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# Climate Change Vulnerabilities: Case Studies of the Maldives and Kenya

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**Abstract:** This paper examines the political and social vulnerabilities of climate change, with the use of two salient case studies, the Republic of the Maldives and Kenya as exemplars of effects observed and projected. The susceptibilities for each nation are examined, with unique sensitivities highlighted and common themes synthesized between the two states. Examples of existing conflict, and implications of projected territorial conflict will be discussed. Policy outcomes will also be discussed for the situation of each nation, each with its own set of contextual sensitivities in the face of climatic shifts. Generalized policy options will be proposed for the common vulnerabilities between the two states.

## ***Introduction***

With the imminent threats of climate change becoming clearer as they loom ever-closer, the vulnerabilities of nations, and the policy questions that these vulnerabilities raise become more apparent in the political arena. A process with the capacity to drastically change life processes on the surface of the Earth, climate change brings to the surface issues of human relocation, statelessness, and resource conflict. To reach these vital questions, the focus of this paper will consist in an evaluation and analysis of the varying vulnerabilities facing both the Republic of the Maldives and Kenya, two nations that exemplify different faces of the growing climatic shifts stemming from anthropogenic climate change, but still demonstrate similar underlying impacts. With the Maldives facing territorial reduction, and eventual insular inundation, and Kenya facing increased social conflict, especially regarding water, the two case studies form an expansive model for the range of effects that climate change has had, and is projected to have. However, both face damages to their vital industries, questions of resource access, and face migration and social issues, whether internal or external.

After this thorough examination of the vulnerabilities of each nation, an investigation into policy already undertaken or attempted, along with projected issues that will require political attention, such as statelessness, social conflict, and migration, will be examined. Potential policy outcomes, and best-case scenarios for legal measures will be outlined for each state's individual context and unique set of climate threats.

This paper will track the climate change vulnerabilities of each of these developing states, highlighting commonalities between the two, and examining policy actions taken and recommended for such vulnerabilities. Adaptation efforts already undertaken will be examined, along with projected policies, all with the goal of increasing adaptive capacity when facing climate shifts. An analysis of political outcomes and policy options for the two affected states will arise from the synthesis of such vulnerability and policy data.

The initial argument of this paper is that citizens of at-risk nations, especially those with a "developing" status, increasingly face issues of conflict related to resource access, and in some cases, statelessness, exacerbated by climate change processes. Two examples of such states are Kenya and the Maldives, which face both current and prospective conflicts related to human movement and resource allocation, respectively, all tied to climatic shifts.

## ***Literature Review***

Patterns of climatic change threaten to alter the global social and political arena, along with geography of the modern world. Beyond the initial physical changes, there is a very prominent human element to these shifts. The potential ability of such events to bring about security issues, matters of relocation, social conflict, and the need for political measures to mitigate and adapt to the changes mean that; "there is every reason to worry about the impacts of these changes on human systems given that the rate of change is unprecedented in the past 10,000 years, and that climatic variations have triggered large-scale social disruptions in

the past" (Barnett 2007, 640). Knowledge of these events and their consequences for human life will be pivotal in the formation of policy aimed to face these effects.

***Population Movements***

Themes of migration necessitated by climatic changes are also prevalent in the current literature regarding the social and political effects of climate change. Each of these nations, still developing in their current state, has populations further sensitive to any fluctuation in the natural systems that support their livelihoods. Therefore, the issue of development status, in conjunction with climate change processes becomes relevant. Reuveny addresses this issue, and states; "if climate change causes severe environmental degradation, many people may leave affected areas, particularly in LDCs (Less-developed Countries), which may lead to conflict between migrants and residents in receiving areas. Policymakers may mitigate this outcome if they take initiative early on" (Reuveny 2007, 657). This prediction coincides with most literature on the subject; positing that the more vulnerable, less-developed nations will bear the majority of social relocation and upheaval. Less-Developed Countries, or LDCs, have lower loyalty to the borders that define their countries, often because they were drawn by colonizing powers, an issue that makes migration from affected LDCs more common.

Further, the issues faced by developing nations are magnified in comparison to those of further-developed nations; "concerns in LDCs include serious threats to food security and health, considerable economic decline, inundation of coastal areas, and degradation of land and freshwater resources", while in DCs (Developed Countries), threats are "generally less extreme" (Reuveny 2007, 657). The article

also notes that these migrations, forced by "quick changes" of the climate and sudden effects on the population, are likely to increase in frequency and magnitude (Reuveny 2007). Some uptick in this frequency has already been noted: "in recent decades Asia, Africa, and Latin America have both faced the most intense environmental problems and depended the most on the environment for livelihood. We thus expect that environmental migration will be relatively more prevalent in these regions…Regions that exhibit more environmental problems and depend more heavily on the environment for livelihood also exhibit more environmental migration episodes." (Reuveny 2007, 661, 662). This may be why the most common type of migration-inducing environmental change included in Reuveny's case studies is land degradation (Reuveny 2007, 662). This process will prove especially relevant to the case of the Maldives. Reuveny's article examines a spectrum of environmental migration cases, in which; "19 of the 38 cases analyzed involved intrastate migrations, 6 cases involved interstate migrations, and 13 cases involved both," with the highest numbers of migrants per event occurring in Bangladesh, followed by the Sahel, Brazil, the Philippines, Sudan and Somalia (Reuveny 2007, 662). Further, 19 of the 38 cases were of an intrastate nature, which leads the author to suggest that migration tensions are lessened when people move into an area of residents sharing their ethnicity and religion. "Environmental migration does not always lead to conflict, but when it does, the conflict intensity can be very high, including interstate and intrastate wars. In almost all the conflict cases, the receiving areas were underdeveloped and depended on the environment for livelihood. Other factors associated with conflict include resident emigrant

ethno-religious tension and competition over resources and resource scarcity in the receiving areas" (Reuveny 2007, 668). Reuveny notes Hurricane Katrina's internal migration effects as a counterexample to environmental events creating migration conflict. In the end, the literature seems to posit that environmental problems are not the sole cause of migration conflict, but merely one factor that contributes.

***Social conflict: Aggravated by Climate Change?***

The concept of climate change as a conflict intensifier, or "threat multiplier," alongside population size and density, is outlined as a route to environmental scarcity, "linked to a rise in violent conflict: environmental change, population growth, and unequal resource distributions" (Knight 2013, 84). Stressing relevant examples from South Sudan, with cattle raids exacerbated by the particular and demonstrated vulnerability to global temperature rises in the region, Knight's article emphasizes the social conflict that corresponds with climate change acting as a causal mechanism, and not merely a correlative one. It also appears that natural disasters increase the likelihood of violent internal conflicts in the long and short run. Focusing on the "destabilization" of society through these incidents, the literature argues that states' ability to respond often decreases in situations such as those brought about by climatic change (Nel 2008, 179). The ability of climate change to throw a society and a state's structure into a period of rapid and unprecedented change is what may prove to be this "destabilizing" factor in both Kenya and the Maldives, though different in manner of manifestation; whether in pastoral social conflict or relocation of refugees/former citizens to be classified as stateless.

Reuveny posits that certain situational factors may breed conflict, especially when involving matters of migration: competition, ethnic tension, distrust, fault lines and auxiliary conditions (Reuveny 2007). Lack of development and income inequality, issues prevalent in these case studies, also create an environment that allows for climatic processes to deepen into a larger issue. The magnitude of social conflict is also a factor: "The conflict intensity is classified broadly in four levels: (1) low, mostly unarmed, non-state violence; (2) medium, semi-organized, semi-armed, non-state violence; (3) high, intrastate insurgency, interstate skirmishes, or inter-communal, armed violence; and (4) very high, intrastate or interstate war" (Reuveny 2007, 662).

