populations.

Specifically, the statistical model (Chapters 4 and 5) demonstrated that ethnic fractionalization, unemployment, and climatic events (droughts, famine, wild fires and floods) increase the probability of riots, protests and revolutions. Also, increases in food prices (due to the impact of climate change) are statistically significant with regard to political instability. The statistical findings of this study confirms the theoretically basis for this project. The case studies of Egypt and Oman added more depth to the thesis' central hypotheses. The case study on Egypt (Chapter 6) also reveals that rapid growth in food prices played an important part in political violence and uprisings. In the future, Egypt's relationship with its natural resources (food and/or water) will dictate its outlook.

In Oman (Chapter 7), rapid population growth, coupled with vast unemployment and scarcity of resources has been contributing to instability. As scarcity of water increases and oil begins to run out, the Omani government will have to deal with additional political instability in an already rapidly growing population.

As this project demonstrated, climate change will continually impact the political, economic, social and cultural aspects of developing populations. Now, the question is: what can we do about it?

This chapter speaks on the concept of adaptation, which is needed to confront climate change and environmental degradation in the future. A state's ability to adapt will depend on that state's vulnerability. Vulnerability could be measured in various ways, like human security. Human security will progressively be threatened as climate changes continually go unchecked (IPCC 2014). Culture is also an important factor in this equation. The methods international organizations and governments use to address climate change will need to be culturally sensitive and aware.

In beginning of this chapter, the author will define and examine adaptation in general terms. Following, the author will assess strategies that the IPCC believe will be important in mitigating climate change. The author outlines 5 policy-changing goals, which should be addressed at each local, regional and international level. These goals would be to lessen the burden of the changing climate and provide the population with a sense of preparation for natural events. Then, there will be a brief conversation on the future of international relations in political science.

Adaptation to Climate Change

First, what are the broader implications of this study? Developed and developing countries need to pay closer attention to climate change and environmental degradation. This phenomenon should be considered an international security priority. Going forward, mechanisms should be in place to mitigate the impact of global warming. It is important to note that while climate change is global, the responses and strategies must be locally driven. Social, cultural and economic considerations need to be taken into account when confronting this potential catastrophe.

To properly address climate change, there needs to be more policy-driven research in this sub-field of political science. Specifically, this type of research needs to be cultural competent. Therefore, findings are able to take into account cultural characteristics, adaptation strategies and realistic goals. Thankfully, the number of scientific publications available for assessing climate change impacts, adaptation and vulnerability doubled between 2005 and 2010 (IPCC 2014). This level of analyses allows for better investigations, which can support policymaking at the local, state and international level.

The IPCC defines adaptation, specifically to climate change, as an “adjustment in ecological, social or economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities” (Adger, Arnell and Tompkins 2005; IPCC 2014; Schneider 2014). Adaptation is actions taken in society by individuals, groups (organizations) and governments (Adger, Arnell and Tompkins 2005). Adaptation

to climate change will take a global effort. The motivating factor or incentive needed to take action, besides total destruction of the planet earth, should be stability in the political and economic markets.

Adaptation is highly regionally and context specific, with no single approach for reducing risk appropriate across all settings (IPCC 2014). A strategy that may work in one country, may fail in another, even within the same region. Developed countries have to start playing a vital role in assisting developing countries. And it has to begin at their local level. Local governments and private sectors are increasingly recognized as critical to progress in adaptation (IPCC 2014). Adapting to climate change involves cascading decisions across a landscape made up of agents from individuals, firms and civil society (Adger, Arnell and Tompkins 2005).

This includes public bodies and governments at regional and national scales, plus international agencies (Adger, Arnell and Tompkins 2005). International organizations like the UN, IPCC, and WMO must continually assist developing countries in putting together action plans, but that fit their particular governmental system. This is where political scientists could play a pivotal role. Scholars in this field can assist climatologists and help with understanding the political, historical and economic issues facing a particular state or region. The success of adaptation will depend on how much all these partners are invested in short-term and long-term goals and implementation.

