

CONFRONTING
CLIMATE CHANGE:
A STRATEGY FOR
U.S. FOREIGN POLICY

GEORGE E. PATAKI AND THOMAS J. VILSACK
CHAIRS

MICHAEL A. LEVI
PROJECT DIRECTOR

DAVID G. VICTOR
SENIOR ADVISER

Confronting Climate
Change:
A Strategy for U.S.
Foreign Policy

Confronting Climate
Change:
A Strategy for U.S.
Foreign Policy

Report of an
Independent Task Force

The Council on Foreign Relations is an independent, nonpartisan membership organization, think tank, and publisher dedicated to being a resource for its members, government officials, business executives, journalists, educators and students, civic and religious leaders, and other interested citizens in order to help them better understand the world and the foreign policy choices facing the United States and other countries. Founded in 1921, the Council takes no institutional positions on matters of policy. The Council carries out its mission by maintaining a diverse membership; convening meetings; supporting a Studies Program that fosters independent research; publishing *Foreign Affairs*, the preeminent journal on international affairs and U.S. foreign policy; sponsoring Independent Task Forces; and providing up-to-date information and analysis about world events and American foreign policy on its website, CFR.org.

THE COUNCIL TAKES NO INSTITUTIONAL POSITION ON POLICY ISSUES AND HAS NO AFFILIATION WITH THE U.S. GOVERNMENT. ALL STATEMENTS OF FACT AND EXPRESSIONS OF OPINION CONTAINED IN ITS PUBLICATIONS ARE THE SOLE RESPONSIBILITY OF THE AUTHOR OR AUTHORS.

The Council sponsors an Independent Task Force when an issue of critical importance to U.S. foreign policy arises, and it seems that a group diverse in backgrounds and perspectives may nonetheless be able to reach a meaningful consensus on policy through private and nonpartisan deliberations. Task Force members are asked to join a consensus signifying that they endorse “the general policy thrust and judgments reached by the group, though not necessarily every finding and recommendation.” Individual views and dissents that sharpen differences of analysis and prescription are also encouraged. Once formed, Task Forces are independent. Upon reaching a conclusion, a Task Force issues a report, which the Council publishes and posts on its website. Task Force chairs, directors, and members are solely responsible for the content of their reports.

For further information about the Council or this Task Force, please write to the Council on Foreign Relations, 58 East 68th Street, New York, NY 10065, or call the Director of Communications at 212-434-9400. Visit the Council’s website at CFR.org.

Copyright © 2008 by the Council on Foreign Relations®, Inc.
All rights reserved.
Printed in the United States of America.

This report may not be reproduced in whole or in part, in any form beyond the reproduction permitted by Sections 107 and 108 of the U.S. Copyright Law Act (17 U.S.C. Sections 107 and 108) and excerpts by reviewers for the public press, without express written permission from the Council on Foreign Relations. For information, write to the Publications Office, Council on Foreign Relations, 58 East 68th Street, New York, NY 10065.

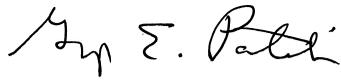
This report is printed on paper that is certified by SmartWood to the standards of the Forest Stewardship Council, which promotes environmentally responsible, socially beneficial, and economically viable management of the world’s forests.



Mixed Sources

Product group from well-managed
forests and other controlled sources
www.fsc.org Cert no. SW-COC-1530
© 1996 Forest Stewardship Council

Task Force Chairs



George E. Pataki



Thomas J. Vilsack

Project Director



Michael A. Levi

Senior Adviser



David G. Victor

Task Force Members

Timothy D. Adams	William A. Pizer
Sally M. Benson	William K. Reilly
Aimée R. Christensen*	Theodore Roosevelt IV
Stuart E. Eizenstat	Stephen M. Ross
Thomas F. Farrell II	David M. Rubenstein
Sherri W. Goodman	David Sandalow
Shirley Ann Jackson	Lawrence R. Scanlon
Robert W. Lane	Lawrence H. Summers *
Jonathan Lash	Mark R. Tercek
Michael A. Levi	David G. Victor
Robert A. Malone	Thomas J. Vilsack
Jessica T. Mathews	Timothy E. Wirth*
Kenneth B. Mehlman	James D. Wolfensohn*
Steven W. Pacala	Philip D. Zelikow
George E. Pataki	

*The individual has endorsed the report and submitted an additional or a dissenting view.

Contents

Foreword	xi
Acknowledgments	xiii
List of Acronyms	xv
Task Force Report	1
Executive Summary	3
Introduction	11
History and State of U.S. Climate Policy	25
Domestic Policy	33
Achieving Leverage on Global Emissions	42
Adaptation and Other Measures Beyond Mitigation	63
A UN Deal	67
A Partnership for Climate Cooperation	79
Leadership	89
Additional or Dissenting Views	93
Task Force Members	96
Task Force Observers	107
Appendix	109

Foreword

Recent years have seen a remarkable shift in the U.S. debate over global climate change—yet there is still little consensus on how the United States and the world should confront the challenge. Domestic policy options to reduce greenhouse gas emissions are numerous, and the potential exists to produce a strategy that is fully consistent with economic prosperity and energy security. Yet, as this report makes clear, domestic policy alone is not enough; a new U.S. foreign policy to tackle climate change is also essential. The United States accounts for about 15 percent of global greenhouse gas emissions, leaving the rest—a growing fraction of which comes from rapidly emerging economies like China and India—outside the scope of domestic measures.

For these reasons, the Council on Foreign Relations established an Independent Task Force to examine climate change strategy, especially those dimensions that involve foreign policy. Based on a careful assessment of challenges and opportunities, the Task Force finds that ambitious, comprehensive, and equitable U.S. domestic policy is a prerequisite to effective international leadership. It then argues that U.S. foreign policy must focus on the largest economies and emitters, both advanced and rapidly developing.

The Task Force advocates a strategy for advancing international cooperation, proposing that the United States seek a global UN climate agreement while also promoting other arrangements that may be less formal, limited both in scope and participation, but still highly ambitious. As a core part of that, it proposes a new Partnership for Climate

Cooperation that would focus the world's largest emitters on implementing aggressive emissions reductions. The Task Force emphasizes the need to align the interests of developing countries, whether in economic development, energy security, or public health, with steps that will help mitigate climate change. It shows that the tools available to the United States in this effort extend well beyond the traditional environmental sphere to such areas as technology, security, and trade. The Task Force also discusses what can and should be done by the United States if international progress proves elusive. And the report urges wealthy countries to help more vulnerable ones adapt to the impacts of unavoidable climate change.

On behalf of the Council on Foreign Relations, I wish to thank Task Force chairs George E. Pataki and Thomas J. Vilsack, who contributed their depth of experience and untiring commitment to this important project. The Council is also indebted to the individual Task Force members, a group of prominent experts and leaders whose insights were indispensable. Finally, I wish to thank Michael A. Levi, the Council's David M. Rubenstein senior fellow for energy and environment, for capably and knowledgeably directing this project, and David G. Victor, the Council's adjunct senior fellow for science and technology, for offering his substantial expertise as senior adviser. All those involved have produced an important study that points the way toward effective international leadership by the United States in confronting climate change.

Richard N. Haass
President
Council on Foreign Relations
June 2008

Acknowledgments

The Independent Task Force on Climate Change, sponsored by the Council on Foreign Relations, has benefited immeasurably from the wisdom, experience, and leadership of George E. Pataki and Thomas J. Vilsack. Climate change is a challenge that often attracts simplistic policy proposals and intensely partisan reactions. Our chairs, leading a knowledgeable, thoughtful, and pragmatic group of Task Force members, have ably avoided those twin pitfalls. It has been a pleasure to work with them.

The Task Force is also most grateful to Mark R. Warner, who served as a chair from May 2007 through September 2007 before leaving to pursue a seat in the U.S. Senate.

The Task Force is deeply indebted to David G. Victor, adjunct senior fellow at the Council, for serving as senior adviser. I am personally most thankful for the generosity with which he has shared his knowledge, insight, and time in making this report as strong as possible.

This effort benefited from the work of many Council staff. Susan Basu skillfully supported Task Force operations and research for the first year of the effort, and Katherine Michonski ably stepped in to help guide the report through its final stages and publication. Lee Feinstein helped launch the Task Force, and Anya Schmemann, Lindsay Workman, and Swetha Sridharan ensured the Task Force ran smoothly, offering invaluable advice and guidance while working closely with the rest of the Council. Patricia Lee Dorff and Lia Norton took the written document and figures and turned them into a polished report.

Along the way, Irina A. Faskianos organized National Program seminars with Council members in four cities, as well as outreach sessions with state and local officials and with the Council's Higher Education Working Group for college and university presidents and foundation leaders. Nancy D. Bodurtha and Kay King led the Meetings departments in organizing outreach and release events for Council members in New York and Washington, DC. I also thank Lisa Shields and the Communications team, the Council's Corporate and Outreach programs, and Kay and her team in Washington, DC, for working hard to gain the report the widest possible audience.

I am also thankful to a long list of individuals who met with the chairs and me during visits to Beijing, Brussels, London, and Tokyo. Several U.S. government officials were also generous with their time and insight.

I am particularly grateful to Council President Richard N. Haass for convening this Task Force and to Director of Studies Gary Samore, who supported this initiative. This project was made possible by the generous support of both the John D. and Catherine T. MacArthur Foundation and the Rockefeller Foundation, and by David M. Rubenstein's support for the Task Force program.

Michael A. Levi
Project Director

List of Acronyms

APP	Asia-Pacific Partnership on Clean Development and Climate
CCS	carbon capture and sequestration
CDM	Clean Development Mechanism
EPA	U.S. Environmental Protection Agency
Ex-Im Bank	Export-Import Bank of the United States
IEA	International Energy Agency
IGCC	integrated gasification combined cycle
IPCC	Intergovernmental Panel on Climate Change
LNG	liquefied natural gas
MEM	Major Economies Meetings
OECD	Organization for Economic Cooperation and Development
OPIC	Overseas Private Investment Corporation
RD&D	research, development, and demonstration
RPS	renewable portfolio standards
TPA	Trade Promotion Authority
USAID	U.S. Agency for International Development
USCAP	U.S. Climate Action Partnership
UNFCCC	UN Framework Convention on Climate Change
WTO	World Trade Organization

Task Force Report

Executive Summary

Unchecked climate change is poised to have wide-ranging and potentially disastrous effects over time on human welfare, sensitive ecosystems, and international security. This urgent challenge demands that the United States and the world take comprehensive action to limit the buildup of greenhouse gases in the atmosphere and to address the consequences of any unavoidable climate change.

Sustaining strong domestic policy—a prerequisite to international leadership—will require that U.S. leaders honestly communicate the challenges and opportunities involved in tackling climate change. Meanwhile, as climate change rises up the policy agenda, leaders will need to draw on tools from beyond the traditional environmental sphere and balance climate change with other top-tier objectives.

U.S. strategy for confronting climate change must begin at home. The Task Force recommends that U.S. policymakers support a “cap-and-trade” system that begins reducing U.S. emissions now and that sets a course for cuts of between 60 percent and 80 percent from 1990 levels by 2050; those targets should be periodically revisited and revised as necessary. This system would let the market find opportunities to reduce emissions and remove greenhouse gases from the atmosphere at the lowest possible cost. It can and should be designed in a way that avoids shocks to the economy and that does not impose undue burden on any particular part of society.

A cap-and-trade system will create economic incentives to reduce emissions, but those incentives will not be sufficient to deliver deep

cuts in emissions at an acceptable cost. The Task Force thus recommends that the United States take complementary steps to help market forces function more effectively and to seize the many opportunities to align the goal of slowing climate change with other important policy objectives. Those other steps include adopting policies that would improve energy security by reducing oil use in ways that also lower emissions; using traditional regulation in places where markets fail to function efficiently, most notably by targeting opportunities to improve energy efficiency; expanding federal support for research, development, and commercial-scale demonstration of low-carbon technologies; and supporting the construction of new infrastructure, such as a more robust electric grid, that will support low-carbon energy. The Task Force also recommends that the United States seek to reduce biofuels tariffs, since many imported biofuels are currently more climate-friendly than many domestically produced ones; however, the United States should do so only in a context where changes to tariffs do not ultimately encourage increased emissions. It also recommends phasing out subsidies for mature biofuels such as conventional corn-based ethanol.

The Climate Strategy Tool Kit

As the United States takes increasingly aggressive action at home, it will be in a stronger position to ask more of others. The Task Force has focused on opportunities for leverage in the emerging economies, concentrating on the five largest emitters in that group—Brazil, China, India, Indonesia, and Russia. It has also focused on these countries' three biggest sources of emissions: coal in power and industry, oil in transportation and elsewhere, and the destruction of tropical forests. It recommends that the U.S. government do the same.

Some tools are noncontroversial. The Task Force recommends that the United States continue to work with developing countries to understand their vulnerabilities to climate change, which will help encourage those countries to address the climate challenge head-on. The United States should also cooperate with developing countries to help them understand the many ways to reduce emissions while also saving money and promoting economic growth. The Task Force also

recommends that the United States promote international cooperation on research, development, and commercial-scale demonstration of new technologies, all of which would, over time, lower the costs of cutting emissions and thus make deep cuts in emissions politically and economically more palatable.

Climate strategy becomes more complicated when difficult trade-offs are involved. The Task Force has focused in particular on ways that the United States might influence the economic and security incentives that drive developing-country decisions.

Many low-carbon development options are costlier than their dirtier alternatives, and in these settings it has proven especially difficult to encourage developing countries to take action. Policymakers have thus long sought prudent ways for wealthier countries to provide financial support for reducing emissions in the developing world. The leading effort to date is known as the Clean Development Mechanism (CDM), a scheme established as part of the Kyoto Protocol that allows developed countries to pay developing-country firms that reduce (“offset”) their emissions in lieu of cutting emissions themselves. The CDM has, for a variety of reasons, been largely unsuccessful in encouraging real and significant changes in developing countries.

The Task Force recommends that the United States promote a conceptually similar but more robust effort focused on a small number of high-payoff areas. The system would fix many of the flaws in the CDM by focusing investment in a few targeted areas where leverage on emissions is greatest. The United States should catalyze this by building a carefully designed “offset” scheme into U.S. cap-and-trade law. Success will hinge on creating a gold standard that ensures offsets represent real emissions cuts, often a tall task. This offset system should include not only energy and industrial activities, but also land use, including avoided deforestation. The Task Force cautions, though, that international offsets, while important, will play a limited role, in part due to the administrative difficulty in determining whether an emissions offset represents a real reduction in global emissions.

The Task Force thus recommends a complementary effort involving U.S. and international “climate funds.” Among other things, these funds could directly finance developing-country emissions cuts; they

could buy low-carbon technology and resell it at a discount; and they could support steps to stem deforestation. This can often be done with greater administrative ease and lower cost than through offsets. At the same time, these funds are limited by their reliance on governments, rather than markets, to find and fund opportunities to reduce emissions. Task Force members disagree as to the wisdom of using climate funds to provide large-scale support to major economic competitors such as China, but agree that any substantial support involving economic competitors should be made part of packages of commitments from those countries, in areas such as intellectual property, that deliver visible benefits for the U.S. economy.

Trade policy is poised to play a major role in climate strategy. The Task Force recommends the United States promote climate-friendly U.S. technology exporters by increasing Export-Import Bank (Ex-Im Bank) and Overseas Private Investment Corporation (OPIC) emphasis on low-carbon technology, and also by pressing developing countries to eliminate barriers to trade in low-carbon technologies.

Some have also suggested that the United States impose tariffs or other similar penalties on emissions-intensive imports such as steel and cement from rapidly emerging countries that are not taking sufficiently ambitious steps to control their emissions. They argue that this would protect U.S. firms and pressure developing countries to control emissions themselves. The Task Force recommends that the United States not dismiss the possibility of eventually imposing trade penalties, within a multilateral context and in a manner that adheres to U.S. obligations within the World Trade Organization (WTO). At a minimum, though, the United States should first attempt to include rapidly emerging economies in an international climate agreement, and encourage them to impose their own prices on emissions-intensive exports, whether through broad policy or through levies on exported goods. Trade sanctions should not be brandished aggressively—that would complicate climate negotiations and reduce U.S. leverage in broader efforts to make trade both freer and fairer.

The Task Force also encourages policymakers to look beyond financial and trade levers. In the near term, the United States and other nations could work to reassure China and India that shifting away from

coal would not undermine their national security. The Task Force thus recommends efforts to improve security of supply for critical resources such as natural gas and nuclear fuel, which would complement efforts to boost renewables and improve energy efficiency. In the longer term, tying China's and India's desires to be great powers to actions to reduce their greenhouse gas emissions is also likely to be a powerful tool—but only if the United States itself takes strong action at home and works with those countries to demonstrate that addressing climate change need not frustrate their economic development.

These tools are all aimed at achieving deep reductions in emissions. But some climate change is inevitable. The developed world, which has emitted most of the greenhouse gases now in the atmosphere, has a responsibility to help those societies that are most exposed to climate harm adapt to unavoidable change. It also has a national security interest in helping vulnerable countries and populations adapt.

Incorporating climate considerations into traditional development aid is the most effective way to assist with adaptation, and the Task Force recommends that adaptation assistance be delivered primarily through such an approach. It urges the United States and other nations to insist that development projects incorporate climate change into their planning wherever relevant. Climate change will inevitably increase the need for development aid, and the advanced industrial states should meet that challenge. The Task Force also recommends that advanced countries provide adaptation assistance to poorer countries in strategic ways that will earn their support for putting political pressure on the largest and most rapidly developing countries to control their own emissions. For too long, “developing countries” have been treated as a uniform block; it is important to ensure that those that are relatively wealthy and are capable of controlling their emissions not be able to hide behind others that are far poorer.

A UN Deal

Most thinking about international climate policy has focused on the Kyoto Protocol and the design of its post-2012 successor. The governments of the world, including the United States, agreed in December

2007 in Bali to pursue a new global treaty. It is widely agreed that the path from here to agreement on a strong new treaty by December 2009 in Copenhagen—the deadline set in Bali—will be extremely challenging. The Task Force recommends that the United States engage constructively in the ongoing negotiations, guided by five principles:

- Seek agreement on an initial long-term goal of cutting emissions at least in half by 2050, mindful that this will need to be revisited and revised periodically.
- Be willing to commit credibly, along with the other advanced industrial countries, to its own near-term numerical targets for cutting emissions. This would provide confidence in U.S. intentions and lay a foundation for international emissions trading.
- Seek commitments from major developing countries to actions that would significantly reduce emissions from their expected paths. The United States should not seek emissions caps, which are difficult to set given the difficulty of projecting future developing-country emissions. Instead, it should accept meaningful portfolios of policies and measures, over which developing countries have much greater control.
- Promote a reformed scheme for financing emissions cuts in developing countries and for encouraging the spread of low-carbon technology, including a tightened and targeted successor to the CDM and a fund for assistance with clean development.
- Ensure that any deal emphasizes the importance of adaptation and creates a strong and credible framework for pursuing adaptation efforts.

While the United States will need to be flexible, it must also be clear that these principles are part of a package. The Task Force finds that even as the United States pursues ambitious and mandatory policies at home, it should not sign on to an emissions cap as part of any global deal that does not include strong commitments to actions from the major emerging economies. It will be difficult to conclude such a deal, which will require big changes in the positions not only of the United States but of every major developing country. Investment in this process

is essential, however, because a good UN deal would provide a strong foundation for global efforts, and because negotiations, regardless of the final outcome, can help build international support for wise policy.

Nonetheless, the need for a legal foundation for emissions trading is so great that should the UN efforts to Copenhagen fail, the United States, the European Union (EU), and Japan, along with others, should be prepared to create a smaller agreement among countries that are able to implement robust and reliable domestic emissions caps and want to use emissions trading. This would ensure that the foundation for linking national systems into an international trading arrangement is not erased by the expiry of the Kyoto Protocol.

A Partnership for Climate Cooperation

An ambitious UN deal would set a course for the next several years of international climate efforts. But the UN efforts face challenges. There is a substantial chance that the UN process will not yield a strong deal in the near term. Ensuring that the biggest emitters, advanced and developing, actually honor any commitments they make will, in any case, be a monumental task.

The Task Force thus recommends that the United States, in concert with other major advanced industrial and emerging economies, create a standing process that would bring together the world's largest emitters to implement aggressive emissions reductions. This would be a core element of a new strategy that would complement and strengthen ongoing UN efforts. This "Partnership for Climate Cooperation" would be different from the valuable Major Economies Meetings that the Bush administration and several other governments have advanced, as it would be rooted in an aggressive effort to cut U.S. emissions and would focus on practical actions and implementation of specific strategies.

The partnership would seek practical strategies to move away from traditional fuels, technologies, and behaviors that cause most emissions of greenhouse gases. Exploring opportunities to link emissions trading systems "from the bottom up" would be an important element. It

would also address agricultural and land management practices, such as those that lead to deforestation.

The effort would be anchored in a structured series of regular meetings at the highest levels of government. Leaders would make commitments to aggressive packages of actions that they would then implement at home. They would also make commitments to provide incentives and assistance for others to meet their goals. This flexible format would free countries to adopt agendas that they might be wary of incorporating in treaties. Vigorously addressing climate change takes the world into uncharted waters, making it hard for countries to be confident that they will be able to deliver on the boldest efforts. The challenge presented by climate change, though, demands nothing less.

Introduction

Climate change poses a stark challenge to the United States and the world. A series of careful and widely respected recent studies, including, most prominently, those of the Intergovernmental Panel on Climate Change (IPCC), have raised consistently troubling and increasingly loud alarms about dangerous climate change.¹ The newest report of the IPCC, published in 2007, concluded that “most of the observed increase in global average temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic greenhouse gases concentrations.” Those increased concentrations—primarily of carbon dioxide (CO₂)—result mainly from the burning of fossil fuels, such as coal and oil, and from deforestation as well as other changes in how people use land. The IPCC found that this human-caused warming is likely already altering ecosystems, weather, and sea levels. Many of those signals may still be faint today but, if the world continues on course, they are expected to become far stronger.

To many, the temperature changes often predicted by experts may not sound like much. Yet they would have large and wide-ranging consequences that would unfold over the coming years, decades, and centuries. In fact, the likely effects of climate change resulting from unchecked greenhouse gas emissions extend well beyond temperature. They have the potential to affect life in a panoply of ways, endangering

¹ The U.S. National Academy of Sciences has made similar statements. For example, see National Academy of Sciences, “Joint science academies’ statement: Global response to climate change,” June 7, 2005, <http://www.nationalacademies.org> (accessed April 15, 2008).

coastal populations, reducing the availability of fresh water, increasing damage from storms and wildfires, changing growing patterns and productivity, shifting the geographical range of disease, and straining biodiversity.² These effects, bad enough alone, could also be classic “threat-multipliers,” intensifying conflict and stoking instability in some of the most fragile parts of the world.³

To be sure, the litany of long-term effects—not all of them certain to be negative for all societies, but on balance deeply harmful for the planet and the United States—cannot be predicted with anything approaching precision. The climate system is extremely complex and can be highly sensitive. Some observers have used the resulting uncertainty as an excuse for delay or inaction. Those uncertainties, however, imply the disturbing possibility of much greater buildup of greenhouse gases in the atmosphere and more severe changes in climate, making it hard to rule out the possibility that climate impacts could be much worse than most experts’ assessments of what is likely.⁴

The Task Force finds that the likely effects associated with unchecked climate change are large and demand serious U.S. attention, both because they would deeply affect the welfare of Americans and of people around the world, and because they could have adverse impacts on international security. It also finds that the chance, however small, of far more extreme impacts is reason for strong and urgent concern.

Reducing the risks of dangerous climate change requires limiting the buildup of greenhouse gases in the atmosphere. In turn, that requires efforts to cut the emissions of greenhouse gases and to increase the removal of greenhouse gases from the atmosphere. These efforts are collectively known as “mitigation.”

² IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry et al., eds. (Cambridge: Cambridge University Press). Note that these effects will vary in intensity—for example, climate change is expected to be more pronounced over land than on the oceans, particularly acute in the Arctic, and most consequential in poorer societies.

³ *National Security and the Threat of Climate Change* (Alexandria, VA: The CNA Corporation, 2007); Joshua W. Busby, *Climate Change and National Security: An Agenda for Action* (New York: Council on Foreign Relations Press, 2007).

⁴ Gerald H. Roe and Marcia B. Baker, “Why Is Climate Sensitivity So Unpredictable?” *Science*, Vol. 318, No. 5820, pp. 629–32, October 26, 2007.

At the onset of the industrial revolution the global concentration of CO₂ in the atmosphere was about 280 parts per million. Today it is roughly 386 parts per million. When the effects of other greenhouse gases, along with aerosols, other air pollutants, and other gases released from land use change are included, the overall effect is equivalent to between 311 and 435 parts per million (referred to as CO₂ equivalents, or CO₂e).⁵ That concentration is rising at an increasing rate. The International Energy Agency recently judged that the current trajectory of global emissions was consistent only with stabilization at between three and four times preindustrial concentrations—a level that likely carries with it ultimate temperature increases of roughly ten degrees Fahrenheit.⁶

Many studies have explored the possible effects of stabilizing atmosphere concentrations of greenhouse gases at lower levels. Some of their findings, as compiled by the IPCC, are collected in Table 1. This table only describes the likely effects on global average temperature of stabilizing at different concentrations. Small differences in temperature, in turn, could have large influences on climate and well-being. In addition to changing the most likely outcomes, cutting the ultimate concentration of greenhouse gases would also lower the odds of more extreme consequences.⁷

Public discussion of mitigating climate change has increasingly focused on a goal of ultimately limiting atmospheric concentrations of greenhouse gases to between 450 and 550 parts per million CO₂e. This

⁵ IPCC, 2007: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al., eds. (Cambridge: Cambridge University Press), p. 27.

⁶ For the first statement, see International Energy Agency, “World Energy Outlook 2007: China and India Insights,” pp. 206–7. For the second statement, see Figure 1.

⁷ Stabilizing concentrations at 750 parts per million CO₂e would, for example, carry a substantial chance of exceeding a 10°F increase in temperatures, according to the studies reviewed by the IPCC. Reducing that to 550 parts per million would sharply lower those odds, while limiting concentrations to 450 parts per million would virtually eliminate the possibility. IPCC, 2007: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al., eds. (Cambridge: Cambridge University Press), p. 65. Numerical estimates are very crude. Their central message is that very large temperature increases and large climactic changes cannot be confidently excluded. Hence we have used suggestive words rather than misleadingly precise numbers.

