FOUR

ARRESTING CLIMATE CHANGE

CLIMATE CHANGE POSES an existential challenge: either all the world's major economies must join together to stop global warming or the world will risk a wave of catastrophe that will change life as we know it. A rise in global sea levels, changes in precipitation patterns, and an increase in extreme weather may be felt most severely by those living in developing countries, but the security and economic repercussions will reach into the industrialized world. Any solution will require radical changes in fossil fuel consumption and significant advances in technology. Yet few countries will sacrifice short-term economic growth to cut the greenhouse gas (GHG) emissions associated with energy use. Hence the dilemma before us—the need for an international agreement that protects all nations from global warming, yet also ensures economic growth and energy security.

Climate change will lead to severe flooding and droughts that will devastate food production in many countries, spread disease, and contribute to hundreds of thousands of deaths each year.[1] Across the developing world, global warming is predicted to push an additional 45 to 70 million people into poverty,[2] potentially negating the efforts of poverty-eradication campaigns of recent decades, driving migration, and exacerbating regional conflicts. Millions living in emerging economies such as China and India already face the impacts of climate change. In China a water crisis resulting from climate change is threatening the agricultural

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region that produces half the country's wheat.[3] In India leaders consider the impact of climate change on its deteriorating water situation to be the biggest risk facing the country.[4] Yet despite a growing awareness that irreparable damage to the environment could lead to economic and social disasters, these emerging powers cannot contemplate slowing their economic growth given the still high levels of poverty, rising populations, and soaring expectations.

Similarly, many American policymakers continue to operate under the illusion that the developed world will be insulated from the worst impacts of climate change. Hurricane Katrina was a glaring example of the dangers of this assumption, and Katrina's devastation may pale in comparison with future global warming scenarios.[5] If temperature increases remain on the current trajectory, parts of Florida and South Carolina could be under water within the next hundred years. Residents of the American Southwest already confront serious water shortages from changing rainfall patterns[6] and growing populations.[7]

Much like their American counterparts, Russian politicians have shrugged off the effects of warming. They might consider whether they would regret it if St. Petersburg were submerged under water, or whether they see a cautionary tale in the devastation of Canada's western forests.

The United States and Europe will face security threats brought on by climate change across the globe. Many countries and regions will face large-scale natural disasters and the potential for violent conflict because of competition for increasingly scarce resources. International stability and the global economy will be threatened if major energy consumers allow competition over diminishing supplies to escalate into war in regions crucial to energy security, particularly in the Middle East, Central Asia, and Africa. A robust international response would be needed to address these growing conflicts, compelling the international community to become more involved in conflict prevention, humanitarian intervention, and reconstruction.

Political leaders today do not imagine or articulate the scale of the devastation and economic burden that the international community will bear if global temperatures continue to rise at current rates. Even as scientists, environmental activists, and business leaders develop an increasingly nuanced understanding of climate change and its diverse impacts, public policies fail to match the seriousness of potential outcomes.

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To create a more effective global framework to arrest climate change, policymakers must overcome two interrelated and equally significant challenges. First, they must use markets and prices to reduce global GHG emissions by creating better incentives for energy efficiency, alternative fuels, protection of forests, and innovation. Second, they must transfer technology, finance innovation, and support adaptation measures while bringing basic infrastructure to the world's poor—in effect, transforming our economies to halt global warming and redress its impacts. Both challenges are connected by policy choices to reflect the cost to our society of GHG emissions that cause global warming.

The United States must lead to break a global deadlock on these issues. Science tells us that decisions within the next decade will determine the depths of the crisis to come. We emphasize that the United States can benefit from measures to mitigate climate change if it accelerates commercialization of green technologies and the development of global markets in energy-efficient and clean-energy technologies. If it does, the scale and importance of the American market can be a driver for global change. If not, the United States will find that over time the opportunity for leadership will be replaced by crisis management of a scale well beyond the Katrina disaster.

INTERCONNECTED PROBLEMS: CLIMATE, SCARCITY, AND SECURITY

Climate change lies at the intersection of earth sciences, technology, economics, politics, and international security. It is central to the competition for energy, land, and water that increasingly threatens economic growth and national security around the world. Understanding the nature of this competition and how it relates to the science behind global warming is critical to arresting climate change.

As human and industrial processes release increasing amounts of carbon dioxide and other greenhouse gases, these gases remain in the atmosphere, trap the heat of the sun, and thus lead to rising global temperatures that alter the climate of the earth. The longer these gases are emitted, the more difficult it becomes to avoid the impacts on human life. The Intergovernmental Panel on Climate Change (IPCC) established that the maximum temperature increase that the world can sustain by 2050,

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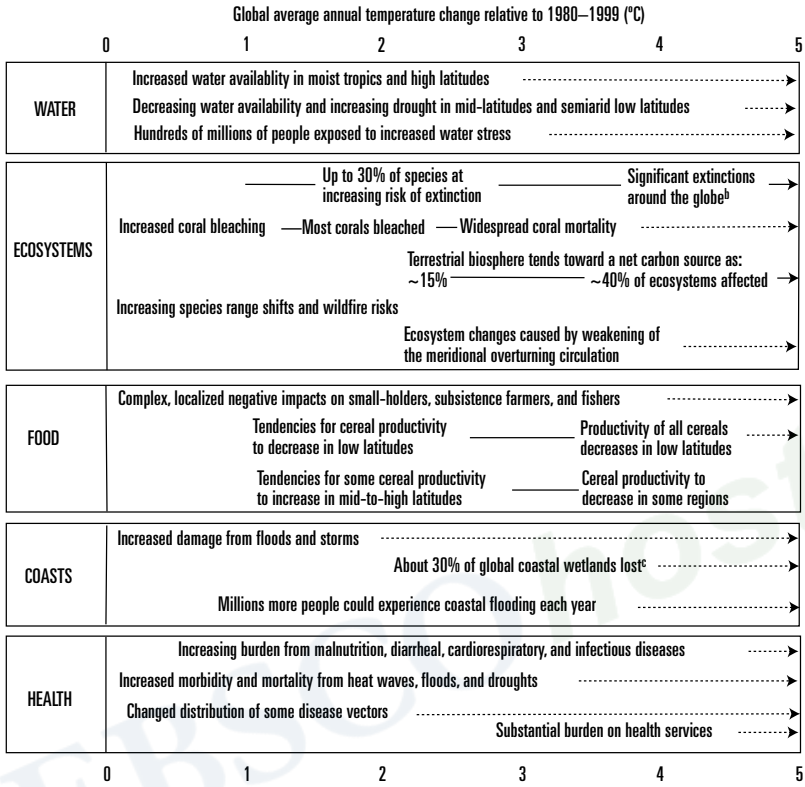
FIGURE 4-1. Global Temperature Change and Its Potential Impacts[a]



Source: IPCC, *Climate Change 2007: Synthesis Report Summary for Policymakers* (November 2007), p. 10.

a. Impacts will vary by extent of adaptation, rate of temperature change, and socioeconomic pathway.

b. *Significant* is defined here as more than 40 percent.

c. Based on average rate of sea level rise of 4.2 mm/year from 2000 to 2080.

without causing irreparable damage, is roughly 2.5°C. Figure 4-1 illustrates that the higher the temperature change, the greater the devastation. Most experts accept the IPCC consensus that GHG emissions (carbon dioxide and equivalent gases, or CO_2e) must remain within 445–490 parts per million (ppm) to contain the earth's temperature within the 2.5°C mark.[8] Current global levels are estimated at between 420 and 445 ppm of CO_2e—in other words, we do not have much room for maneuver.[9]

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Estimates of the level of reductions in global GHG emissions required to stabilize atmospheric concentrations between 445–490 ppm of CO_2e range between 50 and 85 percent (Table 4-1).[10] If we continue current trends, emissions will rise by 25 to 90 percent by 2030 and even more by 2050. The IPCC concludes that global CO_2e emissions must peak in 2015 to keep temperature increases under 2.5°C and avoid the worst changes in our environment. Assuming a two-term American presidency beginning in 2009, the policy choices of the next American president and his international counterparts will determine our environmental future.

