John Podesta and Peter Ogden

The Security Implications of Climate Change

In terms of the effects of climate change, the future is becoming increasingly clear.[1] The expected greenhouse gas emissions scenario developed by the Intergovernmental Panel on Climate Change (IPCC) portends a world in which people and nations will be threatened by massive food and water shortages, devastating natural disasters, and deadly disease outbreaks.[2] No foreseeable political or technological solution will enable us to avert many of these climatic impacts even if, for instance, the United States were in the near future to enter into an international carbon cap-and-trade system. Meanwhile, a technological breakthrough that would lead to a decisive, near-term reduction in the concentration of carbon dioxide (CO_2) in the atmosphere remains far away.

In addition, this scenario assumes that climate change does not trigger any significant positive feedback loops (e.g., the release of CO_2 and methane from thawing permafrost). Such feedback loops would multiply and magnify the impacts of climate change, creating an even more hostile environment than the one projected here. Thus, it is not alarmist to say that this scenario may be the best we can hope for over roughly the next 30 years. It is certainly the least we ought to prepare for.

That said, science only tells part of the story. The geopolitical consequences of climate change are determined by local political, social, and economic factors as much as by the magnitude of the climatic shift itself. As a rule,

John Podesta is president and CEO of the Center for American Progress (CAP) in Washington, D.C., and was chief of staff for President Bill Clinton. Peter Ogden is a senior national security analyst at CAP. He may be reached at pogden@americanprogress.org. This article was prepared with research assistance from Lillian Smith and derived from a chapter in the November 2007 CSIS/Center for a New American Security monograph, *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change*.

The Washington Quarterly • 31:1 pp. 115–138.

wealthier countries and individuals will be better able to adapt to the impacts of climate change, whereas the disadvantaged will suffer the most. An increase in rainfall, for example, can be a blessing for a country that has the ability to capture, store, and distribute the additional water. It is a deadly source of soil erosion for a country that does not have adequate land management practices or infrastructure.[3]

Consequently, even though the IPCC projects that temperature increases at higher latitudes will be approximately twice the global average, it will be the developing nations in the earth's low latitudinal bands, as well as sub-Saharan African countries, that will be most adversely affected by climate change. In the developing world, even a relatively small climatic shift can trigger or exacerbate food shortages, water scarcity, destructive weather events, the spread of disease, human migration, and natural resource competition. These crises are all the more dangerous because they are interwoven and self-perpetuating: water shortages can lead to food shortages, which can lead to conflict over remaining resources, which can drive human migration, which can create new food shortages in new regions.

Once underway, this chain reaction becomes increasingly difficult to stop. It is therefore critical that policymakers do all they can to prevent the domino of the first major climate change consequence, whether it be food scarcity or the outbreak of disease, from toppling. The most threatening first dominos, where they are situated, and their cascading geopolitical implications are identified in this essay.

Migration and Immigration

The United States, like most wealthy and technologically advanced countries, will not experience destabilizing levels of internal migration due to climate change, but it will be affected. According to the IPCC, tropical cyclones will become increasingly intense in the coming decades, forcing the resettlement of people from U.S. coastal areas. This can have significant economic and political consequences, as was the case with the evacuation and permanent relocation of many Gulf Coast residents in the wake of Hurricane Katrina.[4]

In addition, the United States will experience border stress due to the severe effects of climate change in parts of Mexico and the Caribbean. Northern Mexico will be subject to severe water shortages, which will drive immigration into the United States in spite of the increasingly treacherous border terrain. Likewise, the damage caused by storms and rising sea levels in the coastal areas of the Caribbean islands, where 60 percent of the Caribbean population lives, will increase the flow of immigrants from the region and generate political tension.[5]

The impact of climate-induced migration will be most pronounced in the developing world. Migration will widen the wealth gap between and within many of these countries. It will deprive developing countries of sorely needed economic and intellectual capital as the business and educated elite who have the means to emigrate abroad do so in greater numbers than ever.[6] In some cases, it will even spark war by heightening competition over scarce resources and by upsetting the cultural or ethnic order within a country or region.[7] The three regions in which climate-induced migration will present the greatest geopolitical challenges are South Asia, Africa, and Europe.

No region is more directly threatened by human migration than South Asia.

South Asia

No region is more directly threatened by human migration than South Asia. The IPCC warns that "coastal areas, especially heavily populated mega-delta regions in South, East, and Southeast Asia, will be at greatest risk due to increased flooding from the sea and, in some mega-deltas, flooding from the rivers."[8] Bangladesh in particular will be threatened by devastating floods and other damage from monsoons, melting glaciers, and tropical cyclones that originate in the Bay of Bengal, as well as water contamination and ecosystem destruction caused by rising sea levels.

The population of Bangladesh, which stands at 142 million today, is anticipated to increase by approximately 100 million people during the next few decades, even as the impact of climate change and other environmental factors steadily render the low-lying regions of the country uninhabitable.[9] Many of the displaced will move inland, which will foment instability as the resettled population competes for already scarce resources with established residents. Others will seek to migrate abroad, creating heightened political tension not only in South Asia but in Europe and Southeast Asia as well.

