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Climate Change as a Driver of Humanitarian Crises and Response

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Cover Photo: *A man on horseback rides through a sandstorm in Niger's Tillaberi region in the southwest.* © Jaspreet Kindra/IRIN

Contents

ABSTRACT

This paper explores the relationships between climate change, humanitarian crises, and humanitarian response through a review of published and grey literature. On a global level, we seek to define the nature of humanitarian crisis and response and better understand connections to trends in climate change. To do this, we examine the historical evidence for associations between climate change and humanitarian crises, and then move on to a brief review of present humanitarian crises directly attributable to disasters triggered by climatological events. Finally, we look at three interrelated aspects of future trends: changing weather patterns, increasing societal vulnerabilities, and shifting demographics. We first explore the anticipated direct effect that climate change will have on humanitarian crises via the frequency and geography of extreme weather events. Second, we look at how some of the major drivers of human vulnerability are likely to affect this relationship. As part of this, we examine the role of globalization, urbanization, migration, and population growth, and briefly review examples of state-aided vulnerability. Third, we anticipate the likely and desired response of states to their future disaster loads and analyze the challenge this new future poses for international humanitarian agencies. We conclude with some thoughts on the policy and practical implications for the aid community, academia, and donor and crisis-affected states, emphasizing the need to shift from a mind-set in which crisis response is exceptional and interventionist to one in which managing crises is seen as the norm, part of sovereignty, and internalized within more formal international and national arrangements. ■

1: INTRODUCTION

Climate change—over decades, centuries, millennia—is the norm, but what matters to us is the pace of that change. People and societies have consistently sought to adjust to, and accommodate, its vagaries. This paper explores the relationship between past, and more importantly, future climate change, and the occurrence of and consequences for humanitarian crises. Humanitarian crises are social and economic phenomena that occur when coping and resilience breaks down in a catastrophic way. In this paper, we will examine the complexities that govern how societies have, and will, react to climate change, and the relationships among human vulnerability, resilience, and response to crisis.

The historical record provides us with some insight into how communities have coped with climate change. We will review related documentation for clues as to how coping may occur in the future. The last one hundred years provide many examples of humanitarian crises induced by climate change, or at least, extreme climatic events. We will review these to better understand how modern societies can react to such catastrophes and to map the present global distribution of humanitarian crisis.

Looking forward, we highlight likely scenarios in extreme climatic events and connections to possible humanitarian crises. In this analysis, we consider the social, economic, and political trends that render society more, or less, susceptible to climate-induced crises. Finally, we will reflect on how both states and the international humanitarian response system may have to adjust to better mitigate, prepare for, and respond to crises in the future. ■

2: DEFINING HUMANITARIAN CRISES

Humanitarian crises happen when a society cannot cope with the stresses upon it, and when its coping breaks down in a catastrophic way. That breakdown can be triggered by exceptional change, such as a particular hazard limited in time and geography, or a chronic condition like seasonal flooding or drought. Breakdown can also be triggered when the pace of change affecting a community is just too rapid for it to adjust to in a safe way. In these situations, identifying when the crisis begins and ends can be a somewhat arbitrary process. In all cases, it is the combination of vulnerable people (the society that cannot cope) and some form of hazard event, albeit drawn out, that tips society from just coping to catastrophic collapse (Policy Development and Studies Branch, OCHA, 2011).

In this paper, we will use the term humanitarian crisis when referring to the catastrophic effects natural, and man-made, hazards can have on communities. In many of the works reviewed here, humanitarian crisis is synonymous with term disaster, though some writers use the term "disaster" to refer to the hazard event, not its effect. When defining humanitarian crises, size matters. The most comprehensive database of humanitarian crises, EMDAT, is compiled by the Centre for Research on the Epidemiology of Disasters at the Université Catholique de Louvain in Belgium. They define a disaster (humanitarian crisis) as being an event that meets one or more of four criteria:

- "Ten (10) or more people reported killed.
- Hundred (100) or more people reported affected.
- Declaration of a state of emergency.
- Call for international assistance." (EMDAT, 2011).

Since there is no recognized formal international system for reporting humanitarian crises, EMDAT relies on a variety of sources for its data: official government statistics, media reports, and aid agency reports. Thus the database reflects not only the prevalence of crises

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Flooding in Bangkok, Thailand

but also the effectiveness and comprehensiveness of reporting.

We are interested in the subset of humanitarian crises that can be attributed to climate. That attribution can be direct: a flood in which people drown, for instance. It can also be indirect, such as deaths from the complications of malnutrition brought on by food shortages triggered by a period of unusual drought. Or it can be more tenuous—civil unrest in the face of an increasingly draconian regime as it struggles to survive against the natural and social consequences of rapid climate change. Clearly, as these linkages become more complex, the distinction between hazard and vulnerability breaks down; vulnerability affects the nature of the hazard, the nature of the hazard affects vulnerability (Wisner and Luce, 1993).

The humanitarian response community also conceives of humanitarian crises as being events that outstrip local response capacity, because local authorities cannot, or will not, respond to the crisis. This somewhat imperious view of crises is softening, as industrial states face major crises, such as after Hurricane Katrina in the United States or the tsunami that hit Japan in 2011, and as developing states, frequently hit by crises triggered by natural events, realize that coping with such crises is becoming an essential part of their development plans and sovereign responsibilities. The evolving approach of the British government to humanitarian aid, as laid out in its recent Humanitarian Emergency Response Review (HERR) report, exemplifies this approach (Ashdown, 2011).

Finally, and particularly in relation to climate change, we need to address the frequency, duration, and perception of humanitarian crises. In most writing about crises, there is an implicit assumption that they are exceptional and abnormal events. They are often modeled as temporary blips on the curve of social and economic development, rather than iterative events or processes. But, for some regions of the world, this state of crisis has become a norm. In Afghanistan, Somalia, and northern Ethiopia, populations have been receiving humanitarian assistance, continuously, for more than eight years. Indeed, according to one authoritative source, well over half of all humanitarian funding goes into crises that have lasted five or more years. Are these humanitarian crises or new, unacceptable states of normality (Development Initiatives, 2009)? ■

3: THE NATURE AND MEANING OF HUMANITARIAN RESPONSE

Faced with this complexity, an international system has grown up, principally since the Second World War, to provide support to vulnerable populations in times of crisis. The humanitarian response system is primarily funded by the industrialized nations of the Organisation for Economic Cooperation and Development (OECD), to the tune of 10 to 15 billion US dollars a year, with perhaps an additional 4–5 billion USD coming from the general public, again principally in the OECD nations; non-OECD nations contribute maybe an additional 1 billion USD a year (Development Initiatives, 2009). Funds flow, not primarily to the crisis-affected states, but to the UN agencies, the Red Cross and Red Crescent Movement, and a handful of big international NGOs that have developed a market niche in crisis response. Funds are used for immediate lifesaving activities through the provision of water, sanitation, food, shelter, and health care, and for programs to help communities rebuild after crisis. Only 18% of international funding is available in funds that can be immediately drawn down upon in a crisis. The rest is raised on the basis of appeals and proposals submitted, after the crisis breaks, by the operational agencies to the main donors. The system is thus ad hoc and reactive. The system has developed its own internal mechanisms for improving coordination between agencies and for setting minimum standards of response, although they act more as guidelines than rules, with the quality of response depending greatly upon the responding agency, level of funding, and the political context of the host country (Walker and Maxwell, 2009).

In its present manifestation, the system faces five key challenges. First, as previously mentioned, the sustainability and efficiency of its funding; second, the challenge of moving from an anecdote- and case study-driven business to one driven by evidence; third, the challenge of the increasing number of open-ended, long-term crises where the interventionist lifesaving model seems increasingly inadequate; fourth, the challenge of new institutions, donors, and NGOs from the Global South, mega-churches and other religious institutions along with military forces seeking to play a humanitarian role in international crises, but often conceiving of that role in a very different way from that of the traditional agencies. And finally, the challenge of moving from an independent interventionist approach to one that seeks to work with and through increasingly competent and concerned local authorities (Walker, 2010).

Such an ad hoc and politically uninvested system faces significant challenges in responding to the crises of today, let alone the more complex and perhaps more pervasive crises to come. Evolving and reforming this system will, out of necessity, be an integral part of any coherent response to climate change related crises in the future. ■

4: LOOKING TO THE PAST

Humanity experienced many periods of rapid climate change and extremes of climate in the past. The gradual warming of the continents after the last ice age is associated with the spreading—and increase—of prosperity and social complexity around the globe, along with periods of inclement weather associated with distinct dips in population. For example, Anderson charts the relationship between climate change and human settlement in North America. He shows how "the onset of the Younger Dry as cold interval, which lasted from ca. 12,900–11,650 cal. BP/10,800-10,100 rcbp, [approximately 12,000 years ago], closely corresponds to the demise of the continental–scale Clovis cultural adaptation, the completion of the late Pleistocene megafauna extinctions, and the emergence of distinct regional cultural traditions" (D. G. Anderson, 2001).