Furthering the concept of climate susceptibility, Scheffran delineates the rules of vulnerability, while insisting that climate change exacerbation of its factors would be completely indirect (Scheffran 2012, 870). Other scholars, including Thomas Homer-Dixon, argue a direct connection between increasing environmental scarcity and violence. Arguing that environmental scarcity, likely to arise out of global climate change, often facilitates movement of a state towards a "self-reinforcing spiral of violence, institutional dysfunction, and social fragmentation," in combination with other varying state-level contextual factors, Homer-Dixon examines the role of environmental scarcity as a causal mechanism, interacting with other stability factors within a state's sociopolitical context, in conflict creation (Homer-Dixon, 4-5). Thus, there exists a significant section of the literature on the destabilizing capacity of climatic processes, that states that many other societal

factors would intervene, with climate change being only a part of the spectrum of potentially conflict-breeding problems.

There is, however, an alternative standpoint in which it is stated that economic growth lowers the occurrence of state conflict, potentially offsetting its developmental contributions to climate change processes: "even if climate change drives conflict, the effect may not be visible if it is overshadowed by the peace-building effect of economic development" (Gleditsch 2012, 6). This view is corroborated by Devitt, who also states that; "economic growth reduces the risk of conflict and the impact of climate change" (Devitt 2012, 130). Homer-Dixon argues, however, that many developing countries, a category that encompasses both the Republic of the Maldives and Kenya, will be susceptible to economic upset instigated by climate change-related disruptions of their fragile, natural resource-dependent economies (Homer-Dixon, 4).

In further contrast, some scholars hold the view that climate change-related weather events can cause "negative growth shocks," which then allow the events to; "cause armed conflict via their negative impact on growth," something posited by the literature to be more common in developing states to begin with (Bergholt 2012, 149). Therefore, to synthesize Gleditsch and Devitt's views with those of Bergholt; a nation already affected by one climatic event would become less well-equipped to handle any further incidences, as the former would weaken the nation's economic structure and social dynamic, leaving economic development stunted and unable to counteract the ill effects of climate change. Barnett backs this argument, stating that; "the more people are dependent on climate sensitive forms of natural capital, and

the less they rely on economic or social forms of capital, the more at risk they are from climate change" (Barnett 2007, 641). Therefore, it would seem that climate effects have a cyclical nature; damaging, increasing vulnerability, and then exploiting said vulnerability and damaging yet more thoroughly.

In stark contrast, Gleditsch goes on to outline that there is not currently enough evidence to establish causal connections between climate change processes and conflict, providing a contrasting piece of literature on the relation between these two phenomena. However, this view is balanced by Homer-Dixon's outlines of multiple types of conflict likely to arise out of environmental scarcity, which is further examined in the social conflict section regarding Kenya.

## ***Research Design***

The research question will consist of a comparison of climate vulnerabilities in the Republic of the Maldives and Kenya, along with an examination of the causal relation between climate change processes and issues of statelessness and social conflict. A thorough analysis of the socio-political implications of this anthropogenically-aggravated process will be conducted with the above two cases investigated. Though seemingly disparate, the cases highlight different outcomes of climate change effects on society, only then to link under the theme of climate change-induced human impacts.

### *Operational Definitions of Variables*

The research question broaches a wide area of analysis, with the variables being "operationalized" in that social conflict and issues of human movement will be analyzed in regards to its underlying climatic factors and their ability to be tracked

to climate change-related environmental shifts. Based upon the aforementioned operational definitions of the variables involved, along with the selection for examination of two case studies, the nature of the research involved in this project will be inductive, rather than deductive. It will be quantitative in terms of the examination of specific and relevant geophysical shifts caused by climatic change, such as sea level rise projections, however, the majority of the exploration of the topic will be qualitative, consisting in its majority, of case analysis. Independent variables will be denoted as climatic changes, whether they be sea level rise or changes to regional hydrology or agricultural zones. These will be operationalized through measures of coastal erosion, sea level measurements, regional rainfall projections, and yearly temperature changes. Dependent variables will be social and political turmoil, migration from and within affected areas, and any incidences of statelessness resulting from the former variables. Turmoil will be operationalized as violent outbreaks or projections of conflict documented in my sources, migration through data stating that citizens have relocated within or outside of areas affected by climate change, and statelessness in a mostly theoretical sense; as the Maldives have not yet felt major external relocation of its nationals.

The foundations of this investigation are based on a prediction that climate change does, indeed, act as a causal mechanism, an aggravator or "threat multiplier," for socio-political conflict and forced migration leading, in some cases, to matters of statelessness (Knight 2013, 84).

Throughout the course of this paper, the foundation of the examination of the Maldivian and Kenyan cases will consist in the threats multiplied by climate change,

or their vulnerabilities to climate. Here, "vulnerability is an aggregate measure of underlying conditions," or further, an "aggregate measure of the underlying factors that influence exposure" (Downing 1992). The nature of vulnerability to climate change varies from state to state, geophysical area to area. The conditions existing previous to the effects of these climatic shifts are crucial to the understanding of a state's unique risk in the face of these events. A nation's geophysical makeup, its population distribution, its biological norms, and its economic makeup all contribute to the liabilities and capabilities that a nation has working both against, and in favor of its capacity to adapt to climate change: "Vulnerability can be broken down into three factors: (i) exposure to climate change, (ii) sensitivity to climate change, and (iii) adaptive capacity" (Scheffran, 870). Heightened sensitivity to climate change may be offset by high levels of adaptive capacity, however, this is often not the case, especially in developing nations.

*Case Study: The Maldives*

In the first case study of the Maldives, many data from policymakers will be utilized; as a nation that has been politically verbal about the implications of climate change upon their topography, and thus their population, there is much existing information about the nation's approach to both mitigation and adaptation policy. First to be examined, however, will be the physical shifts, brought about by climate-related changes. These consist of the threat of inundation of the series of islands composing the nation within 50 years, ceteris paribus. "More than 60 percent of its population lives along the coast," creating the backdrop for issues of internal relocation or emigration when this predicted inundation occurs. The more erosion

of coastlines and coral atolls that occurs along the boundaries of the island nation, the more vulnerable a position the Republic of the Maldives finds itself to be in (Karthikheyan 2010, 347).

In terms of policy examination for the island state, an investigation will be performed regarding both "soft" and "hard" legal adaptation attempts through the country's creation of the ICCR, or the "Integrating Climate Change Risks into Resilient Island Planning in the Maldives" Program, a policy body promoting awareness, and physical and "institutional resilience" measures (Sovacool 2012, 296). The particular case of the Republic of the Maldives as an exemplar for climate change affecting the socio-political arena of a state is appropriate for this investigation due to the extreme urgency of its situation, its corresponding international legal efforts to mitigate and adapt to climate change, along with its being an archetype for an issue facing many different, low-lying, small island states.

*Case Study: Kenya*

Offering a view of a different facet of the climatic change, Kenya shows the more resource scarcity-driven aspect of conflict linked with these climatic shifts. The increasingly drought-ridden state, unstable in its agricultural yields even before this onset of water deficiency, has shown the impact of climatic change processes on its farming sector. Kenya "is facing a typical situation with conflict induced by environmental scarcity" (Adano 2012, 66). Conflict and movement of populations has occurred, made tense by the presence of small arms, especially in the northern regions of the nation, where a pastoral lifestyle dominates, dependent upon livestock and availability of pasture and water. This case is apt for the investigation

into social conflicts exacerbated by locally experienced shifts branching from global climatic changes because of its variation from the main problems faced by the Maldives, along with its ability to typify resource conflict.

