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Global Warming Battlefields: How Climate Change Threatens Security

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By any reckoning, global climate change poses a threat to world security writ large. Because it will imperil food production around the world and could render many heavily populated areas uninhabitable, it has the potential to endanger the lives and livelihoods of hundreds of millions of people. So far, most experts' warnings have naturally tended to focus on the large-scale, nontraditional security implications of global warming: mass starvation resulting from persistent drought, humanitarian disasters caused by severe hurricane and typhoon activity, the inundation of coastal cities, and so on. Just as likely, however, is an increase in more familiar security threats: war, insurgency, ethnic conflict, state collapse, and civil violence. The Nobel committee affirmed as much in October when it awarded the Peace Prize to former Vice President Al Gore and the Intergovernmental Panel on Climate Change for their efforts to raise awareness about global warming. The prize committee cited "increased danger of violent conflicts and wars, within and between states."

Climate change will increase the risk of conflict because it is almost certain to diminish the supply of vital resources—notably food, water, and arable land—in areas of the planet that already are suffering from resource scarcity, thus increasing the risk that desperate groups will fight among themselves for whatever remains of the means of survival. In wealthier societies, such conflicts can be mitigated by food and housing subsidies provided by the central governments and by robust schemes for relocation and reconstruction. In poorer countries, where little or no such capacity exists, the conflicts are more likely to be decided by ethnic or religious militias and the power of the gun.

Violent conflict over vital resources has, of course, been a characteristic of the human condition since very ancient times. Archaeological remains and the oldest written records attest to the fact that early human communities fought for control over prime growing areas, hunting zones, timber stands, and so on. A growing body of evidence also suggests that severe climate changes—for example, the "little Ice Age" of circa AD 1300–1700—have tended to increase the risk of resource-related conflict. Steven A. LeBlanc of the Peabody Museum of Archaeology and Ethnology at Harvard has noted, for example, that conflict among the Anasazi people of the American Southwest appears to have increased substantially with the cooling trend (and reduced food output) of the early 1300s, as indicated by the abandonment of exposed valley-floor settlements in favor of more defensible cliff dwellings.

Resource conflict has continued into more recent times, growing even more pronounced as European adventurers and settlers invaded Africa, Asia, and the Americas in search of gold, furs, spices, timber, land, human chattel, iron, copper, and oil—often encountering fierce resistance in the process. Today, indigenous peoples are still battling to preserve their lands and traditional means of livelihood in the few remaining unexploited tropical forests, mountain highlands, and other wilderness areas left on the planet.

Elsewhere, many of those on the bottom rungs of the socioeconomic ladder—especially those who depend on agriculture or herding for their livelihoods—are also caught up in perennial con-

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flict over access to land, water, energy, and other resources. Even as inter-state wars have diminished in number worldwide, conflicts between various groups in recent times have been exacerbated by rapid population growth; increased competition from agribusiness and cheap imported foodstuffs; the growing popularity of militant ethnic, religious, and political ideologies; and other exogenous factors. Even without global warming, these factors will continue to increase the likelihood of intergroup conflict. As climate change kicks in, the risk of resource wars will grow many times over.

THE HARDEST HIT

Accelerated by the greenhouse effect (the warming produced as greenhouse gases such as carbon dioxide trap heat in the atmosphere), climate change will affect the global resource equation in many ways. Essentially, these can be grouped into four key effects: (1) *diminished rainfall* in many tropical and temperate areas, leading to more frequent and prolonged droughts; (2) *diminished river flow* in many of these same areas as a result of reduced rainfall or the shrinking of mountain glaciers, producing greater water scarcity in food-producing regions; (3) *a rising sea level,* leading to the inundation of coastal cities and farmlands; and (4) *more frequent and severe storm events,* producing widespread damage to farms, factories, and villages. These effects will vary in their application to different parts of the globe, with some areas experiencing greater trauma than others, but the net result will be a substantial reduction in life-sustaining resources for a good part of the earth's population.

Migratory pressures are likely to be among the most destabilizing impacts of global warming.