As humanity evolved from hunter–gatherer to settled agriculturalist to urbanite, their traces in the archeological record become stronger, and it is possible to pick out societal change at shorter time intervals and to associate it with more specific changes in weather patterns.

Looking at just the past 2,500 years and using tree ring data to map climate change, Büntgen et al. show how variations in climate coincide with the historic record of crop yields and human health. They show how the more prosperous years of the Roman and Medieval periods coincide with runs of agriculturally good warm and wet years and conversely, how the demise of the Western Roman Empire between 250–600, and the mass migrations that it triggered, coincided with a period of increased climatic variability (Büntgen et al., 2011).

Moving further into the historic record, we are able to track both social and climate change with a higher resolution. Calamities, lasting years, not hundreds of years, become identifiable, including war, famine, and pestilence.

Opie writes about the profound effect a change in climate had on society in medieval Europe:

"During the widespread famine of 1315-1317 [precipitated by an abnormal run of wet summers], rural regions went without assistance and cities could find no grains to import. Perhaps 10 percent of the population perished. That unexpected threat to human existence was a great psychological shock. Until the famine, it was believed that European society had long passed the threat of food calamity. Nor was the threat temporary. Famine and near famine persisted for almost a generation, affecting all classes and creating an unrelieved picture of gloom." (Opie, 1987)

It was against this background that Dante penned *The Divine Comedy* describing his journey through hell and purgatory, and the folk tale of *Hansel and Gretel* had its origins, with its folk description of famine coping mechanisms—abandoning children, famine foods from the forest, and maybe, at the end, cannibalism.

Zhang et al. (D. D. Zhang, Brecke, Lee, He, and Zhang, 2007) looked at the relationship between climate change, civil violence, and economic prosperity, as measured through agricultural output, for both Northern Europe and China from 1400 to 1900, thus including the "little ice age" of the 1400 and 1500s. They showed that long-term changes in the frequency of war mirror the long-term changes in climate, essentially rising as the temperature went down and falling as the temperature increased. They hypothesize that climate change has a direct effect on the ability of the territory to support a population, as measured via agricultural production. As production goes into decline, the propensity for violence increases.

Moving forward into the modern history of the twentieth and twenty-first centuries, where annual records for individual countries can be examined, our resolution increases further.

For example, the Dust Bowl of the 1930s in the USA, triggered by one of the most devastating droughts of the century in North America (Schubert, Suarez, Pegion, Koster, and Bacmeister, 2004), and poor soil conservation practice, created a human crisis (in the form of famine and displacement) well-described by Steinbeck in *The Grapes of Wrath* (Steinbeck, 2006).

Environmentalist William Lockeretz describes a dust storm in this way:

"During a bad dust storm, any semblance of normal activity was out of the question. Homes, barns, tractors, and fields were buried under drifts up to 25 feet high. The sky could turn completely black in a matter of minutes, and at times dust obscured the sun for several days. Some people actually thought they were seeing the end of the world." (Lockeretz, 1978)

Reuveny argues that the mass migrations out of the Dust Bowl states, and similar migrations of up to 12 million people later in the 1950s out of the Ganges and Indus valley in the Indian subcontinent, were driven by periods of prolonged drought (Reuveny, 2007).

In Africa, similar patterns of drought, coupled with poor soil conservation practice and colonial governance, have been linked to both local famine and the beginnings of the independence movements in East Africa (D. Anderson, 1984).

Nel and Righarts carried out one of the few studies to use modern datasets on the occurrence of disasters to look for correlations with climate change (Nel and Righarts, 2008). Reviewing 50 years of global data (from the EMDAT database) on the occurrence of natural disaster and civil wars, they found that, for low- and middle-income countries, the occurrence of natural disasters significantly increased the risk of violent conflict, both in the short and medium term. Further, they showed that rapid-onset disasters posed a higher risk than slow-onset ones, and that geological disasters (earthquakes and volcanic eruptions) posed the highest risks of all. In looking at the relationship between the annual number of recorded climatic disasters in a country and the risk of short- and medium-term conflict, the relationship turns out to be non-linear, with the risk peaking at five to eight disasters a year, dropping off significantly if less than five or more than eight disasters are experienced. We can draw two conclusions from this work. First, natural disasters put stress upon society and that stress, particularly in countries with fewer resources for coping, can result in civil unrest and violence. Second, in countries that experience such disasters very rarely, the risk is low, as it is in countries that experience disasters very frequently, suggesting that frequent exposure leads to the adoption of more robust local and institutional coping mechanisms. This also suggests that, as climate changes and the frequency of weather-triggered crises increase from low to medium, states will see an upsurge in stress and violence until they adapt to this new norm.

Most recent work, though, has focused on Africa and the potential for understanding conflict there through the lens of climate change. Such models essentially posit that, in Africa, national prosperity is still closely linked to agricultural and pastoral production. When production goes down, people become less prosperous, and in societies with few safety nets in place, this in turn leads to social unrest, and war.

The Sahel in Africa has suffered a long history of drought. Since 1900, three major drought periods can be identified: 1910–16, 1941–45 and most of the 1970s. In all of these periods, drought led to a downturn in agricultural production and pastoralist herd sizes. Millions of displaced herders and farmers moved to the cities in search of food and work. Food market systems broke down and food insecurity, often resulting in famine, rose (United Nations Environment Programme, 2011).

Looking at the period 1981–1999, Miguel et al. assert a causal relationship between rainfall shocks (drought leading to decreased production) and the continuation of civil unrest (Miguel, Satyanath, and Sergenti, 2004).

Looking at the period 1981 to 2002—and focusing on African civil wars with over 1,000 battle-related deaths per year—Burke et al. show a correlation suggesting that a 1 degree Celsius increase in average annual temperature will lead to a 4.5% increase in civil war in that year (Burke, Miguel, Satyanath, Dykema, and Lobell, 2009). Looking at a much shorter time scale, 1990 to 2005, Buhaug failed to find any positive correlation between worsening climate and increased violence in Africa (Buhaug, 2010). They caution, though, that this analysis is based on data that treats each country as a single unit. For large countries in Africa, this makes little sense, both in terms of the prevalence of violence and annual changes in temperature and rainfall. Second, the study looked for direct, short-term

linkages and did not look at possible longer-term linkages as climate change affected economic systems, which in turn affected social and political structures. Finally, in looking only at a short (15–year) period they were observing only relatively small fluctuations in climate, whereas Zhang et al. were examining much larger changer over longer time periods. For all these studies we need to interpret the conclusions with caution, as the sample size is of necessity very low.

Slettebak, writing in the *Journal of Peace Research*, used a multivariate model to see if adding in climate-induced disasters increased the predictive power of his conflict prediction model. He found that, using the existence of a major disaster in a year as a binary variable, 1 for its existence 0 for no existence, significantly increased the models predictive power, but in a negative way. Years with disasters predicted for less conflict, not more (Slettebak, 2012)! Of course, the model's prediction is critically dependent on the definitions used for "major disaster" and "conflict."

There are perhaps two key lessons to draw from this historical analysis. First, the resolution with which one is able to look at the data and the time period over which one looks has a major effect on the nature and clarity of trends seen. Long time intervals allow us to see correlations that are lost in the noise when we look at shorter time intervals. Second, it would appear that there is a relationship between climate and crisis. As climate changes rapidly, particularly from agriculturally-conducive to less conducive, this puts stress on society and, if the change is happening too rapidly or is too extreme for society to absorb, crises result, manifesting as war, mass displacement, and starvation. Finally, the propensity for climate change to impact society is greatest where there are few mechanisms for absorbing that shock. Thus, agrarian economies, with their direct linkage to climate, suffer more than more industrialized societies. Societies that exhibit some form of social contract between the rulers and the ruled fair better than autocracies (Stromberg, 2007).

Pinker, in his recent book looking at the relationship between levels of violence and levels of social organization over much longer historic periods (thousands of years), makes a strong case for the continuous decline in violence, as measured by the percentage of deaths from violent causes (Pinker, 2011). His thesis, put simply, is that as society organized from hunter-gatherer to settled communities through city states to nation states, the need for individuals to kill other individuals in order to gain resources and survive went down. The social compact replaced "might is right."

When looking for relationships between climate change and violence we have to understand this underlying longer-term and much more aggressive trend. Prehistoric archeological sites of hunter gatherers suggest between 20 and 60% of all non-child deaths were violent. By 1200, the rate has declined to one per thousand people per year in Western Europe. Today it is less than one per 100,000 (Pinker, 2011,). We should also be cautious in using violent and unexpected death as the only and most appropriate measure of humanitarian crises in the past. We use death rate figures because these are the ones most available, yet we are equally interested in other forms of human suffering, such as numbers of people tipped into poverty by a crisis, or the total amount of economic loss. ■

5: LOOKING AT THE PRESENT

The most comprehensive database of disasters worldwide is maintained by the Centre for Research on the Epidemiology of Disasters (CRED) at the Université Catholique de Louvain, Belgium (EMDAT, 2011). Started in the 1970s and enhanced in the late 1980s, the database contains records of natural, technological, and manmade disasters, recording for each disaster the number of people killed, affected, injured, or made homeless. It also gathers data on the financial cost of disasters.

