

RESOURCES



Engaging China on
Climate Change



RESOURCES FOR THE FUTURE

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10 Precepts for U.S. Climate Policy

▶ www.rff.org/tenprecepts

Engaging China on Climate Change

▶ www.rff.org/engagingchina

Former Treasury Secretary Paulson Calls for Global Commitments that are Transparent, Meaningful

Eight days before he left office, then Treasury Secretary Henry M. Paulson, Jr. came to RFF to talk about the future of climate policy. A successful policy would have to be consistent with continued economic growth, he said, and it would require

vigorous cooperation by the United States and leading developing countries, especially China.

He strongly opposed the suggestion that, in setting up penalties on carbon dioxide emissions in the United States, Congress might resort to tariffs to protect American industries from goods made in countries with weaker standards.

Frank Loy, a member of RFF's board, asked how, if not by tariffs, American producers could be shielded from less-regulated competition. Paulson replied that the alternative was "a global system, where we have commitments made by major developing and developed countries [that] are transparent, meaningful, clear."

The developing countries, he added, will need to eliminate their own tariffs on green technology and services from the more developed world.

The talk (part of RFF's Policy Leadership Forum series) was an informal conversation between Paulson and Phil Sharp, RFF's president, who asked the secretary whether the subject of climate change came up in his many meetings with Chinese officials.

"It came up a lot," Paulson said. He spoke of a trip with Chinese experts to the Chenghai Plateau: "And there you see a real example of



HENRY M. PAULSON, JR.

what's happening in terms of global warming. You see the biggest lake slowly drying up. On this very high plateau you've got the source of the seven big rivers of China. The Yellow River no longer flows continuously. The Chinese scientists explained to me that the temperature on this plateau was increasing by one degree a year and that in 25 or 30 years you wouldn't have the glaciers there any more."

Sharp asked Paulson how he would assess the Chinese government's willingness to take action to reduce carbon emissions.

The Chinese are dealing with serious challenges created by their high economic growth rate and soaring demands for energy, he said.

Developing countries will need to eliminate their own tariffs on green technology and services from the more developed world.

But they understand those challenges, he added, and they are focused on them.

Paulson emphasized the importance of American initiative in building a global regime to protect the climate. "The U.S. is the leader," he said, "and so unless the U.S. is engaging on a bilateral

basis directly with all the major economies, we're not going to have the kind of multilateral success you'd like to have."

He chided the United States for its failure to adequately help small and unsophisticated countries deal with climate policy. "We are very stingy when it comes to appropriating and spending money for use outside of the U.S., for a country as wealthy and as large as we."

The Treasury Department will need to play a central role, he said, in American climate policy:

"There is no way that we are going to be able to solve the enormous problems that we have in front of us without the deployment of a great deal of new technology. And it's going to take . . . hundreds of billions of dollars of investment in capital from the private sector. And that is something that the Treasury Department knows something about . . ."

"There's the science, which is strong and overwhelming. There's the politics, but then there's the economics. And so, unless we can have the proper pricings and unless we can have the capital flows that are going to allow us to put in place the regulatory system that's going to allow for sustainable economic growth, we're not going to be successful." ■

Reflections on Three Decades of Energy Policy

Phil Sharp

Often the statement is made that America lacks an energy policy. In truth, we have a plethora of policies intended to reshape energy markets. What people really mean is that we lack a coherent vision, with policies that are strong enough to generate major, sustained changes in the way energy is produced and consumed.

Over the last 30 years we have periodically engaged in intensive policymaking, usually in association with disruptive swings in energy prices. Each time we have struggled to achieve a national consensus.

That struggle has focused on both "ends" and "means." Essentially, there are four different goals that differing political factions have argued must be addressed.

The first is economic, namely, assuring that we can afford to fuel our homes, schools, industries, and commercial activities. All sorts of policy interventions to stimulate oil production, ethanol production, and so on have been defended on the grounds that they are important to our economic prosperity. Many of us have argued that efficiency and conservation additionally serve this purpose.

The second is protection of our national security. A host of concerns have been articulated: the threat of disruption of international oil and natural gas supplies by governments or terrorists; the pressure on our foreign policy to accommodate oil-producing states that are hostile to our values; the flow of wealth from U.S. consumers to rogue nations; and terrorism.

