



## **Assessing the Impact of Climate Change on Migration and Conflict**

Clionadh Raleigh, Lisa Jordan and Idean Salehyan

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# **Assessing the Impact of Climate Change on Migration and Conflict\***

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## **Executive Summary**

Climate change is expected to bring about significant changes in migration patterns throughout the developing world. Increases in the frequency and severity of chronic environmental hazards and sudden onset disasters are projected to alter the typical migration patterns of communities and entire countries.

We examine evidence for such claims and roundly conclude that large scale community relocation due to either chronic or sudden onset hazards is and continues to be an unlikely response. We propose an alternate framework through which to examine the likely consequences of increased hazards. It is built upon the five major conclusions of this paper:

First, disasters vary considerably in their potential to instigate migration. Moreover, individual, community and national vulnerabilities shape responses as much as disaster effects do. Focussing on how people are vulnerable as a function of political, economic and social forces leads to an in-depth understanding of post-disaster human security.

Second, individuals and communities in the developing world incorporate environmental risk into their livelihoods. Their ability to do so effectively is contingent upon their available assets. Diversifying income streams is the predominant avenue through which people mitigate increased hazards from climate changes. Labour migration to rural and urban areas is a common component of diversified local economies. In lesser developed countries, labour migration is typically internal, temporary and circular.

Third, during periods of chronic environmental degradation, such as increased soil salinization or land degradation, the most common responses by individuals and communities is to intensify labour migration patterns. By doing so, families increase remittances and lessen immediate burdens to provide.

Fourth, with the onset of a sudden disaster or the continued presence of a chronic disaster (i.e. drought or famine), communities engage in distress migration patterns. The characteristics of distress migration are quite different within and across countries as they are shaped by the severity and geography of a crisis, the ability of a household to respond, evacuation opportunities, existing and perpetuating vulnerabilities, available relief, and intervening government policies. However, generally communities face three choices in relief: 1) to depend on social networks for relief; 2) to be processed by agencies to access aid

and investigate possible resettlement options or 3) to relocate to camps for temporary or long term resettlement assistance. The first option is a very common response to disasters. The third option remains understudied but is frequently cited as the most probable response to Sea Level Rise in vulnerable countries. In generally, disaster victim return rates are quite high, although little research has been done on this stage of migration.

Fifth, as environmental migration is typically internal and short term, the potential for instigating conflict is quite minimal. However, unstable urban and rural demographics are related to higher risks of civil war and low level communal conflicts during periods of environmental stress are common.

While it is important to highlight environmental pressures and their association with migration, the term ‘environmental refugee’ conflates the idea of disaster victim with refugee and reduces the complexity of real situations. We emphasize the linkage between the economic and political vulnerabilities of households and communities with the extent of migrations practiced. We consider how governments and external organizations affected those migrations, and design policy matrices to compare policies designed to address environmental migration.

These conclusions should be considered with multiple caveats. First and foremost, we relied heavily on case studies of previous disasters to determine the main points of our framework. These case studies emphasise the differences across groups, locations and disasters, but do not consider the ‘worst case’ climate change scenarios promoted in public discourse. Further, the social consequences of climate change generally, and migration and climate change specifically, are quite under-researched. The framework promoted here can inform future studies on migration victim profiles, and serve as a basis for the development of prediction models on migration and conflict risk using climate inputs.

## **Introduction**

This is a stocktaking piece on the social consequences of climate change, with a specific focus on the relationship between environmental hazards and migration. This paper surveys the available literature on disaster migration to offer sound and reasonable projections on future migration patterns in response to the direct and indirect changes due to climate change. Further, it assesses the propensity for increased social conflict as a consequence of intensified migration patterns.

Although it is accepted that increased disasters and chronic environmental degradation will be followed by population movements, it is unclear what form such migrations will take. Our study discusses local reactions and adaptations to short and medium term climate changes. We do so by reviewing case studies of natural disaster affected communities, their migration practices, and government policies toward relief and adaptation<sup>1</sup>. We discuss how migrants in developing states designate the form of migration in response to hazards and economic hardships. Government and international agencies influence those patterns through regulations regarding land use, migration policies, and migrant assistance in receiving areas.

We begin by discussing why migration is regarded as an important issue within the climate change adaptation discourse. The environmental-security literature often presents climate change as an external push factor to which migration is the mechanical response. Speculation about the social consequences of climate change has relied on ‘worst case’ scenarios. This has involved broad generalizations about countries and regions where linkages between the physical processes and social consequences are suggestive rather than elaborated. Instead of relying on the more egregious estimates and causal chains promoted by scholars (see Doos, 1997 and Myers, 1993 and 2002), the IPCC has refined the connection between migration and climate changes. We briefly review the new perspectives and frameworks employed when addressing the social consequences of climate change and specify what kinds of chronic degradation or sudden onset disasters are likely to cause migration. We summarize data on the numbers of effected people by disaster and region from 1968-

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<sup>1</sup>Individual migrants, households and communities may experience several forms of migration, sometimes over a short period of time. Individual migrants may therefore develop complex migration biographies; many are twice, three-times or many times migrants. Likewise, many households and communities have complex migration histories involving multiple periods and types of migration (Van Hear, 2000:91).

2007 and assess the estimated risk of future environmental crisis within and across countries by tabulating future hotspots based on disaster risk, population density and sub national GDP.

We then turn to actual migration patterns, emphasizing that the most adverse effects of climate change will undoubtedly affect the global south. As lesser developed countries are limited in their abilities to mitigate environmental hazards, researchers have speculated about the propensity of people to engage in mass movements. However, we find that international migration is quite limited. Often researchers emphasize how people in degraded or disaster prone areas incorporate risk into their livelihoods through individual and community coping mechanisms. Such coping mechanisms are shaped by economic assets, social position, political relationships, and government policies. Internal migration is one such coping strategy and is a frequent response to both economic and environmental hardship. Typical patterns of internal migration and distress migration patterns are discussed. We summarize the effects of government policies on effected communities.

Increased conflict is frequently presented as an indirect consequence of climate change (see Homer Dixon 1991, 1994, 1999). Contrary to conjecture from security researchers, we find little evidence that migration will exacerbate already volatile situations in the developing world. While resources and resource distribution do heavily influence the risk and patterns of conflict, the direct and indirect effects of climate change do not appear to. As the people most affected by climate change are typically the poorest and least powerful within a country, they are less capable of waging significant conflicts to redress grievances against neighbors or governments.

Finally, we review the main points of this report and recommend new research projects which can add to our limited knowledge about climate change and migration.

### **Changes in the Current Discourse**

Two major changes have occurred in the discussion over the social consequences of climate change. The first is a general move away from vague statements and conjecture on ‘environmental refugees’. The IPCC has altered its initial position on the likely patterns of migration in response to increased disasters and negative effects of climate change. The second change is recognition that physical vulnerability to climate change constitutes only one factor in a person’s overall vulnerability to environmental hazards. Economic, political, and social vulnerabilities, on the individual, community, and national levels, comprise the overall risk to climate related changes.

## **Changing Perspectives on Climate Change Induced Migration**

The IPCC initially warned: “the gravest effects of climate change may be those on human migration as millions are displaced by shoreline erosion, coastal flooding and severe drought” (IPCC, 1990:20). Since 1990, there have been significant changes in the IPCC position as it recognized that a variety of complex interactions mediate migratory decision-making. Subsequent reports have adopted more nuanced depictions of migration, primarily by redirecting the focus in terms of “human vulnerability” (IPCC, 2001a). In fact, reference to *human* migration as a *consequence* of climate change was eliminated from the 2001 Policy Maker’s Summary (IPCC, 2001a). Vulnerable demographics more broadly, as opposed to migration specifically, are contextualized by various statuses of economic development, land entitlements, public health challenges and are rightly the new focus (Lutz, 2004).

The latest 2007 report continues to focus on vulnerability, or adaptive capacities, of populations to climate change, instead of migration (IPCC 2007). Here, migration is addressed as a consequence of climate change through two channels: drought and cyclones. Interestingly, in relation to sea-level rise, migration is not considered a direct consequence, but as a projected cause of poorer health. Certainly, the causal pathways between climate change and human migration can be addressed with greater rigor.

Indeed, the markedly lessened language could be due to how the science of climate changes is not compatible to its presumed social consequences. Problems in equating climate change and human migration research include scalar mismatches (aggregate relationships are a focus of empirical migration findings, as opposed to local, small-area climate predictions), temporal mismatches (migration models tend to be static, whereas climate models tend to be dynamic), and the treatment of forecasting (probabilistic models are rare in migration research, but common in climatologic research).

## **A Changing Framework**

How vulnerable communities are to disaster is only partially based on their physical risk. In considering national and local reactions to climate changes, researchers increasingly rely on a conceptual framework which emphasizes the differentiated capabilities and vulnerabilities of countries and groups. Vulnerability is a concept used to determine the relative risk experienced by

individuals, households and communities to adverse changes in their environment. It is a construction based on the ability to anticipate, cope with, resist and recover from a disaster (Adger, 2000). Vulnerability can be best understood through a scalar approach: it is built on ‘everyday issues’, such as livelihoods and marginal social status which may contribute to poor land management practices, resource pressures and increasing reliance on degraded resources. It is compounded by ‘episodic issues’ such as flooding or droughts (Bailey and Bryant, 2003: 30). The distribution of costs involved in everyday and episodic changes are not random. It is the poor and otherwise marginalized members of society who are disproportionately affected by all disasters.

The IPCC’s definition of vulnerability is pointedly related to the physical risks communities experience from environmental hazards. However, geographic literature on natural hazards has repeatedly stresses the role of human agency either in causing disasters, or in causing populations to be more vulnerable to disaster (Wijkman and Timberlake, 1984; Hewitt, 1983; McGregor, 1994; and National Research Council, 2007). Heijmans (2004) finds that disaster response agencies are increasingly using the concept of vulnerability to analyze processes that lead to disasters and to identify responses.

Broadly speaking, the hazards literature suggests that vulnerability stems from location and social disadvantages often manifest in income poverty (Cutter, 1996). This lack of power reduces access to resources and in turn narrows the range of options available to groups in times of stress (see Adger, 1999; Adger and Kelly, 1999; and Blaikie et al., 1994). Multiple models of vulnerability have been advanced recently in disaster literature, yet vulnerability assessments are not associated with widely accepted indicators or methods of measurements (McLeman and Smit, 2006 and Downing et al. 1997). Indeed, any measure of vulnerability (or marginal status) cannot be regarded as static- not all poor are vulnerable, and those that are, are not all vulnerable in the same way (Bankoff et al., 2004). Yet, scholars are clear that vulnerability is based on economic, social and physical factors. Locally, economic considerations include assets, type of employment, future income potential; social aspects shaping vulnerability include type of political institutions, marginalization, minority status, education, gender, and age. Finally, physical vulnerability considers the geography of livelihoods and hazards, previous disasters, resource depletion and scarcity, and established infrastructure (Wisner, 2004).

The main point of this approach is to emphasize that we live in ‘politicized environment’ where the costs and benefits associated with environmental change are distributed unequally among actors (Bailey and Bryant, 2003). This is apparent on the international scale, where climate changes exacerbated by developed countries seriously affect the capabilities of developing countries, especially those economically dependent on the environment. Developing countries are under pressure to incorporate adaptive and mitigation policies against climate change. Stained budgets and, in many cases, resource dependence and unstable political environments increase vulnerability. Differential vulnerability is most apparent within disaster affected countries, and indeed most of the work on responses to environmental changes is situated on the sub-national level. Within countries, researchers emphasize that the effects of chronic and sudden onset environmental disasters are exacerbated by uneven development and the narrow margin of sustainable livelihoods already present within least developed states<sup>2</sup>.