The biggest driver of GHG emissions is the consumption of fossil fuels. The use of fossil fuels is central to economic growth, and rapid growth in developed and emerging economies is driving energy demand in ways that will continue to increase overall emissions unless radical changes are made in technology. The International Energy Agency (IEA) projects that by 2030 consumption of fossil fuels will increase by 53 percent to sustain global economic growth.[11] China and India account for close to 50 percent of that growth (see Figure 4-2).[12] The rate of China's rising energy demand is absolutely astounding. Since 2000 China's energy demand has doubled, and it has accounted for one-third of the increase in global oil demand during this period.[13] In 2005 and 2006 alone China's electricity generation increased by an amount equivalent to all the electricity required by the United Kingdom, and 85 percent of that electric power came from coal, the highest carbon-emitting fuel.[14] By 2030 China alone will add the equivalent of a European Union (EU) in electricity generation.[15] Unless economic growth is separated from fossil fuels and resulting emissions, particularly in emerging economies with the most growth in world energy demand, reducing global emissions will be close to impossible.

The competition for scarce energy has itself become a global security threat. For now huge fluctuations of fuel prices are the norm, the product of an oil market with little short-term flexibility on either the demand or supply side—at a time of insecurity in oil-producing regions and along transport routes. This includes conflict in the Middle East, the risk that the Iraq war will spill into the Persian Gulf, the risk of U.S. conflict with Iran, violence in the Niger Delta, populist governments in Iran and Venezuela, and the difficulty of securing major oil transport routes.[16] Add to this the power vested in energy-rich states—especially Russia, Iran, and

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TABLE 4-1. Temperature and Stabilization Scenarios

Scenario	CO_2 concentration at stabilization (2005 = 379 ppm)	CO_2 equivalent atmospheric concentrations at stabilization, including GHGs and aerosols (2005 = 375 ppm)	Peaking year for CO_2 emissions	Percent change in global CO_2 emissions in 2050 (percent of 2000 emissions)	Global average temperature increase above pre-industrial at equilibrium, using "best estimate" climate sensitivity (°C)	Global average sea level rise in meters above pre-industrial at equilibrium from thermal expansion only	Number of assessed scenarios
I	350–440	445–490	2000–2015	–85 to –50	2.0–2.4	0.4–1.4	6
II	400–440	490–535	2000–2020	–60 to –30	2.4–2.8	0.5–1.7	18
III	440–485	535–590	2010–2030	–30 to +5	2.8–3.2	0.6–1.9	21
IV	485–570	590–710	2020–2060	+10 to +60	3.2–4.0	0.6–2.4	118
V	570–660	710–855	2050–2060	+25 to +85	4.0–4.9	0.8–2.9	9
VI	660–790	855–1130	2060–2090	+90 to +140	4.9–6.1	1.0–3.7	5

Source: IPCC, *Climate Change 2007: Synthesis Report Summary for Policymakers*, p. 20.

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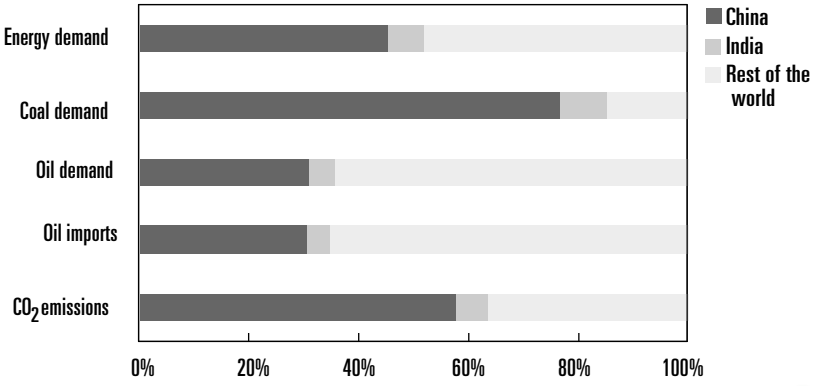
FIGURE 4-2. Increase in World Primary Energy Demand, Imports, and Energy-Related CO_2 Emissions in the Reference Scenario, 2000–06



Source: International Energy Agency, *World Energy Outlook 2007*.

Venezuela—which have demonstrated that they are willing to use their energy market power to manipulate consumers and exert pressure on recipient states. In 2007 oil consumers paid $4 billion to $5 billion more for crude oil every day than they did five years before, transferring more than $2 trillion to oil companies and oil-producing nations.[17]

Moreover, the instability that has restricted access to energy supplies in some regions is driving a wedge between major powers and preventing them from cooperating on other threats. Tensions among the United States, Russia, and China regarding Iran's energy supplies are an obstacle in efforts to counter Iran's growing nuclear program. European dependency on Russian gas complicated a coherent response to Russia's incursion into Georgia in 2008. Major powers' oil interests in Sudan and West Africa have inhibited multilateral cooperation to stop the genocide in Sudan and address rising unrest in Nigeria. If climate change further disrupts access to energy supplies, the risk of clashes among consumers will become more acute.

Particularly in the United States, the tendency to view climate change through a lens of energy independence creates other vulnerabilities. The search for energy independence has led to investing in alternative energy sources without due regard for the consequences on other transnational threats. Nuclear power can help reduce fossil fuel consumption but, as we discuss in chapter 5, it creates its own risk of proliferation if not

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accompanied with controls over the fuel cycle and reprocessing. Similarly, more than $10 billion in annual subsidies for biofuels, especially in the United States and Europe, have had a series of adverse effects: land has been shifted out of food production, contributing 20–30 percent of increased food prices from 2006 to 2008,[18] while accelerating destruction of rain forests and scarcity of water—with little net savings on carbon emissions using current technology.[19] Deforestation now accounts for 20 percent of global GHG emissions and has put Brazil and India into the top five emitters of greenhouse gases.[20] By some estimates, the global community will have tapped all global fresh water supplies by 2050.[21]

Population growth will make all these problems worse. By 2050, the world's population is projected to grow from 6.7 billion today to 9 billion.[22] Already 1.6 billion people without electricity want it and should get it.[23] Add to that another 2.3 billion people on the planet in the next four decades, most of them in Asia and Africa.[24] Conservatively, this means that the world will need to accommodate 3.9 billion new electricity consumers by 2050. Building this capacity by replicating current patterns of energy use and economic growth will create a new form of mutually assured destruction. This underscores the urgency of action. A stable climate cannot sustain current rates of growth in energy use, GHG emissions, and use of limited resources while we wait for technological solutions. Instead, we must put all existing technologies to maximum use and create incentives to conserve in the present—and while we do all these things, enact policies to stimulate innovation that can transform our future.