Table 1: Relationship between Concentrations, Emissions, and Temperature

Stabilized CO ₂ e concentration (ppm)	Best estimate of global mean temperature increase above preindustrial (°F; °C in parentheses)	Peaking year for global emissions	Change in global emissions in 2050 relative to 2000 (%)
445–490	3.6–4.3 (2.0–2.4)	2000–2015	– 85 to – 50
490–535	4.3–5.0 (2.4–2.8)	2000–2020	– 60 to – 30
535–590	5.0–5.8 (2.8–3.2)	2010–2030	– 30 to + 5
590–710	5.8–7.2 (3.2–4.0)	2020–2060	+ 10 to + 60
710–855	7.2–8.8 (4.0–4.9)	2050–2080	+ 25 to + 85
855–1,130	8.8–11.0 (4.9–6.1)	2060–2090	+ 90 to + 140

The trajectory for cutting emissions to stabilize concentrations at a particular level usually rises before declining. The “peaking year” is the point at which global emissions would need to begin declining to stabilize concentrations at a particular level. Adapted from IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, B. Metz et al., eds. (Cambridge: Cambridge University Press).

goal, which has been embraced by a growing number of governments, corporations, and advocacy groups, would sharply lower the risks of dangerous climate change. Achieving such goals will require cuts in net emissions, and the effect of such limits on emissions accumulates only after many years of sustained effort. This is because CO₂ is unlike most of the pollutants that have been the focus of environmental policy to date.

Most traditional air pollutants, such as those that cause urban smog, are short-lived in the atmosphere; as a result, a change in emissions leads relatively quickly to lower concentrations. Carbon dioxide, by contrast, is long-lived, as some of the processes that ultimately remove the gas from the atmosphere take centuries or more. A change in emissions thus does not immediately yield a change in atmospheric concentrations—indeed, any plausible reduction in emissions will still lead to increasing concentrations in the near term. Ultimately stabilizing concentrations in the atmosphere at low levels would eventually require deep cuts in emissions.⁸

⁸ It is sobering to look at efforts to address other pollutants of this type. For example, starting in 1987, the international community adopted commitments to make very deep cuts in the

Stabilizing greenhouse gas concentrations between 450 and 550 parts per million CO₂e is technically achievable, though there are real disagreements within society and around the world on the cost and value of doing so. Ensuring that concentrations never rose above 450 parts per million CO₂e would require a highly ambitious program in which global emissions peaked by 2010 and were then cut below half of 1990 levels by 2050.⁹ Other pathways to stabilize concentrations at similar levels also exist, but all entail steep reductions in emissions within the next two decades. Many less ambitious but also challenging goals allow for more flexibility but still require immediate action. For example, stabilizing atmospheric concentrations at 550 parts per million could be achieved with a peak in global emissions anywhere between 2015 and 2040 before dropping to slightly below 1990 levels by mid-century, and to half of that by 2100.¹⁰

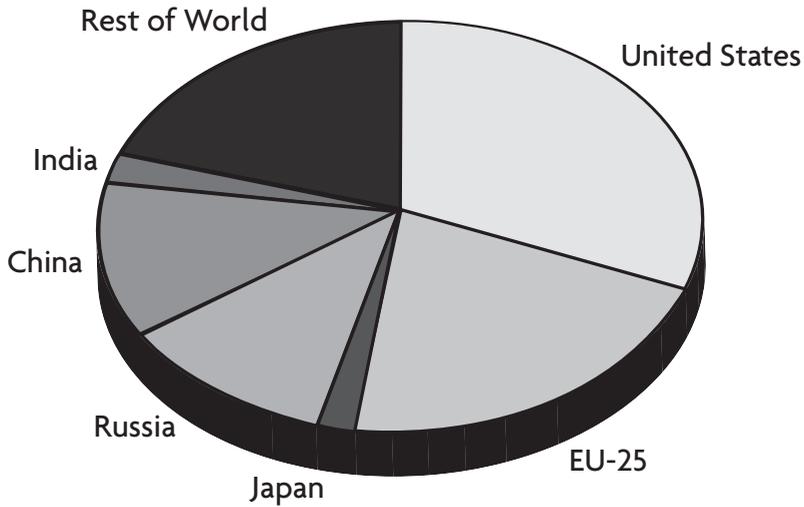
To achieve any of these goals, deep cuts from the current trajectory of emissions, and major policy changes, would be necessary in all nations, including the advanced industrial countries as well as the developing world. For example, if Organization for Economic Cooperation and Development (OECD) emissions were to suddenly be slashed in half, but emissions in the rest of the world continued to grow apace, the world might return to its current total emissions levels in less than ten years.¹¹ Well before that, if new policies imposed costs on developed but not on developing countries, concerns about unfair competition from unconstrained developing countries could become acute, increasing pressure for wider action. *The Task Force finds that different countries will need to take different actions as part of any approach to controlling emissions—*

emission of the gases that cause depletion of the ozone layer. Despite great success in that effort, it will take decades before the ozone layer begins to heal and a whole human lifetime before it recovers to its “clean” level. The global warming problem will be even more difficult to address.

⁹ Specific pathways to stabilize at 450 ppm have not been widely studied and require far more careful attention from analysts than they have received thus far. Of more than one hundred scenarios studied by the IPCC, fewer than ten involved stabilization at or below this level. The recent IEA World Energy Outlook includes a 450 ppm scenario, but does not explore details below a global level.

¹⁰ There are also intermediate cases in which concentrations temporarily pass targets, but ultimately drop before stabilizing. These “overshoot” scenarios involve poorly understood risks.

¹¹ Estimate based on reference scenario in IEA, “World Energy Outlook 2007: China and India Insights.”

Figure 1: Cumulative Emissions: 1850–2004 CO₂ from Energy Use

Source: WRI, CAIT

and advanced countries will need to take stronger action sooner—but that a global approach is ultimately essential.

Even if the world makes big cuts in emissions, it is very likely to experience some climate change. The temperature increase expected to accompany greenhouse gas concentrations stabilized as low as 450 parts per million CO₂e is still likely to strain some water supplies, affect agricultural productivity in parts of the world, result in stronger storms, and produce other troubling consequences. Poorer countries are particularly vulnerable to these effects because they are generally less able to adapt to them.¹²

The Task Force finds that some climate change is inevitable. The developed world, which has emitted most of the greenhouse gases now in the atmosphere (Figure 1), has a responsibility to help the societies that are most affected and

¹² IPCC, 2007: *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Geneva, Switzerland: IPCC), p. 14; The National Academies, *Understanding and Responding to Climate Change*, March 2006, p. 14.

least adaptive to harm that has been caused mainly by the industrialized world, including the United States.

Industrial society depends on activities that involve greenhouse gas emissions, and policies to reduce those emissions would involve large changes in the U.S. economy. The economy would, in turn, incur uncertain and uneven costs—and if these are ignored or assumed to be trivial, they may be borne disproportionately by the most vulnerable members of society. They demand attention.

The potential economic consequences of these changes are difficult to predict and will depend on how mitigation policy evolves. Simulations of stringent yet still well-designed, flexible, and market-oriented policies normally project slight decreases in long-term economic growth, set against a backdrop of a large, vibrant, and growing U.S. economy that would continue to thrive over the long term as the United States pursued an ambitious climate change policy.¹³

It is essential, though, for policymakers to recognize that these models miss many real-world details that might significantly magnify or lower the cost to firms and society. Past experiences with environmental regulation have often seen surprising technological developments deeply cut the costs of compliance from what was originally anticipated, as has often been evident in efforts to control air pollution.¹⁴ Experience has also taught government how to more effectively harness the power of markets to meet environmental objectives at lower cost. At the same time, if technologies and infrastructure fail to mature and materialize

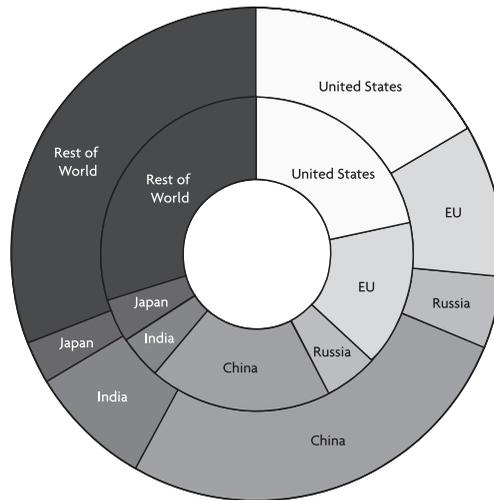
¹³ For example, in an MIT simulation of a very aggressive case, in which U.S. emissions are cut to one-fifth of 1990 levels in 2050, U.S. gross domestic product (GDP) is between 0.01 percent and 1 percent lower in 2020 than it would have been without the emissions cuts; as the projected cuts deepen, the costs rise to between about 0.25 percent and slightly more than 2 percent in 2050. These projections assume policy that is relatively economically efficient. For the worst case, this represents a decrease in annual GDP growth of 0.2 percent, while in the best case, GDP growth would be affected by an undetectable 0.0001 percent. Put another way, in the worst case studied here the United States would take until 2053 to reach the GDP it would otherwise have had in 2050. Note that these estimates do not reflect expected economic benefits of reduced emissions, such as lower mortality or lower costs from natural disasters. Sergey Paltsev et al., “Assessment of U.S. Cap-and-Trade Proposals,” April 2007.

¹⁴ National Science and Technology Council, *National Acid Precipitation Assessment Program Report to Congress: An Integrated Assessment*, 2005, pp. 7–13, <http://www.esrl.noaa.gov> (accessed April 15, 2008).

Emissions Facts

Greenhouse gas emissions are rising rapidly. The International Energy Agency, reporting in late 2007, estimated that global carbon dioxide emissions from energy use grew by roughly 30 percent between 1990 and 2005; those emissions are likely to increase by a similar fraction in the coming ten years and will likely be double 1990 levels by 2030. Emissions from deforestation, which are difficult to quantify, currently add about 20 to 25 percent to the global total. That baseline stands in sharp contrast with the frequently discussed goal of cutting global emissions to half of 1990 levels by 2050—and signals the extraordinary level of ambition that will be required to reach any target close to that.

**Carbon Dioxide Emissions from Energy Use
Current (2005) and Projected (2030)**



Source: IEA, 2007

Advanced industrial countries (approximated by OECD totals) are responsible for roughly 40 percent of annual global CO₂ emissions (though a far larger fraction of past emissions), while the five largest emitters outside this group—Brazil, China, India, Indonesia, and Russia—are, if emissions from deforestation and land use change are included, responsible for a similar amount. Together, these countries contribute roughly three-quarters of global CO₂ emissions.

as expected, if policies are poorly designed, or if people do not respond to market incentives as expected, the total cost to the economy could rise substantially higher than predicted in the standard economic models.¹⁵ Equally important, long-term models can also disguise the potential for shorter-term spikes in cost and other disruptions. This could, if managed poorly, hurt the most vulnerable while derailing long-term political support for aggressive and necessary climate change policy.

Society-wide projections can also mask harsher effects on subsets of the population: losses are likely to be concentrated in a relatively small number of economic sectors as well as among low-income individuals. Coal mining, for example, is likely to shrink unless there is rapid utilization of still-untested new technologies that could allow coal to be used with very low emissions. Steelmakers, in another example, would face challenges from increased electricity prices. Low-income people, who spend a greater part of their income on basic energy services, could be disproportionately affected by increased energy prices unless climate change policies are designed to spare them unfair burdens from increased energy costs. These factors matter because they affect the livelihood of Americans and because they are critical to the long-term political viability of any policy. It is widely believed, though, that properly designed and executed domestic policy—something explored in more detail in the domestic policy chapter of this report—can dampen these shocks, providing time for businesses and communities to adjust.

The Task Force concurs with the broad consensus that properly designed policy, periodically revisited and revised in light of evolving knowledge, including about climate dangers, technology for cutting emissions, and real-world impacts of climate policies, can avoid unacceptable shocks or disruptions and smooth the transition to a low-carbon economy. The Task Force finds that while poorly designed and inflexible climate change policy aimed at making large cuts in greenhouse gas emissions could impose unacceptable costs on the economy, economically efficient policy would be much more affordable. For a wisely chosen target,

¹⁵ The Task Force also notes that some studies, though a small minority, argue that gains from efficiency improvements could actually increase long-term growth despite very deep cuts in emissions. Predictions of such increased growth are more common for less ambitious mitigation agendas.

it would be worth paying for, given the reduced risks that policy, sustained over time, would deliver. The Task Force is more concerned with the potential negative effects of climate change policy on certain individuals, communities, and sectors, as well as with the potential for short-term cost spikes and other disruptions.

Climate policy is far from only about confronting challenges. It also presents opportunities to strengthen important parts of the economy and create jobs, to rebuild U.S. partnerships and alliances, and to bolster energy security.

Large long-term reductions in greenhouse gas emissions at relatively low costs will require developing new low-carbon technologies and deploying them on a massive scale.¹⁶ (Throughout this report, low-carbon technologies should be understood to include not only those that generate lower emissions, but also those that improve energy efficiency and thus reduce demand, those that help absorb carbon dioxide from the atmosphere, and those that reduce emissions of other greenhouse gases.) This technological and economic revolution will require society to invest large amounts of resources. If done wisely, however, it will also yield dividends that include jobs and value in science, engineering, and skilled trades. Private investment in emerging and transforming industries has the potential, as in past technological revolutions, to deliver substantial returns for the economy and workforce, with particular benefits to the United States if it can harness its traditional ingenuity.

Past experience with high-technology industries strongly suggests that those countries that move first in developing new technologies and training an appropriately skilled workforce gain a substantial advantage in the global marketplace. Examples include the Internet boom, which finds its epicenter in the United States and is partly the result of wise early investments to push clusters of information networking technologies that are now the backbone for those industries. Similarly, a vast industry to design and build low-pollution power plants has arisen over the last four decades, much of it also centered in the countries that moved first to control air pollution—the United States, as well as Japan

¹⁶ “New technologies” should be read to include technologies that are currently known but not yet commercial at large scale, such as plug-in hybrid vehicles and coal with carbon capture and sequestration.

and Europe. The success that Japanese and European automakers have had with efficient hybrid and diesel engines, likewise, stems in part from regulatory pressure and technological investments in those markets.

Investment in developing low-carbon technologies has increased rapidly in recent years.¹⁷ Some have pointed to this as evidence that climate change can be dealt with without significant policy measures—that technology will develop alone. Indeed, the flow of money into clean energy development is driven in part by higher prices for oil and other resources, which on their own create larger markets for efficient technologies. It is also spurred by actions governments have already taken to address energy security and climate change, whether through requirements for biofuels in gasoline or through tax credits for the use of solar power. Yet a large share of the investment is driven by expectations that future policy will give low-carbon technologies advantages in the marketplace that they do not enjoy today.¹⁸ Current investment trends illustrate the potential of a new energy economy, but are far from a sign that government action is unnecessary.¹⁹

The Task Force finds that policies that require lower greenhouse gas emissions will create incentives for new industries. U.S. firms and workers stand to reap important gains from the new markets that will arise at home and abroad for low-carbon technologies.

Climate change policy also provides an opportunity to mend U.S. relations with other countries. Among the advanced industrialized nations, the United States is viewed as the country that has been slowest to develop a credible climate policy. The shape of U.S. policy has many origins. The United States found it especially difficult to meet the emissions targets set forth in the Kyoto Protocol primarily because its own emissions rose rapidly during the economic boom of the late

¹⁷ Joel Makower et al., “Clean Energy Trends 2007,” March 2007, <http://www.cleaneedge.com> (accessed April 15, 2008).

¹⁸ Matt Richtel, “Silicon Valley investors seek to sway Washington on alternative energy,” *International Herald Tribune*, January 29, 2007.

¹⁹ Note that so long as other major economies regulate greenhouse gas emissions, American producers will be able to find markets for clean technologies, even if no similar policies are enacted at home. Implementing policies to reduce American emissions will, however, widen that market and accelerate the technical advances that only come with the experience gained by widespread deployment. Also, without American action, others will not sustain their own efforts indefinitely.

1990s and because it chose not to require emissions reductions; the European Union, by contrast, has seen its emissions rise much less sharply for a variety of reasons linked to its slower population growth, generally less robust economic expansion, fortuitous changes in its energy systems, and its active policies to cut emissions.²⁰

The perceived lack of a sufficiently aggressive U.S. policy, along with the United States' failure to ratify the Kyoto Protocol at a time when many in the world view climate change as a paramount danger for the planet, has undercut U.S. credibility in addressing global challenges. To be certain, the United States has adopted a variety of policies that will lead emissions to be lower than they otherwise would be, something discussed in more detail in the next chapter. But combined with an array of other policy differences, the U.S. approach to the climate problem has harmed the transatlantic alliance, long a bedrock of U.S. foreign policy. With climate change a top priority for most major U.S. allies in Europe, engaging in a way that is seen as serious and constructive has the potential to rebuild weakened relationships and accrue goodwill that would be useful across the U.S. foreign policy agenda. At the same time, climate change diplomacy, which will involve every major country in the world, also provides the United States an opportunity to build and intensify relationships that will be important well beyond the climate arena. U.S. leadership on climate change would also help steer any global approach in a direction that the United States finds to be in its interests.

The Task Force finds that engaging on climate change can help repair U.S. relationships with historical allies and provide an avenue for strengthening relations with others.

²⁰ Between 1990 and 2005, American emissions from energy use rose by 20 percent while EU emissions dropped by 3 percent. However, American emissions intensity—emissions indexed to GDP—dropped by 23 percent, while EU emissions intensity dropped by 28 percent, a far smaller disparity. Note also that part of the EU reduction is explained by the collapse of many Eastern European economies; emissions in OECD Europe rose by 3 percent while emissions intensity there dropped by 25 percent. Japanese emissions growth over the same period was 14 percent closer to the United States than to Europe; its emissions intensity, meanwhile, dropped by only 6 percent, far short of U.S. and European progress. This is explained in large part by the fact that Japan was already more energy efficient than the other advanced countries at the start of the period, and also by the fact that, like the United States, it adopted only voluntary policies. All data in this note from International Energy Agency, “World Energy Outlook 2007: China and India Insights.”

Energy security has risen alongside climate change to the top tier of the foreign policy agenda—in much of the United States it outstrips climate change in the priority assigned by the public. In the United States, energy security concerns focus primarily on dependence on imported oil, which accounts for 65 percent of total U.S. oil consumption. In the coming decades it will also link to gas (already the focus of European worries), which the United States imports in small quantities today but is likely to rely on more heavily in the future.²¹ Imported oil and gas distorts the behavior of friends, allies, and competitors alike in ways that are inimical to U.S. interests, exposes the U.S. economy to sharp shifts in resource prices, and constrains U.S. options in dealing with oil- and gas-rich states, all while abetting corruption and antidemocratic forces.²²

Shaping global action to limit the emissions that cause climate change offers the United States opportunities to advance its energy security agenda. For example, cutting emissions around the world by making far more efficient use of energy would also lessen global dependence on oil and gas, in turn depressing the revenues that flow to dangerous oil- and gas-rich states such as Iran and Venezuela. Over the longer term, it is also plausible that large quantities of oil currently used in transportation could be displaced by shifting to electricity for transportation. If future power plants are built in ways that reduce greenhouse gas emissions—such as with advanced coal plants that sequester their CO₂ deep underground, large-scale deployment of wind turbines, fuller use of nuclear power, or any of a host of other technologies—electrifying the transport sector would yield major climate benefits at the same time.

To be certain, the two agendas can also sharply conflict. Excessive zeal to cut dependence on imported oil could lead to large investments in plants that convert coal to synthetic oil, a process that, with current technology, yields very high CO₂ emissions.²³ Likewise, a big shift to

²¹ As North American supplies of gas deplete, the United States will turn to liquefied natural gas (LNG) for gas supply. Today LNG accounts for only 4 percent of U.S. gas supplies, but many projections suggest that will rise to perhaps one-fifth of total gas consumption over the next couple decades.

²² *National Security Consequences of U.S. Oil Dependency*, Independent Task Force Report No. 58 (New York: Council on Foreign Relations Press, 2006).

²³ If future technology could be used to sequester all or most of the CO₂ produced during the process of making synthetic oil, then a shift from oil to synthetic fuel would not increase emissions.

greater use of nuclear power around the world could provide large amounts of electricity with near-zero emissions. But strong growth in nuclear power without sufficient controls on fuel, technology, and waste has the potential to increase security risks from proliferation of nuclear weapons. A poorly designed policy to reduce CO₂ emissions from the power sector before new technologies are available could also force utilities to switch rapidly from carbon-heavy coal to cleaner natural gas; yet a big surge in the consumption of natural gas could lead to sharply higher prices for natural gas and also to much greater dependence on imports.

The Task Force finds that there are many potential synergies between policies designed to mitigate climate change and policies aimed at strengthening energy security. Climate change and energy security objectives can also clash sharply, but the Task Force sees this as a reason to develop an integrated strategy, rather than as a reason to choose one objective over the other. The United States should craft its policy with the potential for double benefits in mind, while carefully managing tensions between the two goals.

History and State of U.S. Climate Policy

Any U.S. approach to climate change will unfold against the backdrop of nearly two decades of concerted international diplomacy, as well as a host of recent developments on the domestic front. Regardless of their assessment of the wisdom of these past efforts, U.S. policymakers must be realistic about this starting point, since many important countries and stakeholders have anchored their expectations in these earlier policy efforts. The Task Force has thus reviewed the current state of U.S. and international policy. Based on its previous assessment of challenges and opportunities, and taking into account the current state of policy domestically and internationally, it recommends basic foundations for international climate policy at the end of this chapter.

International efforts to address climate change began in earnest with the 1992 United Nations Framework Convention on Climate Change (UNFCCC), which entered into force in 1994. The parties to the near-universal treaty, including the United States, agreed to cut emissions with the objective of “preventing dangerous anthropogenic interference with Earth’s climate system” in a way that recognized “common but differentiated responsibilities” of various countries. Yet no country made any specific commitments. The treaty produced little in its early years.

The 1997 Kyoto Protocol to the treaty, which has been the focal point of climate change diplomacy for the last decade, attempted to address the lack of specifics. Under the protocol, participating developed

countries collectively committed to reduce their average annual greenhouse gas emissions between the years 2008 and 2012 to 5.2 percent below their 1990 levels. This was divided up through negotiations that assigned targets to individual countries. (The European Union pooled its targets and, through its own internal negotiations, reallocated its collective target to each EU nation individually.) Most countries have ratified Kyoto; while the United States participated vigorously in all stages of the negotiations, it has chosen not to ratify the protocol. The Senate indicated that this would be the case early on with its 95–0 vote in 1997 in favor of the so-called Byrd-Hagel Resolution, which signaled that the United States would reject any international climate agreement that did not include “specific scheduled commitments” from developing countries. (That resolution has in some ways been superseded by the bipartisan 2005 Bingaman-Specter resolution, which called on the United States to lead at home with mandatory emissions reductions, even while it chose not to ratify Kyoto.) This outcome—and the way that the United States withdrew, for several years, from follow-on negotiations—has antagonized U.S. allies. Even those advanced industrialized countries that sympathize with some arguments against Kyoto have argued that the treaty is an important experiment in climate policy that can provide useful lessons for crafting future approaches.

Developing countries were not required to limit their emissions under the Kyoto Protocol, and nearly all developing countries steadfastly refused to consider such limits during the negotiations. Instead, through its Clean Development Mechanism, the protocol allows developed countries to pay developing-country firms that reduce (“offset”) their emissions in lieu of cutting emissions themselves. Thus, in effect, developing countries undertake no substantial obligation by joining the treaty and are paid for emissions reduction projects. This calculus helps to explain the near-universal acceptance of the Kyoto Protocol. The CDM itself has been criticized for lacking integrity, a contention that the Task Force addresses in chapter four of this report. The sharp distinction between developed and developing countries has also come under fire for failing to distinguish the various shades of gray in international development and for lumping countries into categories that no longer apply today.

The UN Framework Convention on Climate Change process remains the main international forum for addressing climate change. At the annual meeting of its parties in December 2007, governments, including the United States, committed to an agenda for negotiating a new agreement that would follow the Kyoto Protocol when it expires in 2012. That so-called Bali road map establishes four negotiating tracks—mitigation, technology, finance, and adaptation—toward an agreement that the parties aim to conclude by the end of 2009.²⁴ The Bali road map has been noted in particular for an agreement by the developing countries to “commitments” and by developed countries to “actions” that in both cases would be “measurable, reportable and verifiable.” The Bali meeting also yielded notable but still nascent initiatives on avoiding deforestation and on helping vulnerable countries adapt to climate change.

Until Bali, the Bush administration had chosen not to engage actively in the UN process. Its policy long rejected binding country-by-country limits on greenhouse gas emissions, focusing instead on a long list of voluntary bilateral and regional initiatives, of which the Asia Pacific Partnership on Clean Development and Climate (APP) has been the most prominent.²⁵ These activities have produced some additional focus on technological opportunities to control emissions, but they consist mainly of meetings and have mobilized only very small sums of money and technological resources.

More recently, the Bush administration’s series of Major Economies Meetings on Energy Security and Climate Change has taken center stage in U.S. foreign policy on climate change.²⁶ The Major Economies

²⁴ The mitigation track is focused on identifying emissions reduction commitments and actions; the technology track is focused on the development and deployment of technologies in support of mitigation and adaptation; the finance track is focused on instruments that would help pay for mitigation and adaptation; and the adaptation track is focused on developing a framework for helping countries cope with unavoidable climate change.

²⁵ Launched in 2006, the APP brings together Australia, China, Canada, India, Japan, South Korea, and the United States to cooperate on technology development and diffusion. For more information, see “Fact Sheet: The Asia-Pacific Partnership on Clean Development and Climate,” January 11, 2006, <http://www.whitehouse.gov> (accessed April 15, 2008).

²⁶ Other initiatives aimed directly at climate change or involving it in significant ways include the Generation IV initiative on advanced nuclear technologies, the ITER fusion research collaboration, the methane-to-markets program, the U.S.-India nuclear deal, and U.S. participation in the IPCC. The United States has also engaged on climate issues in the context of the G8 and Asia-Pacific Economic Cooperation (APEC).

Meetings (MEM), which held its first meeting in September 2007, brings together sixteen countries responsible for roughly four-fifths of global emissions, as well as representatives of the European Union, European Commission, UNFCCC, and United Nations, with the stated goal of agreeing, by the end of 2008, on emissions reduction targets, and, by the end of 2009, on a new international framework and strategy for meeting those targets. The effort is intended to feed directly into the UNFCCC process. The Bush administration has also recently expressed a new openness to binding country-by-country limits on greenhouse gas emissions, so long as all major economies are included.²⁷ As part of that effort, it has announced a willingness to commit the United States to stop its emissions growth by 2025 and stop the growth of power plant emissions within ten to fifteen years.

In the view of those, including the Bush administration, who have championed an emphasis on the world's largest emitters, the form of the international process is of central importance. Indeed, the basic principle of focusing efforts on small numbers of countries has a long intellectual pedigree in important quarters of the international and environmental communities.²⁸ By establishing a small forum responsible for most of the world's emissions, the administration has underscored the contention that an exclusive focus on truly universal diplomatic processes, because they involve a very large number of countries with diverging interests, may make it more difficult to deal with the bulk of global emissions. And by encouraging representation at its meetings from across governments, the administration has intended to draw in

²⁷ James Kanter and Andrew C. Revkin, "U.S. tells Europe it's open to binding deal on climate," *International Herald Tribune*, February 27, 2008.