### **The Impacts and Migration Potential of Select Disasters**

The IPCC report (2001b: 13-16) noted that climate change is likely to very likely to cause higher maximum temperatures, more intense precipitation events, increased risk of drought, increase in tropical cyclone peak wind intensities, and an increasing number of floods in some areas (see Perch-Nielsen, 2004). Further, “it is widely accepted that climate change is not only manifested in changes in long term average conditions, but may include changes in extremes or variability, and will be experienced via changes in the frequency, severity, timing and spatial extent of climatic conditions and events such as droughts and floods” (Houghton et al., 2001). In this report, we focus on both chronic and sudden onset disasters as climate researchers emphasize that an increase in the frequency and severity of such events is the most likely short to medium-term effect of climate changes<sup>3</sup>: “recently, it has become more evident that climate change will not express itself primarily through slow shifts in average temperature over a long period...there is mounting evidence that it is

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<sup>2</sup> The Maasai of Kenya provide an appropriate example of the interaction between physical and social vulnerabilities. They are considered marginalized as their access to social services, physical infrastructure, and political representation are routinely well below national averages in remote and low population density pastoral areas (Coast 2002). If drought should affect large swaths of Maasai and non-Maasai territory, Maasai would be most vulnerable to severe and crippling economic effects, as their margin for ‘disaster’ is so narrowly constructed by forces partially beyond their control.

<sup>3</sup> In the past decade, weather related natural hazards have been the cause of 90% of natural disasters and 60% of related deaths. The effects are especially dire in developing countries where environmental hazard victims represented 98% of all disaster affected populations (IFRC, 2005).

extreme events, such as droughts, floods and heatwaves that we must prepare for," (Helmer and Hilhorst, 2006:1 and Van Aalst, 2006).

The physical impacts, time frame, and migration potential of such disasters differ significantly. We proceed by distinguishing the impacts of the most likely climate related disasters (drought, floods, waves, extreme temperatures) and the types of migration patterns they may give rise to over time. A descriptive analysis of Emergency Disaster Data follows.

*Droughts and Famines:* Drought caused by physical and climates changes is a significant cause of livelihood insecurity. Declines in the ability of households to be self-sustaining are related to climatic vagaries, long term declines in production (i.e. degradation), increasing population growth and land shortages. Yet the exposure and risk of households and communities differ significantly as a function of marginalization, land tenure arrangements, coping strategies, opportunities and market infrastructure and availability of government assistance.

Migration patterns due to chronic drought conditions initially follow pre-established labour migration patterns, and may not differ in intensity from areas with established high rates of temporary, circular migration (Henry, Boyle, and Lambin, 2003; Findley, 1994 and Perch-Nielsen, 2001). In comparison to other disasters where few victims consider permanently changing location, the percentage of people considering migration was highest in drought areas (ranging from 10% to 31%) (Burton et al., 1993, and Perch-Nielsen, 2004: 81).

*Floods and Slides:* Because of their repetitive nature, most types of floods are 'known risks' (White, 1945). But flood risk, frequency, and strength are altered due to increased precipitation, melting snow, deforestation, urbanization, and landslides as a result of climate changes (Perch-Nielsen, 2004:50). People are differently vulnerable in flood plains (i.e. lives versus assets), but the same flood can have dissimilar effects in different areas, due to variability in power, income and assets primarily. The root causes of increased flood risk are linked to degradation of flood plain land, but also unequal patterns of asset ownership and income, rural land tenure systems, population growth in marginal areas, and governments land access policies (Wisner et al., 2004:216).

Although there are few surveys that analyze the direct impacts of floods on people, floods are a cause of significant localized temporary out-migration, often to relief sites (El-Hinnawi, 1985; O'Neill et al., 2001; and Perch-Nielsen, 2004).

*Cyclones, Hurricanes and Waves:* These related hazards are a cause of significant death and destruction along multiple coasts. It is uncertain how climate change may affect cyclonic activity; available estimates point to a 5-10% increase in peak intensities and a 20-30% increase in precipitation rates (IPCC 2001c and Perch-Nielsen, 2004). The effect of cyclones on migration has not been directly examined as it not considered a strong or relevant factor in permanent migration. Instead, similar to floods, cyclonic activity leads to distress migration until such time as population return to rebuild. Hurricanes and increased wind storms are expected to increase as a direct effect of other, climate related disasters (especially cyclones). Similar to other sudden-onset disasters, wind storm and hurricanes are likely to lead to temporary distress migration, after which time people typically return to the disaster site to rebuild their livelihoods. In a study of migration patterns following the 1972 Nicaraguan earthquake and Guatemala in 1976, researchers found that not only did the majority of victims return to their homes, but a population retention rate of 90% was found in damaged and undamaged areas, indicting that the migration rate in disaster effected communities may be similar to overall migration rates and hence not driven by the natural hazard (Belcher and Bates, 1983 and Perch-Nielsen, 2004).

*Extreme Temperatures:* These have not been related to significant death or migration in the past. Although long term trends will certainly change livelihoods and considerations for agriculture, especially those dependent on subsistence agriculture.

*Sea Level Rise:* IPCC projections of future sea level rise range between .09 and .88 meters between 1900 and 2100 (Church et al., 2001; IPCC, 2001b; Perch-Nielsen, 2004). The most likely effects of SLR which will affect migration include increasing flood frequencies, erosion, inundation and rising water tables (Perch-Nielsen, 2004:66). The social consequences of sea level rise are frequently addressed through future predictions. Basic questions have not been yet addressed about how people react to Sea Level Rise, whether permanent migration is at all feasible, and how adaptations to SLR lessen migration as a response.

Physical vulnerability to SLR is a function of how rapidly the change in sea level is expected, the presence of low-lying atolls, the population on the island, and the available mitigation possibilities. Social vulnerability is shaped by the available economic resources to deal with rising levels and the political relationships between atoll and neighboring states. Clearly, the regions most physically and socially vulnerable to SLR include small islands states and atoll countries (Barnett,

2004:90 and Leatherman, 2001). The countries most ‘at risk’ include Kiribati, the Maldives, the Marshall Islands, Tokelau, and Tuvalu. With the exception of Tokelau (in free association with New Zealand), all are independent (Barnett and Adger, 2001). ‘Managed retreat’ or the ‘progressive abandonment of land and structures in highly vulnerable areas and resettlement of inhabitants’ is frequently mentioned in reference to erosion and SLR. However, to date, no such movements have been taken. Retreat may be an option for sparsely inhabited coasts, but is unlikely in urban areas (Leatherman, 2001 and Perch-Nielsen, 2004).

### **Estimating Effected Populations and Migrant Potential**

Long term, empirical data on migration patterns in response to environmental hazards does not exist. However, data on the effects of previous disasters is available. We summarize the Emergency Events Database (EM-DAT) in Tables 1 and 2<sup>4</sup>. Table 1 presents the mean percentage of a country’s population effected, killed and made homeless by seven common chronic and sudden disasters. We tabulate across all countries and events and then sample by income and political instability. Table 2 summarizes the average number and proportion of people affected by disaster and region over time. As we will emphasize throughout this paper, the proportion of effected and homeless people to engage in permanent migration is quite low. The maximum numbers of distress migrants (those needing short term access to food, water, temporary housing) are the numbers presented in the following tables. The actual number may be quite a bit lower, as responses to disasters differ by time, location, and social group.

Results of descriptive statistics from Tables 1 and 2 confirm several impressions already advanced in disaster literature. Specifically, chronic long-term environmental hazards (drought/famine) are not the most common but do effect the most people, at an average of 10% of a country’s population (see Chart 1 2). The effect is heightened in low-income states to 13% of a country’s population. Although unstable states make up about 8% of country years from 1970-2004, these unstable states account for 13% of drought and famine effected states. The range of drought-

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<sup>4</sup> EM-DAT data does not record the number of migrating victims as a result of disasters, but does provide the number of people affected, killed or made homeless as a result. Affected people are those requiring immediate assistance during a period of emergency, i.e. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance and includes the appearance of a significant number of cases of an infectious disease introduced in a region or a population that is usually free from that disease. See <http://www.emdat.be/ExplanatoryNotes/explanotes.html>

**Table 1: Summary of EM-DAT Statistics by Disaster\***

Disaster		All Countries			Low Income Countries			Unstable Countries
	Event Breakdown	Population Affected	Population Killed	Population Homeless	Population Affected	Population Killed	Population Homeless	Population Affected
<b>Drought</b>	<i>Overall:332</i> <i>LowIncome:261</i> <i>Unstable: 43</i>	10% St. Dev. 21 (0-100%)	<1% St. Dev. 0.7 (0-1%)	<1% St. Dev. 0.02 (0-.4%)	13% St. Dev. 22 (0-100%)	<1% St. Dev. 0.08 (0-1%)	<1% St. Dev. 0.02 (0-.4%)	8.5% St. Dev.18.87 (0-100%)
<b>Extreme Temperature</b>	<i>Overall:324</i> <i>LowIncome:148</i> <i>Unstable: 117</i>	<1% St. Dev. 2.5 (0-40%)	<1% St. Dev. 0.6 (0-.05%)	<1% St. Dev. 0.002 (0-.05%)	<1% St. Dev. 3.39 (0-40%)	<1% St. Dev. 0.01 (0-.01%)	<1% St. Dev. 0.002 (0-.05%)	1.5% St. Dev. 7 0-40%
<b>Flood</b>	<i>Overall:2839</i> <i>LowIncome:1801</i> <i>Unstable: 117</i>	<1% St. Dev. 3 (0-48%)	<1% St. Dev. 0.02 (0-.12%)	<1% St. Dev. 0.5 (0-27%)	<1% St. Dev. 3.64 (0-48%)	<1% St. Dev. 0.01 (0-.038%)	<1% St. Dev. 0.7 (0-27%)	1% St. Dev.4.21 (0-48%)
<b>Slides</b>	<i>Overall:451</i> <i>LowIncome:311</i> <i>Unstable: 117</i>	<1% St. Dev. 0.14 (0-2.5%)	<1% St. Dev. 0.004 (0-.1%)	<1% St. Dev. 0.8 (0-2%)	<1% St. Dev. 0.17 (0-2.5%)	<1% St. Dev. 0.005 (0-.09%)	<1% St. Dev. 0.8 (0-2%)	<1% St. Dev.0.03 (0-1%)
<b>Wave/Surge</b>	<i>Overall:34</i> <i>LowIncome:25</i> <i>Unstable: 117</i>	<1% St. Dev. 1.21 (0-6%)	<1% St. Dev. 0.03 (0-1%)	<1% St. Dev. 0.7 (0-4%)	<1% St. Dev. 0.5 (0%-3%)	<1% St. Dev. 0.03 (0-.18%)	<1% St. Dev. 0.5 (0-2.5%)	<1% St. Dev. 0.00 (0-1%)
<b>Wind Storms</b>	<i>Overall:2311</i> <i>LowIncome:519</i> <i>Unstable: 117</i>	1.1% St. Dev. 7.5 (0-100%)	<1% St. Dev. 0.01 (0-.42%)	<1% St. Dev. 4.48 (0-100%)	2% St. Dev. 10 (0-100%)	<1% St. Dev. 0.02 (0-.42%)	<1% St. Dev. 6.31 (0-100%)	1.77 St. Dev. 10 (0-100%)

\* **Population Affected:** Affected people are those requiring immediate assistance during a period of emergency, i.e. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance and includes the appearance of a significant number of cases of an infectious disease introduced in a region or a population that is usually free from that disease

**Population Killed:** Persons confirmed dead and those presumed dead.

**Population Homeless:** People needing immediate assistance of shelter.

**Low Income Countries:** Countries with an annual GDP per capita less than \$3000.

**Unstable Countries:** Countries whose POLITY score assessment has moved more than two places (positive or negative) over the period of one year.

