Climate Change and Global Poverty

A Billion Lives in the Balance?

LAEL BRAINARD

ABIGAIL JONES

NIGEL PURVIS

Editors

BROOKINGS INSTITUTION PRESS
Washington, D.C.

1775 Massachusetts Avenue, N.W., Washington, D.C. 20036
www.brookings.edu

Library of Congress Cataloging-in-Publication data

Climate change and global poverty : a billion lives in the balance? / Lael Brainard, Abigail Jones, Nigel Purvis, editors.

p. cm.

Includes bibliographical references and index.

Summary: "Discusses how climate solutions must empower global development by improving livelihoods, health, and economic prospects and how poverty alleviation must become a central strategy for reducing global vulnerability to adverse climate impacts. Draws on expertise to ask how public, private sectors can help the poor manage the global climate crisis"—Provided by publisher.

ISBN 978-0-8157-0281-8 (pbk. : alk. paper)

1. Climatic changes—Economic aspects. 2. Global environmental change. 3. Global temperature changes. 4. Poverty—Government policy. 5. Economic geography. 6. Economic development—International cooperation. I. Brainard, Lael. II. Jones, Abigail. III. Purvis, Nigel. IV. Title.

QC903.C545 2009

362.5'56—dc22 2009014999

9 8 7 6 5 4 3 2 1

Printed on acid-free paper.

Typeset in Adobe Garamond

Composition by Cynthia Stock
Silver Spring, Maryland

Printed by R. R. Donnelley
Harrisonburg, Virginia

10

The Climate-Security Connection: What It Means for the Poor

JOSHUA W. BUSBY

WHEN CYCLONE NARGIS struck Myanmar's Irrawaddy River Delta in May 2008, the world received yet another reminder of nature's sometimes terrifying capacity for physical destruction. In its wake, the storm left more than 80,000 dead, another 50,000 missing, and some 2.4 million survivors.[1] The storm also brought unprecedented scrutiny to Myanmar's military government, which was seen as negligent in ignoring early warnings from Indian meteorologists and dilatory in responding to the pleas for help from its country's displaced population.[2] A few isolated voices called for military intervention to provide aid to the Burmese people.[3] More serious wrangling occurred over visas for Western aid workers; in the aftermath of the aborted Saffron Revolution of 2007, the Myanmar military rulers saw the influx of foreigners as a threat to its government and deflected pressure to admit aid workers by at first limiting visas to workers from Asian nongovernmental organizations (NGOs).[4]

Thousands of Burmese soldiers were mobilized after Nargis, putatively to provide relief but, to many outside observers, mainly to restore stability and protect the regime. The Myanmar military leaders were so worried that international aid might be tantamount to a foreign invasion that they rebuffed the U.S. government's offer to deliver humanitarian aid by ship.[5] After three weeks of waiting, U.S. secretary of defense Robert Gates huffily announced plans to redeploy U.S. naval assets that had been stationed offshore ready to provide additional aid at a moment's notice.[6]

In a world where scientists predict that climate change will exacerbate the severity and number of extreme weather events, Myanmar's experience with Nargis, like America's with the hurricanes that buffeted the U.S. Gulf Coast in 2005, gave people around the world a visual image of the potential future.[7] These storms provided the public with a sense of the security risks when affected countries lack the capacity or will to respond. They observed what resembled the aftermath of an armed attack: widespread suffering, destruction of infrastructure, mobilization of the military, and the movement of refugees. Lacking only human intent to wreak such devastation, the failure of the Myanmar government's response underscored how natural disasters tend to be magnified by incompetent or venal governance.

Even if storms such as Cyclone Nargis and Hurricane Katrina cannot be linked directly to climate change, these weather events have altered the terms of the climate debate.[8] In 2007, "climate change and security" emerged as a linked concern on the international agenda. A host of reports and meetings from think tanks and governments highlighted in dramatic language the emerging risk to peace and security from the effects of climate change. By 2008, these products had become almost too numerous to enumerate.[9] In the reports on climate and security, climate change was frequently described as a "threat multiplier" for conflict and even state failure. Though hardly unanimous in their assessment, parallel academic discussions linked a number of expected effects of climate change—such as rainfall variability, disasters, and refugee flows—to the increased likelihood of violent conflict.[10]

Policymakers have also made the connection between climate and security. In April 2007, at the initiative of the U.K. government, the UN Security Council held its first-ever debate on the potential impact of climate change on peace and security.[11] In June 2007, the UN secretary general, Ban Ki-moon, weighed in, controversially linking the crisis in Darfur, Sudan, to climate change. In October 2007, the Nobel Peace Prize committee recognized this emerging threat to peace and security by awarding former U.S. vice president Al Gore and the Intergovernmental Panel on Climate Change its Peace Prize. The EU's high representative for foreign policy and security, Javier Solana, released his own report in March 2008.[12] The U.S. Congress requested a national security estimate from its intelligence apparatus,[13] and a classified report by the National Intelligence Council was duly prepared and released in June 2008.[14]

According to these many initiatives, poor countries and poor communities, particularly in Africa and Asia, face some of the gravest security risks. Poor countries lack the capacity to respond to severe flooding, droughts, storms,

extreme heat waves, water scarcity, and other subsequent direct or indirect consequences of climate change, like refugee flows and crop failure. Their vulnerability is partly an accident of geography; sites near the equator, the poles, along coasts, and those reliant on glacier melt for water are likely to experience more weather volatility and the worst effects of climate change. In most of these cases, vulnerability is made worse by poverty, bad governance, and past conflict in societies already riven by sectarian strife.[15] And for low-lying island nations, climate change poses an existential risk that may make those countries uninhabitable, requiring eventual resettlement of their populations.[16]

For practitioners, this emergent interest in climate and security has a number of problems. Most analyses focus their energies on causal connections and problem justification rather than on what should be done. We ultimately need to move beyond diagnosis to prescription and begin to identify the appropriate strategies and policies to minimize the adverse security consequences of climate change, particularly for the world's poor. However, understanding the nature of the climate-security challenge does have important policy implications. The existing discussion of climate and security has largely focused on whether or not climate change will cause conflict. If practitioners focus on the climate-conflict connection, they may end up overlooking or minimizing more likely security consequences—large-scale disasters that create humanitarian emergencies for which military assets will be frequently mobilized, unless there is significant investment in adaptation and risk reduction.

This chapter proceeds in three steps. The first section provides an overview of the climate security literature, with a critique of the excessive focus on conflict and an argument for why natural disasters could be a more imminent security challenge for practitioners.[17] The second section provides a bit more context to the nature of the challenge, describing the impact of disasters and the actions that have been taken to reduce their risks. The third section then identifies what different actors should do to minimize the adverse security consequences of climate change, beginning with the international community, then considering regional organizations and national governments, before finally turning to the role of nonstate actors, including philanthropies, NGOs, and businesses.

Climate and Security: The State of the Literature

In June 2007, UN secretary-general Ban Ki-moon made the audacious claim that the situation in Darfur, Sudan, was perhaps the first war sparked by

climate change (he did not quite say that, but that was how the media reported it). "Amid the diverse social and political causes," he said, "the Darfur conflict began as an ecological crisis, arising at least in part from climate change." Here, the secretary-general was alluding to the droughts of the 1980s that brought nomadic herders into conflict with more settled agriculturalists over grazing rights in this part of Sudan.[18]

This assertion was hotly contested among a number of Sudan experts, most notably Alex de Waal, who wrote: "But depleted natural resources and livelihood transformations cannot on their own account for conflict, let alone armed conflict. The most important culprit for violence in Darfur is government, which not only failed to utilize local and central institutions to address the problems of environmental stress in Darfur, but actually worsened the situation through its militarized, crisis management interventions whenever political disputes have arisen."[19]

Idean Salehyan echoed de Waal's skepticism: "Furthermore, if famine and drought led to the crisis in Darfur, why have scores of environmental catastrophes failed to set off armed conflict elsewhere?"[20] David Victor brought forward another frequent critique of this literature—that it is merely a polemic to get policy heavyweights to pay attention: "Serious thinking about climate change must recognize that the 'hard' security threats that are supposedly lurking are mostly a ruse. They are good for the threat industry—which needs danger for survival—and they are good for the greens who find it easier to build a coalition for policy when hawks are supportive."[21]