²⁸ Those who have advocated a focus on the largest emitters disagree on the wisdom of the MEM process in particular. That noted, for examples of arguments for an effort focused on relatively small groups of emitters, see David G. Victor, "How to Slow Global Warming," *Nature* 349 (1991), p. 451; Christopher Flavin, "The Legacy of Rio," in Lester R. Brown et al., *State of the World 1997* (New York: W.W. Norton & Company, 1997); Paul Martin, "A Global Answer to Global Problems," *Foreign Affairs*, May/June 2005 (see related material on climate at <http://www.l20.org>); Tony Blair, G8 Chair's Statement at Gleneagles, July 8, 2005; David G. Victor, "Fragmented Carbon Markets and Reluctant Nations: Implications for the Design of Effective Architectures," in Joseph E. Aldy and Robert N. Stavins, eds., *Architectures for Agreement: Addressing Global Climate Change in the Post-Kyoto World* (New York: Cambridge University Press, 2007); Todd Stern and William Antholis, "A Changing Climate: The Road Ahead for the United States," *Washington Quarterly*, Winter 2007–2008.

not only environment and energy ministries but often more powerful (and, in its view, more pragmatic) industry, trade, finance, and foreign policy elements, as many have recommended. The MEM process has been at least partly effective at engaging these other ministries in a more flexible, nonbinding format.²⁹ It is too early to assess whether the process has contributed to better policies for reducing emissions and promoting adaptation to a changing climate, and the effort toils in an unfortunate cloud of suspicion that the United States is not serious about tackling the climate problem.

In shaping and justifying its climate change policy both at home and abroad, the Bush administration has emphasized what it sees as significant economic risks associated with stringent targets for emissions reductions, as well as uncertainty in climate science. Internationally, it has argued that in the absence of major commitments by developing countries to reduce their emissions, any U.S. emissions reductions would be for naught.³⁰

Consistent with that philosophy, the Bush administration has pursued a domestic climate change policy that emphasizes the continuing study of climate science, research and development on potential breakthrough technologies, and incentives for deployment of specific low-carbon sources of energy, most notably nuclear generation and biofuels.³¹ In fact, the U.S. government is the largest single funder of climate science. The United States also played a leading role in the formation of the IPCC in 1988, the main international body for assessment of climate science. The administration has endorsed the findings of the most recent round of IPCC assessments, which include statements warning of the large dangers from unchecked climate change.

The federal government also invests heavily in development of climate-friendly technologies, although it is difficult to measure the

²⁹ "Attendee Participant List" September 28, 2007, <http://www.state.gov/g/oes/climate/mem/92889.htm> (accessed April 15, 2008).

³⁰ For an example of these arguments, see "President Bush Participates in Major Economies Meeting on Energy Security and Climate Change," U.S. Department of State, September 28, 2007, <http://www.whitehouse.gov> (accessed March 16, 2008).

³¹ See, for example, "Fact Sheet: Toward a New Global Approach to Climate Change and Energy Security," September 28, 2007, <http://www.state.gov> (accessed March 16, 2008). The Task Force notes that there is much controversy over whether all biofuels being promoted are genuinely low carbon.

exact level of investment, as the effort is spread across government. That public investment is supplemented by steadily increasing private investment in relevant technologies—much of it driven by the anticipation of a binding federal climate policy in the near future and by the reality that some states are already imposing limits on the emission of greenhouse gases.

Other elements of the U.S. government have taken a more positive and proactive attitude toward the sort of legally binding emissions reductions pursued by many countries party to the Kyoto Protocol. Opinion in the business community and in the public has also changed rapidly in the past few years.

State and local governments have played an increasingly large and important role. Many have, in particular, committed to placing caps on greenhouse gas emissions in critical sectors of the economy; notably, the efforts have also cut across party lines. The most prominent among these are the Regional Greenhouse Gas Initiative, under which ten states have agreed to reduce their collective power plant emissions to 10 percent below current levels by 2019, and the California Global Warming Solutions Act, which requires the state to reduce its emissions to 1990 levels by 2020. Other states are pursuing similar initiatives as well. Beyond emissions caps, many have adopted biofuels requirements for gasoline and requirements that a minimum fraction of power be generated from renewable sources (so-called renewable portfolio standards).

Recent years have also seen significant movement in Congress, particularly in the Senate. The Energy Independence and Security Act of 2007 contains measures that will lower greenhouse gas emissions from what would otherwise have been their course. Most strikingly, a succession of proposed legislation envisions deep mandatory reductions in U.S. greenhouse gas emissions by 2020 and 2050. Creatively designed, they have attracted increasing bipartisan support in Congress. While each proposal has also found critics among those calling for either stronger or weaker action, the proposals are widely regarded as having been unthinkable a few years ago. The presidential candidates have either introduced or cosponsored far-ranging legislation—and have included ambitious climate change plans as parts of their campaign platforms.

Still, the recent shifts, while large, should not be overestimated. In particular, increasing willingness in Congress to approve aggressive domestic limits on greenhouse gas emissions should not be confused with a similar appetite for new international treaties. The relative difficulty of having Congress approve a traditional treaty—which requires sixty-seven votes in the Senate—compared with the challenges involved in passing domestic legislation must be kept in mind as a climate strategy is designed.

A growing portion of the business community has also moved aggressively and begun advocating for strong laws mandating deep reductions in greenhouse gas emissions. The most prominent group of such businesses is contained within the U.S. Climate Action Partnership (USCAP), which includes a wide range of businesses in manufacturing, automobiles, energy, and financial services, in partnership with several environmental organizations, and calls for stabilizing atmospheric concentrations of greenhouse gases at between 450 and 550 parts per million CO₂e and for a mandatory cap-and-trade system that would require reductions in U.S. greenhouse gas emissions to 1990 levels by 2020 and to between 60 and 80 percent below current levels by 2050.³² To be certain, the business community represents a wide range of views, with many companies still strongly opposed to mandatory emissions reductions, and USCAP has faced internal challenges as the coalition focuses on particular aspects of pending legislation. But on balance, businesses have articulated strongly supportive positions on aggressive action on climate change that would have been impossible a few years ago.

All this has been driven by rapidly increasing concern among the American public. Polls conducted in mid-2007 showed that a large majority of Americans view climate change as a serious problem of which human activity is a significant cause.³³ That worry has been intensified by accompanying concerns about U.S. dependence on foreign oil and the association, rightly or wrongly, of disasters such as

³² Note that in many schemes, actual U.S. emissions would be higher; the difference would be met through international offsets, which are discussed later.

³³ Pew Global Attitudes poll, conducted April 23–May 6, 2007: 47 percent say “very serious”; 28 percent say “somewhat serious.” PIPA poll, conducted May 29–July 26, 2007: 71 percent say “human activity is a significant cause.”

Hurricane Katrina with climate change. It has also broadened to nontraditional constituencies such as the evangelical community, which has increasingly associated climate protection with stewardship of God's creation, and the national security establishment, which has identified myriad ways in which climate change could affect U.S. security.³⁴ In crafting strategy, U.S. policymakers will need to remain aware that support for climate change action is not monolithic but instead rests on several pillars—environmental, economic, and security—that will each need to be satisfied.

Reviewing the state of climate change policy, the Task Force finds that U.S. action in the context of renewed global effort is essential to meeting the challenges and capturing the opportunities described in the previous chapter. A highly ambitious initial long-term goal of cutting global emissions to no more than half of 1990 levels by 2050 is consistent not only with its assessment of challenges and opportunities but also with the stated objectives of major U.S. allies and of a wide range of stakeholders within the United States. Mindful of the need to periodically review and revise any long-term goals, the Task Force recommends that U.S. policy be framed by the initial long-term goal of cutting global emissions so that they do not exceed half of 1990 levels by 2050.

³⁴ For the former, see, for example, "Climate Change: An Evangelical Call to Action," <http://www.christiansandclimate.org> (accessed March 16, 2008). For the latter, see, for example, *National Security and the Threat of Climate Change* (Alexandria, VA: The CNA Corporation, 2007).

Domestic Policy

Without deep U.S. emissions cuts, it will be impossible to achieve a global reduction in emissions to half of 1990 levels by 2050. An ambitious U.S. effort is essential since U.S. emissions are such a large share of the world total, and because visible U.S. leadership is essential to getting other nations, especially the rapidly growing developing countries, to make significant efforts. As of 2005, the United States accounted for approximately 15 percent of global greenhouse gas emissions, more than any other country aside from China—and most analysts believe that China’s emissions surpassed the U.S. level in 2007.³⁵ Those emissions—most of which were CO₂ from electricity and heat production and from transportation—were 20 percent higher than U.S. emissions in 1990.³⁶ The IEA projects that, without new policies, U.S. carbon dioxide emissions will increase by 10 percent by 2015 and by 20 percent by 2030. The U.S. Environmental Protection Agency (EPA) projects that non-CO₂ emissions will increase by 20 percent by 2020.³⁷

A wide range of scientific, business, and environmental groups have supported a path in which the United States, along with the other advanced industrial countries, begins reducing its emissions immediately

³⁵ Includes Land Use Change and Forestry.

³⁶ This compares to an average increase of 3 percent in OECD Europe. The bulk of the difference, however, can be explained by more rapid GDP growth in the United States.

³⁷ Projecting future emissions is difficult, and different institutions and models can give substantially different results. For the purposes of this report, CO₂ data and forecasts from the International Energy Agency (IEA) were used whenever possible; for other greenhouse gases, forecasts and data from the EPA were used.

and ultimately reduces them to roughly 60 percent to 80 percent below 1990 levels by 2050, a trajectory reflected in several bipartisan bills currently before Congress. These are extremely ambitious goals, but they are ones the Task Force has previously identified as having the strong potential to be economically reasonable, assuming flexible and carefully designed policy, particularly given the gravity of the climate challenge. If developing countries control their emissions so that they are roughly the same in 2050 as today, that would be consistent with a global goal of halving emissions from 1990 levels by 2050.

In addition to the immediate quantitative need to reduce the U.S. contribution to global emissions, there is also a broader case for aggressive U.S. action and leadership. Without it, the United States will have far less leverage in moving the rest of the world toward emissions cuts in a way that is most attractive to the United States. Moreover, by not taking early action, the United States will give up opportunities to rebuild critical alliances, to create jobs in new industries, and to bolster support for near-term measures that could strengthen energy security. Indeed, it could endure real economic harm if, retaliating for a lack of U.S. action, other countries imposed tariffs on emissions-intensive U.S. exports, as some in Europe have threatened to do. To be certain, precipitous action and inflexible policy would entail dangerous economic risks—but, as the Task Force has already found, efficient, equitable, and adaptable climate policy would make those risks far smaller.

*The Task Force finds that aggressive and mandatory domestic efforts to cut U.S. greenhouse gas emissions are a prerequisite to effective U.S. engagement and leadership internationally on climate change policy. A policy that begins reducing U.S. emissions now and that is initially aimed at a goal of cuts as deep as 60 percent to 80 percent below 1990 levels in 2050 at reasonable cost is appropriate.*³⁸ The Task Force finds that with emissions rising, current policies are nowhere near the level of effort required to stop and then reverse growth in greenhouse gas emissions, let alone reach these targets.

While a range of approaches is possible, it is widely agreed that government action to put a uniform price on emissions would be the

³⁸ Simulations by the Energy Information Administration (EIA) of several pending cap-and-trade bills project similar reductions in 2020. In particular, simulations of S.2191, known as Lieberman-Warner, project emissions roughly 3 percent below 2006 levels in 2020.

most economically efficient way of inducing cuts. (The Task Force notes that placing a uniform price on emissions contrasts with an approach that alters prices through specific subsidies and that, in turn, would explicitly pick technological winners and losers.) Making people and polluters pay for their greenhouse gas emissions would naturally lead them to reduce those emissions. It would also prompt firms to develop technologies that would make cutting emissions cheaper and let the market find the most economically effective solutions.

Proponents of creating uniform price incentives for emissions reductions have long debated whether a cap-and-trade system or a carbon tax would be the best way to do that. Under a cap-and-trade system, the government would issue a fixed number of emissions permits, and entities subject to the system (“covered entities”) would be required to hold permits covering their emissions during some fixed period, usually one year. The permits would be tradable—a firm that could reduce its emissions cheaply could sell excess permits to another firm for which emissions cuts were more costly. That would minimize the total cost to the economy of meeting the cap.³⁹ Under a carbon tax, rather than being required to hold permits, each covered entity would pay the government a fixed fee for each ton of greenhouse gases (again, often restricted to carbon dioxide) it emitted. Both systems work, fundamentally, by raising the cost of emissions and thus sending an economic incentive to alter technologies and behavior.

Environmental advocates have mostly backed cap-and-trade systems because a cap ensures that the United States will meet particular targets for reducing emissions.⁴⁰ Many economists have instead supported carbon taxes as a lower-cost way to reduce emissions, arguing that they create greater certainty about the cost of compliance, which in turn makes it easier for industry to engage in wise long-term planning. In practice, the relative strengths of each are less clear-cut, and wise design

³⁹ Caps might also be satisfied through the purchase of international offsets or through trading with other countries that have adopted emissions caps, issues that are addressed in chapters four, six, and seven.

⁴⁰ For example, Environmental Defense Fund, “The Cap and Trade Success Story,” available at <http://www.edf.org> (accessed April 15, 2008); Pew Center on Global Climate Change, “Climate Change 101: Cap and Trade,” February 2008, p. 6, available at <http://www.pewclimate.org> (accessed June 6, 2008).

of domestic policy can embrace the strengths of both approaches.⁴¹ Yet a cap-and-trade system is, importantly, far less politically toxic than a carbon tax, something that has been apparent not only in the U.S. debate but around the world.⁴² While mainstream support for carbon taxes is growing in the United States, most aggressive climate change bills before Congress involve cap-and-trade approaches. (The Task Force notes that many of the leading proposals contain elements, such as so-called safety valves or emissions banking and borrowing, that attempt to replicate some of the advantages of carbon taxes; in particular, these elements make it easier for industry to anticipate the cost of compliance and to plan capital investments.⁴³) The cap-and-trade approach is also supported by large segments of industry and by most major environmental groups.⁴⁴

The Task Force finds that, assessed from a domestic economic perspective, the relative advantages of cap-and-trade and carbon tax approaches to reducing emissions are easily overstated. Either, designed with a mix of efficiency and

⁴¹ Cap-and-trade approaches, for example, guarantee certain emissions reductions only if the caps are never revised, while the efficiency of taxes is affected by the possibility that they too could change in the future. A cap-and-trade system shares many important characteristics with a pure carbon tax if all emissions permits are sold by the government at auction, while a carbon tax accompanied by tax breaks for those hardest hit by increased energy costs and prices can have many similarities to a cap-and-trade system, where some permits are given away for free. Nor do efficiency and environmental predictability have a monopoly as the appropriate measures of whether a particular approach is desirable. For example, a cap-and-trade system might make it easier to smooth the transition for carbon-intensive industry because hard-hit firms, individuals, and regions could be given some valuable emission credits to help them adjust, while a carbon tax would provide revenue that could support climate-friendly research and development or be used to cut income, payroll, or capital gains taxes.

⁴² Europe, for example, attempted to impose a carbon tax long before settling on a cap-and-trade system, and taxes are far more politically acceptable in Europe than in the United States. Japan has recently begun investigating a possible cap-and-trade scheme, while New Zealand implemented, and then repealed, a carbon tax. Only a few jurisdictions worldwide have imposed carbon taxes successfully—notably Norway, although British Columbia will soon adopt a tax. Both, though, may ultimately move to systems that involve elements of cap-and-trade as well.

⁴³ Other potentially smart cost-cutting measures, such as allowing companies to support agricultural activities that reduce emissions in exchange for permits to increase their own emissions, also play an important role in the domestic debate, because they allow for more cost-effective approaches to cutting net emissions and because they engage important political constituencies.

⁴⁴ A crucial element for the support of carbon-intensive industries in a cap-and-trade system is the prospect that some or all of the valuable emission credits would be given away, as has been done for nearly all of the emission credits in the European system.

fairness in mind, would be an acceptable approach to reducing emissions. The Task Force finds, however, that the political momentum behind cap-and-trade makes its near-term adoption much more likely, which in turn would ensure a greater U.S. contribution to global emissions reductions and greater leverage for the United States in shaping international climate change policy. Delays in adopting a clear and strong national approach to reducing emissions would also increase the long-term costs of meeting environmental targets. The Task Force thus recommends that policymakers support the near-term adoption of a cap-and-trade system initially designed to begin reducing U.S. emissions now and with a long-term goal of lowering U.S. emissions to 60 percent to 80 percent below 1990 levels by 2050 at reasonable cost. That goal should be periodically reviewed and revised in light of evolving knowledge of science, technology, and economics. It also urges the use of instruments that help to improve the predictability of compliance costs.

Cap-and-trade systems and carbon taxes focus narrowly on climate change, thus potentially failing to capture opportunities for payoffs in multiple dimensions. Excessive dependence on oil, in particular, accounts for a substantial fraction of U.S. greenhouse gas emissions, but also hurts U.S. national security.⁴⁵ In addition to putting a price on carbon, complementary policies could directly aim to reduce oil consumption, which would magnify the incentives to cut greenhouse gas emissions and also strengthen U.S. national security.

The Task Force finds that reducing oil consumption by cars and trucks, as well as elsewhere in the economy, can be a valuable part of a broader energy strategy that cuts emissions and improves national security by reducing oil demand. Developing a policy that addresses oil dependence at the same time as climate change will also help build broad political support for action on climate change. The Task Force recommends that the United States adopt targeted policies to discourage oil consumption. The specifics of the appropriate policies will depend at least as much on a careful assessment of energy security strategy that is beyond the scope of this report.

Broad price incentives have important limits in cases where markets do not work efficiently. In many of these cases, traditional regulation can be economically prudent and environmentally effective. Take one

⁴⁵ On oil as a fraction of emissions, see World Resources Institute, "Climate Analysis Indicators Tool," 2000, available at <http://cait.wri.org>. (accessed June 6, 2008).

example: Many people and businesses fail to capture money-saving efficiency improvements in the construction and operation of buildings. There are many reasons for this. Landlords, for example, sometimes do not charge for gas or electricity, instead folding a flat rate into rent; as a result, short-term changes in energy prices give consumers little reason to save. Those who occupy buildings for short periods of time may also not have time to recover savings associated with investments to improve efficiency, such as installation of insulation or better appliances, absent building codes that require such investments. Moreover, people often lack the information needed to make money-saving changes, or simply cannot be bothered with the nuisance. It is important to note, at the same time, that too much regulation can also play a role: in particular, when energy prices are not fully passed on to consumers due to price regulation or implicit subsidies, consumers have reduced incentives to conserve.

In addition to cases of market failures, there may be another role for traditional regulation in cases where a cap-and-trade system would be administratively hard to implement. For example, large numbers of small emitters might be dealt with more efficiently through direct regulation than through price incentives.

The Task Force finds that traditional regulation can in some cases yield cost-effective emissions reductions and should be an important part of any domestic strategy, even as price incentives remain at its core. The choice between price and traditional regulation is not exclusive: efforts on both fronts are, if designed properly, complementary.

Both price incentives and direct regulation create incentives for private research, development, and demonstration to promote new technologies and to deploy them at a large scale, all of which reduce the long-term cost of cutting emissions. Those approaches, however, still leave important gaps. Uncertainty over future government policy discourages firms from investing in novel technologies with long-term payoffs. In addition, it is also often difficult for firms to capture the benefits of basic research for themselves—the results are often just as useful for their competitors—making it hard to justify investments in those areas. For such reasons, the economy underinvests in research, development, and demonstration (RD&D). Given the magnitude of

the long-term goal for reducing emissions, this underinvestment is particularly striking since all routes to deep long-term cuts in emissions depend critically (though not exclusively) on massive technological change.

Public financial support for RD&D in low-carbon energy and in energy efficiency can help address these issues. It could take many forms, such as direct government funding, partnerships with private companies, prizes, and tax incentives for private investment. Through the U.S. Department of Energy, the government has increased investment in energy RD&D, excluding traditional burning of fossil fuels, to roughly \$1.7 billion in FY08, an increase of nearly 50 percent from FY06.⁴⁶ Still, several strong and reputable studies have found many opportunities for effective use of additional funds, and have recommended large increases in support along with a strong emphasis on public-private partnerships, basic research, international cooperation, and an approach based on a wide portfolio of efforts rather than on an attempt to pick a small number of winners.⁴⁷

The bulk of any new funds will be needed to support privately led consortia to develop and test critical advanced technologies. Government guidance in building private consortia can also be invaluable, as evidenced by the successful creation of the nonprofit research consortium SEMATECH to strengthen U.S. competitiveness in semiconductor technology. There are also, however, cautionary examples of large government investments in technology development that have gone nowhere while wasting enormous amounts of money; the most frequently cited example of this is the synfuels effort, a response to an earlier energy crisis.⁴⁸ While governments sometimes need to step in

⁴⁶ Figures based on K. S. Gallagher, "DOE Budget Authority for Energy Research, Development, and Demonstration Database," February 2008, available at <http://belfercenter.ksg.harvard.edu>. All figures in 2008 dollars. These include all spending on nonfossil sources as well as spending on clean coal technology.

⁴⁷ For example, National Commission on Energy Policy, *Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges* (Washington, DC: NCEP, 2004); Peter Ogden et al., "A New Strategy to Spur Energy Innovation," *Issues in Science and Technology*, Winter 2008.

⁴⁸ The Task Force notes that there is debate over whether the failure of synfuels could have been anticipated at the time that U.S. policy to promote development of those fuels was conceived. When the price of oil crashed in the 1980s, synfuels became much less cost-effective, and shortly after that the program was stopped.

where markets fail, markets have normally proven far more effective than governments at picking viable technologies. Still, since government support for RD&D will sometimes be necessary, and will inevitably end up supporting particular technologies over others to some degree, avoiding all bad decisions will be impossible, and policymakers will need to consider both successes and failures in evaluating approaches.

The detailed design of an RD&D initiative is beyond the scope of this report, but at least two lessons from history are important. First, no big push to supply new technologies will be successful without a comparable demand for those technologies in the economy—reflected in a clear and credible price for carbon, as well as relevant regulations to encourage the actual deployment of new low-carbon technologies and capture of energy-efficiency opportunities. Second, past programs have not been designed in ways that are sufficiently independent of political forces; thus, many technology programs have become pork-barrel ventures.

The Task Force finds that substantial government support for research and development, both public and through public-private partnership, is an essential complement to “technology-neutral” approaches to addressing climate change. Current funding, while having admirably increased in recent years, is still failing to capture many opportunities. The Task Force recommends continued increases in annual support; extending and expanding tax incentives for low-carbon and energy-efficiency investments; renewed attention to program management; and continuous evaluation of the technology landscape to determine where government support would be valuable and where markets are delivering needed technologies without it. It also recommends that the government support a broad portfolio of technologies rather than betting on one or a small number of potential breakthroughs.

Many of the opportunities to deploy low-carbon technologies require the existence of appropriate infrastructure. Natural gas, for example, cannot be significantly expanded without new pipelines or liquefied natural gas (LNG) terminals. Effective use of wind, solar, and other renewables whose cost-effectiveness depends strongly on where they are deployed requires a robust long-range grid that can carry power efficiently from where it is best generated to where it is needed.⁴⁹ The

⁴⁹ A more robust, national grid can also be valuable beyond renewables in cases, such as with nuclear power, where local community concerns may prevent plants from being in what would otherwise appear to be sensible locations.

use of coal with carbon capture and sequestration (CCS), which has not yet been proven at commercial scale for power generation, will require infrastructure for transportation and storage along with an appropriate regulatory framework. Nuclear power will ultimately require new waste-storage infrastructure if it is to be sustained and expanded. And without a smarter electricity grid, the United States will miss opportunities to generate and use power more efficiently. While the private sector will have a leading role in any infrastructure development, markets will not yield the necessary new infrastructure—which will be the subject of regulation and political decision-making—alone.⁵⁰

The Task Force finds that without a deliberate government effort to promote the development of infrastructure that would enable the fuller use of low-carbon technologies and improved energy efficiency, the United States risks overly constraining its energy choices and thus incurring greater costs in reducing its emissions. Such investments might include gas pipelines and LNG terminals; long-range, robust, and smarter electric grids; transportation and storage for CCS; and nuclear waste storage. While the precise contours of any infrastructure plan are beyond the scope of this report, the Task Force recommends a careful but deliberate effort in the federal and state governments to promote development of new infrastructure that will support deployment of the technologies needed for deep cuts in carbon emissions.

⁵⁰ Any government press for new energy infrastructure will involve picking winners to some degree. It is worth noting, however, that choosing not to support new infrastructure would do the same thing, implicitly supporting those energy choices that do not require new infrastructure to be exploited.

Achieving Leverage on Global Emissions

The Task Force now turns to foreign policy. This chapter presents findings and recommendations on a wide range of specific incentives that the United States and others might use to steer countries toward lower-carbon paths. The next chapter examines measures beyond mitigation, most notably those for adapting to climate change. The last three chapters develop a broad strategy that exploits the incentives explored here.

There is an urgent challenge to begin ambitious and coordinated international emissions reductions and to spur development of technologies that will make ever-larger reductions less expensive in the future. Yet the sheer volume of states and activities responsible for greenhouse gas emissions can easily overwhelm efforts to craft and implement an effective foreign policy strategy for reaching those ends. Focus is therefore important.

There are six basic greenhouse gases and more than 180 countries. However, 80 percent of the world's emissions are carbon dioxide. Moreover, the advanced industrial countries—mainly the United States, European Union, and Japan—along with Brazil, China, India, Indonesia, and Russia contribute together roughly three-quarters of global CO₂ emissions. Those emissions come primarily from coal use in power and industry, oil use in transportation and elsewhere, and tropical deforestation.