**Table 2: Summary of EM-DAT Disaster Statistics by Region\*\***

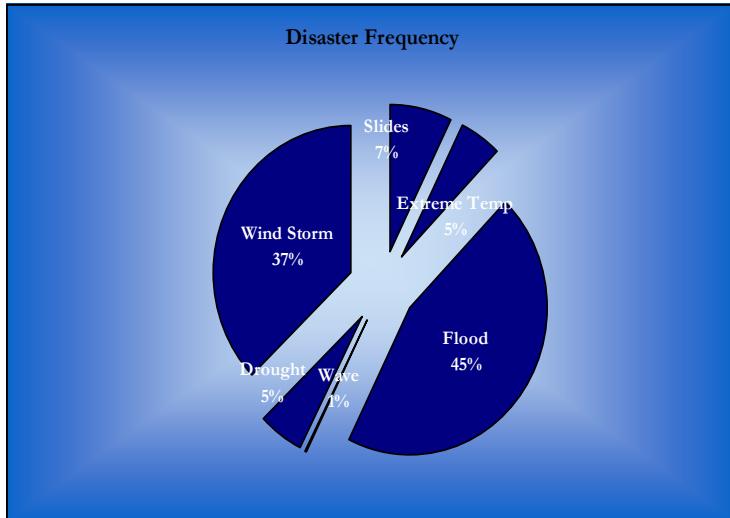
Region	Sub-Region***	Droughts	Extreme Temperatures	Floods	Slides	Wave/Surges	Wind Storms
<b>Americas</b>							
	<b>Caribbean (283)</b>	268,636(12%)	n/a	42,304 (1%)	512 (<1%)	n/a	104,241 (5%)
	<b>North (612)</b>	30,000 (<1%)	200 (0%)	200,035 (<1%)	1,531 (<1%)	n/a	5,000,047(2%)
	<b>Central (356)</b>	58933 (2%)	1052 (<1%)	26,198 (<1%)	708 (<1%)	1,720 (<1%)	103,808 (2%)
	<b>South (599)</b>	1,905,980(7%)	131927 (<1%)	136,544 (<1%)	7425 (<1%)	931 (<1%)	15,545 (<1%)
<b>Africa</b>							
	<b>East (401)</b>	1,765,088 (14%)	n/a	108,167 (2%)	562 (<1%)	27556 (2%)	118,167 (3%)
	<b>Middle (88)</b>	374,726 (9%)	n/a	25,990 (<1%)	73 (<1%)	n/a	9,645 (<1%)
	<b>North (145)</b>	1,700,243 (7%)	40 (<1%)	98,628 (<1%)	3323 (<1%)	12 (<1%)	24,402 (<1%)
	<b>South (94)</b>	295,531 (15%)	21 (<1%)	24,111(1%)	34 (<1%)	n/a	48,314 (4%)
	<b>West (200)</b>	967,841 (22%)	333,359 (13%)	52,944 (<1%)	519 (<1%)	n/a	4,822 (<1%)
<b>Asia</b>							
	<b>Central (65)</b>	n/a	200,008 (1.5%)	33,735 (<1%)	3502 (<1%)	n/a	2,505 (<1%)
	<b>Eastern (856)</b>	9,934,389 (1%)	3,132 (<1%)	6,413,745 (1%)	1580 (<1%)	9,693 (<1%)	999,417 (<1%)
	<b>South East (864)</b>	974,805 (7%)	n/a	258,548 (1%)	10490 (<1%)	64,640 (<1%)	369,193 (<1%)
	<b>Southern (1,051)</b>	32,600,000 (11%)	5,248 (<1%)	2,461,976 (1%)	58129 (<1%)	294,222 (2%)	423,754 (<1%)
	<b>Western (209)</b>	302,900 (6%)	652 (<1%)	57,770 (1%)	240 (<1%)	n/a	4,293 (<1%)
<b>Europe</b>							
	<b>East (288)</b>	0 (0%)	14,508 (<1%)	49,474 (<1%)	281 (<1%)	n/a	48,356 (1%)
	<b>North (103)</b>	n/a	37 (<1%)		38 (<1%)	n/a	n/a
	<b>Russian Fed (46)</b>	n/a	n/a	6,084 (<1%)	1,411 (<1%)	n/a	2,610 (<1%)
	<b>South (270)</b>	1,023,333 (13%)	1,417 (<1%)	26,601(<1%)	1,262 (<1%)	n/a	12,904 (<1%)
	<b>West (221)</b>	n/a	1,406 (<1%)	5,646 (<1%)	715 (<1%)	13 (<1%)	39,868 (<1%)
<b>Oceania</b>							
	<b>Aust/NZ (197)</b>	1,011,429 (6%)	920,161 (5%)	1,556 (<1%)	243 (<1%)	n/a	40662 (<1%)
	<b>Melanesia (126)</b>	139,149 (8%)	n/a	25,830(2%)	2,029 (<1%)	6096 (<1%)	18336 (4%)
	<b>Micronesia (18)</b>	56400 (5%)	n/a	n/a	n/a	n/a	1334 (1%)
	<b>Polynesia (46)</b>	n/a	n/a	4 (<1%)	178 (<1%)	n/a	11213 (15%)

\*\* Each disaster total is the total affected people (including killed and homeless) by disaster. In parentheses is the percent by region and disaster as proportion of population.

\*\*\* These are the EM-DAT designated subregions with the total number of EM-DAT disaster entries in parentheses.

Effected populations are significant, with multiple cases (8) reaching a population effected rate over 90%. This is most clear in East and West Africa, where affected populations reach 14% and 22% respectively. Southern Asia has many more people effected (over 32 million) at a mean rate of 11% of the population.

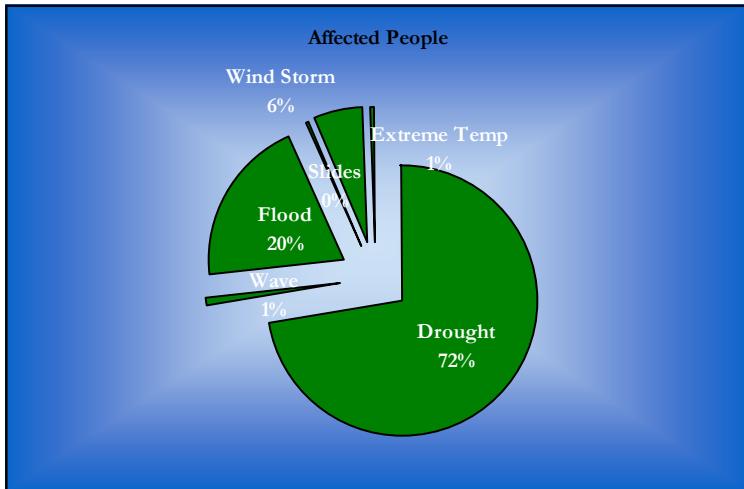
**Chart 1: Relative Disaster Frequency**



The effects of drought and famines are heightened because of the spatial coverage of these disasters. Other sudden-onset disasters vary in their effects, although extreme temperatures, slides, wave/surges are localized events, and therefore effect less than 1% of a country's mean population (see Chart 2 and 3). Wind storms typically affect slightly less than 2% of the population. However, the ranges and standard deviations of the percentages of effected people are very telling: wind storms can disturb entire countries (over 90% of a countries population was affected in 7 cases) and floods can effect up to 48% of a country's population.

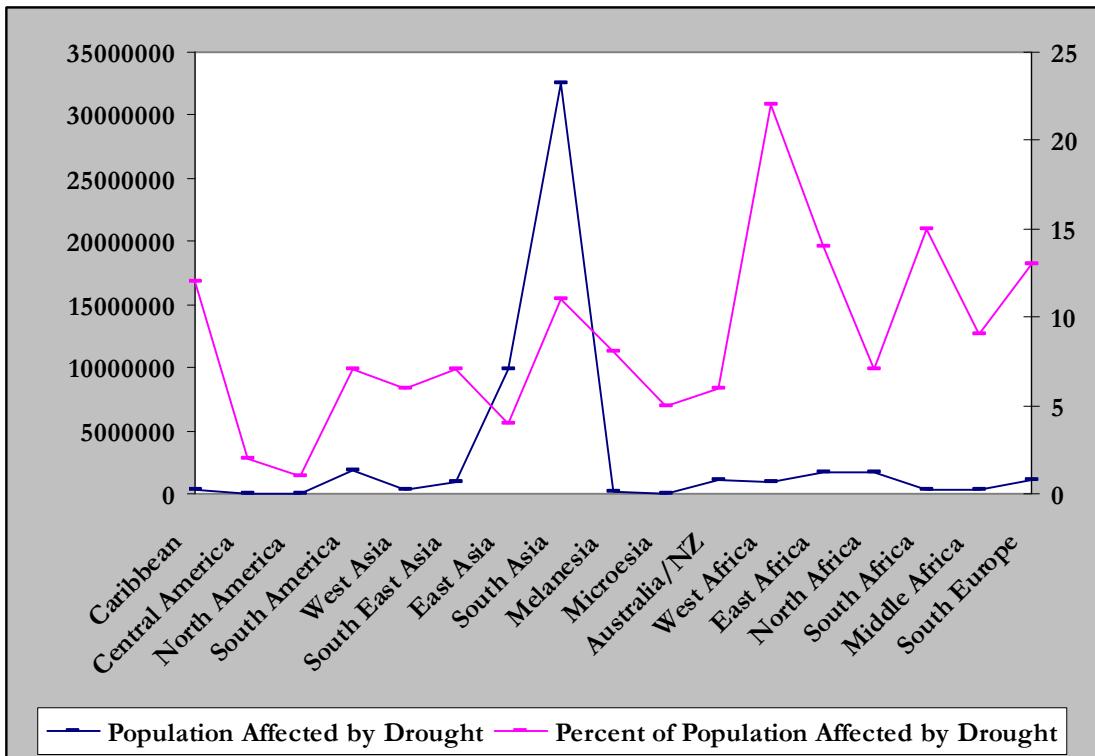
As shown in table 2, the mean effect of wind storms on populations is highest in the Caribbean and Polynesia, although the number of people affected is higher in East Asia, South Asia, South East Asia, East Africa, and Central America. Again, it is important to emphasize that these numbers count those 'effected', they does not necessarily indicate distress migration rates, especially if aid is administered in or close to the disaster effected areas. Homelessness as a result of chronic disasters is considerably smaller percentage, and although does indicate that people may be more prone to move, past research has emphasized the propensity of people to return to their homes following a disaster (Gold, 1980; Haque, 1997; Morrow Jones and Morrow Jones, 1991).

**Chart 2: Relative Disaster Effect**



In short, EM-DAT confirms that disasters have various effects both within and across countries. There is some evidence that vulnerability to the range of disasters presented here may be due to the income or stability of a country. However, the most compelling results show that disasters typically affect small portions of populations. Further, those made homeless are a small portion of those affected.

**Chart 3: Number and Percentage of Regional Populations Affected by Drought**



## **Hotspots and Predictions**

We have presented a framework which emphasizes the physical and socially constructed parameters of vulnerability to climate change, and have considered those factors in determining future hotspots for environmental stresses and migration. As previously discussed, there are multiple ways to construct a vulnerability index and a number of caveats to this assessment are necessary: first, we assume that the relative spread of disasters across countries will not change substantially and second, we assume that demographic growth and limited income will constitute equally important risk factors.

The hotspot maps are based on three variables: projected population for 2050, from the (US Census International Population Database)<sup>5</sup>, GDP per capita for 2000 (World Bank)<sup>6</sup>, and the number of disaster events, relating to droughts, floods, or wind storms (specifically, hurricanes, typhoons, tropical storms, and typhoons), as coded in the EM-Data from 1968-2007).