Seven categories of disasters on which data is gathered can be attributed directly to meteorological phenomena and thus directly affected by climate change: drought, extreme temperature, floods, mass movement because of drought, mass movement because of flooding, storms, and wildfires.

in the form of displacement, lost homes, and severe livelihood disruption as a result of climate-related disasters. These are the people who are rendered more vulnerable to future disasters, unless a very strong response is implemented. The figures on financial losses are taken from government and insurance sources and as such represent a considerable undervaluing of total losses. They say nothing about the financial losses suffered by the vast majority of crisis victims in the Global South, who have no insurance and do not show up in the financial calculations of destroyed infrastructure. At an estimated annual loss of $69 billion, this is still a significant sum: it is roughly equal to the entire combined GDP of Uganda and Cambodia (CIA, 2011).

Guha-Sapir et al., in their 2011 analysis of the 2010 disaster statistics, highlight the huge cost of

2000–2011	# events	People killed	People affected	Financial loss ($1,000s)
Mass movement dry	8	282	2,037	$0
Wildfire	150	770	2,139,149	$24,407,467
Drought	212	1,520	855,761,888	$29,723,408
Mass movement wet	233	10,981	3,547,410	$2,291,785
Extreme temperature	258	148,412	87,683,539	$38,196,886
Storm	1,193	174,853	430,096,203	$517,393,220
Flood	1,993	65,420	1,162,556,228	$218,764,020
Total	4,047	402,238	2,541,786,454	$830,776,786
Annual totals	*337*	*33,520*	*211,815,538*	*$69,231,399*

Source, EMDAT

As Table 1 shows, over the past 11 years, climate-related disasters have been killing an average of 33,520 people a year, and, as critically, affecting the lives of over 211 million people. "People affected" is of course a rather imprecise term, but it does highlight the extent of suffering

natural disasters worldwide (Guha-Sapir, Vos, Below, and Ponserre, 2010):

"In 2010, 385 natural disasters [which also include earthquakes and tsunami] killed more than 297,000 people worldwide, affected over 217.0 million others

and caused US$123.9 billion of damages. A total of 131 countries were hit by these natural disasters, though only 10 countries accounted for 120 of the 385 disasters (31.2%). Similar to previous years, China, India, Philippines, United States and Indonesia were the countries most often hit by natural disasters."

As in most years, the data is highly skewed towards a few at-risk countries:

"Nineteen countries, representing 98.6%, 95.0% and 89.0% of the total reported number of deaths, victims and damages, respectively, made up the top 10 rankings of 2010. Six out of these nineteen countries are located in Asia, representing 87.7% of the global reported victims from natural disasters. Six other countries are located in the Americas." (Guha-Sapir, Vos, Below, and Ponserre, 2010,)

The year 2010 also saw two devastating, but highly different, climate-related disasters, the floods in Pakistan and the heat wave in Russia.

"In the summer of 2010, one-fifth of Pakistan was under water. Over 20 million people were affected by flooding that ran the length of the country, along the Indus River. The flooded area was similar in size to Italy and destroyed more than 1.6 million acres of crops, making millions homeless. This calamity has surpassed the humanitarian aid scope of the 2004 Indian Ocean tsunami. [ ] A heat wave unseen in 130 years that fueled disastrous wildfires in Russia killed nearly 56,000 as result of heat and increased air pollution, destroying one third of the country's wheat crop." (Guha-Sapir, Vos, Below, and Ponserre, 2010,)

Looking back over the data for the past few decades, the United Nations International Strategy for Disaster Reduction "UNISDR" (United Nations, 2011) notes one optimistic trend, that the number of people being killed by weather-related disasters, including those in Asia, which is where such disasters are concentrated, has been going steadily down. This mirrors similar trends in the first half of the twentieth century, when death rates in famines similarly went into decline, as states started to play an active role in crisis mitigation and response, perhaps fearing the political consequences of high death tolls (Plümper and Neumayer, 2009).

In a detailed statistical analysis of the death toll from recent natural disasters between 1980 and 2002, Khan has shown that there is no evidence that rich nations experience fewer disaster-events per se; rather, the events have less impact (Kahn, 2005). He goes on to show that less democratic nations and nations with larger income inequalities suffer proportionally larger death tolls from disaster.

Whilst nations that are more democratic and have a strong social contract between citizens and those in power may successfully mitigate the effects of disaster, geography is still important. Khan goes on to show that, statistically, "all else equal, a nation in Asia is 28.5 percentage points more likely to experience a disaster in a given year than one in Africa. Larger nations, those that are more elevated, and those that are farther from the equator are more likely to experience shocks."

The UNISDR in its 2011 review also points out that the populations of people at risk from weather-related disasters, and particularly tropical cyclones, has almost tripled since the 1970s as the number of people living in vulnerable coastal cities has increased, with most of this increase being in low-income, shanty-town like developments (UNISDR, 2011). ■

6: ANTICIPATING THE FUTURE OF CLIMATE HAZARDS

The data clearly show that the frequency, intensity, and cost of natural disasters are increasing, and that the twenty-first century holds the possibility for much greater levels of destruction than previously experienced (IPCC, 2007; CARE International and Maplecroft, 2008). To date, increases in natural disaster burden can be attributed, at least in part, to development forces, including population growth, endemic sociopolitical inequities, and the failure of governance systems to avoid human settlement on dangerous terrain (Dodman, 2009; UNISDR, 2008; Bankoff, Frerks, and Hilhorst, 2004).

However, in its Fourth Assessment Report (IPCC, 2007), the International Panel on Climate Change (IPCC) found that natural hazards themselves were likely to increase infrequency and intensity during the course of the coming century. The report described a range of possible outcomes:

The report concluded that rain–fed agricultural yields in Africa could drop by up to 50% by 2020, and that as many as 1.25 billion people in Africa and Asia could be exposed to water shortages and stress by 2050.

Non-IPCC actors have arrived at similar—or even more alarming—findings. In 2006, Hansen et al. predicted an increase in severe storms linked to the El Nino effect (Hansen et al., 2006), while others forecast climate change that could lead to severe drought and "inexorable sea level rise" if peak carbon emissions scenarios are realized (Solomon, Plattnerb, Knuttic, and Friedlingsteind, 2009). Solomon and colleagues also assert that climate change resulting from

Confidence level	Primary effects	Secondary effects
"Very high" (greater than 90% chance)	Coastal erosion and sea level rise Coral bleaching, with implications for livelihood and food security in fish-dependent areas Loss of wetlands, contributing to loss of protection from cyclonic storms Major flooding events in the mega–deltas of Asia and Africa, as well as on low-lying islands	Displacement Reduced food security Impacted livelihoods Water shortages in small island states
"High" (greater than 80% chance)	Increased extent of drought-affected areas in the "dry tropics" Increased heavy precipitation events leading to flood risk Declining freshwater supplies from mountain glaciers Pressure on "ecosystem goods and services"	Undermined livelihoods in climate-sensitive industries, especially in coastal and riverine areas where "rapid urbanization" is occurring Health impacts in the form of: Malnutrition • Death, disease, and injury due to heat waves, floods, storms, fires, and droughts • Increased diarrheal disease • Increased cardio-respiratory disease • Change in the spatial distribution of infectious disease (i.e., malaria)

shifts in atmospheric carbon dioxide are "largely irreversible" for 1,000 years after the cessation of emissions. One report has likened rising sea levels to an "invisible tsunami" and noted that, in the United States alone, 3.7 million people could be affected by coastal flooding by midcentury (Gillis, 2012).

The International Food Policy Research Institute (Nelson et al., 2009) projected that climate change will in fact cause a decline in the availability of calories per capita in developing countries, relative to 2000 levels. The result will be a 20% increase in the number of malnourished children, relative to a world without climate change.

prove disastrous to many communities: more intense cyclones, food and water shortages, major flooding, droughts, degraded ecosystem goods and services, and changes in the frequency and patterns of disease. Moreover, as the IPCC notes, those with underlying vulnerabilities (such as resource scarcity or weak adaptive capacity) are likely to be especially hard-hit, transforming natural disasters into natural catastrophes and raising the specter of more (and more serious) humanitarian crises (IPCC, 2007).

