

Center for American Progress



# Global Warning

*The Security Challenges of Climate Change*

John Podesta and Peter Ogden  
November 2007

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## The Security Challenges of Climate Change

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*This paper was prepared for a Center for Strategic and International Studies and Center for a New American Security task force on the potential security implications of climate change. It appears in abridged and revised form in the task force report, "The Age of Consequences: The National Security and Foreign Policy Implications of Global Climate Change" and as an article in The Washington Quarterly (Winter 2007–2008).*

## Executive Summary

**D**uring the course of the past year, a high-level working group of foreign policy experts, climate scientists, historians, and other specialists has met regularly to investigate the national security and foreign policy implications of climate change. Many of the key findings of this task force, which was directed by the Center for Strategic and International Studies and the Center for a New American Security, are presented in a new report entitled “The Age of Consequences.”

“The Age of Consequences” is organized around three possible climate change scenarios that were developed by Pew Center Senior Climate Scientist Dr. Jay Gullede in consultation with other leading experts in the field. Our chapter, presented here in its complete, unabridged form, analyzes the foreign policy and national security implications of the most moderate of these scenarios over a 30-year timeframe. We identify the critical challenges created or exacerbated by climate change that the United States and the international community will confront, including:

- Large-scale human migration due to resource scarcity, increased frequency of extreme weather events, and other factors, particularly in the developing countries in the earth’s low latitudinal band.
- Intensifying intra- and inter-state competition for food, water, and other resources, particularly in the Middle East and North Africa.
- Increased frequency and severity of disease outbreaks.
- Heightened risk of state failure and regional conflagration.
- Significant shifts in the geostrategic roles of every major fuel type.
- Increased U.S. border stress due to the severe effects of climate change in parts of Mexico and the Caribbean.
- Increased uncertainty over how China’s political leadership will respond to growing domestic and international pressure to become a “responsible stakeholder” in the global environment.
- Strain on the capacity of the United States—and in particular the U.S. military—to act as a “first responder” to international disasters and humanitarian crises due to their increased frequency, complexity, and danger.
- Growing demand for international institutions to play new and expanded roles in the management of refugee crises and in providing forums for the negotiation of climate agreements.

## Introduction

When it comes to the effects of climate change, the future is becoming increasingly clear.<sup>1</sup> The expected greenhouse gas emission scenario developed by the Intergovernmental Panel on Climate Change portends a world in which people and nations will be threatened by massive food and water shortages, devastating natural disasters, and deadly disease outbreaks.<sup>2</sup>

There is no foreseeable political or technological solution that will enable us to avert the majority of the climatic effects projected here. The world will confront many of these challenges in the course of the next 30 years even if, for instance, the United States were to enter into an international carbon cap and trade system. The scientific community, meanwhile, remains far from a technological breakthrough that would lead to a decisive, near-term reduction in the concentration of carbon dioxide in the atmosphere.

Moreover, the IPCC's projection assumes that climate change will not trigger any significant positive feedback loops (for instance, the release of carbon dioxide and methane from thawing permafrost). Such feedback loops would multiply and magnify the effects of climate change, creating an even more hostile environment than the one we consider here. Thus, it is not alarmist to say that the IPCC scenario on which we have based our analysis may be the best we can hope for. It is certainly the least we ought to prepare for.

Significantly, the foreign policy and national security consequences of climate change are as much determined by local political, social, and economic factors as by the magnitude of the climatic shift itself. As a rule, wealthier countries, and wealthier individuals, will be better able to adapt to the effects of climate change, while the disadvantaged will suffer the most. For example, an increase in rainfall can be a blessing for a country that has the ability to capture, store, and distribute the additional water; however, it is a deadly source of soil erosion for a country that does not have adequate land management practices or infrastructure.<sup>3</sup>

Consequently, even though the IPCC projects that the 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 and sub-Saharan Africa 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 remain-

ing resources, which can drive human migration, which, in turn, can create new food shortages in new regions.

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

## 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, and this will force the resettlement of people from coastal areas in the United States. 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.<sup>4</sup>

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.<sup>5</sup>

It is in the developing world, however, where the impact of climate-induced migration will be most pronounced. 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 before.<sup>6</sup> In some cases, it will even spark war by heightening competition over scarce resources and upsetting the cultural or ethnic order within a country or region.<sup>7</sup>

The three regions in which climate-induced migration will present the greatest geopolitical challenges are: South Asia, Africa, and Europe.

### *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 megadeltas, flooding from the rivers.”<sup>8</sup> 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 effects of climate change and other environmental factors steadily render the low-lying regions of the country uninhabitable.<sup>9</sup> Many of the displaced will

move inland, which will foment instability as the resettled population competes for already scarce resources with the 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.

Notably, the issue of climate change has not generated the same degree of public concern or political activity in India as it has in many other countries. A recent global public opinion poll found that only 19 percent of Indians believe that global warming is a sufficiently “serious and pressing problem” to merit taking immediate action if it involves significant cost.<sup>10</sup> In contrast, 42 percent of Chinese and 43 percent of Americans support taking such action.<sup>11</sup>

In the coming decades, however, there will likely be some shift in domestic attitudes—and in international expectations for greater engagement—as India’s booming population begins to confront acute environmental stress stemming from climate change and environmental degradation.<sup>12</sup> According to the IPCC, agricultural productivity throughout South Asia will decrease significantly due to high temperature, severe drought, flooding, and soil degradation. India will reach a state of water stress before 2025, and incidences of water-borne infectious diseases and cholera are projected to increase.<sup>13</sup>

To date India has steadfastly refused to any binding limits on its carbon emissions, but there are indications that domestic policymakers in India are beginning to recognize the need to start facing the challenges posed by climate change. On July 13, 2007, Prime Minister Manmohan Singh chaired the inaugural meeting of the National Council on Climate Change to oversee the development of India’s first national climate change policy. What role India will play in international negotiations over carbon reduction policies in the years to come remains unclear, however, for its share of global energy demand and carbon emissions is projected to continue to lag far behind major consumers and emitters like the United States and China for decades.