This debate over Darfur is reminiscent of the initial discussion about environmental security that emerged in the 1990s that focused on the connections between environmental scarcity and conflict. The recent upsurge in scholarly and think-tank attention to climate and security has been in keeping with this narrow conception linking climate change to violent conflict. The earlier debate concluded that environmental factors are rarely if ever sufficient to cause conflict, but they can contribute to violence when coupled with other socioeconomic and political dynamics.[22] As Thomas Homer-Dixon (one of the pioneers of that literature) noted in his reply to de Waal, the debate over Darfur comes down to assessments of which causal factors matter more, but because they interact; he argued: "In the case of Darfur, it's pointless to ask about, or to argue over, the relative importance of climate change as a cause of the violence. But based on the evidence available, we can say with considerable confidence that any adequate description or explanation of the crisis must include climate change as a causal factor."[23]

If policymakers want definitive evidence that climate change has caused conflict, will cause conflict, or is an especially important contributor to conflict, they are likely to be disappointed. Even as think-tank reports warn that climate change will become a threat multiplier for instability and possibly contribute to state failure, academics have generally been more circumspect. Social science analytical methods are designed to explain the past. With climate change, we are largely talking about a prospective problem, for which past patterns may be unreliable. As Ragnhild Nordås and Nils Petter Gleditsch wrote in 2007: "Unfortunately, the precision in conflict prediction remains at the stage where meteorology was decades ago: the best prediction for tomorrow's weather was the weather today."[24]

The risk of making sweeping claims about the potential effects of climate change is twofold: making claims that cannot be tested, and a sort of "the sky is falling" alarmism. One way academics have sought to get around this problem is to identify the expected consequences of climate change (rainfall variability, water scarcity, refugees, disasters) and assess whether or not they have historically been correlated with conflict. A focus on more bounded, short-run climate effects allows us to identify the potential security consequences that can be tested empirically. For example, if climate change is likely to lead to more variable precipitation, we can test, as Marc Levy and his colleagues have done, whether or not rainfall volatility has historically been correlated with a higher incidence of violent conflict.[25] At the same time, scholars have challenged each other to think through the precise chain of events that could lead from climate change to conflict.

Migration is one specific mechanism invoked as a potential cause of climate-induced violent conflict. Climate change, through discrete events like hurricanes, is likely to spur large of numbers of people to move either between or within countries. A report from the CNA Corporation, for example, identifies the risk of refugees fleeing Bangladesh to India after intense storms. More gradual processes, such as persistent drought, may also spur migration. Like the Hutu who fled the aftermath of the 1994 Rwandan genocide to the Congo, refugees may cause conflict in recipient countries, either by eliciting a cross-border response from their former country or by clashing with locals. Salehyan and Kristian Gleditsch find that countries experiencing an influx of refugees from neighboring states are significantly more likely to experience civil wars.[26] However, unlike political refugees, Nils Petter Gleditsch and his colleagues caution that climate refugees may not be as prone to organized violence: "Purely environmental migrants . . . often do not have

political agendas in their home region and they do not necessarily regard themselves as victims of persecution deserving justice." Whether or not environmental migration turns violent depends on how local governments handle the inflow of new arrivals.[27] Clionadh Raleigh and Lisa Jordan, for their part, discount the potential of environmental migration to lead to violent conflict, because most migratory movements are local and only temporary.[28]

Another possible mechanism whereby climate change may lead to conflict is through the effects of more variable rainfall, contributing to periodic water scarcity, crop failure, and rising desperation. Studies have sought to get at the specific linkage between climate change and conflict by correlating variability in precipitation with the onset of conflict. Two studies—one by Levy and his colleagues and another by Cullen Hendrix and Sarah Glaser—found that variable rainfall makes the onset of violent conflict more likely as economic conditions drive desperate men to take up arms.[29]

In addition to the potential for conflict related to water variability, natural disasters themselves may make violent conflict more likely. With climate change likely to intensify weather-related disasters, this finding is quite troubling. Early studies suggested disasters could help diminish civil conflicts by producing a rallying effect where former antagonists work together to resolve common problems.[30] Dawn Brancati, by contrast, suggests that only in rare circumstances, as after the 2004 Asian tsunami, will groups involved in conflict be so weak or so profoundly affected by a disaster that they will be less likely to fight on. She argues that disasters foster competition between groups for basic resources—food, water, shelter, relief—thus enhancing the likelihood that conflict will occur. She found that earthquakes make violent conflicts more likely, particularly in poor countries with a history of conflict. Earthquakes also increase the likelihood of rebellions and, to a lesser extent, civil wars, again especially in poor countries with a recent history of conflict. She believes these effects are generalizable to other kinds of natural disasters.[31] Philip Nel and Marjolein Righarts similarly find that disasters enhance the risk of violent civil conflict, particularly in countries with high levels of inequality, mixed regimes, and slow economic growth.[32]

Although several of these studies are suggestive, much more work in this field needs to be done to assess how environmental and sociopolitical sources of vulnerability conjoin and the precise mechanisms by which conflict could come about. For policymakers, the emphasis on whether or not climate change will cause conflict potentially misses an essential point: Conflicts are rare and potentially becoming rarer, even in Africa, the most conflict-affected continent. In 1999, there were sixteen state-based conflicts in sub-Saharan

Table 10-1. Number of People Reported Killed, by Type of Disaster and Level of Development, 1990–2008

			High income			
Disaster	*Non-OECD*	*OECD*	*Low income*	*Lower middle income*	*Upper middle income*	*Total*
Drought	0	0	1,329	2,939	0	4,268
Earthquake (seismic activity)	3	5,965	134,719	392,622	21,906	555,215
Epidemic	515	464	111,989	26,421	2,240	141,629
Extreme temperature	353	76,430	14,143	1,850	6,108	98,884
Flood	229	2,520	67,173	41,129	35,656	146,707
Mass movement, dry	. . .	. . .	136	548	486	1,170
Mass movement, wet	16	655	5,602	7,418	1,582	15,273
Storm	130	7,924	321,376	48,104	2,519	380,053
Volcano	0	76	221	881	26	1,204
Wildfire	0	323	219	398	330	1,270
Total	1,246	94,357	656,907	522,310	70,853	1,345,673

Source: EM-DAT: The OFDA/CRED International Disaster Database, Université Catholique de Louvain, Brussels, Belgium (www.emdat.be [January 2009]).

Africa; by 2006, there were only seven. Moreover, the number of nonstate conflicts in the region—between warring nonstate rebel groups, for example—declined from twenty-eight in 2002 to twelve in 2006.[33] These trends may not last but, as I suggest in the next section, disasters may be a more direct and imminent consequence of climate change that will place demands on security practitioners.

The Effects of Disasters

Between 1991 and 2005, nearly 1 million people were estimated to have lost their lives in natural disasters, with poor countries bearing the burden of almost two-thirds of those deaths (see table 10-1).[34] This was nearly the same number of people who died in battle, including civilians, during that same time period.[35] During this period, the number of people affected by disasters was far larger, nearly 3.5 billion, of which nearly 90 percent were in developing countries (see table 10-2). Floods, like those that have inundated Mozambique and parts of Southern Africa in recent years, accounted for nearly 60 percent of those affected by disasters.[36] These numbers led one study to claim that far more people were affected by disasters each year than armed conflict.[37] Moreover, though total economic damages were larger in rich developed countries, the effects on poor countries can be especially devastating as a proportion of gross domestic product (GDP).[38] In addition, foreign

Table 10-2. Number of People Reported Affected, by Type of Disaster and Level of Development, 1990–2008

Disaster	*High income: non-OECD*	*High income: OECD*	*Low income*	*Lower middle income*	*Upper middle income*	*Grand total*
Drought	0	13,000,000	534,357,000	392,142,000	28,470,000	967,969,000
Earthquake (seismic activity)	3,259	999,957	15,355,600	81,837,900	5,277,250	103,474,000
Epidemic	5,123	621,302	14,514,300	1,378,530	1,263,640	17,782,900
Extreme temperature	500	4,614,640	3,558,880	82,056,800	1,451,910	91,682,800
Flood	33,087	14,909,100	741,945,000	1,553,280,000	14,708,800	2,324,870,000
Insect infestation	0	0	200	2,000	2,200	
Mass movement, dry		400	9,577	2,819	12,796	
Mass movement, wet	1,776	18,417	2,227,520	1,046,550	257,376	3,551,630
Storm	379,060	22,210,400	96,686,800	445,955,000	7,976,750	573,208,000
Volcano	200	91,620	600,345	2,586,030	253,608	3,531,800
Wildfire	240	1,105,380	73,201	4,187,950	138,393	5,505,170
Grand total	423,245	57,570,800	1,409,320,000	2,564,480,000	59,802,600	4,091,590,000