The particular impacts of these global warming effects on various communities have been studied in a piecemeal fashion for some time, but were given their most systematic examination in the Fourth Assessment Report of the UN-sponsored Intergovernmental Panel on Climate Change (IPCC), released in April 2007. As part of this study—the most comprehensive of global warming yet conducted—the IPCC convened a task force on "Impacts, Adaptation, and Vulnerability," called Working Group II. Ecosystem by ecosystem, region by region, this group's report provides an extraordinary overview of what can be expected from global warming's long-term impact on natural habitats and human communities around the planet. Although dry and dispassionate in tone, the report of Working Group II is devastating in its conclusions. Among its principal findings:

On water scarcity: "By mid-century, annual average river runoff and water availability are projected to . . . decrease by 10 to 30 percent over some dry regions at mid-latitudes and in the dry tropics, some of which are presently water-stressed areas. . . . In the course of the century, water supplies stored in glaciers and snow cover are projected to decline, reducing water availability in regions supplied by meltwater from major mountain ranges, where more than one-sixth of the world population currently lives."

On food availability: "At lower latitudes, especially seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increases (1 to 2 degrees centigrade), which would increase the risk of hunger. . . . Increases in the frequency of droughts and floods are projected to affect local crop production negatively, especially in subsistence sectors at low latitudes.

On coastal inundation: "Many millions more people are projected to be flooded every year due to sea-level rise by the 2080s. Those densely populated and low-lying areas where adaptive capacity is relatively low, and which already face other challenges such as tropical storms or local coastal subsidence, are especially at risk."

Most of these effects will be felt across the entire planet, but the degree to which they produce death, injury, and suffering will vary with the relative wealth and resiliency of the societies involved. In general, affluent and well-governed societies will be better able to cope with trauma and provide for the minimum needs of their affected citizens; poor and inadequately governed nations will be much less able to cope. And it is in the latter countries where conflict is most likely to arise over the allocation of relief supplies and relocation options.

The pivotal relationship between climate change and the coping capacity of affected states will be especially pronounced in Africa. That continent is expected to suffer disproportionately from the direst effects of global warming—especially from prolonged drought and water scarcity—and it possesses the least capacity to mitigate these impacts.

According to Working Group II, as early as 2020, between 75 million and 250 million Africans are expected to face increased water scarcity as a result of climate change; by the 2050s, this number is projected to range between 350 and 600 million people. Because food production in Africa is already stretched to the limit, the decline in water availability will reduce crop yields and greatly increase the risk of hunger and malnutrition. According to the Working Group II report, yields from rain-fed agriculture in some African countries could be reduced by as much as half by 2020. Increased rural unrest and conflicts over land are a likely result.

Parts of South and Central Asia could also suffer from violence related to global warming. A rise in average temperatures and a decline in water supplies are expected to produce a sharp reduction in cereal production throughout this vast region, which contains some of the most heavily populated countries in the world. In Bangladesh, for example, wheat production could decline by 32 percent by 2050 and rice production by 8 percent. For all of South Asia, according to the IPCC report, "net cereal production . . . is projected to decline at least between 4 to 10 percent by the end of this century under the most conservative climate change scenario." With many millions of subsistence farmers in these countries already struggling to survive, production declines on this scale will prove catastrophic. Large numbers of rural residents forced into destitution will no doubt migrate to cities in search of jobs. But some may be attracted to radical sects or ethnic bands that promise salvation through the seizure of less-affected lands held by wealthy landowners or other ethnic groups.

In general, adverse effects from global warming likely will produce suffering on an unprecedented scale. Many will starve; many more will perish from disease, flooding, or fire. Others, however, will attempt to survive in the same manner as their predecessors: by fighting among themselves for whatever food and water remains; by invading more favorable locales; or by migrating to distant lands, even in the face of violent resistance.

Resource Wars

The onset of severe climate change will increase the frequency and intensity of certain familiar types of conflict and also introduce some new or largely unfamiliar forms. Two kinds of conflicts—resource wars and ethnic warfare attendant on state collapse—are among the more familiar of these. A third, less familiar type of violence likely to increase as a result of global warming might best be described as migratory conflict.