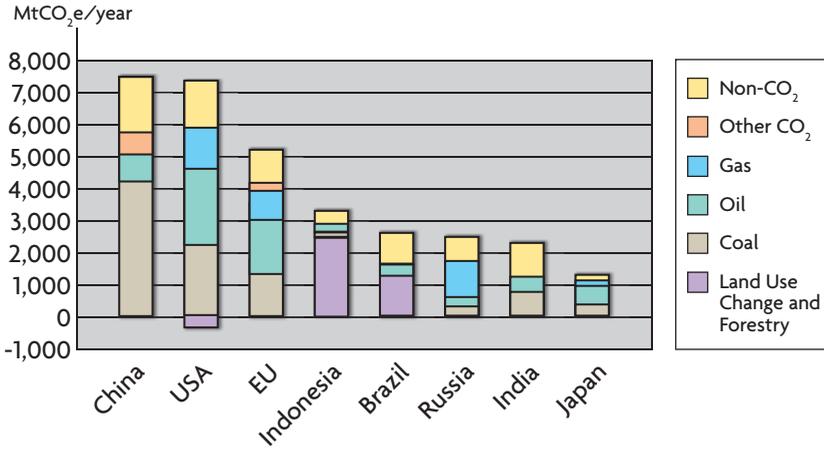
The Task Force finds that an initial (though not exclusive) emphasis on emissions from coal, oil, and deforestation in a small number of the world's largest emitters would focus U.S. foreign policy while addressing roughly three-quarters of global emissions. This approach, if pursued with diligence and in a context that continues to engage the rest of the world, would also lay the groundwork for increasingly inclusive and effective global policy. It would also provide other payoffs: for example, shifting to cleaner power production could deliver big health benefits, controlling oil use could alleviate some energy security concerns by reducing global demand, and conserving forests would deliver benefits for biodiversity.

The rest of the advanced industrial world has, for the most part, adopted more aggressive policies than the United States toward avoiding dangerous climate change, though with uneven results on the ground. While those countries will need to continually intensify their efforts at home, U.S. foreign policy strategy is unlikely to determine whether that happens there. The European Union, in particular, has already promised, alone, to achieve a substantial (20 percent) cut in emissions by 2020, and offered to make an even deeper cut (30 percent) if other countries make major efforts.

The major developing countries will be much harder to address than the major developed countries, yet they are at least equally, and eventually will be much more, important. Burning coal for power and industry, the single largest contributor to China's and India's greenhouse gas emissions, is anchored in strong economic and security fundamentals. Both countries need increasingly large amounts of energy to fuel their rapid economic growth, and coal is cheaper and more readily available than other fuels. While some factors mitigate against coal's dominance—notably an interest in cutting local air pollution as well as in diversifying energy supply—unseating coal from its position is likely to be impossible. A similar pattern holds for oil use, most prominently in transportation but also, significantly, in heating and other applications.

Brazil's and Indonesia's emissions come principally from deforestation. Economics is a primary driver, with cleared forests providing income through timber sales as well as by opening land for livestock pasture and agriculture.⁵¹ This is exacerbated by ambiguous property

⁵¹ The principle drivers of deforestation in the Brazilian Amazon are the clearing of land for livestock pasture and agriculture as well as timber harvesting. In Indonesia, timber harvesting is a stronger driver of deforestation, due to the greater value of the wood. Clearing for oil

Figure 2: Greenhouse Gas Emissions by Source (2005 est.)

This chart includes the eight countries with the greatest emissions. Land Use Change and Forestry data is as calculated by WRI, CAIT for 2000; other data is from the IEA for 2005.

rights and poor enforcement of existing rules. As in the case of coal and oil, some countervailing incentives exist—illegal deforestation costs governments tax money, while accidental forest fires wipe out value for all. Without improved policies, deforestation is unlikely to significantly abate. In some respects, the current boom in energy prices and growing concerns about energy security have made matters worse by creating incentives to put lands into biofuels production, which can indirectly amplify pressure to destroy natural forests.

The Task Force finds that, absent new incentives, emissions from coal and oil in China and India will rise, and those from deforestation in Brazil and Indonesia will not drop, despite the existence of some countervailing factors. The Task Force finds, though, that each activity has drivers—primarily but not exclusively economic—that foreign governments can in principle affect in ways that would lead to lower emissions.

The remainder of this chapter thus examines a wide range of possible ways in which the United States and others can alter the incentives for Brazil, China, India, and Indonesia. The Task Force

palm plantations, cultivated for biodiesel production, is also a major cause of Indonesian deforestation; conversion of cropland for ethanol production is, to a lesser extent, an indirect cause of Brazilian deforestation as well.

concentrates on those countries because no strategy for achieving deep cuts in emissions globally will be viable unless it can alter behavior there. However, the Task Force is mindful that this approach must be pursued in a way that allows it to be extended, ultimately, to address the varied incentives in many other countries. Notably, Russia offers special opportunities and challenges. It is far less wealthy than the United States, but it is not nearly as poor as China, India, or Indonesia, and it generates only one-fifth of its power from coal.

Understanding Dangerous Climate Change

The most obvious incentive for reducing emissions is a desire to avoid dangerous climate change. Yet for essentially all major developing countries, this has proven an insufficient reason to tackle emissions directly. Each of the developing countries examined here invests in climate science, notably in assessments of the impacts of climate change on its own territory, though to differing degrees. Those studies are, for example, revealing that China is vulnerable in many ways, including along its long coastline (where most of its economic production is concentrated), in agricultural areas, and in its already stretched water supplies. The others have done far less to assess the potential impacts of climate change on themselves. *The Task Force finds that cooperation with these countries in assessing their vulnerability to climate change, while far from enough alone to induce them to take steps to control their emissions, would help steer them in that direction at essentially no cost to the United States, and recommends a concerted effort on this front.*

Technical Cooperation

In perhaps the simplest direct approach to effecting emissions reductions, advanced industrial states would work with developing-country governments and firms to identify and exploit negative-cost opportunities to reduce emissions. Cooperation tends naturally, though not exclusively, to focus on improving efficiency in energy use. Efforts can include identifying opportunities for increased efficiency, sharing best practices, helping design regulatory codes, and assisting in building the capacity to enforce them. Such initiatives cost the United States little and can

have large payoffs in reduced emissions. The United States and others already work with China and India in these areas. In particular, Japan and China are already engaged in extensive cooperation.

Heavy industry can also benefit from technical cooperation in improving energy efficiency. This could be politically controversial in the United States, since it would reduce production costs for firms that compete with U.S. companies. It might also, however, reduce costs for American consumers of some imported goods.

Technical cooperation can also contribute to reducing the rate of deforestation. Cooperation on strategies to improve forest management can help governments improve enforcement of forest policies, remove perverse incentives that encourage deforestation, and make forests more productive. Those outcomes can deliver large benefits beyond lowering the emissions that cause climate change. Better management would include improved systems for remote sensing, fire detection and suppression systems, and, where relevant, improved surveillance and management of timber operations. Stronger property rights would also create incentives for sustainable forestry, which could moderate CO₂ emissions, and the United States and others could assist with sharing best practices and with legal advice. The U.S. Agency for International Development (USAID), for example, has worked with Indonesia, Brazil, and nations of the Congo Basin, among others, on a variety of efforts to stem deforestation.⁵² Avoiding deforestation on a scale large enough to contribute meaningfully to climate change mitigation, though, would likely require direct payments for avoiding deforestation that would tilt the economic balance. (Options for financial support are discussed later in this chapter.) Weak property rights and enforcement, though, could undermine any scheme built on such payments; technical cooperation is thus an essential component of any strategy to address forests.

The Task Force finds that technical cooperation, typically and most naturally conducted on a bilateral or regional basis, is too often overlooked or denigrated by policymakers focused on "high diplomacy." Technical cooperation can prompt

⁵² USAID, "U.S. Activities in Indonesia Related to Global Climate Change," December 2007, <http://indonesia.usaid.gov> (accessed April 12, 2008); USAID, "Environment," <http://brazil.usaid.gov> (accessed April 12, 2008); USAID, "Congo Basin Forest Partnership," <http://www.usaid.gov> (accessed April 12, 2008).

large reductions in developing-country emissions at a low direct cost to the United States and its partners, and the Task Force recommends aggressive efforts on this front. Since the emissions reductions resulting from much of that cooperation also reduce energy or other costs, it is likely to be welcomed. Those changes in costs, however, are generally small enough as to not raise competitiveness concerns for U.S. firms.

International Cooperation in Research, Development, and Demonstration

International cooperation on research, development, and demonstration of climate-friendly technologies addresses important gaps in national-level efforts. Just as public-sector investment in RD&D is made necessary by the fact that firms cannot fully capture the benefits of their own early-stage investments, so international cooperation addresses the fact that RD&D funded by one country will benefit others. Intensive international RD&D cooperation—among advanced industrial countries as well as with major developing-country emitters—can dramatically ease the task of mitigating emissions by speeding the development of technologies that would reduce the costs to developing countries of cutting their emissions. Eventually, all nations might be expected to contribute to an international RD&D program. However, only a small number of nations account for the vast majority of energy-related research—these countries include all of the largest emitters from energy use—and a program that begins with them would achieve most of the benefit of a concerted global approach.

Particular focus will be needed for the aspects of international technology cooperation that will be most costly and where the capabilities of even the large emitting countries are mismatched. That means an emphasis on technology demonstration programs. Carbon capture and sequestration, for example, is likely to be developed primarily by technologically advanced countries, but will need to be widely deployed in the developing world. Demonstrating the feasibility of CCS in Norway or Canada does not prove its viability in China or India, where local conditions, such as geologies and regulations, are different. International cooperation on demonstration, in this case and in others, is the only

way to bridge this gap. Successful efforts in these areas can also take advantage of nascent centers of technological expertise in the emerging countries. For example, one of China's power generation companies is already developing many elements of a carbon capture system, and some of India's power companies are keen to deploy more efficient advanced power plants. An international technology demonstration program would be most productive if it concentrated its efforts in areas such as these where doors are already open and where there are competent technological partners with local knowledge that are best able to work in concert with an international program.

In all cases, the United States will need to balance an interest in promoting its own firms with the need to get others to engage wholeheartedly in cooperation. If the United States insists on too large a role for its own companies in cooperative projects, at the expense of its partners, those partners may simply focus their collaborative efforts on others. China, for example, might choose to cooperate with Europe rather than with the United States. If that happens, both the United States and U.S. firms will lose out. The United States will also need to be careful to ensure that its firms' intellectual property is protected in any venture.

The Task Force finds that international cooperation on R&D holds the promise of leading to new technology developments more quickly and more cost-effectively than national-level efforts, in turn creating incentives for developing countries to reduce emissions. Demonstration projects in collaboration with developing countries, in particular, can have the dual effect of promoting technology diffusion and positioning U.S. exporters advantageously. The Task Force accordingly recommends that the United States aggressively pursue opportunities for R&D cooperation, with a particular emphasis on demonstration projects in developing countries, notably in carbon capture and sequestration, while being mindful of intellectual property concerns.

International Emissions Offsetting

For at least a decade, international climate policy has focused strongly on using international emissions offsetting to deliver financial incentives

for reducing emissions to developing countries.⁵³ The Task Force expects that, in time, most industrialized countries will have cap-and-trade systems in place.⁵⁴ Entities covered by a cap must hold permits corresponding to their total emissions. States might then allow those entities to buy additional permits—offsets—from countries that have not adopted emissions caps; those countries would be required to reduce emissions in energy, land use, or elsewhere, from some agreed-upon baseline in order to generate offsets for sale.⁵⁵ This sort of one-way carbon trading (in principle) reduces developing-countries' emissions while transferring funds that could be used to pay for those reductions. This approach has the potential to mobilize enormous financial resources that could effect widespread change in developing-country behavior. It is also attractive to some developed-country emitters, as those emitters could lower the costs of complying with a domestic emissions cap by purchasing low-cost offsets from abroad.

Exactly this approach was envisioned with the creation of the Kyoto Protocol's Clean Development Mechanism, which was born of a desire to engage developing countries that refused to accept mitigation commitments under Kyoto and to lower costs for developed countries that agreed to caps.⁵⁶ But the CDM, while responsible for some real emissions reductions in developing countries, has been disappointingly ineffective at achieving its goal of effecting fundamental shifts toward cleaner energy production, particularly in light of the tens of billions of dollars it is expected to direct to developing countries. In its initial years, it mostly generated reductions in non-CO₂ greenhouse gases that were sold to Kyoto parties for much more than the cost of those reductions; meanwhile, most of the legitimate power generation projects it has funded

⁵³ The analysis in this section does not apply directly to carbon trading among countries that have adopted reliable caps on their emissions, something examined in chapter six, nor is it meant to apply to domestic offsets.

⁵⁴ To date, the largest and most consequential of these systems is the EU's emission trading scheme.

⁵⁵ The Task Force notes that offsets schemes can be integrated with domestic regimes based on carbon taxes as well. Given its recommendation that the United States adopt a cap-and-trade system, the Task Force focuses on cap-and-trade in this discussion.

⁵⁶ The CDM has become the largest system of international offsets, and the value of its credits now sums to several billion dollars per year.

have been at small scales.⁵⁷ The scheme has also failed to address deforestation, missing a major source of emissions.

Enthusiasm for international offsetting in general, and the CDM in particular, is uneven. Europe is expected to buy tens of billions of dollars' worth of CDM credits, but current European Commission proposals envision severe restrictions on the use of offsets after 2012.⁵⁸ Many Japanese policymakers, meanwhile, are eager to expand the CDM, including to CCS and to nuclear power. China and India, while initially lukewarm to offsets, have embraced them wholeheartedly. And Brazil and Indonesia, along with many other forest-rich nations, have recently warmed to the future possibility of using offsets to pay for avoided deforestation.

The Task Force finds that, in principle, international emissions offsetting offers a powerful means of effecting reductions in developing-country emissions. Nonetheless, it finds that the CDM has been largely unsuccessful in achieving that goal. To the extent that international offsets are used, an overhauled approach is essential. Any changes will need to be made in the context of substantial existing support for the use of offsets, and, in many quarters, for the CDM specifically.

If international offsetting is to be used effectively, four problems exposed by the CDM experience must be addressed: offsets must create sufficient incentives for real reductions from business as usual; schemes must be crafted to effect fundamental shifts in energy, transportation, and forestry; capacity to monitor emissions and verify actions must be effective; and the financial transfers involved in offset schemes must be structurally sensible and politically viable.

What does this mean future offset schemes should look like? It is impossible to know precisely in advance. Instead, the United States and others will need to experiment. Rather than trying to make offsets work across hundreds of types of projects, those countries would benefit

⁵⁷ The integrity of many of those reductions is also suspect. See Michael W. Wara and David G. Victor, "A Realistic Policy on International Carbon Offsets," Program on Energy and Sustainable Development, Stanford University, Working Paper #74, April 2008; and Lambert Schneider, *Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement* (Berlin: WWF, November 2007).

⁵⁸ This increasingly negative attitude is driven primarily by a desire to force Europe itself to shift to a low-carbon economy—to the extent that European countries can meet their targets for reducing emissions by buying CDM credits, there is little incentive to make major changes at home—as well as by some concern over the integrity of offsets.

from restricting their use of offsets to a relatively small yet growing number of straightforward but important opportunities, in energy and in avoided deforestation, that would almost certainly be uneconomical without offset support. It would also be strategically unwise to use offsets as an incentive for major economic competitors in the absence of strong reciprocal commitments and independent action to reduce emissions. The Task Force notes that using offsets to address forests would largely avoid that problem, since most forest-rich nations are not major economic competitors and since the activities that forest credits would reward are not pivotal in national competitiveness; at the same time, the Task Force notes that forest-based offsets face distinct and important challenges in ensuring integrity and avoiding international leakage.

Clear U.S. policy in this area, combined with the fact that entities within the United States may eventually be the largest buyers of offsets, could focus countries on creating a “gold standard.” The Task Force notes that the United States need not wait for international agreement on a successor to the CDM—indeed, it can and should lead by establishing a “gold standard” for offsets in both energy and forestry as it creates the rules for its own domestic cap-and-trade system. Ultimately, though, it will need to develop a coordinated approach to ensuring integrity, since linking emissions markets will require that international offsets be fungible between markets. Failure to coordinate will erode environmental integrity and severely impede the ability of developed-countries’ emissions-trading markets to become linked together.

The Task Force recommends that the United States and the world experiment with new and stricter approaches to offsets, guided by the lessons learned from experience, in both energy and forestry. The United States should pursue that not only through a successor to the CDM but also, critically, through its domestic cap-and-trade law. The Task Force finds, however, that offsets will be limited in their ability to effect the emissions reductions required from the largest developing-world emitters, and particularly those that are major economic competitors to the United States. Given the limited role for offsets, the Task Force strongly cautions against a narrow focus on them and warns that unless the United States and others aggressively pursue other types of leverage—including but not limited to other financial incentives—to effect emissions reductions, they will fail to help shift the developing world onto a safe course.

Climate Funds

For every case where offsets have the potential to tip the balance in favor of low-carbon development, direct government-to-government or government-to-firm payments might accomplish the same thing, as might payments from international institutions such as the World Bank. The most prominent precedent for this approach is the Multilateral Fund established under the Montreal Protocol on ozone-depleting substances.⁵⁹

Paying directly to support emission reductions has several downsides when compared to using offsets. Governments may find it hard to mobilize financial resources on the same scale that the private sector can, limiting the potential impact.⁶⁰ Paying economic competitors directly for emissions reductions is also likely, in many if not most cases, to be difficult politically, and strategically unwise.⁶¹ This barrier might be partly ameliorated if money came from an international fund rather than from a particular government, though the accompanying loss of control over how funds would be deployed would cut the opposite way.

Direct payments also have important strengths. They can be tailored to focus on low-cost opportunities for reducing emissions in a way that could avoid delivering windfall profits to competitor firms.⁶² In addition, were advanced industrial countries to focus offsets on a handful of project types, as the Task Force recommends, direct payments could be used to target other emerging opportunities that the new offset approach missed. Relatedly, if the U.S. government, rather than a large

⁵⁹ Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (Cambridge, MA: Harvard University Press, 1991), p. 223.

⁶⁰ A climate fund might, however, be supported by the sales of emission permits that will likely be part of a cap-and-trade program.

⁶¹ China or India might also object to the interference in their domestic affairs inherent in an approach where the U.S. government picked particular firms to target with assistance, as might Brazil and Indonesia if outside governments targeted particular areas for avoided deforestations.

⁶² One study, for example, has estimated that through the use of offsets the advanced industrial countries will pay over \$1 billion to developing countries (with China the largest recipient) to eliminate two-thirds of their emissions of HFC-23, a potent greenhouse gas. In contrast, the study estimates the true cost of eliminating *all* HFC-23 emissions in the developing world at a mere \$31 million per year—an amount that is small enough that it could be mobilized and spent through a government funding mechanism similar to that of the Montreal Protocol. See Michael Wara, “Is the global carbon market working?” *Nature* 445, February 8, 2007.

number of U.S. firms, makes payments for emissions reductions, it can use its monopoly power to target its funds.⁶³ Direct payments might be able to target opportunities where emissions reductions are uncertain, but where governments can take risks. This could be particularly useful in initiatives to avoid deforestation, since payments might support crosscutting investments rather than specific, targeted emissions cuts. In all cases, a professional, independent administration would be needed to ensure that funds concentrate on activities and technologies for which the lack of funding is a true bottleneck.⁶⁴

Rather than transferring monies, advanced industrial country governments or institutions could also purchase low-carbon technologies themselves and sell them at a discount to developing countries, making them cost-competitive with high-emissions technology. (The Marshall Plan and the World War II Lend-Lease program both transferred goods rather than monies.) Such an approach could help ensure that money was spent, at least partly, on technologies sold by donor-country firms, making the program more politically attractive. Explicitly transferring technologies would, nonetheless, have important downsides. Intellectual property concerns, in particular, could be acute: firms would sell goods to governments or international institutions, and might then lose control over whether those were resold to countries with lax intellectual property controls.

The Task Force finds that climate funds can play an important role in a climate strategy. The Task Force recommends that funds, both U.S. and international, be established for this purpose. The Task Force notes, however, that directing climate funds toward major economic competitors such as China and India introduces significant challenges; Task Force members differ over the wisdom of using climate funds to support such countries. They agree, however, that any large-scale support is likely to be politically unworkable absent accompanying concessions from those receiving that support. As a result, the Task Force recommends that support for major competitors be made part of package deals that include other commitments from those countries. These may be in areas outside the climate sphere, such as intellectual property or trade.

⁶³ The degree to which that would be effective would depend in part on whether other countries offering incentives cooperated.

⁶⁴ The Task Force notes, for example, that both China and, belatedly, India are in the midst of shifting to more efficient technologies for new coal-fired power plants—a welcome trend that will slow the growth of those countries' CO₂ emissions and that does not require any additional outside funding to encourage.

Strengthening Security of Supply

While neither China nor India is likely to shift from using inexpensive coal in producing energy simply to address climate change, other nonfinancial incentives may be able to guide them in that direction. In particular, the United States and others could help further align China's and India's energy security and climate change incentives by taking steps that would increase those countries' confidence that shifting away from coal would not undermine their energy security.

The United States and others could provide political support for, or refrain from opposing, diversification of transportation routes for natural gas.⁶⁵ Making natural gas supplies more reliable would make China and India more likely to shift to its use, which could lead to much lower CO₂ emissions, since gas emits about half the CO₂ per unit of useful energy when compared with coal.⁶⁶ Gas pipelines could, however, deepen Chinese and Indian relations with unsavory partners, an undesirable outcome not only for the United States. This is particularly true in the case of India, which has explored projects with Iran and Myanmar. China, in contrast, has focused more on Central Asia and Russia, though many—particularly in Europe—would be concerned about the potential for Russia to use control over gas supplies to gain political leverage. In all cases, supporting the expansion of liquefied natural gas infrastructure can help mitigate against some of these problems by offering a flexible and scalable source of gas that can complement the fixed infrastructure of international pipelines; when countries are less reliant upon single suppliers and modes of supply, they feel more secure.

The Task Force finds that providing political support for Asian gas infrastructure would lead to greater use of gas rather than coal in China and India, and hence assist in steering both countries in a climate-friendly direction. While such a step would not be without downsides, encouraging countries to build infrastructure

⁶⁵ *National Security Consequences of U.S. Oil Dependency*, p. 49.

⁶⁶ One study has found, for example, that efforts to switch from coal to gas in just one Chinese province (Guangdong) for the purpose of cutting local noxious air pollutants would also fortuitously reduce annual emissions of CO₂ by more than the entire EU effort under the Kyoto Protocol. BinBin Jiang, "The Future of Natural Gas vs. Coal Consumption in Beijing, Guangdong and Shanghai: An Assessment Utilizing MARKAL," Program on Energy and Sustainable Development, Working Paper #62, September 2007, available at <http://pesd.stanford.edu>. (accessed June 6, 2008).

that includes LNG as well as pipelines would substantially improve security. It thus recommends working with the major gas-consuming countries to develop strategically prudent and cost-effective gas supply networks.

On the nuclear front, the United States and others could work to establish confidence in the supply of uranium and technology for nuclear power expansion. The recent U.S.-India nuclear deal, which does just that for India, is highly controversial due to India's status as a state with nuclear weapons that will remain outside the Nuclear Non-Proliferation Treaty. Regardless, that agreement is likely to eventually come into force. The United States should continue to promote substitution of nuclear for coal power in India while ensuring that it ties Indian cooperation on nonproliferation and arms control with continuing access to nuclear technology.

Indeed, nuclear power plays a strong role in almost every careful assessment of a world with deeply reduced greenhouse gas emissions. Yet while much of that increase would happen in countries that already have nuclear power, its broader spread could sharply increase the risk of new countries acquiring nuclear weapons.⁶⁷ *So long as it is economically competitive, the Task Force strongly supports its growth in the countries that already have nuclear power.*⁶⁸ *The Task Force finds, though, that efforts to rein in greenhouse gas emissions by supporting the further spread of nuclear power should only be made in the context of a nonproliferation regime that strongly reduces the associated risks of nuclear proliferation. It thus recommends a vigorous effort to bolster the nuclear nonproliferation regime as a complement to other elements of an effective climate policy, along with efforts to improve fuel supply reliability and address waste disposal.*⁶⁹

⁶⁷ The Task Force notes that increasing stocks of fissile material present security challenges even in countries that already have some nuclear base and recommends that ensuring security for those stocks be a priority.

⁶⁸ While Task Force members disagree on the wisdom of the U.S.-India nuclear deal, they find that support for Indian nuclear power, so long as it is tied to nonproliferation and arms control, would be beneficial and is recommended.

⁶⁹ That effort, as many have argued, should naturally focus on constraining the spread of the so-called fuel-cycle, which can easily be abused to produce nuclear power, while allowing the spread of power plants themselves. Bruno Pellaud, "Nuclear Fuel Cycle: Which Way Forward for Multilateral Approaches?" International Atomic Energy Agency, Bulletin 46/2, March 2005, available at <http://www.iaea.org>. (accessed June 6, 2008).

Export Promotion

While a broad effort to increase global demand for low-carbon technologies would boost many U.S. firms and create accompanying jobs, additional efforts could be devoted specifically to helping U.S. exporters take advantage of these new opportunities. The United States could provide low-cost loans, loan guarantees, or explicit subsidies to climate-friendly technology exporters, making them more competitive with firms in Europe and elsewhere. Such efforts, done right and paired with appropriate industrial policy and education at home, have special potential to create economic opportunity and high-skill jobs in the United States. The United States would need, though, to carefully balance the interests of technology exporters and their workers with those of firms and workers in emissions-intensive industries whose overseas competitors might be boosted.

The United States could promote clean-technology exports by tilting the focuses of the Ex-Im Bank and OPIC. The Ex-Im Bank currently reviews projects for their environmental impact and offers special financing arrangements for hydroelectric and renewable energy projects.⁷⁰ It could strengthen its role by setting targets for clean-technology exports, including not only renewable power but also other low-carbon energy sources, and by extending its special arrangements to projects aimed at improving energy efficiency. OPIC has long had a less active role in promoting clean technology exports, focusing on avoiding potential environmental downsides rather than boosting technologies with substantial upside. It has, however, recently created a fund that will support as much as \$500 million in financing for renewable energy projects in emerging markets, and could further adopt policies aimed at more aggressively promoting clean exports.⁷¹ The United States could also create tax incentives for exporters of clean technologies to developing countries.

Multilateral initiatives, notably through the World Bank, could also improve prospects for clean-technology exports. The bank has produced

⁷⁰ Export-Import Bank of the United States, "Environmental Procedures and Guidelines," <http://www.exim.gov> (accessed August 20, 2007).

⁷¹ "OPIC Supports Renewable Energy Investment Fund for Emerging Markets," March 5, 2008, <http://www.opic.gov> (accessed April 12, 2008).

a road map for investment in clean technology in the developing world, identifying the necessary scale of investment, manages \$2 billion directed to that end, and is aiming to greatly expand the scope of its efforts.⁷² Increasing the bank's resources for promoting the diffusion of clean energy technology would create new opportunities for American firms. It could also avoid the political difficulties associated with explicit U.S. support for exports to India and, in particular, China.

Not all export promotion must involve spending by governments. In particular, the United States and Europe have recently promoted a complementary effort aimed at reducing global barriers to trade in low-carbon technologies. Success would lead to wider adoption in the developing world of technologies that reduce emissions, while avoiding concerns about subsidizing economic competitors. This would improve prospects for U.S. technology exporters and their workers. Countries might also consider a deal that paired lower trade barriers with increased direct support for technology transfer.