India will struggle to cope with a surge of displaced people from Bangladesh, in addition to those who will arrive from the small islands in the Bay of Bengal that are being slowly swallowed by the rising sea. Approximately four million people inhabit these islands, and many of them will have to be accommodated on the mainland eventually.[10]

Bangladeshi migrants will generate political tension as they traverse the region's many contested borders and territories, such as those between China, India, and Pakistan. The Indian-Bangladeshi border is already a site of significant political friction, demonstrated by the 2,100-mile, two-and-a-half-meter

high, iron border fence that India is in the process of building.[11] Due to be completed in 2007, this fence is being constructed at a time when there are numerous signs of rising Islamic extremism in Bangladesh. In the wake of the U.S. invasion of Afghanistan, for instance, hundreds of Taliban and jihadists found safe haven in the country.[12] In his recent article, former National Security Council staffer and CIA analyst Bruce Riedel argues that Bangladesh is among the places most likely to become a new base of operations for al Qaeda.[13] The combination of deteriorating socioeconomic conditions, radical Islamic political groups, and dire environmental insecurity brought on by climate change could prove a volatile mix with severe regional and potentially global consequences.

The risk of state failure will increase in Nigeria and East Africa.

Unfortunately, climate change is making many of the development projects being financed by the international community in South Asia and elsewhere less effective just as it is making them more necessary. The World Bank estimates that 40 percent of all overseas development assistance and concessional finance is devoted to activities that will be affected by climate change, but few of the projects adequately account for the impact that climate change will have. As a result, dams are built on rivers that will dry up, and crops are planted in coastal areas that will be frequently flooded.[14]

Furthermore, the water shortages resulting from climate change are coinciding with an increased tendency among donors and international financial organizations such as the World Bank to promote the privatization of water, which frequently raises the cost for rural subsistence farmers to a level they cannot afford. This in turn foments tension between the poorer, rural segments of society and the urban middle and upper classes by exacerbating existing economic and social inequities.

In Nepal, for instance, climate change is contributing to a phenomenon known as glacial lake outburst, in which violent flood waves reaching as high as 15 meters destroy downstream settlements, dams, bridges, and other infrastructure. Millions of dollars in recent investment have been lost because hydropower and infrastructure design in Nepal largely fails to take these lethal floods into account. Ultimately, this puts further stress on the already beleaguered country as it struggles to preserve a fragile peace and reintegrate tens of thousands of Maoist insurgents. Due to its proximity to the entrenched conflict zone of Kashmir and the contested borders of China and India, an eruption of severe social or political turmoil in Nepal could have ramifications for the entire South Asian region.

Nigeria and East Africa

The impact of climate change–induced migration will be felt throughout Africa, but its effects on Nigeria and East Africa pose particularly acute geopolitical challenges. This migration will be both internal and international. The first domestic wave will likely be from agricultural regions to urban centers where more social services are available, and the risk of state failure will increase as central governments lose control over stretches of their territory and their borders.

Nigeria will suffer from climate-induced drought, desertification, and sea-level rise. Already, approximately 1,350 square miles of Nigerian land turns to desert each year, forcing both farmers and herdsmen to abandon their homes.[15] Lagos, the capital, is one of the West African coastal megacities that the IPCC identifies as at risk from sea-level rise by 2015.[16] This, coupled with high population growth (Nigeria is the most populous nation in Africa, and three-fourths of the population is under the age of 30), will force significant migration and contribute to political and economic turmoil. For example, it will exacerbate the existing internal conflict over oil production in the Niger Delta.[17] To date, the Movement for the Emancipation of the Niger Delta has carried out a successful campaign of armed attacks, sabotage, and kidnappings that has forced a shutdown of 25 percent of the country's oil output.[18] Given that Nigeria is the world's eighth-largest and Africa's single-largest oil exporter, this instability is having an impact on the price of oil, and it will have global strategic implications in the coming decades.[19] In addition to the Niger Delta issue, Nigeria must also contend with a Biafran separatist movement in its southeast.

The threat of regional conflagration, however, is highest in East Africa because of the concentration of weak or failing states, the numerous unresolved political disputes, and the severe impacts of climate change. Climate change will likely create large fluctuations in the amount of rainfall in East Africa during the next 30 years; a 5–20 percent increase in rainfall during the winter months will cause flooding and soil erosion, while a 5–10 percent decrease in the summer months will cause severe droughts.[20] This will jeopardize the livelihoods of millions of people and the economic capacity of the region, as agriculture constitutes some 40 percent of East Africa's gross domestic product (GDP) and 80 percent of the population earns a living from agriculture.[21]

In Darfur, for instance, water shortages have already led to the desertification of large tracts of farmland and grassland. The fierce competition that emerged between farmers and herdsmen over the remaining arable land combined with simmering ethnic and religious tensions to help ignite the first genocide of the twenty-first century.[22] This conflict has now spilled into Chad and the Central African Republic. Meanwhile, the entire Horn of Africa continues to be threatened by a failed Somalia and other weak states. Al Qaeda cells are active in the region, and there is a danger that this area could be-

come a central breeding ground and safe haven for jihadists as climate change pushes more states toward the brink of collapse.