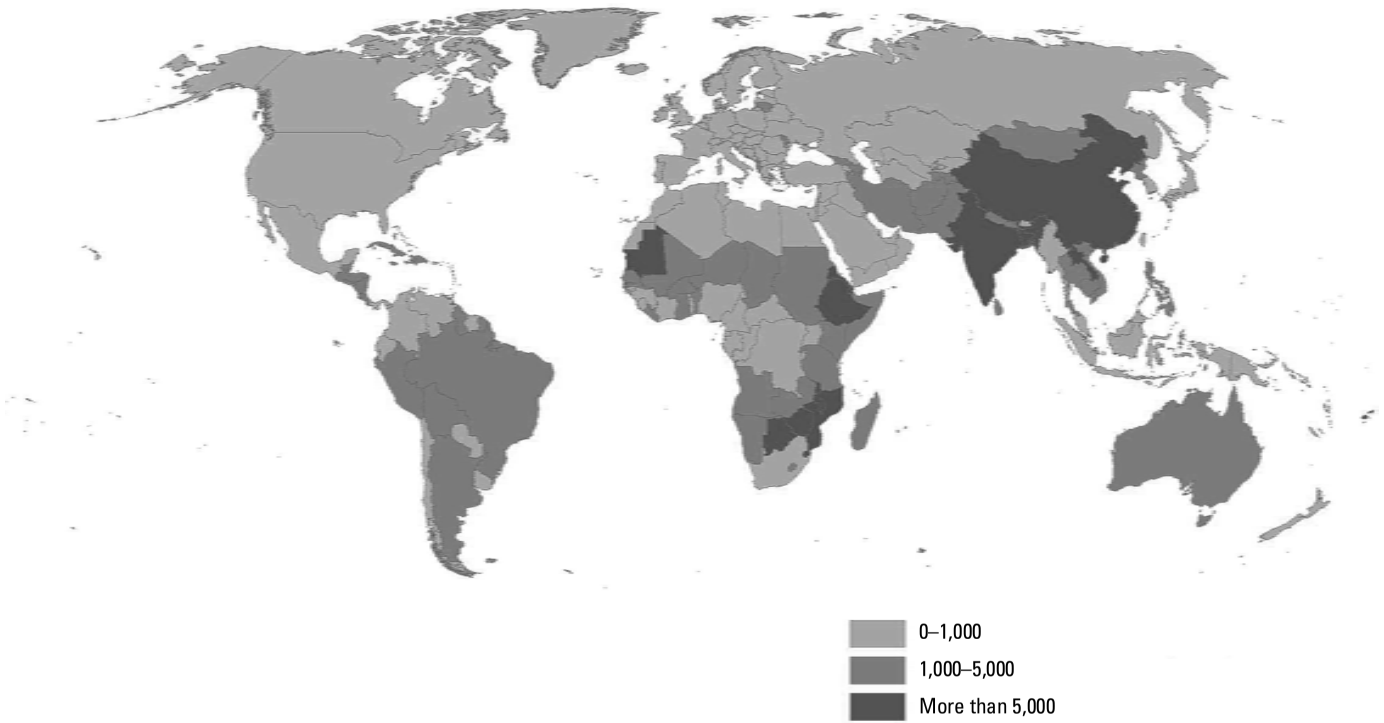
Source: EM-DAT: The OFDA/CRED International Disaster Database, Université Catholique de Louvain, Brussels, Belgium (www.emdat.be [January 2009]).

assistance typically lags far behind the losses from disasters.[39] Africa and Asia have borne a disproportionate share of the effects of disasters on human lives (see figure 10-1).[40]

Although the number of people affected by natural disasters rose over the course of the twentieth and early twenty-first centuries, the number of people killed by natural disasters declined during this period.[41]

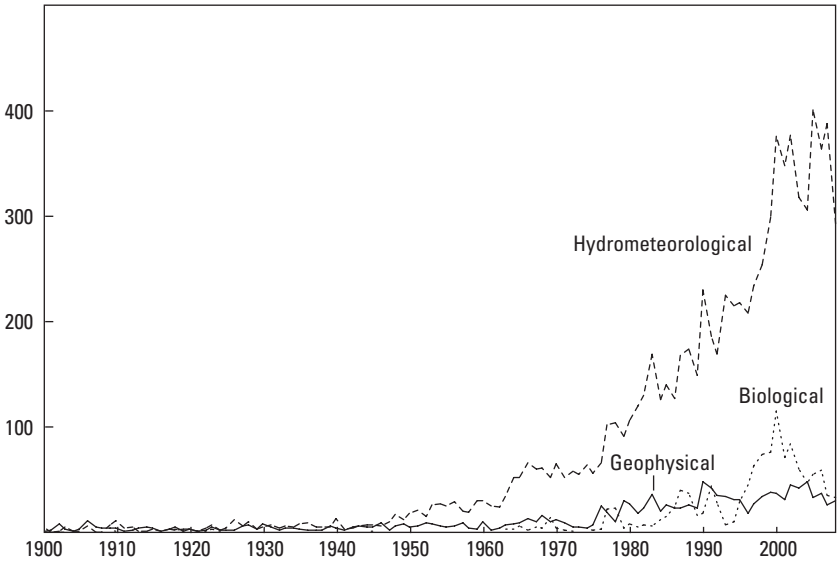
In Africa, for example, reported deaths from disasters fell from 579,452 between 1983 and 1992 to 43,078 between 1993 and 2002.[42] So, though we are getting better at preventing people from dying, more people are having their lives disrupted by disasters. Declining disaster fatalities is a consequence of two related policy successes. On one level, actions to reduce risks—such as early warning systems and better building codes—have ensured that disasters kill fewer people. At the same time, more robust disaster response mechanisms (both internationally and by affected governments and communities) have reduced the number of people who subsequently die from starvation, thirst, injury, and disease. For example, as ill prepared and botched as the effort to protect the dikes in New Orleans in the lead-up to Hurricane Katrina was, fewer than 2,000 people died, despite the dislocation of more than a million people.[43] Higher numbers of people affected by disasters may be a consequence of the rising number of reported hydrometeorological disasters (which may already or soon be made more likely as a consequence of climate change) (see figure 10-2).

Figure 10-1. Total Number of Deaths and People Affected by Natural Disasters, by 100,000 Inhabitants, 1974–2003



Source: EM-DAT: The OFDA/CRED International Disaster Database, Université Catholique de Louvain, Brussels, Belgium (www.emdat.be [January 2009]).

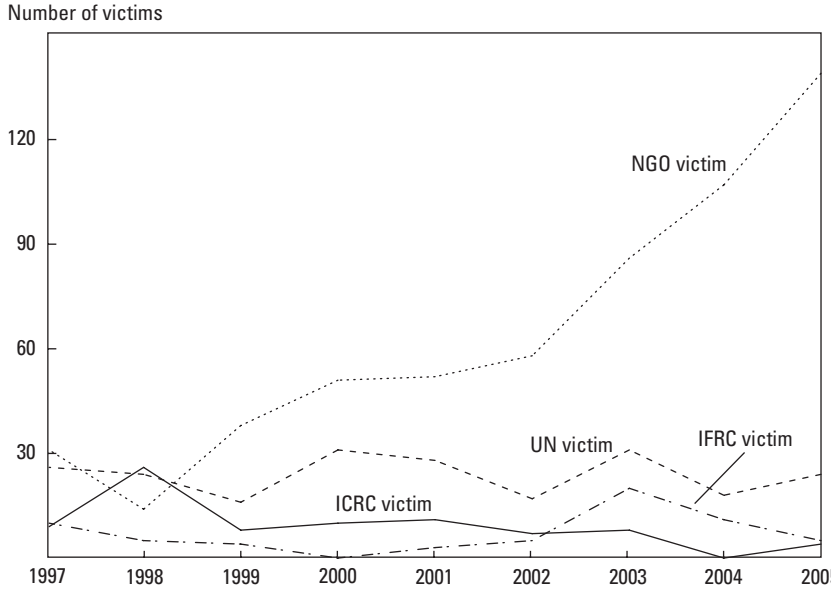
Figure 10-2. The Number of Natural Disasters, 1900–2008



Source: EM-DAT: The OFDA/CRED International Disaster Database, Université Catholique de Louvain, Brussels, Belgium (www.emdat.be [January 2009]).