The IPCC 2014 report highlights two different kinds of adaptation: incremental and transformational. Incremental is adaptation where the central aim is to maintain the essence and integrity of a system or process at a given scale (IPCC 2014). This could be a

situation where the country has made strides to address environmental degradation and climate change but needs mechanisms to sustain this change. This could either be more capital, research or long-term strategies. Transformational are fundamental changes in a system to response to climate and its effects (IPCC 2014). This could be a situation where a country has not taken any action on climate change. Transformative processes need to take place for mitigation on climate change.

Adaptation is needed across all scale in an ecological system. This enhances mitigation complexity, since different biological and ecosystem processes dominate at different levels (Adger, Arnell and Tompkins 2005). There must be a global strategy, where each state is able to ratify an agreement to save the world. Then, regional and local policies could be effective in addressing the particular nuances of climate change.

Cultural Importance

An understanding of culture is important for both mitigation and adaptation to climate change (Adger et al. 2012). Articulated in Chapter 5, climatic events impacts ethnic cleavages within societies. However, attempting to enact strategies without any historical or cultural background will exacerbate risks to cultures (Adger et al. 2012) and ethnic groups.

Particularly in developing countries, culture is important for several reasons. First, it is essential in governance, influences social and religious activities and has economic foundations. Climate change is often portrayed as a global-scale problem. It is. However, like politics, climate change is also local. In the previous two chapters, Egypt and Oman

are both Islamic societies, within similar geographical regions, but they possess different individual cultures. Climate change strategies that might be effective in Egypt might not be successful in Oman. This cultural sensitivity is important if change is going to occur. Adaptation strategies can cause more harm than good if they do not account for the tradition of a population.

Culture will play a central role in developing countries transitioning to renewable energies, inventing promising environmental technology and developing mitigation strategies. This means experts who are assisting the governments in these countries must speak their language and understanding their historical background. This will aid them to be able to effectively communicate and creating realistic action plans. A cultural perspective helps explain differences across populations to the same environmental risks (Adger et al. 2014: 113). Being able to identify with individual and their collective identities open up the possibility for change (Adger et al. 2012: 114).

Strategies

Developed and developing countries must take multiple steps in preparing for climate change. This study listed a couple of steps that would be beneficial in limiting climate change impact. Some of these suggestions have been taken from the IPCC Report in 2014. The first step towards adaptation to future climate change is:

1. Reducing vulnerability in developing countries by improving governmental structures (IPCC 2014).

This means addressing underlining issues outside of climate change. Like stated previous, climate change alone may not ignite conflicts but it amplifies them. Variables like unemployment, rapid population growth, and stability in the global food market, hunger and poverty increases the likelihood of political conflict. Without addressing these underlining issues, mitigation to climate change will not be enough to prevent political instability.

Different organizations like International Labor Organization (ILO), Food and Agricultural Organization (FAO) and United Nations Development Programme (UNDP) could assist in achieving some of these goals. Future strategies need to focus on improving social protections for developing populations and protections for refugees and migrating populations. Women and children are highly impacted by natural disasters. Learning programs, which teach them safety measures, would benefit developing populations.

2. Existing and emerging economic instruments can foster adaption by providing incentives packages (IPCC 2014).

The effectiveness of an action on climate will depend on future economic conditions (Adger, Arnell and Tompkins 2005). An instable global food market will increase the likelihood of political instability. There must be regulations in terms of food prices. Most developed countries are able to ‘weather the storm’ in terms of global food

price unpredictability. Unfortunately, most developing countries (especially in the Middle East and North Africa) rely on food exports. There must be a better, more effective system, where the risk in the market is more widespread.

Also, there must be risk-financing mechanism across scales, which increase resilience to climate extreme and climate variability (IPCC 2014). This way, internal risk mechanism could be put in place to aid developing countries. Declining incomes, food price volatility, high unemployment from a growing population will negate changes that attempt to be made.

3. Long-term allocation of money to developing countries to assist with climate-related strategies.

Like stated earlier in the earlier chapters, climate change has largely been created by the developed countries. Third World countries will need assistance to combat this challenge. While research and planning is important, the allocation of money is needed for long-term strategies. This type of long time planning is costly. International organizations like UN, IPCC or WMO could assist in the distribution of climate capital. These funds would go at addressing agricultural land, flood protection, famines prevention and better access to clean water.