Europe

Because most African and South Asian migration will be internal or regional, the expected decline in food production and fresh drinking water combined with the increased conflict sparked by resource scarcity will force more Africans and South Asians to migrate further abroad.[23] The result is a likely surge in the number of Muslim immigrants to the European Union, which could exacerbate existing tensions and increase the likelihood of radicalization among members of Europe's growing and often poorly assimilated Islamic communities.

The number of Muslim immigrants to Europe and the risk of radicalization will likely increase.

Already, the majority of immigrants to most western European countries are Muslim. Muslims constitute approximately 5 percent of the European population, with the largest communities located in France, the Netherlands, Germany, and Denmark.[24] Europe's Muslim population is expected to double by 2025, and it will be much larger if, as we expect, the effects of climate change spur additional migration from Africa and South Asia.[25]

The degree of instability that this generates will depend on how successfully these immigrant populations are integrated into European society. This process has not always gone well, as exemplified in 2005 by the riots in the poor and predominantly immigrant suburbs of Paris, and the suspicion with which Europe's Muslim and immigrant communities are viewed by many would be greatly intensified by an attack from a homegrown terrorist. Given that a nationalist, anti-immigrant backlash could result from even a small or unsuccessful attack, the risk that such a backlash will occur is high.

If the backlash is sufficiently severe, the EU's cohesion will be tested. At present, the ease with which people can move between EU countries makes it extremely difficult to track or regulate immigrants, both legal and illegal. In 2005, for instance, Spain granted amnesty to some 600,000 undocumented immigrants and yet could provide few assurances that they would remain within Spain's borders.[26] The number of Africans who attempt to reach Spain's Canary Islands—the southernmost EU territory—has more than doubled since then. In 2006, at least 20,000 Africans attempted the perilous, often fatal journey.[27]

Thus far, the EU has responded to this challenge with ad hoc measures, such as the creation of rapid-reaction border guard teams.[28] Although the influx of immigrants from Africa, Muslim and otherwise, will continue to be

viewed by some as a potential catalyst for economic growth at a time when the EU has a very low fertility rate, the viability of the EU's loose border controls will be called into question, and the lack of a common immigration policy will invariably lead to internal political tension. If a common immigration policy is not implemented, significant border restrictions will possibly reemerge and, in so doing, slow the EU's drive toward increased social, political, and economic integration.

Water Competition in the Middle East

Increasing water scarcity due to climate change will contribute to instability throughout the world. As discussed, in many parts of Africa, for instance, populations will migrate in search of new water supplies, moving within and across borders, creating the conditions for social or political upheaval along the way. This was the case in Darfur, and its effects were felt throughout the entire region.

Water scarcity also shapes the geopolitical order when states engage in direct competition with neighbors over shrinking water supplies. Although this threat may evoke apocalyptic images of armies amassing in deserts to go to war over water, the likelihood of such open conflict in this scenario over the next 30 years is low. There are a very limited number of situations in which it would make strategic sense for a country today to wage war in order to increase its water supply.

Water does not have the economic value of a globally traded strategic commodity such as oil, and to reap significant benefit from a military operation would require capturing an entire watershed, cutting supply to the population currently dependent on it, and then protecting the watershed and infrastructure from sabotage.[29] Thus, although we are not likely to see "water wars" per se, countries will more aggressively pursue the kinds of technological and political solutions that currently enable them to exist in regions that are stretched past their water limits.

This is likely to be the case in the Middle East, where water shortages will coincide with a population boom. The enormously intricate water politics of the region have been aptly described as a "hydropolitical security complex."[30] The Jordan River physically links the water interests of Israel, Jordan, Lebanon, the Palestinian Authority, and Syria; the Tigris and Euphrates Rivers physically link the interests of Iran, Iraq, Syria, and Turkey. This hydrological environment is further complicated by the fact that 75 percent of all the water in the Middle East is located in Iran, Iraq, Syria, and Turkey.[31] Such conditions would be cause for political tension even in a region without a troubled history.

Turkey's regional position will likely be strengthened as a result of the water crisis. Situated at the headwaters of the Tigris and Euphrates, Turkey is the only country in the Middle East that does not depend on water supplies that originate outside of its borders and, although far from a water-rich country, will not find its water supply significantly threatened by climate change within the next three decades.

Increasing water scarcity will contribute to instability throughout the world.