The Task Force finds that clean-technology export promotion offers an opportunity to support emissions reductions while boosting the competitiveness of U.S. firms and stimulating the creation of U.S. jobs. It recommends increasing Ex-Im Bank and OPIC emphasis on low-carbon technology and exploring tax incentives for exporters. The Task Force also finds that tying export promotion to developing-country climate commitments could offer even greater leverage in effecting emissions reductions, and could further increase demand for exports, though making such a link essential could lead to missed opportunities. It recommends that the United States explore that possibility and determine on a case-by-case basis whether export promotion should be tied to developing-country commitments. It also recommends that the United States promote the elimination of barriers to trade in low-carbon technologies.

Trade Penalties

If major developing countries do not adopt strong emissions-mitigation policies, the United States and others could in theory use so-called border adjustments (sometimes called carbon tariffs), which would

⁷² It judges that tens of billions of dollars are required annually to cover "the incremental costs of transitioning to a low carbon economy" ("Clean Energy for Development Framework: The World Bank Group Action Plan," March 6, 2007).

impose costs on greenhouse-gas-intensive imports commensurate with those incurred by domestic producers.⁷³ Such an approach has attracted increasing attention in the United States during the last year, has been incorporated in various ways into some of the leading congressional proposals for regulating U.S. emissions, and will undoubtedly continue to play a significant role in the domestic American debate. It has also been a major part of the European policy debate, with the United States the primary target.⁷⁴

Imposing barriers at the border would likely achieve the goal of protecting domestic producers from foreign imports that faced lower costs because their greenhouse gas emissions were unregulated.⁷⁵ However, a host of other measures could be used to achieve similar ends, protecting American companies and workers from unfair competition.⁷⁶

It is unclear whether “fair” border measures would be legal under the WTO.⁷⁷ Regardless of their efficacy or legality, though, the threat or use of border measures by the United States would have broader political and strategic ramifications. Threatening tariffs or other controls could damage prospects for future progress on trade—including efforts both to liberalize trade and to make it fairer—and could hurt bilateral relations with target countries more broadly.⁷⁸ Leading bipartisan legislation in Congress has not envisioned the possible application of border

⁷³ If the United States were to adopt a cap-and-trade system, it might require importers to buy emissions permits; if it adopted a carbon tax, an explicit charge would be more appropriate. The United States could, alternatively, create environmental standards for emissions-intensive imports as a way of maintaining the environmental integrity of its domestic efforts. Such an approach might be more straightforward, and provide more clarity, than schemes involving border fees. To have any chance of complying with global trade rules, however, similar standards would need to be imposed domestically.

⁷⁴ For the most part, however, emissions-intensive industries in Europe have pressed for free allowance allocations rather than for border measures.

⁷⁵ It would also extend the environmental benefits of domestic efforts to control emissions, though barriers to imports would increase prices for consumers.

⁷⁶ For a careful analysis of a range of options for protecting U.S. companies and workers, see Trevor Houser et al., *Leveling the Carbon Playing Field: International Competition and U.S. Climate Policy Design* (Washington, DC: Peterson Institute for International Economics, 2008).

⁷⁷ Determining whether adjustments were in fact leveling the playing field, rather than protecting domestic producers under the guise of climate policy, could be extremely difficult. The WTO might also require the United States and others to make a good faith effort to draw developing countries into a global climate change scheme before imposing any border measures.

⁷⁸ The economic effect of that could substantially outweigh any economic benefit arising from the adjustment itself, though with global trade negotiations already facing a wide array

adjustments for roughly another decade, and includes language requiring that any measures ultimately taken be consistent with international agreements, including the WTO.⁷⁹

There is, to be certain, anecdotal evidence that the prospect, however remote, of facing trade measures has led to an increasingly conciliatory Chinese position on action to reduce emissions. While some Chinese officials appear to not take these threats seriously, others have thought them through carefully.⁸⁰ In addition, some American allies (not only in Europe) believe that keeping border measures on the table is useful.

The Task Force finds that the United States should view trade penalties as a measure of last resort and should seek other ways to ensure its companies and workers are not hurt by the inevitably uneven international efforts to limit emissions of greenhouse gases. The Task Force recommends, though, that the United States leave open the possibility of eventually imposing border measures, within a multilateral context, if rapidly developing countries do not make and honor strong commitments to control emissions of greenhouse gases. The United States should work with other countries to build agreement on what border measures might be acceptable and WTO-compliant. The Task Force finds that the wisdom of actually imposing border measures will need to be determined in the context of the future state of broader trade policy and of the economic effects of uneven climate change efforts.

The Task Force notes that there are more subtle approaches that would encourage Americans to consume imports that are produced in climate-friendly ways. Voluntary labeling and certification schemes, in

of challenges, it is unclear that new measures on the climate front would make or break broader near-term trade progress. On the strategic front, China and India present different pictures. Regardless of whether China attempted to have border adjustments ruled illegal, those measures would complicate ongoing efforts to improve trade relations between the United States and China, which are already under heavy strain. The threat of border adjustments would also damage the strategic relationship between the United States and India, as India would perceive them as interfering with its domestic affairs, long a point of friction with the United States.

⁷⁹ Both S.2191 (Lieberman-Warner) and S.1766 (Bingaman-Specter) contain such provisions as well as requirements that any border adjustments be WTO-compliant.

⁸⁰ China has already taken basic steps to preempt them by eliminating some export subsidies for energy-intensive goods. This is, however, driven by a wide variety of factors that extend beyond climate. Still, in general, developing countries might preempt any border charges by levying export tariff on their own goods, which would let them keep any associated revenues. This could create a constituency of companies affected by these trade measures that would press for broader and more consistent regulation of greenhouse gas emissions.

particular, have had success in a wide variety of areas, such as sustainable forestry (such as through the Forest Stewardship Council as well as industry-backed certification systems) and in energy efficiency (such as with Energy Star labeling). These schemes, backed by either private or public entities, help responsible consumers choose products, including imports, that are more environmentally responsible, thus addressing some concerns (albeit far from perfectly) about high-emissions imports gaining advantage over low-emissions products made domestically, without actually blocking high-emissions imports. *The Task Force recommends that the United States encourage the expansion of voluntary labeling and certification schemes, including, where appropriate, by directing government procurement toward robustly and reliably certified products.*

Lowering Biofuels Tariffs

Removing U.S. tariffs on biofuel imports, and particularly on Brazilian sugar-based ethanol, would improve American energy security by increasing the availability of alternatives to oil. It could also, in theory, reduce the costs of cutting American greenhouse gas emissions; many imported biofuels are currently more climate-friendly than many domestically produced ones. Increased biofuels production, spurred by lower tariffs, could, however, lead to dangerously large greenhouse gas emissions from deforestation and other land use change that would grossly outweigh any other climate benefits.

Indeed, the net effects of biofuels use on global climate change are very poorly understood and depend on the details of the biofuels under consideration.⁸¹ There have been several recent moves that attempt to reflect these difficulties in policy. The European Commission, for example, has proposed a requirement that biofuels reduce emissions relative to fossil fuels by at least 35 percent; the same proposal would only designate biofuels that were not made on certain types of land

⁸¹ There are also legitimate concerns that rapid growth in biofuels use can dangerously drive up food costs—especially for the urban poor. However, other factors such as crop failures and growing global demand for food may be far more significant.

with high biodiversity as renewable.⁸² No effort will be perfect, but schemes that carefully distinguish between biofuels of different provenance can help better align biofuels efforts with climate change objectives.⁸³

The Task Force finds that the wisdom of lowering or removing biofuels tariffs depends on the emissions impact of the fuel in question. It notes that a similar assessment applies to policies that promote domestic biofuels production and use. No blanket judgment is possible—promoting some biofuels sources will be unequivocally unwise, encouraging others will be clearly prudent, and much will fall into murkier territory. The Task Force recommends that the United States, as a basic principle, seek to reduce and remove biofuels tariffs, but that it do so only with careful attention to the impact of those tariffs on net emissions. That might be done through standards for biofuels—applied equally to domestic and imported biofuels—or by making tariff reductions part of broader climate packages designed to achieve net cuts in emissions in the countries that produce and consume biofuels. It also recommends that the United States and others, notably the EU, work together to harmonize any standards for low-carbon biofuels to ensure an efficient and environmentally sound global market. At the same time, it recommends that the United States phase out domestic subsidies for mature biofuels such as conventional corn-based ethanol.

Broader Incentives

As climate change rises up the list of American foreign policy priorities, incentives for reducing greenhouse gas emissions need not directly involve climate policy. Russia, for example, only ratified Kyoto after European countries agreed to support its bid for WTO membership, a carrot from outside the climate sphere. With a large slate of bilateral issues on the table, particularly in the case of China, the United States

⁸² This includes production and tailpipe emissions, as well as credit for CO₂ sequestered during the growth of biofuels crops. It does not include indirect emissions from land use change. Commission of the European Communities, “Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources,” January 23, 2008, <http://ec.europa.eu> (accessed April 12, 2008).

⁸³ In particular, the EU initiative does not deal with indirect emissions resulting from clearing land for new food production as a result of decreased availability of other land due to biofuels production.

might find opportunities for deal making by linking the climate issue to a wide array of other concerns. Climate change will be one of the most important foreign policy challenges of the century; as such, it merits status as a central foreign policy objective and efforts toward climate goals should include trade-offs against other goals where needed.

The United States and others could also target more general desires among leading developing countries to become central players in international politics, a particularly salient issue with both China and India. The United States has recently focused on making China a “responsible stakeholder” that would play a positive role in the international system. That approach, which implicitly ties together Chinese actions in different areas, has been widely accepted as an effective way of engaging Beijing. The United States has similarly sought to help India further integrate itself into the international mainstream. That approach to India at once appeals to Indian desires to be a great power, but is difficult for those Indians who are still focused primarily on maintaining their country’s independence.

The United States could emphasize that being a major and responsible power entails a growing commitment to curb greenhouse gas emissions. So long as the United States takes only voluntary and relatively mild actions to reduce its own emissions, it can hardly argue that China and India are being irresponsible by doing the same—indeed, it might suggest just the opposite. But as the United States takes more aggressive action at home, it will be in a much stronger position to ask the same of others.

The Task Force finds that incentives from outside the climate sphere may be powerful, and recommends that the United States seek opportunities to trade across different foreign policy issues and challenges. It also finds that, in the longer term, tying China’s and India’s desires to be treated as great powers to actions on their parts to reduce their greenhouse gas emissions is likely to be a powerful tool, but only if the United States takes strong action at home. It thus reiterates and reemphasizes its previous recommendations on strengthening U.S. domestic mitigation policy.

Adaptation and Other Measures Beyond Mitigation

Any realistic scenario for future greenhouse gas emissions involves greenhouse gas concentrations that make disruptive effects on the climate all but certain, even if a stringent policy for mitigating climate change is pursued; indeed, meaningful impacts would likely happen even if the world (implausibly) stopped emitting greenhouse gases immediately. As a result, the world will need to adapt to some climate change. Climate change impacts will be felt disproportionately by poorer countries, not least because of their weaker capacities to naturally adapt.

Since richer countries generally have greater capacity to adapt to change, including to a changing climate, economic growth in the developing world will contribute strongly to countries' abilities to adapt to climate change. Effective adaptation, however, requires more than economic growth, if only because adaptation will be necessary before growth can provide the capacity for many countries to adapt. If developed countries judge that they should help those affected by climate change, either out of self-interest or a sense of responsibility, they will need to provide direct assistance with adaptation.

The Task Force finds that the developed countries, including the United States, have a responsibility to help developing countries adapt. The bulk of the greenhouse gases currently in the atmosphere—those that will contribute most to unavoidable climate change—were emitted by today's advanced industrial countries. The Task Force also finds that the developed countries, including the United States, have a direct national security interest in helping developing countries and vulnerable populations adapt to

unavoidable climate change. Unless developing countries are assisted with adaptation, climate change is likely to affect them in ways that will ultimately have direct impacts on the United States, including on its national security. For example, as climate change affects resource availability, migratory pressures will steadily grow, potentially intensifying existing sources of conflict.⁸⁴

Even without specific policies aimed at helping countries adapt to climate change, development assistance will still contribute to that goal. For example, rather than providing separate help in dealing with infectious disease problems exacerbated by climate change, assistance could simply deal with infectious disease. Some, however, argue that climate change adaptation should be a priority for development aid, even if developing countries have other more immediate needs. They appeal to a sense of responsibility: since much climate change will be caused by the past emissions of today's advanced industrial countries, those countries, they argue, have a special responsibility to deal with its effects that does not exist in other areas of development.

The Task Force finds that a large shift of development aid toward a narrow focus on climate change adaptation would be unwise. Much of the developing world's aid needs, such as those in education, will not be affected by climate change. Developing countries themselves recognize that, and many have expressed concern that development aid not be diverted from their most pressing needs. Ignoring that would be wrong. Moreover, many development activities, such as the creation of more effective markets and the sponsorship of agricultural extension services, would also improve the capacity of low-income societies to manage the effects of climate change and other external shocks.

Climate change will, however, alter the problems developing countries confront, and might also put work done through traditional development aid in jeopardy.⁸⁵ If development aid is shaped without an eye toward future climate change, its efficacy could be undermined. Indeed, many institutions, whether national, international, or nongovernmental, are already mainstreaming climate change projections in their development work. USAID is, in some cases, designing its projects deliberately

⁸⁴ *National Security and the Threat of Climate Change* (Alexandria, VA: The CNA Corporation, 2007).

⁸⁵ Assistance in building housing, for example, might be undermined by climate change if that housing was built near increasingly vulnerable coasts.

to be resilient in the face of climate change.⁸⁶ The World Bank has gone much further, developing a plan for integrating climate change vulnerability analysis into all of its assistance.⁸⁷ Private donors, such as philanthropic foundations, are increasingly doing the same.⁸⁸

The Task Force finds that incorporating climate considerations into traditional development aid is the most effective way to assist with climate change adaptation, and recommends that U.S. adaptation assistance be delivered primarily through such an approach. It also finds that climate change will increase the need for development aid, and recommends that the United States and other advanced industrial states meet that challenge, through both public and private assistance.

Support for adaptation can also be a political tool, inducing the least developed countries to join international agreements on climate change and demonstrating that the industrialized countries are acting in good faith to address the full range of consequences of climate change. Those least developed countries can, in turn, join in pressuring the rapidly emerging economies to take steps to reduce their emissions. *While, in general, development assistance should not be narrowly climate specific, the Task Force recommends that the United States and others take advantage of opportunities where providing climate-specific adaptation assistance to poorer developing countries will lead those nations to pressure the larger developing countries that are major emitters to make fuller efforts to mitigate emissions.*

Geoengineering

Computer models of future climate change are not sophisticated enough to rule out the possibility that future increases in atmospheric greenhouse gas concentrations will lead to drastic changes in temperature and associated effects on the earth's climate. Even with diligent efforts to regulate emissions, the planet might "tip" into new, harmful climate regimes. Geoengineering, by cooling the planet directly, may be able to quickly ameliorate large dangers if the climate turns out to be

⁸⁶ USAID, "Global Climate Change Brochure: USAID's Global Climate Change Program," available at <http://www.usaid.gov>.

⁸⁷ World Bank Group/Global Environmental Facility Program, "Managing Climate Risk: Integrating Adaptation into World Bank Group Operations," 2006, available at <http://www.worldbank.org> (accessed June 6, 2008).

⁸⁸ For example, John D. and Catherine T. MacArthur Foundation, "Conservation and Sustainable Development: Grantmaking Guidelines," available at <http://www.macfound.org> (accessed June 6, 2008).

extremely sensitive to greenhouse gas concentrations, or if mitigation policy fails.

Geoengineering involves altering the amount of solar radiation that reaches the earth's surface, in turn cooling the planet. A variety of schemes, ranging from injecting reflective aerosols into the atmosphere to placing large numbers of small mirrors in space, have been proposed. While not a form of adaptation to climate change, geoengineering is, like adaptation, a potential complement to mitigation.

Geoengineering measures are, however, highly controversial, since large-scale interference with earth systems can, just like the buildup of greenhouse gases, have unpredictable, wide-ranging, and perhaps irreversible effects. Suggestions that geoengineering might be a cheap substitute for mitigation are also misplaced. In particular, ever-growing concentrations of greenhouse gases in the atmosphere would lead to a need for steadily more aggressive efforts to engineer the climate, with effects that are difficult to anticipate. They would also allow some dangerous effects of greenhouse gas accumulation, such as acidification of the oceans (which harms marine ecosystems), to remain unchecked.

Independent of whether the United States pursues large-scale geoengineering, others may do so. In fact, geoengineering is one of the few steps that states might take unilaterally that could have powerful effects on the earth's climate. Such unilateral action could lead to international tensions, as actions taken by one state could have deleterious effects on others. As a result, some have proposed international discussions on rules of the road for geoengineering.⁸⁹

The Task Force finds that the large-scale use of geoengineering in the foreseeable future is neither likely nor appropriate, and that the prospect of geoengineering options does not reduce the urgency of strong, near-term steps to mitigate greenhouse gas emissions. Task Force members differ over whether smaller-scale research to develop geoengineering options is wise and should be pursued. Regardless, the Task Force finds that international discussion on geoengineering would help avoid future clashes, as would efforts to ensure that any geoengineering research is pursued in a multilateral context so that scientists and policymakers worldwide can become apprised of the risks. It recommends efforts to avoid large-scale, near-term use of geoengineering and to promote transparency in any geoengineering research and policy.

⁸⁹ Eli Kintisch, "Tinkering With the Climate to Get Hearing at Harvard Meeting," *Science*, Vol. 318, No. 5850, p. 551, October 26, 2007.

A UN Deal

Confronting climate change will require aggressive and sustained international action. The Task Force has already found that a commitment to deep cuts in American emissions is a prerequisite for the United States to be a leader in that international process, and has recommended a comprehensive corresponding domestic policy. The Task Force has also found, however, that satisfactory international action will not flow automatically from U.S. domestic policy. The United States will need to draw systematically on the full range of available incentives if it is to be an effective international leader in efforts to reduce emissions. The Task Force advocates a two-pronged approach that it elaborates on in the next two chapters.

The world is already engaged in negotiations on a successor to the Kyoto Protocol under the stewardship of the United Nations. The United States must engage constructively in that process. It should seek a UN deal that involves near-term commitments to emissions limits from the advanced industrial countries; commitments from the wealthier emerging economies to actions that would reduce their emissions intensities; new financing and technology mechanisms that learn from the lessons of the CDM and that are directed first toward the least developed countries; and a framework for assisting poor countries in adapting to climate change. This deal will not be easy to conclude, particularly since the single package must include ambitious commitments from many different countries, all of which have widely varying interests. It will also almost certainly require side agreements that are

not part of a formal deal itself. Nonetheless, a good UN deal may be possible. Moreover, even if UN negotiations fail to yield a good deal as quickly as diplomats would like, wise American involvement will prove worthwhile.

At the same time, the need for a legal foundation for emissions trading is so great that should the UN efforts to Copenhagen fail, then the United States and EU, along with others, should be prepared to create a smaller bridge agreement among countries that are able to implement robust and reliable domestic emissions caps and want to use emissions trading, while still continuing to seek broader agreement within the UN process.

Negotiating Principles

Most thinking about international climate change policy has focused on the Kyoto Protocol and the design of a UN-based successor that would govern once the protocol expires in 2012. As the Task Force noted in chapter two, the world, including the United States, agreed in December 2007 at Bali to pursue a new global agreement that would include “measurable, reportable and verifiable” mitigation “commitments” from the developed countries along with “measurable, reportable and verifiable” mitigation “actions” by others. What these “commitments” and “actions” might actually entail, along with other elements of a deal, was left open. It is widely agreed that it will be extremely challenging to reach consensus on a new agreement by December 2009 at the UNFCCC meeting in Copenhagen, a deadline set at the Bali conference.

The Task Force finds that the world's largest emitters, including the United States, will be critical to any deal. Europe and Japan have been the most aggressive champions of the Kyoto Protocol and of binding limits on national greenhouse gas emissions. Beyond 2012, Europe has advocated a goal of holding global temperature increases to, at most, 2°C (3.6°F) above preindustrial levels, and both have pushed corresponding aims of cutting global emissions in half by 2050.⁹⁰ Both have emphasized

⁹⁰ Europe calls for a cut from 1990 levels, while Japan has argued for a 50 percent cut from present levels. Europe has also pressed for developed countries to commit to cutting their emissions to 30 percent below 1990 levels by 2020, and to 60 percent to 80 percent below

the necessity of working within the UN system and of building on Kyoto. Their positions are, however, far from identical. Japan has been more adamant than Europe that major developing countries make strong near-term commitments to control emissions. Europe, for its part, is far from monolithic, with Western Europe taking a more aggressive approach than the poorer Eastern European countries, and with the United Kingdom generally more willing to compromise with the United States than other wealthy European countries have been.

The Task Force finds that the other countries that have so far been a focus of this report—Brazil, China, India, Indonesia, and Russia—are all far more hesitant about pursuing aggressive action. Russia is the only one of them subject to an emissions cap under the Kyoto Protocol, but Russian officials have argued that they will resist strong future commitments to reducing emissions in the absence of similar commitments from the United States, and perhaps also China.⁹¹ Meanwhile, Brazil, China, India, and Indonesia regularly point to the principle of “common but differentiated responsibilities,” and in doing so have refused to consider commitments to constraints on their total emissions.

Given that backdrop, the Task Force recommends that the United States engage constructively in the ongoing UN negotiations, guided by five principles:

- Seek agreement on an initial long-term goal of cutting emissions in half by 2050, mindful that this will need to be periodically revisited.
- Be willing to commit, along with the other advanced industrial countries, to its own strict and binding near-term reductions in emissions.
- Seek commitments from major developing countries to actions that would help control global emissions and ameliorate competitive-concerns.
- Promote a financing and technology scheme that includes a revamped CDM focused on encouraging investment in high-integrity offsets

1990 levels by 2050. Japan has focused its midterm efforts on obtaining agreement that global emissions peak within ten to twenty years. Both support quantified national targets for developed countries.

⁹¹ It agreed to that cap, however, only after judging that it could be met without any policies targeted at greenhouse gas emissions; it ratified the agreement only after extracting EU support for its entry into the WTO.

in a small number of high-payoff areas, along with dedicated climate funds that can help cover the incremental costs of shifting to low-carbon technology and of avoiding deforestation.

- Ensure that any deal emphasizes the importance of adaptation alongside mitigation, and creates a framework for pursuing adaptation efforts, with particular attention to the least developed countries that are most vulnerable to a changing climate.

While the United States will need to be flexible, it must also be clear that these principles are part of a package. *In particular, the Task Force recommends that without commitments from the major rapidly emerging developing countries to actions that would ameliorate legitimate concerns about undermining U.S. competitiveness, the United States should not, for reasons elaborated below, make binding commitments of its own as part of a UN deal. This in no way, however, conditions the Task Force's earlier recommendation that the United States promptly adopt national legislation requiring domestic emissions reductions.*

The Task Force cautions that it will be difficult to conclude such a deal, which will require substantial changes in the negotiating positions of every major developing country. Large shifts are certainly possible but are impossible to predict—indeed, there is no better evidence for this than the rapid change in U.S. attitudes toward climate policy over the past two years—and the United States should carefully monitor changing attitudes in all major countries. Whatever the chance of success, the UN effort is worth a major U.S. investment because a deal would provide a foundation for global efforts to combat climate change. The process of negotiation itself, regardless of the final outcome, can also help build global support for constructive policy and identify areas of possible agreement. And regardless of whether a deal emerges at Copenhagen itself, the United States will need to continue its efforts within (as well as outside) the UN.

A Long-Term Goal

The post-Bali process has already initiated an intensive discussion on a long-term global goal for emissions reductions.⁹² The United States

⁹² Though most understood the Bali road map as having defined four tracks, a fifth—“shared vision for long-term cooperative action”—has emerged in subsequent negotiations.

along with its allies has supported the effort. Many developing countries have been skeptical, realizing that no ambitious global goal can be met without significant reductions in their own emissions. *The Task Force recommends that the United States should seek consensus around an initial goal of cutting global emissions roughly in half by mid-century.*⁹³ This would provide a much clearer compass for mitigation efforts than the UNFCCC's objective of avoiding "dangerous anthropogenic interference with the climate system." It would also send an unambiguous signal to developing countries that they must control emissions. Given the fluid understanding of climate science, technology, and economics, this target should be periodically revisited and revised in the future.

Emissions Commitments from Advanced Industrial Countries

*The Task Force recommends that the United States, with the other advanced industrial countries, commit to economy-wide limits on its greenhouse gas emissions. Those commitments should be consistent with what the United States can implement through domestic emissions reduction laws.*⁹⁴ They should cover a period long enough to send a clear signal to the U.S. economy that emissions must be controlled and to allow time for the economy to adjust; the period should, at the same time, be short enough so that it can be modified in the future with evolving knowledge of climate science, technology, and economics. While there are serious arguments to be made for an agreement built around other types of commitments (such as to carbon prices), the United States would be alone among the advanced industrial countries in arguing for such an alternative, and thus almost certainly would fail if it pressed for an agreement that did not include some form of caps. That would undermine American leverage in shaping the broader international approach to climate change, while gaining nothing in an actual agreement.⁹⁵

⁹³ Whether that is done relative to 1990 levels, as the Task Force has advocated be an initial target and as Europe has proposed, or relative to present levels, as Japan has urged, can be the subject of negotiation.

⁹⁴ Negotiations on this front, as well as on developing-country commitments, would be part of the "mitigation" track established in Bali.

⁹⁵ The value of a binding agreement in providing confidence to firms should also not be missed—a legally binding commitment to cut emissions would provide firms with a clearer signal that they should invest in long-term efforts to reduce emissions and to develop technology. By contrast, commitments that are codified only in domestic law are less credible because they are more easily reversed.

To be certain, attaining agreement among the advanced industrial countries on targets and timetables will not be easy. In particular, American emissions are currently far higher, relative to traditionally referenced 1990 levels, than those of most other advanced industrial countries, and the current starting point would need to be reflected in any agreement. Other countries, though, will ultimately need to face a choice between a realistic deal and no deal at all.

An agreement to cap emissions must be accompanied by effective verification. A deal should therefore include a strong institutional capacity, housed within the UNFCCC, that has the authority and resources to carefully assess and audit emissions totals from individual countries, both developed and developing. The UNFCCC system has built a strong foundation in this area, but the effort must be expanded to include better data on forests and land use in particular.

Commitments to cap emissions would also provide the necessary legal foundation for emissions trading among the advanced industrial countries. That outcome is highly valued in Europe, and it will be of long-term importance for the United States since the most important cost advantages from emissions trading will arise when trading systems have global scope. An agreement would need to include not only specific targets and timetables but also processes to harmonize rules on emissions trading, dispute resolution mechanisms, safeguards against unexpected flows in emissions permits (which could represent tens or hundreds of billions of dollars), and the other elements of a well-functioning market. Creating an international emissions-trading system is little different from inventing a new form of money, and it is essential that this process be approached carefully and be based on the confidence of a “gold standard” of solid institutions.