What is certain is that 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 4 million people inhabit these islands, and many of them will have to be accommodated on the mainland eventually.<sup>14</sup>

Bangladeshi migrants will generate political tension as they traverse the region’s many contested borders and territories, such as those between India, Pakistan, and China. Already, the India-Bangladesh border is a site of significant politi-

**FIGURE 1: 2003 QUANTITY/2030 QUANTITY AND PERCENT GROWTH**

	CHINA	INDIA	U.S.	WORLD
Total Energy	45.5/139.1	14.0/32.5	98.1/133.9	420.7/721.6
Quadrillion BTUs	4.2%	3.2%	1.2%	2.0%
Million Metric Tons	3,541/10,716	1,023/2,205	5,796/8,115	11,878/26,180
Carbon Dioxide	4.2%	2.9%	1.3%	2.1%

Source: Energy Information Administration International Energy Outlook 2006.

cal friction, as evidenced by the 2,100-mile, 2.5-meter high iron border fence that India is in the process of building.<sup>15</sup> 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 United States' invasion of Afghanistan, for instance, hundreds of Taliban and jihadists found safe haven in Bangladesh.<sup>16</sup> The combination of deteriorating socioeconomic conditions, radical Islamic political groups, and dire environmental insecurity brought on by climate change could prove a volatile mix, one with severe regional and potentially global consequences.<sup>17</sup>

Unfortunately, climate change is reducing the effectiveness of many of the development projects being financed by the international community in South Asia and elsewhere even 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 effect 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.<sup>18</sup> Furthermore, the water shortages brought about by 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, Nepal's stability has regional ramifications. An eruption of severe social or political turmoil in Nepal could ripple across all of South Asia.

### ***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, which will impose a heavy burden on central governments. Simultaneously, the risk of state failure will increase as these migration patterns challenge the capacity of central governments to control 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.<sup>19</sup> Lagos, the capital, is one of the West African coastal megacities that the IPCC identifies as at risk for sea level rise by 2015.<sup>20</sup> 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. It will, for instance, exacerbate the existing internal conflict over oil production in the Niger Delta.<sup>21</sup>

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.<sup>22</sup> Given that Nigeria is the world's eighth largest—and Africa's single largest—oil exporter, this instability is having an effect on the price of oil, and it will have global strategic implications in the coming decades.<sup>23</sup> 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 effects 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 to 20 percent increase in rainfall during the winter months will cause flooding and soil erosion, while a 5 to 10 percent decrease in the summer months will cause severe droughts.<sup>24</sup> This will jeopardize the livelihoods of millions of people and the economic capacity of the region. The agriculture sector constitutes

some 40 percent of East Africa's GDP and provides a living for 80 percent of the population.<sup>25</sup>

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 21st century.<sup>26</sup> 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 become a central breeding ground and safe haven for jihadists as climate change pushes more states toward the brink of collapse.

## Europe

While 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.<sup>27</sup> This will likely result in a 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.

Already, the majority of immigrants to most Western European countries are Muslim. Muslims constitute approximately 5 percent of the European population,