*Statelessness*

An examination into the political and legal implications of statelessness, an issue forefront particularly in Maldivian policy, will also be conducted, though the case of the Maldives and many other small island states is somewhat unprecedented, and therefore would require that UN dealings in the matters of statelessness would have to be extrapolated from other causes to those of territory loss due to climatic changes (United Nations 1949, ix). Based upon the statement by the UN, that; "everyone has the right to a nationality," and the legal precedence that dictates that a state is the "sole authority responsible for determining the rules governing the attribution of its own nationality," the investigation will cover these precedents and attempt to extrapolate them to the delicate and looming policy situation of nations such as the Maldives, facing a threat to their sovereignty and authority which would render the nation unable to grant such nationality (United Nations 1949, 4-5).

*Issues with Research Design*

Some problems that may arise within the framework of this thesis would lie in the establishment of causal links between climatic change and the variables of socio-political conflict, migration, and statelessness. Due to the fact that these dependent variables are; firstly, difficult to operationalize and define, and secondly, difficult to isolate as having one causal mechanism contributing to their frequency of

occurrence, the act of operationally defining these variables will be crucial. This definition may be something that needs to be extremely specific and technical, with specifications delineated as standards by which to define each outcome of climatic changes. This is something that will develop along with an agglomeration of literature and various types of source material. For example, during the peer-review session for the research design of this project, it was noted that there could be many intervening variables besides climate change, that contribute to social conflict; "there could be a conflict between two groups because of ethnic tensions, perceived injuries, etc. rather than conflict because of the stress of climate change." For example, in examining the Kenya case; "the direct correlation between climatic shifts affecting the nation's resource availability may be difficult to isolate: "the risk of increased conflict trends in Africa are likely a result of many complex reasons, including inadequate governance, rampant corruption, heavy dependence on natural resources and ongoing cycles of violent conflict" (Adano, 66).

Further, the ability to link Kenya and the Maldives, because of their broad differences, may prove more difficult than anticipated; the original design was to link them through underlying currents of forces of migration pushed by climate change. However, it may be necessary, according to Robyn Caron during the same peer-review session, to prove and strengthen further the relationship between Kenya and the Maldives. One being a land-locked nation with resource scarcity issues, and the other being a low-lying island nation with geographical territorial encroachment issues, the implications for these processes of climate change are, in many aspects, different. This will be accomplished through an amassment of source

material as well, especially regarding their rates of migration over time, their linking factor.

Further, in evaluating policy, it is very possible that one country's approach to policy regarding climate change and its effects on the geography and social climate of their state may be extremely disparate from that of the other. For example, encounters with literature regarding Maldivian policy attempts to reduce contributions to human input to climate change on the international scale, are quite common, whereas Kenyan legislation is less prominent on the subject.

*Evidence Previously Collected*

So far, much of the literature encountered for this investigation has involved opinion pieces, including case studies within, as to whether climate change truly is a magnifying force to socio-political conflict, or whether it is a mere drop in the bucket of issues for each of these states, the Maldives and Kenya, which is but a small contribution to their socio-political and sovereign ills. Further, data has been gathered regarding Maldivian policy responses, yet it remains to be seen what Kenya has done legally to address the variables of this project. Data has been collected regarding the political precedence regarding statelessness, what its implications and historical causes are, and how the law views those deemed to be in such a political state.

What remains to be analyzed is census data depicting migration patterns for each of these affected states, along with documentation of any political precedence for a nation losing its sovereignty to supposedly "natural," causes. Further, deeper insight into the nature of the conflicts already occurring in the Kenyan case study

would be beneficial in creating an opportunity to attempt to isolate climate change as an aggravating force behind said turmoil.

***Case Study Choice: The Maldives***

A salient example of geographic vulnerability due to low elevation, the Republic of the Maldives is particularly susceptible to climate change damages because of its high population growth rate, overcrowding, overburdened infrastructure, and poor land planning all combine with the Maldives' dependence upon foreign tourism to create a particularly threatened situation for the island state (Karthikheyan 2010, 344). However, it is the physical shifts, brought about by climate-related changes, which have been the cause of much political distress over the fate of the Maldives. As a low-lying state, it is threatened with inundation within a span of 50 years, ceteris paribus. "More than 60 percent of its population lives along the coast," marking the beginning of issues of infrastructural damages, along with temporary internal relocation or more permanent emigration. Further, the coral atolls which compose much of the islands' barrier against the sea have been depleted for use as building materials, and have left beaches further vulnerable to the erosion that has already afflicted the coastline (Karthikheyan 2010, 347). Decreases in freshwater access, reduction of biodiversity, especially in corals, and, "intensifying tropical cyclones," are further issues that increasingly face the Maldives (Karthikheyan 2010, 347).

***Case Study Choice: Kenya***

The newly increasing drought cycle in Sub-Saharan Africa, coupled with its dearth of water supplies and agricultural stability, has caused fundamental changes

to social dynamics in many areas of the region. In particular, Kenya "is facing a typical situation with conflict induced by environmental scarcity" (Adano 2012, 66). Many areas of the nation, especially the northern border are inhibited by pastoralists, and are witnessing resource conflicts between said pastoralists. Turmoil over livestock, availability of pasture and water sources, along with the presence of small arms weaponry in the area have contributed to tensions. However, Adano notes that in this case it may not be climate change solely or directly affecting these changes; "the risk of increased conflict trends in Africa are likely a result of many complex reasons, including inadequate governance, rampant corruption, heavy dependence on natural resources and ongoing cycles of violent conflict" (Adano, 66). Further, Kenya faces the potential for increased vector-borne disease, such as malaria, with infections entering new regions as the weather patterns, temperature, and vegetative landscape change as a result of climate change (Downing, 14-15).

Thus, the issues Kenya is facing are disparate from those faced by the Maldives in that there is not a threat of geographical loss of national territories. However, each case is underscored by a vulnerability caused by dependence on natural resources for economic stability and development, and follows trends of migration prompted by climatic changes.

*Analysis of Policy Outcomes*

Many developed nations have increased restrictions on immigration from LDCs across their borders as a response to the rise in numbers requesting entry. However, it is predicted throughout environmental migration literature that these

measures will not prove sustainable in the long run (Reuveny 2007, 668). Further, "vulnerable LDCs could lessen their dependence on the environment for livelihood or protect certain areas against rising sea level" (Reuveny 2007, 669).

However, there first comes the issue of sensible and widespread awareness, preparation and mitigation. Much of the literature advises against portraying climate change as a necessarily conflict-inducing process, noting that this type of legislative reaction would be conducive to changes in perception of government figures and destabilizing militarization efforts (Gleditsch 2012, 7). However, to balance this view, many stress the necessity of education about the urgency of this climatic phenomenon. Both Karthikheyan and Scheffran suggest that the possibility of conflict must be included in creating management plans to mitigate the effects of climate change; "Thus, there is a need for conflict-sensitive mitigation and adaptation strategies that contain conflict and contribute to cooperation via effective institutional frameworks, conflict management, and governance mechanisms" (Scheffran 2012, 871). This integration into legislation is deemed necessary by many sources.