RESPONSIBLE SOVEREIGNTY AND CLIMATE CHANGE

Climate change is a showcase for why responsible sovereignty must be an organizing principle for international engagement. First, because greenhouse gases contribute equally regardless of where they are emitted, all countries affect one another; the problem has no boundaries. Second, no country can isolate itself from climate change; each nation's welfare and security depend on and are interrelated with other countries' energy use and GHG emissions. Third, no country alone can succeed; restricting emissions in one country will have little net impact if

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investment and manufacturing grow in countries with "dirtier" technologies. Fourth, states must act now for the benefit of future generations—they must exercise responsibility across time and not just borders. Fifth, the issue is interrelated with other transnational challenges: climate change and misguided policies to address it will affect energy, water, land, and food scarcities, and all of these together will increase the risk of conflict.

This interdependence among nations and issues creates a common long-term incentive to solve climate change, but also complicates the short-term prospects to find workable solutions. The negotiator's nightmare is a harsh reality: any major emitter has a veto to a successful outcome. And this tension—between the need for responsible sovereignty on climate change and the capacity of any major power to undermine it—has characterized the nature of the current international framework. Although countries have recognized the need to restrict national emissions to halt global warming, the international regime remains weak because the major emitters have not been willing to participate.

At present, the rules and scientific foundations for responsible sovereignty on climate change center on the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which set standards and goals for state actions, and the IPCC, which provides the scientific underpinning to those actions. Within this framework, a multiplicity of actors have operational roles, such as the UN Environmental Program (UNEP), the UN Development Program (UNDP), the World Bank, bilateral development agencies, and the European Union (EU). These operational agencies support investments ranging from energy efficiency to rain forest protection. The European Union runs the EU Emissions Trading Scheme (EU-ETS), which is a regional market for carbon. Coherence in the international framework is crucial to make the operational agencies effective.

Intergovernmental Panel on Climate Change

UNEP and the World Meteorological Organization (WMO) created the IPCC in 1988. Its membership includes the 190 members of the WMO, and a small secretariat within the WMO runs it. It convenes scientists, governments, and civil society to assess the process of climate change, options for its prevention, and how to adapt to its conse-

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quences.[25] The IPCC is perhaps the best example from any field of the valuable role the United Nations can play to achieve scientific consensus and serve as a watchdog on an issue of global concern. The 2007 Nobel Peace Prize to the IPCC demonstrates global recognition of its accomplishments.

Since its creation, the IPCC has fundamentally changed how the international community views and deals with global warming. Its first assessment report served as the basis for negotiating the UNFCCC, which has become the most important global forum on the issue. Subsequent IPCC reports presented decisive evidence of climate change and its devastating impacts and thus have made it a top priority worldwide. The IPCC's strength is that it collects scientific submissions from around the world and provides a forum to forge consensus on key findings. Its weakness is that it does not have the staff and resources to set and run its own analytic agenda. The IPCC can assess long-term trends in the relationships among GHG emissions, temperature, and the resulting impacts, but it cannot test and evaluate the effectiveness of specific policies within countries and regions or verify national emission levels.

United Nations Framework Convention on Climate Change

At the Rio Earth Summit in 1992 the United Nations created the UNFCCC as a forum of 192 countries to take actions to reduce the causes of global warming and to cope with its impacts.[26] The UNFCCC's notable endeavors include its ambitious goal of reducing industrial country greenhouse gas emissions by 25 to 40 percent below 1990 levels by 2020;[27] annual global summits among all parties to the convention to reflect on progress; and creation of the Kyoto Protocol to commit countries to reduce carbon emissions. The UNFCCC's greatest advantage has been its inclusive nature: countries around the world regard it as a legitimate, authoritative, and equitable forum. Its global membership is also its greatest disadvantage: it is an unwieldy and bureaucratic body, marred by politics and inefficiency because of the conflicting interests of its many members.

The UNFCCC process is based on the principle of "common but differentiated responsibilities and respective capabilities."[28] The principle recognizes that "the largest share of historical and current global emissions of greenhouse gases has originated in developed countries . . . and

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that the share of global emissions originating in developing countries will grow to meet their social and developmental needs."[29] In particular, it emphasizes that "responses to climate change should be coordinated with social and economic development . . . taking into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty."[30] The UNFCCC's members, including the United States, acknowledge that those who contributed most to the buildup of atmospheric carbon should do the most to cut their emissions, but also that all countries must take part in reducing global emissions. Success in the future depends on translating this principle into a legal framework that balances interests across countries in a way that they perceive as fair.

Kyoto Protocol

The Kyoto Protocol is an agreement by the parties to the UNFCCC that establishes binding commitments to reduce greenhouse gas emissions. It shares the objectives, principles, and institutions of the UNFCCC but significantly strengthens the convention by committing industrialized countries to individual, legally binding targets to limit or reduce their emissions. As delineated in Annex I of the protocol, 36 countries (all industrialized countries that signed the treaty) committed to reduce greenhouse gas emissions to levels specified for each of them.[31] These commitments add up to a total cut in GHG emissions of about 5 percent from 1990 levels in the commitment period from 2008 to 2012. Developing countries, defined by the protocol as Annex II countries, were not bound to emissions targets but rather committed to be more aware of their climate obligations.[32]

The Kyoto Protocol was an important step in international efforts to address climate change, but in recent years debates over its shortcomings have often overshadowed the more important issue of how to move forward at the end of its first commitment period in 2012. The point is not to declare a victor between Kyoto supporters and detractors, but to learn from the Kyoto experience to forge a more effective vehicle for future climate policy. Kyoto has been greatly constrained by two factors: the failure of some of the major emitters to ratify the treaty and tension between developed and developing country signatories. As a result, the Kyoto Protocol has not limited the emissions of four of the five biggest emitters

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of greenhouse gases. India and China do not have quantitative targets because they are considered "developing countries" under the protocol. Russia's targets exceed actual emissions because of the collapse of the Soviet industrial economy and therefore do not constrain its greenhouse gas emissions.[33] The United States, of course, never ratified the agreement. (Australia, the world's fifth largest contributor of emissions as of 2000,[34] ratified Kyoto under new Prime Minister Kevin Rudd only in December 2007.) [35] Absent support from the nations central to addressing the problem, the Kyoto Protocol could not mitigate the causes or address the catastrophic impacts of climate change.

The path toward achieving a new international framework on climate change has been complex. Officially, the UNFCCC orchestrates the process. A target has been set to agree on an international framework at the UNFCCC Conference of the Parties scheduled for Copenhagen in December 2009. Reaching an agreement, however, is complicated by substance—the wide divergence of the parties—and by process. In addition to the UNFCCC, negotiations have taken place among the G-8, the G-8 +5 (China, India, South Africa, Brazil, and Mexico), and the Major Economies Meeting (MEM) convened by the Bush administration. Although the MEM process was established on the reasonable presumption that the major producers of carbon must agree on a strategy to forge a global agreement, the juxtaposition of this meeting against other climate change forums has obfuscated leadership and the process to reaching consensus, causing the MEM process to be seen, especially among emerging and developing economies, as a rival to the UNFCCC rather than a means to help forge consensus.