The international community could go about different ways to raise money for climate change. It could start at either a climate tax or penalties from corporations who neglect CO₂ emission standards. Everyone entity, from local governments, international organizations, multi-national corporations needs to be on board for this transformative

change. Global warming will continually get worse without radical changes. Climate change planning by governments at present tends to concentrate on providing public goods (Adger, Arnell and Tompkins 2005). While this is important, it needs to also be backed by capital and investment in long-term policies.

4. Improved reduced-emissions targets, which include strategies, choices and actions that reduce climate change and its impacts (IPCC 2014).

This includes countries coming together and deciding a limit on CO₂ emissions and target goals. The international community has made great strides in this area. The international conferences every couple of years to set emission goals, the IPCC 5-year reports and individual countries taking the initiative on climate change.

Importantly, all countries will need to make sacrifices. There needs to be a shift in philosophy. The environmental and the survival for our children and children's children should be imperative. This change has to be transformative. Sustainability and developing a better system to deal with the climate will be important and vital for all countries involved.

5. Improve energy efficiency and shift to a cleaner energy sources (IPCC 2014).

Developing countries rely too heavily on nonrenewable energy like oil and coal. Like stated previous, oil and gas are finite resources. There will not last forever. Developed and developing will be need to start transitioning their energy economy into

cleaner energy. This change needs to be transformative and begin today. Developed countries that are endowed with an abundance of resources use these resources to effectively control their population. Without these resources, it will be very difficult to enact that same control.

Countries need to make better strides in becoming energy efficiency. Using resources like wind, solar energy, hydroelectric energy and bio-waste. All of these options in the long-term would be cheap in costs but able enable developing countries to transition their energy foundations. Countries like Oman have already begun modifying their energy resources using wind and solar energy. In places like the Middle East and sub-Saharan Africa, sunlight is in abundance. Countries could use this resources, which is better and more energy efficient.

Limitations of this Study

There were multiple limitations throughout this study. The first limitation was the number of years available for climate data. This study only had climate data from 1995 – 2012. A longer time-series might yield different results with different variables. A study examining climate data starting from 1970 or 1980 might produce greater and more robust results.

Secondly, this study only focused on two case studies, Egypt and Oman. It is difficult to draw broad conclusions from two case studies; however, these studies could provide the basis for future research in other regions around the world. Ideally, I wish to examine countries in regions: sub-Saharan Africa, South Asia and Latin America and the

Caribbean. Latin America and the Caribbean is an area where in depth research is possible.

Also, a limitation could be competing explanations for political instability. While this study used a theoretical perspective from international relations, there is a literature in comparative politics on social movements (Tarrow 1994) and revolutions (Skocpol 1979) that were not mentioned in this dissertation. In future research, I wish to examine these approaches, in conjuncture with the ecological framework to discover if they complement this framework.

Concluding Remarks

In general, a system's capacity to cope with existing climate variability can be interpreted as an indication of its ability to adapt to climate change in the future (Capon et al. 2013). One of the keys to human adaptation to climate change is minimizing the risks associated with changing climatic conditions, especially the frequency and severity of extreme weather events (Capon et al. 2013).

In closing, the ecological security theory gives social scientists a strong foundation to begin assessing and solving the problem of climate change. Based on the findings of this study, global warming will increase the likelihood of political stability in the future. The more that the climate goes unchecked; the world would begin to experience additional volatility in developing countries.

Social scientists like sociologists, anthropology, economists and political scientists could make differences in the lives of millions of people with additional research in this area. While this research has been limited, future research could produce better results with more accurate data. And to do that, goals need to be culturally conscience. Culture sensitivity will be important in addressing some of these major goals. Climatologists cannot, nor should they have to do it alone. With the tools we possess in the social sciences, scholars are more than able to make contributions in this sub-field of global relations.