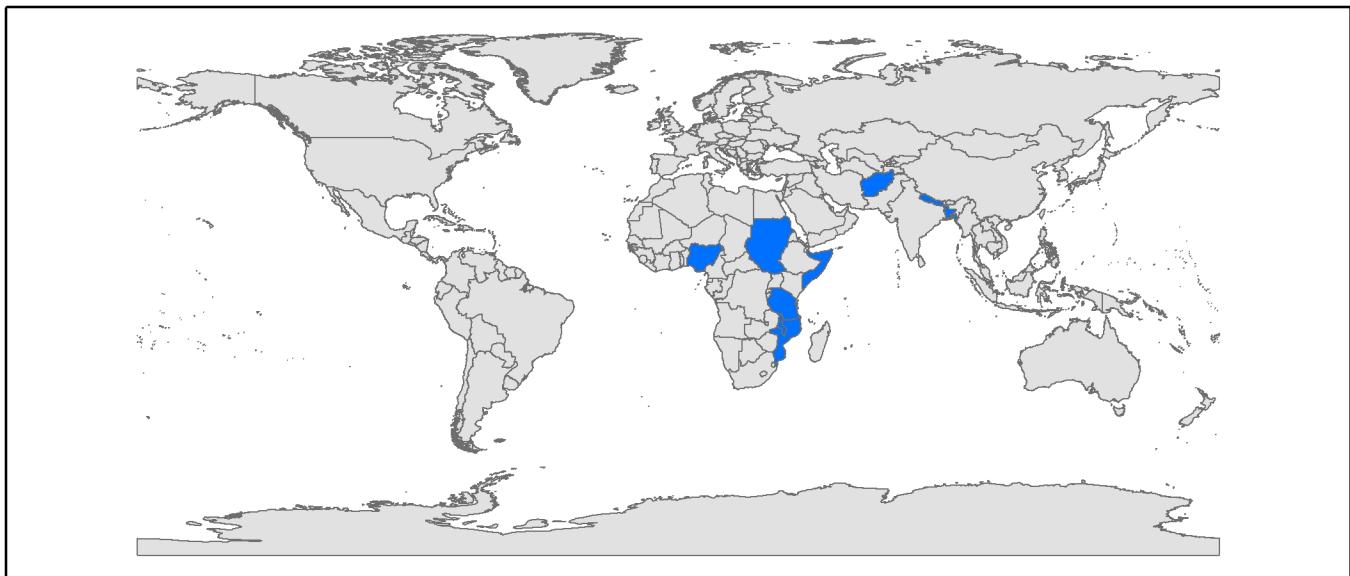
Areas were recognized as highly vulnerable if: 1) their projected population was in the upper 30% for all countries (exceeding 18 million in 2050), 2) their present GDP per capita fell in the bottom 30% for all countries, and 3) the number of disasters experience fell in the top 30% for all countries (>4 for droughts, >18 events for floods >8 for wind storms). The countries summarized in Table 3 and maps 1 and 2 are the countries with the highest physical, economic and social vulnerability to climate change. They are also least likely to mitigate the effects of hazards due to their developing status. In essence, these countries are the most ‘at need’ if disasters do increase in frequency and intensity. Low lying island states are not listed in table 3, as their risk is based on future predictions and not past evidence. Also, the number of people affected by SLR will be significantly lower than those affected by droughts, floods, and wind storms. Map 1 is a general depiction of Table 3.

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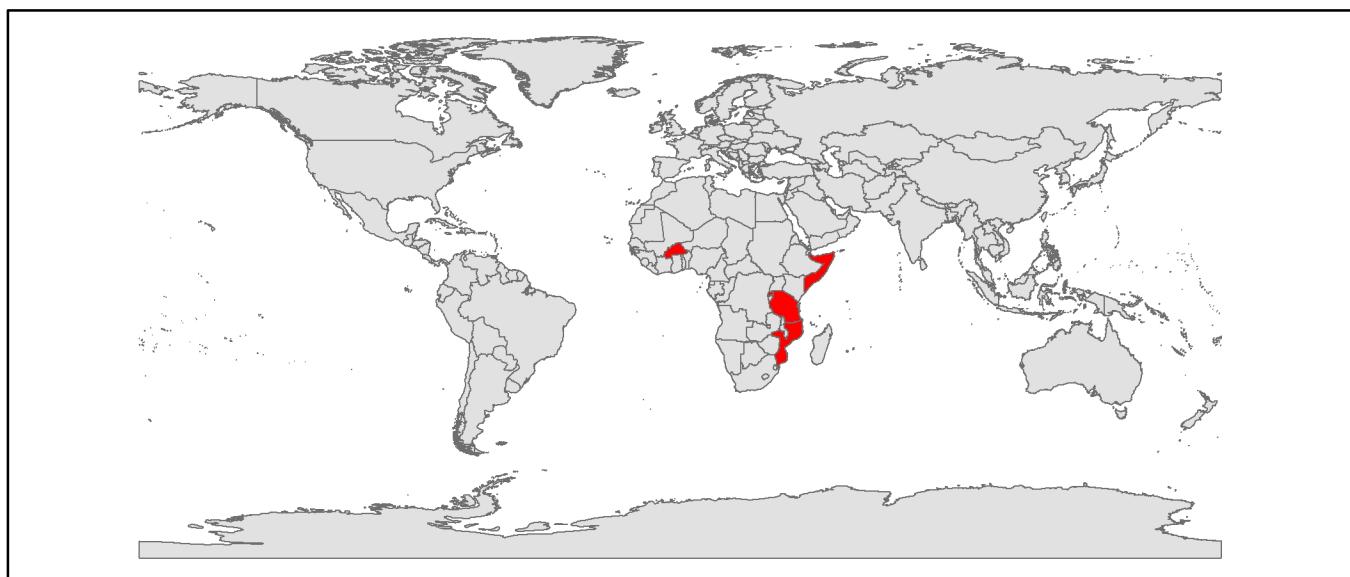
<sup>5</sup> <http://www.census.gov/ipc/www/idb/>

<sup>6</sup> <http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20394802~menuPK:1192714~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html>

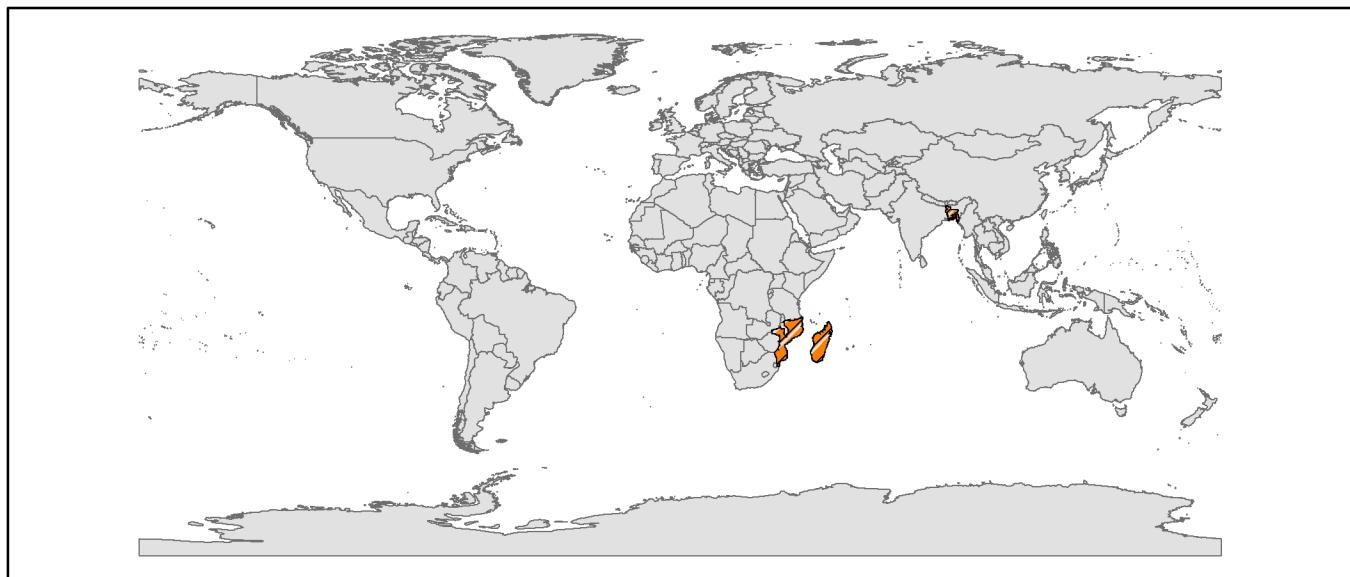
 High Vulnerability for Floods



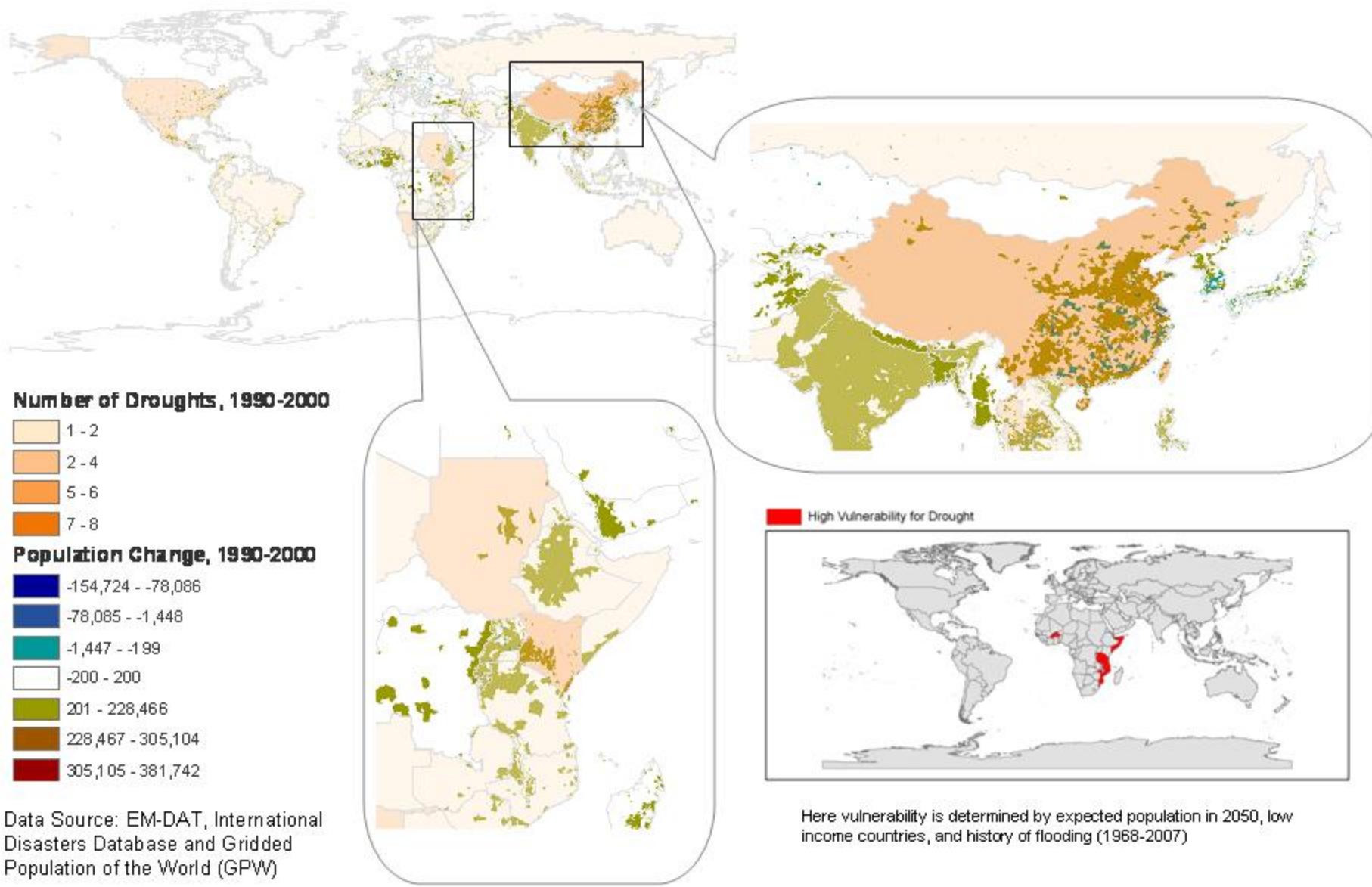
 High Vulnerability for Drought



 High Vulnerability for Wind Storms



## Significant Population Change is Occurring in Locations Where Drought May Be Exacerbated



**Table 3: Areas Highly Vulnerable to Disasters in Near Future**

Droughts	Floods	Wind Storms
Burkina Faso	Afghanistan	Bangladesh
Mozambique	Bangladesh	Madagascar
Rwanda	Malawi	Mozambique
Somalia	Mozambique	
Tanzania	Nepal	
	Nigeria	
	Somalia	
	Sudan	
	Tanzania	

Map 2 displays the population changes and clusters in countries at risk for drought. High-density population clusters will undoubtedly experience a compounded risk in already high risk states. Although droughts will probably not occur in the areas with the most densely populated areas of Burkina Faso, Mozambique, Rwanda, Somalia and Tanzania, those areas will experience a strong effect as droughts can shift labour migration patterns and victims may be in need of significant aid. Zones of high population and high drought risk could be ‘chronically vulnerable areas’ or CVA’s. These areas within a country are a particular risk of livelihood failure. Overall, our assessments point to a need to pre-emptively bolster disaster mitigation strategies in all counties listed in Table 3.