The process of establishing a framework for emissions trading with Europe and Japan could also be useful to the United States, providing leverage as those nations coordinate their policies on important issues, such as how to encourage emissions controls in rapidly developing countries. This is particularly relevant to any effort to improve standards for offsets and to increase their scope to include forests and other critical areas. Offsets built into various national laws will ultimately need to be fungible in international carbon markets—and the United States and

others will be unable to link their markets unless they establish comparable standards for offset integrity.

Commitments to Actions from Major Developing Countries

Commitments to actions from major developing countries must be part of any UN package.⁹⁶ *It is impossible to predict the outcome of a complex multilateral process, but the Task Force recommends that American negotiators follow four principles:*

- Do not seek hard emissions caps from the major developing countries.
- Seek efforts that are roughly equivalent in terms of reducing emissions intensity or other appropriate indices, while focusing on the wealthier developing countries.
- Be willing to accept commitments to portfolios of specific policies and measures in lieu of explicit commitments to limit emissions intensity.
- Emphasize actions in sectors that would address competitiveness concerns.

The Task Force recommends against seeking hard emissions caps from developing countries. Rapidly developing countries cannot confidently predict their future growth and hence emissions.⁹⁷ As a result, any hard emissions limits they adopt are likely to be cautious, extremely generous, and thus meaningless.

*The Task Force recommends instead that negotiators compare efforts according to emissions intensity or by some other index that ensures that developing countries are not penalized for the growth of their economies.*⁹⁸ This means accepting that in the near-term, international efforts should aim to slow, rather

⁹⁶ Many developing countries have argued that the Bali road map absolved them from “commitments” and instead set out that they would only need to take “actions.” But while the text only mentions “actions,” it does not exclude the possibility of including “commitments” in a final deal.

⁹⁷ The same is true for projections of future deforestation. Both Brazil and Indonesia also have strong aversions to placing hard limits on deforestation, a step that could have widespread and unpredictable political consequences in countries where changes in how land is treated have deep and difficult social ramifications.

⁹⁸ While emissions intensity is the simplest way to adjust for a changing economy, it is not the only one. Other indexed approaches might, for example, adjust for changing economic structure that is not reflected in GDP growth.

than reverse, developing-country emissions.⁹⁹ The approach should also exempt the poorest developing countries from any need to make firm commitments.

The Task Force recommends that negotiators be willing to accept, in lieu of explicit commitments to economy-wide intensity (or other indexed) targets, commitments to actions—suites of policies and measures—that analysts would reasonably expect to achieve those same goals. For example, India might feel more comfortable committing to derive a certain fraction of its newly installed power from renewable sources and nuclear, to enforce certain fuel economy standards for new cars, to liberalize energy prices more fully, to require that new coal plants meet certain standards, and to cap emissions intensity within its cement production sector—all in a way that would be expected to yield a sufficient cut in emissions intensity. (A wide variety of potential measures is described in the appendix.) Indeed, in cases where verifying economy-wide emissions is difficult, such commitments to particular policies and measures may be easier to check.¹⁰⁰ Such an approach is likely to be more palatable to developing countries since it would be more transparently linked to efforts, which governments control, rather than to particular outcomes, which they often cannot.

The Task Force recommends that negotiators place special emphasis on actions in sectors that would mitigate competitiveness concerns. That would help ameliorate some of the worries that stand in the way of sustained efforts by the advanced industrial countries to reduce emissions. Agreements on minimum standards in energy-intensive sectors are particularly important here. (Many options for so-called sectoral commitments are described in the appendix.) They would also help establish multilateral

⁹⁹ For example, China's commitment to cut emissions intensity by roughly 40 percent by 2020 might be judged commensurate with a U.S. commitment to reduce its emissions to 1990 levels by 2020; the latter is a common goal in climate legislation currently being debated in the United States. Nonetheless, based on reasonable economic and energy projections, this formula would accept that China's emissions would still grow by roughly 20 percent from 2005 to 2020, at which point they would be between two and three times their 1990 levels.

¹⁰⁰ Compliance with intensity commitments might also be readily verified—inexact but meaningful and reputable estimates, such as those of emissions from energy use made by the IEA, are regularly made. While these are insufficient to underpin emissions trading, they may be adequate for assessing compliance with broad commitments.

standards against which trade-based enforcement measures might later be based.

Mechanisms for Mitigation Financing and Technology

A serious UN agreement must provide a credible financial and technological framework for developing countries to cut their emissions.¹⁰¹ *The Task Force recommends that a UN deal include a tightened and targeted successor to the CDM as well as a dedicated fund for assistance with low-carbon technology and avoided deforestation.*

The Task Force found earlier that the CDM is deeply flawed as an approach to financing. Reforms should lead to more effective standards, better auditing for improved emissions outcomes, and truly independent verification, while supplementing it with the direct assistance that the Task Force has found is an essential complement. (Deforestation must, unlike in the Kyoto Protocol, be a significant part of this effort, including through a new offset mechanism and through the targeted fund.) The dedicated fund that would provide assistance could transfer funds to cover the marginal costs of clean technology or avoided deforestation directly, or could purchase technology itself and then transfer it.¹⁰²

Despite the central need to focus on the largest emitters, the United States, in crafting a successor to the CDM, should support efforts to make sure that the least developed countries are not left behind. There is value in explicitly channeling some investments to those countries, which would, among other things, help build UK support for U.S. policy, as the UK has pressed strongly for reforming low-carbon financing mechanisms in this direction.

Assistance for Adaptation

The Task Force recommends that a UN deal break the narrow focus, dominant in the past, on reducing emissions, and extend the scope to include adaptation

¹⁰¹ Negotiations on this front would be part of the “finance” and “technology” tracks established at Bali.

¹⁰² As noted in chapter four, the latter approach might prevent corrupt governments from diverting funds, but extra care would need to be taken in ensuring that intellectual property rights were respected.

too.¹⁰³ The world agreed to do just that at the December 2007 climate negotiations in Bali. The final agreement should reaffirm the responsibility of the wealthier countries to help those less capable adapt to the effects of climate change. That should be done, however, in a way that clearly reassures developing countries that help with climate adaptation will not displace other development assistance; in particular, this will require clear commitments that additional support for adaptation assistance is incremental and will not take away from other development assistance. A UN deal should commit countries to mainstream climate impacts into their development assistance, establish mechanisms for determining developing-country adaptation needs, and ensure that assistance from the wealthier countries is coordinated. Beyond being the right thing to do, this effort would help peel off many developing countries that would otherwise shield their larger and wealthier partners from pressure to adopt meaningful mitigation commitments.

Bottom Lines and a Backup Plan

The five elements of an acceptable UN deal are interdependent. *In particular, the Task Force recommends that without appropriately ambitious commitments to actions from the major rapidly emerging economies, the United States and the other advanced industrial countries should refuse to make their own commitments part of a UN deal.* Making commitments without reciprocal action from others would give up an important point of leverage and would impede efforts to adjust commitments in light of concerns about competitiveness. Moreover, it is simply unimaginable that Congress would approve a deal that contained hard U.S. commitments along with an explicit agreement to let rapidly emerging economies that are major competitors off the hook—and concluding a deal that is later rejected by Congress would be even more damaging to the United States than making no deal at all.

The Task Force also recommends that the advanced industrial countries be clear that if the Kyoto Protocol expires without a replacement, elements of the

¹⁰³ Negotiations on this front would be part of the “adaptation” track established at Bali. Depending on the direction they ultimately took, they might also intersect with the “finance” and “technology” tracks.

CDM may expire along with it. The major developing countries should not expect to continue to receive CDM support if they are unwilling to make mitigation commitments of their own.

Still, if the United States fails to embed its commitments to reduce emissions in a sensible UN deal, it should seek ways to put those commitments on firmer ground than national legislation alone would. This is true for many of the same reasons that a UN deal involving commitments to emissions targets from advanced industrial countries is desirable: it would convince others that the United States is committed to cutting emissions, in turn gaining it leverage. It would also provide greater predictability for firms. Perhaps most importantly, it would put emissions trading on solid legal ground.

*The Task Force thus recommends that if the United States is unable to conclude a satisfactory UN deal, it seek a separate bridge agreement with the other advanced industrial countries that would cement their near-term emissions-reduction commitments while harmonizing rules for compliance and trading.*¹⁰⁴ True linkage will require a large degree of technical cooperation between countries, some of which will require new legally binding instruments.¹⁰⁵ (An agreement could also link in trading systems from beyond the advanced industrial countries, so long as they were reliable and robust—a high but not insurmountable standard.) It will also require agreement on standards for international offsets, since offsets incorporated in various domestic systems, whether in energy, forestry, or elsewhere, ideally should be made fungible on international carbon markets. In addition, it will demand strong institutional infrastructure, including institutions that are trusted to verify national emissions. A bridge agreement that addressed these needs would ensure that the foundations for linking national systems into an international trading

¹⁰⁴ This could be done through a single multilateral agreement or, more clumsily but perhaps more feasibly, through a series of bilateral deals. If, in time, those countries collectively found that the major developing countries were not doing enough, they could revise their pact with agreement only among themselves. Conversely, if the major developed countries later decided to adopt meaningful commitments, those could be folded into a UN deal along with the developed-country commitments.

¹⁰⁵ The Task Force notes that establishing the basis for emissions trading is not the same as requiring it. Some countries may not be ready to link their domestic policies for some time, as such linkages are largely irreversible and subject domestic markets to additional sources of external influence.

arrangement are not erased by the expiry of the Kyoto Protocol and the absence of a global successor.

The Task Force finds that while such a bridge agreement would satisfy a critical need for the countries that want to sustain strong emissions-trading markets, that agreement is no substitute for a broader UN deal, and, in particular, action by the major emerging economies. The next chapter thus discusses ways in which the United States and others can promote action by the major emerging economies. Success on that front will, in turn, lead those countries to become more willing partners in a more ambitious UN deal. The next chapter also assesses steps that the United States and others can and should take if major emerging economies do not take sufficiently ambitious action, whether as part of a UN deal or unilaterally.

A Partnership for Climate Cooperation

An ambitious global deal would set a course for the next several years of international climate efforts. But ensuring that the biggest emitters met their commitments would still be a monumental task. And if the UN process leading to Copenhagen yields either no deal or a weak one, the need for other diplomatic efforts will be even more acute. *The Task Force thus recommends that a standing process bringing together the world's largest emitters to address their emissions be a core element of a new strategy that would complement and strengthen ongoing UN, as well as bilateral and regional, efforts.*

This Partnership for Climate Cooperation would be aimed at implementing aggressive mitigation strategies—leading to emissions reductions as well as strong incentives for continued innovation and application of low-carbon technologies—in contrast with the UN process, which is focused on the important work of negotiating binding targets for emissions reductions and universal mechanisms for supporting them. *It would involve a broad mix of initiatives rather than a single all-encompassing deal. While independent, it would be supportive of the UN process, which will continue for decades: Efforts within it will help states meet any UN commitments, while initiatives established through this focused but less formal process might build the confidence needed to eventually fold them in to a broader deal within the UN framework.*

The Task Force emphasizes that the substance and purpose of the Partnership for Climate Cooperation would be very different from that of the Bush administration's major economies meetings. The MEM process has been a valuable fixed-term effort to help negotiate a successor to the Kyoto Protocol. Its discussions, however, have not yielded specific steps to reduce emissions in the industrialized and emerging countries, in part by design and in part because it has operated under a cloud of distrust surrounding U.S. intentions. The Partnership for Climate Cooperation would, in contrast, be based on a foundation of clear and firm U.S. commitment to domestic emissions reductions, and would focus first on producing specific mitigation actions.

Principles and Rationale

Countries involved in the Partnership for Climate Cooperation would, as they do in the UN process, commit to mitigation actions and provide incentives for others to do the same. A smaller group, though, could do that in a more direct, flexible, and less formal way that would fill some of the most important gaps that a UN effort will leave. That would allow the United States and other countries responsible for the bulk of the world's emissions to press as ambitious an agenda as possible while a more comprehensive and robust global approach was steadily being developed, intensified, and implemented.

The Task Force finds that a small group could confront several problems that bedevil a global approach. Developing countries may not yet be willing to commit to ambitious economy-wide targets for their greenhouse gas emissions as part of a legally binding global agreement. And while the Task Force has recommended the United States be open to the other global alternative—an agreement where each major developing country commits to its own distinct set of policies rather than to an overall emissions number—sheer complexity may ultimately overwhelm the approach. Each country in a smaller group, though, would only need to assess a smaller number of other efforts to determine that they were acceptable. At the core of this approach would be serious commitments by each member to specific policies. Progress might be measured with emission caps, intensity targets, or other benchmarks not explicitly involving emissions

quantities. What matters most is meaningful action. Commitments to practical policies that cut emissions might include, in some countries and sectors, emissions-trading systems, as well as links between different systems, where those are workable.

In addition, the Task Force has previously found that the most appropriate incentives for stimulating efforts in the developing world to control emissions vary from state to state. *The Task Force finds that the wide array of starting points and interests among the developing countries imply that discussions that proceed, initially, in a small group have the potential to produce outcomes that would be impractical to craft through a global negotiation. Even if developing countries sign up to ambitious commitments as part of a UN deal, it will be too complicated to incorporate the full variety of country-specific incentives that will be needed to help them deliver on those promises.* Nor is it even clear today what the most appropriate and effective policies and incentives are, suggesting even greater value for a more intimate forum in which nonbinding political commitments could be meaningfully made yet still revised as appropriate.

How could this work in practice? Participants in the Partnership for Climate Cooperation would make a regular array of offers of policies and other efforts, along with measurable goals. Countries would confer over the adequacy of those offers and focus on areas where coordination would allow for steps that are even more powerful in their impact on emissions. The effort would focus on specific action and on where those actions fall short. Those areas of coordination might include technical cooperation (for example, on advanced low-emission coal technology or on building efficiency); assurances (for example, on routing for gas pipelines and on nuclear fuel supply and waste disposal); policy assistance (for example, on the design of energy-efficiency programs, energy pricing reform, or forest management) and similar efforts in other areas. The participants in the process would also agree to a regular review of their offers and goals.

This process is unusual in international environmental diplomacy, but it is commonplace in complex trade negotiations, such as with the WTO. In the early days of the Kyoto negotiations an idea along these lines—known as “pledge and review”—was proposed, but never gained traction because little work had been done to ensure that pledges would be meaningful.

In theory, such an approach could be implemented through a series of complementary bilateral, regional, and other small settings. Yet a standing group of major countries may find arrangements among partners that might not otherwise have identified opportunities. *More importantly, the Task Force finds that only a major-emitters process would provide an opportunity for heads of state and a broad set of senior cabinet officials to regularly focus together on climate—and that only such senior leadership will have the power needed to make holistic judgments of others' efforts (as opposed to simply comparing emissions caps or prices) and to identify incentives from different areas (as opposed to only financial incentives from emissions trading or climate funds).* In contrast, a tangle of other climate meetings would require too much time for those individuals to all be consistently involved. To be sure, heads of state and ministers regularly engage in bilateral and regional settings—but aside from in meetings among environment and energy ministers, climate is rarely the sole, and hardly ever even the central, issue.

The Task Force finds that a Partnership for Climate Cooperation would need to comprise roughly a dozen participants and recommends that it be assembled accordingly. To cover a large fraction of the world's emissions, the eight largest emitters—the United States, European Union, Japan, Russia, Brazil, China, India, and Indonesia—would need to be included. The group might be expanded to include one or two more advanced industrial countries, such as Canada or Australia; keeping the European Union to a single representative would also be politically difficult. One or two other major developing emitters—such as Mexico, Nigeria, or South Africa—might also be brought in, most notably because of concerns about competitiveness or regional balance.¹⁰⁶

In any case, the Task Force finds that to ensure that members were invested in the group, it would be essential that it be built through consultation rather than by U.S. or developed-country fiat, and recommends that the United States take such an approach. That process would foster a valuable sense of partnership, avoiding sending a message to other advanced industrial countries that the effort is a U.S. attempt to sideline traditional forums, most notably the UNFCCC, or convincing developing countries that

¹⁰⁶ The United States, for example, might want Mexico included, while China and Japan might seek to bring in South Korea.

it is an attempt to gang up on them. The needed forum could in principle evolve from the existing G8 + 5 “Gleneagles” process, but the Task Force is concerned that that process is overweighted toward European countries and that, more importantly, the G8 has not been able to integrate the important developing countries into its deliberations in a regular, orderly, and respectful way.

Setting Expectations and Making Commitments

The core element of the Partnership for Climate Cooperation would be a series of commitments by both developed and developing countries that were periodically reviewed and revised. Having recommended a binding commitment to deep emissions cuts by the advanced industrial countries, ideally as part of a UN deal but, if that proves impossible, alongside it, what should be expected of the developing countries? The Task Force recommends that the guidelines it has proposed for UN negotiations—in particular, that the world as a whole aim to halve its emissions by mid-century, and that countries’ efforts be compared on the basis of emissions intensity or other similar indexes—be used as a guideline against which policy commitments made by developing countries, as well as follow-through on them, should be measured. If the world succeeds in concluding a UN deal along these lines, it will serve as a strong anchor. If, however, a weaker deal (or no deal) is concluded, the Partnership for Climate Cooperation should still focus on the more ambitious goal of halving emissions by mid-century and of attracting uniform levels of effort.

Developing countries might meet that goal through explicit commitments to limits on emissions intensity, and through subsequent follow-through.¹⁰⁷ Such an approach has the virtue of simplicity, and might well be acceptable to rapidly but unpredictably growing developing countries, if commitments were not made legally binding.¹⁰⁸ Alternatively, as in the case of a UN deal, countries might commit to a mix of policy measures, so long as other members of the group judged

¹⁰⁷ Even if a country makes a commitment within a UN deal, it might make a more ambitious one within this setting as part of a package involving greater flexibility and incentives.

¹⁰⁸ China, India, and Russia have already made similar commitments on energy intensity, though, critically, the former two are not expected to meet them (and, in the case of India, the commitment is not particularly ambitious in the first place).

those to be sufficient. Compliance with many possible measures would be easy to verify—commitments to renewable portfolio standards, for example, could be checked against International Energy Agency assessments, while commitments to keep deforestation under a certain level could be checked through aerial or satellite surveillance. In many cases, such as with a renewable portfolio standard or building efficiency standards, it would also be fairly straightforward to predict the emissions reductions that particular measures would create if properly and fully implemented. Measures could also be closely tied to targeted incentives, such as offset schemes aimed at a small number of shifts in power generation or technical cooperation on building efficiency. Moreover, in the case of near-term steps that will only lead to long-term emissions reductions—building the groundwork for CCS or fuller use of renewables are two examples—near-term emissions reductions are useless as a measure of developing-country action, and only commitments to policies will be verifiable. Policy commitments will also be the only near-term option where the ability to monitor emissions is currently absent or not yet reliable, as may be the case, for example, in the important case of forestry.

Focusing on policy commitments rather than broad emissions or emissions-intensity commitments does have downsides. In many cases, predicting the quantitative impact of particular commitments will be difficult.¹⁰⁹ Thus, despite developing-country compliance with commitments, overall targets for emissions might not be met. Sharply focused policy commitments can also sacrifice flexibility.¹¹⁰ Yet both of these problems—the difficulty of predicting the impact of some policies, and the possibility of unanticipated opportunities and difficulties—would be mitigated by the sort of flexible approach that the Partnership for Climate Cooperation would allow.

The Task Force finds that in the near term, within a Partnership for Climate Cooperation, developing-country commitments to specific policies (many options

¹⁰⁹ For example, commitments to strengthen property rights for forests, or to developing infrastructure for low-carbon energy, would be much harder to relate in advance to specific emissions reductions.

¹¹⁰ For example, India might, at some point, find it easier than expected to reduce transportation emissions, while harder than anticipated to reduce emissions from power generation, yet have previously committed to aggressive action on power and to weaker action on transport.

are outlined in the appendix) are preferable to commitments only to economy-wide emissions or emissions-intensity limits. This is primarily because they can be tied more directly to outside incentives and can apply to critical measures that lay the groundwork for future mitigation actions but that do not reduce emissions in the near term. These might be complemented by economy-wide limits on emissions intensity. *The Task Force recommends that within the Partnership for Climate Cooperation, the United States and others focus their efforts on obtaining commitments to specific policy measures.*

Reviewing and Revising Policy

Having taken initial steps to commit to emissions reductions and to provide incentives to others, all participating countries, including the United States, will need to periodically decide whether to relax, intensify, or sustain their efforts at home as well as the incentives they offer. That will allow them to confidently experiment with different schemes for cutting emissions, without fear that they might be locked in to wasteful, ineffective, or counterproductive approaches.

The United States must anticipate the possibility that the major developing countries will not constrain their emissions sufficiently, whatever their formal commitments. The advanced industrial states need to think now about how they would respond, not only in case they have to, but also in order to deter developing countries from falling short.

The Task Force finds that in the near term, the process of ensuring that developing-country commitments are aligned with their own non-climate-related goals and interests, along with the prospect of facing changed incentives from the advanced industrial world if they fail to act sufficiently, will need to be the central means by which the advanced industrial countries maximize the likelihood that the major developing countries deliver on their promises. Formal and punitive compliance mechanisms, as are often associated with international agreements, will play a much weaker role at best.

In the face of insufficient developing-country action, the United States and others would naturally reexamine both their efforts at home and the incentives they offer abroad.¹¹¹ Simply threatening to relax

¹¹¹ Some might judge it premature for the United States to consider how it might alter its policies in the face of others' inaction, given that it does not currently have emissions limits of its own. Yet unless the United States is confident in understanding how it might be able to adjust its policies, it will be unwilling to be more ambitious up front, potentially losing

American efforts at home is unlikely to prompt developing countries to strengthen their own domestic policies.¹¹² For such threats to have a substantial effect, those countries would need to be so worried about the possible consequences of climate change that they would choose to compensate for others' lack of emissions reductions. China and India, among others, have come nowhere close to making climate change the sort of priority that would drive this dynamic.¹¹³

Nonetheless, if mitigation efforts prove to be substantially more expensive than anticipated, and a lack of developing-country action appears to be swamping emissions cuts in the developed countries, those countries, including the United States, might choose to examine whether a less ambitious policy made sense.

Several factors weigh against this. There is a real danger that the United States might give up too soon in the face of a critical threat from climate change. Moreover, by reducing its ambition at home, the United States would lose leverage at a time when it might be most necessary. In addition, if competitiveness concerns were primary, other measures might be a more appropriate first response.¹¹⁴

The Task Force finds that the United States should be cautious about scaling back its efforts at home if it confronts developing-country inaction. The Task Force recommends that the United States not consider such moves for at least five years after adopting its own domestic program. Even then, the Task Force recommends that any changes be made carefully, targeted at first in areas where the impact on competitiveness of vulnerable sectors is acute, and that alternatives be considered instead. If over the medium term—perhaps after another five years—developing-country action is grossly inadequate, the United States should consider a fuller range of options in modifying its domestic policy. These decisions will need to be made based on the state of the world, the American economy,

opportunities for progress on climate change. It will also lose opportunities for real leverage with major developing countries.

¹¹² The prospect of increased domestic ambition might, however, be tied to more relevant incentives. In particular, the European Commission has proposed that, if developing countries took sufficient action, it could strengthen its caps, in turn making it more comfortable with increased CDM purchases. The latter possibility would be a direct incentive for stronger action from developing countries.

¹¹³ The United States and others might also choose to increase, rather than scale back, their efforts at home, to compensate for a lack of emissions reductions elsewhere, or to strengthen incentives for technology development that might ultimately lead to deep reductions at lower costs in the developing world.

¹¹⁴ Trevor Houser et al., *Leveling the Carbon Playing Field*. If they could be pursued in a multilateral and WTO-compliant manner, trade measures might be appropriate as well.

and climate science and technology at the time, none of which can be predicted with any confidence.

If major developing countries fail to act sufficiently toward reducing their emissions, the United States and others will also need to reevaluate the incentives they offer. They may choose to intensify existing incentives or add new ones, to scale back what they offer, or to continue on course.

Strengthening incentives for emissions reductions would likely lead to stronger action on the part of major developing countries. A policy that promised to strengthen incentives in the face of inadequate developing-country action might, however, perversely motivate developing countries to hold back on aggressive efforts to cut emissions in the hope of receiving more assistance. In contrast, a policy of weakening incentives in the face of developing-country inaction might deter developing countries from falling short, lest they lose outside support.¹¹⁵

The Task Force finds that the wisdom of strengthening or weakening any incentive in the face of inadequate developing-country action will depend on the demonstrated effectiveness of the incentive in question; on whether strengthening the given incentive in the face of inaction would encourage other countries to withhold action in an attempt to extract greater incentives; and on the cost to the United States of providing the incentive.

Given the degree to which the wisdom of offering particular incentives will be determined by circumstance and informed by ongoing experience, the Task Force recommends rigorous and regular reassessment of the incentives offered to developing countries, both by the United States alone and by the Partnership for Climate Cooperation collectively, to identify the most effective approaches. The United States should proceed slowly in any changes to its approach, giving it time to assess the effects.

Legal Commitments

Legally binding treaties have dominated the climate policy debate. They are traditionally associated with ambitious action, while nonbinding commitments have been associated with inadequate effort.¹¹⁶ The flexi-

¹¹⁵ Experience with specific incentives may also reveal that they are unlikely to be effective even if they are strengthened. Pouring effort into such areas would likely to be a waste of resources.

¹¹⁶ This pattern holds historically—for example, Europe, which has commitments under Kyoto, has made more aggressive efforts to control its emissions than has the United States, which did not ratify the protocol.

ble approach to climate diplomacy involved in a Partnership for Climate Cooperation, however, suggests that a focus on binding agreements might undermine its value.

Binding approaches have important strengths. All else being equal, such agreements make it easier for any one state to act, since that state has greater certainty regarding future action by others. (That is true even if formal enforcement mechanisms are weak, as they will almost certainly be in any climate deal.) Binding agreements can thus provide the long-term stability that states and firms need to make the long-term investments required to address climate change.¹¹⁷ They also have an intangible quality: the United States would help repair its reputation by working not only through informal approaches but also through legally binding ones.

Legally binding agreements, however, can be less ironclad than they might appear. States can violate them or withdraw, risking uncertain retaliation. This is a significant risk for many rapidly developing countries, and one that the Task Force has already noted must be addressed more by a mix of realism in setting developing-country commitments along with the prospect of changed incentives for developing-country action than by any formal enforcement mechanism. A lack of substance in any agreement can also undermine the certainty it appears to provide, a point that led the Task Force to counsel earlier against including lax country-by-country emissions caps in a global UN deal. Moreover, legally binding agreements minimize the flexibility that states might need to adjust climate policy in the future in response to changing conditions.