Resource wars arise when competing states or ethnic enclaves fight over the possession of key resources—particularly water supplies, oil reserves, diamond fields, timber stands, and mineral deposits. Such conflicts, as noted, have been a feature of human behavior since time immemorial. Conflicts over resources were less prevalent during the cold war era, when ideological antagonisms were the driving force in world affairs, but they have become more conspicuous since the demise of the Soviet Union and the outbreak of fresh disputes in the developing world. Though often characterized as ethnic and religious wars, many of these newer conflicts have been, at root, disputes over the allocation of land, water, timber, or other valuable commodities. Bitter fighting in Angola and Sierra Leone, for example, was principally driven by competition over the illicit trade in diamonds. Struggles over diamonds, timber, and coltan (a critical ingredient in the manufacture of cell phones) have fueled the ongoing violence in Congo. Wars in Somalia, Ethiopia, and the Darfur region of Sudan have largely been sparked by disputes over land and water rights.

Even without global warming, the incidence of intergroup wars like these is likely to increase because the demand for key resources is growing while supplies, in many cases, are shrinking. On the demand side of the ledger, many developing countries are expected to experience a sharp increase in population over the next several decades along with a steady increase in per capita consumption levels. On the supply side, many once-lucrative sources of oil, natural gas, uranium, copper, timber, fish, and underground water (aquifers) are expected to be depleted, producing significant scarcities of these materials. Virtually all states and societies are likely to experience some traumas and hardships as a result, but some groups will suffer far more than others. And because these disparities are likely to coincide with national, ethnic, and religious distinctions, they will provide ample fodder for those who seek justifications for waging war on "others" who can be portrayed as the cause of one's own hardships and misfortunes.

Add climate change to the equation, and the picture becomes much, much worse. While most of the world's regions are likely to experience a reduction in the supply of at least some critical resources, it is true that a few could see limited

gains from global warming. Some countries in the far north, for example, could benefit from more rainfall and longer growing seasons, allowing for increased food output. Russia also hopes to benefit from the melting of the Arctic ice cap, which theoretically would allow oil and natural gas drilling in areas now covered year-round by thick ice. But even if these hypothetical advantages are not outweighed by other, less desirable consequences of global warming, any perception of a widening chasm between the "winners" and "losers" of climate change—when the overwhelming majority of the world's population is likely to fall in the latter category—could direct angry and potentially lethal attention toward the former.

Climate change will increase pressure on nearly every key resource used by humans, but land and fresh water will probably experience the greatest effects. Conflict over arable land has been one of the most persistent causes of warfare throughout history, and it is hard to imagine that global warming will not increase the likelihood of this type of conflict. If the projections by the IPCC's Working Group II prove accurate, vast inland areas of North and South America, Africa, and South and Central Asia are likely to suffer from diminished rainfall and recurring drought, turning once productive croplands into lifeless dustbowls. At the same time, many once reliable river systems will offer sharply reduced water flows, as the glaciers and snowpacks that feed them melt and recede or disappear. Again, not *every* area will suffer in this fashion: Some coastal highlands (for example, in the Horn of Africa) could experience increased precipitation and longer growing seasons, allowing greatly increased food production. Under these circumstances, those who feel cheated by the vagaries of climate change may feel impelled to invade and occupy the lands of those who, in their view, are unjustly blessed by the same fickle forces.

As climate change kicks in, the risk of resource wars will grow many times over.

An area of particular concern among many climatologists is the Sahel region of Central Africa. The Sahel—the southern fringe of the Sahara Desert—stretches clear across Africa at its widest point from Senegal and Mauritania in the west through Mali, Niger, Chad, and Sudan (notably Darfur), to Eritrea and Ethiopia in the east. This is an area historically inhabited by Muslim pastoralists (mainly cattle herders) who are now being driven south by the steady advance of the Sahara into lands occupied by non-Muslim farmers—often provoking conflict in the process. The southward advance of the Sahara is believed to be one of the earliest observable effects of climate change and, as global temperatures rise, its rate of expansion is expected to increase. This, in turn, is likely to trigger intensified conflict from one end of the Sahel to the other.