### **Coping with Increased Environmental Risks**

To be vulnerable to climate changes does not make someone a potential ‘climate migrant’. The evidence connecting climate change to migration is quite limited, both because data are generally unavailable and the decision to migrate is based on multiple factors. We contend that we can only base our future predictions of migration on previous research on community responses to natural hazards. That research has emphasized how people incorporate physical and social vulnerabilities to hazards into their livelihoods as an initial resilience strategy. People in marginal regions have developed a great variety of mechanisms to strengthen their ability to cope with both slow climatic changes and extreme climatic events (Mula, 1999:318; Maxwell, 1996:301; Meze-Hausken, 2000; Findley, 1994).

Discussions of climate change coping mechanisms are typically located at the household level and a number of broad conclusions from case study literature are evident (McLeman and Smit, 2006 and Henry 2006). How a household reacts to environmental hazards depends of the severity of

the change, their particular vulnerabilities, and available assets and strategies (Mortimore, 1989 and Meke-Hausken, 2000). Resilience strategies are found to be tailored to the gravity of the particular situation (Watts, 1983); and as most climate changes will be gradual, households can determine how to slowly reshape their livelihoods (Henry, 2006)<sup>7</sup>.

Multiple factors unrelated to environmental change influence resilience most directly. The availability of markets, access to infrastructure, and the promise and delivery of aid influence the ability of families to prepare for and withstand environmental hazards and changes (Eriksen et al., 2005). Yet, factors such as war, government controls on movement, and employment opportunities are beyond the control of families and communities but strongly shape actions and movements in response to calamities.

We have divided our discussion on the specifics of adaptive responses into two sections. The first deals with chronic environmental hazards, such as droughts and degraded lands. The second discusses how communities cope with fast-onset disasters.

### **Building Resilience to Degradation, Droughts, and Famine**

Communities experiencing chronic environmental hazards generally mitigate risk through livelihood diversification. Rural livelihoods are typically composed of a combination of three strategies: agro pastoral activities, livelihood diversification and migration (De Haan, Brock and Coulibaly, 2002). These strategies are well established, and are shaped by access to assets and entitlements. Typical labour migration is a critical component of rural livelihoods as migrant wages provide investment capital for rural commodity production, while the experience of migration is a conduit for the flow of new ideas and social practices into rural areas (Baker and Aina, 1995). Case studies in East, West and South Africa found approximately that 45% of rural incomes were generated from the non-farm sector (Reardon, 1997).<sup>8</sup>

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<sup>7</sup> Coping mechanisms are regarded as separate from adaptive changes to climate induced hazards. For the purposes of this paper, coping and adaptation are defined as the actions and activities that take place within existing structures, such as production systems; whereas, adaptation frequently involves changing the framework within which coping takes place (Eriksen et al, 2005:288 and Adger, 1999).

<sup>8</sup> It varied from 15% to 93% (Francis, 2002).

A severe stress situation, such as drought, brings into stark focus the ways in which a diversity of income sources and dynamic coping strategies form the basis of rural livelihoods (Eriksen et al. 2005). During lean times, coping strategies tend to become more specialized and directed towards surviving droughts and insulating families against ‘distress migration’ (McGregor, 1994 and Eriksen et al.. 2005). Significant variations across communities are apparent, based on local and national circumstances. Diversification, short term migration, non farm work and social support networks are shown to be critical dimensions in mitigating environmental risk (Roncoli and Ingram, 2001). Principal, or first order, coping strategies tend to be specialized and of high intensity. Those with a reliable principal source of income during the drought, exemplified by salary or remittances, engaged in fewer drought activities on average than households that did not receive a salary or remittances. In contrast, diversity is a key factor in the viability of secondary, or complementary, strategies. For example, dispersed grazing, change in planting practices, collecting foods, inter-household transfers and loans, use of credit, rationing food, sale of assets, commodity trading, consumption of relief aid, and various migration strategies are components of typical drought/famine survival strategies (Corbett, 1988). While the additional income from these activities was significant, it is typically low and unreliable. Vulnerability depends, to a great extent, on the ability of individuals to specialize successfully. Although, coping strategies tend to contract during non-drought periods (Eriksen et al, 2005), the maintenance of indigenous coping institutions is found to be crucial for continued existence in marginal lands (McCabe, 1990).

With regard to SLR, many small island societies are proved to be resilient in the face of past social and environmental upheaval (Bayliss-Smith et al., 1988). Resilience is based on traditional knowledge, institutions and technologies, opportunities for migration and remittances, land tenure regimes, the subsistence economy, and the linkages between state and customary decision making (Barnett, 2001 and Barnett and Adger, 2001).

### **Coping with Sudden Onset Disasters**

People in areas prone to sudden onset disasters have a range of coping strategies that are largely based on their available assets and social networks. In wealthier states, insurance against disaster destruction is common for households in flood plains, fire prone areas, and fault lines. In developing states, coping mechanisms and social networks are closely tied, indicating that losses due to disaster will be shared amongst those in a community or group. International migration is an important

household strategy for risk-reduction, as it has been shown that remittances greatly reduce the vulnerability in recovering from disasters (Suleri and Savage 2007 and Young, 2007).

To summarize, ecological calamities have occurred with sufficient frequency as to influence how people incorporate such risks into their livelihood (Mcleman and Smit, 2006). The three most critical strategies when living on degraded land or uncertain ecological climates are diversification of livelihood, consolidation of savings into incontestable forms and social investment (i.e. migration). If a crisis should occur, the most commonly observed reactions are liquidation of savings, service labour and movement (i.e. distress migration) (Shipton, 1990: 363). Coping strategies are underscored by initial assets and networks. When hazards and climate changes become as severe and common as to destroy the abilities of households and communities to mediate their situation and risks, distress migration or massive livelihoods changes are posited to occur.

### **Direct and Indirect Environmentally Induced Migration**

Migration is only one of a variety of survival strategies pursued by families either simultaneously or consecutively with other coping strategies (McGregor, 1994 and Reardon, 1997). It is difficult to separate the underlying causes of such migrations as the importance of short term and seasonal migration in response to economic and environmental hardship is well established (Maliki et al, 1984; Cleveland, 1991; Painter et al., 1994; and De Bruijn and Van Dijk, 2003). Limited evidence suggests that, in certain circumstances, environmental hazards do alter the migration patterns typically observed in developing countries. A number of case studies demonstrate that chronic environmental changes do initially lead to increases in typical labour migration patterns. However, sudden onset disasters and prolonged chronic hazards lead to ‘distress migration’. Labour and distress migration both occur, by and large, within countries and are temporary (see Findley, 1994; McGregor 1994; and de Haan, 2002). We focus on both types of observed patterns to reveal possible future migratory processes. Table 4 summarizes how migration patterns vary in response to direct and indirect disasters.

**Table 4: Typology of Potential Migrations**

Direct Climate Changes	Indirect Climate Changes	Type of Movement	Time Span
Gradual climate change	Chronic disasters such as drought, degradation	Seasonal labour migration. Temporary circulation	Seasonal
Gradual climate change	Chronic disasters-drought/ degradation	Contract labour migration	Yearly
Sudden or gradual climate change	Natural disasters/ severe drought/ Famine/Floods	Forced/distress migration	Temporary
Sudden or gradual climate change	Extreme Temperatures/ Sea Level Rise	Permanent migration	Lifetime

(Partially adapted from Kothari, 2002:20)

### Internal Migrations

Most migrants move internally and follow a circular pattern, either into urban or other rural areas. Seasonal, circular rural out migration is a critical component of rural livelihoods because it increases the stability in rural areas and it provides agricultural labour opportunities for otherwise unskilled migrants in wealthier regions. It also allows for return (or reversibility) possibilities, which is a strong determinant of rural poverty coping mechanisms (Watts, 1983). A focus on economically motivated migration is important as studies find that labour migrations intensify and slightly change during droughts or famines (Shipton, 1990:370 and Perch-Nielsen, 2004).

The patterns of migration observed across communities are shaped by the difference in development and wealth patterns found within states. Whether people migrate to a rural or urban area is largely dependent on social capital across groups and pre-established links (de Haan, 2004) and to the infrastructure linking rural areas and urban areas. Rural-rural movements are considered to be the most common form of migration in the developing world (Bilsborrow, 1991; de Haan, 2002; and Lipton, 1980). These migratory patterns are generally circular, and are especially popular amongst the poor, but not necessarily the poorest, who may not have resources to instigate migration (Kuhn, 2000 and Deshingkar, 2006). Yet, urban migration has increased in China, India,

Indonesia and Vietnam as traditional/low yield agriculture has decreased and labour opportunities in urban areas are a draw. Improvement in transport and communication channels has facilitated large scale internal movements.

Urban areas within states continue to draw skilled and unskilled migrants due to the perceived availability of labour opportunities. Urban population rates have dramatically increased in recent years, and the carrying capacity of developing cities continues to be a serious concern (UNFPA, 2007). Considerable country and regional differences exist. In-migration is the source of about 25% of urban growth in sub-Saharan Africa, but in other cases (such as Bangladesh) urbanization has increased more than 60%, mainly due to rural-urban migration (Chen, Valente and Zlotnik, 1998; Elahi, 1972; Islam, 1976; and Khan 1982). However, as most rural-urban migration is of circular character, migrants continue to maintain links with their rural areas of origin and participate in further development of the home area (Deshingkar, 2006).

Although the majority of developing country migrants choose to move internally, intra-regional migration is a widespread phenomenon, particularly in specific areas. West Africa, for example, is marked by a dense network of migration, in accordance with labour opportunities, environmental concerns, and currency valuations shifts. Migrants are welcomed when demand for labour exceeds supply, but debates switch to an emphasis on limiting immigration when the demand-supply balance tilts to the other side (McDonald, 1999). In some situations, the capital skill and business links refugees have brought with them have been beneficial to hosts (Cuba-US; Tibet-Nepal). In other contexts, public policies initiated by the host state have stimulated economic change, such as Cyprus rebuilding in war zones (McGregor, 1994).

The dynamics of community rural migration can change in response to pressures. Rural out migration intensifies following a major drought or a poor harvest as a way to minimize risk (Pederson, 1995; Findley, 1994 and Ezra, 2001). The literature points to differences in migrant composition flows and destinations over time and across countries. For example, during various Malian drought periods, migrants engaged in urban migration to Sahel cities or internal Malian destinations. Limited assets and government policies were the determining factors (Findley, 1994). In a study of Ethiopian patterns, Ezra and Kiros (2001) found that out migration of certain family members to urban areas was critical to survival, in addition to typical labour migration. But migration in response to drought was found in only 2% of households in areas of India and

Bangladesh during 1983 and 1994-95. Increased migration was not a response to drought conditions partially because substantial labour migration has previously taken place (Caldwell et al., 1986 and Paul, 1995). Most people depend on such remittances from labour migrants or family networks to continue living in drought effected areas (Caldwell et al., 1986 and Perch-Nielsen, 2004).

Internal migration therefore has multiple benefits. It underlies rural household abilities to cope and is also a way to relieve pressure and sustain continued existence on marginal land.

### **Distress Migration**

Migration flows as a result of natural disasters are often categorized as ‘distress migrations’ or ‘forced migrations’. Discussions of ‘environmental refugees’ and ‘climate migrants’ typically focus on distress migration patterns. They are composed of a large number of distressed and impoverished people seeking aid until which time they may be able to return, if possible. Two characteristics of disaster induced migration deserve emphasis: first, forced migration as a result of ecological disaster often results in internal, rather than international, displacement. Second, such migrations cause temporary displacement, but not permanent, migration. If permanent migration is the result of a disaster, it is seen as a reflection of the state’s deficient response rather than the natural hazard impact (Oliver-Smith, 2004; Woods, 2001; Black, 2001 and Castles, 2002).