The Task Force finds that aside from the case of a UN deal and legal agreements required to underpin carbon trading, the United States and the Partnership for Climate Cooperation should be careful not to focus narrowly on legally binding agreements. It recommends that the United States take advantage of the forum to experiment rather than consistently getting bogged down in legal negotiations. The Task Force emphasizes, though, that this should not be read as a broad rejection of legally binding agreements.

¹¹⁷ This is true whether states are attempting to match action to action (commitments to reduce emissions) or incentive to action (such as matching financing commitments to promises of greater use of renewable power generation).

Leadership

The Task Force has outlined an approach to climate policy that will demand much of U.S. leaders. Sustaining strong domestic policy—a prerequisite to international leadership—will require that American leaders clearly, honestly, and consistently communicate both the challenges and opportunities involved in tackling climate change. Advancing effective foreign policy will require that leaders draw together tools from well beyond the traditional environmental sphere and balance climate policy with other first-order foreign policy objectives. Nor will climate diplomacy be restricted to a single intense negotiation or even to a small set of deals: true success will require constant engagement, sustained over decades, at the highest levels as well as among those on the ground.

Congressional-Executive Cooperation

Mutually supportive foreign and domestic policies must be at the center of any effective U.S. strategy. These will require strong cooperation between the executive branch and Congress. That demand is particularly acute when it comes to the matter of legally binding treaties, which are signed by the president but must be approved by Congress.

The Task Force recommends that Congress be involved in any major international negotiations, as it has been in the past, whether within the UN process or in other forums. As has been done in past negotiations in other areas, a standing observer group composed of House and Senate

members should be present at international meetings to develop buy-in to any agreements that emerge. Regular meetings between members of Congress and top executive branch officials would also help keep American strategy consistent and focused.

The risk that Congress will reject an agreement that the executive branch has already signed may deeply weaken the ability of any U.S. president to negotiate a strong agreement in the first place. Congress should look for formal ways to bolster the U.S. negotiating position without giving up its power to influence policy. It should focus on the way it goes about approving U.S. climate agreements.

Environmental agreements, including the Kyoto Protocol, have traditionally been handled in Congress as treaties. Obtaining the necessary two-thirds majority in the Senate, though, is extremely difficult—and even if that is obtained, it may still be insufficient if the House is unwilling to approve legislation to implement it.

Traditional treaties are not, however, the only type of legally binding international agreements under U.S. law: congressional-executive agreements, which are typical for trade deals, require a simple majority in the House and the Senate.¹¹⁸ The approach thus makes Senate approval more likely. At the same time, the additional burden of passing a congressional-executive agreement in the House is unlikely to be meaningful for most major climate agreements, since those agreements will ultimately need to be implemented by traditional legislation anyhow. For example, an international agreement to cap U.S. emissions would need to be supported by U.S. law creating incentives to meet that cap.

The Task Force finds that treating climate agreements as congressional-executive agreements rather than as treaties will normally strengthen the United States' hand in international negotiations. The Task Force recommends that the United States normally treat legally binding climate deals as congressional-executive agreements. It cautions, however, that this not be exploited as a

¹¹⁸ This comparison of treaties and congressional-executive agreements in the climate sphere is based substantially on Nigel Purvis, *Paving the Way for U.S. Climate Leadership: The Case for Executive Agreements and Climate Protection Authority* (Washington, DC: Resources for the Future, 2008.) Somewhat confusingly, both are considered to be treaties, and are treated as equal, under international law.

partisan tool, something that would undermine the long-term viability of U.S. climate policy.

The international leverage gained by a president who has the confidence of Congress might be further strengthened by adopting the sort of Trade Promotion Authority (TPA) that has historically been used for many of the most complex trade deals. Congress, in consultation with the executive branch, would pass legislation outlining criteria that a particular climate agreement would need to satisfy in order for Congress to approve it. The executive branch, in exchange for adhering to those guidelines and for consulting with Congress throughout negotiations, would receive a commitment from Congress to hold a vote on the deal, without any amendments, within a short, predefined, period. This streamlined approach would further strengthen the American negotiating position by making ultimate passage of any agreement more likely.

It would, however, limit U.S. flexibility in negotiating an agreement in the first place. At least in the near future, this could be a particularly acute problem with complex agreements, given the current absence of clarity on the direction that international climate negotiations will take and the lack of climate expertise in Congress. This contrasts sharply with the clearer path forward and stronger congressional expertise in trade issues, the area with which these sorts of procedures are normally associated.

The Task Force finds that a streamlined approach to climate agreements would further strengthen American leverage in international negotiations, so long as the conditions imposed by Congress do not overly constrain U.S. negotiators and so long as Congress and the executive branch cooperate throughout negotiations. It recommends that new Climate Protection Authority, modeled after Trade Promotion Authority, be carefully considered for climate agreements.

Coordination

Whatever arrangements are made with Congress, international leadership will fundamentally need to come from the executive branch. Yet no cabinet official will have access to the full range of tools that will be needed to promote effective climate diplomacy. And no member

of the White House or U.S. Department of State staff, however senior, will have the political latitude and stability needed to sustain an aggressive policy through what will sometimes be difficult times. *The Task Force finds that American efforts will need to be led by someone whose purview is the whole of government, who can exercise leadership, and who, within those constraints, is as insulated as possible from day-to-day political winds. The president or vice president is best suited to that role. The Task Force thus recommends that either the president or vice president make climate change, along with the full spectrum of energy challenges, a personal priority.*

Nonetheless, top leaders will need strong support from across government. Regular meetings of relevant cabinet officials, from the Departments of State and Treasury to the Departments of Energy and Agriculture, focused squarely on climate change and energy security, will help ensure continued focus and promote coordination. So would a more frequent and more formal process involving lower-level officials and focused squarely on climate change.

All through this, bipartisanship will be critical—climate change cannot be dealt with in a single congressional session or presidential term, and a strategy that cannot be sustained through major political changes will ultimately fail. Addressing climate change will be no easy task. But with careful and creative strategy, tempered by modesty in its knowledge of how to address to the challenge but driven by an equally clear recognition of its gravity, the United States can ultimately help lead the world to a safer place.

Additional or Dissenting Views

The report provides important insights and recommendations at a critical time both for U.S. political leadership and in the global treaty negotiations. I particularly endorse the Task Force's recognition that climate change cooperation strengthens our international relationships: collaboration on clean energy and climate change with the Latin American governments in the 1990s built trust through shared mutual challenges and opportunities, benefited their development objectives, and opened up new markets for U.S. firms. It also diversified U.S. foreign policy relationships beyond long-standing difficult issues like the illegal drug trade and immigration.

While the Task Force has identified forests as a leading source of emissions, it has, unfortunately, understated the potential contribution of avoided deforestation to climate mitigation, including its importance to a post-2012 treaty deal, while overemphasizing integrity concerns. Avoided deforestation can be a fast, low-cost, large-scale solution to climate change with co-benefits for communities, biodiversity, and poverty alleviation, creating new constituencies for climate action both in the United States and internationally.

Finally, I disagree with the enthusiastic support for expansion of nuclear power in countries that already have it. The report rightly notes that this support is preconditioned on the economic competitiveness of nuclear power as well as a strong nonproliferation regime, but fails to also condition it on finding solutions for waste disposal. Given the challenges facing nuclear power, I find the report's enthusiasm unwarranted.

Aimée R. Christensen

I have signed this report because it makes the need for urgent action on climate change clear and presents a smart and thoughtful agenda for reducing U.S. emissions, building international consensus, and promoting international action, with which I broadly concur.

The Task Force rightly notes that the costs of addressing climate change are highly uncertain, but I remain concerned that many policy-makers do not sufficiently appreciate how large these uncertainties are or the consequences of paying them insufficient attention. Environmental certainty enjoys much attention while uncertainty over the cost of cutting emissions receives too little. This balance is wrong, particularly in the short term, since emissions in any given year matter little, while high costs, even for a short period, can cause substantial economic harm, particularly to the most vulnerable.

Domestic legislation should thus strike a careful balance here. I am pleased that, as part of its support for a cap-and-trade system, the Task Force “urges the use of instruments that help to improve the predictability of compliance costs.” To this end, a cap-and-trade system should probably include floors and ceilings on the price of emissions permits. To the extent that emissions permits are tradable internationally, multilateral mechanisms to avoid unreasonable prices should also be developed.

Ultimately, however, there will be substantial risk—economic and environmental—in any choices we make. I concur in this report not because I share in all of its tactical judgments but because I share the animating strategic judgment that there is far more danger of the United States doing too little rather than too much to address climate change.

Lawrence H. Summers

This report is in most respects a thoughtful, balanced, and valuable contribution to the debate. However, we remain very skeptical of the recommendation that a new “Partnership for Climate Cooperation” be established. The idea detracts from the welcome focus on a comprehensive, binding, and enforceable agreement within the UN Framework Convention. It involves the oxymoron of “nonbinding political commitments” . . . “so long as other members of the group judged

[them] to be sufficient.” How that might be made meaningful is not explained, and perhaps is not explainable.

Global Leadership for Climate Action, a partnership between the United Nations Foundation and the Club of Madrid, of which we are a part, recommends the creation of a new category of “rapidly industrializing countries” and that those countries commit to reduce their energy intensity by 30 percent by 2020 and agree to emissions-reduction targets afterward. This approach provides the flexibility that the Task Force seems to seek without encouraging mere political promises, lightly made and lightly ignored.

Multilateral cooperation among large emitters on practical steps to implement aggressive mitigation strategies and to link emissions trading systems, the stated goal of the proposed Partnership, is worthy enough, but multiple avenues for such cooperation already exist. We do not understand what the Partnership adds, and fear that at best it would divert scarce political attention, staff resources, and precious time and at worst would not backstop, but rather undermine the UN negotiation process by creating a deal-cutting forum that would leave out most of the countries in the world.

Timothy E. Wirth
James D. Wolfensohn

Task Force Members

Timothy D. Adams is managing director of the Lindsey Group. Previously, Mr. Adams served as undersecretary of treasury for international affairs. As undersecretary, Mr. Adams was the administration's point person on international financial issues, including exchange rate policy, G7 meetings, and IMF and World Bank issues. He regularly interacted with counterparts in key emerging markets including China, India, and Brazil and traveled extensively throughout Asia, the Middle East, and Europe. Mr. Adams has also served as chief of staff to both Treasury Secretary Paul O'Neill and Treasury Secretary John W. Snow. He was policy director for the Bush-Cheney reelection campaign from November 2003 to November 2004 and served in the White House under the first President Bush at the Office of Policy Development.

Sally M. Benson is executive director of Global Climate and Energy Project (GCEP). Dr. Benson is responsible for guiding the development of GCEP's diverse research portfolio in low-emission energy-supply technologies. A professor in the Department of Energy Resources Engineering at Stanford University's School of Earth Sciences, she has been a member of Stanford's faculty since 2007. Prior to joining GCEP, Dr. Benson worked in a number of capacities at Lawrence Berkeley National Laboratory, including earth sciences division director, associate laboratory director for energy sciences, and deputy director of operations.

Aimée R. Christensen leads Christensen Global Strategies, LLC, advising clients seeking to address the global challenges of climate change, ecosystem degradation, and resource scarcity. Ms. Christensen previously developed climate change strategy for Google.org and worked with the legal department of the World Bank, Environment 2004, Baker & McKenzie, the International Centre for Trade and Sustainable Development, and the U.S. Department of Energy, where she developed the first bilateral agreements on climate change. She is a member of the advisory boards of EKO Asset Management Partners, the Sustainable Endowments Institute, Vote Solar, and the Yale Center for Environmental Law and Policy, and is on the board of directors of the American Council on Renewable Energy, ecoAmerica, and the National Association of Environmental Law Societies.

Stuart E. Eizenstat heads the international practice at Covington & Burling LLP and testifies frequently before Congress on climate change issues. From 1993 to 2001, he was U.S. ambassador to the European Union, undersecretary of commerce, undersecretary of state, and deputy secretary of the treasury. He led the U.S. government delegation in negotiating the Kyoto Protocol on Climate Change in 1997, and was the Clinton administration's chief negotiator on Holocaust restitution issues. He was President Jimmy Carter's chief domestic policy adviser and executive director of the White House domestic policy staff (1977–81).

Thomas F. Farrell II is chairman, president, and chief executive officer of Dominion, one of the nation's largest producers of energy. Mr. Farrell earned both a BA in economics and a JD from the University of Virginia. He is a member of the board of directors of Dominion Resources Inc. and Altria Group, Inc. Mr. Farrell also is a member of the board of visitors and has served as rector of the University of Virginia. Other board memberships include the Colonial Williamsburg Foundation, the Institute of Nuclear Power Operations, and Edison Electric Institute.

Sherri W. Goodman is general counsel at the CNA Corporation, a nonprofit analysis and solutions organization for the Department of

Defense and other public sector leaders. Ms. Goodman has led CNA's project on national security and climate change, whose report, *National Security and the Threat of Climate Change*, was released in April 2007. She served as deputy undersecretary of defense (environmental security) from 1993 to 2001, where she was responsible for defense policies on climate change. Ms. Goodman has served on the staff of the Senate Armed Services Committee for Chairman Senator Sam Nunn and practiced law at Goodwin Procter. She is on the boards of the Atlantic Council, Woods Hole Oceanographic Institution, and the National Academy of Sciences Board on Environmental Studies and Toxicology.

Shirley Ann Jackson is president of Rensselaer Polytechnic Institute. Dr. Jackson has held senior leadership and advisory positions in government, industry, research, and academia, with a particular focus on global energy security and the national capacity for innovation. A theoretical physicist, she was chairman of the U.S. Nuclear Regulatory Commission from 1995 to 1999. She is a member of the National Academy of Engineering and the American Philosophical Society, and is a fellow of the American Academy of Arts and Sciences, the American Physical Society, and the American Association for the Advancement of Science (AAAS). She is a vice chairman of the Council on Competitiveness and co-chair of its energy security, innovation, and sustainability initiative, and was formerly president (2004) and chairman of the board (2005) of the AAAS. She is a regent of the Smithsonian Institution, on the board of NYSE Euronext, and a director of IBM, FedEx, Marathon Oil, Medtronic, and Public Service Enterprise Group.

Robert W. Lane has served as chairman and CEO of Deere & Company since August 2000. Deere & Company is the world's leading provider of advanced products and services for agriculture and forestry equipment and a major provider of advanced products and services for construction, lawn and turf care, landscaping, and irrigation. John Deere also manufactures and markets engines used in heavy equipment and provides worldwide financial services. Mr. Lane earlier led the World-wide Agricultural Equipment division and served as the company's chief financial officer. He also served as president of Deere Credit, Inc.,

and directed equipment operations around the world. Mr. Lane is a director of General Electric Company and Verizon Communications Inc. He is an honorary director of the Lincoln Park Zoo and a national director of the Lyric Opera of Chicago. He graduated with high honors from Wheaton College and earned an MBA from the University of Chicago Graduate School of Business.

Jonathan Lash has served as president of the World Resources Institute since 1993. A former co-chair of President Clinton's Council on Sustainable Development, secretary of natural resources for the State of Vermont, Peace Corps volunteer, federal prosecutor, and law professor, Mr. Lash serves on the advisory board of Generation Investment Management, the board of directors of the Avina Foundation, and the advisory council of Viva Trust.

Michael A. Levi is the David M. Rubenstein senior fellow for energy and environment at the Council on Foreign Relations and director of its program on energy security and climate change. He was previously science and technology fellow in foreign policy studies at the Brookings Institution. Dr. Levi, whose research focuses on the intersection of science, technology, and foreign policy, is the author of two books, most recently *On Nuclear Terrorism* (Harvard, 2007). He holds an MA in physics from Princeton University and a PhD in war studies from the University of London (King's College).

Robert A. Malone is chairman and president of BP America Inc. Mr. Malone is BP's chief representative in the United States. He has served on the California Climate Action Registry board of directors and was a member of the board of regents for the University of Alaska system. Mr. Malone has been selected for the board of trustees of the National Urban League, the Foreign Policy Association, and the Board of the National Petroleum Council. In addition, he is currently on the executive committee for the American Petroleum Institute, a director of the Greater Houston Partnership, and a member of the Business Roundtable. Mr. Malone is also a trustee on the board for the Museum of Science and Industry in Chicago.

Jessica T. Mathews was appointed president of the Carnegie Endowment for International Peace in 1997. A former senior fellow at the Council on Foreign Relations and director of the Council's Washington Program, Ms. Mathews was founding vice president and director of research at the World Resources Institute, a center for policy research on environmental and natural-resource management issues. She has also served on the editorial board of the *Washington Post*, covering energy, environment, science, technology, arms control, health, and other issues, and later became a weekly columnist for the *Post* and the *International Herald Tribune*. Ms. Mathews has served in government as director of the Office of Global Issues of the National Security Council, covering nuclear proliferation, conventional arms sales, chemical and biological warfare, and human rights; and as deputy to the undersecretary of state for global affairs. She is a trustee of the Rockefeller Foundation, the Century Foundation, the Nuclear Threat Initiative, and the International Crisis Group.

Kenneth B. Mehlman is managing director and head of global public affairs at Kohlberg Kravis Roberts & Co (KKR). Before joining KKR, Mr. Mehlman was a partner at Akin Gump Strauss Hauer & Feld LLP, where he helped businesses and individuals manage risk and seize opportunities at the nexus of business and public policy. At Akin Gump, he was co-chairman of the climate change practice. Mr. Mehlman served as chairman of the Republican National Committee and campaign manager for President George W. Bush's 2004 reelection campaign. He also served in high level positions in Congress and the White House, including as White House political director during President Bush's first term.

Stephen W. Pacala currently holds the Frederick D. Petrie chair in Princeton University's Department of Ecology and Evolutionary Biology and is director of the Princeton Environmental Institute. Dr. Pacala's research focuses on forests and the global carbon cycle. He also directs, with Robert Socolow, Princeton's Carbon Mitigation Initiative, which is aimed at finding solutions to the greenhouse warming problem.

Dr. Pacala has received numerous honors and awards, including election to the National Academy of Sciences in 2007.

George E. Pataki is counsel of Chadbourne & Parke LLP, focusing on their environmental energy and corporate practice areas. Governor Pataki is also the founder and chairman of the Pataki-Cahill Group, a consulting firm concentrating on climate change, energy, and the environment. He was previously governor of New York (1995–2006), during which time he led the establishment of the first mandatory cap-and-trade carbon initiative (Regional Greenhouse Gas Initiative). Governor Pataki also implemented the first integrated strategy for creating clean, renewable transportation networks, worked to create public-private partnerships for clean energy generation in New York State, and instituted the nation's first green building tax-credit incentive program.

William A. Pizer is a senior fellow and research director at Resources for the Future, where his research looks at how the design of environmental policy affects costs and environmental effectiveness, often related to global climate change. Dr. Pizer was a lead author on the Intergovernmental Panel on Climate Change Fourth Assessment Report, chaired the U.S. Department of Energy (DOE) review of its Integrated Assessment of Climate Change Research Program, and serves on both the U.S. Environmental Protection Agency Environmental Economics Advisory Committee and the DOE Climate Change Science Program Product Development Advisory Committee. During 2001–2002, he served as a senior economist at the President's Council of Economic Advisers, where he worked on environment and climate change issues.

William K. Reilly is a founding partner of Aqua International Partners, LP, a private equity fund dedicated to investing in companies engaged in water and renewable energy, and a senior adviser to TPG Capital, LP. Mr. Reilly served as administrator of the U.S. Environmental Protection Agency, president of the World Wildlife Fund, and president of the Conservation Foundation. He was head of the U.S. delegation to the United Nations Earth Summit at Rio in 1992. Mr. Reilly is chairman emeritus of the board of the World Wildlife Fund, co-chair

of the National Commission on Energy Policy, chair of the advisory board for the Nicholas Institute for Environmental Policy Solutions at Duke University, chair of the board for the Global Water Challenge, and a director of the Packard Foundation and the National Geographic Society. He also serves on the board of directors of DuPont, ConocoPhillips, and Royal Caribbean International.

Theodore Roosevelt IV is managing director at Lehman Brothers and a member of the firm's senior client coverage group, which oversees the firm's client and customer relationships. He joined Lehman in 1972 as a general banker in domestic corporate finance. Mr. Roosevelt is chairman of Lehman Brothers' Council on Climate Change. He is chair of the Pew Center for Global Climate Change, a member of the Governing Council of the Wilderness Society, and a trustee of the Alliance for Climate Protection, the American Museum of Natural History, the World Resources Institute, the Cultural Institutions Retirement System, and Trout Unlimited. He is also a counselor of the China-U.S. Center for Sustainable Development, and served as both a board member and the chair of the League of Conservation Voters.

Stephen M. Ross is chairman, chief executive officer, and founder of Related, LP, an international real estate development company formed in 1972. Mr. Ross is chairman of the Real Estate Board of New York and chairman of the board of directors of both Centerline, the country's largest financier of affordable housing, and Equinox Fitness Clubs, one of Related's most recent acquisitions.

David M. Rubenstein is a cofounder and managing director of the Carlyle Group. Mr. Rubenstein is on the board of directors or trustees of Duke University, the Johns Hopkins University, the University of Chicago, the Lincoln Center for the Performing Arts (vice chairman), the Kennedy Center for the Performing Arts, the Memorial Sloan-Kettering Cancer Center, Johns Hopkins Medicine, the Council on Foreign Relations, the Institute for Advanced Study, the Cold Spring Harbor Laboratory, the National Museum of American History of the Smithsonian Institution, the Museum of Natural History of the

Smithsonian Institution, the Center for Strategic and International Studies, the Asia Society, the American Academy in Berlin, the American Council on Germany, Freedom House, and Ford's Theatre. From 1977 to 1981, during the Carter administration, Mr. Rubenstein was deputy assistant to the president for domestic policy.

David Sandalow is energy and environment scholar and a senior fellow at the Brookings Institution. Mr. Sandalow is chair of the energy and climate working group of the Clinton Global Initiative and a senior adviser to Good Energies, Inc. He has served as assistant secretary of state for oceans, environment, and science; senior director for environmental affairs, National Security Council; associate director for the global environment, White House Council on Environmental Quality; and executive vice president of the World Wildlife Fund-U.S. Mr. Sandalow has been a Stimson fellow at Yale University; a member of the sustainable development roundtable at the OECD; a member of the American Bar Association (ABA) Standing Committee on Environmental Law; and co-chair of the ABA's annual conference on environmental law.

Lawrence R. Scanlon started his career in the union in 1974 as a field representative for the 250,000-member New York Civil Service Employees Association, AFSCME Local 1000. He held a series of positions with the union culminating in his appointment as executive director in 1992. In 1995, President Gerald W. McEntee appointed Mr. Scanlon to direct AFSCME's political department. Responsibilities for the 1.3 million-member union include the development and implementation of the union's political strategy to support candidates and campaigns (federal, state, and local) that will positively impact on public policy and union member concerns.

Lawrence H. Summers is the Charles W. Eliot university professor at Harvard University. He served as twenty-seventh president of Harvard University from July 2001 until June 2006. An eminent scholar and admired public servant, Mr. Summers has taught on the faculty at Harvard and MIT. He has served in a series of senior public policy positions, including political economist for the president's Council of

Economic Advisers, chief economist of the World Bank, and secretary of the treasury of the United States. In 1993 he received the John Bates Clark Medal, given every two years to the outstanding American economist under the age of forty. Mr. Summers received a BS from MIT and a PhD in economics from Harvard.

Mark R. Tercek is a managing director of Goldman, Sachs & Co., and heads the firm's environmental strategy group and its Center for Environmental Markets. Mr. Tercek joined Goldman Sachs in 1984 and was named a partner in 1996. In previous positions he headed the firm's equity capital markets, corporate finance, real estate, and consumer/healthcare departments. In an earlier assignment, Mr. Tercek coheaded the firm's corporate finance business in Tokyo. He is an adjunct professor at New York University's Stern School of Business with appointments in both the finance and management and organization departments. Mr. Tercek serves on the board of trustees of Resources for the Future, Business for Social Responsibility, Seachange Capital, and Western Reserve Academy. He is also a member of the steering group on the Prince's Rainforest Project.

David G. Victor is a professor of law at Stanford University Law School, where he teaches energy law, regulation, and political economy. Dr. Victor is also director of the program on energy and sustainable development at Stanford University's Freeman Spogli Institute for International Studies, which focuses on power sector reform, the emerging global market for natural gas, energy services for the world's poor, the practical challenges in managing climate change, and the role of state-controlled oil and gas companies in the world's hydrocarbon markets. Much of the program's research concentrates in Brazil, China, India, Mexico, and South Africa. Previously, he directed the science and technology program at the Council on Foreign Relations, where he remains adjunct senior fellow. Dr. Victor directed the Council's Task Force on Energy and U.S. Foreign Policy chaired by John Deutch and James R. Schlesinger. He also leads a study group that is examining ways to improve management of the nation's \$50 billion strategic oil reserve.

Thomas J. Vilsack is of counsel in the Dorsey trial group at Dorsey & Whitney LLP. Governor Vilsack's practice focuses on strategic counseling and advising clients in the fields of energy conservation, renewable energy, and agribusiness development. He previously was governor of Iowa (1998–2006), during which time he focused on improving education, particularly in early childhood, expanding health care to the uninsured, and making the state a national leader in renewable energy. Governor Vilsack served as an Iowa State senator and mayor of Mt. Pleasant, Iowa. He is also a highly regarded litigator, with more than twenty-five years of trial experience handling complex litigation and class actions with state-wide and national implications.

Timothy E. Wirth is the president of the United Nations Foundation and the Better World Fund. As president of the UN Foundation (UNF) since its inception in early 1998, Wirth has organized and led the formulation of the Foundation's mission and program priorities, which include the environment, women and population, children's health, and peace, security and human rights. Senator Wirth served in the U.S. House of Representatives from 1975 to 1987 and in the Senate from 1987 to 1993. Following these two decades of elected politics, Wirth was national co-chair of the Clinton-Gore campaign and served in the U.S. Department of State as the first undersecretary for global affairs from 1993 to 1997. He chaired the U.S. delegation at the 1994 Cairo Conference on Population and Development and was the lead U.S. negotiator for the Kyoto Climate Conference until late 1997. He was recently honored as a Champion of the Earth by the United Nations Environment Programme.

James D. Wolfensohn is chairman of Wolfensohn & Company, LLC, a private investment firm, and an adviser to corporations and governments. Mr. Wolfensohn became chairman of Citi International Advisory Board; he is also adviser to Citi's senior management on global strategy and on international matters. Mr. Wolfensohn was the ninth president of the World Bank Group, from 1995 to 2005, during which time he led successful initiatives on debt reduction, environmental

sustainability, anticorruption programs, and AIDS prevention and treatment. He is also chairman of the advisory group of the Wolfensohn Center, a new research initiative focused on global poverty, at the Brookings Institution.