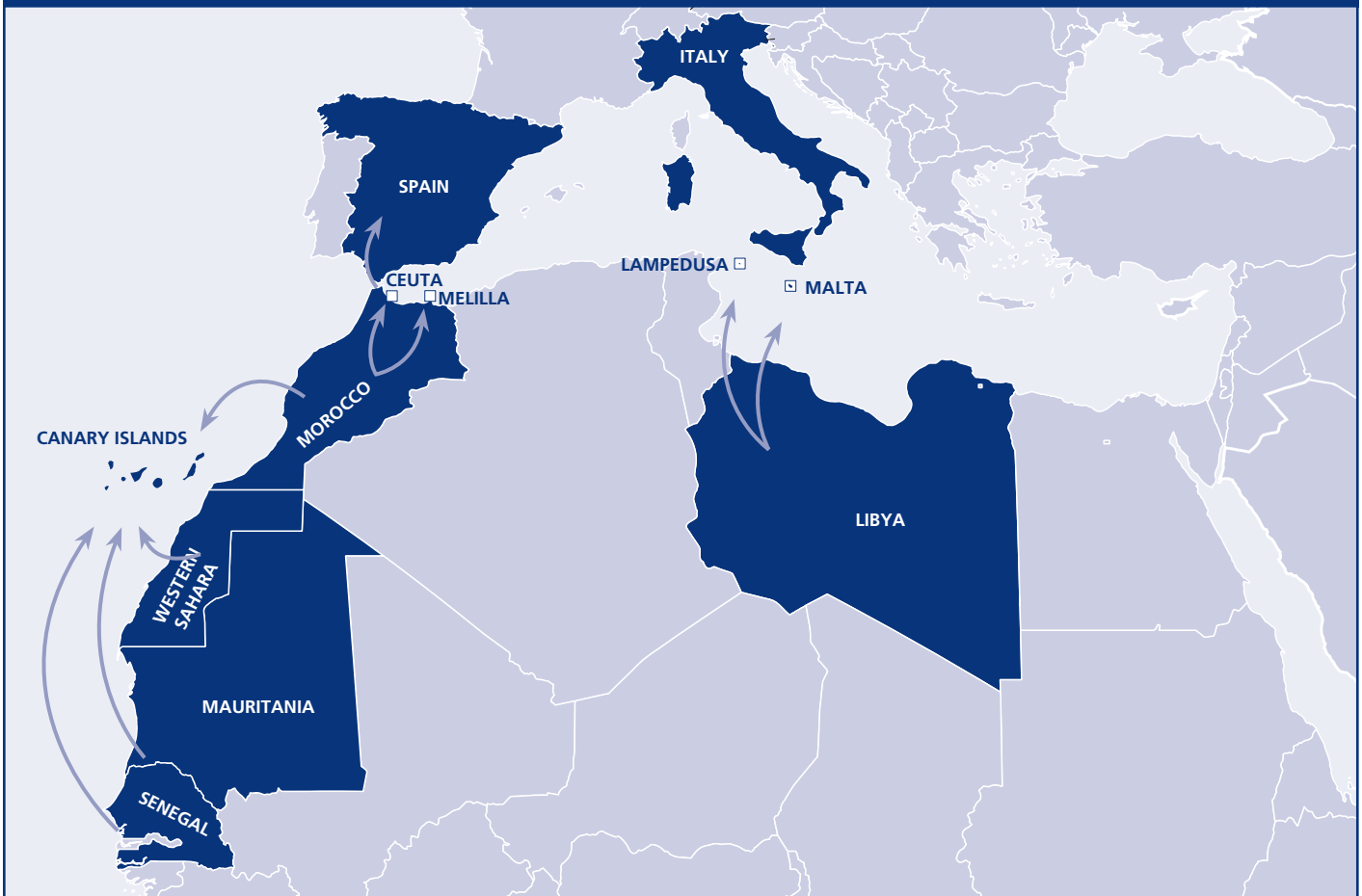
with the largest communities located in France, the Netherlands, Germany, and Denmark.<sup>28</sup> Europe’s Muslim population is expected to double by 2025, and it will be much larger if, as we expect, the effects of climate change spur additional migration from Africa and South Asia.<sup>29</sup>

The degree of instability 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. The suspicion with which many view Europe’s Muslim and immigrant communities has

been intensified by “homegrown terrorist” attacks and plots, and the risk of a serious nationalist, anti-immigrant backlash is steadily increasing.

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 both legal and illegal immigrants. 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.<sup>30</sup> The number of Africans who attempt to reach the Spanish Canary Islands—the

**FIGURE 2: KEY MIGRANT ROUTES FROM AFRICA TO EUROPE**



Source: BBC News. Available at <http://news.bbc.co.uk/2/hi/europe/5313560.stm>.

southernmost European Union territory—has more than doubled since then. In 2006, at least 20,000 Africans attempted the perilous, often fatal journey.<sup>31</sup>

Thus far, the EU has responded to this challenge with ad hoc measures, such as creating rapid reaction border guard teams.<sup>32</sup> While 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, there is the possibility that significant border restrictions will re-emerge and, in so doing, slow the European Union’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 we have discussed, in many parts of Africa, for instance, populations will migrate in search of new water supplies, moving within and across borders, creating conditions for social or political upheaval along the way. This was the case in Darfur, and its effects have been felt throughout the entire region.

But water scarcity also shapes the geopolitical order when states engage in direct competition with neighbors over shrinking water supplies. While 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 30-year scenario is low. There are a very limited number of situations where 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 like oil, and to reap significant benefit from a military operation would require capturing an entire watershed, cutting supply to the population currently dependent upon it, and then protecting the watershed and infrastructure from sabotage.<sup>33</sup>

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.”<sup>34</sup> The Jordan River physically links the water interests of Syria, Lebanon, Jordan, Israel, and the Palestinian Authority; the Tigris and Euphrates Rivers physically link the interests of Syria, Turkey, Iran, and Iraq. 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.<sup>35</sup> 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 Rivers, Turkey is the only country in the Middle East that does not depend on water supplies that

originate outside of its borders. Though Turkey is by no means a water-rich country, climate change per se will not significantly threaten its water supply within the next three decades.

But 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. Upon completion in 2010, Turkey will have built 22 dams and 19 power plants along the Euphrates River, thereby reducing water supply further downstream. 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.<sup>36</sup>

Turkey's ability to use water as a political tool will become increasingly important in its relations with Syria. Turkey has previously threatened to cut off water in retaliation for Syria's support of the Kurdish Workers' Party, or PKK, and it has the capacity to reduce water supplies to Kurdish-controlled northern Iraq.<sup>37</sup> Though 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.<sup>38</sup> Over-pumping 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