Mass migrations from areas hardest hit by frequent disasters is, at best, expected to increase, and at worst, may bring about further instability in both sending and receiving areas (see Homer Dixon, 1994 and Myers, 1993). But the scant literature on previous natural disaster induced migration does not support the notion that massive and ceaseless migration flows will follow disasters. Instead, there is a clear distinction made between where and what is effected, the coping mechanisms of those who stay in a disaster area, the migration patterns of those induced to flee, and the return process of forced migrants. Two main conclusions from case studies are that wholesale community relocation as a reaction to natural disasters is a relatively rare occurrence, especially within the context of developing nations (Hunter, 2005) and communities choose different strategies based on their pre-disaster characteristics. Social capital networks, relatives, histories of migration and trade, shared political alliances, and ethnic identity or origin, all encourage and direct post-disaster movement (Hitchcox, 1990 and McGregor, 1994).

It is useful to categorize distress migration decisions as being shaped by local and external institutions (Colson, 2003). Community decisions in a post-disaster environment generally fall into

three categories: 1) they can be locally displaced and rely heavily on social capital, community networks, and economic resources to structure decisions; 2) they can choose to be processed by agencies to access aid and relocate to camps for temporary or long term assistance; or 3) they can consider possible resettlement options. The third aspect is the most underdeveloped and rare as resettlement typically involves moving people into new places and environments and indicates more permanent changes in people's lives (Oliver-Smith, 2004).

*Local displacement:* Displacement is characterized by movements to the nearest safe location and is the most common response to immediate threat. The composition of distress migration flows can differ significantly by country, region, and group and, in some cases, age and gender. Distance to possible hosting areas is a crucial factor for distress migrants, as people often move close (Perch-Nielsen, 2004: 57-58 and Paul, 2005). The primary reasons for temporary moves include structural damage, loss of utilities, danger, and need for provisions. Destinations are chosen based on community relations, individual social capital networks and the availability of emergency provisions. The moves are frequently temporary until such time as people can return to rebuild their livelihoods (Gold, 1980; Haque, 1997; Morrow-Jones and Morrow-Jones, 1991; Quarantelli, 1982 and Perch-Nielsen, 2004).

Social capital networks are critical factors in distress migration. People frequently rely on relatives and friends for short periods of time before returning to their homes (Belcher and Bates, 1983; Quarantelli, 1982; Perch-Nielsen, 2004; Gold, 1980; Haque, 1987; and Morrow Jones and Morrow Jones, 1991). Highly connected networks tend to produce post-disaster migration stability (Hendrix, 1976; Mileti and Passerini, 1996). Migrants use personal networks/social capital to guide settlement decisions as such communities provide insurance against uncertainties and reinforce links with sending areas (Colson, 2003).

Yet, there are differences in the composition of distress migrant groups over time. For example, the absolute number of migrants did not rise during the Malian droughts of 1983-1985, but the compositions of flows were markedly different. Women and children temporarily migrated to nearby destinations in order to reduce food consumption (Findley, 1994). Famine relief literature generally concludes that those without dependents leave first, followed by older men, and then families (Shipton, 1990:370; Meke Hausen, 2000; and Findley, 1994). Those most likely to resist

relocation tend to have the strongest attachments to the community's cultural roots (Kirshenbaum, 1996).

Most of the data on post-disaster displacement is from Bangladesh, where frequent disasters allow researchers to study the community patterns (Perch-Nielsen, 2004). Zaman and Weist (1991) found that local displacement is common in disaster prone areas of Bangladesh; people moved on average 2 miles from their previous residence, as there was a persistent belief that it was critical to stay close to family and that land will be reclaimed (see also Hutton and Haque, 2004). Multiple displacements are common characteristics of Bangladeshi charland settlements<sup>9</sup>. Although most return to re-establish their livelihood when new land subsequently re-emerges<sup>10</sup>, a considerable proportion of displaces (between 10 and 25%), move to urban centres and become permanent squatter settlers. Those urban migrants cited economic factors, including landlessness, poverty and unemployment, and natural hazards as the major causes of the rural push (Islam, 1996).

The available evidence suggests that distress migrants return to their home areas at a remarkably high rate (Surhke, 1993). In a study of migration patterns following the 1972 Nicaraguan earthquake and Guatemala in 1976, researchers found a 90% population retention rate in damaged and undamaged areas, indicating that the permanent migration rate in disaster effected communities may be similar to overall migration rates and hence not driven by the natural hazard (Belcher and Bates, 1983 and Perch-Nielsen, 2004). Studies of post-disaster migrants and non-migrants in Guatemala and the Dominican Republic found that people's intention of staying in their villages was not related to the damage they experienced, but rather the type of work they were previously involved in. Specifically, those working in coffee plantations decided to move as their economic future looked bleak. Further, people who had invested more in their home area were less likely to move (Belcher and Bates, 1983, Quarantelli, 1982, Morrow-Jones and Morrow Jones, 1991 and Perch-Nielsen, 2004).

*Seeking Aid:* Case study literature notes that the number of people seeking relief aid varies depending on geography, infrastructure, instability, pre-disaster assets, and past experiences with aid distribution. Humanitarian aid is available only in certain areas which pushes people to migrate (McGregor, 1994; Erza, 2001; and Erza and Kiros, 2001).

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<sup>9</sup> In 1995, the Flood Plan Coordination Organization (1995) estimated that 728,000 people between 1981 and 1993 were displaced. Over 40% of the displaced squatters had been uprooted three or four times and 36% percent had been displaced between 5 and 10 times. Another 14% had been displaced more than 10 times (Hutton and Haque, 2004).

The geography of relief is a critical factor: in very severe emergencies, families may seek relief in camps, although the destinations are often quite vague. Urban areas can also be popular destinations for forced migrants. Research on Kenyan and Somali reactions to climate hazards and drought conditions notes a swelling of population around market towns, due to both a growing dependence on aid and markets for a sustainable lifestyle (Little et al., 2001). Regional urban pushes have been found in similar contexts: “migrants who can do so commonly head for towns and cities and famines swell peri-urban shantytowns with new arrivals.....Those who are far from towns and lead agrarian lifestyles may suffer more from famines” (Shipton, 1990: 353).

There are multiple cases where people did take preventive actions or seek shelter in safe places. A study of communities affected by the 1988 Bangladesh flood describes how some families stayed and others sought relief was based on family risk assessments: 1) the risk of having possession stolen or squatters in homes; 2) reduced privacy in camps; 3) food insecurity; 4) dirty water; 5) crime; 6) disease (Shaw, 1992 and Thomalla and Schmuck, 2004). In response, in situ aid is becoming more common in badly affected areas, especially where residents contend that aid distribution is politicized. Paul (1998, 2003) found that in situations where disaster aid ran smoothly and without irregularities, people did not move from affected areas (similar to US schemes to prevent mass out-migration in post disaster environments). Several studies recently conducted show relief has increasingly become more equitable and free of irregularities (Paul, 1998 and Ibrahim, 2003).

Effective aid and reconstruction can stimulate local markets and employment opportunities in effected villages and relief camps, preventing economic out migration. The UNHCR has incorporated such local contexts into some relief planning. Instead of large camps, assistance can be provided to a dispersed population, creating less concentrated environmental impacts and opportunities for locals and refugees (Black and Sessay, 1998: 704-707). But, the right of refugees to settle on common property varies across countries, and is generally subject to a host of local governing regulations and negotiations. Furthermore, refugees have differential access to public resources depending on the institutional dynamics regulating their stay.

*Permanent Relocation and Resettlement:* Permanent resettlement of high risk populations in disaster zones has been a policy challenge for governments and development agencies. It is now considered as possible strategy to address environmental problems, particularly SLR in low lying or overpopulated island states. For the most part, government induced resettlement has a very poor reputation as a

response to development, conflict or environmental problems. This is mainly due to inadequate planning and facilities, the politicized nature of the resettlement process, and the general inability of governments to address post-resettlement issues. In cases of both voluntary and involuntary movement, governments face the same three issues: people are hesitant to move, there are considerable settlement and development issues in new locations and people often attempt to return to their home area.

Resettlement programs often have unintended costs to migrants. Negative changes in income, living conditions, social networks and future prospects are often cited consequences (Afolayan, 1987; Chan, 1995; Cernea, 1997; Heming et al., 2001; and Wisner et al., 2004). Ethiopia's attempt to resettle famine affected populations in the 1980s is considered a state-created disaster, possibly increasing the number of deaths during the famines of the 1980s (Clapham, 1988 and van Leeuwen, 2001). In other cases, increased impoverishment is a consequence; of the few Bangladeshi displaces reported to have receive resettlement assistance from either a government or non-government agency (approximately 7%), those who moved into urban areas were at a disadvantage in labour markets<sup>11</sup>. Approximately 45% of non-displacees were satisfied with their living conditions, compared to 29% of urban displaces (Hutton and Haque, 2004). Again, rural-urban kinship ties are found to be extremely integral to the urban migration experience, helping displacees cope and adapt to new circumstances (Zaman 1988). While natural hazards may result in loss of livelihood, it does not necessarily correspond to the loss of community and social support.

Yet, one of the major issues surrounding relocation is that many of the resettled attempt to return to their original settlements (Chan, 1995). Chinese authorities found that a reverse flow of flood migrants has taken place in almost every case of resettlement because of inadequate receiving area conditions and lack of compensation for assets lost (Hemin, Waley, and Rees, 2001:199-200). Although the entire population of Tristan de Cunha was relocated to Britain in 1961 following an eruption, most had returned to the disaster area after two years (Smith, 1992 in Chan, 1995).

There have been a number of successful resettlement projects in Bangladesh, China, Nepal and Vietnam (Zaman, 1996 and Badri et al., 2006). A 'best practices' plan developed from these experiences emphasizes that 1) careful attention be paid to social, economic and health issues (through an initial survey); 2) stakeholders should engage in 'meaningful participatory' decisions

about relocation; 3) an appropriate compensation strategy be devised for all effected populations; 4) such a compensation package should be flexible (offering cash, grants, land, or employment) and should explicitly recognize all losses; 5) special attention should be paid to the highly vulnerable (elderly, single mothers etc); 6) a strong organization should oversee the process to monitor and evaluate activities; and 7) a practical time frame should be established for the process (Cernea, 1997; Burbridge, Norgaard and Hartshorn, 1988; Fernandes, 1995 in Badri et al., 2006).

A special case is the effect of SLR and erosion on migrant potential. Indeed, previous evidence of river bank erosion in Bangladesh did lead to sizable migrations (Zaman, 1989 and Mahmood, 1995). Future projections of SLR call for a consideration of resettlement as an adaptive strategy to climate change, particularly in very high risk countries such as pacific islands and low lying atolls (Barnett, 2001). The limited research that has been undertaken on this issue finds that past SLR has not lead to displaced coastal populations; instead people coped through a variety of different adaptations (Black, 2001 and Perch-Nielsen, 2004). Considerable resilience to short term hazards has been documented in the Pacific Islands (Campbell, 1990; Firth, 1959; Lessa, 1964; Marshall, 1979; and Rappaport, 1963). ‘Sufficient evidence exists to show that people have maintained habitation of the Pacific islands during periods of substantial exogenous and human induced environmental changes, although adaptation was at times traumatic,’ (Barnett, 2001:986). This is possibly due to cross-island community efforts-- in times of need, such as after a cyclone, communities would assist each other through the redistribution of food or allow for the dispersal of people to other islands. More recently, smaller scale migrations within home islands were observed in Samoa and Tokelau during Cyclone Ofa (Campbell, 1998; Hooper, 1990). This requires good social relations with ‘neighbors’ and increased cooperation at the regional level (Torry, 1979 and Nicholls and Mimura, 1998). There is some concern that those island linkages that did exist have been weakened and replaced by connections with more distant countries as remittances now constitute a large proportion of post-disaster assistance (Campbell, 1998 in Barnett, 2001:987). As populations on each island decrease due to labour outmigration, the pre-disaster resilience of those remaining is also strengthened by remittances.