Disasters are security problems, whether or not they contribute to armed conflict. Mobilization for disaster relief is an increasingly familiar task for many modern militaries.[44] A world with more severe extreme weather, however, poses vexing challenges for continued military mobilization and the broader international community. At some level, the military's sustained engagement in disaster relief, whether at home or abroad, may divert a country's armed forces from essential security tasks elsewhere. Moreover, not all these missions are welcomed by local populations, as the United States discovered to its dismay during Operation Restore Hope in Somalia. When governments, as in Myanmar, are unwilling or unable to respond as they should to disasters, international political friction is more likely, as outside governments and private actors seek to provide aid directly. Under these circumstances, some observers like the journalist Robert Kaplan have called for armed humanitarian relief, or like France's foreign minister (and Doctors Without Borders cofounder) Bernard Kouchner for an extension of the responsibility to protect for disaster relief.[45] However, as former U.S. secretary of state Madeleine Albright argued in a June 2008 opinion piece, the

Figure 10-3. Trends in Total Numbers of Victims, by Institution, 1997–2005



Source: Abby Stoddard, Adele Harmer, and Katherine Haver, *Providing Aid in Insecure Environments: Trends in Policy and Operations—Summary of Quantitative Analysis* (New York: Center on International Cooperation, and London: Overseas Development Institute, 2006) (www.cic.nyu.edu/internationalsecurity/docs/aidworkes_final.pdf [September 2008]).

Note: ICRC = International Committee of the Red Cross; IFRC = International Federation of Red Cross and Red Crescent Societies; RC = Red Cross; NGOs = nongovernmental organizations.

political support for humanitarian intervention has suffered in recent years: "The notion of national sovereignty as sacred is gaining ground, helped in no small part by the disastrous results of the American invasion of Iraq."[46] What is more, aid workers themselves are increasingly becoming targets. In the first half of 2008, more than twenty aid workers were killed in Somalia in a deliberate campaign of intimidation, despite an ongoing drought.[47] This is part of a larger trend of increased attacks and fatalities among aid workers, particularly among NGO workers (see figure 10-3).

The encroachment by the military on humanitarian endeavors makes the development-and-relief community uneasy. At the same time, when we think of "security," too often we think of what the military can do. In the context of potentially diminished enthusiasm for intervention and the broader politicization of emergency aid, preventive strategies of risk reduction and enabling more localized resilient response, tasks only peripherally relevant to

militaries, become all the more important. Though Myanmar represented an extreme situation, given the outsized paranoia of the country's ruling elite, this episode demonstrated the poverty of a primarily military approach to disaster management. At the same time, Myanmar's experience showed the need for improved information collection and sharing, as well as better early warning and risk reduction systems and more robust protocols for international disaster assistance, even with pariah regimes.

Climate Risk Reduction and Dealing with Disasters

Because, sadly, some climate change is already inevitable, we need to prepare for its likely consequences, including the swift onset of extreme weather events and more slow-moving disasters like droughts. When disasters exceed the capabilities of local civilian police, fire, and rescue, there are few options other than emergency military and humanitarian mobilization or leaving people to fend for themselves, as Myanmar largely did. If we focus our energies on disaster response (which is part of the equation), we have waited too long—people are dead, lives are disrupted, infrastructure is damaged, and communities can become desperate or resentful or both. Postdisaster environments are going to be the dangerous moments when mishandled or inadequate disaster response can give way to the kinds of lingering grievances that motivate people to take up arms.

A modest investment in risk reduction and adaptation in poor countries will likely be much more cost-effective and security enhancing than responding to humanitarian disasters through military and relief operations. One estimate from the U.S. Geological Survey and the World Bank suggested an investment of $40 billion would have prevented worldwide disaster losses of $280 billion in the 1990s. Between 1960 and 2000, the Chinese spent $3.15 billion on flood control and averted losses of an estimated $12 billion.[48] Despite this favorable cost-benefit ratio, the world currently spends too little on adaptive strategies that would reduce climate risk and the risks of disasters. In 2006, for example, only 4 percent of the estimated $10 billion in humanitarian assistance was spent on disaster prevention, even though each $1 spent on prevention could save between $5 and $10 in economic losses from disasters.[49]

Why is there so little interest in risk reduction and adaptation? On one level, humanity generally—though not always—seems to be a reactive species, waiting for crises to happen. With respect to climate change adaptation (which involves such mundane measures as early warning systems, better

building codes, coastal defenses, and the development of water resistant crops), it has been wrongly perceived as a competitor to climate change mitigation. Supporters of a more robust climate policy have been unenthusiastic about adaptation because they fear it would signal that the world had given up on greenhouse gas emissions reductions. Though the world cannot adapt its way out of the climate change problem (the consequences for most countries would ultimately be too severe), adapt we must. The antiadaptation attitude has started to change, but unless the change is accelerated, the international community, regional organizations, and affected countries will be forced to expend greater effort later on, including calling upon military assets, to compensate for inadequate risk reduction and disaster response capabilities.

The International Community

Even before the climate community had fully appreciated the connection between climate change and disasters, the international community, largely through the auspices of the United Nations, had already increasingly become engaged on the subject of disaster risk reduction. Since 2001 the UN's Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UN/ISDR) has coordinated efforts among the UN system, regional and international organizations, governments, and nonstate actors to reduce the risks posed by disasters. In January 2005, the Second World Conference on Disaster Reduction took place in Kobe. There, participants reviewed the 1994 Yokohama Strategy on natural disasters and established the Hyogo Framework for Action for the next decade. UN/ISDR's objective has been to "mainstream" disaster risk reduction into country-level planning efforts. Government agencies as diverse as finance, health, and housing all should be thinking about how disasters might effect their area of responsibility and how to incorporate risk reduction as a normal part of doing business. In recent years, the UN/ISDR agenda for disaster risk reduction has intersected with climate change, and the two communities have increasingly tried to synchronize their agendas.

Internationally, however, there are scant funds for climate change adaptation or disaster risk reduction. Estimates of poor countries' needs for adaptation run into the billions of dollars. As of 2008, however, the level of resources available for adaptation was but in the hundreds of millions (see chapter 11 in this volume by Bapna and McGray). Interestingly, the United States has not contributed to the primary adaptation funds that have been created, which are managed by the World Bank's Global Environment Facility (GEF).

In addition to the GEF-administered adaptation funds, the World Bank also manages the small, disaster-specific Global Facility for Disaster Reduction and Recovery (GFDRR). Coming out of the 2005 international conference on disaster reduction in Japan, the GFDRR was created in 2006 as a partnership between the World Bank and UN/ISDR to support disaster risk reduction and response. As of June 2008, the GFDRR had received modest contributions of $78 million, including $15 million of the Bank's own resources. Again, the United States, as of this writing, has not contributed anything.[50] One of the highest priority areas for the GFDRR is to support more detailed vulnerability assessments, not just which countries are the most vulnerable to disasters but also the subregions that are subject to disaster risk. Such efforts will almost surely improve the "guesstimates" of the likely costs of adaptation. An important preliminary effort was developed by Columbia University, which identified more than eighty disaster hot spots where more than 30 percent of the country's GDP was at risk to two more or natural disasters.[51] The GFDRR has targeted these hot spot countries to support the incorporation of disaster risk reduction into national planning.

A key difficulty for many poor countries is the lack of capacity and information on disaster risks, including tracking basic meteorological information. Though rich countries like the United Kingdom and the Netherlands have six or more meteorological stations per 10,000 square kilometers, many African countries are lucky if they have one. Ethiopia's meteorological budget was but $2 million in 2005.[52] Malawi's was less than $1 million; its meteorologists described their meager setup as follows: "Broken equipment, outmoded technology, slipshod data and a sparse scattering of weather stations are all that this national agency can manage on a $160,000 budget."[53] Outside support coupled with concerted and creative local efforts can partially overcome these obstacles. Mali's government, for example, successfully used simple rain gauges to collect better data on rainfall and worked with local farmers' organizations and NGOs to disseminate that information to improve agricultural planning.[54]

Given that tens of billions of dollars in additional resources will soon be needed for climate change adaptation, what should be done to facilitate larger sums of international assistance? Though adaptation was a high priority at the Bali Conference of the Parties (COP) on the United Nations Framework Convention on Climate Change in December 2007, the world has been in something of a holding pattern waiting for the George W. Bush administration to wind down. In 2009, with Barack Obama the new U.S. president, there will be high expectations that the Copenhagen COP will

provide critical guidance on the future of the climate regime, including adaptation. Two related problems appear likely. Given the GEF's undistinguished track record in transferring large amounts of resources (and its unpopularity with developing countries), it is unclear that the GEF can be the sole conduit for adaptation funds. As with HIV/AIDS relief, donor countries will likely wish to channel a significant portion of funding through bilateral relationships. However, similar to other areas of development assistance, these will likely be subject to significant limits of absorptive capacity among recipient countries. This could become yet another area in which developing countries seek unrealistic sums of resources that donors are not prepared to give and poor countries are not prepared to receive.