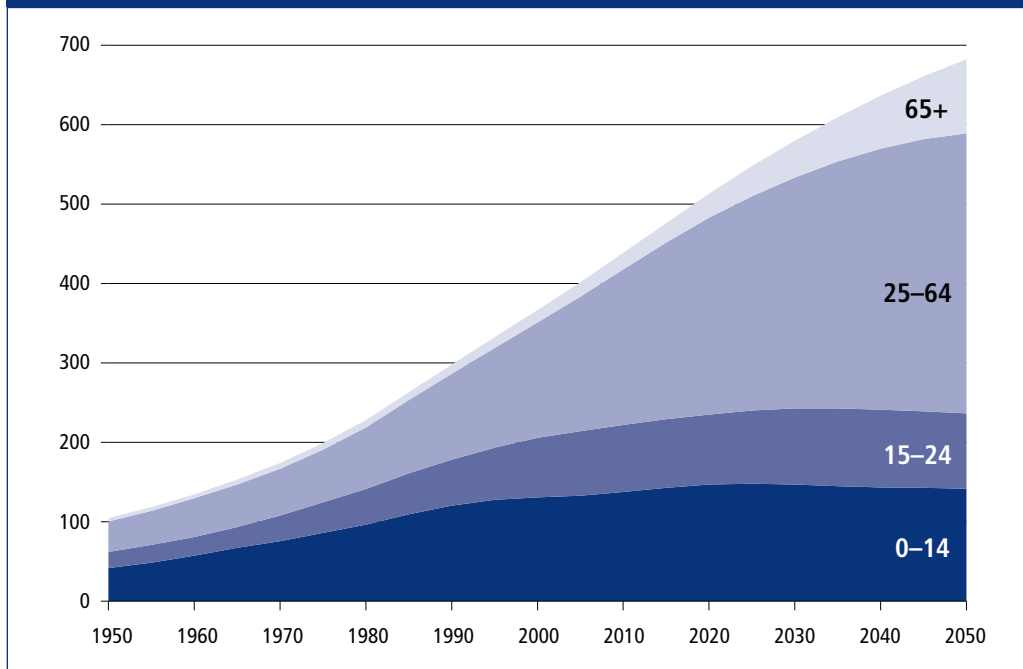
of it is from the Golan Heights and another third is in the mountain aquifer that straddles the West Bank and Israel.<sup>39</sup>

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—where Turkey would ship water directly to Israel in tankers—is eventually completed.<sup>40</sup> 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.<sup>41</sup>

Israel's relations with Syria will also be strained by its need for the water resources of the Golan Heights. Although there is a mutual recognition 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 3). According to current projections, the Middle Eastern and North African population could double in the next 50 years.<sup>42</sup> 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.<sup>43</sup> These clashes will only become more prevalent as the population increases and available water resources diminish.

**FIGURE 3: POPULATION OF MIDDLE EAST & NORTH AFRICA BY AGE GROUP 1950–2050**



Source: Ragui Assaad and Farzaneh Roudi-Fahimi, "Youth In the Middle East and North Africa," April 2007, *Population Reference Bureau*, available at <http://www.prb.org/pdf07/YouthinMENA.pdf>.

## 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 particularly prevalent in countries that experience significant additional rainfall due to climate change.<sup>44</sup> Shortages of food or fresh drinking water will also render human populations both more susceptible to illness and less capable of rapidly recovering. Moreover, the risk of a pandemic is heightened when deteriorating conditions prompt human migration.<sup>45</sup>

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 where 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, it will severely damage political relations.

This outcome might be averted if countries establish in advance common immigration policies that are specifically designed to cope with international health crises. However, it is most likely that this kind of coordination will occur after the fact, as it did in Europe following several cholera pandemics in the mid-nineteenth century.<sup>46</sup>

In addition to the challenges posed by restrictions on the movement of people, restrictions on the movement of goods will 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 the country approximately \$2 billion in trade revenue.<sup>47</sup> Countries that depend on tourism could be economically devastated by even relatively small outbreaks. The fear of Severe Acute Respiratory Syndrome, or SARS, sharply curtailed international travel to Thailand in 2003, whereas the 2006 military coup had little impact on tourism.<sup>48</sup> And 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, however, 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, now U.S. General Accountability Office, estimated that Africa's gross domestic product would be one-third higher if malaria had been eradicated in 1970.<sup>49</sup>

The outbreak of disease can also lead a government to adopt policies that may be seen 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 anti-governmental groups with the opportunity to increase their popularity and legitimacy by providing those health services that the government does not.<sup>50</sup> When these groups are sponsored by foreign governments, such as Iran's support for Hezbollah in Lebanon, the line between medicine and foreign policy vanishes.

In 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.<sup>51</sup> 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 non-democratic political foundations, there is a heightened risk that this will lead to civil war or a toppling of the government altogether.

Given the country's geopolitical significance, it is worth noting that 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 waterborne 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.<sup>52</sup>

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.<sup>53</sup> The high HIV infection rate in several African militaries provides a recent example of how a disease can come to have a disproportionate effect on a sector of the population that is critical to a country’s national security.<sup>54</sup>

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 out-

breaks 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.-Sino relations.

China’s current pattern of energy production and consumption poses a tremendous long-term threat to the global environment. China has surpassed the United States as the world’s largest na-

**FIGURE 4: THE ENERGY INFORMATION ADMINISTRATION PROJECTS THE FOLLOWING GROWTH RATES FOR CHINA, THE U.S., AND THE WORLD TO 2030**  
*Selected Energy Projections—2003 Quantity/2030 Quantity and Percent Growth Rate*

	CHINA	U.S.	WORLD
Total Energy	45.5/139.1	98.1/166.2	420.7/721.6
Quadrillion BTUs	4.2%	1.3%	2.0%
Oil	5.6/15	20.1/27.6	80.1/118
Million barrels/day	3.8%	1.2%	1.4%
Natural Gas	1.2/7.0	22.3/26.9	95.5/182
Trillion cu feet	6.8%	0.7%	2.4%
Electricity	1671/5971	3669/5619	14,781/30,116
Billion kWe-h	4.8%	1.6%	2.6%
Nuclear Electricity	42/304	764/871	2,523/3,299
Billion kWe-h	7.6%	0.5%	1.0%
Coal	2168/5855	1095/1704	5250/10581
Million short tons	3.7%	1.9%	2.5%
CO <sub>2</sub> Emissions	3,541/10,716	5,796/8,115	25,028/43,676
10 <sup>6</sup> metric tons	4.2%	1.3%	2.1%
GDP per capita	4,618/19,940	35,467/63,148	8,048/17,107
Dollars	5.6%	2.9%	2.8%
Energy/capita	31.5/96.2	337/454	66.7/88.0
10 <sup>6</sup> BTU per person	4.2%	1.1%	1.0%