Yet, climate change will leave all of the other countries that are dependent on water from the Tigris and Euphrates Rivers more vulnerable to deliberate supply disruption. Turkey is seeking to maximize this leverage with its massive Southeastern Anatolian Project. When completed in 2010, Turkey will have built 22 dams and 19 power plants along the Euphrates River, thereby reducing downstream water supply. The dams will also give Turkey the capacity to cut Syria's water supply by up to 40 percent and Iraq's water supply by up to 80 percent.[32]

Turkey's ability to use water as a political tool will become increasingly important in its relations with Syria. Turkey demonstrated its capacity to cut water supply to Syria in January 1990, when it disrupted the flow of the Euphrates River to fill a reservoir in front of the Ataturk Dam. Turkey has also threatened to cut off water in retaliation for Syria's support of the Kurdish Workers' Party (PKK), and it has the capacity to reduce water supplies to Kurdish-controlled northern Iraq.[33] Although Syria's support for the PKK ended in 1998, the chaos in Iraq could prompt an emboldened PKK to seek renewed support from potential regional allies.

Israel, already extremely water poor, will only become more so. One thousand cubic meters of water per capita is considered the minimum amount of water necessary for an industrialized nation. By 2025, Israel will have fewer than 500 cubic meters of water per capita.[34] Overpumping has also contributed to the gradual depletion and salinization of vital aquifers and rivers. Much of Israel's water supply, moreover, is from sources located in politically fraught territory. One-third of it is from the Golan Heights, and another third is from the mountain aquifer that straddles the West Bank and Israel.[35]

Israel will need to place additional importance on its relationship with Turkey, and a deeper alliance could be forged if a proposed water-trading agreement in which Turkey would ship water directly to Israel in tankers is eventually completed.[36] This new source of supply would not offset the added pressures of climate change and population growth, but it would deepen their strategic ties and cushion any sudden short-term supply disruptions or embargoes.[37]

Israel's relations with Syria will also be strained by its need for the water resources of the Golan Heights. Although each side recognizes that any peaceful and sustainable resolution over the Golan Heights will need to include a water-sharing agreement, the issue of direct access to the Sea of Galilee will continue to complicate negotiations over the final demarcation of the border, as it did in 2000.

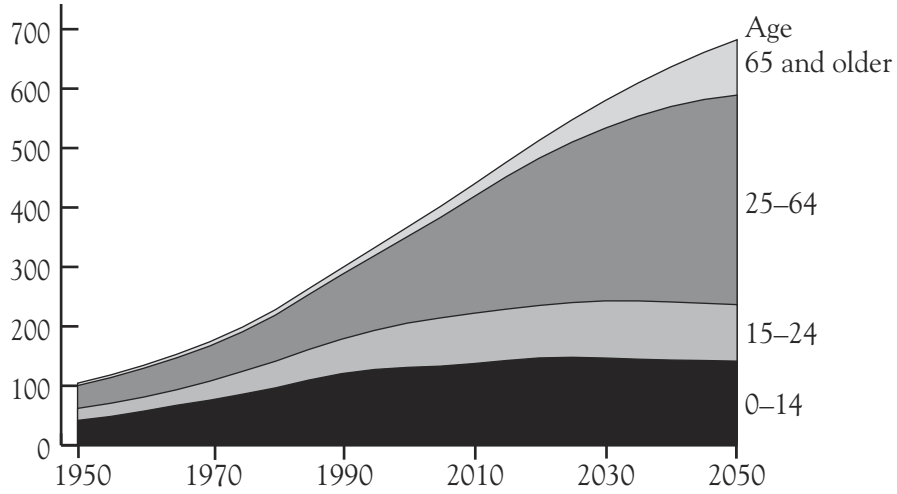
The region's water problems will be compounded by its population growth (see figure 1). According to current projections, the Middle Eastern and North African population could double in the next 50 years.[38] In the Middle East, the fastest growing populations are in water-poor regions such as the Palestinian territories. In the West Bank, a lack of available freshwater has already contributed to food shortages and unemployment, and there have been incidences of small, violent conflicts over water supplies.[39] These clashes will only become more prevalent as the population increases and available water resources diminish.

Disease

Climate change will have a range of decisively negative effects on global health during the next three decades, particularly in the developing world. The manner in which countries respond or fail to respond to these health challenges will have a significant impact on the geopolitical landscape. Water-borne and vector-borne diseases, such as malaria and dengue fever, will be most prevalent in countries that experience significant additional rainfall due to climate change.[40] Conversely, many airborne diseases will thrive in those areas that become more arid due to drought and higher temperatures, such as in parts of Brazil. Shortages of food or fresh drinking water will also render human populations more susceptible to illness and less capable of rapidly recovering. Moreover, the risk of a pandemic is heightened when deteriorating conditions prompt human migration.[41]

This increase in the incidence of disease will inevitably generate disputes between nations over the movement of people. Immigrants or even simply visitors from a country in which there has been a significant disease outbreak may not be welcomed and could be subject to quarantine. If the policies that underlie such practices are perceived as discriminatory or motivated by factors other than legitimate health concerns, they will severely damage political relations. This outcome might be averted if countries establish common immigration policies in advance that are specifically designed to cope with international health crises. Unfortunately, this kind of coordination will most likely occur after the fact, as it did in Europe following several cholera pandemics during the nineteenth century.[42]

Figure 1. Population of Middle East and North Africa by Age Group, 1950–2050 (in millions)



Sources: United Nations, *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2005 Revision*.