Further, recommendations regarding focus on economic growth and poverty elimination are included in relevant literature. Climate change can contribute to both civil unrest and economic slowing, forces that can feed into each other to create a socially unstable state; "This means that there are two potential poverty traps in the model – sluggish growth leading to civil war and further slow growth; climate change slowing growth and enhancing vulnerability to climate change – and the two poverty traps may reinforce one another" (Devitt 2012, 132). Therefore,

measures against slowing of development are likely to create a stronger base to avoid this aforementioned cycle. Low-carbon growth initiatives, recommended as a policy option for Kenya in particular, would act as capacity-building measures, increasing resilience economically, while bringing awareness to climate impacts that often accompany development (Downing, 13).

The cyclical economic vulnerability view of climate change, which is somewhat in concordance with this "poverty trap," needs to be avoided in the policies put forth by Gleditsch, who stresses climate change as a mere exacerbating factor to problems already present, here economic underdevelopment resulting in decreased adaptive capability. This aspect of policy adaptation will be examined over the duration of this project. Barnett also highlights certain contextual factors that "undermine human security" in conjunction with climate change; "poverty, the degree of support (or conversely discrimination) communities receive from the state, their access to economic opportunities, the effectiveness of decision making processes, and the extent of social cohesion within and surrounding vulnerable groups. These factors determine people and communities' entitlements to economic and social capital that in turn determine their capacity to adapt to climate change so that the things that they value are not adversely affected" (Barnett 2007, 641). Thus, Barnett suggests that an improvement in these more locally focused matters would lessen impacts exacerbated by climatic processes.

Further, improvements to legal frameworks regarding stateless persons and environmental refugees are policy options that have been broached by much of the existing literature, and will be examined over the course of this project (Docherty,

350). Limitations to climate refugees' status that appear in current legal frameworks, such as the United Nations' *Study of Statelessness,* would be much improved by a formal convention regarding the classification and humanitarian provisions for these groups (Docherty, 350). This would prove particularly relevant to the Maldivian case, in which relocation of citizens will become a necessary action.

Thus, the literature holds myriad viewpoints of the nature of the causal link between climate processes and conflict, but with a few linking undercurrents; the theme of migration and tension caused therein, the theme of structural, economic, legal and governmental vulnerability being a magnifying factor in the impacts of climate change processes, along with the cyclical effects of climate on economic growth, and vice versa. The case studies of the Maldives and Kenya best show the range of matters that modern states face in the approach of ever-intensifying climate shifts, yet are linked in their human element due to their inclusion of the question of movements of people. Policy outcomes and options will be examined as an integral part of an evaluation of the climate contexts of both the Republic of the Maldives and Kenya.

## ***Discussion***

### ***Maldivian and Kenyan Context***

Many nations find themselves to be particularly vulnerable merely because of their elevation in relation to the sea level, such as in the Maldives. Other nations find themselves experiencing more frequent drought, and resource scarcity because of the shifting of temperatures and the change of local weather patterns, as is the

situation of Kenya. Instability of economic systems also contributes, magnifying the effects climate change has, and will have, on state actors: the Maldives' dependence upon tourism, and Kenya's long-unstable agricultural yields offer points of fissure that climate change processes have the capacity to quickly erode (Adano, 66). Climate change itself can be considered a "threat multiplier," for both countries (Knight 2013, 84). Below, an examination of each state's particular climate vulnerabilities will be conducted, along with an assessment of policy actions undertaken and recommended by and for each state.

***Vulnerabilities of the Maldives***

As an island state, the Republic of the Maldives faces a unique set of problems as compared with continental nations. "In popular climate change discourse, islands are referred to as the planet's barometers of change, litmus tests, and canaries in a coal mine" (Lazrus, 287). Islands will be barraged with climate-exacerbated issues affecting not only their topography and biology, but oftentimes their territorial reaches and political sovereignty. Categorical analysis of generalized "coastal area and Small Island vulnerabilities" reveals that the issues of coastline erosion, human and economic damages, and loss of tourism income are the most urgent and threatening vulnerabilities that exist in these areas, achieving a label of "high level of concern" (Leary, 14).

*Figure 1: Vulnerabilities of the Republic of the Maldives and Kenya*

| Vulnerability | Maldives | Kenya |
|---|---|---|
| Seawater Encroachment | Yes; Territorial inundation within 50-100 years | Yes; coastal areas like Mombasa |
| Increased occurrence and intensity of storms | Yes | |
| Infrastructural Damages | Yes; crowded and infrastructurally strained coastally-centered cities will be affected | Yes; densely populated coastal cities like Mombasa, along with surrounding areas, will be affected |
| Freshwater Access | Yes; saltwater intrusion and shifts in precipitation patterns will strain resources | Yes; pastoral conflict may result |
| Loss of Biodiversity | Yes; inundation by seawater will render territories incapable of supporting terrestrial vegetation and non-aquatic life | Yes; change in vegetative land cover may occur; agricultural capacity may change |
| Vector-borne Disease | | Yes; malarial infections will resurge in areas with previously low infection rates |

Reference: (Karthikheyan, 346), (Williams), (Adger, 325), (Downing, 12, 15), (Awuor, 232), (Adano, 66)

**Inundation of Territory**

As the "flattest country on Earth," with the highest level of vulnerability to sea level rise of all south Asian states, the Maldives face one of the most pressing outcomes of climate change in the next century (Khan, 133). Sea level changes tend to occur on the local scale, differing from region to region, and are determined by the geophysical makeup of a particular area; as seen in Figure 1, the Maldives' flat surface areas are subject to sea level more than most non-island states (Khan, 135). The fact that the nation is so low-lying, at a mean height of only 1 meter above sea

level, lends itself to climatic peril, with its coasts' geophysical integrity currently at risk (Karthikheyan, 346).

On the whole, the Republic of the Maldives has been projected to have its coastlines inundated with seawater within the next century; "there is a strong belief that the Maldives would be flooded within 50–100 years, thus leaving no trace of its existence" (Karthikheyan, 349). According to the Intergovernmental Panel on Climate Change, the Maldivian capital of Male will be 85% flooded by seawater by the year 2100, under projected greenhouse gas emission scenarios (Khan, 135). Further, occurrences of "severe coastal erosion" are caused both by the aforementioned mounting sea levels, along with the "increase in frequency and intensity of extra-tropical and tropical storms" (Leary, 14). Such erosion only quickens the encroachment process leading to the total inundation of Maldivian territories. This encroachment is also aggravated by the overuse of the land along the shoreline existing prior to climatic shifts, and the elimination of protection that wetlands and now-bleaching coral reefs once provided (Leary, 14).

In terms of the human factors of such territorial intrusion by seawater, more than 60% of population lives along coastline, which implies that coastal intrusion of salt-water will very quickly impact human settlements in the Maldives, necessitating relocation (Karthikheyan, 347). With a population of over 330,000 people, the question of refugee status and statelessness will appear as political questions for the affected peoples and government of this small island republic. As the aforementioned eventual total inundation of the Maldives' island territory is

projected as an imminent outcome of climate change processes, the question of universal Maldivian relocation will arise prominently in the state's political agenda.

**Sea Level and Storms**

Another outcome of climate change categorized as existing at a "high level of concern," is the "more frequent and greater loss of life, infrastructure damage, displacement of population and disruption of economic activities," all resulting jointly from both sea level changes and the aforementioned increase in occurrence and intensity of storms" (Leary, 14). Cyclones are predicted to heighten in intensity and damage capacity in the coming century (Adger, 326). These projections of storms, in conjunction with coastline encroachment by seawater and the contextual vulnerabilities that exist population-wise in the areas to be flooded, form the backbone of the human impacts of Maldivian climate change effects. Most of the population of the Maldives resides along the shoreline, which faces erosion and eventual inundation, more so with each incremental increase to the severity of climate change (Karthikheyan, 346). For these reasons, the human magnitude of effects that would occur is comparatively higher in the Maldives; " a far greater proportion of the population suffers from the potential effects of a mere 1 m sea level rise than in larger neighbouring states" (Karthikheyan, 346).