Source: Energy Information Administration International Energy Outlook 2006.

tional emitter of carbon dioxide—though, notably, it 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 because 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<sub>2</sub> per day.<sup>55</sup>

Today, coal use accounts for more than 80 percent of China's carbon emissions, while automobile emissions only constitute approximately 6 percent.<sup>56</sup> However, cars and trucks will be an increasingly important factor in the future because 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.<sup>57</sup>

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—as well as 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 urbanisation, industrialisation, and economic development.”<sup>58</sup> For instance, according to the report, “The rain-fed crops in the plains of North and North-East 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.”<sup>59</sup> China's first national report on climate change, released in late 2006, estimates that national wheat, corn, and rice yields could decrease by as much as 37 percent in the next few decades.<sup>60</sup> Even a far smaller decrease, however, would require significant action by the central government.<sup>61</sup>

China, moreover, is severely affected by desertification, and the UN Framework Convention on Climate Change notes that desertification-prone countries are “particularly vulnerable to the adverse effects of climate change.”<sup>62</sup> More than a quarter of China is already desert, and the Gobi is steadily expanding—it grew some 52,400 square kilometers between 1994 and 1999.<sup>63</sup> According to the UN Convention to Combat Desertification, this threatens the livelihoods of some 400 million people.<sup>64</sup>

Water shortages will also pose a major challenge to China. In 2004, the UN reported that most of China's major rivers had shrunk, and in December 2006 it found that the Yangtze River's water level dropped to an all-time low because of climate change.<sup>65</sup> 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.<sup>66</sup>

Despite 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 half of a century to complete—environmental factors will contribute to domestic social and political unrest. One source of unrest will be increased human migration within China due to environmental degradation. 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.<sup>67</sup>

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.<sup>68</sup>

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, and just three months later, 15,000 people rioted for three days in the eastern factory town of Xinchang—just 180 miles south of Shanghai—over the pollution from a pharmaceutical factory.<sup>69</sup>

Moreover, the findings of a poll conducted in China last year by the Chicago Council on Global Affairs and WorldPublicOpinion.org indicate that there is 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."<sup>70</sup>

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 the 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 local officials are selected not by high-level SEPA officials but by local governments.<sup>71</sup> These officials do not at present have the necessary incen-

tive 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, then it will need to change the incentive structure and provide more oversight.

However, it is also possible that the Chinese leadership will 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 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.<sup>72</sup> This target is considered extremely ambitious and the added economic costs of constraining its carbon emissions would make it even more so.

Regardless, there will be escalating pressure on China to be a “responsible stakeholder” as its economic and political strength grow and its share of global carbon emissions increases. Mounting global awareness about the threats posed by climate change—and the harm it is inflicting on the developing countries that

China is seeking to expand its political and economic influence over—will make it difficult for China to remain outside of a U.S.-supported post-Kyoto regulatory framework on climate change without severely damaging its international standing.

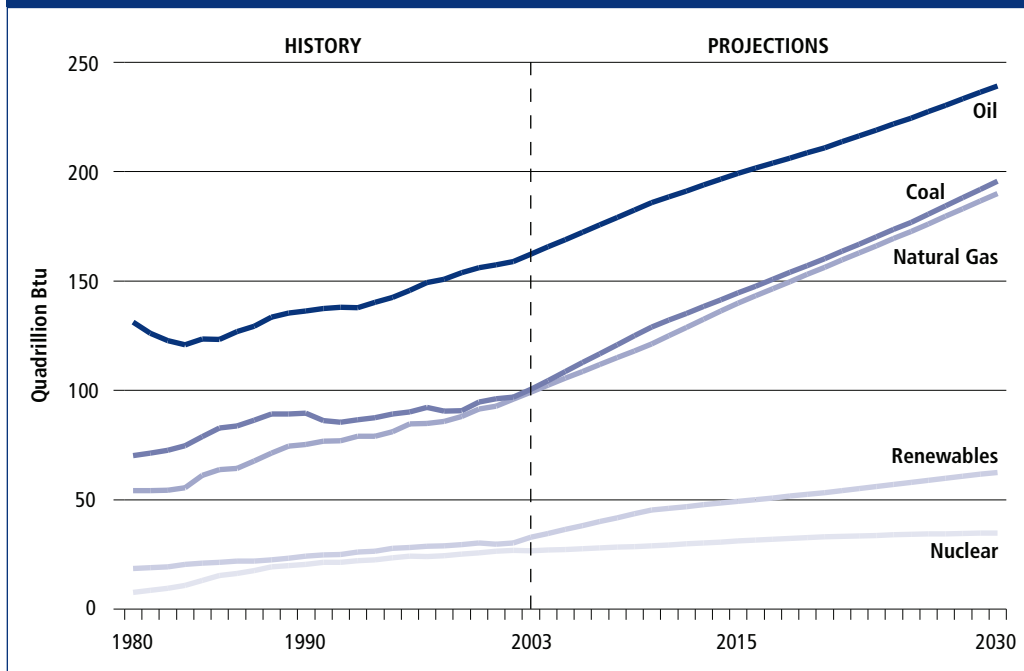
But if the United States is not a participant in the post-Kyoto framework and has not adopted significant carbon reduction policies of its own, China will undoubtedly be spared much of this international pressure and be far less likely to limit its carbon emissions, particularly given that climate change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

## Impact of Climate Change on Fuel Types

In its 2006 International Energy Outlook, the U.S. Energy Information Administration forecasts increased global demand for every major fuel type through 2030, though the rate of growth varies significantly between them.