Projecting the countries and locales likely to be most impacted by climate change generally involves extrapolating from current hazards. For example, the Asian Development Bank (ADB,

Virtually certain	Very likely/ high confidence	Likely	Medium confidence	Low confidence★
Warming in temperature extremes	Increase in mean sea level rise, resulting in coastal inundation and erosion	Increased frequency of heavy precipitation	More intense droughts in Mediterranean, central Europe, central North America, Central America, Northeast Brazil, Southern Africa	Change in drought patterns outside identified regions
	Heat waves, glacial retreat, and/or permafrost degradation, leading to high mountain disasters	Higher proportion of total rainfall from heavy falls, especially in tropics and high latitudes		Changes in fluvial (riverine) flood patterns
		Higher average cyclone wind speed (though frequency of cyclones NOT likely to increase; distribution changes uncertain)		Changes in large-scale patterns of natural climate variability, such as ENSO

Source: (IPCC, 2012)

*Low confidence, according to the IPCC, indicates a limited possibility of event occurrence within the defined parameters. These results, however, may be due to inherent methodological biases rooted in data gaps and systemic issues such as inadequate field reporting. This type of statistical uncertainty underscores most projections—whether generated by the IPCC or not—that are related to climate change. Moreover, even rare events may warrant attention, if the potential consequences are sufficiently catastrophic.

Most recently, a 2012 IPCC report on climate extremes found that several hazards—with the potential to spawn humanitarian crises—were likely to emerge in the twenty-first century. Their findings can be summarized as:

In short, climate change is highly likely to generate the sorts of natural hazards that can

2010) justifies its climate work in the Philippines by noting that 50% of the land area of the country—representing 85% of GDP—is currently exposed to natural disasters. The implication is that current impacts will mirror future events in geography if not scale (see also CARE International and Maplecroft, 2008).

In light of these extreme events, the IPCC (IPCC, 2012) notes that human losses could be felt in the form of economic costs and displacement, especially in sectors with close links to climate (such as water, agriculture, food security, forestry, health, and tourism). However, social factors are expected to mediate these impacts:

The report also identifies steps for addressing extreme events:

1. Low-regrets measures (such as early-warning systems and land management), that can be implemented immediately and with little downside

2. Multi-hazard risk management approaches

3. Making use of synergies between disaster risk reduction and climate change adaptation

4. Further integrating scales, from the international to the local, and making use of local knowledge

5. Accurate and timely communication of risks to affected communities

6. Iterative monitoring and evaluation processes for long-term learning

7. Addressing underlying causes of vulnerability, through a sustainable development framework yielding both short- and long-term benefits, with both incremental and transformational mmmeameasures.

Empirical evidence at the national scale is nothing like as robust as we would like it to be. Climate change forecasting is challenging due to both uncertainty (especially at more local scales (Institute for Social and Environmental Transition, 2010; Ministry of Environment and Forest, 2005)) and the unprecedented nature of the hazards (which weaken historical analysis and render participatory methods less useful (Institute for Social and Environmental Transition, 2010)).

Even if impacts are understood in general terms, the complexity of natural disasters may pose difficulties for forecasting. For example, Anwar Ali (Ali, 1999) conducted a study of cyclones and sea surface temperature in the Bay of Bengal, one of the busiest cyclone belts on earth. His analysis was complicated by the nature of such storms: Is the concern the intensity or frequency of such storms? Is it relevant whether they form at all, or only if they strike (populated) land? Is the most important metric wind speed, storm surge, or coastal erosion? Even with relatively straightforward events, predicting impact can be a values- and assumptions-laden enterprise.

Choices of scale are also critical in conducting climate change impact forecasts. Various authors have used global demographic groups (D. Campbell-Lendrum and Corvalan, 2007), geophysical sub-regions (WHO, 2005), political regions (Yusuf and Francisco, 2009), national (Ministry of Environment and Forest, 2005), or local units (Asian Development Bank, 2010) for their analysis. None of these choices is inherently incorrect, since climate change will act in different ways at each of these scales. However, the multitude of different reports may create a confusing and challenging environment for policymaking. Nonetheless, several efforts have made use of notably innovative techniques.

For example, in its National Adaptation Plan of Action, or NAPA, (UNEP, NEPA, and GEF, 2009), Afghanistan developed a list of current climate hazards in the country via participatory discussion methods with local people. These hazards were then quantitatively evaluated in terms of their impact on human systems (such as water, agriculture, and health) in order to determine the impacts of greatest concern (those related to desertification ranked highest). Though the authors noted that they were hampered by a lack of digitized, historical climate data, their use of participatory methods alongside quantitative analysis was a useful contribution.

Bangladesh, as one of the most disaster-prone countries on earth, was able to draw on a very long history and a rich literature in evaluating the potential climate impacts within its borders. For its NAPA, the authors made use of extensive scientific assessments of the country's physical conditions and vulnerabilities, especially along the coastline, and used a scenario-driven process to escape uncertainty problems (Ministry of Environment and Forest, 2005). However, the study placed less emphasis on participatory methods, compared with the Afghan study. Moreover, despite the country's rapid urbanization trend, urban impacts were given minimal attention.

The problem with highly local evaluations is that empirical calculations of localized impacts are extremely difficult to develop, and even when non-conflicting, temporally specific, geographically precise information exists, applying this knowledge effectively on the ground has proven elusive (Moss et al., 2010). Nonetheless, a number of authors have attempted to do so. For example, a team in Jaipur, India attempted to downscale global climate change projections in order to forecast future rainfall in and around that city (ISET and CEDSJ, 2011). They found that rainfall was likely to decrease, undermining already-fragile water security in the area. However, their findings were limited by long-range uncertainty issues, and by the enormous quantity of data and analytic techniques needed to arrive at their conclusion, which may not be possible in all contexts.

Studying climate impacts in Ho Chi Minh City, Vietnam, the ADB projected urban flooding risk up to the year 2050. In doing so, they were able to assess the impact on the city's transport, water and sanitation, health, and agricultural systems. However, they cautioned that their study should be taken as "merely indicative," and that still more localized studies would be needed for optimal policymaking (ADB, 2010).

In their study of Mumbai, Rio de Janeiro, and Shanghai, Alex de Sherbinin et al. (de Sherbinin, Schiller, and Pulsipher, 2007) used global climate forecasts to project climate-related changes, such as sea level rise, temperature increase, and rainfall deviation. These forecasts were then downscaled to reflect each city's general

geographic position. These projections were then applied to the specific natural and socioeconomic conditions in each locale, to draw conclusions about future climate-related vulnerabilities.

All of these localized studies are laudable for their effort to work through the many layers of assumption and complexity needed to arrive at policy-relevant conclusions. And while their methodologies are very different, their basic conclusions are the same: increases in temperature, rainfall, flooding, and drought are likely to place heavy burdens on the poorest and most vulnerable societies and individuals.

Even more challenging than predicting financial or physical impacts is the linking of these physical impacts to different types of humanitarian crisis. While it is clear that dwindling natural resource bases and degraded ecosystems can contribute to conflict (Hammill, Crawford, Craig, Malpas, and Matthew, 2009; Purvis and Busby, 2004b; Barnett and Adger, 2007), drawing a direct, causal tie between climate impacts and social conflict is significantly more difficult to determine (Nordas and Gleditsch, August 2007).

Vulnerabilities and related disasters come in many forms, but share a common theme: varying degrees of societal breakdown born— sometimes indirectly—of environmental degradation. For example, the increased risk of natural disasters in South Asia is further layered by the threat of climate-related conflict. The path from climate change to conflict is neither proven nor straightforward. As the German Advisory Council writes: "The impacts of climate change will be especially severe in this region: glacial retreat in the Himalayas will jeopardize the water supply for millions of people, changes to the annual monsoon will affect agriculture, and sea-level rise and cyclones will threaten human settlements around the populous Bay of Bengal. These dynamics will increase the social crisis potential in a region which is already characterized by cross-border conflicts (India/Pakistan), unstable governments (Bangladesh/Pakistan) and Islamism" (German Advisory Council on Global Change, 2008).

Beyond disaster and conflict, climate change also brings about the prospect of humanitarian crisis

in the form of pandemic disease. The WHO reports that the climate change that has already taken place is responsible for approximately 150,000 excess deaths per year (WHO, 2010). Though many of these deaths are the result of rainfall or temperature extremes, vector-borne disease—especially malaria—is a major culprit (WHO, 2010). While the burden of climate-related health conditions is low relative to other current health risk factors (WHO, 2009), it is expected to grow in the coming decades, perhaps doubling by 2020 and more than tripling by 2050 (Zacher, 2012). Moreover, these data are likely to become more precise and accurate over time, as effective techniques for measuring the health impacts of climate are only now emerging in many parts of the world (Kuhn, Campbell-Lendrum, Haines, and Cox, 2005).

This increasing future risk is partially due to prospects for an expanded range for disease vectors (D. H. Campbell-Lendrum, Corvalan, and Pruss-Ustun, 2003), and partially due to the impact that climate change is expected to have on food production and on flooding—malnutrition and flood events being aggravating factors in the spread of infectious disease (D. H. Campbell-Lendrum, Corvalan, and Pruss-Ustun, 2003). Since least-developed countries, by definition, suffer from deficiencies in food, water, sanitation, and health care, these excess stresses are likely to place disproportionate harm in those places (Zacher, 2012). Potential effects of increased temperature may be further intensified by the demographics of affected populations; a growing proportion of elderly people in many countries will be susceptible to heat waves (McMichael, Woodruff, and Hales, 2006). Thus, climate change may play both a direct and an indirect role in the emergence of future pandemics.