The third is guarding our environment—mitigating or preventing damage to our air, water, and land from the production and use of

energy, such as burning coal in power plants, combusting gasoline in vehicles, and disposing of nuclear waste. Given federal ownership of massive land acreage and the outer-continental shelf, major disputes arise over access for drilling and mining. Today, of course, climate change represents the mother of all environmental concerns, with calls for a radical overhaul of our energy systems in order to dramatically cut greenhouse gas emissions in the decades ahead. This issue had been identified by RFF scholars back in the 1970s.

A fourth goal has been addressing equity or fairness issues: concern for the poor and concern for regional impacts such as rising fuel oil prices for home heating in New England or gasoline prices for long-distance drivers in the West. When prices spike, political fights invariably erupt over how to protect the consumer from the producer. The intensity of equity fights rises and falls with prices.

Thus far, our political system has not been able to set priorities among these goals in a strong and sustained way. In the recent presidential campaign, the two major candidates essentially argued that we could serve all these goals, blurring the fact that policy that serves one goal may undercut another, such as support for coal-to-liquids.

In the last 30 years, we have seen a significant ebb and flow in government efforts to redirect our energy markets.

Following the Arab oil embargo of 1973, there was a major drive to cut oil imports and shield the economy from expected disruptions and price spikes. Independence was the mantra. Price controls had long been in place

for natural gas; oil-price controls were adopted in the 1970s as part of an economywide anti-inflation program of wage and price controls. Such controls proved to be counterproductive to reducing oil imports. They deterred conservation and discouraged domestic production, and, further, they disrupted the internal shipment of fuels to consumers. We appear to have learned the lesson of such failure: during the recent run-up in oil prices, no political leaders called for price controls.

During the 1970s, there were other major market interventions, including mandates, public investment, loan guarantees, and tax incentives. Auto manufacturers were required to meet fuel economy standards, utilities were required to purchase electricity from other industries that co-generated power, and utilities were prevented from building new natural gas facilities. On the public investment front, huge sums were appropriated for basic research into advanced energy technologies and for direct investment in large-scale demonstration projects meant to show, for example, that liquid fuels could be produced efficiently from coal. The tax code was reconfigured to provide incentives for a host of production and conservation activities, from installing solar panels to insulating homes, and taxes were levied on windfall profits from oil and on gas-guzzling vehicles.

Energy policy was radically overhauled during the 1980s: price controls on oil and natural gas were lifted; some mandates were ended; many tax incentives were repealed or allowed to expire; investment in large new demonstration plants ceased; and spending on research was cut back. Many of these changes derived

from the Reagan administration's belief that energy developments should be left to private markets, that the tax code should not be used for social engineering, and that government's role in research should be limited to advancing basic science. But change also resulted from the dramatic fall in oil prices in 1986 and the reversal in the conventional wisdom that prices were only headed upward. Investors, consumers, and political leaders in both parties lost interest in the development of unconventional and renewable fuels, energy conservation, and efforts by government to intervene in the markets.

In the 1990s, policymaking was re-energized. On the heels of the Iraqi invasion of Kuwait came bipartisan passage of the Energy Policy Act of 1992. In the act, market liberalization continued with the drive to bring competition into electricity wholesale markets. (Several states also moved toward competitive retail markets—a movement substantially set back by the California electricity crisis in 2001.) In the 1992 Act, tax incentives were again adopted, including the production tax credit that was viewed as an improvement over the old investment tax credits as a technique for promoting renewable power. Energy efficiency standards for select household appliances were also enacted. But the Democratic Congress and the Bush administration had no appetite for upgrading auto fuel economy standards or for public investment in large-scale technology projects.

In this decade, with the passage of comprehensive energy bills in 2005 and 2007, we have seen, on a bipartisan basis, the greatest market intervention since the 1970s. Mandates were imposed to promote ethanol production, to ban incandescent light bulbs, to improve fuel economy, and to upgrade household appliances. A host of tax provisions were adopted to entice changes in investor and consumer practices, including speeding the purchase of hybrids and all kinds of energy equipment in the commercial and industrial sectors and pushing production of conven-

tional and advanced fuels. Loan guarantees were re-introduced for advanced nuclear plants, advanced coal systems, and biofuel refineries. And there was a return to appropriations for big demonstration projects like the FutureGen coal plant, the fate of which is now questionable.

In recent years, rising prices and policy initiatives by federal and state governments have heightened investor interest in unconventional fossil fuels and in renewable fuels. As gasoline prices reached previously unimaginable levels, consumers sharply shifted their vehicle purchases away from suvs and even curbed their driving habits. In

Ahead remains the tough intellectual and political work to design, adopt, and sustain the policies that can meet the climate challenge and deliver economic growth, not only in the United States but around the globe.

multiple ways, investors and consumers showed renewed interest in a host of energy-efficient technologies.