In short, although resettlement may be successful in reducing the physical vulnerability of people to disaster risk, it is often coupled with a decrease in development and living standards, thereby possibly increasing the economic and social vulnerability of resettled populations. This is mainly due to issues surrounding employment, land acquisitions and water resources, unequal access

to resources and opportunities faced by migrants, a decrease in social networks and capital (Badri et al., 2006). Further, governments often face the issue of forced migrants attempting to return to their home. High risk areas, such as Pacific Islands, face an uncertain future with regard to SLR and erosion. A number of islands have established a disaster exit option through dependency and migration agreements with neighbouring or other countries. There is also evidence to suggest sharing environmentally induced burdens for people in a post-disaster scenario may lessen the impetus to migrate due to SLR and erosion.

To summarize, the distressed condition denotes a sharp impact, great vulnerability and needed assistance to avoid further suffering and conflict (Surhke, 1992). The characteristics of distress migration are quite different within and across countries as they are shaped by the severity of a crisis, the ability of a household to respond, the geography of the crisis, evacuation opportunities, existing and perpetuating vulnerabilities, available relief, and intervening government policies. It appears that household and community responses to disasters are primarily shaped by compensation opportunities, income restoration possibilities and community support over relocation and resettlement possibilities (Turton, 2003). Temporary, local relocation is common (approximately 30% of effected population) in part because of social networks (Belcher and Bates, 1983, Quatantelli, 1982 and Perch-Nielsen, 2004). After a brief period, displaced and forced migrants return to their home area at a remarkably high rate (Surhke, 1994, Berry and Downing, 1993, Belcher and Bates, 1983 and Perch-Nielsen, 2004).

Displaced experience sub national socio-economic impoverishment and marginalization as a consequence of involuntary migration. This is in part a socially constructed process, reflecting inequitable access to land and other resources (Hutton and Haque, 2004). The majority of urban displaced endure accumulative and increasing impoverishment, and limited opportunities to relieve debt and attain savings which might ease the hardships associated with displacement (Greenberg and Schneider, 1996; Haque, 1997). In extreme severe cases, large scale distress migration can be accompanied by ‘abject misery, large scale beggary and greatly increased mortality’ (Adhana, 1991:187 as quoted in Perch-Nielsen, 2004).

### **The Effects of Government Policies on Environmental Migrants**

Although cross-national evidence is limited, governments have pursued a number of different policies in response to chronic and sudden onset disasters. The most successful policies involve

lessening vulnerability, increasing resilience and coping mechanisms, and improving emergency aid. Below we review and critique various strategies developing governments have pursued to address environmental hazard risk.

### **Government Policies Which Influence Vulnerability and Coping**

Political, economic, social, environmental and household factors affect vulnerability and resilience to environmental hazards. It therefore follows that policies which influence vulnerabilities will affect the production of migrants (and origin and destination communities), who might be negatively impacted by climate change (Hunter 2005 and Wallerstein 1997). Table 4 reviews the strategies government can and has employed to increase community resilience, reduce actual vulnerability in high risk environments, and encourage long term adaptation to increased and intensified environmental hazards. For example, micro-credit lending for sustainable (environmentally-conscious) development and improvement of livelihoods, encouraging food security in poorer countries with semi-arid climates (Petty and Savage 2007), improved planning of coastal communities (Chanda and Coetzee, 2002), fair trade programs, cash-based targeting, particularly education programs (as in Mexico) (Coady et al., 2004) are not “climate change programs” per say, but they act to reduce the negative impacts of migrations that are directly or indirectly the result of climate change.

Of those strategies designed to increase resilience, land use and development regulations drastically impact the ability of people to engage in viable livelihoods, as is evidenced by accounts of communal versus public lands in East Africa, pastoral common areas in the Sahel zone, dam projects in China, and flood plain arrangements in Bangladesh and India. Policies designed to reduce hazard vulnerability, such as early warning systems, the replacement of lost income and preservation of productive assets have confirmed positive results (see Cutler, 1993). In a marked contrast to the norm and as example of true adaptation, the Botswana Drought Relief Program (1982-1985) was directed towards the replacement of lost income and the preservation of productive assets. Botswana’s program was successful in preventing famine deaths by recognizing the county’s vulnerability to drought, creating an effective early warning system and a national drought prevention strategy, with infrastructure and competent civil services to ensure a prompt release of resources (Hay, 1988). Botswanan programs confirm that sustainable, local development goals are consistent with mitigating disaster-driven migrations (IPCC 2007; Young 2007).

Most strategies designed to reduce hazard vulnerability and/or adapt to climate changes are in early stages of development. However, successful programs such as early warning systems are becoming more widespread. Strategies such as crop insurance and cash based aid to disaster victims are not widespread. Long term adaptation demands improved planning and regulation in hazard zones, possible population movements and the construction of protective infrastructure (Wisner et al., 2004).

**Table 5: Government Policies Influencing Vulnerability and Resilience**

Government Policies on Coping Mechanisms		
Goals	Strategies	Examples
Increase Resilience	Encourage Rural Development Micro-credit Improvement of livelihoods Encourage food security  Build Infrastructure Roads Relief centers Watershed management  Land Use and development regulations Communal versus Private Land Land reform	Grameen bank loans Fair Trade programs World Food Program Initiatives  United Nations Water and sanitation program (e.g. bore holes)  Tanzania versus Kenya Public Lands
Reduce Hazard Vulnerability	Early Warning Systems Replace lost income Preservation of productive assets Crop insurance systems Strict regulation in hazard zones Secure squatter settlements in urban areas	e.g. Famine Early Warning System (FEWS) USAID (Somalia) Botswana Drought Relief Program Multiple cases See Wisner et al., 2004
Adaptation <sup>12</sup>	Sea walls (SLR) Population movement (SLR) Neighboring relocation agreements (SLR) Improved planning for coastal communities (SLR)	Nigeria Proposed in Maldives e.g. New Zealand/US  See Wisner et al., 2004

<sup>12</sup> Many ‘adaptation’ policies are possible future strategies to address sea level rise (SLR).

## **Government Policies Influencing Labour and Distress Migration Patterns**

Environmental hazards may lead to various types of intra-state population movements. Table 6 summarizes the strategies and policies designed to hinder or encourage migrations specifically. The policies regarding distress migration are somewhat ad-hoc in developing states, and are perhaps related to the availability of outside aid. Therefore, many of the policies outlined below are suggestive, based on information from case studies.

As discussed above, labour migration is an important component of rural livelihoods. Therefore, the treatment of migration as the focus for climate related policy is potentially problematic. Governments affect mobility through regulations on migrants in urban and international destinations. Rural migrants are often invisible to administrations, and policies rarely address circular migration from rural areas to other agricultural areas (De Bruijn and Van Dijk, 2003). However, there exist a number of discriminatory policies designed to prevent rural to urban migration, many of which restrict rights and benefits to urban migrants. In many Asian countries, governments attempt to control rural-urban migration through a combination of rural employment creation programmes, anti-slum drives, and restricted entry to urban areas (Deshingkar, 2006). Other policies limit the ability of migrants to settle or receive social benefits: China's Hukou system will not permit a rural resident to claim state benefits in the urban areas and Vietnam's KT system classifies residents in urban or rural areas. Only those who reside in their original registration areas are entitled to full government benefits. India does not attempt to place direct controls on population movements, but has a range of policies that indirectly work against poor migrants. Indonesia redirects population from rural areas to areas with labour shortages, due to concerns about over population in urban areas (Deshingkar, 2006).

Government policies on distress migrations have a significant effect on the form of forced migration and the relief opportunities available to refugee seekers. Evidence suggests that the ways in which governments respond to disasters is largely predicated on the kind of political relationships that existed between sectors before the crisis (Pelling and Dill, 2006). Multiple case studies support these assertions, specifically in reference to famines, disaster relief and post-disaster assistance.

**Table 6: Government Policies on Labour and Distress Migration**

Government Policies on Labour and Distress Migration		
Goals	Strategies	Examples
Strengthen rural-urban connections	Encourage rural investment via remittances Encourage circular, temporary migration	Widespread practice See de Haan, 2002
Reduce controls on movement	Restrictive movement policies	e.g. China's Hukou Systems, Vietnam's KT System, India's 'People Below the Poverty Line (BPL)' system
Increase urban employment	Increase opportunities in national and regional Cities	See UNFPR, 2007
Treat disaster victims In-situ	Redesign relief infrastructure Compensation opportunities Community Support (over relocation) Encourage state involvement in relief De-politicize aid	e.g. UN, WFP e.g. Botswana famine relief program See Paul, 2005
Safer relief camps	Reduce restrictions on movement Reliable, safe relief	Multiple organizations
Relocation and resettlement assistance	Forced relocation Government villagization  Temporary relocation and local work	Ethiopian Famine Relief Organization e.g. Ethiopia, Rwanda, Mozambique, China  UNHCR

In areas where the state is a benign or beneficial institution and where international agency relief is unhindered, disaster-affected communities return to stability relatively quickly, as demonstrated by reports on Bangladeshi and Pakistani effected communities (Paul, 2005). However, the state may be absent from relief efforts if the effects of the disaster is very localized. The ad-hoc nature of relief and government aid can force those suffering from disasters to rely on social networks during recovery. For example, drought migrants in the Bandiagara plateau in Sahel are extremely marginalized, dispersed and mobile, operating without significant government assistance (De Bruijn and Van Dijk, 2003).

In other cases, government restrictions on travel in and out of disaster zones can undermine local recovery strategies (McGregor, 1994). During the drought and famine occurring in Dar Masalit

in Sudan, assistance policies prevented Chadian refugees from leaving relief camps, and attempted to maintain them in an ecologically fragile area, creating an especially prolonged famine (de Waal, 1997). Many discussions of cyclone shelters in Bangladesh (Bern et al, 1993 and Haque, 1991) find that overcrowded shelters and corruption often prevented effective disaster relief (Paul, 2005).

In a comparison of famine impacts in Botswana, Ethiopia, Kenya, Mali, Mozambique, and Sudan during the early to mid 1980s, migration patterns, economic impacts and government responses differed significantly due to pre-disaster contexts, internal responses and international relationships. Migration in Sudan and Ethiopia was quite substantial and directed towards relief camps in eastern Sudan. Return was not an option until the end of severe and long term internal conflicts. In Mali, migration rates varied, but north-south movements to relief camps is believed to have eventually totaled 30% (Berry and Downing, 1993). Migration was not a strong response in either Botswana or Kenya, as Botswana relief program was effective and efficient, while Kenya's relief program was directed towards large and politically significant groups. Within countries, specific government policies in famine areas can result in drastically different outcomes.

The variation in each country's economic and political health profoundly influenced their famine responses. Pre-famine trading relationships in Kenya and Botswana provided insurance against economic failure, while international relief flowed to responsive governments. The infrastructure and type of relief strongly affected migration and mortality rates. While in Botswana, a decentralized program focused on household entitlements and a labour program, Kenya depended primarily on normal market channels to distribute relief. The remaining states constructed an extensive relief complex and relied on free food distribution. The political response to each famine was contingent upon each government's willingness to avoid crisis, tailor relief efforts based on need, and appeal for aid. However, as Cutler (1993) persuasively argues, relief efforts are based on the strategic importance of the population at risk. As remote, rural people hardly constitute a threat to the established order, their struggles, climatic or otherwise, were ignored by regimes. If famines threaten towns or cities, action is often swift as urban unrest is a significant worry to regimes. Famine aid is therefore allocated by 'political weight', with urban areas first, followed by politically important rural areas and other rural areas last. The lack of research on current government responses to famine limit our ability to discuss whether these policies have continued.

In conclusion, although it is difficult to properly vague the impact of government policies on environmentally induced migration, it seems clear development policies, independent from climate change policy, strongly shape the risks of communities in disaster prone regions. Governments can bolster a community's immunity to disaster by encouraging local and urban development, thereby lessening the social and economic vulnerability to hazards. A wide range of other polices designed to reduce physical risks and increase adaptation are not widespread.

We will now address another component of the 'environmental refugee' discussion – that of migration and conflict. That environmental migration will lead to violent conflict is a frequent conjecture in the environment-security literature. We survey the available evidence and role that migration has previously played in civil wars.