The humanitarian implications of such impacts are clear, yet the true costs are not (Stern, 2007). At least one organization, however, suggests the price of aid missions might jump by anywhere from 32% to 1600% due to climate change (Feinstein International Center, 2009). Unfortunately, because of the length of time greenhouse gas emissions may reside in the atmosphere and the diffuse nature of the effects of industrial emissions, costs associated with

climate change are not borne by those responsible for it (Stern, 2007). Climate change is, as the report notes, an externality. A 2008 report by the Commission on Climate Change and Development asserts that, if states were to account for resource degradation in the true costs of development projects, there could be improved accountability with respect to increased disaster risk and a related disincentive to develop unsustainably (Commission on Climate Change and Development, 2008). ■

7: ANTICIPATING CHANGES IN POPULATION VULNERABILITY

Part of the challenge in making localized assessments of climate impact is that societies are highly dynamic. The rapid and complex changes expected in the coming decades will radically reconfigure population vulnerabilities and their implications for humanitarian practice. Thus, all robust analyses of climate risk account not only for the distribution of hazards, but also the current and predicted vulnerabilities of the populations that will be affected. For example, Thow and de Blois (Thow and de Blois, 2008) used mapping techniques to show that natural and human factors intersect in potentially devastating fashion in much of sub-Saharan Africa, as well as South and Southeast Asia. Yusuf and Francisco (Yusuf and Francisco, 2009) conduct a similar, more fine-grained analysis of specific natural-human overlaps in Southeast Asia.

Yet these analyses can only make guesses at future conditions, which are being influenced by a powerful set of global forces. This section will examine the climate-related consequences of four important changes currently shaping global populations: migration, urbanization, globalization, and state-aided vulnerability.

Migration: Theory and Empirics

Migration plays a central role in the theory of climate change and its humanitarian implications. One school of thought is that climate change will exacerbate underlying underdevelopment, creating pressure on human security and threatening to cause humanitarian crisis. Involuntary migration will serve as a *symptom* of these underlying problems. Conversely, through remittances, voluntary migration may serve as a key adaptive strategy in the face of climate change. For an overview of this phenomenon, see OECD. For a local case, see Sall et al. (Sall, Samb, Tall, and Tandian, 2011) on Senegal. Moreover, voluntary forms of migration may reduce later forced displacement, reducing the number of people exposed to natural hazards (for a classic example of this reasoning, see Tacoli, 2010). As such, migration

should be analyzed from a development perspective and planned for in climate policymaking, rather than being measured as an undifferentiated outcome of climate change (ADB, 2012).

In this vein, a landmark report from FORESIGHT (FORESIGHT, 2011) found that migration was likely to be a major feature of human societies in the coming decades. However, the authors argued that, for underlying social reasons, this movement was equally likely to be *towards* areas of environmental stress as *away* from such areas—as in the river deltas and mega-cities of coastal Asia. Meanwhile, the authors distinguished between *migration* (which may have a positive role in risk-reduction) and *displacement* (which is likely to be universally negative). Preventing *migration* out of stressed areas may lead to an increase in *displacement*. Moreover, rather than creating a whole new class of "climate migrants," the authors argued that climate was likely to be linked to migration via additional weight placed on "migration drivers" such as economic and environmental forces.

More localized studies have similarly demonstrated the difficulty in parsing climate change from other drivers of migration. Field work from the Mekong Delta of Vietnam (Dun, 2011), the Zambezi River Valley of Mozambique (Stal, 2011), and the coast of the Philippines (Castillo, 2011) has also demonstrated the complex mix of economic, political, and economic forces contributing to population movement.

A second school of thought focuses on the dislocation related to natural events. Climate change will create more environmental pressures and natural disasters that displace people from traditional homelands (O. Brown, 2010), particularly in areas of extreme exposure, such as coral atolls (IPCC, 2012). These mass migration events will *cause* human security challenges and may serve as the basis for humanitarian crises (Werz and Conley, 2012).

In an interview with the Center for American Progress, Anne-Marie Slaughter enunciates this view quite clearly: "If your land is no longer good, you rarely sit around and accept that, you move. And inevitably you move on to land that belongs to others, and that creates conflict. It is really the oldest source of war, of unrest, of conflict of various kinds, and that is exactly what we're already starting to see with the effects of climate change [in Darfur, for example]" (Slaughter, undated). Similarly, Lester Brown argues, "People do not normally leave their homes, their families, and their communities unless they have no other option. Yet as environmental stresses mount, we can expect to see a growing number of environmental refugees." (L. Brown, 2011a). Conversely, Adger and colleagues (Adger, Huq, Brown, Conway, and Hulme, 2003) note that migrants often do not inherently cause resource scarcities—and indeed, that the empirical evidence shows migrants play a constructive role in sustainable resource management in many frontier contexts.

While neither school is intrinsically right or wrong, the paradigm embraced has major implications for humanitarian practice. For adherents of the first school, the main challenge is to address the underlying "symptoms" or "drivers" of migration, such as underdevelopment and resource scarcities, as well as climate change itself. Voluntary migration can serve as part of the solution by reducing pressures and creating opportunities. Adaptive action can reduce future humanitarian loads. For adherents of the second school, the main challenge is to reduce the number of mass migration events, since migration ("displacement") is the root of conflict. Migration is seen as a "failure of adaptation" and constitutes an inherent human security obstacle. Population containment, together with climate change mitigation, can reduce future humanitarian loads.

The number of people on the move due to climate change is deeply contested. The most commonly cited figure is 50 million to 1 billion people by 2050 (UNFPA, 2009), a breathtaking range. Critics argue that such numbers are "deterministic," failing to account for human agency and strategies in the face of climate change. Not everyone "at-risk" for migration

does so (Gemenne, Brucker, and Glasser, 2011). Moreover, major policy biases against migration (especially in its international forms) may impede movement for many affected people (Adger, Huq, Brown, Conway, and Hulme, 2003; Feinstein International Famine Center, 2004).

Oli Brown (Brown, 2008) posits that migration calculations are also subject to uncertainties about the intensity of climate change. Mild climate change, a less than two degrees Celsius rise in pre-industrial levels, would yield migration flows "virtually indistinguishable from existing patterns of migration," though it should be noted that certain existing flows, such as the rural–to–urban migration in China, are quite enormous (McGranahan, Balk, and Anderson, 2007). Meanwhile, moderate levels of climate change, two to four degrees Celsius, would lead to more migration, especially "displacement," projected at 250 million people. Catastrophic global warming, above four degrees Celsius, could lead to environmental destruction and social dislocation displacing untold numbers of people.

More recent scholarship has attempted to avoid this quantitative quandary by generating scenarios and decision frameworks, rather than arriving at a single figure (FORESIGHT, 2011). Scholars have also attempted to move away from the contested terrain of "climate migration" to the broader issue of environmental migration (FORESIGHT, 2011).

For instance, Renaud and colleagues (Renaud, Dun, Warner, and Bogardi, 2011) created three labels for migrants related to environmental change: 1) environmental emergency migrants are those who leave their homes in the wake of a natural disaster, such as a cyclone; 2) environmentally-forced migrants are those who leave in the face of impending ecological crisis, such as a drought expected to cause crop failure; and 3) environmentally-influenced migrants are those who leave voluntarily from stressed ecosystems in order to seek better livelihoods elsewhere.

The Renaud framework clarifies the issues for humanitarians quite well. Emergency migration (pure "displacement") is unquestionably negative

and may imply the need for humanitarian aid. Environmentally-influenced migrations are likely to reduce the number of people exposed to disaster, and thus may reduce humanitarian burden (though potential needs and vulnerabilities of those left behind should be considered (FORESIGHT, 2011; Gemenne, Brucker, and Glasser, 2011; WHO, 2011; Wrathall, 2011)). The middle group, however, presents a humanitarian dilemma: both mass displacement and *in situ* deterioration could create humanitarian crisis, and outside aid may be less likely to be forthcoming for these "slow-motion" emergencies.

Very recent scholarship has also addressed the issue of government-sponsored migration in the face of climate change (de Sherbinin et al., 2011). Directly or indirectly, policy decisions not only *respond to* environmental migration but also *contribute to* the actual flows of people, especially within national borders. Government development policies may influence whether people build and settle on ecologically sensitive areas, such as flood plains and hillsides (Dodman, 2009). Governments may resettle populations from areas of perceived natural hazard, or in the wake of a natural disaster (Gemenne, Brucker, and Glasser, 2011). Or governments may take climate-related actions, especially water or food security projects, such as hydroelectric dams, that either attract workers to an area, displace local populations, or both (de Sherbinin et al., 2011). These adaptive actions could reduce certain vulnerabilities, but may create others of concern to humanitarians.