Appendix

Table A-1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Democracy	2408	0.5128738	17.90678	-88	10
Autocracy	2408	-1.245432	17.21836	-88	10
Ethnic Fractionalization	2392	0.5100126	0.237361	0	0.9302
Gross Domestic Product	2328	3438.692	6633.45	0	87916.4
Polity	2354	1.931606	6.453468	-10	10
Protests	2420	0.6669421	2.868595	0	74
Revolutions	2401	0.1949188	0.4604246	0	3
Riots	2421	0.3122677	1.265552	0	27
Urban Population	2401	49.10389	22.27881	7.211	100
Unemployment	1076	9.634758	6.641293	0.3	39.3
Refugees (New Territory)	2388	0.7076907	3.372174	0	42.6046
Refugees (Origin Country)	2388	0.7608095	2.791162	0	35.8012
Climatic Events	2428	4.060956	7.874086	0	101
Floods	2114	0.7275307	1.334506	0	17
The Middle East and North Africa	2435	0.1544148	0.3614201	0	1
sub-Saharan Africa	2435	0.3334702	0.4715497	0	1
Latin America and the Caribbean	2435	0.1683778	0.3742783	0	1
South Asia	2435	0.100616	0.3008814	0	1
East Asia	2435	0.0295688	0.1694292	0	1
Europe	2435	0.17577	0.3807026	0	1
Riots (Log)	2420	-0.4762436	0.5532125	-0.6931472	3.314186
Percentage Change in GDP	2191	0.1060245	0.1521581	-1	0.9127562
Food Price Change	1608	0.0013897	0.0360048	-0.4480369	0.2761906
Protests (Log)	2419	-0.3339445	0.7397637	-0.6931472	4.310799
GDP (Log)	2327	7.159741	1.384203	3.761549	11.38414
_spline1	2402	-108.3926	146.3678	-528	0
_spline2	2402	-285.0141	422.9524	-1560	0
_spline3	2402	-276.7379	460.0772	-1800	0

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EDUCATION

University of Nevada, Las Vegas

Doctorate of Philosophy

Major: Political Science

Concentration: International Relations

Las Vegas, Nevada

Aug 2011 – Oct 2014

3.80 GPA

College of Southern Nevada

Certificate

Major: Arabic

Las Vegas, Nevada

Jan 2012 – Jan 2014

4.00 GPA

St. John's University

Master of Arts

Major: Government and Politics

Concentration: Economic Development

Queens, New York

Aug 2008 – May 2010

3.75 GPA

Advanced Certificate: International Law

St. John's University

Bachelor of Arts

Major: Sociology and Criminology

Concentration: Population Growth

Queens, New York

Aug 2003 – May 2007

3.31 GPA

RESEARCH

EXPERIENCE

Principal Investigator

University of Nevada, Las Vegas Political Science Department

Las Vegas, Nevada

Aug 2011 – Oct 2014

Dissertation: “*Global Climate Change: The Political Impact of Global Warming on Developing Countries*”

This study utilizes both qualitative and quantitative analyses to investigate the relationship between climate change and its effects on political volatility in developing countries. Using regression models, I examined all non-OECD countries (140 countries) and their relationship to political instability. The results indicate that the rise in food prices, climatic events (droughts, famines, floods and extreme temperatures) increase the probability of protests, riots and revolution. Also using the ecological security theory as a basis, the results suggest that climate change, in fact, acts as a threat multiple, which increase the likelihood of political instability.

Global warming impacts variables like food, water, oil, rapid population growth, health and diseases in the developing world.

St. John's University – College of Professional Studies
Graduate Research Assistant

Queens, New York
Aug 2008 – May 2010

- Served as the primary academic researcher for the Director of the Criminal Justice Department.
- Pioneered in depth research on U.S. national security policies and transnational terrorism.
- Strengthened Criminal Justice program by creating a graduate certificate program and customized workshops.
- Obtained practice in preparing grant proposals for the Criminal Justice Department.

University of Delaware – Disaster Relief Center (DRC)
Disaster Research Assistant

Newark, Delaware
June 2006 – May 2007

- Conducted scientific research on natural disasters and wrote policy suggestions towards international aid.
- Applied theories in social sciences of natural disasters and environmental security in international communities affected by natural disasters by utilizing statistical analyses (SPSS and STATA).
- Cross-trained with the Department of Defense and the National Science Foundation through the University of Delaware, Newark (UDEL) in attempt to solve complex problems regarding environmental disasters.
- Became proficient in social science methods and hypotheses construction.