**Economic and Infrastructural Risks**

Further, the Maldivian economy is relatively homogeneous, and therefore fragile. "Tourism and leisure industries are the major source of income in Maldives," forming a limited set of income-generating practices that mean that this loss of land over time will create economic suffering and loss of economic identity within the

island state (Karthikheyan, 350). This high dependence upon these economic systems aggravates further the damages that the island state will see inflicted upon the revenue generating "infrastructure, beaches, water supply and ecosystems that provide tourism-related services" (Leary, 14). A traditionally high population growth rate, especially along coastlines, have left these areas further economically vulnerable to inundation (Karthikheyan, 344). Damages to vital fishing industries may also have implications beyond the economic; resulting in a decrease in food security for Maldivian citizens. Coastal erosion and saline intrusion will result in "decreasing productivity from agriculture and artisanal fishing" (Adger, 325). Overall, the economic damages would be severe for island states in general, with estimates in the billions of USD worth of damage: "a rise of one metre, which is widely considered possible later this century is estimated to lead to damage of around $187 billion," (Williams).

### *Mid-level Risks*

Below these aforementioned "high-level risks," exist certain vulnerabilities generalized to island states that are considered to be at a "medium level of concern," including; ecosystem impacts upon the fishing industry and "diminishing and less reliable water supply" (Leary, 15).

### Freshwater Access

Freshwater access is a further risk that will create harsher living conditions for citizens: with rainfall patterns changing in "timing and amount of rain," particularly in island nations, the shifts in climatic patterns will create weather instability and unpredictability (Lazrus, 288). Lower latitudes are expected to

receive less precipitation, and the waters surrounding nations in these latitudes are projected to become more saline, rendering it further non-potable and less easily converted to freshwater (Karthikheyan, 347). It is also a pattern of island nations to aggravate this situation further by extracting increasing amounts of groundwater (Leavy, 15). The "narrow subterranean freshwater lens," from which atoll nations extract their water is particularly susceptible to saltwater intrusion and development-related pollution (Adger, 322). "Due to coastal erosion and a reduction in resilience of corals, the net impact on atoll societies are likely to be increases in flooding events, freshwater aquifers becoming increasingly contaminated with saline water from storm surges and seepage," and dependent agriculture are also likely to be affected by said changes to the water table, both in its composition in terms of salinity, and overall availability for use (Adger, 325).

**Biodiversity Loss**

Beyond these two categories of level of concern exist additional risks, including the biological; "shift in species composition and competition" (Adger, 325). This shift to climate would further affect fish species, and agriculture on this atoll nation, even beyond the aforementioned water access issue (Adger, 325). Coral atolls would suffer even beyond the impacts of sea level rise, in that other effects of climate change, like; "enhanced climatic variability and extreme weather events may in themselves constitute a 'dangerous' level of climate change to atoll social-ecological systems" (Adger, 325). This change in the biological makeup of the atoll nation and its surrounding waters will exacerbate coastal erosion, and contribute to

the early stages of loss of the historic geophysical and biological identity, both in a figurative and territorial sense, of the Maldivian state.

***Political Actions Taken by Maldivians***

The Republic of the Maldives entered the international environmental policy arena in 1989, with a conference in Male regarding sea level rise, which "recognized climate change and its effects as a common concern for mankind…[and resulted in the issuance of the] Male Declaration on Global Warming and sea level rise (SLR)," urging industrialized nations to aid the vulnerable small island states seeing the effects of global climate change in the form of said sea level rise (Khan, 134). In more recent years, the former Maldivian President Mohamed Nasheed has involved the Republic of the Maldives as one of the most active and vocal members of the AOSIS, or Association of Small Island States, and has worked extensively, often taking politically charged publicity stunts, like underwater "conferences," to spread awareness of the implications of climate change on low-lying island and atoll nations. An audit was conducted, under his administration, gauging the output of carbon emissions by Maldivians, and a plan to approach carbon neutrality by planting mangroves, and purchasing carbon credits, was proposed by Nasheed, in the face of Cancún climate talks in 2010 (Williams). At these talks, compensation of AOSIS states was brought to the table; "the Association of Small Island States (AOSIS), of which the Maldives is a member, called for an enormous insurance policy funded by the developed nations to help these small states to pay for future damage from rising sea levels. The states at risk would pay a premium but payout for damage would largely be met by developed countries" (Williams). But, beyond

looking for compensation, the former President Nasheed even planned to "divert a part of the country's huge tourist revenue into a very unusual fund…to buy a new, climate-change-friendly homeland as an insurance policy against climate change that threatens to turn the islanders into environmental refugees" (Economic and Political Weekly, 7).

Another measure already taken by the Maldivian government, in concerted efforts within the international legal arena is the; "'Integrating Climate Change Risks into Resilient Island Planning in the Maldives' Program, or ICCR, a four-year $9.3 million adaptation project supported by the Least Developed Countries Fund, Maldivian Government and the United Nations Development Program" (Sovacool, 1). Focusing on "soft" physical resilience infrastructure modifications, institutional training for policymakers, and "strengthening of assets" at the community level to improve adaptive capacity (Sovacool, 1).

***Political Questions for the Maldives***

In terms of the political ramifications of these processes; "this is not only a livelihood issue for the nation; more than that, it is a problem for its sovereignty, as has been highlighted in 2009 by the Maldivian President's call for finding land in other countries" (Karthikheyan, 350). Overall, the most pressing concern that the Maldives will face exists in the form of the relocation of Maldivian citizens. It is projected that, because of territory loss, these citizens will, under currently narrow definitions of refugees and stateless persons; "become de facto stateless persons if without having been deprived of their nationality they no longer enjoy the protection and assistance of their national authorities" (United Nations, 8). This

political ramification will occur for climatic reasons, with citizens becoming deprived of their homeland, and thus their nationality, through such an unprecedented manner within the realm of nationality and statelessness. Citizens will likely become formally stateless, that is, without intervention in regards to current international law surrounding displaced persons; an overall "absence of general rules for the attribution of nationality and the discrepancies between the various national legislations constitute the permanent source of statelessness" (United Nations, 4). These stateless former Maldivian citizens would likely be "obliged to live outside the law," due to the inevitable uncertainties regarding their legal statuses, vulnerable in that they have "no clearly defined rights" (United Nations, 9).

This gradual loss of territory, resulting in complete insular inundation, will necessitate an organized and strategic re-settlement of Maldivians within the territories of other states. The paths of the International Refugee Organization, which generally consist of repatriation or re-settlement of refugees under its care, are limited in this case, as repatriation options will be rendered impossible due to the inundation of the entire Maldivian territory (United Nations, 5). Thus, Maldivians will face inadequate international legal frameworks for the acknowledgment of their citizenship, as climate refugees are often neglected in this respect within modern international law.