LESSONS FROM MULTILATERAL EXPERIENCE

The foremost political challenge confronting a new climate regime is historical inequity. The industrialized world caused global warming and the concentration of greenhouse gases, yet the cooperation of emerging economies and developing countries is required to forge a solution. Developing countries justifiably argue that they should not bear the cost of a problem they did not create, but the crisis cannot be solved without them. Even if all high-income countries had zero carbon emissions as of tomor-

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row, the rising emissions of emerging and developing nations would still put them on a trajectory to climatic disaster and threaten the very economic growth and stability they desire.[36] If China and India alone continued on a trajectory of growth that brought them close to U.S. levels of per capita carbon emissions by 2050, their carbon emissions would be close to four times the "allowable" global concentrations.[37] Without the participation of emerging economies, an international response to avoid the worst impacts of climate change will not succeed.

The combination of inequities and interdependence has produced five blocs on climate change policy from which must emerge a new framework that embodies responsible sovereignty. The first is anchored by Europe and, with less fervor, Japan, and supports adopting an international treaty with common and binding global emissions targets. The second has been driven by the United States under the Bush administration and supports setting a long-term, internationally agreed goal on emissions levels and medium-term commitments that are binding only at the national level.

The third consists of emerging-market economies led by China and India, and has resisted any form of binding international targets. Emerging economies, stressing continued economic growth, have focused their demands on disseminating technology and financing clean technologies. The fourth group comprises developing countries, those that least contribute to greenhouse gas emissions but would bear the brunt of flooding, desertification, and other catastrophic effects. Unsurprisingly, they demand financing to adapt to the impacts of climate change. A subset of these emerging and developing economies includes those nations whose deforestation contributes 20 percent of global GHG emissions. International negotiations have yet to figure out how to create effective incentive structures so that governments of these countries, and their populations, have more to gain from protecting forests than destroying them.

An emerging fifth group is made up of energy suppliers who see the world shifting away from fossil fuels. Either they could emerge as facilitators of transition if they invest their wealth in technology dissemination and position themselves as winners in a greener international market, or they could be spoilers who drive up prices and profits to capture the greatest earnings during transition.

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It is within this landscape of varied political interests and economic competition that a new international framework on climate change must navigate to stop global warming. Several critical lessons have emerged.

Support from the United States is essential, but the United States must first consolidate consensus on domestic policy before it can act credibly at an international level. The Clinton administration, sympathetic as it was to an international agreement to reduce emissions, was ultimately unable to build consensus on its urgency or forge a coalition to pass legislation. Despite Vice President Al Gore's best efforts to bring climate concerns to the top of the domestic agenda, the interests of labor unions and the politics of the North American trade treaty's ratification ultimately trumped the administration's environmental ambitions. President Clinton never submitted the Kyoto agreement to the Senate for ratification, knowing it had no chance of passing. President Bush failed for most of his administration to recognize climate change as a global problem. The Bush administration blocked domestic action and lost international credibility to lead on the issue. Without domestic support, the United States may be in a position to block international consensus, but it will not have the credibility to advance a positive agenda.

Developing countries, particularly China and India, must be part of a multilateral framework on global climate change. Their economic and population growth will increase global greenhouse gas emissions and energy demand, even as their governments strive to become as energy efficient as possible and still bring their populations out of poverty. The multilateral system must reconcile emerging economies' focus on growth with an awareness of their growing contribution to global warming. Over time a multilateral climate change framework must engage and assist developing countries to reduce their greenhouse gas emissions. Otherwise the potential exists for global CO_2 concentrations to balloon even as industrialized countries take drastic steps to change their behavior. A worst-case scenario is possible whereby investments flow to countries that are fast becoming the greatest emitters, causing a net increase in emissions.

Weak institutional capacities compromise the ability of the international community to combat global threats. The Kyoto Protocol has been plagued by well-intentioned but not well-structured internal mechanisms, with the Clean Development Mechanism (CDM) the most prominent example. CDM subsidizes companies to start green projects in

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developing countries, yet many of these projects might have happened anyway.[38] In addition, the proliferation of agencies and organizations within the United Nations and World Bank involved with fighting climate change has led to confusion and duplication. Too many UN organizational structures with too few resources address different facets of the problem, with little coordination and sharing among them.[39] A more efficient climate architecture must clarify and streamline the roles of various organizations, reform or do away with those that have proven ineffective, and expand financial support for others that show promise.

The private sector is a reservoir of capital and technology, and global and state institutions must leverage it. Many of the world's largest and most powerful multinational corporations support energy-efficient operations and reduced CO_2 emissions. Conoco recently publicly linked emissions from fossil fuels to global warning and lobbied for federal regulation of greenhouse gas emissions.[40] Six of the world's largest multinational companies announced a Supply Chain Leadership Coalition to require all their suppliers to release data about their carbon emission levels and strategies to mitigate climate change.[41] Companies as diverse as Wal-mart, GE, Shell, General Motors, and Sun Systems have all called for regulation to establish clear and common guidelines for all U.S. industries and stimulate conservation and technological innovation.[42] More than fifty major U.S. money managers, including Merrill Lynch and CalPERS (the country's largest public pension fund with $230 billion in assets), have also joined the chorus requesting U.S. domestic legislation to curb carbon emissions.[43] Companies across the world increasingly demand consistent regulation and carbon pricing because that will reduce risk and create a stable foundation for investment.

The nonprofit sector plays a crucial role in generating analysis, raising awareness, and calling attention to global warming. At every UNFCCC international meeting, nongovernmental organizations (NGOs) gather to scrutinize the proceedings and press states to act on issues ranging from cutting emissions to protecting rain forests to helping poor countries mitigate and adapt to the impacts of climate change. NGOs have pressed companies and countries to be more transparent in reporting their emissions. They are generally less well positioned to influence international legislation on binding commitments; advocacy efforts are often stymied by the vocal industry lobbies that stand to lose from such legis-

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lation. An improved multilateral framework on climate change could better channel diverse NGO voices, information sharing skills, and advocacy efforts into policymaking processes.

Perhaps the most important lesson that can be garnered from past and present efforts to address climate is that an extraordinary variety of actors must work together to make progress. It is one challenge to bring together governments to combat climate change, but quite a different one to mobilize companies, nonprofits, and individuals to work toward the same ends. The United States has a central role to play in linking these many players.

BUILDING A FOUNDATION FOR INTERNATIONAL AGREEMENT: U.S. ACTION

President Obama will be the most crucial actor in fundamentally changing U.S. and global climate policy. He will need to educate and motivate domestic constituents from many different industries and sectors and across the political spectrum. He will need to engage and build credibility with nations at varying levels of economic development, because each brings a distinct perspective of its own climate and energy dilemma. He will need to bring policy cohesion to an issue that fundamentally affects economic growth and national politics.