On the giving side, linking funding for climate change adaptation to Clean Development Mechanism (CDM) credits under the Kyoto Protocol will likely create a more reliable stream of support than sums subject to annual foreign aid appropriations. When the United States adopts a domestic cap-and-trade system, it should reserve a portion of the funds generated from allowances for both domestic and international adaptation. Other donors and developing countries should use whatever diplomatic leverage they can to entreat the United States to make that kind of dependable funding stream available. A determined President Obama may secure Congress's blessing for a cap-and-trade scheme by the latter part of 2009. In that event, the 2009 Copenhagen COP must include discussion of how American companies can potentially participate in the CDM (or some successor regime) going forward, if the United States becomes a party to the post-2012 regime. Breakthroughs on eventual U.S. participation in the CDM would provide another stream of revenue for adaptation.

But even if these funds are made available, aid absorption will still be a significant problem. Channeling all the resources through traditional aid mechanisms would likely end in tears, either in a disappointingly slow or low-level scaling up of activities and a fair amount of aid diversion, either by tied aid to Western companies or by corrupt governments. To guard against these problems, donors ought to focus on how to link adaptation finance to private sector and large-scale public investments in developing countries, particularly but not exclusively to climate-proof new infrastructure investments. These measures should be accompanied by transparency mechanisms so that mass publics can follow the funds through the system. In addition, the World Bank, the World Food Program, and the GFDRR have experimented with supporting the development of insurance markets in poor countries, helping countries like Ethiopia and Haiti and farmers in the Mekong Delta purchase

insurance.[55] It is unclear if insurers will ultimately balk at providing these services to poor countries that are vulnerable to increasing weather events. That said, donors should continue to experiment with such insurance schemes. As the United Nations Development Program noted, conditional cash transfers could be linked to a greater degree with climate disasters. In this setting, people living in vulnerable areas or already affected by disasters might receive assistance if they engage in some other socially desirable activity, either ones directly related to disaster risk reduction or a tangentially related issue such as inoculating their children.[56]

While authorities recognize that risk reduction must be the main focus to minimize the negative security externalities of climate change, some disasters will inevitably be too large to be completely contained by early action. Warning systems and vulnerability assessments will help policymakers identify the places most susceptible to climate risks. However, environmental vulnerability is only a part of total vulnerability. In 2004, the Brookings scholar Nigel Purvis and I recommended that "the emerging early warning systems in the disaster reduction community must take political indicators of vulnerability, such as the repressive nature of political regimes and other governance factors, more fully into account."[57]

Scholars at Columbia University provided an important first cut at that kind of analysis as an input into the National Intelligence Council's assessment on the security risks of climate change for the United States. In a July 2008 working paper, the Columbia team looked at three measures of environmental vulnerability: (1) the size and percentage of the population located near coastal areas, (2) countries with low adaptive capacity at different ranges of projected temperature increases, and (3) countries facing water scarcity. They studied the intersection of that analysis with countries vulnerable to political risk, looking at three criteria: (1) whether the countries were located in dangerous neighborhoods, (2) those that had a history of crisis, and (3) those that had low capacity. Interestingly, countries with high risk factors for instability and coastal vulnerability were largely located in Asia, including China, India, the Philippines, and Indonesia, whereas many of the countries with low adaptive capacity subject to aggregate temperature increases were located in North Africa, including Morocco, Tunisia, and Sudan. Many of the countries subject to water scarcity and political risk were located in Africa, including Ethiopia, Mozambique, and Nigeria (see table 10-3 for a more complete list).[58] On the basis of data from countries with a high population, a low GDP, and a history of a high number of disasters, Raleigh and Jordan found that a number of countries in Africa and Asia are particularly

Table 10-3. The Countries Most Vulnerable to Climate and Political Risks

Coastal population exposure		*Aggregate temperature changes*	*Water scarcity*
Population exposed	*Percentage of population*		
China, Philippines, India, Indonesia	Philippines, Egypt, Indonesia	South Africa, Nepal, Morocco, Bangladesh, Tunisia, Paraguay, Yemen, Sudan, Côte d'Ivoire	Mozambique, Côte d'Ivoire, Nigeria, Iraq, Guatemala, Zimbabwe, Ethiopia, Somalia, China, Syria, Algeria

Source: Marc A. Levy, Bridget Anderson, Melanie Brickman, Chris Cromer, Brian Falk, Balazs Fekete, Pamela Green, Malanding Jaiteh, Richard Lammers, Valentina Mara, Kytt MacManus, Steve Metzler, Maria Muñiz, Thomas Parris, Randy Pullen, Catherine Thorkelson, Charles Vorosmarty, Wil Wollheim, Xiaoshi Xing, and Greg Yetman, *Assessment of Select Climate Change Impacts on U.S. National Security* (New York: Center for International Earth Science Information Network, Columbia University, 2008) (www.ciesin.columbia.edu/documents/Climate_Security_CIESIN_July_2008_v1_0.ed.pdf [January 2009]).

vulnerable to certain kinds of disasters: floods, droughts, and windstorms (see table 10-4 for their list).[59] This research agenda will benefit from refinement, but in the meantime, disaster-risk donors and national security experts at a minimum should pay special attention to the countries that fall in this risk cohort.

Regional and National Action on Risk Reduction and Response

Although the mobilization of enhanced resources for climate change adaptation and the evaluation of climate risk by the international community are critical, regional organizations and action can also help facilitate more effective risk reduction and response. Though neighbors may sometimes be on unfriendly terms, regional allies and organizations are often perceived as less threatening than the international community or Western countries. And, while it might be tempting for the United Nations to discuss extending the responsibility to protect for disaster response, the further politicization of humanitarian relief would probably be counterproductive and make the Red Cross and other NGO providers fatter targets for violent reprisals. More effective action might be taken at a regional level by identifying at-risk countries and seeking more technocratic treatment of disaster preparedness and response. In the wake of Cyclone Nargis, for example, the Thai government has offered to help establish an early warning system in Myanmar.[60]

Many disaster risks extend beyond borders or have the potential for negative spillover effects, giving regional partners an added incentive to help their neighbors. Given the proximity of Bangladesh and India, and Bangladesh's history of coastal flooding and refugee movements, both countries have a

Table 10-4. The Countries Most Vulnerable to Disasters

Droughts	*Floods*	*Windstorms*
Burkina Faso, Mozambique, Rwanda, Somalia, Tanzania	Afghanistan, Bangladesh, Malawi, Mozambique, Nepal, Nigeria, Somalia, Sudan, Tanzania	Bangladesh, Madagascar, Mozambique

Source: Clionadh Raleigh and Lisa Jordan, "Climate Change, Migration, and Conflict," paper presented at American Political Science Association meeting, Boston, 2008.

stake in improving Bangladesh's disaster preparedness. Because nearly half of Bangladesh's population lives within 10 meters of sea level, the situation may not be easily soluble and could lead to tension between the two countries, as has already occurred since India has built a border fence.[61]

Western militaries and regional organizations can play a less controversial role: conducting training exercises with local militaries in disaster assistance. In the wake of the Myanmar cyclone and China's earthquake, the Chinese and American militaries, for example, plan to conduct joint humanitarian relief training missions in 2009.[62] In the 1990s, the U.S. Department of Defense also organized a number of trust-building environmental security workshops in Central Asia, the Middle East, and Africa. Southcom, the U.S. regional military command for Latin America, has oriented its operations around missions like disaster relief. Africom, the regional command for Africa that was formally inaugurated in October 2008, was set to model its efforts on Southcom.[63] The U.S. military would be well advised to resurrect those training workshops, with a special emphasis on training African militaries for disaster preparedness.[64]

Risk Reduction and the Roles of Nonstate Actors

Security issues are typically viewed through a state-centric lens, but nonstate actors—NGOs, businesses, and private philanthropy—all have hugely important roles in facilitating disaster risk reduction and resilient responses at all levels, from the local community to the nation-state to regions and beyond. NGOs are among the most important service providers of relief. Space forbids a comprehensive review of this sector, but one institution in particular has a special role to play in this area: the Bill and Melinda Gates Foundation.