Policy recommendations regarding statelessness and refugee status have often focused upon the creation of an independent convention on the status of climate refugees. Such a title for displaced peoples is a relatively new concept, with

an inadequate existing legal framework to address the problems of relocation and citizenship outcomes (Docherty, 350). With guarantees of human rights during the process of displacement and relocation, along with provisions for institutions to uphold such guarantees, a convention could assure that climate refugees do not continue to fall between the gap that exists between the Refugee Convention and the United Nations Framework Convention on Climate Change. Involvement of community-level groups and "civil society" would be advisable, especially for the Maldivian case, in order to expedite negotiations and further ensure humanitarian provisions (Docherty, 350). Further, advocacy for the recognition of a formal status of such affected people as environmental or climate refugees under international law has been proposed, especially by the industrialized nations that have contributed to climate impacts, thus taking part in a long-term and neglectful "environmental persecution" that led the soon-to-be refugees to such a fate (Economic and Political Weekly, 7).

As a more local political measure for the Maldives, Karthikheyan suggests that the; "Maldives still has the difficult task of sensitising the global community about the environmental problem surrounding it, and to alleviate its existential threat. Maldives also faces the challenge of successfully integrating these environmental concerns into their national policies and programmes. The successful implementation of a viable environmental policy resides in the ability of Maldives to garner international support both in terms of financial and technical assistance" (Karthikheyan 2010, 350).

There exist certain policies that have proved useful for atolls in adapting to environmental upheavals throughout history; resilience through "traditional knowledge, institutions and technologies; opportunities for migration and subsequent remittances, land tenure regimes; the subsistence economy; and linkages between formal state and customary decision-making processes" (Adger, 328). However, these processes are arguably undermined by integration of atoll nations into the global economy, through exploitation of their Economic Processing Zones and tourism sectors (Adger, 329).

***<u>Vulnerabilities of Kenya</u>***

As a rule: "Africa is predicted to have greater impacts than other world regions, because of higher vulnerability and lower adaptive capacity. Impacts could threaten past development gains and constrain future economic progress. Some regions and populations in Kenya have very high vulnerability" (Downing, ii). The economic context of Kenya, along with its geographical and physical makeup, make it particularly vulnerable to the risks of sea level rise, agricultural loss and economic damages, resource access problems, and social conflict.

***Sea Level Rise: Coastal Encroachment***

Kenya, as another state bordered by ocean, also faces coastal encroachment of seawater as a result of sea level rises. Cities like Mombasa, a vital port city with a highly concentrated population, lie along this coastline. Mombasa is the second-largest city in Kenya, after Nairobi, and as the "largest international seaport in Eastern Africa," plays a vital role as a commercial and tourism hub, along with that of a population center (Downing, 12). Mombasa and surrounding towns are also

low-lying areas, with "significant population and infrastructure, and are home to tourism, aquaculture and agriculture" (Downing, 12). Mombasa is projected to continue with population growth, and for this reason, increase its exposure, both in its human and infrastructural elements, to the risks of sea level rises (Downing, 12).

Overall, in Kenya; "coastal flooding from sea level rise is estimated to affect 10,000 to 86,000 people a year by 2030," along with a rise in "wetland loss and coastal erosion…[with] economic costs in 2030 estimated to be $7 to 58 million per year, including flooding" (Downing, iii). These economic damages are also predicted to increase over time. Damage costs would; "by 2050…increase to $31 - 313 million per year and would increase further in future years through to 2100…without adaptation, the physical, human and economic impacts will be significant" (Downing, 11).

***Agro-biological Losses and Tourism Damages***

In terms of economic damages, disruption of the already fragile agricultural system would be at the forefront of issues: "Food security and general economic performance is … very low; the latest available figures (from 1997) show that 38.2 per cent of the population face absolute poverty and 38.6 per cent face food poverty" (Awuor, 232). This context places Kenya in a state of vulnerability to changing weather patterns that have bearing over crop productivity. As a "top earner of foreign exchange," the agricultural sector is also a cornerstone to the tenuous Kenyan economy (Downing, 23). The majority of Kenya's population is still classified as rural, despite rural-to-urban movement trends, and livestock production is an essential part of the lifestyles of populations in the arid and semi-

arid regions of the country (Downing, 23). It has been noted, that "weather-related hazards already present a serious threat to agriculture. These will be potentially exacerbated by a mix of climate and socio-economic change" (Downing, 23). Projections of complex agricultural impacts have been made, with some positive, such as $CO_2$ fertilization, and some negative effects, like increased summertime temperatures decreasing crop yields. For Kenya, "increased winter temperatures are associated with higher crop revenue, increased summer temperatures have a negative impact and increased precipitation was positively correlated with net crop yield" (Downing, 23). Overall, these mixed patterns, affecting different landscapes with varying outcomes, show significant and complex impacts on agriculture, with "differences [in effects on yield] with potential zones, predicting a 1% gain in high potential zones but a 22% loss in medium and low potential zones" (Downing, 24). Some highlands may see increased crop yields, however, these benefits would be offset by significant shifts in evapo-transpiration and rainfall processes, leading to land cover changes in other areas (Downing, 24). This relatively conflicting projection for Kenya, with its diverse landscapes, leaves significant shifts in agricultural production on the projected timeline. At the very least, adaptation efforts will be necessary in response to both the positive and negative crop impacts.

Overall ecosystem stresses are already reported in Kenya, affecting water supply, biodiversity, food provision, and energy resources. These natural processes are projected to shift, affecting nature-based economic activity even beyond farming practices; "In addition to agriculture, nature-based tourism, fishing, timber and charcoal production are other important sources of income in the country"

(Downing, 25). These ecosystem services, as well as provision of raw materials, will be put under significant strain, and the climate shifts at fault will only add to the pressures already undergone by these systems.

Tourism is a pillar of the Kenyan economy, especially in coastal cities like Mombasa, and damages to the shoreline and the ecosystem attractions in their general vicinity will prove devastating to this industry (Awuor, 232-233). The main factors of coastal Mombasa's vulnerability to climatic shifts consist in its geophysical makeup, much like the Maldives' vulnerabilities. These vulnerabilities include: "low altitude, and high temperatures and humidity levels. Regarding the first of these, Mombasa is on the coastal plain…parts of the city and its surroundings are likely to be submerged with a rise in sea level, and this would consequently disrupt ecosystem functions and balance, disrupt agricultural and industrial activities, cause the destruction of human settlements and interfere with the water supply" (Awuor, 233). In one city alone, albeit one particularly vulnerable to the oceanic effects of climate change, the spectrum of damages brought about by climate change can be seen, and many extrapolated to other regions of Kenya.

***Disease***

Many regions of Kenya have been, until the effects of climate change, protected from certain temperature-sensitive diseases by their highland landscapes. However, with warming in Kenya projected to be significant, malaria is also predicted to increase its effects upon the vulnerable populations of Kenya. "The model projects that by 2055, as a result of the central average climate warming (2.3ºC) across the projections, the population annually affected by malaria in rural

areas over 1000 metres (which comprises 63.5% of the population of Kenya) would increase by up to 74% (in absence of adaptation)" (Downing, 15). This increase in disease occurrence is projected to bring economic costs of over $86 million in the 2050s, in addition to Kenya's present malarial burden. These projections also do not account for co-prevalence with HIV/AIDS infections, which could enhance the economic damages (Downing, 16).

***Resource Access***

In the more northern, arid regions of Kenya, the main issue that has arisen due to temperature changes and meteorological pattern shifts is resource access; "the changes in rainfall patterns and frequent droughts make the survivability of pastoralists in the arid environments particularly difficult. Cyclical droughts are increasing in frequency, with the drought cycle, on average, increasing" (Adano, 66).