CONFERENCE PAPERS

National Conference for Black Political Scientist

Paper Titled: “Political Violence in sub-Saharan Africa”
Las Vegas, Nevada – April 2012

Thesis: This study used a large N, cross-sectional time series to investigate the relationship between regime type and political violence. Data coverage for the political instability model ranges from 1990 – 2008. Utilizing statistical methods (SPSS) and covering 40 countries in sub-Saharan Africa, the paper demonstrates a causal and statistically significant relationship between political violence and regime type.

International Studies Association – West Annual Conference

Paper Titled: “Climate Change & Water Scarcity in Northern Africa”
Pasadena, California – October 2012

Thesis: This paper examines how climate change can impact political stability in Northern Africa. The case studies selected for analysis was Sudan and South Sudan. Using qualitative analysis, this research demonstrates that variables like resources scarcity, rapid population growth, lack of international water laws and regime type increases the likelihood of political instability in Northern Africa.

Western Political Science Association – Annual Conference

Paper Titled: “Food Prices and its Environmental and Political Impacts”

Seattle, Washington – April 2014

Thesis: This paper examines how environmental degradation has impacted political stability in Egypt, which led up to the revolution in 2011. The case study selected demonstrates how food prices impacted political stability in Egypt. Using qualitative and quantitative analysis, this research demonstrates that variables like wheat, soybeans and rice could in fact, cause political instability in the region, the Middle East and North Africa.

**TEACHING
EXPERIENCE**

University of Nevada, Las Vegas

Adjunct Lecturer

Las Vegas, Nevada

Aug 2011 – May 2014

- Teaching load includes undergraduate classes in American Politics, topics covering economics, constitutional law and domestic and foreign policy.
- Constructs complex lectures dealing with political issues domestically and internationally.
- Engineers class involvement through use of case studies, technology and guest speakers.
- Responsibilities include academic advising, participation in university committees and supervising undergraduate projects.
- Implements group trips, lab preparation, test construction, grade assessment and lab supervision.

Undergraduate Political Science Courses (teaching-assistant)

University of Nevada, Las Vegas

Introduction to Comparative Politics

Aug 2011 – Jan 2012

Introduction to American Politics

Aug 2012 – Jan 2013

Constitutional Law

Jan 2013 – May 2013

Politics of the Middle East and North Africa

Aug 2013 – Jan 2014

International Law and Organizations

Jan 2014 – May 2014

INVITED TALKS

“Ecological Security, Climate Change & Food Security: The Environmental and Political Impact of the Arab Spring in the Middle East and North Africa,” PSC 405Q: Global Eco-Politics. University of Nevada, Las Vegas, October 2012.

“The Politics of the North-South: The Future Relationship between Human Populations and the Environment,” PSC 403C: Environmental Policy. University of Nevada, Las Vegas, April 2013.

“The Politics of Conservative Arab Regimes in the Middle East and North Africa,” PSC 404Q: The Politics of the Middle East and North Africa. University of Nevada, Las Vegas, November 2013.

“American’s Nuclear Waste... What are we going to do?” PSC 403C: Environmental Policy. University of Nevada, Las Vegas, February 2014.

INTERNATIONAL EXPERIENCE

Egypt Volunteer

Cairo, Egypt (Summer 2012)

- Activities included volunteer work at Animal Care in Egypt (A.C.E.), caring for around 4,000 injured, sick and mistreated animals.
- Learned how to adapt to unanticipated situations, improvise new plans for unexpected political instability and unrest due to the Arab Spring.
- Cultivated language and communication skills utilizing the Arabic language with people in the region. Also, utilized the Egyptian dialect to communicate with peers.

Intensive Arabic Abroad, Critical Language Scholarship Program

Noor Majan Training Institute: (Summer 2013)

Ibri, Oman

- Awarded the Critical Language Scholarship from the U.S. Department of State for an 8-week intensive Arabic language program.
- Studied intermediate-level Arabic while lived with a host family and used Arabic daily as the primary language.
- Completed a research project on the multiethnic Arabic society in Oman, which included conducting interviews and presenting results in Arabic.