In the last few months, with a Katrina hitting Wall Street, the economy turning terribly sour, and oil prices plunging, all of these developments may be in jeopardy. Past experience suggests that investors, consumers, and political leaders will lose interest in greater efficiency and cleaner fuels.

This time, however, may be different. If the scientific community sustains or intensifies the latest assessment by the Intergovernmental Panel on Climate Change (IPCC), there should be greater motivation for action to curb greenhouse gas emissions. The stage was set when both presidential candidates called for mandatory controls that would transform the energy sector. Indeed both candidates connected that transformation to economic growth and to greater energy security. These connections are easier to make in rhetoric than in reality, but they represent a significant shift in the public discourse. Ahead remains the tough intellectual and political work to design, adopt, and sustain the policies that can meet the climate challenge and deliver economic growth, not only in the United States but around the globe. ■

► More commentaries are available at www.rff.org/weeklycommentary.



Right: RFF President Phil Sharp

Climate Policy and Competition: U.S. Industry's Regulatory Dilemma

**Carolyn Fischer and
Richard D. Morgenstern**

The potential scale of impacts and the range of industries affected by domestic climate regulation are unprecedented in the history of U.S. environmental regulation. Pricing carbon emissions, via either a cap-and-trade system or an emissions tax, will affect electricity and primary energy producers, and it will hurt the competitive performance of certain downstream energy-intensive, import-sensitive users of fossil fuels, such as steel and chemical producers. This gives rise to two overarching concerns:

First, a small but prominent subset of domestic companies may be disproportionately harmed if domestic carbon policies affect their operations without corresponding controls on carbon from trading partners around the world.

Second, some environmental benefits will be eroded if increases in U.S. manufacturing costs cause production to shift to nations that have weaker greenhouse gas policies or none at all.

Addressing these issues is difficult, and policymakers are working with a paucity of data on specific industry-level impacts of carbon-mitigation policy choices. To help inform the ongoing discussion of competitiveness issues, RFF researchers Mun Ho, Richard Morgenstern, and Jhih-Shyang Shih recently completed a detailed analysis of the impacts of a \$10-per-ton price on carbon dioxide emissions (CO₂) on domestic industries in more than 50 industrial categories (see the chart on page 6).

The most common approach to assessing the impact of carbon-control policies is to focus on the long-run impacts, after firms have adjusted by using new energy-efficient technologies and new import patterns have been established. Such analysis, however, fails to capture an important part of the story—the short-run costs that most firms will experience. A chemical or steel plant suddenly faced with higher energy costs cannot immediately or costlessly be retrofitted to rely on more energy-efficient methods. A policy that ignores the initial impacts will raise concerns about fairness and invite opposition, while plans suitable for the short term may not serve the economy well as time passes.

To paint a full picture, Ho, Morgenstern, and Shih employ four different modeling approaches in order to consider outcomes along four different time scales:

- The very short run, when firms cannot adjust prices and profits fall accordingly.
- The short run, when firms can raise prices to reflect the higher energy costs, with a corresponding decline in sales as a result of product or import substitution.
- The medium run, when in addition to the changes in output prices, the mix of inputs may also change, but capital remains in place, and economywide effects are considered.
- The long run, when capital may be reallocated and replaced with more energy-efficient technologies.

The Findings

In modeling various industrial sectors across different time horizons, the analysis yields a number of observations. They include:

Looking at the economy as a whole, the impacts are relatively modest from the type of carbon policies currently under discussion. At the same time, some industries are clearly affected more than others.