Creating an ambient of inherent vulnerability, which climate change appears to magnify, are certain conditions that Kenya is enduring as a nation still striving for development. Kenya; "is experiencing the drying up of lakes and rivers, dwindling water supplies, and serious food shortages" (Adano, 66). Each of these climate-dependent processes determines the distribution of resources, of fresh water uncontaminated by intruding seawater, and of agriculture dependent upon temperature stability along with the aforementioned fresh water. However, there appears a paradox in terms of the agricultural effects of climate change yet to take full effect in this sub-Saharan state; "National food production potential in Kenya may well increase with increased temperature and precipitation. However, the impact of climate changes on productivity and vulnerable socioeconomic groups in

the semi-arid areas could be devastating. For pastoralists and farmers, reductions in the area suitable for cultivation in the order of 15 to 30 per cent in the sub-humid and semi-arid provinces significantly increases the number of people with inadequate climatic resources for sustainable agriculture" (Downing 1992). This projected increase in unusable land for pastoralist groups may prove both socially and politically harmful in the long run, which will be examined in the next section.

***Social Conflict***

As a developing country, Kenya is projected in the high-risk category for environmental scarcity-related social conflict stemming from climatic change in the region. Most developing nations, as they are highly economically dependent upon natural resources and have fewer adaptive resources to "buffer themselves from the effects of environmental scarcities" (Homer-Dixon, 4). The potential for conflict between "urban and rural dwellers or between nomads and sedentary farmers" is high as food-crop production systems are put under climatic strain. Environmentally-induced social conflict generally appears in one of five forms: "disputes arising directly from local environmental degradation…ethnic clashes from population migration…civil strife caused by environmental scarcity…scarcity-induced interstate war…[and] North-South conflict between developed and developing worlds over mitigation and adaptation" (Homer-Dixon 5). In the case of Kenya, many predict an appearance of social conflict in the form of civil friction over scarce resources.

Stresses on land use and distribution, in combination with growing populations dependent upon such divided agricultural production sectors may

exacerbate tensions within states (Homer-Dixon, 3). The main occurrences in Kenya of conflict that has been, and is projected to be, affected negatively by climate change processes, have been related to such nomadic pastoralist lifestyles. The aggravation of water resource access, and of the agricultural systems and practical norms throughout, primarily, the arid North of Kenya, has created incidence of social conflict. "In the Sahel, in Kenya, changing rainfall patterns have the potential to increase resource scarcity as a driver of pastoral conflict" (Scheffran, 870). This social conflict coincides directly with the vulnerabilities of water and land resource access, along with agricultural system stability.

Generally, the patterns of rainfall determine the patterns of movement of pastoralist groups, a prevalent lifestyle in arid and semi-arid areas of Kenya. The use of distinct grazing areas is determined by such meteorological events, and community relations are dictated by decisions as to this matter. "The availability of common-pool resources across border areas leads to periodic conflicts in the drylands. Conflicts between pastoral communities in the arid border- lands of northern Kenya, southern Sudan and southern Ethiopia are said to be over access to pasture and water, livestock raiding and the heavy presence of small arms" (Adano, 66). Thus, water availability conditions are already strained, with conflicts emerging in pastoral groups over the resource; shifts in weather patterns and temperature that are projected to come will likely only aggravate this context. As a pattern in sub-Saharan Africa, "a one percentage point decrease in rainfall raises the likelihood of a country experiencing conflict incidence by about two percentage points and conflict onset by three percentage points" (Bergholt, 149). Therefore, the

aforementioned predicted upheaval of rainfall patterns, and change in vegetative ground cover, along with an increasingly harsh drought cycle will heighten such resource-related tensions, and likely the frequency of social conflict.

The particular vulnerabilities mentioned above make Kenya an area particularly vulnerable to further conflict. "Food insecurity has been found to contribute to violence, as exemplified by recent "food riots" but there is little empirical evidence that climate variability is an important driver of violent land-use conflicts." However, in Kenya, pastoral conflict may be driven by resource scarcity increased by changes to rainfall (Scheffran, 870).

***Policy undertaken in Kenya***

A National Climate Change Action Plan (NCCAP) has been created in Kenya, which consists of proposed adaptive measures by the Kenyan government in response and preparation to climate change. Multiple climate vulnerability assessments are recommended, in sectors like transportation, along with integration of climate resilience measures into its operations and plans for infrastructure, such as "climate-resilient materials and designs" (Republic of Kenya, 3). The modification of rural electrification programs, to account for increasing climate variability, financing of low-cost, efficient energy sources for citizens, and energy source diversification (much of which will be aimed toward renewable energy sources) are energy-sector measures proposed in the NCCAP. Meteorological alert systems spread at the community level, as well as community involvement in land use deliberations (Republic of Kenya, 20). Funding for the National Council for Science and Technology, in order to incentivize cross-discipline research regarding

climate adaptations, and to disseminate it nationally, has also been suggested in the Plan. The creation of an environment conducive to "low-carbon and climate resilience investments and technologies," as well as to the equitable distribution of land through "efficient implementation" of the Kenyan National Land Use Policy (Republic of Kenya, 37). This measure may address pastoralist conflicts, in that it manages land use for Kenyan citizens, a source of resource contention as mentioned above. The addressing of population movements, likely motivated by resource availability shifts due to changes in weather patterns is occurring with a; "regional, holistic approach to migration as an adjustment or coping mechanism in the face of current climate variability and climate change, working in close collaboration with other national governments in East Africa and international organizations" (Republic of Kenya, 35). In planning for regional, inter-state collaboration, Kenya's plan leaves room for international agreements regarding any potential refugees from the changing landscape and climate of Kenya. Awareness and research programs have been proposed in the action plan, in each of the sectors mentioned above.

### *Adaptive Policy in Kenya*

Four main adaptation policies have been outlined for Kenya's particular case, the first two of them considered "development activities," and the third and fourth policies associated with climate risk management: "Accelerating development to cope with existing impacts, increasing social protection, building adaptive capacity and institutional strengthening, and enhancing climate resilience" (Downing, v). The first category of development acceleration deals with questions like "integrated

water management, electricity sector diversity, natural resources and environmental management," aimed toward preventative progress in the face of climate change. The policy of increasing of social protection promotes "cash transfers to the most vulnerable following disasters, [and] safety nets for the most vulnerable," in order to increase societal resilience (Downing, v). The climate risk management efforts begin with adaptive capacity-building policy; this includes improvements to meteorological monitoring, along with education. Resilience improvement efforts include the more physical measures such as infrastructure modification and flood prevention measures, adaptive efforts to ease the impending burdens of extreme climate change weather events and sea level rise.

The aforementioned policy adaptations are projected to be extremely productive in terms of adapting to climate effects like rising sea levels; it is predicted that early adaptation will significantly lessen economic damages, especially in coastal areas, along with the numbers of people affected by coastal flooding (Downing, vii). Low-carbon growth has also arisen as a recommended policy focus for Kenya, with adaptive investment plans and regional collaboration allowing advantages through increased economies of scale, marking Kenya as an "early mover" in this field of development (Downing, 13).

Considerations have been made in Kenya for infrastructural management of the effects of climate change, specifically phenomena like flooding; recommendations for improved drainage facilities have been made throughout literature regarding potential policy routes for Kenya. Measures like; "coastal

defences; realignment of coastal defences landwards; abandonment (managed or unmanaged); measures to reduce the energy of near-shore waves and currents; coastal morphological management; and resilience-building strategies," have been surveyed as options for coastline adaptations (Downing, 33). Further, the encouragement of settling in "peri-urban" spaces away from the shoreline is another route, a specific charge that Kenya's local and national government may choose to take in facing Mombasa and other coastal cities' unique risks (Awuor, 240). Flood risk mapping as a preventative and informative measure has also been projected as a necessary policy option. These policies must be integrated into development plans in order to maintain the integrity of coastal and floodplain areas (Downing, 40).