Urbanization

Besides government policy on climate and related topics, other forms of social change unrelated to climate change may influence patterns of vulnerability and resilience. For example, Gordon McGranahan and colleagues (McGranahan, Balk, and Anderson, 2007) have found that many of the world's large and fast-growing cities are located at lower than ten meters above sea level along coastlines (so-called "low-elevation coastal zones," or LECZs, which are susceptible to all manner of "seaward threats"). These processes are being driven by development processes and governmental choices that may have little to do with modern climate

patterns, much less future climate change (McGranahan, Balk, and Anderson, 2007; WHO and UN-HABITAT, 2010). Yet these choices may heavily influence the numbers and patterns of people vulnerable to future natural hazards (O'Brien and Leichenko, 2000). Moreover, the complexities and economic importance of these mega-cities may pose unique challenges for humanitarian action (Patel and Burke, 2009; Patel and Burkle, 2011).

Urbanization may serve a role in adaptation to climate change. For example, the urban context may be more conducive to low-emission lifestyles, and to accessing essential goods and services (Martine, 2009; Satterthwaite, 2009; UNICEF and WHO, 2012). Urbanization is also widely regarded as a pathway to socioeconomic development, which plays a central role in vulnerability reduction (Adger, Huq, Brown, Conway, and Hulme, 2003; Martine, 2009; Satterthwaite, 2009; WHO and UN-HABITAT, 2010). Rural-to-urban migration has been (and remains) a key strategy for resilience in many developing country contexts, where rural livelihoods are particularly susceptible to climate variability (Adger, Huq, Brown, Conway, and Hulme, 2003).

However, the nature of rapid urbanization is critical. With the number of slum dwellers set to rise from one billion to two billion in the coming decades (UN-Habitat, 2003), and "urbanization [becoming] synonymous with slum formation" (UNICEF, 2012), the potential for urban humanitarian crisis is rapidly expanding. These slums often lack even the most basic environmental services, such as improved water and sanitation. A UNICEF/WHO report (UNICEF and WHO, 2012) found that the number of people lacking access to improved sanitation has grown by 183 million people since 1990; a separate analysis estimated that half of urban residents in Africa, Asia, and Latin America are the victims of diseases related to poor water and sanitation facilities (WHO, 2011). The low-cost and informal nature of slum settlements also means that they are located on highly marginal land, such as flood plains and steep slopes (Feinstein International Famine Center, 2004; WHO and UN-HABITAT, 2010). Circumstances in these communities are the epitome of what O'Brien and Leichenko

Newly arrived refugees from Somalia wait to be registered at Dagehaley camp, one of three camps that make up the Dadaab refugee camp in north eastern Kenya

(O'Brien and Leichenko, 2000) call "double exposure" to climate change and globalization (Adger, Huq, Brown, Conway, and Hulme, 2003).

More specifically, one study found that half of Asian urban dwellers lack adequate water and sanitation services (Butala, VanRooyen, and Patel, 2010), contributing to major breakdowns in health security and heavy burdens of infectious disease (Butala, VanRooyen, and Patel, 2010). Many slums are highly vulnerable to flooding: data from Dhaka, Bangladesh show that nearly two-thirds of the country's urban slums flood once or more per year (UN-Habitat, 2009). Similarly, a study in Gorakhpur, India found that parts of the city were water-logged for five to six months out of the year, due to waste management and drainage problems (Institute for Social and Environmental Transition, 2010). The situation is further exacerbated by the vulnerability of health system facilities themselves to natural disasters, which may hamper local coping capacity and necessitate outside response (WHO, 2007).

While urban spaces are generally underemphasized in national adaptation plans, for example the Bangladesh National Adaptation Plan of Action fails to mention the capital of Dhaka altogether (Ministry of Environment and Forest, 2005), the world is quickly becoming more urban than rural. This reconfiguration of where and how people live must be accounted for in any humanitarian planning around climate change.

Globalization

Climate change is itself a product of globalization; in many ways it is the world's first fully globalized environmental risk. Whereas previous pollution problems—such as particulate pollution from smokestacks—were concentrated around their source, climate emissions cause atmospheric warming, no matter where on earth they are produced. Indeed, the poor people in poor countries who will be most burdened by climate-related disasters are among the world's smallest emitters of greenhouse gasses (Satterthwaite, 2009).

Globalization also changes the profile of

populations vulnerable to climate change. For example, food systems are more integrated today than ever before in human history. Disruptions in one part of the world can thus affect accessibility thousands of miles away. Food shortages in 2007–2008 triggered food riots in more than 30 countries (Gillis, 2011). The causes of the 2007–8 food price spikes are complex, but climate-related factors are thought to be partially responsible (Pineiro, Bianchi, Uzquiza, and Trucco, 2010). Meanwhile, the Russian forest fires of 2010—fueled by abnormal heat and drought—led to that country imposing an export ban on grain (Unsigned, 2010). These trends are particularly worrisome because, as Lester Brown argues, food insecurity is closely tied to state failure (L. Brown, 2011b). At the same time, globalization and its impacts on agriculture in developing countries (O'Brien and Leichenko, 2000) may hinder farmers' efforts to adapt to these new realities.

Globalization is also creating incentives for states to establish industrial production zones at close proximity to the sea, for easier access to intercontinental shipping. However, these developments are often at very low elevation, jeopardizing the people and investment in property should sea levels rise in the coming century (Balk et al., 2008; McGranahan, Balk, and Anderson, 2007).

Another hallmark of globalization has been the recent trend of Asian countries, such as China, investing heavily in trade with Africa nations, in order to obtain sufficient food and raw materials for their large and industrializing populations (Fan, Nestorova, and Olofinbiyi, 2010). Recently, this investment has extended to the purchase of large tracts of land in the region, for the purposes of growing food (Rowe, 2011). In doing so, the supply of arable land in the region is facing a squeeze, just as climate change will begin to accelerate drought and desertification processes in a region where agricultural land is already under heavy pressure (Rowe, 2011a; Young, 1999). The implications for land and food security are potentially alarming.

Globalization has transformed not only modes of production and transportation, but also those of communication. As the Arab Spring of 2011 demonstrated, it is now easier than ever for

localized tensions to globalize quickly, via mobile telecommunications and the internet, though we should note that some authors, including Anderson (L. Anderson, 2011), doubt the role of social media and the Internet in the on-the-ground events of 2011, but the (contested) digital transmission of events to a global audience is harder to dispute (Dunn, 2011). While these protests had links (in the form of increased food prices) to climate-related phenomena, they were also rooted in complex and unique political and social circumstances in the countries of the Middle East (Werz and Conley, 2012). Nonetheless, they highlight a critical underlying phenomenon: the local is becoming global, and vice versa. Therefore, even seemingly "localized" climate change impacts may rapidly metastasize into wider humanitarian crises.

Conversely, globalization may impact the humanitarian response to climate change in more constructive ways. For example, the IPCC has noted that humanitarian response is often required as the result of a failure in disaster risk reduction (DRR) (IPCC, 2012). By expanding global flows of capital, products, and know-how, globalization may improve DRR capacity in vulnerable locales, mitigating the need for humanitarian response (IPCC, 2012; Hammill and Tanner, 2011). Technological innovations, ranging from early warning systems in Bangladesh (WHO, 2007) to disaster-resilient schools in Thailand (Unsigned, 2007) can be developed, shared via the Internet, and accessed around the globe. Moreover, the globalized development and dispersion of community-based participatory methods may bolster DRR and reduce future vulnerabilities to climate change (IISD, 2010; IPCC, 2012). See IIED, 2011 for examples from several Southeast Asian and Latin American countries—though the authors also caution that international response in a globalized world can also have the effect of drowning out local voices in the recovery process.

State-Mediated Vulnerability: Water Wars and Border Fences

Ironically, the preparations that states take in anticipation of climate change may also create vulnerability to climate change in some regions,

as adaptive (or perhaps more accurately, "maladaptive") policies lead to unintended consequences. Thus, states may in fact augment the hazards at work on a warming planet.

For example, many of the major waterways in South and Southeast Asia run through China—Zeitoun and Allan (Zeitoun and Allan, 2008) have dubbed the nation "a hydro-hegemon." Chinese policymakers have reason to be concerned about future water and energy scarcities, and have taken adaptive action such as the hydroelectric damming of rivers and the routing of water from southern to northern China, where it can be put to use in the country's traditional agricultural belt (L. Brown, 2011a; de Sherbinin et al., 2011). However, these projects may create water shortages for countries downstream, elevating the potential for scarcities and reduced agricultural yields, and triggering human security crises (Richardson, 2009). Moreover, these projects have ratcheted up political tensions between China and its neighbors, further raising the humanitarian stakes (AFP News, 2012; WSJ Staff Reporter, 2011).