Pricing carbon must be the central tenet of U.S. policy to stimulate private investment, drive technological innovation, and encourage conservation. Three ways to price carbon are a tax on emissions, a cap-and-trade system, or fuel efficiency or renewable fuel standards that implicitly impose a cost. The three are not mutually exclusive. The last is politically easier because it hides the price, but it is less effective than transparent pricing. Europe began a cap-and-trade system in 2005, the EU-ETS. As the world's largest tradable permit system for carbon dioxide, it handles an estimated $30 billion market in emissions trading.[44] Australia is considering an innovative system based on long-term permits to emit carbon combined with annual sales of short-term permits, similar to how a central bank sells bonds and adjusts interest rates to manage monetary policy.[45]

Efforts to price carbon in the United States have stalled on two fronts. The first is political: pricing carbon will hurt fuel-intensive industries and labor groups in those industries. Because the Bush administration first

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denied the seriousness of climate change and then resisted legislation, the United States has still not debated the localized impacts and how to mitigate them. This will take time to negotiate. It will be harder in the midst of a financial crisis that creates fear about any actions that may hurt competitiveness and cut jobs. The second is a conundrum between science and technology. Given the political costs of pricing carbon, politicians have resisted emissions targets driven by science that current technology may not be able to achieve, yet delaying action will only exacerbate the problem.

The U.S. political environment is starting to facilitate progress. The Lieberman-Warner bill for an economywide cap-and-trade policy was favorably reported out of the U.S. Senate Environmental and Public Works Committee in December 2007. It did not pass because climate advocates realized that the Bush administration would have weakened the legislation and chose to wait for better prospects. Relative to 2005, the bill called for a 10 percent reduction in emissions by 2020, 20 percent by 2030, and 70 percent by 2050.[46] The Energy and Independence Act, passed in late 2007, included stronger implicit carbon pricing policies such as higher corporate average fuel economy (CAFE) standards, ambitious renewable fuel standards (RFS), and new energy efficiency requirements in lighting, buildings, and commercial equipment. [47]

In addition to movement in Washington, twenty-five states have enacted legislation to cut greenhouse gas emissions to levels far lower than proposed in pending federal legislation.[48] Despite an ongoing legal battle between the EPA and California on the latter's landmark climate change legislation,[49] state and regional efforts have generally enabled stronger federal action. States have already had to grapple with what kind of power plants to build and how to increase efficiency, cut emissions, and fuel their economies in environmentally sustainable ways.

President Obama should capitalize on this burgeoning interest and demonstrate leadership on state, federal, and international stages. To do so, he must move above politics and partisanship, which have too often misdirected America's domestic dialogue on climate change and thus clouded U.S. domestic policies.

First, President Obama will need to take on the role of educator-in-chief. He must explain why the United States must act, why Americans must take personal responsibility, and why we must absorb and mitigate

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the transitional costs that will come for specific industries and labor groups. Nationally, the United States must move away from framing energy and climate challenges under a single rubric of energy independence. Reliance on oil shale and corn-based ethanol may diversify America's energy sources, but will not help reduce its GHG emissions, and the latter will exacerbate international food shortages.[50] Energy security is central to national security, but so are the imperative and urgency to protect the planet. If global emissions do not peak by 2015, prospects to avoid catastrophic impacts seriously diminish.

Second, the administration should press for changes in national, state, and municipal regulation that will encourage the fastest possible spread of the available technological capacity of the private sector to create a more energy-efficient economy. In the southern United States, for example, the marginal cost of new solar power is already competitive with the marginal cost of new investments in gas and coal, but the current grid system precludes this head-to-head comparison. Innovative policies to distinguish new investments from municipal grids would immediately drive up the incentive for investments in solar power, and eventually larger economies of scale would make solar even more cost competitive. National building standards and investments in a smart grid are other examples of policies that could reduce emissions with existing technology and generate "green" jobs while reducing dependence on fossil fuels.

Third, President Obama will need to build consensus on a climate change policy that will unleash the technological innovation and investment needed to make the planet sustainable and prosperous in the long term. Failure to define a credible domestic policy has undermined U.S. influence on international policies that affect American economic, environmental, and security interests. The United States has relegated itself to being a "taker" of the impacts of climate change rather than a "driver" of policies to forge international consensus to forestall climate change and protect energy security. The United States must have a sound domestic foundation to drive consensus around goals articulated to and supported by the broader American public. It must create regulatory incentives to drive investment in available technologies to save and create renewable sources of energy. Pricing carbon is a necessary and fundamental tool to achieve these goals.

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TOWARD A STRENGTHENED MULTILATERAL ARCHITECTURE

A new international framework on climate change must combine the inclusivity of the UN's negotiating forums with the powerful engagement of the world's major emitters. It must create incentives for the private sector to invest and innovate. It must institutionalize a role for NGOs to inject their insights, sustain scrutiny, and create pressures for compliance.

The principle of responsible sovereignty—the need for accountability for actions that reverberate across borders and time—combined with effective use of the UN and major-power negotiations, ideally through the G-16 we propose in chapter 3—together create the means to avert the looming climate crisis. The United States, because of the scale of its economy, level of emissions, and technical capacity, must be part of any solution. Europe, which has gone the furthest to create a regional climate regime, must continue to lead in setting goals that drive the international community to match its policies and actions with pressing scientific realities. Japan's technical prowess in energy efficiency can be a foundation for practical cooperation. Emerging economies must have confidence that an agreement will allow them to grow even within an international regime that curbs emissions. The process must engage the world's poorest countries on the impacts of climate change and the need to bring electricity to the 1.6 billion who lack it. In terms of substance and process, this is a tall order.

The goal must be a new, legally binding agreement to arrest global warming under the auspices of the UNFCCC. It should incorporate all the major economies and ideally include all the 192 signatories to the UNFCCC, and it should be built on the IPCC's scientific findings. Signatories to the agreement would commit that they will not allow the temperature of the planet to increase more than 2.5°C by 2050 relative to preindustrial levels, to reach a peak in global annual CO_2e emissions in 2015 and therefore to reduce CO_2e emissions by 50–85 percent by 2050.

To achieve these goals, the agreement must include two tracks that are separate but linked: (1) an "investment track" that gives nations the incentives and means to conserve energy, develop and commercialize technology, protect rain forests, and adapt to the effects of climate change; and (2) an "abatement track" that establishes the targets, timelines, policy framework, and accountability measures to control emissions. Because

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scientific understanding and technology continue to evolve, the agreement must be adaptable. It must include a formal annual review to tighten or loosen performance targets based on scientific evidence. It must explicitly call for NGOs to contribute to and monitor these reviews.

UN Secretary General Ban Ki-moon has called for completing a successor agreement to Kyoto at the Conference of the Parties to the UNFCCC scheduled for Copenhagen in December 2009. We endorse this target with caveats. The first commitment period of the Kyoto Protocol will end in 2012. An agreement in 2009 would give countries time to ratify it and come into effect when the Kyoto Protocol ends. Talks have been scheduled to negotiate a draft by the time of the Copenhagen conference. Yet it will be well into 2009 before a new U.S. administration and Congress could forge domestic consensus on a climate and energy strategy, solidify domestic constituencies, and ideally pass supporting legislation that would empower a U.S. negotiating position. China will not commit to an international strategy if the United States is silent. Even if the UNFCCC process can produce drafts for international reaction, these would be but opening positions until the United States and China align their strategies. Further, we described at least five major blocs of countries with widely varying agendas. The international financial crisis of 2008 will make it harder for every country to commit to policies that many perceive as constraining growth amidst a global recession.