The Bill and Melinda Gates Foundation has thus far largely resisted pressure from Al Gore, Jeffrey Sachs, and other leaders in the international community to embrace a widened issue focus on climate change mitigation

and/or adaptation, but it should rethink its resistance. Every natural disaster potentially undoes much, if not all, of the foundation's good work in public health and development. The foundation would benefit from a more robust climate adaptation emphasis in both its development and health operations. Though the Gates Foundation may not have a comparative knowledge advantage in climate change mitigation, adaptation is a closer fit with its expertise and mission. It already has made a few grants to support adaptation measures, including research into drought-tolerant maize in Africa, as well as several grants to NGOs providing disaster relief.[65] Moreover, with its legal imperative to distribute 5 percent of its endowment annually, including the influx of Warren Buffett's huge donation, the foundation needs to give away more than $3.5 billion a year—an especially tall order.[66] It may well need new sectors that can absorb large amounts of resources. Finally, the Gates Foundation is now the outsized player in the foundation world, the largest in the United States and by some measures in the entire world.[67] Though governments still possess greater resources to dedicate to global causes, the Gates Foundation has the capacity to lead by example, signaling where the good bets are to other donors, including governments. For example, the Gates Foundation was one of the early champions of the Global Fund to Fight AIDS, Tuberculosis, and Malaria, pledging $100 million in 2001 to help legitimate it and get it off the ground.[68] With the World Bank's adaptation and disaster funds lagging in visibility and resources, a Gates Foundation grant of significant size could challenge the public sector, particularly in the United States under a new president, to match and exceed that effort.

Among the efforts that the private sector—including but not limited to the Gates Foundation—can take to enhance the adaptation agenda are supporting local community groups in their efforts to more effectively communicate disaster risks. The GDFRR, for example, has supported innovative efforts such as television programs highlighting disaster risks. Patrick Meier has written about the capacity for local viral self-organizing efforts by communities to protect themselves from and respond to disasters. He writes of nonviolent guerrilla communication strategies, taking advantage of the latest in mobile telephone and satellite technology, even in places like Myanmar.[69] Indeed, as David Rieff has pointed out, the Burmese people's capacity for self-help actually prevented the worst fears of the NGO community from being realized.[70] Though formal systems of disaster preparedness are important, donors may profit from more diffuse efforts to support community organization, disaster consciousness, and communication technologies that will lead to unexpected capacities by vulnerable communities to get the word

out and protect themselves.[71] Businesses have a fiduciary imperative to protect themselves, and they should begin to internalize climate risks in all aspects of their investment strategies. And lest private firms be deterred from investing in countries with potential climate risks, the public sector may need to incorporate additional support for disaster risks in export credit guarantee programs.

Conclusion

This chapter has focused on an aspect of the climate-security connection, emphasizing the importance of preventive disaster risk reduction as a means of avoiding (or at least reducing the incidence of) the costly mobilization of military assets for humanitarian relief. The operating assumption has been that climate change would more likely yield this sort of security externality than contribute to the increased incidence of violent conflict. That said, if the emergent academic discussion of the links between likely climate change consequences and conflict is right, then the strategies discussed here should also make an important contribution to conflict prevention. This has enormous significance for the poor, who already are likely to bear the brunt of climate change. As Paul Collier found in his research for his book *The Bottom Billion,* one of the best predictors of poverty is past incidence of conflict.[72] Therefore, strategies designed to reduce the potential for conflict will also redound to a country's capacity to become wealthy. In this context, climate change adaptation and risk reduction will not only insulate poor countries and communities from the direct impact of climate change on their lives and livelihoods but also have an indirect impact on their long-term well-being and security.

Notes

1 Associated Press, "UNICEF: Burma Cyclone Recovery Proceeding Well," *USA Today,* July 7, 2008 (www.usatoday.com/news/world/2008-07-07-Burma-recovery_N.htm [September 2008]).

2. Reuters, "Burma Cyclone Death Toll 'Hits 22,000,'" ABC News, May 6, 2008 (www.abc.net.au/news/stories/2008/05/06/2237290.htm [September 2008]).

3. Robert D. Kaplan, "Aid at the Point of a Gun," *New York Times,* May 14, 2008 (www.nytimes.com/2008/05/14/opinion/14kaplan.html [September 2008]).

4. Simon Montlake, "Asian, Apolitical NGOs Get Better Access in Burma (Myanmar)," *Christian Science Monitor,* May 17, 2008 (www.csmonitor.com/2008/0517/p04s01-woap.html [September 2008]).

5. The delivery of U.S. humanitarian aid by air, which was more easily controlled, was still allowed.

6. Merle D. Kellerhaus Jr., "U.S. Navy Ships to Begin Withdrawing from Burma Coast June 5," America.gov, June 4, 2008 (www.america.gov/st/peacesec-english/2008/June/20080604110925dmslahrellek0.9681665.html [September 2008]).

7. A 2007 Working Group report by the Intergovernmental Panel on Climate Change concluded that "confidence has increased that some weather events and extremes will become more frequent, more widespread and/or more intense during the 21st century." All are likely continuations of trends already observed at the end of the twentieth century. Intergovernmental Panel on Climate Change, *Fourth Assessment Report: Climate Change 2007—The Physical Science Basis* (http://ipcc-wg1.ucar.edu/wg1/wg1-report.html [September 2008]).

8. Scientists do not attribute single weather events like Nargis to climate change; at most, they would say that climate change makes extreme storms like Nargis more likely. Whether climate change has been responsible for an increase in both the severity and number of hurricanes and tropical cyclones is one of the most hotly debated subjects in the scientific community. For an overview, see Chris Mooney, *Storm World: Hurricanes, Politics, and the Battle over Global Warming* (Orlando: Harcourt, 2007).

9. Publications included reports from several U.S. think tanks: the CNA Corporation, a joint report from the Center for a New American Security and the Center for Strategic and International Studies, as well as a special report for the Council on Foreign Relations by this author: Josh Busby, *Climate Change and National Security: An Agenda for Action* (New York: Council on Foreign Relations, 2007) (www.cfr.org/publication/14862 [September 2008]); Kurt M. Campbell, Jay Gulledge, J. R. McNeill, John Podesta, Peter Ogden, Leon Fuerth, R. James Woolsey, Alexander T. J. Lennon, Julianne Smith, Richard Weitz, and Derek Mix, *The Age of Consequences* (Washington: Center for Strategic and International Studies and Center for a New American Security, 2007) (www.csis.org/media/csis/pubs/071105_ageofconsequences.pdf [September 2008]); CNA Corporation, *National Security and the Threat of Climate Change* (Washington: CNA Corporation, 2007) (http://securityandclimate.cna.org/report/ [September 2008]). See also Josh Busby, "Climate Change and Security: A Credible Connection?" *Disarmament Times,* Fall 2007, 2–3, 8; Josh Busby, *Addressing the Security Consequences of Climate Change,* Atlantic Community.org, 2007 (www.atlantic-community.org/index/articles/view/Addressing_the_Security_Consequences_of_Climate_Change [September 2008]); Joshua Busby, "Under What Conditions Could Climate Change Pose a Threat to U.S. National Security?" in *Global Climate Change: National Security Implications,* ed. Carolyn Pumphrey (Durham, N.C.: Triangle Institute for Security Studies, 2008), 142–54. Think tanks and institutes from Canada, the United Kingdom, and Germany also weighed in: Cleo Paskal, *How Climate Change Is Pushing the Boundaries of Security and Foreign Policy* (London: Chatham House, 2007) (www.chathamhouse.org.uk/publications/papers/view/-/id/499/ [September 2008]); German Advisory Council on Global Change, *Climate Change as a Security Risk: Summary for Policymakers* (Berlin: German Advisory Council on Global Change, 2007) (www.wbgu.de/wbgu_jg2007_kurz_engl.html [September 2008]); Oli Brown, Alec Crawford, and Christine Campeau, *Environmental Change and the New Security Agenda: Implications for Canada's Security and the Environment* (Winnipeg: International Institute for Sustainable Development, 2008) (www.iisd.org/pdf/2008/env_change_security_canada.pdf [September

2008]). Articles on the topic appeared in prominent journals like *Foreign Affairs, Survival,* and the *Washington Quarterly:* Scott Borgerson, "Arctic Meltdown," *Foreign Affairs,* March 2008 (www.foreignaffairs.org/20080301faessay87206/scott-g-borgerson/arctic-meltdown.html [September 2008]); John Podesta and Peter Ogden, "The Security Implications of Climate Change," *Washington Quarterly,* Winter 2008 (www.twq.com/08winter/docs/08winter_podesta.pdf [September 2008]).