Another example lies along the India–Bangladesh border. India has constructed a fence along the border, to stop what it calls the flow of illegal immigrants into the country (O. Brown, 2008). Outside observers, however, see the fence as a barrier to Bangladeshis exiting their country as climate change begins to take its toll on the sensitive, low-lying Ganges–Brahmaputra River Valley running through the heart of the country (L. Brown, 2011c; O. Brown, 2008). Evidence for this interpretation is bolstered by national security scenario exercises conducted by the American National Defense University, which predicted that climate-related pressures would send hundreds of thousands of Bangladeshis across the border, sparking religious conflict and imposing vast costs to Indian social and physical infrastructure (Werz and Conley, 2012). Seen in this light, the fence represents an adaptive intervention—population containment and mass migration prevention—leading to a maladaptive, vulnerability-increasing outcome, forcing tens of millions of people to remain in one of the most crowded, ecologically-sensitive, and climate-vulnerable regions on earth (Gemenne, 2011).

These are just two of the most straightforward examples of government-mediated vulnerability. Many other regions are wrestling with flooding/water management and migration issues. (See IPCC, 2012 for an overview and the Heinrich Boll Foundation on Sudan (O. Brown, 2010), or IISD (O. Brown and Crawford, 2009) on the Levant for regional context.) Often these issues pre-date the climate change era, and as several authors have cautioned, the links between climate change and state conflict are extremely complex (O. Brown and Crawford, 2009; Thow and de Blois, 2008). Indeed, in the short run, conflict may play a larger role as a determinant vulnerability to climate change than as a symptom of climate change itself (Thow and de Blois, 2008). Climate change may also create motivations for cross-boundary cooperation rather than violence or competition (Association of Southeast Asian Nations (ASEAN), 2005). Still, the long-run ramifications of climate change as a "threat-multiplier that makes existing problems more complex" is not to be, so long as more proximate factors of diplomacy and development are not set aside in doing so (O. Brown, 2010).

The Changing Face of Vulnerability

Taken together, migration, urbanization, globalization, and state action related to climate change are changing the planet in unprecedented ways. These social forces will vastly reshape the demographic and geographic profile of who is vulnerable to climate change by mid-century, just as the clearest effects of global warming are starting to be felt. Yet while these forces are important in the run-up to climate-induced humanitarian crises, we must also consider how states respond to crisis today—and how they might respond in the future. ∎

8: STATE RESPONSES TO FUTURE CRISIS LOADS

Given the high probability of increasingly disruptive climatic events, it is critical to understand 1) the distribution of changing weather patterns across geographic areas and 2) the nature of disaster prevention and response strategies in the highest-risk areas. Section 6 of this paper provided an overview of the places that may be hit hardest by climate change. Over the next two to three decades, the locations of "extreme weather hazards" will not change tremendously, but the occurrences will intensify (CARE International and Maplecroft, 2008). As discussed in Section 5, China, India, the Philippines, the United States, and Indonesia sustained the greatest number of natural disasters in 2010. In these and other areas of heightened risk, how will states respond to crisis? Efforts to mitigate the impact of future incidents may be slowed by increasingly stressed infrastructure (Purvis and Busby, 2004a; Feinstein International Center, 2009). High-risk regions must, therefore, successfully cope with continued environmental crises and the possibility of diminished response capabilities rooted in systemic vulnerabilities (UNISDR, 2008; UNEP, NEPA, and GEF, 2009).

Around the world, questions of disaster risk reduction arise. How will Sahelian communities cope with the ongoing threat of drought? What strategies will Indonesia employ to mitigate or adapt to projected flooding and landslide threats? How will the threat of climate-related conflict be abated in South Asia? Given the potential for climate change to trigger a series of devastating effects (IPCC, 2007), what types of measures do nations have in place to avert weather-related disasters? The World Bank writes, "a disaster exposes the cumulative implications of many earlier decisions" and that, in the end, prevention is cost effective (World Bank, 2010). Despite this understanding, strategies to deal with climate change at its most basic levels may be limited in many areas. When appropriate measures are in place, how might the relative value of policy—and associated implementation of critical response measures—be evaluated in a comprehensive way? Issues vary by region, but four major challenges exist with respect to state

response to climate change–related disaster:

- *Prevention, mitigation, and adaptation policies are not in place.* According to a UNISDR report, the majority of regional initiatives managed by a variety of organizations in South Asia are related to generic disaster response capacity building—not "managing" or "confronting" climate change specifically (UNISDR 2011). Although efforts may be complementary, the authors note that this is not always the case and may lead to maladaptation if climate is not appropriately taken into account.

- *Capacity to implement policies is weak.* Research reflects, for example, extensive disaster risk reduction and climate policies in Indonesia and a disconnect between policy and intended outcomes (Department for International Development, Undated). On a larger scale, while 168 countries subscribe to the landmark Hyogo Framework for Action (HFA) that guides disaster response planning, not all participants are fully able to meet its goals (UNISDR, 2011). Although the number of international environmental treaties has risen over the years (Feinstein International Famine Center, 2004), a gap between policy and action still exists.

- *Systematic data collection to evaluate and report response results does not exist.* Another problem lies in the lack of data to evaluate and inform the nature of the DRR efforts. Although many countries have taken substantive steps towards DRR—and the HFA is a good step towards systematic reporting—there is more work to be done (Oxfam, 2010). As of now, the best—and admittedly flawed—proxy for successful policy implementation lies in the mortality indicators provided by EMDAT.

- *Short-term national adaptive strategies can prove to be maladaptions at the international level and for other states.* The aforementioned cases— buying up of land in Africa to produce food for non-African nations, the fencing off of Bangladesh from India, and the diversion of waters in China which lessens flow to

nations downstream—are all examples of such maladaption (AFP News, 2012; Gemenne, 2011; Rowe, 2011).

In 2005, the Hyogo Framework for Action a 10-year plan adopted by 168 United Nations members, signaled a changing political environment: "There is now international acknowledgement that efforts to reduce disaster risks must be systematically integrated into policies, plans and programmes for sustainable development and poverty reduction, and supported through bilateral, regional and international cooperation, including partnerships" (UNISDR, 2008a). At least one major international relief organization calls HFA "the key global instrument for the implementation of DRR," and indicated that progress in the next five years must be expanded beyond awareness and planning (Oxfam, 2010). Dejo Olowu writes in the Journal of Disaster Risk Studies that the HFA's effect upon disaster risk reduction in African countries is mixed: "Regrettably, as with many other people-oriented initiatives, most African States have hardly moved beyond the scope of formal commitment to declarations and high-level meetings: compliance with the agreed terms of initiatives has always been problematic" (Olowu, 2010).

This critique is mirrored in UNISDR's most recent Hyogo Framework Agreement report: "Despite a manifest commitment to disaster risk management (DRM), few countries systematically account for disaster losses and impacts or comprehensively assess their risks. The political and economic imperative to invest in DRM remains weak, with few countries reporting dedicated national budget lines or adequate financing for risk reduction" (UNISDR, 2011).

In addition to the HFA, the International Federation of the Red Cross and Red Crescent Societies received formal state support for its "Guidelines for the domestic facilitation and regulation of international disaster relief and initial recovery assistance» in 2007. The IFCRC guidance, known as the "IDRL Guidelines," aims to expedite the flow of aid into countries of need while concurrently increasing the accountability of organizations tasked with rapid deployment of goods and services (IFRC, 2010). Finally, DRR is a key consideration in other high-level international negotiations such as the United Nations Framework Convention on Climate Change (UNEP, 2009).

Although widespread support of international disaster guidance signals a shift in support of standardized methods of managing disaster response, as mentioned previously, the gap between policy and action remains a major hurdle. One basic issue that contributes to this dilemma lies in the tenure of political representatives versus the need for long-term disaster planning. While a politician might be in office for two years, comprehensive decision-making requires a much longer time horizon and commitment that is not subject to the ephemeral oscillations of election cycles (EEAC Working Group Governance, 2009). A solution to this is a dedicated and equitable local disaster response planning process that operates in conjunction with international actors (UNISDR, 2008a; Oxfam, 2010). In countries such as Mozambique and Colombia, for example, strong internal disaster response teams are complemented—rather than ruled—by multinational organizations (Walker, Rasmussen, Molano, and Sebastián, 2012). The result is a more sustainable response relief effort over time. ■

9: HUMANITARIAN SYSTEM RESPONSE TO FUTURE CRISIS LOADS

As we look to a future where crisis response and seeking to mitigate crises through increasing societal and economic resilience becomes the norm, we have to ask if the international humanitarian response system is truly "fit for purpose."

Not unexpectedly, many of the strategic challenges already identified in the aid business speak directly to its ability to serve this changing world. Four challenges in particular speak to the fit–for–purpose question.

Is the System Evidence–driven?