Ideally both tracks of a new international agreement—on investment and abatement—would merge by the December 2009 conference. If they cannot, they should be separated and proceed in parallel, with the investment track closing in December 2009; an interim step on abatement could entail endorsing key principles that still must be translated into binding measures. An agreement on investment is within reach and will gain support from developed and developing countries alike that desire access to technology, resources, and other incentives to control emissions. Success on the abatement track will be far more difficult; key states remain far apart on politics and policy. If the tracks are phased, Copenhagen could endorse the principle of pricing carbon to promote conservation and innovation, plus reinforce a mandate for a G-16 Climate Group to formulate a proposal to restrict emissions and bring it to the

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UNFCCC, with the aim of a binding agreement on emissions as soon as possible, with the end of 2010 as a target.

The phased introduction of a new agreement would reflect a meeting point between the realities of science and international politics. First is the imperative to agree to change investment patterns and peak emissions. Second, Copenhagen needs to sustain momentum among the parties and not explode a process that has no alternative to consensus. Better to have the parties emerge demonstrating unity and a sustained commitment for better results than leave a policy and procedural void, as occurred at the blowup of the Doha trade round in July 2008. Third, the parties should not simply settle on an ineffective substantive outcome for the sake of agreement. A bad outcome will not produce results, may not be ratified by parliaments, and could shatter prospects for compromise with little to show for it, rendering future negotiations harder. Better to create bargaining space for more effective policies when countries have more political will, and possibly more technological options.

Finally, to reach an agreement and set it on a constructive course, there must be clarity on the roles of two actors—the UNFCCC and the G-16.

The complex intersection of science, technology, economics, politics, international security, and bureaucratic politics demands one forum where all actors can voice demands and seek clarification. The UNFCCC must provide that forum and sustain a network among other key actors, particularly the IPCC, UNEP, the World Bank, and the Food and Agriculture Organization (FAO). For all its limitations in capacity, the UNFCCC has a mandate from 192 nations to act on their behalf to avert the catastrophic impacts of climate change. It has a forum and process for negotiations. Europe, China, Japan, and developing countries have engaged in that process, as has the United States, but with less commitment and usually with the intent to restrain rather than advance consensus.[51] The UNFCCC and the IPCC have already established a mechanism to incorporate scientific findings into the negotiating process, and that should be retained and not reinvented.

The second key body is a G-16 Climate Group (a "group of responsibility" that includes the G-16 plus other states central to the emissions debate). In chapter 3 we made the case for a G-16 to bring order to complicated negotiations with global significance and to bring its proposals to

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wider international bodies to seek legitimacy. This recognition of the value of a smaller forum has been a founding principle behind the MEM process put forth by the Bush administration in 2007. We agree with the principle behind the Major Economies initiative, but implementing it with no clear relationship to the G-8, the UN, or any other body has raised suspicions of its intent. The G-16 Climate Group should not be an alternative to the UN, but instead be established as a formal Subsidiary Body for Scientific and Technical Advice (SBSTA) within the UNFCCC, closing the gap between the MEM process and the UN process and, indeed, empowering the UN process. SBSTAs are already recognized as a forum to provide scientific advice to the Conference of the Parties of the broader UN climate change framework. Establishing a forum for negotiation among G-16 countries within an SBSTA would enable core countries to set objectives, rationalize priorities, create bargaining space, and set the foundation for actions within the larger UNFCCC process.

Recent international negotiations have seen debate over a possible new World Climate Organization (WCO).[52] Certainly, once negotiated, a new international agreement will need an effective coordinating mechanism, and a new agreement may well create demands for new capabilities and new mechanisms that could justify transforming the UNFCCC into a WCO. But negotiations over a WCO at this stage are putting the cart before the horse. Hence we call for keeping the UNFCCC as the central point for implementing any agreement until such time as new agreements require new mechanisms. Even then, a WCO should be conceived as a coordinating entity, mobilizing the many different capabilities that are likely to be needed to implement a robust international climate agreement. If a new agreement reaches consensus on carbon trading, appropriate mechanisms will be needed to set market rules and monitor performance. Multiple approaches will be needed to facilitate investment. Scientific capacities to stimulate innovation will rest in separate bodies. Even monitoring and verification of emissions will require different capacities for industry and agriculture. Attempts to fold all these capabilities into one organization would cause it to collapse under its own weight. Conversely, failure to define a central point of coordination within an orchestrated network would equally make an international agreement dysfunctional.

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TRACK 1: INVESTMENT IN TECHNOLOGY INNOVATION AND DISSEMINATION

Success in addressing climate change requires technology and innovation. Most countries will not adopt binding restrictions on emissions that would keep them from providing jobs for their citizens. Investment in technology, both commercializing existing capacities and developing new ones, is essential to merge global interests in energy security and climate change. Japan and parts of Europe have demonstrated that through technology and innovation they can radically reduce energy consumption and still achieve rapid economic growth. Japan's current use of energy per unit of GDP is 43.75 percent less than China, 12.5 percent less than India, and 37.5 percent less than the United States.[53] The United States has already developed some new industries based on energy efficiency and clean growth. There is little doubt that we can discover new ways to achieve economic growth and still cut global greenhouse gas emissions. Yet the scale on which changes in efficiency and technology must be implemented has no precedent. That is the rationale for moving immediately with a technology track that has immediate impact and creates new possibilities.

The goals of Track 1 are to leverage resources, expand effective financing mechanisms, drive research, accelerate commercialization, and stimulate investment in energy and environmental technologies and infrastructure. Even more so in the wake of a global financial crisis and credit crunch, both policy and financial instruments are needed to reduce intertemporal risk and reduce disincentives to private investment with long payoffs. Track 1 on investment and Track 2 on abatement are related, most importantly through policies to price carbon. As argued earlier, prices will affect incentives to invest in technology and to curb emissions. We advocate separating the tracks only because an agreement to reduce emissions will take time, and many technologies are commercially feasible under current pricing scenarios.

The Track 1 agreement would give nations multiple investment channels to commit and disburse financing for technology: the GEF, World Bank, International Finance Corporation (IFC), UNFCCC's CDM, and regional development banks. Although nations will need to help finance public expenditures, especially for infrastructure in developing countries,

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public sector investment and finance will not be sufficient. The UN and partner multilateral organizations must unlock larger sources of private capital.

Track 1 will require flexibility and resources to address the distinct investment needs of countries at different levels of development around the globe: downstream investment in implementing and deploying existing energy-efficient technologies, and upstream investment in innovating technology and bringing new technologies to market.

For developed countries, private capital should finance most investments. Putting an implicit or explicit price on carbon is part of the answer, as growing technology markets in many European countries demonstrate. But better policies and risk mitigation mechanisms are still needed across high-income nations to create even stronger markets for already existing energy-efficient technologies. If industrial nations revamped their internal markets for clean technologies such as solar power, they could spur competitive investment in renewables and energy efficiency and reduce their GHG emissions.[54]

Emerging economies such as China and India have a different focus: attracting the fastest possible investments in technology that will increase efficiency, addressing both environmental and energy security concerns, yet still sustaining rapid growth. These nations can attract private capital for deploying clean technology, but have little incentive to shoulder the cost differential between business-as-usual technologies and energy-efficient technologies to solve a problem they did not create. New emissions from emerging economies now are the fastest drivers of climate change, but these governments rightly argue that their growth would not be an issue absent market failures in the industrialized world. For emerging economies, the two key issues are technology access and measures to share commercial risk globally and thus reduce the cost of capital. If Track 1 does not address these needs, emerging economies will not commit to an international agreement with binding emissions reduction targets.