Watching the River Flow

Global climate change is also likely to increase the risk of conflict over vital supplies of fresh water. Although states have rarely gone to war over disputed water supplies in recent times, they have often threatened to do so, and the risk factors appear to be growing. Water scarcity and stress are already a significant problem in many parts of the world, and are expected to become more so as a result of population growth, urbanization, and industrialization. Furthermore, many of the countries with the greatest exposure to water scarcity are highly dependent on river systems that arise outside their territory and pass through nations with which they have poor or unfriendly relations. Egypt, for example, is almost entirely dependent for its fresh water on the Nile, which arises in Central Africa (in the case of the White Nile) and Ethiopia (in the case of the Blue Nile). Iraq and Syria both depend for much of their water on the Tigris and Euphrates, which originate in Turkey. Israel relies on the Jordan River, which originates, in part, in Lebanon and Syria.

When an upstream country in any of these trans-boundary systems decides to dam a river and use it for domestic irrigation, the downstream country will inevitably experience a reduced flow, and this can be seen by that country as a significant threat to its well-being. It is not surprising, then, that downstream states like Egypt and Israel have threatened to go to war against any upstream state that endangers its water supply in this manner. "Water for Israel is not a luxury," former Prime Minister Moshe Sharett once proclaimed. "It is not just a desirable and helpful addition to our natural resources. Water is life itself."

How, exactly, global warming will affect any particular river system cannot be predicted with absolute assurance. However, it is clear from the IPCC's Fourth Assessment Report that many of the world's most important trans-boundary river sys-

tems in tropical and mid-temperate areas are likely to experience reduced flows as a result of climate change. This will significantly increase the competition among states for the ever-diminishing supply, thus increasing the risk of conflict.

Egypt is a source of particular concern in this regard, both because of its extreme reliance on the Nile—which originates far from its own territory—and because of its repeated threats to attack any upstream country that attempts to interfere with the river's flow. The Nile is the world's longest river and travels for more than a thousand miles through nearly cloudless desert before reaching Cairo, making it especially vulnerable to higher evaporation rates as global temperatures rise. Any reduction in upstream rainfall would also reduce its flow, increasing Egypt's vulnerability. Meanwhile, as water scarcity grows, so will Egypt's population, which is projected to increase from 80 million today to between 115 million and 179 million by 2050. Under these circumstances, any efforts by Ethiopia, Sudan, Uganda, or any of the other upstream states to divert the Nile's flow to meet the needs of their own soaring populations would almost assuredly trigger a panicky and quite possibly violent response from Egypt.

The Mogadishu Effect

A second type of violence that likely will increase as a result of global climate change is the sort of militia rule and gang warfare that prevail today in Mogadishu, the Somali capital. This is a condition in which the established government no longer exists or exercises effective authority; as a consequence, armed bands of one kind or another control access to critical resources, and these gangs or militias constantly fight among themselves over what little remains. Such violence has become familiar in the post–cold war era, as once vigorous states have collapsed and ethnic militias—often allied with or built around criminal associations—have arisen in their place. Multinational peacekeeping forces have confronted such bands in Somalia, Sierra Leone, Congo, Bosnia, Haiti, Sudan, Rwanda, and elsewhere, often with discouraging results.

Much research has been devoted to the causes of state collapse and the rise of ethnic militias in the post–cold war era, but this research has not managed to identify a clear, consistent set of precipitating factors. Corruption, authoritarianism, endemic poverty, ethnic favoritism, and poor social services are often common factors, but each case has its own distinctive features. What is true in all of these instances, however, is that the central government proves incapable of coping with an onslaught of powerful socioeconomic forces and either disintegrates entirely (as in Somalia) or loses control of large regions of the country—sometimes everything but the capital itself. Looking around the world, one can identify any number of countries that could, under existing circumstances, fall prey to these types of forces. Add global warming to the mix, and the pressures on these already vulnerable states grow much stronger.