10. For a summary of these discussions, see Josh Busby, "Who Cares about the Weather? Climate Change and U.S. National Security," *Security Studies* 17, no. 3 (2008): 468–504.

11. UN Security Council, *Security Council Holds First-Ever Debate on Impact of Climate Change on Peace, Security, Hearing over 50 Speakers* (New York: United Nations, 2007) (www.un.org/News/Press/docs/2007/sc9000.doc.htm [September 2008]).

12. Javier Solana, "Climate Change and International Security: Paper from the High Representative and the European Commission to the European Council," European Commission, 2008 (www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/reports/99387.pdf [September 2008]).

13. In March 2007, Senators Richard J. Durbin (D-Ill.) and Chuck Hagel (R-Neb.) introduced a bill requesting a National Intelligence Estimate to assess whether and how climate change might pose a national security threat; Dick Durbin, "Statement of Introduced Bills and Joint Resolutions" (www.fas.org/irp/congress/2007_cr/s1018.html [September 2008]).

14. Thomas Fingar, *National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030* (Washington: Director of National Intelligence, 2008) (www.dni.gov/testimonies/20080625_testimony.pdf [September 2008]).

15. Many of these concerns were anticipated by Nigel Purvis and Josh Busby, *The Security Implications of Climate Change for the UN System* (Washington: Woodrow Wilson International Center for Scholars, 2004) (www.wilsoncenter.org/topics/pubs/ecspr10_unf-purbus.pdf [September 2008]).

16. Ilan Kelman, "Island Security and Disaster Diplomacy in the Context of Climate Change," *Les Cahiers de la Sécurité* 63 (2006): 61–94.

17. For a more detailed assessment of these arguments, see Busby, "Who Cares about the Weather?"

18. Ban Ki-moon, "A Climate Culprit in Darfur," *Washington Post,* June 15, 2007 (www.washingtonpost.com/wp-dyn/content/article/2007/06/15/AR2007061501857_pf.html [September 2008]). Most scientists would shy away from attributing a single incident to human-induced climate change, claiming only that climate change would make events like this one more likely.

19. Alex de Waal, *Is Climate Change the Culprit for Darfur?* (New York: Social Science Research Council, 2007) (www.ssrc.org/blog/2007/06/25/is-climate-change-the-culprit-for-darfur/ [September 2008]).

20. Idean Salehyan, "The New Myth about Climate Change," *Foreign Policy,* August 2007 (www.foreignpolicy.com/story/cms.php?story_id=3922 [September 2008]). For an elaboration of this argument, see Idean Salehyan, "From Climate Change to Conflict? No Consensus Yet," *Journal of Peace Research* 45, no. 3 (2008): 315–32.

21. David G. Victor, "What Resource Wars?" *The National Interest,* November/December 2007 (www.nationalinterest.org/Article.aspx?id=16020 [September 2008]).

22. Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence* (Princeton, N.J.: Princeton University Press, 1999).

23. Thomas F. Homer-Dixon, *Cause and Effect* (New York: Social Science Research Council, 2007) (www.ssrc.org/blogs/darfur/2007/08/02/cause-and-effect/ [September 2008]).

24. Ragnhild Nordås and Nils Petter Gleditsch, "Climate Change and Conflict," *Political Geography,* 26 no. 6 (2006): 633.

25. Marc A. Levy, Catherine Thorkelson, Charles Vörösmarty, Ellen Douglas, and Macartan Humphreys, *Freshwater Availability Anomalies and Outbreak of Internal War: Results from a Global Spatial Time Series Analysis* (Oslo: Human Security and Climate Change Conference, 2005) (www.cicero.uio.no/humsec/papers/Levy_et_al.pdf [September 2008]); Cullen S. Hendrix and Sarah M. Glaser, "Trends and Triggers: Climate Change and Civil Conflict in Sub-Saharan Africa," *Political Geography* 26, no. 6 (2007): 695–715.

26. Idean Salehyan and Kristian Skrede Gleditsch, "Refugee Flows and the Spread of Civil War," *International Organization* 60, no. 2 (2006): 335–66.

27. On climate-change-induced migration as a plausible cause of interstate conflict, see Nils Petter Gleditsch, Ragnhild Nordås, and Idean Salehyan, *Climate Change and Conflict: The Migration Link* (New York: International Peace Academy, 2007) (www.ipacademy.org/asset/file/169/CWC_Working_Paper_Climate_Change.pdf [September 2008]).

28. Clionadh Raleigh and Lisa Jordan, "Climate Change, Migration and Conflict," paper presented at meeting of American Political Science Association, Boston, 2008.

29. Levy et al., *Freshwater Availability Anomalies*; Hendrix and Glaser, "Trends and Triggers."

30. For an exploration of these questions, see www.disasterdiplomacy.org.

31. Dawn Brancati, "Political Aftershocks: The Impact of Earthquakes on Intrastate Conflict," *Journal of Conflict Resolution* 51, no. 5 (2007): 715–43.

32. Philip Nel and Marjolein Righarts, "Natural Disasters and the Risk of Violent Civil Conflict," *International Studies Quarterly* 52, no. 1 (2008): 159–85.

33. Human Security Report Project, *Human Security Report 2008* (www.humansecurity brief.info [September 2008]).

34. UN Inter-Agency Secretariat of the International Strategy for Disaster Reduction, *Disasters Statistics 1991–2005: Disasters Impact* (www.unisdr.org/disaster-statistics/impact-killed.htm [September 2008]).

35. According to the Uppsala–International Peace Research Institute battle deaths data set, there were an estimated 1,069,579 battle deaths between 1991 and 2005. "Battle deaths" include all people, both soldiers and civilians, killed in combat. The data set has a high, low, and "best' estimate of battle deaths, and the number here reflects the "best" estimate. Center for the Study of Civil War, *Battle Deaths Data* (Oslo: International Peace Research Institute / PRIO, 2007) (www.prio.no/CSCW/Datasets/Armed-Conflict/Battle-Deaths/ [September 2008]).

36. UN Inter-Agency Secretariat of the International Strategy for Disaster Reduction, *Disasters Statistics 1991–2005: Disasters Impact—Number of People Reported Affected by Natural Disasters, 1991–2005* (www.unisdr.org/disaster-statistics/impact-affected.htm [September 2008]).

37. Between 1990 and 1999, one report estimated that 188 million people per year were affected by natural disasters, six times more than the 31 million affected by armed conflict. The report defined "affected by natural disaster" as those people who for a time either lost their home, animals, their crops, their livelihoods, or their health as a result of a natural disaster. UN Inter-Agency Secretariat of the International Strategy for Disaster Reduction, *Living with Risk: A Global Review of Disaster Reduction Initiatives* (Geneva: United Nations, 2003) (www.unisdr.org/eng/about_isdr/basic_docs/LwR2003/lwr-03-ch2-2-eng.htm#1 [September 2008]).

38. The World Bank estimated that between 1990 and 2000, natural disasters resulted in damages constituting between 2 to 15 percent of exposed countries' annual GDP. World Bank, *Natural Disasters: Counting the Cost* (Washington: World Bank, 2004) (http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,contentMDK:20169861~pagePK:64257043~piPK:437376~theSitePK:4607,00.html [September 2008]).

39. In the period 1990-2004, disaster losses exceeded foreign assistance by a ratio of 4 to 1. Koko Warner, *PPPs and Disaster Risk Reduction: Economic Benefits and Success Factors* (Washington: World Bank, 2007) (http://siteresources.worldbank.org/INTDISMGMT/Resources/339456-1158594430052/2950719-1172605496630/warner.pdf [September 2008]).

40. EM-DAT: The OFDA/CRED International Disaster Database (http://www.emdat.be/ – Université Catholique de Louvain – Brussels – Belgium [January 2009]).

41. This could be an artifact of better data collection. EM-DAT: The OFDA/CRED International Disaster Database (http://www.emdat.be/ – Université Catholique de Louvain – Brussels – Belgium [January 2009]).

42. Reid Basher and Sálvano Briceño, "Climate and Disaster Risk Reduction in Africa," in *Climate Change and Africa,* ed. Pak Sum Low (Cambridge University Press, 2005), 271.