Developing countries usually have limited access to private capital but require massive investments in energy infrastructure for economic growth. The IEA projects that even with $45 trillion in new global energy investments by 2050, an average investment of $185 billion each year, about 1.4 billion people will still remain without electricity.[55] If the

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poverty reduction objectives of the Millennium Development Goals are met, investing in energy infrastructure across the developing world will be even higher.[56] The developing world also has a related issue of how to finance investments in public goods such as creating or maintaining biological carbon sinks such as forests. Although poor countries have the least human capital, technology, resources, and resilience to cope with climate change, many will be struck first and hardest by droughts, floods, and reduced productivity. These countries will need public financing, particularly through the World Bank and regional development banks, to invest in infrastructure, rain forests, and adaptation to climate change.

A global climate change agreement cannot encompass every type of investment mechanism. Through the UNFCCC, however, it should provide a means for countries to pledge funds, designate vehicles to allocate funds, scrutinize national performance on commitments, consolidate reporting on the effectiveness of funding, and give nations and NGOs a transparent means to comment on funding priorities and vehicles. With that in mind, the following are illustrative funding mechanisms and priorities that should be strengthened under track 1.

Raising capital: The GEF should be recognized as the principal international mechanism to raise international donations for climate change and channel it to implementing UN agencies, the World Bank, regional development banks, national governments, and NGOs. Its role should be to assess needs, raise capital, set performance standards, set investment priorities, allocate funds, and report on performance. The GEF must put more emphasis on investing in abatement in the developing world and it should work more closely with the private sector—together with the IFC, regional development banks, and state-funded investment agencies—to leverage private investment in clean energy technologies or production.

Creating guarantee mechanisms: Mitigating risk can leverage private capital and reduce its cost, especially in emerging economies. One valuable model is the IFC's work with national banks to partially guarantee private bank loans to finance clean technology and renewable energy products. In China, demand for IFC assistance has outstripped available funding. The Multilateral Investment Guarantee Agency (MIGA), also part of the World Bank Group, should be tasked with working from the IFC model and establishing new products to address the intertemporal risk of investing in energy-efficient technologies. Both agencies should set

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standards for national risk-mitigation measures through investment insurance agencies such as Overseas Private Investment Corporation (OPIC).[57]

Sharing liability and insuring risk: Some technologies such as carbon capture and sequestration will require multiyear commercial testing before they can be used.[58] A global risk insurance mechanism, with waivers on national legal liabilities, should be created to foster international cooperation on challenging technological frontiers. Nations would need to agree on conditions in which they would approve such waivers. In addition, nations should implement domestic programs where they share liability with companies for demonstration of particularly risky and expensive products to bring to commercialization. France, for example, recently announced a carbon capture and storage (CCS) initiative in which it covers the liability costs for twelve CCS demonstration projects funded by private capital.[59]

Forming public-private investment partnerships: Currently, the CDM under the UNFCCC provides incentives for investments in developing countries to reduce greenhouse gas emissions. In doing so, CDM can support the growth of developing countries and steer capital to markets where investments will have the greatest environmental impact. Still, the CDM needs substantial overhaul so that it no longer pays industrial countries to carry out energy-efficient projects that might be financed anyway.

Leveraging development banks: The World Bank and regional development banks should continue to serve as the locus to finance energy infrastructure in developing countries and to support adaptation to climate change impacts. In 2008, the United Kingdom, United States, and Japan pledged $5 billion to $10 billion to support the World Bank Climate Investment Funds (CIF) to accelerate transformation to low carbon growth through innovation and deployment of clean technologies as well as to build climate resilience.[60] China has also demonstrated interest in funding green infrastructure in Africa that supports other Chinese investments. Energy and other commodity companies also share an interest in developing infrastructure in poor countries. The development banks should offer a mechanism to match private funding and set common standards. It would benefit developing countries to channel private and other aid through a common vehicle to ensure quality and to reduce the management burdens that multiple donors impose on developing country capacity, as we discuss in chapter 9.

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Monitoring and protecting rain forests: UNEP, UNDP, and FAO launched in September 2008 the Reduced Emissions from Deforestation and Forest Degradation Program (UN-REDD) to assist nine developing countries (including Bolivia, Indonesia, and Zambia) in establishing systems to monitor, assess, and report forest cover. Norway donated $35 million to finance the initial phase. UN-REDD will be a critical field test of whether external financing can verifiably reduce the rates of deforestation.[61]

Developing innovative technologies: A renewable international fund of $10 billion should be created to fund competitive proposals for technical innovation. The IEA could run the fund, which would be open to public and private applicants. The focus would be on supporting technical innovation and establishing commercial viability. It would be oriented around reducing liability of investment in the riskiest of technologies and helping bridge the gap between the private sector and public research and development programs. A part of the fund could be reserved to support NGOs and programs that would build public-private partnerships for research and commercialization, such as the Civilian Research and Development Foundation, which has employed thousands of weapons scientists and institutes and linked them with commercial opportunities.

Creating networks of international research partners: A network would be created among national laboratories, research laboratories at universities, other centers of excellence, and private sector hubs of innovation and investment. The network would post developments in technical innovation and link scientists working in common areas. Those within the network could seek support from the technology fund and the broader venture capital community.

TRACK 2: EMISSIONS ABATEMENT

Climate change cannot be solved unless the major emitters buy into an international framework. The Kyoto Protocol will not significantly restrain emissions growth because the United States, China, and India have not participated. To date, the United States is responsible for having emitted the largest amount of energy-related CO_2 emissions into the atmosphere of any country (as of 2006, an estimated 320 billion tons of CO_2).[62] By 2030, energy-related CO_2 emissions from China are pro-

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jected to account for 26 percent of the world total and 48 percent of the total coal-related emissions worldwide. If both China and India sustain their projected rates of economic and industrial growth over the next twenty-five years, they will together contribute about 60 percent of the global increase in carbon emissions.[63]

Track 2 on emissions abatement creates a process for the major emitters—a G-16 Climate Group—to shape a strategy to cut emissions and link their negotiations to a wider UNFCCC framework. As we indicated, a new international framework should limit global temperature increases and cut emissions, reflecting the IPCC's scientific conclusions. Track 2 should establish guidelines to achieve these targets based on the UNFCCC's core principle of "common but differentiated" responsibilities. Track 2 should be performance-based, emphasizing results rather than prescribing policies. As a core principle, it must recognize that GHG emissions must be priced to reflect the costs they impose through flooding, disease, scarcity, and conflict. Nations would choose how to do so: through some combination of a tax, a cap-and-trade system, or policies and measures for fuel efficiency and conservation.

Nations must have flexibility to adopt policies that reflect their political realities, yet the combined policy outcomes must be measured against science-driven targets. A carbon tax will be unpopular during a global recession. Cap-and-trade systems are difficult enough to establish nationally, much less globally or regionally. A global carbon market would have to manage key risks, such as a major player like the United States or China withdrawing from the market and causing its collapse. National cap-and-trade systems could be coordinated across countries, but comparable pricing mechanisms would need to be created. Regulatory targets on fuel efficiency and the use of renewables may create short-term momentum, but perhaps not the incentives needed to invest in new technology. These are just a handful of the complications that almost certainly preclude agreement at Copenhagen in December 2009.