Climate change will contribute to the propensity for weak states to collapse and give rise to militia rule and ethnic conflict for a variety of reasons. Consider any nation in the tropical or sub-temperate regions that depends for a significant share of its gross domestic product on farming, herding, forestry, and fishing, and that encompasses within its population more than one major ethnic, religious, or linguistic community. As indicated in the report of Working Group II, global warming is likely to harm some if not all of these livelihoods, though not to the same extent and not all at once. Also, some outlying parts of the country may become virtually uninhabitable, forcing people to migrate to the major city (or cities), often the capital or major port; or to areas more fortunate, which may be occupied by people of a different ethnicity (or religion, language group, and so forth). The decline in farming, fishing, and other livelihoods will contribute to a reduction in GDP, diminishing the revenues of the central government and thus its ability to shoulder additional burdens. Meanwhile, the movement of desperate refugees to the cities or other areas will produce an enormous need for relief services and exacerbate inter-group tensions.

All this would be a Herculean challenge for even the most affluent and capable governments, as the aftermath of Hurricane Katrina showed Americans. For poor, weak, and divided governments, the challenge could well prove insurmountable. As states collapse under the strain, what might be called the "Mogadishu effect" will kick in. Armed groups will coalesce around clans, tribes, village ties, and so on, as each group strives to ensure its own survival, at whatever price in bullets and blood. It is in precisely these circumstances, moreover, that extremist movements take root. With food and housing in short supply and city streets clogged with refugees, it is easy for a demagogue to blame another group or tribe for

his own group's misfortunes and to call for violent action to redress grievances.

Because existing models cannot pinpoint future climate trends at the local level, it is not possible to predict where this combination of effects is most likely to result in state collapse, militia rule, and warfare among armed bands in the years ahead. Nonetheless, in its carefully worded manner, the IPCC in its Fourth Assessment Report provides some revealing hints. Speaking of the "negative effects" of climate change on human populations, it concludes: "The most vulnerable industries, settlements, and societies are generally those in coastal and river flood plains, those whose economies are closely linked with climate-sensitive resources, and those in areas prone to extreme weather events, especially where rapid urbanization is occurring." In most nations, moreover, vulnerable areas are not isolated but are linked in extensive and complex ways to other parts of their countries and to the surrounding regions.

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As the impacts from climate change spread and state systems collapse in their wake, giving rise to gang and militia rule, violence might take many forms. Street-to-street combat for control over particular neighborhoods (and the distribution of relief supplies or vital commodities) is one common form. Fighting for control over desert oases, as in Darfur, is another. Impoverished farmers driven from their own territories by drought may invade neighboring lands. All of this will cause immense suffering and generate more refugees, creating ripple effects and sparking calls for international humanitarian intervention, as in the case of Darfur. This could lead as well to the deployment of international peacekeeping forces, and so result in clashes of yet another sort. The breakdown of state rule in affected areas will also facilitate the activities of criminals, mercenaries, drug traffickers, and others who flourish in an atmosphere of chaos—including international terrorists.

MIGRATORY CONFLICTS

Yet a third type of conflict arising from global climate change might best be described as migratory warfare. This is armed violence provoked by efforts by large groups of people to migrate from environmentally devastated areas to less affected regions in the face of armed resistance by those inhabiting the more privileged locales. Of course, undocumented migrants from drought-prone areas of Mexico and Africa are already meeting significant resistance in their efforts to enter the United States and Europe, respectively. Many have perished in desperate attempts to circumvent the fences, border patrols, and other means employed to impede them.

But these struggles take place largely on an individual basis, or in groups of ten or a hundred at a time. Once global warming occurs on a massive scale, it is possible to conceive of migratory movements encompassing entire communities or regions, involving tens of thousands of people—some equipped with arms or formed into militias. In such scenarios, the struggle to cross national borders and settle in new lands could take on the form of ragged military campaigns—not unlike the travails experienced by the Israelites on entering the "Promised Land" (the Jordan River valley) as recounted in the Jewish scriptures.

The growing prevalence of migratory pressures like these could produce a number of worrisome phenomena. On one hand, destination countries like the United States, Spain, France, and Italy could choose to place even greater emphasis on the physical sealing-off of their borders and the use of military or paramilitary forces to stem the flood of immigrants. Even as experts debate the utility of such measures—especially in the face of vastly increased migratory pressures—more forcible means are certain to produce higher levels of death (whether through drowning, heat prostration, or shootouts with border guards), raising difficult moral questions. On the other hand, the growing intrusion of people with alien backgrounds could further inflame anti-immigrant sentiment in these countries, possibly leading to anti-immigrant violence or the ascendancy of ultranationalistic or even neo-Nazi political parties (with attendant social disorder and the possibility of increased militarism). However this plays out, migratory pressures on this scale are certain to prove highly destabilizing in many parts of the world.