Restrictions on the movement of goods could also be a source of economic and political turmoil. Pandemic-affected countries could lose significant revenue from a decline in exports due to limits or bans placed on products that originate or transit through them. The restrictions placed on India during a plague outbreak that lasted for seven weeks in 1994 cost it approximately $2 billion in trade revenue.[43] Countries that depend on tourism could be economically devastated by even relatively small outbreaks. The fear of SARS sharply curtailed international travel to Thailand in 2003, whereas the 2006 military coup had little impact on tourism.[44] Furthermore, as with the controls placed on the movement of people across borders, restrictions on the movement of goods can be politicized in a way that generates significant international friction.

Even in the absence of trade restrictions, the economic burden that disease will place on developing countries will be severe. Added health care costs combined with a loss of worker productivity from worker absences will exact a large economic toll. In 2001 the U.S. General Accounting Office estimated that Africa's GDP would be one-third higher if malaria had been eradicated in 1970.[45] This economic damage is due not only to the direct loss of life, but to the fact that scarce resources have to be devoted to immediate medical crises rather than to long-term investments in health care, education, and other critical development needs.

The outbreak of disease can also lead a government to adopt policies that may be perceived as discriminatory or politically motivated by segments of its

own population. For example, treatment may be provided first or exclusively to a particular ethnic group, religious faction, or political party. This can provide antigovernment groups with the opportunity to increase their popularity and legitimacy by providing those health services that the government does not.[46] When these groups are sponsored by foreign governments (e.g., Iran's support for Hizballah in Lebanon), the line between medicine and foreign policy vanishes.

Under these economic and social circumstances, a country's political direction can change rapidly. For instance, the inability or perceived unwillingness of political leaders to stop the spread of disease or to provide adequate care for the afflicted will undermine support for the government.[47] In countries with functioning democracies, this could lead to the election of new leaders with political agendas radically different from their predecessors. It could also breed greater support for populist candidates whose politics resonate in a society that believes that its economic and social hardships are due to neglect or mismanagement by the government. In countries with weak or nondemocratic political foundations, the risk is heightened that this will lead to civil war or a toppling of the government altogether.

How countries respond to health challenges will have a significant geopolitical impact.

Given the country's geopolitical significance, Venezuela could be hit hard by a climate-induced increase in disease. In addition to experiencing the increased rainfall that will create favorable conditions for many water-borne and vector-borne diseases, people living along Venezuela's coast, which will be subject to more frequent storms and flooding due to climate change, are at heightened risk.[48]

There is also a small chance that the balance of power between neighboring states could suddenly and decisively shift if one country's military or political elites were seriously affected by a disease while the other country's were not.[49] The high HIV infection rate in several African militaries provides a recent example of how a disease can come to have a disproportionate impact on a sector of the population that is critical to a country's national security.[50]

Regardless of the scenario, however, developing countries will look to the United States and the developed world for help in responding to these health crises. The gap between the world's haves and have-nots will be made increasingly apparent, and the resentment that this will engender toward wealthy countries will only be assuaged if significant resources are devoted to combating disease outbreaks and to caring for the afflicted in the developing world.

China's Climate Change Challenge

In the coming decades, climate change will pose a growing political and economic challenge to China. The manner in which the Chinese leadership responds will have international security ramifications and will become an important factor in determining the course of U.S.-Chinese relations.

China's current pattern of energy production and consumption poses a tremendous long-term threat to the global environment (see figure 2). China has surpassed the United States as the world's largest national emitter of CO_2, although it notably lags far behind on a per-capita basis, while its energy demand is projected to grow at a rate several times that of the United States for decades to come.

China's steep carbon-emissions trajectory is to a large extent the result of its reliance on coal. Currently, coal constitutes approximately two-thirds of China's primary energy consumption, and it will continue to be a major fuel source for the foreseeable future. China has enormous coal reserves, and coal is a far more cost-efficient energy source than imported natural gas at today's prices. China is now building traditional coal-fired power plants at a rate of almost one per week, each of which releases approximately 15,000 metric tons of CO_2 per day.[51]

Today, coal use accounts for more than 80 percent of China's carbon emissions, whereas automobile emissions only constitute approximately 6 percent.[52] Cars and trucks, however, will be an increasingly important factor in the future. The size of China's vehicle fleet is projected to grow from 37 million to as many as 370 million during the next 25 years.[53]

Unless its pattern of energy consumption is altered, China's carbon emissions will reinforce or accelerate several existing domestic environmental challenges, ranging from desertification to water shortages to the deterioration of air quality in urban areas, and become the primary driver of global climate change itself. China's future will be shaped by how its leadership reacts to intensifying domestic and international pressure to address these challenges.

The IPCC projects in its 2007 Fourth Assessment Report that climate change will "impinge on sustainable development of most developing countries of Asia, as it compounds the pressures on natural resources and the environment associated with rapid urbanization, industrialization, and economic development."[54] For instance, according to the report, "[t]he rainfed crops in the plains of north and northeast China could face water-related challenges in coming decades, due to increases in water demands and soil-moisture deficit associated with projected decline in precipitation."[55] China's first national report on climate change, released in late 2006, estimates that

Figure 2. Growth Rates for China, the United States, and the World to 2030

Selected Energy Projections: 2003 quantity/2030 quantity expressed as percentage growth rate.