This EIA projection provides a useful policy-neutral reference case for analyzing the pressures that climate change will exert on patterns of energy production and consumption. There will be significant foreign policy and national security consequences for energy exporting and importing countries alike, including a strengthened geopolitical hand for natural gas exporting countries and, potentially, biofuel exporting countries as well; a weakened hand, both strategically and economically, for importers of all fuel types, who will find themselves increas-

**FIGURE 5: WORLD MARKETED ENERGY USE BY ENERGY TYPE  
1980–2030**



Source: International Energy Outlook 2006.

ingly vulnerable to supply disruption; growing nuclear safety and proliferation threats; and a steady increase in the economic and environmental cost of delaying the implementation of global carbon reduction policies.

### Oil

Climate change will exert upward pressure on oil prices by causing supply disruptions and contributing to instability in some oil producing regions. The increase in temperature brought about by climate change will not result in a large enough reduction in the use of home heating oil—which constitutes a small percentage of global demand—to offset these effects.<sup>73</sup>

In this scenario, the increased frequency of major storms will lead to more dam-

age to off-shore rigs and coastal refineries, while oil tanker shipments will be delayed by weather events. Oil exporting countries will benefit economically from the risk premium that climate change adds to the price of each barrel of oil.

Political instability in oil exporting countries will be exacerbated by climate change as well, leading to reduced output due to everything from acts of sabotage to lack of international investment. For instance, although the United States currently is projected to import between 25 and 40 percent of its oil from Africa by 2015, the adverse political and environmental conditions brought about by climate change may prevent Nigeria and the continent’s nine other oil exporting countries from expanding their existing oil production levels to meet this demand.<sup>74</sup>

Oil-importing developing countries, meanwhile, will be disproportionately affected by increases in the cost of oil because their economies have high energy intensities and fuel switching is difficult. The International Energy Agency estimates that oil-importing and debt-burdened countries in sub-Saharan Africa lose more than 3 percent of their GDP with each \$10 increase in the price of oil.<sup>75</sup>

Despite rising oil prices and an expanding biofuels market, oil will remain a key strategic commodity for the United States, and the U.S. Navy will continue to protect global sea lanes in order to ensure the safe movement of oil shipments around the world. But as China develops its own blue water navy in the next few decades, it too will become involved in securing global sea lanes, in particular the routes linking Northeast and South East Asia.<sup>76</sup> As a result, the U.S. and Chinese navies will need to find ways of coordinating their movements if they are to avoid miscommunication or accidental interference that could cause severe political tension.<sup>77</sup>

U.S.-Sino relations could also be strained if China continues to supplement its international energy deals with state-to-state arrangements that include significant non-market elements such as building airports, offering credit, and tying foreign assistance to energy investment. To date, the list of countries with which it has made such arrangements includes Angola, Sudan, Iran, Algeria, and Saudi Arabia.

A second growing concern for the United States is China's practice of investing in countries where sanctions and other factors limit or preclude the major Western international energy companies from operating. Although China's motivation

may be driven as much by economic as political factors—it is easier, after all, to compete in markets where there is less competition—such investment in sanctioned countries like Sudan and Iran runs counter to the strategic interests of the United States. As China's demand for imported oil increases in the coming years, so will these investments.

### **Natural Gas**

The upward pressure that climate change exerts on the price of oil is likely to help drive demand for natural gas. Moreover, because natural gas is a less carbon-intensive energy source than coal or oil, it will become an increasingly attractive fuel choice, particularly for electricity generation, if stringent national or global carbon emission regulations are adopted.

One likely development will be an increase in the size and scope of the liquefied natural gas market. The United States' overseas liquefied natural gas imports are poised to overtake imports from Canada as its primary source of natural gas within the next few years; Europe, China, and India have all been working to increase liquefied natural gas imports as well.<sup>78</sup>

Although the development of a global liquefied natural gas market will temper the strategic leverage of major natural gas exporters by providing some added security against targeted embargoes or price manipulation, the geopolitical power of countries that are rich in natural gas will nevertheless grow significantly by mid-century. This will create new security risks and new choke points around the world. Countries in Central Asia and the Caucasus will become more strategically important because they can offer energy

supplies and routing alternatives to the Middle East and Russia.

It is Russia, however, that stands to benefit the most from the growing strategic significance of natural gas, as well as from the environmental effects of climate change in general. Russia holds by far the world's largest proven natural gas reserves—almost twice those of Iran, the country with the second largest proven reserves—and currently supplies Europe with two-thirds of its imported natural gas.<sup>79</sup> A warmer climate will help to reduce domestic demand for energy; the IPCC anticipates that “in the United Kingdom and Russia a 2°C warming by 2050 will decrease space heating needs in the winter, thus decreasing fossil fuel demand by 5-10 percent, and electricity demand by 1-3 percent.”<sup>80</sup> In the longer term, increased temperatures could also open up ice-locked northern shipping routes for the export of liquefied natural gas and oil throughout the year.