Further, land planning practices, especially regarding residential settlements, that would benefit Kenya through reduced water-borne disease and lowered risk of flooding, have been proposed. In terms of other disease adaptations, Malaria Early Warning Systems, or MEWS, monitor environmental conditions with regard to the fostering of malaria outbreaks, while pregnant women are focused on for early treatment. "Increasing support for all pregnant women in low endemic and epidemic areas to be targeted" with medication twice during pregnancy to alleviate the adverse symptoms of malaria has been implemented as national policy (Downing, 37). Further, it appears that initiatives such as continuation and enhancement of this treatment practice, along with rapid diagnosis tests, are highly cost-effective policy routes that Kenya will likely take, in the face of increased malarial infection (Downing, 38). Such reactionary measures to the spread of malaria

"Increasing water demands," could be addressed by the government through improvement of sanitation facilities and irrigation networks, a preventative measure that would help to avoid groundwater over-exploitation, along with saltwater intrusion (Awuor, 240). Evident as water policy options are both; demand-side management, which consists in irrigation improvements and end-use efficiency measures, along with supply-side management, to mitigate over-use and allocate for agriculture and pastoral use of water. Ecosystem management to reduce siltation and erosion is also a projected adaptation measure to be implemented in conjunction with the previous water policy measures (Downing, 42).

In the agricultural sector, various strategies for adaptation have been proposed for Kenya's particular vulnerabilities: a community-based approach to the stabilization of now-fragile agricultural systems, utilization of climate warning and information systems, agricultural research and extension services, provision of micro-finance, development of the national market, and food supply chain regulation with pest control. Based on capacity-building, and "anticipatory adaptation," these strategies enhance climate resilience on a community-by-community basis (Downing, 44-45). To further prevent economic damages to the natural resource-based economy of Kenya, ecosystem adaptation policies have been proposed as well: increase of land classified as reserve, establishment of buffer zones around such reserves, wildlife corridors to increase continuity of a particular landscape, translocation or reintroduction of species to affected areas, reforestation, *ex situ* species conservation, and improvements to inter-regional collaboration and research regarding ecosystems' responses to climatic shifts (Downing, 47).

However, it would appear that such changes, proposed initially for Mombasa in particular, will meet roadblocks that seem inherent to sub-Saharan states' economic instability; one of their key vulnerabilities. This cyclical nature of economic and technological limitations leading to decreased preparedness, may prove further damaging in that Kenya will see itself with fewer adaptive and mitigating policy options. "For Africa, low adaptive capacity results largely from the limited financial, technological, and institutional capacity, relatively low levels of economic development and high levels of poverty widely experienced in the continent. Increased climate change threatens to undo decades of development and poverty reduction efforts so far achieved in most countries" (Awuor, 231). However, measures like; "encouraging pilot actions to test promising responses" to climate shifts, and a focus on short-term, low-cost measures, which could arise from such a context, are seen as effective measures in adaptation (Downing, 32).

Preparedness and education initiatives for the general public regarding risks, especially those preemptive to natural disasters aggravated by climate change, are being proposed by many, to be undertaken by juxtaposing the work of local government and meteorological and maritime strategists (Awuor, 241).

**Analysis**

Overall, these two developing nations demonstrate high levels of climatic vulnerability typical of less-developed states, and are projected to suffer particular susceptibilities with limited adaptive capacity due to their developing status. Their typical developing reliance upon nature-based tourism, and raw natural resources

for economic stability is what will undermine them as climate shifts disrupt such economic activity.

Between the two examined states, a wide range of climate vulnerabilities appear, with the Maldives facing insular inundation, more intense storms and rising sea levels, economic/tourism and infrastructural damage, water access changes, and loss of biodiversity. Kenya, in the meanwhile, is projected to suffer from sea level rises/coastal seawater intrusion, agro-biological shifts, losses to tourism, increase in infection of diseases like malaria, resource access, and social conflict.

These two states visibly overlap in many of these key areas of exposure to climate change processes; namely sea level risks, economic/tourism/infrastructural damages, biological losses, and changes to access by populations to resources like fresh water.

While these states are limited in their financial resources in terms of capacity-building, there are some policy options that can be generalized to their situations, in terms of adapting to this anthropogenically-fueled climatic crisis.

**Generalized Policy Options**

The vulnerabilities of both the Maldives and Kenya to climate change, defined by Downing in terms of exposure of a population, leave both states in need of further contingency planning, even if such vulnerabilities affect populations in an indirect manner, as posited by Scheffran in the Literature Review. Homer-Dixon argues that proactive interventions, " a broad and integrated set of responses at the international, regional, national and community levels," will be necessary to avoid deeply entrenched social violence, in the context of environmental scarcity. This

scarcity, likely to arise in both the Maldives and Kenya, can be spearheaded through policy intervention, breaking the "early links in the causal chain" that leads toward social conflict. An avoidance of the use of conventional military institutions, proven to be generally ineffective in dealing with these violent outcomes, through this proactive approach, would be commendable (Homer-Dixon, 10).

Kenya also maintains a focus, in its plans for climate action, on community involvement, and reliance on customary institutions and traditional knowledge and networks in order to implement conflict resolution systems and adaptation measures (Republic of Kenya, 35). This is a strategy that would benefit both states, in that it would promote internal awareness and collaboration, and foster a policy arena conducive to the necessary environmental considerations.

Further, both states have addressed, or begun to address migration issues. As noted in Reuveny's works in the Literature Review, states must take a proactive stance on spearheading this issue of population movements in order to reduce the likelihood of social strife. The destabilizing effects of climate-induced migration, mentioned by Nel, will be better handled if negotiated ahead of the movement of such climate refugees. While the Maldives have specifically sought out areas for relocation of citizens, diverting funds into land purchases for citizen relocation, as mentioned above. Through Resilient Island Planning efforts, the Maldives also plan for soft infrastructural modifications, in order to adapt its population's inhabitation of a more limited land mass. Kenya has also addressed potential population movements, likely to be motivated by resource availability shifts due to changes in weather patterns, with plans for a; "regional, holistic approach to migration as an

adjustment or coping mechanism in the face of current climate variability and climate change, working in close collaboration with other national governments in East Africa and international organizations" (Republic of Kenya, 35).

Overall, however, it is through an acknowledgement of current international law limitations, as noted in the Literature Review's examination of United Nations documents regarding refugees and stateless persons, that these two states would ensure the provision of assistance to its citizens as climate change alters their livelihoods and may push them to relocate. Modifications to the International Refugee Organization, the Refugee Convention and the United Nations Framework Convention on Climate Change, in conjunction with community-level involvement, would ensure provisions for affected peoples facing climatic turmoil within their own states.

Capacity-building and proactive adaptation measures, such as provision of micro-finance and agricultural extension services, as well as funding of research for low-carbon development and climate resilience technologies are another general area in which these states should focus their budgets, as well as any aid provided to them by industrialized nations. The fostering of an aware and adaptive population is a socio-political measure that will branch into all areas of resilience improvements.

Overall, developing states, such as Kenya and the Republic of the Maldives, find themselves in a uniquely strained situation within the impending era of man-made climate change. Their economic fragility and dependence upon their geophysical resources for stability render them comparatively unprepared to adapt to climate change processes, when examined in the shadow of further-industrialized

states. However, the aforementioned policy strategies, some already undertaken, and others yet to be implemented, are best taken proactively and spread across the gap between the international and local community levels.

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