	China	U.S.	World
Total energy (quadrillion BTUs)	4.2	1.3	2.0
Oil (million barrels/day)	3.8	1.2	1.4
Natural gas (trillion cubic feet)	6.8	0.7	2.4
Electricity (billion kilowatt electricity hours)	4.8	1.6	2.6
Nuclear electricity (billion kilowatt electricity hours)	7.6	0.5	1.0
Coal (million short tons)	3.7	1.9	2.5
CO_2 emissions (million metric tons)	4.2	1.3	2.1
GDP per capita (dollars)	5.6	2.9	2.8
Energy per capita (million BTUs per person)	4.2	1.1	1.0

Source: Energy Information Administration, *International Energy Outlook 2006.*

national wheat, corn, and rice yields could decrease by as much as 37 percent in the next few decades.[56] Even a far smaller decrease, however, would require significant action by the central government.

Moreover, China is severely affected by desertification, and the UN Framework Convention on Climate Change (UNFCCC) notes that desertification-prone countries are "particularly vulnerable to the adverse effects of climate change."[57] More than one-quarter of China is already desert, and the Gobi is steadily expanding; it grew some 52,400 square kilometers between 1994 and 1999.[58] According to the UN Convention to Combat Desertification, this threatens the livelihoods of some 400 million people.[59]

Water shortages will also pose a major challenge to China. In 2004 the United Nations reported that most of China's major rivers had shrunk; in December 2006, it found that the Yangtze River's water level dropped to an all-time low because of climate change.[60] Northern China faces the greatest threat in this respect, as it will be subject to heat waves and droughts that will worsen existing water shortages. In addition, two-thirds of China's cities are currently experiencing water shortages, and their predicament will be exacerbated by shifts in precipitation patterns and increased water pollution.[61]

In spite of the colossal development projects that China has initiated in an attempt to mitigate growing environmental stress, such as the South-to-North Water Diversion project, which is anticipated to cost some $59 billion and take a half century to complete, domestic social and political turmoil will increase. One source of unrest will be increased human migration within China due to environmental factors. Much of this migration will reinforce the current migratory trends from countryside to city, putting added pressure on already overpopulated and dangerously polluted urban centers.

Regions of China that benefit from some additional rainfall will also need to cope with an influx of migrants from water-scarce areas. In China's northwestern provinces, where rainfall may increase, the acceleration of the movement of Han Chinese into Muslim Uighur areas will aggravate tensions that have led to low-level conflict for many years. This conflict has intensified as China has begun to extract natural resources from these provinces and as larger numbers of Han Chinese have migrated there in search of employment. The projected increase in Han migration to this area could provoke violent clashes and potentially lead to social turmoil.[62]

In the last few years, concerns over environmental issues have provoked thousands of Chinese to demonstrate across the country. In April 2005, as many as 60,000 people rioted in Huaxi village in Zhejiang Province over the pollution from a chemical plant. Just three months later, 15,000 people rioted for three days in the eastern factory town of Xinchang, 180 miles south of Shanghai, over the pollution from a pharmaceutical factory.[63]

Moreover, the findings of a poll conducted in China last year by the Chicago Council on Global Affairs and WorldPublicOpinion.org indicate widespread recognition among the Chinese public that climate change is a uniquely serious environmental problem. Some 80 percent of respondents concurred that, within 10 years, global warming could pose an important threat to their country's "vital interest."[64]

At present, robust economic growth is the bedrock of the Chinese leadership's domestic political strategy, but in the coming years, the leadership will face growing public pressure to play a much more constructive role in managing the environment and addressing its negative impacts. The Chinese people are likely to insist that their leaders assume greater responsibility for protecting the environment, addressing and redressing the economic damage that results from environmental degradation, and holding accountable those who violate environmental regulations.

On one hand, this may lead to internal political reform designed to address public concern. The central government may assume a much larger role in affairs and policies that to date have been left largely in the hands of regional or local officials. At present, State Environmental Protection Agency (SEPA) local

officials are selected not by high-level SEPA officials but by local governments.[65] These officials do not currently have the necessary incentive to enforce regulations that sacrifice short-term economic growth for longer-term environmental sustainability, and they are also vulnerable to corruption. If the government is to address the underlying environmental challenges and enforce environmental regulations, it will need to change the incentive structure and provide more oversight.

Climate change will pose a growing political and economic challenge to China.

Yet, the Chinese leadership may not make the necessary adjustments even as the effects of climate change and other environmental factors become increasingly severe. This could lead to larger protests and violent clashes with police, as well as more restrictions on the press and public use of the internet. Relations with the West would rapidly deteriorate as a result.

A second factor that could shape China's future is not internal but external, namely, the growing pressure from the international community to curb carbon emissions and to enter into a global carbon-reduction agreement. To date, China has resisted policies and treaties that restrict its carbon emissions, opting instead to set its own energy-intensity targets. The current national goal is to reduce energy intensity by 20 percent by 2010 and to quadruple GDP while only doubling energy growth by 2020.[66] This target is considered extremely ambitious, and the added economic costs of constraining its carbon emissions would make it even more so.