The global security implications of such phenomena were first accorded serious consideration in a 2007 study conducted by a group of retired US military officers convened by the CNA Corporation, a not-for-profit military contractor. In *National Secu-*

rity and the Threat of Climate Change, the officers, led by former Army Chief of Staff General Gordon R. Sullivan, concluded that migratory pressures are likely to be among the most destabilizing impacts of global warming. For the United States, the greatest national security problem arising out of climate change "may be an increased flow of migrants northward into the U.S." Despite vigorous efforts to stem the flood of illegal immigrants, the rate of immigration is likely to rise "because the water situation in Mexico is already marginal and could worsen with less rainfall and more droughts." This, in turn, is likely to produce increased political outrage among long-term residents of border states, along with intensified efforts to exclude illegal migrants—with questionable results.

A similar dynamic is developing in the wealthier parts of Europe. "The greater threat to Europe lies in migration of people from across the Mediterranean, from the Maghreb, the Middle East, and sub-Saharan Africa," the CNA study observed. "As more people migrate from the Middle East because of water shortages and loss of their already marginal agricultural lands (as, for instance, if the Nile Delta disappears under the rising sea level), the social and economic stress on European nations will grow." Such stress can take many forms, but anti-immigrant violence is sure to be among the more likely outcomes.

A sharp increase in international migrations brought about by climate change is likely to have other baneful effects for world stability. As countries act to seal their borders and prevent the inmigration of environmental refugees, they are far less likely to participate in inclusionary political projects like the further expansion of the European Union—which, by its nature, would facilitate migration. Indeed, one might expect the EU to fall apart, with the original core of Western European countries breaking away from Greece and newer members in southeastern Europe, which are expected to suffer from drought and water scarcity as a result of global warming. This, in turn, could give rise to the emergence of new military blocs, with Russia keen to restore its influence in east-central Europe. Other efforts to build and expand regional partnerships—for example, the Association of Southeast Asian Nations—could suffer a similar fate, as politically insecure states seek to drive off migrants from less-fortunate neighboring nations. Isolationism and xenophobia historically have been harbingers of conflict.

LOOKING AHEAD

As the effects of global warming become more pronounced, the world community will have to cope with a wide range of extreme environmental perils: prolonged droughts, intense storms, extensive coastal flooding, and so on. In practical terms, however, it may well be that the most costly and challenging consequence of climate change will be an increase in violent conflict and all the humanitarian trauma this brings with it. The war in Darfur provides a sobering indication of what this is likely to entail: Although this tragic conflict, affecting hundreds of thousands of still-vulnerable civilians, cannot be attributed to climate change alone, it comes as close as any contemporary contest to the global warming battlefields of the future.

All this should lead us to think differently about both "national security" and global warming itself. In traditional national security discourse, the overarching challenge is how best to protect the nation against identifiable armed adversaries. But in a world of severe climate change, the greatest challenge is not likely to come from well-equipped hostile powers. More likely it will emerge from chaos and violence and civil conflicts arising from the breakdown of states and the ensuing struggles over scarce and diminishing resources.

Under these circumstances, national security will take on an entirely new meaning—requiring, for one thing, a corresponding transformation of the role and organization of a nation's armed forces. One would expect, for instance, a much greater emphasis on civil-defense functions: flood control, emergency response in times of disaster, anti-looting operations, refugee protection and resettlement, and so forth. The international community will also need to be much better prepared for humanitarian interventions and peacekeeping in the event of environmental-related conflicts.

Finally, it should be apparent that a world of unceasing resource wars, state disintegration, militia rule, and migratory conflicts will not be a safe or desirable world for anyone. These may not be the images one most associates with global warming, but they may, in fact, prove to be the most immediate and concrete consequences of climate change. As if there were not already enough good reasons to take swift action to curb emissions of greenhouse gases, the prospect of increased armed conflict should, one would hope, convince those still unaware of the magnitude of the danger. ■