Agencies typically are very good at measuring and tracking the inputs to their programs (the finance, personnel, and supplies) and the processes these inputs feed (logistics systems, the supply of water, healthcare, food, and so on), but become progressively poorer at measuring and monitoring as they move downstream to program outputs and outcomes and, at the end of the line, hardly ever measure or evaluate impact (Roberts and Hofmann, 2004). And yet, it is in impact that the true value of an intervention becomes apparent. If humanitarian aid programs are to become concerned with enhancing system resilience as well as basic survival, then they will have to both adopt the methodologies of impact assessment and create the financial and management support needed to ensure such evaluations become routine.

The evidence also suggests that humanitarian operations are no longer synonymous with emergency operations. Most humanitarian assistance today goes into operations that have been running for five years or more. As much as 45% goes into programs more than eight years

Flood waters in Madagascar after Cyclone Bingiza struck the Indian Ocean island of Madagascar on 14 February 2011.

old (Development Initiatives, 2009). Whilst this no doubt saves lives, it also condemns the victims to an endless state of purgatory, beholden to others, the agencies or the state, for their survival. Building resilience is not part of this mind-set. In these long-term crisis environments, in Ethiopia, Sudan, Afghanistan, Palestine—all environmentally fragile states—a major opportunity is being missed to use aid to transform the way communities and their states develop the necessary economies and governance for the future.

How Free from Short-term Political Manipulation Is the Business?

In a new volume edited by Antonio Donini, writer after writer shows how through the history of humanitarian aid and across the spectrum of agencies today, aid programs continually balance the pressure of political opportunism against the needs of crisis victims (Donini, 2012). Pressure can come for war lords and the local political elite seeking to manipulate aid to consolidate their own power, or from within agencies themselves, as they seek to curry favor with local power brokers or key donors, and lastly from the donor community itself, which seeks to have aid bolster short-term foreign policy objectives, often in pursuit of a security agenda. Medecins Sans Frontieres (MSF), one of the most principled agencies, has laid out in a recent publication how their field and headquarters staff are continually having to make judgment calls on compromises between what they think they should do and what they are being pressured to do, in order to ensure access to crisis victims (Magone, Newman, and Weissman, 2012).

This is not the preface to some conspiracy theory; rather it is a reality check that all too often the arenas of humanitarian crisis are also the arenas of acute political and security concern. Acting impartially, and going further to address crisis recovery and resilience, will require aid agencies to far more aggressively assert their independence. They will need to move from the role of charitable care-giver to that of professional independent service provider, emulating the struggle of the medical or legal profession to retain independence. Recent developments proposing core competencies,

certification systems, and possible professional association in the humanitarian field suggest a rigorous debate is already underway (Walker, Hein, Russ, Bertleff, and Caspersz, 2010).

Exclusive and Interventionist, or Mainstreaming?

As we have laid out earlier in this paper, the humanitarian aid system evolved as a Western-based interventionist endeavor, seeing crises as abnormal and responding through exceptional interventions. If we face a future where crises are more pervasive and many more states will have to repeatedly meet the needs of their crisis-affected populations, then response has to be mainstreamed. In many Northern states this is already the norm. In the USA, the Federal Emergency Management Agency (FEMA) provides a comprehensive system of preparedness, response, and recovery from crisis where citizens have clear entitlements and expectations for assistance during a crisis. Crisis prevention cascades down through legislative and planning systems, affecting building regulations and land zoning, evacuation plans, and flood prevention, to name but a few (Koenig, 2007). Of course, even well-tested and normalized systems can still fail in the face of disasters of an unprecedented nature, as happened following Hurricane Katrina in 2005 (Schneider, 2005). Increasingly, as we saw in Section 8 of this paper, Southern states, Indonesia, Philippines, Mozambique, for example, are reforming their own disaster response systems, seeing this as a normal part of sovereign responsibility (Walker, Rasmussen, Molano, and Sebastián, 2012). External aid agencies need to adapt to and support this change. The old methods of working around government systems, rather than with them, have to be challenged. In many crisis-affected states, aid agencies need to see themselves as long-term partners of the state, providing response services, but must also work to build resilience into livelihood systems and the infrastructure of hazard-exposed populations. They need to view recovery from crisis as a process of change to a more resilient state, not just a building back of the past. Such change will not be easy. The humanitarian response sections of aid agencies have tended to see their work in terms of logistics and the impartial, neutral

supply of live-saving aid and have shunned much of the political analysis of the development sector, let alone developed an analysis of complex global processes outlined in Section 7.

A necessary part of this reform will also involve the international aid agencies having to take on a more professional approach to their work. Southern states receiving aid are, quite rightly, increasingly wanting proof of the competence of aid workers and aid agencies and are questioning the traditional reliance on Northern skilled workers when so many local skilled workers are unemployed. The aid community is responding to this trend and moves have been initiated to create more universally accepted core competencies, and from them create a system of international certification for aid workers (Walker, Hein, Russ, Bertleff, and Caspersz, 2010).

Can the Elephant Dance?

International humanitarian aid agencies have grown to become large, multinational organizations, turning over billions of dollars each year and playing a critical in the creation of international civil society norms (Teegen, Doh, and Vachani, 2004). They now resemble major transnational corporations and find themselves increasingly challenged by the risk aversion and inertia that comes with scale and an operational model that is still essentially about organizational control.

Mike Edwards, then a vice president at Ford Foundation, made the point explicitly when he stated:

> The fundamental question facing all NGOs is how to move from their current position—as agents of a foreign aid system in decline—to vehicles for international cooperation in the emerging global arena." (Edwards, 1999,)

Then, a decade ago, he saw their future as lying down one of three roads. First, business as normal, usually a recipe for failure; second, shifting from large command and control organizations to become "global market brands" along a franchising model such as McDonald's; or, third, regaining some of their original mission and becoming international social change movements.

Kamat puts the case even more bluntly. As he sees it, the seduction of market demand has created an alliance between the finances of the Northern industrialized states and the operational muscle of major humanitarian NGOs, leading to NGOs being separated from their original concern to stand with the poor and effectively instrumentalizing them at the bequest of Northern foreign policy (Kamat, 2003).

But we know that, if humanitarian agencies are to be fit to play a meaningful role in the crises of the future, they need to be agile and inventive, able to respond to crisis to hand and able to work with and through local institutions, not around them (Senge, 1993). Roth, in a study of NGOs, power companies, and other service providers, showed how the use of hastily formed networks, which cut across and around normal management hierarchies, enabled rapid and appropriate problem solving in crises (Roth, 2009). So at every level, from the corporate to the field operation, aid agencies are going to need to practice constant adaptation as a way of life, not just a "one off" reaction to a problem. ■

10: CONCLUSION

Variations in the world's climate have been happening for all of human history. Because of the fundamental role of weather in our existence, these changes have often imposed significant stress—and even crisis—on human societies. Over time, we have used our increasing prosperity and knowledge to reduce these burdens. In the past it has been the wealthier societies that have had the resources to absorb and mitigate stress, but now the climate change burden and risk has progressively shifted to those who are less prosperous and powerful. Anthropogenic climate change in the twenty-first century will pose a threat that may be unmatched in all of human existence. The science indicates that flooding, drought, severe storms, and changing patterns of infectious disease are all possible—even probable—impacts of a higher-carbon atmosphere.

Simultaneously, human civilization is undergoing vast social transformation, as migration, urbanization, globalization, and changes to governance structures are all reshaping the world in which we live. Though these changes have both good and bad effects for resilience in the face of climate change, they are fundamentally re-ordering patterns of vulnerability to natural hazards. In doing so, they are posing grave challenges for governments and non-governmental humanitarian actors alike. Simultaneously, there is increasing evidence to support the proposition that more democratic governance leads to better disaster risk reduction. Thus, what was previously seen as a technical challenge is now fundamentally a political one.

Humanitarian agencies have a critical role to play in responding to climate change. Yet, in doing so, they must be sensitive to local context as they work with governments and communities to bolster human security via adaptation. Moreover, aid agencies must themselves become more adaptive and flexible than has historically been the case. They, along with crisis-affected and donor states and civil society groups, will need to build an international crisis response system which moves culturally from interventionist and abnormal, to one that is an integral part of sovereign duty and long-term development policies.

To summarize, some key conclusions reached by researchers:

- It is likely that the location of future weather events related to climate change will not shift dramatically but will increase in frequency and intensity.

- Natural disasters do not have to result in crisis such as death, disease, or migration. The impact of a disaster is either mitigated or intensified by existing social and economic vulnerabilities.

- Reliable field data is limited; current crisis impact indicators are high-level, such as mortality. The result is difficulty in analyzing current—and projecting future—disasters.

- Crises are no longer the exception, but a new state of normal for certain regions. International aid is largely reactionary and ill-equipped with long-term crises of this type.

- Climate change will bring about increasing levels of crisis, but it will do so in the *longue duree*. Thus, the challenge is not simply one of intervention and response, but also one of long-term development, complex analysis, and sophisticated strategy. Business as usual cannot be expected to work in such unusual times. ■

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