### **Migration and Conflict**

Much of the available literature exaggerates the impact of environmental factors in causing or exacerbating conflict (see Levy, 1995 and Gleditsch, 1998 and Barnett, 2000 for critiques). The most prominent studies of environmental conflict suffer from over prediction, a lack of evidence, and a reliance on conjecture (Gleditsch, 1998). Although migrants are frequently cited as catalysts, instigators or victims of conflict, case study literature is inconclusive regarding the propensity of migrants to exacerbate tensions and conflict. It is clear that, in general, migration does not lead to conflict, but a comprehensive study of distress migration and conflict has not been done.

The case study literature notes that climate related migration has a myriad of consequences, which 'may involve violence, or less sensationally but no less importantly, more structural forms of disadvantage' (Barnett, 2001: 282). Yet migrants continue to occupy a place of prominence in causal chains linking physical changes to political outcomes. This is due to environmental-security researchers misunderstanding both typical migration patterns in the developing world and the conditions that create conflict. Environmental issues and migration can be critical contextual factors in some conflicts, as are a host of issues relating to resource use, demographic characteristics, and spatial differentiated patterns of governance.

### **Linking Migrations to Conflict**

Migration is generally considered to be the intermediate stage which links environmental degradation and disasters to conflict (Homer Dixon, 1991 and 1994). As mass relocations are presumed to occur

in response to degradation, conflict may erupt in receiving areas in response to *competition*, as environmental migrants may burden the economic and resource base of the receiving area and promoting contests over resources; *ethnic tension*, which may occur if migrants are from a different ethnic group; *distrust* between sending and receiving areas if the origin site perceives maltreatment of migrants; *'fault lines'* which are pre-existing tensions following socioeconomic issues; or finally, '*auxiliary conditions*' as developing economies are reliant on the environment for survival and if resources are scarce, environmental migrants may possibly join antagonizing groups or intensity the violence through any of the above conditions (Reuveny, 2000: 657-659).

The issue with such proposed causal claims is that there are few, if any, references to actual migration processes. The suppositions and conjectures mask poorly designed models of causation without reference to the mechanisms, opportunities, underlying motivations, past histories, role in international assistance and government policies on migrants. The tensions assumed to arise in receiving areas have occurred in a minority of cases<sup>13</sup>. As we have argued in this paper, the available evidence suggests that, in most cases, migrants move locally and rely on social networks or are directed towards relief centers during a crisis. Forced migration of this kind is often temporary, lessening the burden on hosting areas. In crises that do not involve a civil war on either sending or hosting areas, relief responsibilities for large disasters are shared by international and national agencies.

Distress migration will be very unlikely to lead to conflict under any of the specifications indicated for two main reasons: 1) distressed populations are extremely marginalized and weak compared to non-migrants in host areas (Pelling and Dill, 2006; McGregor, 2002; Eriksen et al., 2005); and 2) distress migrants attempt to merge with ethnic groups within host areas, either through relying on social capital or relief efforts to merge populations (Black and Sessay, 1998 Guilmoto, 1998 and Guiffrida, 2007). Anthropologists have found that new migrants across borders, or into refugee camps, tend to "employ a myriad of strategies which include the redefinition of kinship and social obligations" (Guiffrida, 2007 and Harrel-Bond and Voutira, 1992). Attempts to bridge ethnic gaps are clearly a priority to migrants, who most likely will not engage in conflict far from a solid support base. Further, the destitute arriving due to distress migration are attended to with relief aid, and likely to be temporary residents in a potentially hostile area.

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<sup>13</sup> There is some evidence that interstate conflict refugees do increase the risk of conflict (see Lischer).

Yet, particular demographic pressures are found to exacerbate tensions within developing states (see Goldstone, 2002; Urdal, 2005; Hegre and Raleigh, 2008). Rapid growth in the labour force in slow growing economies, a rapid increase in educated youth aspiring to elite positions when such positions are scarce, unequal population growth rates between different ethnic groups, urbanization that exceeds employment growth and migrations that change the balance between and among major ethnic groups, all appear to increase the risks of violent internal political and ethnic conflicts. The crucial element here is not migration per se, but changing demographics. Migrants, in general, will add to population pressures in urbanized areas, and could be considered a relatively inexpensive fighting force. Such conflicts are not driven by migrant issues, but can perhaps be supplied by migrant labour.

That ‘ethnic competition’ is a cause of migrant-host conflict is a key component of the migrant-security nexus. When one distinct ethnic group migrates into an area and challenges the dominance of the settled population, then conflict may arise. If conflicts escalate into contests for political power, ethnic war and even genocide can be the result (Goldstone, 2002). There has been very little research into the ethnic competition dynamic between situated and newly arrived migrants. There are prominent examples of such conflicts including the movement of Han Chinese into the Uigher areas of Xinjiang and into Tibet; the Bantu migrations into southern Africa which led to wars throughout the continent; and forced movements of people within the Soviet Union has led to a legacy of ethnic and separatist conflicts. In none of these cases has migration been caused by environmental factors. Instead, a political agenda to nationalize identities or weaken potential opposition movement shaped the migrations.

There is a growing concern that armed confrontations are becoming more common in confrontations over pastoral/public land access. Conflict over ‘exclusion’ to public lands concern vacillating definitions of who belongs to groups, and which groups are awarded particular rights. Although groups typically co-operate over issues of common interests, a rise in armed conflict over degraded and depleted public resources is correlated with a decrease in viable state-based solutions and traditional, local modes of establishing resource use rights (Unruh, 2005).

In summary, the social consequences of environmental pressures are highly variable. The findings of numerous case studies note that the most common social consequences of environmental change are continued and exacerbated ‘structural forms of disadvantage’ (Barnett,

2000). The actual consequences of forced migration include oppression, chronic poverty, and marginalization (Barnett, 2000; Surhke, 1994 and Pelling and Dill, 2006). Degradation and migration often bring misery, yet such misery does not generally trigger the elite alienation and opposition to the government necessary for large scale violence to occur (Goldstone, 2002). Whether a given population ends up as destitute refugees or can transform themselves into successful migrants appears to depend on conditions of social peace and the resources available. “Environmental degradation, insofar as it causes displacement of people, is more likely to generate exploitation rather than acute conflict. Those who are victimized by environmental change are also weak and numerically few. Aid for these populations must be seen as a humanitarian obligation rather than a security obligation” (Surhke, 1994:15).

### **Conclusions and Future Research**

This paper has provided an overview of climate change related migration. It has heavily focused on developing countries, as these states will undoubtedly experience the most adverse consequences. It has based the general findings and predictions for future environmentally induced migration on previous studies of societal reactions and adaptation to natural disasters. This is done both to counter the conjecture that has dominated the discourse and to provide a more reasonable and evidence based approach to environmentally induced migration.

To summarize previous case studies in chronic and sudden onset disaster areas, a short to medium term increase and intensification of typical labour migration should be expected out of degraded and drought/famine areas, while initial local displacement will characterize movements from sudden onset disaster areas. A small share of migrants may choose to permanently relocate (case studies have noted a range from none to 30%). No mass migrations should or are expected to occur (Perch-Nielsen, 2004:95). These findings deviate substantially from more egregious estimates from the ‘environmental refugee’ literature, mainly because such discussions fail to take into account human reaction and adaptation to change (Black, 2001).

The available literature and this paper have stressed the role of pre-disaster coping and resilience strategies designed to address household and community vulnerability and risk to environmental hazards. Vulnerability is based on physical risk, political, economic and social characteristics, and individual factors, such as gender and age. Government strategies designed to address vulnerability and increase resilience can provide the basis for successful adaptation to

climate change. There is a clear need for governments to consider strategies for reducing hazard risk and increasing mitigation and adaptation to future climate changes.

It is apparent from this study that more widespread and rigorous research is needed in this field. In general, better data is required on internal migrations and displacement. These data can be used to determine how disasters vary in their effects based on differential development and they would allow for an assessment of local resilience and adaptation programs. We believe that local, contextual information is better than country level data as vulnerability differs significantly across disaster affected communities.

Our recommended research agenda is shaped by the three types of migration experienced and expected in response to environmental changes: labour, distress and relocation. The agenda set forth below encompasses both policy and academic research, and emphasizes a practical engagement between the two.

#### *Labour migration*

Migration scholars are in agreement on the fundamental importance of labour migration, both to encourage development and as a critical component to coping with environmental change in rural areas. Available evidence suggests that labour migration can form the basis of a sustainable livelihood in chronically degraded land, building resilience across households and communities. Indeed, families without labour migrants may suffer more during chronic or sudden onset disasters (Erza, 2001). In that sense, it can be viewed as a positive adaptation strategy.

However, both internal and international migration is an initial economic strain on rural families, and the process of remittance transfer can be made more secure and simple. From a policy standpoint, making credit available to fund the up-front costs of migration could facilitate temporary rural-rural and rural-urban movement. The success of this policy is somewhat contingent upon the feasibility of remittance transfer. Both DFID and the UN Millennium Foundation have increasing focused on remittances transfers, although primarily concerning international remittances. As most migration in developing countries is internal and circular, the most pressing issues may be how to make migration benefits portable, and ease the process of both rural-rural and rural-urban migrants. This would require lessening stringent labour migration laws within countries, and assuring the safety and health of migrants in urban areas. Urban migrants face a host of serious problems, including questionable labour practices, insufficient payment, dangerous living conditions, and

dealing with shanty settlements and harassment (Deskingkar, 2006; Surhke, 1993 and de Haan, 2000).

In numerous case studies researchers alluded to a ‘migration threshold’. Such a threshold could inform research about the ability to sustain livelihoods in chronically vulnerable areas where coping mechanisms are stretched. In those areas, social and economic vulnerability may be so high as to outweigh physical vulnerability. More research should be undertaken in areas where the margin for disaster is exceedingly narrow.

#### *Distress migration*

Distress migration, on the other hand, is a situation characterized by high vulnerability and immediate needed assistance. Distress migrants are disempowered and generally in a poor position to negotiate the terms of their displacement. In response, policy frameworks should be geared towards preventing distress migration whenever possible, or, if inevitable, making relief opportunities safe and close to the distressed location. Lessening the need for distress migration is tied to decreasing pre-disaster vulnerability through building assets, ensuring proper health infrastructure is constructed, negotiating local terms of land tenure and use during dire situations (i.e. food shortages), and insuring crops. During disaster situations, replacing lost income and reinvesting in local trade and rebuilding can prevent out migration in search of provisions and shelter. Rebuilding can also offer employment opportunities for those whose primary source of income has been destroyed. Directly replacing lost income can prevent an onslaught of highly vulnerable migrants in urban areas. Such migrants may fall prey to a number of dangers; the possible weakening of social ties may make distress migrants more prone to exploitation and further impoverishment (Surhke, 1993). The safe return of these migrants and a restoration of local services should be a primary concern.

Disaster situations within already unstable areas can lead to ‘complex emergencies’. These are characterized by the breakdown or “failure” of state structures, intercommunal violence, disputed legitimacy of authority, the potential for assistance to be misused, abuse of human rights, and the deliberate targeting of civilian populations by violent forces. Research into the dynamics of complex emergencies is woefully underdeveloped but sorely needed. A way forward may be to observe the propensity for violence and rebellion in chronically vulnerable areas, while isolating underlying causes and trigger mechanisms.

### *Relocation*

There is also a need to further develop approaches for the managed relocation of populations whose livelihoods and settlements may not be secure. In the near future, the number of people needing to be relocated will be quite minimal. However, a best practices strategy should be designed to deal with the most difficult future situations- that of small island states and urban coastal areas. To prevent significant outmigration, present strategies could include protecting coastal infrastructure and limited building in fragile coastal areas. In addition, regional agreements to facilitate post-disaster recovery should be developed before disasters.

If international assistance is to be offered in the future, the basis of that intervention would have to be clearer. To what extent do those uprooted by environmental disaster have particular protection? If protection and assistance were extended by the international refugee regime to 'environmental refugees', would this help the battle to focus the world's attention on pressing environmental problems (Black, 2001)?

Overall, there is considerable room for advancement across all research and policy agendas on the social consequences of climate change. This paper contributes to a growing literature dismissing the 'securitization' of the issue and instead calling for a focus on the development component of vulnerability to climate change.

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