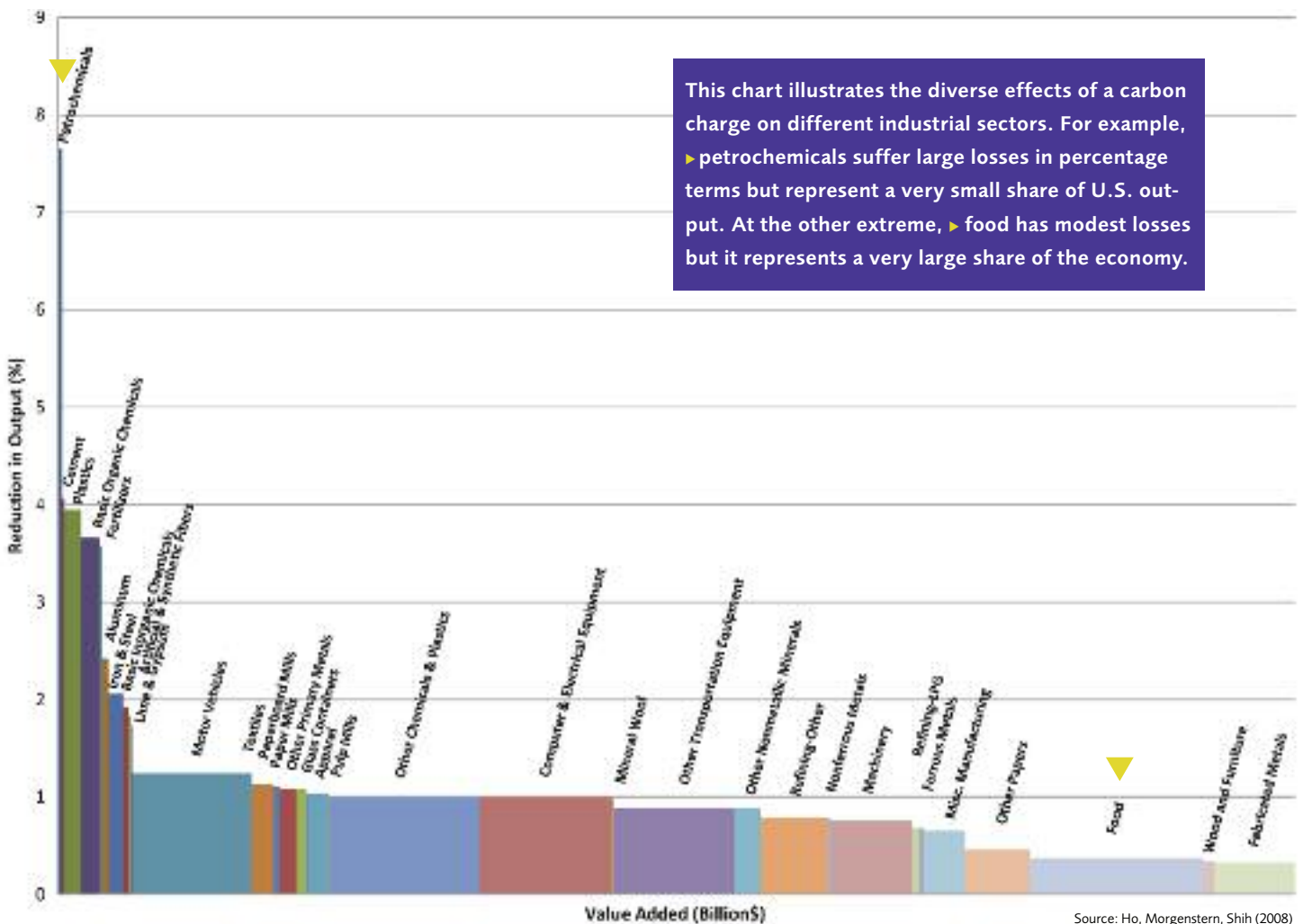
Measured by the reduction in domestic output, a readily identifiable set of industries is at greatest risk of contraction over both the short and long terms. Within the manufacturing sector, industries that will be hardest hit are petroleum refining, chemicals and plastics, primary metals, and nonmetallic minerals.

Although the short-run output reductions are relatively large in these industries, they tend to shrink over time as firms adjust inputs and adopt new technologies. The industries that continue to bear the impacts are generally the same ones affected initially, albeit at reduced levels. When measured in terms of reduced profits, the rebound is especially large and, for some industries, virtually complete.

Focusing on the nearer-term timeframes, the largest cost increases are concentrated in particular segments of affected industries. For example, petrochemical manufacturing and cement see very short-run cost increases of more than four percent from a modest charge of \$10 per ton of carbon dioxide, while iron and steel mills, aluminum, and lime products see cost increases exceeding two percent.

In nonmanufacturing companies, the overall size of the production losses also declines over time, although a more diverse pattern applies. The impact on electric utilities, for example, does not

Effect of a \$10 per ton CO₂ charge on industry (percent change in output and employment)



Source: Ho, Morgenstern, Shih (2008)

substantially worsen over time compared to industries such as mining, which experiences a continuing erosion of sales as broader adjustments occur throughout the economy. Agriculture faces modest but persistent output declines over time, while the service sector is largely unscathed across all timeframes.