Philip D. Zelikow is White Burkett Miller professor of history at the University of Virginia. A former career diplomat, he has continued to serve occasionally in government, most recently as the executive director of the 9/11 Commission and as counselor of the Department of State. He is a member of the advisory panel on global development for the Bill & Melinda Gates Foundation.

Task Force Observers

Scott G. Borgerson
Council on Foreign Relations

Elizabeth C. Economy
Council on Foreign Relations

Charles D. Ferguson
Council on Foreign Relations

Jeffrey A. Harley
Council on Foreign Relations

Appendix

Major Mitigation Opportunities in Major Developing Countries

The main body of the Task Force report devotes extensive attention to effecting developing-country shifts to lower-carbon development pathways. This appendix provides detail on specific technical opportunities. In doing so, it mirrors the body of the report by focusing primarily on carbon dioxide; on coal, oil, and forests; and on Brazil, China, India, and Indonesia. Its aim is to help readers appreciate some of the challenges developing countries face in switching to cleaner development paths and understand the wide variety of commitments that countries could in principle consider making as part of a UN deal or within a Partnership for Climate Cooperation. It cautions that putting the various changes described in this appendix into practice can often be extremely difficult. The practical work of the Partnership for Climate Cooperation and its member governments, as well as a host of bilateral and regional initiatives, would focus on how such measures would be put into practice to yield meaningful reductions in net emissions of greenhouse gases.

The Task Force does not include a similar assessment of options for the advanced industrial countries because it has advocated that, in the context of foreign policy, they focus on economy-wide mitigation constraints (rather than commitments to specific policies and measures) and on delivering incentives to developing countries (already discussed in detail in chapter four.)

Lowering Emissions from Coal Use

The Task Force has identified four basic near-term shifts in China and India that have the potential to sharply reduce emissions from coal from what they might otherwise be. One other step—laying the groundwork for next-generation clean coal power—could also be taken in the near term.

Increased Efficiency of Power Use in Buildings

Reducing the amount of energy needed for basic building functions like heating and operating appliances often offers “negative-cost” opportunities for reducing CO₂ emissions and local pollution—long-run energy savings end up more than paying for any up-front investment. Estimates are difficult, and they change as projections for energy consumption evolve, but one indicative study suggests that more efficient use of energy in Chinese buildings could reduce CO₂ emissions by an amount equivalent to 20 percent.¹¹⁹ (Careful studies are much rarer for India, but would be highly valuable to policymakers.) Yet while people and firms might be expected to exploit these opportunities absent policy interventions (since they would save money), in practice many consumers do not.

To address the efficiency opportunity, China, India, and other developing countries could, in theory, focus on one or more of the following policies and measures. Inclusion of any particular measure on this list is not intended to suggest that it is likely to be adopted; rather, the goal is to present a wide range of possibilities. The same is true for measures described in the rest of this appendix:

- Strengthen, and more importantly enforce, building and appliance efficiency standards, which would directly force consumers and firms to take emissions-reducing measures. Enforcement is difficult, in particular, because of weak administrative capacity, particularly in China.

¹¹⁹ “Global Mapping of Greenhouse Gas Abatement Opportunities up to 2030, Buildings sector deep-dive,” Vattenfall, June 2007, p. 10, available at <http://www.vattenfall.com>. Estimates based on IEA, “World Energy Outlook 2004,” p. 485 (accessed June 6, 2008).

- Reform electricity pricing to better reflect the cost of generating electricity, which would increase incentives for residential and commercial building users to conserve energy and hence reduce emissions. This faces important challenges as controls over electricity pricing offers one of the more powerful means for central planners to tame inflation.
- Provide financing for efficiency projects to firms and individuals that would otherwise be unable to obtain it, so they can make the up-front payments necessary to save both money and emissions over the long term.

Increased Efficiency of Coal Use in Power Generation

Addressing power and heat production may offer great leverage on emissions because large plants are operated by professionals, making it easier to apply complex technologies than in some other areas (such as in dispersed industry or boilers for individual buildings) and because small changes in large facilities can make a big difference. Lifting the efficiency of existing Chinese and Indian plants and accelerating the turnover of plants could make deep cuts in CO₂ emissions while also reducing urban pollution. Some Chinese companies already have incentives to invest in efficiency because they face legal limits on pollution and because the price of coal has risen steeply; careful audits of Chinese plants show that Chinese managers are already making substantial improvements in operation but that a wide array of additional improvements is possible.¹²⁰ Indian plants lag well behind.

A range of policies and measures from China and India could, in theory, promote increased adoption of cleaner coal technologies:

- Commit to minimum efficiency standards for new coal-fired power plants. Price is a barrier here, as is a lack of expertise and access to technology.
- Improve governance of intellectual property, since the prospect of having their technologies stolen deters foreign companies from selling

¹²⁰ E.R.N.Q. Clarke et al., "IEA-China Power Plan Optimisation Study: Summary Visit Report," International Energy Agency, Report No. COAL R253, February 2004, available at <http://www.asiapacificpartnership.org> (accessed June 6, 2008).

energy technology. This is, of course, an endemic problem in China in particular, extending well beyond energy technology.

- Open up regulatory regimes to foreign investment in the energy sector. This could be done broadly or applied more narrowly to clean energy technologies. In both India and China, this would run up against a desire to grow domestic industries.
- Reform financing restrictions, notably those that prevent risky energy projects from reflecting that risk in their financing terms and that thus constrain the availability of credit that is needed to finance efficiency upgrades.¹²¹ In China, financing restrictions are one of many rigidities in capital markets that have proven difficult to change even as the economy has opened up.
- Increase openness to foreign manufacturing, or substantially commit to improving domestic manufacturing capabilities, in the energy sector. The first measure would hurt efforts to grow domestic capacity, while the second would require substantial investment.
- Better regulate pollution from power plants, since increasing efficiency of plants would be one way to comply with such regulations. As in other areas, a lack of central administrative capacity makes this difficult, especially as regional and local officials often have conflicting motives.

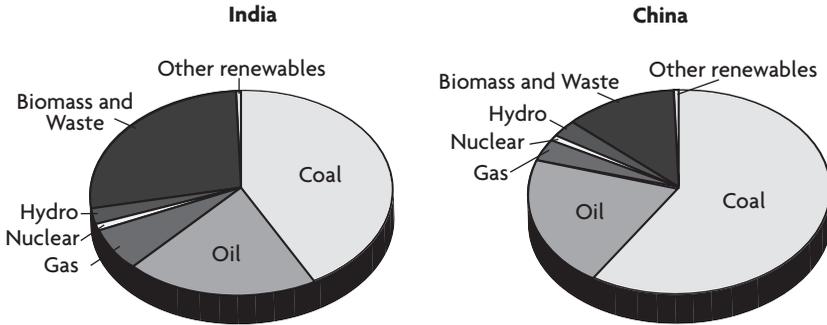
In each case, China poses greater—often much greater—difficulties than India does.

Switching from Coal to Gas, Nuclear, and Renewables in Power Generation

The relative use of gas, nuclear, and renewable energy such as solar and wind to generate power in China and India is expected to increase significantly in any scenarios assuming deep reductions in greenhouse gas emissions.¹²²

¹²¹ William Chandler and Holly Gwin, “Financing Energy Efficiency in China,” Carnegie Endowment for International Peace, January 2008, available at <http://www.carnegieendowment.org> (accessed June 6, 2008).

¹²² International Energy Agency, “World Energy Outlook 2007: China and India Insights,” p. 597.

Figure 3: Primary Energy by Source (2005) in India and China

Source: IEA, 2007

Shifts are already under way in both countries. China is already building a gas infrastructure and is planning an array of LNG import facilities; eventually, large amounts of gas might be imported by pipeline. India imported natural gas for the first time in 2004, and is looking to expand its gas infrastructure. China is also in the midst of a nuclear initiative, with current plans to commission one to two new reactors per year for the foreseeable future. India has ambitious plans, focused primarily on future expansion rather than on immediate growth. China and India also make heavy use of renewable power. Hydroelectricity is expanding rapidly in both countries, but public opposition, particularly in India, is a major obstacle, and often quite justifiable, given the enormous environmental impacts that many hydroelectricity projects have had.¹²³ Both countries are also investing in wind power, and, to a lesser extent, solar. All these alternatives to conventional coal are currently more costly—often much more costly—but are being pursued because they help to create a more diverse energy system and because some create political benefits, such as dam construction jobs.

Each of the policies and measures described above that could increase the use of cleaner-burning coal plants, such as changes in intellectual property governance, could, in theory, also promote shifts to these other cleaner energy sources. Other potential steps include:

¹²³ While hydroelectricity delivers roughly 5 percent of Chinese and Indian power, it accounts for roughly 20 percent of *electricity* generation in both countries. See: *Ibid.*, pp. 596–601.

- Renewable portfolio standards (RPS), under which countries would agree to produce a minimum fraction of their power from renewable sources. China has already set a goal of generating 15 percent of its total power in 2020 from renewables, while India currently aims to produce 8 percent of its power from renewables by 2032. Such standards do not normally include nuclear or gas-fired power, though variations that incorporate them might be considered, since shifts to both of those would prompt reduced emissions. It is important to note that, with present policy, it is far from clear that either of those goals will be met.
- Expansion and diversification of natural gas infrastructure, which would align energy security and emissions reduction incentives. Both countries are making large investments in infrastructure more broadly, and this would need to compete.
- Addressing nonproliferation, arms control, safety, and waste disposal concerns that can block access to nuclear technology. Both China and India have become increasingly cooperative on this front, though major tensions still remain.

Shifting to More Efficient Production of Cement and Steel

Industry is responsible for a large fraction of CO₂ emissions in China, but deep greenhouse gas reductions could be found in cement and steel production at reasonable cost.¹²⁴ It is not as important in India, where less energy-intensive industry dominates.

As of 2005, about one-quarter of the energy used in Chinese industry came from electricity, meaning that efforts to shift electricity production away from dirty coal would reduce emissions from cement and steel production too. A similar amount came from burning coal directly at industrial sites.¹²⁵ Increasing the efficiency of steel and cement production processes would reduce emissions, while also reaping cost savings in

¹²⁴ “Global Mapping of Greenhouse Gas Abatement Opportunities up to 2030: Industry sector deep-dive,” Vattenfall, June 2007, pp. 13, 25; available at <http://www.vattenfall.com> (accessed June 6, 2008).

¹²⁵ To the extent that the Chinese government has allowed coal prices to rise but has kept electricity prices fixed, industry can be expected to draw an increasingly large fraction of its energy from the electric grid.

many cases. Switching to other fuels, as well as modifying cement composition, would also reduce emissions, albeit at some cost.

Many potential policies and measures exist in these areas. In each case, assessments of whether such commitments are plausible vary widely, and depend strongly on what incentives might be presented by other countries, as well as on access to technology and expertise.

- Aggregate emissions limits for the cement or steel sectors. These could be absolute or could be indexed to output.
- Minimum energy-efficiency or emissions standards for major new facilities.
- Standards for composition of concrete. Such a commitment might apply universally; alternatively, it might be applied only to exports.

Even if all the opportunities just described were captured, China's and India's emissions would, in the longer term, continue to grow at a dangerous pace. Eventually, adoption of coal-burning technologies that capture and store the CO₂ they produce underground will likely need to play a critical role. Widespread deployment of this carbon capture and sequestration technology is unlikely in the next ten years, but several actions during that period are critical to making the option technologically, economically, and politically viable.¹²⁶

A leading Chinese power company is currently pursuing its own project on advanced coal combustion that will focus on closely related integrated gasification combined cycle (IGCC) technology. Such experience can lay a foundation that, later, allows for use of CCS with relative ease. India, meanwhile, does not have any significant projects in either area that go beyond research and development.¹²⁷ A much larger near-term effort to test and deploy such new approaches to generating electricity, to identify potential underground storage sites (and site new plants near them), and to develop associated regulatory frameworks could ease the eventual widespread application of such

¹²⁶ For an extensive discussion of this challenge, see John Deutch et al., *The Future of Coal: Options for a Carbon-Constrained World* (Cambridge, MA: MIT, March 2007).

¹²⁷ India does, however, have long-standing efforts to improve underground coal gasification because that would make deep coal resources more readily available. Depending on the approach, underground gasification could also play a role in containing CO₂ emissions.

technologies. Regardless, for the foreseeable future, such plants are likely to be much more expensive than conventional plants. Moreover, the Chinese and Indian governments do not appear to have strong interest in CCS, both because they are focused on more immediate needs, and because plants that use CCS require more coal than traditional plants, creating increased strains on coal resources.

Potential policies and measures in this area include:

- Participation in demonstration projects for IGCC and CCS technology. Cost sharing is likely to be a major sticking point here, as is intellectual property protection.
- Extensive surveying of potential storage sites. This is particularly important in India, which is generally understood to have fewer natural candidates.
- Development of regulatory regimes required for carbon transport and storage.

Decreasing Oil Use

The Task Force has identified three basic near-term steps in the developing world that have the potential to substantially reduce oil use in transportation from what it otherwise would be, while reducing greenhouse gas emissions, not only in China and India but in wealthier countries as well.

Reducing Fuel Consumption in Transportation

Improving vehicle fuel efficiency can be highly effective in cutting oil consumption while saving consumers money on fuel costs, at least in the developing world. China has adopted far more ambitious automobile efficiency goals than India, though enforcement is still inconsistent. Improved public transportation and urban planning can also reduce the need for oil. The clearest policy measure in this area would be to adopt and, most importantly, enforce strong fuel economy standards, though, as in the previous section, weak administrative capacity makes this difficult. Countries might also invest more ambitiously in public transportation and intelligent urban planning.

Substituting Biofuels for Oil in Transportation

Biofuels account for a minuscule fraction of China's liquid fuel, but their use is projected to grow by over 10 percent annually through 2030. A similar situation prevails in India, where growth is expected to be at least twice as rapid over the same period. A recent IEA simulation involving deep reductions in greenhouse gas emissions projected that biofuels consumption would grow at an annual average of 30 percent in India and 15 percent in China through 2030, and that near-term growth would be even more rapid.¹²⁸ A similar situation prevails in the advanced industrial states, which are expected to experience annual growth in biofuels use of roughly 10 percent over the next two decades.

States such as Brazil and Indonesia play a critical role as biofuels suppliers rather than as consumers. Brazilian sugar-cane ethanol reduces tailpipe emissions substantially when substituted for oil, as does biodiesel made from Indonesian palm oil, most of which is exported to China. To the extent that using land for biofuels leads to deforestation or to the conversion of other carbon-rich lands for agriculture or pasture, though, the net result, despite cutting oil consumption, may be a large increase in carbon dioxide emissions.

Potential policies and measures on this front might include:

- Consumer states such as China and India might aim to derive a minimum fraction of their transportation fuels from biofuels. They might also pursue low-carbon biofuel standards similar to those being explored in Europe. Here, cost, availability, and, in the case of a low-carbon standard, administrative capacity are important constraints; domestic production creates additional pressures, notably on water resources. Any policy on this front would need to be extraordinarily careful not to promote even greater greenhouse gas emissions from resulting deforestation and land use change, something that might not be possible for China or India to achieve.
- Consumer states might commit to import biofuels only from states that met minimum standards for land management and forest preservation, so as not to indirectly promote counterproductive emissions

¹²⁸ Alternative Policy Scenario in IEA, *World Energy Outlook 2007*. This scenario is consistent with stabilization at 550 ppm CO₂e.

from land use change. Complementing this, producer states such as Brazil and Indonesia might commit to such minimum standards. Both of these commitments could have limited value, however, to the extent that displaced cropland in one country could still be replaced in another that had not adopted similar standards. In addition, they could hamper achievement of energy security goals, which are met regardless of the deforestation implications of increased access to biofuels.

Avoiding Coal-to-Liquids Technology

A push to reduce China's and India's reliance on imported oil could actually cut against climate change goals by prompting increased use of coal-to-liquids, a technology in which coal is transformed into liquid fuel for transportation. China has already invested here substantially, and India's interest has recently grown as well. Such a shift, unless accompanied by currently unviable CCS technology, would increase greenhouse gas emissions by roughly a factor of two for each gallon of fuel used.

Potential policies and measures to mitigate against this might include:

- Adopting a limit on the share of liquid fuels permitted to be derived from coal. This would, of course, bump up against energy security objectives.
- Committing to use CCS technology on any new coal-to-liquids facilities. This would face hurdles that include cost as well as increased demand on coal.

Reducing Deforestation and Promoting Reforestation

Unlike in coal and oil use, where a diverse range of technical options exist, the high-level technical picture in forestry is relatively straightforward. (The policy picture—discussed in several places in the main text—is more complex.) Deforestation releases greenhouse gases into the atmosphere, while reforestation absorbs them. Sustainable forest management is the basic goal of any policy aimed at reducing emissions from deforestation.

Potential developing-country policies and measures might, in theory, include:

- Setting and meeting specific goals for maximum net rates of deforestation. This could be met through reforestation, afforestation, and avoided deforestation. This would challenge enforcement capacity and could strain some social objectives.
- Setting and meeting specific goals for reforestation and afforestation. Any such commitment would need to be made in the context of broader policy that removed perverse incentives to cut down forests so that land could then be “reforested.”
- Improving capacity for preventing and responding to forest fires, which are responsible for a large amount of deforestation, particularly in Indonesia. This is largely a matter of getting the right expertise, infrastructure, and equipment.
- Strengthening property rights, which create incentives for sustainable forestry. Property rights, to be sure, involve a host of thorny issues related to major social issues in the countries concerned.

Other Gases

While the Task Force has recommended an initial focus on CO₂ emissions, it has also briefly examined the opportunities that this misses. Most studies suggest that there are many cost-effective ways to cut non-CO₂ gases.¹²⁹ Consider three illustrative and important examples.

China has the potential to reduce its annual methane emissions from coal mining (coal-bed methane) by an amount roughly equivalent to shutting down forty typical Chinese coal plants, or roughly all the coal plants that China builds every year, for a total cost of slightly less than \$1 billion, far less than the typical cost of reducing emissions by switching from coal to other fuels.¹³⁰ Opportunities for reducing coal mining

¹²⁹ “Global Mitigation of Non-CO₂ Greenhouse Gases,” United States Environmental Protection Agency, June 2006, available at <http://www.epa.gov> (accessed June 6, 2008).

¹³⁰ Based on a reduction of 160 MtCO₂e, nearly its entire projected emissions, for approximately \$5/tCO₂e as of 2010, and on 1 kg/kWh and full-time operation. See: Zongrang Zhao, “CO₂ Reductions through Efficiency Improvement to Existing Coal-fired Power Plants and Deployment of Supercritical Units in China,” Thermal Power Research Institute, presentation at APEC Workshop, February 16, 2004, available at <http://www.iea.org> (accessed June 6, 2008).

emissions in India are more than five times smaller, reflecting the smaller size of the Indian coal mining industry. Absent better technology to capture these emissions and burn them for fuel, such reductions are unlikely to happen. Reductions would need a special incentive tied to concerns about climate change and either required by Chinese or Indian regulators or paid for by outsiders through a climate fund or another equivalent mechanism.

As with CO₂, large opportunities to reduce non-CO₂ emissions exist in areas that are not cost-effective from a pure climate change perspective, but that make sense based on other policy motivations. China and India, for example, each emit roughly the same amount of emissions from wastewater (methane and nitrous oxide) as they do from coal-bed methane, but eliminating these is not cost-effective from a climate perspective. They could be largely eliminated, though, by public health campaigns aimed at reducing water-borne disease. As in the previous example, that would be equivalent to closing several dozen coal plants in each country.

Black carbon, while not a greenhouse gas, may contribute substantially to warming. If recent studies on black carbon are confirmed, then the inclusion of that substance, which comes from incomplete burning of fossil fuels (such as in small and poorly designed cookstoves and boilers) could lift the role of non-CO₂ gases substantially. China accounts for roughly 20 percent of the world's black carbon emissions, while India accounts for roughly 10 percent.¹³¹

Reducing emissions from inefficient cookstoves and boilers may thus offer large, technically straightforward, and inexpensive opportunities in China and India for mitigating climate change. Even if the contribution of black carbon to warming turns out to be minimal, reducing these emissions would make a large contribution to improving air quality and health; moreover, unlike in the case of assistance directed at major infrastructure, the benefits of aiding in reducing black carbon emissions would accrue to the poorest Chinese and Indians. Reducing black carbon emissions, however, entails a large administrative challenge—it is much easier to influence the behavior of hundreds of large power plant operators than it is to affect tens of millions of households and small industrial operators.

¹³¹ David G. Streets, "Black Smoke in China and Its Climate Effects," 2004, p. 6. The United States is responsible for less than 5 percent.

Recent Independent Task Force Reports Sponsored by the Council on Foreign Relations

- U.S.-Latin America Relations: A New Direction for a New Reality* (2008); Charlene Barshefsky and James T. Hill, Chairs; Shannon K. O'Neil, Project Director
- U.S.-China Relations: An Affirmative Agenda, A Responsible Course* (2007); Carla A. Hills and Dennis C. Blair, Chairs; Frank Sampson Jannuzi, Project Director
- National Security Consequences of U.S. Oil Dependency* (2006); John Deutch and James R. Schlesinger, Chairs; David G. Victor, Project Director
- Russia's Wrong Direction: What the United States Can and Should Do* (2006); John Edwards and Jack Kemp, Chairs; Stephen Sestanovich, Project Director
- More than Humanitarianism: A Strategic U.S. Approach Toward Africa* (2006); Anthony Lake and Christine Todd Whitman, Chairs; Princeton N. Lyman and J. Stephen Morrison, Project Directors
- In the Wake of War: Improving U.S. Post-Conflict Capabilities* (2005); Samuel R. Berger and Brent Scowcroft, Chairs; William L. Nash, Project Director; Mona K. Sutphen, Deputy Director
- In Support of Arab Democracy: Why and How* (2005); Madeleine K. Albright and Vin Weber, Chairs; Steven A. Cook, Project Director
- Building a North American Community* (2005); John P. Manley, Pedro Aspe, and William F. Weld, Chairs; Thomas P. d'Aquino, Andrés Rozental, and Robert A. Pastor, Vice Chairs; Chappel A. Lawson, Project Director; Cosponsored with the Canadian Council of Chief Executives and the Consejo Mexicano de Asuntos Internacionales
- Iran: Time for a New Approach* (2004); Zbigniew Brzezinski and Robert M. Gates, Chairs; Suzanne Maloney, Project Director
- Renewing the Atlantic Partnership* (2004); Henry A. Kissinger and Lawrence H. Summers, Chairs; Charles A. Kupchan, Project Director
- Nonlethal Weapons and Capabilities* (2004); Graham T. Allison and Paul X. Kelley, Chairs; Richard L. Garwin, Project Director
- New Priorities in South Asia: U.S. Policy Toward India, Pakistan, and Afghanistan* (2003); Frank G. Wisner II, Nicholas Platt, and Marshall M. Bouton, Chairs; Dennis Kux and Mahnaz Ispahani, Project Directors; Cosponsored with the Asia Society
- Finding America's Voice: A Strategy for Reinvigorating U.S. Public Diplomacy* (2003); Peter G. Peterson, Chair; Jennifer Sieg, Project Director
- Emergency Responders: Drastically Underfunded, Dangerously Unprepared* (2003); Warren B. Rudman, Chair; Richard A. Clarke, Senior Adviser; Jamie F. Metzl, Project Director
- Chinese Military Power* (2003); Harold Brown, Chair; Joseph W. Prueher, Vice Chair; Adam Segal, Project Director
- Iraq: The Day After* (2003); Thomas R. Pickering and James R. Schlesinger, Chairs; Eric P. Schwartz, Project Director
- Threats to Democracy* (2002); Madeleine K. Albright and Bronislaw Geremek, Chairs; Morton H. Halperin, Project Director; Elizabeth Frawley Bagley, Associate Director
- America—Still Unprepared, Still in Danger* (2002); Gary Hart and Warren B. Rudman, Chairs; Stephen Flynn, Project Director
- Terrorist Financing* (2002); Maurice R. Greenberg, Chair; William F. Wechsler and Lee S. Wolosky, Project Directors
- Enhancing U.S. Leadership at the United Nations* (2002); David Dreier and Lee H. Hamilton, Chairs; Lee Feinstein and Adrian Karatnycky, Project Directors
- Testing North Korea: The Next Stage in U.S. and ROK Policy* (2001); Morton I. Abramowitz and James T. Laney, Chairs; Robert A. Manning, Project Director
- The United States and Southeast Asia: A Policy for the New Administration* (2001); J. Robert Kerrey, Chair; Robert A. Manning, Project Director
- Strategic Energy Policy: Challenges for the 21st Century* (2001); Edward L. Morse, Chair; Amy Myers Jaffe, Project Director

The Council sponsors an Independent Task Force when an issue of critical importance to U.S. foreign policy arises, and it seems that a group diverse in backgrounds and perspectives may nonetheless be able to reach a meaningful consensus on policy through private and nonpartisan deliberations. Task Force members are asked to join a consensus signifying that they endorse “the general policy thrust and judgments reached by the group, though not necessarily every finding and recommendation.” Individual views and dissents that sharpen differences of analysis and prescription are also encouraged. Once formed, Task Forces are independent. Upon reaching a conclusion, a Task Force issues a report, which the Council publishes and posts on its website. Task Force chairs, directors, and members are solely responsible for the content of their reports.

TASK FORCE MEMBERS

Timothy D. Adams
The Lindsey Group

Sally M. Benson
Stanford University

Aimée R. Christensen
Christensen Global Strategies, LLC

Stuart E. Eizenstat
Covington & Burling LLP

Thomas F. Farrell II
Dominion

Sherri W. Goodman
The CNA Corporation

Shirley Ann Jackson
Rensselaer Polytechnic Institute

Robert W. Lane
Deere & Company

Jonathan Lash
World Resources Institute

Michael A. Levi
Council on Foreign Relations

Robert A. Malone
BP America Inc.

Jessica T. Mathews
Carnegie Endowment for International
Peace

Kenneth B. Mehlman
Kohlberg Kravis Roberts & Co.

Stephen W. Pacala
Princeton University

George E. Pataki
Chadbourne & Parke LLP

William A. Pizer
Resources for the Future

William K. Reilly
Aqua International Partners, LP

Theodore Roosevelt IV
Lehman Brothers

Stephen M. Ross
Related, LP

David M. Rubenstein
The Carlyle Group

David Sandalow
The Brookings Institution

Lawrence R. Scanlon
AFSCME

Lawrence H. Summers
Harvard University

Mark R. Tercek
Goldman, Sachs & Co.

David G. Victor
Stanford University and
Council on Foreign Relations

Thomas J. Vilsack
Dorsey & Whitney LLP

Timothy E. Wirth
United Nations Foundation

James D. Wolfensohn
Wolfensohn & Company, LLC

Philip D. Zelikow
University of Virginia

ISBN 978-0-87609-412-9