Regardless, pressure on China to be a responsible stakeholder will escalate as its economic and political strength grow and as it surpasses the United States as the world's largest carbon emitter in the near future. Furthermore, mounting global awareness about the threats posed by climate change and the harm it is inflicting on developing countries in which China is seeking to expand its political and economic influence will make it difficult for China to remain outside of a U.S.-supported, post–Kyoto Protocol regulatory framework on climate change without severely damaging its international standing.

If the United States is not a participant in the post-protocol framework and has not adopted significant carbon reduction policies of its own, then China will undoubtedly be spared much of this international pressure and be far less likely to limit its carbon emissions, particularly given that climate change is just one of many environmental challenges that it faces. This was the case with China's first national strategy on climate change, released in June 2007, in which it rejected any caps on its carbon emissions.

Challenges and Opportunities for the International Community

The natural disasters, humanitarian emergencies, and other crises that climate change causes or intensifies will present serious challenges not only to directly affected countries, but to the entire international community. The developing world will need substantial support to endure the effects of climate change, and it will seek this support with the full awareness that the historical responsibility for the high levels of anthropogenic carbon in the atmosphere rests on the developed world's shoulders.

The United Nations

As a result of climate change, various states and parties will call on the UN and other multinational organizations with increased frequency to help manage refugee flows, food-aid distribution, disaster relief, and other emergencies. To handle its increased workload, the UN will need increased financial and diplomatic support. The United States is likely to supply the former consistently but the latter inconsistently, as operations that require the consent of the UN Security Council will invariably become entangled in disparate international political disputes.

The UN will also play a central role in negotiating and implementing a post–Kyoto Protocol international climate reduction scheme. As climate change impacts become more serious and disruptive, calls for unified, global action will grow ever louder, and a failure to reach a meaningful consensus could precipitate wider political breakdowns at the world body. When the UN Security Council decided to take up the issue of climate change and energy security in April 2007, for instance, the 135 members of the Group of 77 quickly united to protest what they saw as a hypocritical effort by some of the world's worst emitters, past and present, to wrestle control of the climate change issue from the General Assembly.[67] This could foreshadow much more acrimonious clashes between large and small emitters and even among developed nations with different emissions policies.

In the future, the UN might seek to avert these clashes between the Security Council and the General Assembly by creating a new Climate Security Council in which key developed and developing countries, such as Brazil, China, Germany, India, Japan, and South Africa, would be represented. If the UN fails to provide an effective institutional setting for debate and decisionmaking on climate change issues, however, there will be increased interest in developing alternative forums, such as an "E-8" annual summit that is modeled on the Group of Eight but would be comprised of the world's major carbon emitters and be devoted exclusively to ecological and resource issues.[68]

Another serious challenge to the UN is likely to be the magnitude of the demands placed on it by environmental migration. In the aftermath of World War II, the UN established a system to protect civilians who had been forced from their home countries by political violence. Today, almost nine million are officially designated refugees under the protection of the UN High Commission for Refugees (UNHCR), but this number is dwarfed by the more than 25 million people who have fled their homes as a result of environmental degradation.[69] The IPCC estimates that the number could reach 50 million by the end of the decade and up to 200 million by 2050, though even a far smaller figure will still prove difficult for the UNHCR to manage.[70]

> Developing countries will look to the United States and the developed world for help.

The UNHCR has thus far refused to grant these people refugee status, instead designating them as "environmental migrants," in large part because it simply lacks the resources to address their needs. With no organized effort to supervise the migrant population, however, these desperate individuals go where they can, not necessarily where they should. As their numbers grow, it will become increasingly difficult for the international community to ignore this challenge. Significantly more resources will need to be channeled to the UNHCR as well as to other critical international bodies, particularly those that make up the International Red Cross and Red Crescent organizations.

The European Union

The EU today is at the forefront of action to reduce the greenhouse gas emissions of major economies. Its member states continue to lead the international community in carbon reduction policies and practices. The entire EU is responsible for only 14 percent of global carbon emissions at present, and this percentage will shrink even further in coming years.[71] It has also established the world's first functioning carbon market, which could evolve into a global one in years to come. The EU is already considering expanding its Emissions Trading Scheme to include groups or subnational states, such as California.

Consequently, the EU will likely cement its position as the most responsible and united regional organization on the issue of climate change. The Organization of American States (OAS), for instance, may rival the EU in terms of its member countries' carbon emissions, but the OAS is not structured to make such institution-wide policies and seems unlikely to change that practice. Likewise, although the Asia-Pacific Economic Cooperation forum, the Association of Southeast Asian Nations Regional Forum, and the East Asia

Summit bring many of the world's worst carbon emitters together to cooperate on energy and economic issues, these organizations lack the capacity and the mandate needed to develop and impose carbon reduction policies on their members.