Instead, Copenhagen could produce an interim framework that sustains progress toward a comprehensive package in 2010. The framework could:

Endorse IPCC goals: The temperature of the planet should not increase more than 2.5° C by 2050 relative to preindustrial levels.

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Annual CO_2e emissions must peak in 2015 and be reduced 50–85 percent by 2050.

Commit nations to pursue national legislation to cap annual emissions in 2015: Even if not internationally binding, such a commitment would signal markets to change investment patterns and potentially encourage a shift to energy-efficient technologies.

Establish "best practices" for pricing carbon to be adopted in a comprehensive agreement: A comprehensive agreement on best practices would accomplish a number of objectives. Stability in long-term prices, not just short-term price spikes, would create investor confidence to change technologies and consumption patterns. Any pricing scheme would require a short-term safety valve or cost-containment mechanism to compensate for extreme economic contraction, comparable to the need for flexibility to adjust short-term interest rates. Incentives should drive investments where they have the greatest impact. For example, because Europe and Japan have already invested seriously in efficiency, incremental investments will have less impact in these economies than in China or India. "Common but differentiated" responsibilities could be met through time differentials as when emission targets constrain growth, thus preserving a common global policy framework but allowing flexibility on the timing to adhere to it.

Although the emissions abatement track should feed into one comprehensive treaty, we also urge flexibility on the final outcome, if needed, to allow nations to reach an informal arrangement. Given the domestic ratification procedures for treaties in the United States—a two-thirds majority in the Senate—and in other countries, a treaty might have to be so watered down to meet this political test that it could lose the core of its purpose. An arrangement among nations would not require ratification,[64] but would still create a legally binding relationship among countries. Experience with the Financial Action Task Force and the General Agreement on Tariffs and Trade (GATT) after the Second World War suggests the value of alternative models of international frameworks.[65] Nations would agree on common goals and implement nationally binding legislation to achieve these goals. In the United States, such an approach would require only a simple majority in both houses rather than the two-thirds majority in the Senate.

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VERIFICATION AND ENFORCEMENT

Virtually every legislature will ask: How do we penalize countries that do not adopt comparable climate policies so that we do not reduce national competitiveness and export jobs to others? The premise is that tougher environmental standards elsewhere will decrease competitiveness and drive companies to relocate to China and India, resulting in a "leakage" of carbon to less environmentally responsible states. Concerns over lost competitiveness and leakage have led to proposals for a cross-border tax imposed on the carbon content of imported products from countries that do not have comparable policies. In the United States the intended target is China. In France such proposed measures originally targeted the United States. They are misguided and should be avoided.

Most U.S. emissions occur in transportation and housing, sectors that cannot be traded.[66] Energy generally constitutes a small percentage of total input costs in most manufacturing, making a higher price on carbon a small factor in total production costs.[67] For products such as steel, aluminum, cement, paper, and chemicals, which have a high energy and carbon content, less than 3 percent of U.S. imports come from China.[68] For all these reasons, less than 10 percent of the reduction in U.S. emissions from pricing carbon would be replaced by an increase in foreign emissions, and even then most modeling suggests that a border tax would reduce that 10 percent by half a percentage point.[69] Besides being ineffective, a border tax could prove noncompliant with WTO. India and China would argue that the United States is a greater culprit of climate change because of its contribution to aggregated emissions. Signatories to the Kyoto protocol could seek to apply such measures against the United States, which did not ratify it.

What should be the answer? As we suggested in chapter 3, compliance measures will need to be negotiated. To the extent that any individual state applies penalties unilaterally, it will create retaliatory risks that could undermine an entire regulatory regime. States need to understand the range of potential penalties and how they will be applied. They need to decide whether they will accept the scrutiny needed for external adjudication.

Just as important will be the pressures for compliance that can be created from the bottom up, forcing companies to reduce their emissions to compete in the marketplace and benefit from government contracts. To regulate carbon pricing, reporting standards are vital to account for emis-

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sions and enable emission trading schemes. Clear standards on acceptable emissions levels will compel states and businesses to be more transparent, empower investors to compare companies' carbon emissions, and thus increase market incentives for becoming energy efficient.

The International Organization for Standardization (ISO) has made considerable progress in setting standards to account for emissions and to verify them. In 2006, the ISO published its 14064 series standards as the first internationally accepted set of tools for measuring GHG emissions. A consensus for these standards has been growing.[70] They have been supported by the UNFCCC and IPCC, widely adopted by companies, governments, and regional institutions around the globe; further, companies and countries have greatly increased disclosing carbon emissions.[71]

The private and public sectors, including the UN, could continue to capitalize and expand on these ISO standards. Businesses would have incentives to integrate these practices into their commercial strategies to outdo competitors in efficiency rankings and publicize their achievements. Businesses could agree to establish partnerships and give preference to other firms that abided by the ISO 14064 series. Individual nations could adopt the ISO 14064 series as a regulatory standard for business, establishing comparable practice and reporting across firms. To compete for defense contracts, multilateral development bank contracts, and other state-funded procurements, firms would have to comply with ISO 14064.

The UNFCCC could provide further independent scrutiny by institutionalizing in its annual conferences a review of which members employ ISO standards effectively. The UNFCCC could use these occasions to highlight the best and worst firms within states. Organizations such as development banks and the United Nations could write these practices into their procurement regulations, requiring companies to be ISO certified before receiving funding. More powerfully, in the next round of trade talks ISO climate compliance standards could be negotiated into WTO rules on government procurement.

CONCLUSION

There is no harder issue than the climate crisis because it involves science, technology, economics, politics, and international relations. And the stakes could not be higher. The solutions, inevitably, will also be

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complex, involving many institutions and policies, with the expectations that both must change over time as good policy will accelerate technology and open up new possibilities. Logic tells us that this must be so—that in a complex world solutions to complex problems must evolve.

A successful framework on climate change must meet certain tests. The first is to set in motion the policies that will drive innovation and investment. The second is to bring together major and rising powers—which together will produce close to 90 percent of all carbon emissions by 2030.[72] That will require giving emerging economies time before pricing policies on carbon constrain their economic growth. In our judgment, better to get the G-16 moving toward these common goals now rather than pushing for targets that China and India will reject. The final test is to tap private capital, technology, and analytic capacity. In comparison to 1945 when most actors in the international system were states, we now have an array of national, regional, for-profit, and nonprofit actors. Most resources and capabilities are outside of government, and those in the private sector must sustain pressure on government to improve policy.

In the next chapter we focus on nuclear security—an issue where policies on climate change and energy use are already driving many countries to develop civilian nuclear programs. Unless climate policy is coordinated with nuclear security, the gains in one area can create new risks of proliferation. The G-16 will again play a key role, both to reach consensus on nuclear security policies and to ensure that a common set of actors addresses the linkages across issues that must be considered together, not in isolation.

On climate change and nuclear security, U.S. policy is pivotal. For nations to engage collectively, they must share a mutual conviction that each will be better off. To set this tone, the United States must lead in action and not just rhetoric. If President Obama can see beyond short-term uncertainties to act responsibly for future generations, he will find that an aggressive climate policy can help restore America's international image as well as advance its energy security.

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