43. Peter Grier, "The Great Katrina Migration," *Christian Science Monitor,* September 12, 2005 (www.csmonitor.com/2005/0912/p01s01-ussc.html [September 2008]); EM-DAT: The OFDA/CRED International Disaster Database (http://www.emdat.be/ – Université Catholique de Louvain – Brussels – Belgium [January 2009]).

44. The U.S. military, for example, provided relief in the midst of the Somali famine of the early 1990s, after Hurricane Mitch devastated Central America in 1998, after the 2004 torrential rains and mudslides that struck Haiti and later that year in Asia after the tsunami, in the wake of Hurricane Katrina and Hurricane Rita in 2005 and the Pakistani earthquake of that same year, among other operations.

45. Kouchner called on the United Nations to invoke the responsibility to protect after Myanmar's government failed to respond forcefully to the cyclone. The International Crisis Group's Gareth Evans, one of the main champions of the responsibility to protect (where countries would intervene to prevent genocide, crimes against humanity, or war crimes from occurring), initially rejected the extension of the "R2P" for postdisaster situations for fear it would undermine support for the idea. He later seemed to support the idea, seeing the Myanmar government's action as a crime against humanity. Steven Erlanger, "France Urges UN to Force Cyclone Aid on Myanmar," *International Herald Tribune,* May 7, 2008 (www.iht.com/articles/2008/05/07/europe/cyclone.php [September 2008]); Gareth Evans, *Burma/Myanmar: "Facing Up to Our Responsibilities," Gareth Evans*

in The Guardian, International Crisis Group (www.crisisgroup.org/home/index.cfm?id=5430 [September 2008]).

46. Madeleine Albright, "The End of Intervention," *New York Times,* June 11, 2008 (www.nytimes.com/2008/06/11/opinion/11albright.html [September 2008]).

47. Jeffrey Gettleman, "Somali Killings of Aid Workers Imperil Relief," *New York Ti*mes, July 20, 2008 (www.nytimes.com/2008/07/20/world/africa/20somalia.html?hp [September 2008]).

48. U.K. Department for International Development, *Natural Disaster and Disaster Risk Reduction Measures* (London: U.K. Department for International Development, 2005) (www.dfid.gov.uk/pubs/files/disaster-risk-reduction-study.pdf [September 2008]).

49. Eric Schwartz, "A Needless Toll of Natural Disasters," *Boston Globe,* March 23, 2006 (www.boston.com/news/globe/editorial_opinion/oped/articles/2006/03/23/a_needless_toll_of_natural_disasters/ [September 2008]).

50. Global Facility for Disaster Reduction and Recovery, *Global Facility for Disaster Reduction and Recovery: Donor Pledges and Contributions* (http://siteresources.worldbank.org/EXTDISMGMT/Resources/GFDRRDonorPledgesandContributionsJun08.pdf [September 2008]).

51. Maxx Dilley, Robert S. Chen, Uwe Deichmann, Arthur L. Lerner-Lam, Margaret Arnold, Jonathan Agwe, Piet Buys, Oddvar Kjekstad, Bradfield Lyon, and Gregory Yetman, *Natural Disaster Hotspots: A Global Risk Analysis* (Washington and New York: World Bank and Center for International Earth Science Information Network, Columbia University, 2005) (http://sedac.ciesin.columbia.edu/hazards/hotspots/synthesisreport.pdf [September 2008]); Global Facility for Disaster Reduction and Recovery, *Integrating Disaster Risk Reduction into the Fight against Poverty: Annual Report 2007* (Washington: World Bank and UN Inter-Agency Secretariat of the International Strategy for Disaster Reduction (http://gfdrr.org/docs/GFDRR%20Annual%20Report%2007%20FINAL.pdf [September 2008]).

52. United Nations Development Program, *Human Development Report 2007–2008: Fighting Climate Change—Human Solidarity in a Divided World* (New York: United Nations Development Program, 2007), 173–74 (http://hdr.undp.org/en/reports/global/hdr2007-2008/ [September 2008]).

53. Andrew Revkin, "Reports from Four Fronts in the War on Warming," *New York Times,* April 3, 2007 (www.nytimes.com/2007/04/03/science/earth/03clim.html?pagewanted=1 [September 2008]).

54. Watkins, cited by United Nations Development Program, *Human Development Report 2007–2008.*

55. Mark Lacey, "Aid Group Takes Out Insurance on Drought in Ethiopia," *New York Times,* March 7, 2006 (www.nytimes.com/2006/03/07/international/africa/07cndethiopia.html [September 2008]).

56. Watkins, cited by United Nations Development Program, *Human Development Report 2007–2008.*

57. Purvis and Busby, *Security Implications of Climate Change.*

58. Marc A. Levy, Bridget Anderson, Melanie Brickman, Chris Cromer, Brian Falk, Balazs Fekete, Pamela Green, Malanding Jaiteh, Richard Lammers, Valentina Mara, Kytt MacManus, Steve Metzler, Maria Muñiz, Thomas Parris, Randy Pullen, Catherine Thorkelson,

Charles Vorosmarty, Wil Wollheim, Xiaoshi Xing, and Greg Yetman, *Assessment of Select Climate Change Impacts on U.S. National Security* (New York: Center for International Earth Science Information Network, Columbia University, 2008).

59. Raleigh and Jordan, "Climate Change, Migration and Conflict."

60. Xinhua News Agency, "Thailand to Establish Cyclone Warning Network System for Myanmar" (http://reliefweb.int/rw/rwb.nsf/db900SID/KHII-7GC9VA?OpenDocument [September 2008]).

61. Roland Buerk, "Villagers Left in Limbo by Border Fence," BBC (http://news.bbc.co.uk/2/hi/programmes/from_our_own_correspondent/4653810.stm [September 2008]); International Institute for Environment and Development, *Climate Change: Study Maps Those at Greatest Risk from Cyclones and Rising Seas* (London: International Institute for Environment and Development, 2007) (www.iied.org/mediaroom/releases/070328coastal.html [September 2008]).

62. Reuters, "US Eyes Humanitarian Drills with Chinese Military" (www.reuters.com/article/latestCrisis/idUSN16372214 [September 2008]).

63. Thom Shankar, "Command for Africa Is Established by Pentagon," *New York Times,* October 5, 2008 (www.nytimes.com/2008/10/05/world/africa/05command.html?pagewanted=1&hp [September 2008]).

64. Elsewhere, I have explored how the United States should incorporate climate risk strategies as part of a broader Disaster Risk Reduction Pool, modeled on a similar initiative by the British government; see Busby, *Climate Change and National Security.*

65. Bill and Melinda Gates Foundation, *Global Development Grants* (Seattle: Bill and Melinda Gates Foundation, 2008) (www.gatesfoundation.org/GlobalDevelopment/Grants/default.htm?yearFrom=2008&yearTo=2008&startPage=1&recordsPerPage=20&SortBy=RANK&SortOrder=descending&SortType=number [September 2008]).

66. Bill and Melinda Gates Foundation, *Implementing Warren Buffett's Gift* (Seattle: Bill and Melinda Gates Foundation, 2006) (www.gatesfoundation.org/AboutUs/RelatedInfo/Buffett.htm [September 2008]).

67. Timothy L. O'Brien and Stephanie Saul, "Buffett to Give Bulk of His Fortune to Gates Charity," *New York Times,* June 26, 2006 (www.nytimes.com/2006/06/26/business/26buffett.html [September 2008]).

68. Between 2001 and 2008, the Gates Foundation contributed $450 million to the Global Fund, which has received more than $10.5 billion in contributions overall; see Global Fund to Fight AIDS, Tuberculosis, and Malaria, *Pledges and Contributions* (www.theglobalfund.org/en/funds_raised/pledges/ [September 2008]).

69. Patrick Meier, "The Burmese Cyclone, Nonviolent Action, and the Responsibility to Empower," *Peacework,* 2008 (www.peaceworkmagazine.org/burmese-cyclone-nonviolent-action-and-responsibility-empower [September 2008]).

70. David Rieff, "Save Us from the Rescuers," *Los Angeles Times,* May 18, 2008 (www.latimes.com/news/opinion/sunday/commentary/la-op-rieff18-2008may18,0,5635138.story [September 2008]).

71. Michael H. Glantz, *Usable Science 8: Early Warning Systems: Do's and Don'ts* (Boulder, Colo.: National Center for Atmospheric Research, 2004) (www.ccb.ucar.edu/warning/report.pdf [September 2008]).

72. Paul Collier, *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done about It* (Oxford University Press, 2007).