The United States as First Responder

Although some of the emergencies created or worsened by climate change may ultimately be managed by the UN, nations will look to the United States as a first responder in the immediate aftermath of a major natural disaster or humanitarian emergency. The larger and more logistically difficult the operation, the more urgent the appeal will be.

The questions of if and how to respond will be recurring ones for the United States, each time raising a difficult set of questions with important national security and foreign policy implications. How much financial assistance should the United States pledge and how quickly? With which other countries should the United States seek to coordinate its response, either operationally or diplomatically? Should the U.S. military participate directly, and if so, in what capacity and on what scale?

This last question is particularly sensitive, but it presents potential geopolitical rewards as well as risks. For instance, the U.S. military played a vital role in the international relief efforts undertaken in the aftermath of the December 2004 Indian Ocean tsunami. There was simply no substitute for the more than 15,000 U.S. troops, two dozen U.S. ships, and 100 U.S. aircraft that were dedicated to the operation. The performance of the U.S. military was resoundingly applauded by the international community. In Indonesia itself, the public image of the United States improved dramatically.

A Pew Research Center poll conducted in the spring of 2005 found that 79 percent of Indonesians had a more favorable impression of the United States because of its disaster relief efforts, and as a result, the overall U.S. favorability rating in Indonesia rose to 38 percent after having bottomed out at 15 percent in May 2003.[72] Admiral Michael Mullen, chairman of the Joint Chiefs of Staff, was right to describe the military's response to the tsunami and the subsequent improvement of the U.S. image in the region as "one of the most defining moments of this new century."[73]

Whether the tsunami response will be remembered in 30 years time as defining or as an exceptional case, however, is not yet clear. As the world looks to the United States for assistance with greater frequency and when disaster strikes in places where the U.S. military could be greeted with some hostility, the difficulty of executing relief missions will become increasingly complex and dangerous. What will happen when a U.S. soldier or marine is killed by an

insurgent or terrorist in the midst of a relief operation? Will the United States shun direct participation in countries where it fears that short-term humanitarian assistance could evolve into long-term stability operations, even if it is precisely these countries that are in the greatest danger of failing without such direct engagement?

As international and domestic political circumstances present new challenges to the U.S. military, the shifting physical environment will do so as well. The increased frequency of severe storms will create adverse conditions, in particular for air and sea operations, while rising sea levels will threaten the long-term viability of bases situated on islands or low-lying coastal areas.

Will the 2004 tsunami response be remembered as a defining or an exceptional case?

As a result, the U.S. military will need to plan for how it will protect or, in an extreme case, compensate for the loss of bases in vital strategic areas, such as the Diego Garcia atoll in the southern Indian Ocean, which serves as a major hub for U.S. and British missions in the Middle East and was instrumental in the military's rapid response to the tsunami.[74] Expanding existing bases or establishing new ones can be expensive and politically treacherous, and the United States may invest more in developing its own offshore "sea basing" platforms that do not require host-country consent.

The roles of the U.S. Army and National Guard will also need to evolve. At present, National Guard troops are responsible for responding to domestic natural disasters when needed, yet their deployment overseas could leave the United States short of troops and equipment precisely when extreme weather events will be occurring more frequently at home. Furthermore, regular Army and Marine Corps troops may need to receive training in how to provide disaster relief in potentially hostile environments, perhaps as part of a post-Iraq focus on developing the skill sets needed for counterinsurgency, stabilization, and other nonconventional operations.

More generally, the United States may become reluctant to expend ever-greater resources on overseas disaster relief, not to mention longer-term humanitarian and stabilization operations, as the impacts of climate change begin to be felt more acutely at home. Natural disasters already cost the United States billions of dollars annually, and the IPCC projects that climate change will create an "extended period of high fire risk and large increases in area burned" in North America and particularly in the western United States.[75] In addition, the United States will have to meet rising health costs associated with more frequent heat waves, a deterioration of air quality, and an increase in water-borne disease.

We might have glimpsed this future in the response to the Pakistani earthquake of 2005, which occurred just two months after Hurricane Katrina. With its time and resources devoted to the Gulf Coast, the United States may not have responded as quickly and effectively as it otherwise would have and, as a result, missed a rare opportunity to recast its image in a strategically critical country.[76]

The Danger of Desensitization

Over the next three decades, the spread and advancement of information and communication technologies will enable the public to follow these crises more closely, making it difficult to ignore the widening chasm between how the world's haves and have-nots are affected by climate change. Yet, as noted in a recent report by the British Ministry of Defence's Development, Concepts, and Doctrine Centre, the very words and images that at first will catalyze action might eventually lose their impact: "Societies in the developed and developing worlds may become increasingly inured to stories of conflict, famine, and death in these areas and, to an extent, desensitized."[77]

Ultimately, the threat of desensitization could prove one of the gravest threats of all.

Ultimately, the threat of desensitization could prove one of the gravest threats of all, for the national security and foreign policy challenges posed by climate change are tightly interwoven with the moral challenge of helping those least responsible to cope with its effects. If the international community fails to meet either set of challenges, it will fail to meet them both.

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