During the past few years, Russia has proven willing to use its energy assets for political leverage. In January 2006, for instance, Russia dramatically increased the price of natural gas in the run up to the Ukrainian parliamentary elections. When Ukraine refused to pay the new rates, Russia countered by reducing supply to the pipelines that run through Ukraine's territory, leaving Ukraine and several EU countries that also depend on these pipelines short of natural gas in the middle of winter. As global demand for oil and natural gas grows, Russia's energy assets are likely to become an increasingly potent—and frequently employed—political tool.

This tension will be exacerbated and become a more direct challenge to the

national security of the United States if NATO expands to include Ukraine, Georgia, or other countries that are embroiled in ongoing energy conflicts with Russia. Sen. Richard Lugar (R-IN), who as chairman of the Senate Foreign Relations Committee did much to draw attention to global energy security threats, has argued that the deliberate cutoff of energy supplies to a NATO country should trigger a compulsory Article 5 collective response by its members.<sup>81</sup> According to this interpretation, Russia's natural gas supply cutoff to Ukraine would have required U.S. action because Italy and other NATO allies were affected.

Another area of concern for the United States and its allies will be Russia's relationship with China. As Russia becomes an important supplier of energy to East Asia, the strategic interests of China and Russia may become more closely aligned, particularly with regard to Central Asia. Their joint leadership in the Shanghai Cooperation Organization, a regional group that includes Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan, could enable them to exert significant influence over this critical region's energy supplies and pipelines, as well as its overall political and strategic relationship with the West. At their July 2005 summit, for instance, SCO members issued a declaration calling for the closure of U.S. military bases in the region, and before the end of the month the United States had been formally evicted from its base in Uzbekistan.<sup>82</sup>

There also remains a possibility that a natural gas cartel will develop out of the Gas Exporting Countries Forum, in which Russia plays a role analogous to that played by Saudi Arabia within OPEC. At present, natural gas is primarily distrib-

uted through pipelines that involve long-term, regional contracts, and natural gas pricing is closely linked to oil prices. However, the International Energy Agency projects an expansion of global liquefied natural gas capacity from 246 billion cubic meters per year in 2005 to 476 billion cubic meters by 2010. Simultaneously, a larger spot market for liquefied natural gas will emerge, and this will make pricing more susceptible to manipulation by a cartel of natural gas suppliers. As the global natural gas giant, Russia stands to gain the most from this development.

## Coal

For the first time in 16 years of forecasting worldwide energy use, the 2006 International Energy Outlook projects that the rate of growth in coal consumption will exceed that of natural gas.<sup>83</sup> Although there is only a tenth of a percent difference between their projected rates, this signals an alarming trend given the enormous environmental threat posed by carbon emissions from coal-fired power plants. In the absence of international carbon emission restraints, climate change will likely reinforce this trend by increasing the price of natural gas and oil relative to coal.

Given coal's low cost as a fuel source for electricity generation and its wide distribution among developed and developing nations, it is inconceivable that it can or will be largely replaced in the next 30 years.<sup>84</sup> Rather, the question is whether coal will continue to be a driver of climate change or if the development and implementation of clean coal and, in particular, carbon dioxide capture and storage technology can make it a viable fuel source in a carbon-constrained economy.

A 2007 MIT study, "The Future of Coal," found that, despite the lead times involved, carbon capture and sequestration technology can in fact be deployed on a wide enough scale to significantly reduce the carbon emissions from coal-fired power plants by 2050, though only if a global carbon emissions restriction or tax is in place and near-term government investment in research and development is increased.<sup>85</sup>

## Nuclear Power

The Energy Information Administration projects a slight decline in the installed nuclear capacity of Organization for Economic Co-operation and Development countries by 2030, but rapid growth in the nuclear sectors of non-OECD countries such as China.<sup>86</sup> Two of the factors that drive the use of nuclear power are high fossil fuel prices and energy insecurity. As we have seen, climate change will contribute to both.

There is a risk of proliferation associated with this fast expansion of nuclear power. The development of nuclear power capabilities and the associated facilities for the manufacturing and production of nuclear fuels could bring many more countries to the brink of nuclear weapon status. There is also a smaller risk that commercial fuel cycle technology will be transferred to a country that is interested in developing a clandestine nuclear weapons program, as has occurred in Iran.

Approximately a dozen countries in the Middle East and North Africa have recently sought the International Atomic Energy Agency's assistance in developing nuclear energy programs.<sup>87</sup> Political insecurity coupled with the increased

availability of nuclear fuel cycle technology may lead these countries over time to pursue nuclear weapons programs as well.

There is also a risk that a Sunni Arab country will receive assistance from scientists or government officials from Pakistan, the only Sunni state that already possesses nuclear weapons. In addition, non-nuclear Bangladesh could be tempted to pursue such a program if climate change destabilizes the region and its relations with its nuclear neighbor, India, deteriorate further.

Furthermore, rapid nuclear expansion heightens the risk of a nuclear accident. In addition to the local health and environmental consequences, a large-scale accident anywhere in the world could provoke a global backlash against nuclear power. This would increase the economic burden of limiting carbon emissions by forcing countries to switch to more expensive alternatives and could cause countries to reconsider any carbon reduction policies in place.

If global carbon reduction policies are adopted in this time frame, nuclear energy will become more cost-competitive with fossil fuels. This could provide added political justification for countries to develop domestic commercial nuclear power programs that might lead to weapons programs or it could rekindle interest in weapons programs that had been abandoned. Despite these risks, however, nuclear power will continue to play an integral role in the energy strategies of many countries that are seeking to reduce their carbon emissions, making it all the more imperative that the international community redouble its nonproliferation efforts.