Morocco Language Research

Rabat, Morocco (Winter 2014)

- Awarded the CLS Language Research Scholarship from the U.S. State Department.
- Activities included learning about the cultural historic connection between northern Africa and Europe.
- Discovered the geographical history of the Kingdom of Morocco.
- Developed new language skills by learning the Moroccan dialect. Utilized this skill by communicating with locals about history and travel.

Summer Arabic Language and Media Program

Manah, Oman (Summer 2014)

- Awarded an Arabic Language Scholarship to study advanced Arabic in Manah, Oman by the Sultan Qaboos College for non-Native Speakers.
- Allowed students to gain a deeper knowledge of the Arabic language and Islamic culture.
- Became proficiency in the Arabic language and the traditional customs of Oman.
- Conducted several presentations on the how the environment is impacting political stability in Oman.

WORK EXPERIENCE

Office of Council Member Mark Weprin

Legislative Director

New York, NY

July 2014 – Present

- Establishes the legislative agenda for Council Member Mark Weprin in the New York City Council.
- Directs legislative staff and serves as the point man for all legislative issues in the office.
- Reviews constituent mail dealing with legislative matters and coordinate with different city agencies.
- Introduces all legislations behalf of Council Member Mark Weprin to the New York City Council.
- Serves as a communication and public relations officer.

Target Corporation

Intelligence Analyst

Hauppauge, New York

May 2010 – Aug 2011

- Provided investigative support for stores within the northern New Jersey, Long Island, New York City, and Upstate New York markets.
- Created algorithmic sensors to locate and anticipate large organized theft rings.
- Initiated, investigated, and resolved multi-million dollars internal cases involving cash theft and misuse of company resources for stores throughout the national market.
- Spearheaded the apprehension of the biggest embezzler in Target Corporation's history, recovering more than \$4 million dollars in goods and assets.

Gateway Sports Club
Assistant Manager/Swimming Instructor

Queens, New York
Sept 2007 – May 2010

- Taught and trained individuals of all ages on the safety and proper techniques of swimming.
- Managed and supervised a staff of 50, organized recruitment, aquatic safety, shifts and administrative duties.
- Communicated with adults on a daily basis on the development and growth of their children.

FOREIGN LANGUAGES

Arabic – Oral Proficiency Interview – Advanced-low level

French – Beginner level: Verbal, listening and writing skills.

Spanish – Beginner level: Verbal, listening and writing skills.

LEADERSHIP ROLES & VOLUNTEER ACTIVITIES

- **St John's University** – New Student and Parent Orientation Program, *Orientation Leader*, (10/2003 – 01/2006)
- **St. John's University** – Student Conduct Board, *Associate Judge*, (09/2004 – 05/2006) *Chief Judge* (06/2006 – 05/2007)
- **St. John's University** – Student Government Association, Executive Vice-President (09/2005 – 05/2007)
- **St. John's University** – Torch Newsletter, *Assistant News Editor and Columnist* (09/2005 – 05/2007)
- **University of Nevada, Las Vegas** – Black Graduate Student Association (BGSA) (08/2011 – 05/2014)
- **University of Nevada, Las Vegas** – Senator for the Political Science Department in the Graduate and Professional Student Association (GPSA) (08/2013 – 05/2014)
- **College of Southern Nevada** – *International Language Roundtable*: Volunteered teaching interested students about the Arabic language and its culture.

ACADEMIC ACHIEVEMENTS & AWARDS

- ❖ Awarded the **Summer Arabic Language and Media Scholarship** (2014): Manah, Oman.
- ❖ Received the **Graduate Dean Award** (2014): University of Nevada, Las Vegas.
- ❖ Received the **Roosevelt Fitzgerald Outstanding Scholarship and Leadership Award** (2014): University of Nevada, Las Vegas.
- ❖ Awarded the **Critical Language Scholarship (CLS) from the United States Department of State** (2013): Washington D.C. – Ibri, Oman.
- ❖ Granted a **Full Academic Scholarship** to receive a *Doctorate in Philosophy* (2011 – 2014): the University of Nevada, in Las Vegas.
- ❖ Granted a **Full Academic Scholarship** to received a *Master of Arts* (2008 – 2010): St. John's University, in Queens, New York.