## Biofuels

Biomass fuels have the potential to emerge as a competitor to oil, particularly in the transportation sector. This is most likely to occur if a global carbon reduction policy is adopted that creates a strong market incentive for investments in both research and development and infrastructure for such fuels.

The United States and Brazil currently account for more than 70 percent of global ethanol production, but other countries in Latin America and elsewhere could be poised to participate in an expanded international biofuels market.<sup>88</sup> This would help to offset some of the geostrategic importance of oil suppliers.<sup>89</sup> China could be a significant biomass fuel consumer, as it would rather import this fuel than sacrifice food crops for energy crops, particularly if its food security is threatened by climate change. Japan already imports ethanol from Brazil.

The biofuels market will need to be managed effectively in order for it to grow to scale and avoid replicating some of the flaws that plague the fossil fuel market. This requires developing and implementing policies that minimize the total “fields to wheels” carbon emissions from biofuels, which includes emissions from any fossil fuel used to raise energy crops, refine these crops into fuel, and distribute the fuel to consumers.<sup>90</sup>

It is also important to consider non-environmental externalities such as the effect that replacing food crops with energy crops could have on food prices around the world. Although productivity gains have, to date, enabled U.S. farmers to raise sufficient quantities of crops to meet

demand for both food and fuel, policy-makers will need to monitor this issue closely as demand increases in the coming decades.

## Disaster, Humanitarian, and Crisis Response

### *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 the 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 a 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, the United Nations and other multinational organizations will be called on 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 be called upon to play a central role in negotiating and imple-

menting a post-Kyoto international climate reduction scheme. As climate change effects 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 in April 2007 decided to take up the issue of climate change and energy security, for instance, the 135 G-77 nations 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.<sup>91</sup> This could foreshadow much more acrimonious clashes between large and small emitters and even between 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 Germany, Japan, Brazil, India, China, and South Africa would be represented. If the UN fails to provide an effective institutional setting for debate and decision making on climate change issues, however, there will be increased interest in developing alternative forums. For example, an "E-8" forum may emerge that is modeled on the G-8, but would be comprised of the world's major carbon emitters and be devoted exclusively to ecological and resource issues.<sup>92</sup>

In addition to struggles within and between the Security Council and General Assembly, a serious challenge to the UN is likely to be the magnitude of the demands placed upon 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, there are almost 9 million officially designated refugees under the protection of the UN High Commission for Refugees—but this number is dwarfed by the more than 25 million people who have fled their homes as a result of environmental degradation.<sup>93</sup> 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 prove difficult for the UNHCR to manage.<sup>94</sup>

The UNHCR has thus far refused to grant these people refugee status, instead designating them “environmental migrants,” in large part because it lacks the resources to address their needs. But with no organized effort to supervise the migrant population, 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, in particular those that make up the International Red Cross and Red Crescent organizations.

### ***The European Union***

The European Union 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.<sup>95</sup> It has also established the world’s first functioning carbon market, which could evolve into a global one in years to come. Already the EU is considering expanding its Emissions Trading Scheme to include sub-national states or groups such as California.

Consequently, it is likely that the EU will cement its position as the most responsible and united regional organization on the issue of climate change. The Organization of American States, 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, though the ASEAN 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.

### ***United States as “First Responder”***

While some of the emergencies created or worsened by climate change may ultimately be managed by the UN, the United States will be looked to 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 question of if and how to respond will be a recurring one 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 United States' overall favorability rating in Indonesia rose to 38 percent after having bottomed out at 15 percent in May 2003.<sup>96</sup> U.S. 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 America's image in the region as "one of the most defining moments of this new century."<sup>97</sup>

But it is not yet clear if the tsunami response will be remembered in 30 years time as "defining" or as an exceptional case. As the world looks to the United States for assistance with greater fre-

quency, and when disaster strikes in places where the U.S. military could be greeted with some hostility, 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, particularly 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.

Consequently, the U.S. military will need to plan for how it would protect or, in extreme circumstances, 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.<sup>98</sup> Expanding existing bases or establishing new ones can be both expensive and politically treacherous, and it is possible that the United States will choose to invest more in developing its own off-shore "sea basing" platforms that do not require host country consent.

The roles of the Army and National Guard will also need to evolve. At present, National Guard troops are respon-

sible 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 non-conventional operations.

More generally, it is possible that the United States will become reluctant to expend ever greater resources on overseas disaster relief, not to mention longer-term humanitarian and stabilization operations, as the effects 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.<sup>99</sup> 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.<sup>100</sup>

### ***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. However, as noted in a recent report by the UK Ministry of Defense’s Development, Concepts, and Doctrine Center, 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.”<sup>101</sup>

Ultimately, the threat of desensitization could prove one of the gravest threats of all, for it is clear that 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. And if the international community fails to meet either set of challenges, it will fail to meet them both.

## Conclusion

**T**he foreign policy and national security challenges outlined in this chapter are based on climate change projections that are not alarmist. On the contrary, they are largely inescapable. The scientific evidence clearly indicates that we will see effects at least as dramatic as those we outline here within the next three decades. What is not inevitable, however, is how human society responds to global warming and its attendant resource scarcity, extreme weather, and rise of disease.

Many of the conflicts and challenges we describe are tightly interwoven with underlying social, political, and economic factors that exist independently of climate change. It is critical that governments, particularly in the wealthier nations that have the requisite tools and resources, begin to plan immediately for how to prevent, mitigate, and manage the consequences of climate change. Delaying this planning process risks touching off a chain reaction of crisis that will be nearly impossible to stop once it is firmly underway.

## Endnotes

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