In terms of employment, short-term job losses are proportional to those of output. Over the longer term, however, when labor markets are able to adjust, the remaining, relatively small losses are fully offset by gains in other industries.

Leakage across Borders

A unilateral approach—in which the United States takes the first step by establishing a price for carbon—could lead to the problem of “leakage.” If in response to the policy, production shifts overseas to nations that have weaker or non-existent policies, environmental gains in the United States will be offset by increased activity elsewhere.

The Ho, Morgenstern, Shih study shows that over the long term, the leakage rate for the most vulnerable industries can be as high as 40 percent or more. In many cases, much of the carbon reduction that regulators achieve domestically ends up reoccurring offshore. When a steel mill in the United States loses orders and cheaper mills in China—where standards are more lenient—take up the slack, we haven’t done anything to cut the release of carbon into the Earth’s atmosphere.

Importantly, the displacement of production is not the only source of carbon leakage from unilateral policies. A large-scale withdrawal of demand for carbon-intensive energy from the United States will drive down fossil fuel prices globally and expand consumption elsewhere. For example, coal will become cheaper, making electricity and steel in China less expensive and more carbon intensive. This driver of leakage can only be addressed by ensuring that all major international players take on comparable carbon policies and prices.

Still, while leakage related to production shifting may be only part of the problem, little can be gained by allowing domestic industries to contract if the accompanying emissions reductions are merely offset abroad.



Policy Tools

Efforts to ameliorate the leakage and competitiveness problems are being considered in Congress and by the Obama administration. In general, cost-effective policies that allow access to inexpensive mitigation opportunities throughout the United States and potentially around the world will minimize the economic costs of achieving any given emissions target and could be viewed as a first response to competitiveness concerns. Beyond that, policymakers have a number of options at their disposal to address these challenges, including:

- weaker overall program targets,
- partial or full exemptions from the carbon policy for some sectors,
- standards instead of market-based policies for some sectors,
- free allowance allocation under a cap-and-trade system, and
- trade-related policies, including some form of border adjustment for energy- or carbon-intensive goods.

A weaker overall policy—less-stringent emissions caps and lower emissions prices—represents the least focused approach available for addressing competitiveness impacts. It has an advantage that policymakers do not have to identify vulnerable sectors or firms, by avoiding a “gold rush” of industries seeking relief. The clear disadvantage is that less ambitious emissions-reduction targets will produce smaller environmental benefits and weaker incentives for technology innovation.

Simply exempting certain sectors or types of firms provides a direct response to competitiveness concerns and the most relief to potentially affected industries, but it is also the most costly option in terms of reducing the economic efficiency of the policy.

More traditional (non-market-based) forms of regulation, such as emissions standards or intensity-based regulations, can be used to avoid direct energy price increases and deliver some emissions reductions. Regulated industries will still face compliance costs, but not the added burden of allowance purchases for their remaining emissions. However, the overall cost to society of achieving a given environmental objective using these forms of regulation will tend to be higher than under an economywide pricing policy.

Pending legislation has focused mostly on the last two options: free allowance allocation and trade-related policies. In the case of free allocation, the emphasis is on updating allocations on the basis of current output. This is in contrast to a fixed allocation tied to historic emissions as was used in Title IV of the Clean Air Act. A recent paper by RFF researcher Carolyn Fischer and co-author Alan Fox examined several variations of these options, including a border adjustment for imports from countries without “sufficient” regulation;

border relief for exports; a full border adjustment for both imports and exports; and domestic-production-based rebates in the form of an updating allowance allocation tied to current output.

However, they find that for most U.S. sectors, a full border adjustment (both imports and exports) is most effective at reducing global emissions. When border adjustments are limited (such as for reasons of WTO compatibility) to the domestic emissions rate or lower, a domestic rebate can be more effective at limiting emissions leakage and encouraging domestic production.

Two of the caveats that apply to these findings are as follows. First, although an emissions cap can be effective in limiting domestic emissions, awarding additional allowances to certain sectors to compensate for competitiveness concerns will tend to raise allowance prices overall and shift costs among sectors. In particular, it is not advised for energy-producing sectors like electricity or petroleum refining, where conservation should be encouraged as a cost-effective means of reducing emissions. Second, border adjustments or other trade-related policies risk providing political cover for unwarranted and costly protectionism and may provoke trade disputes with other nations.

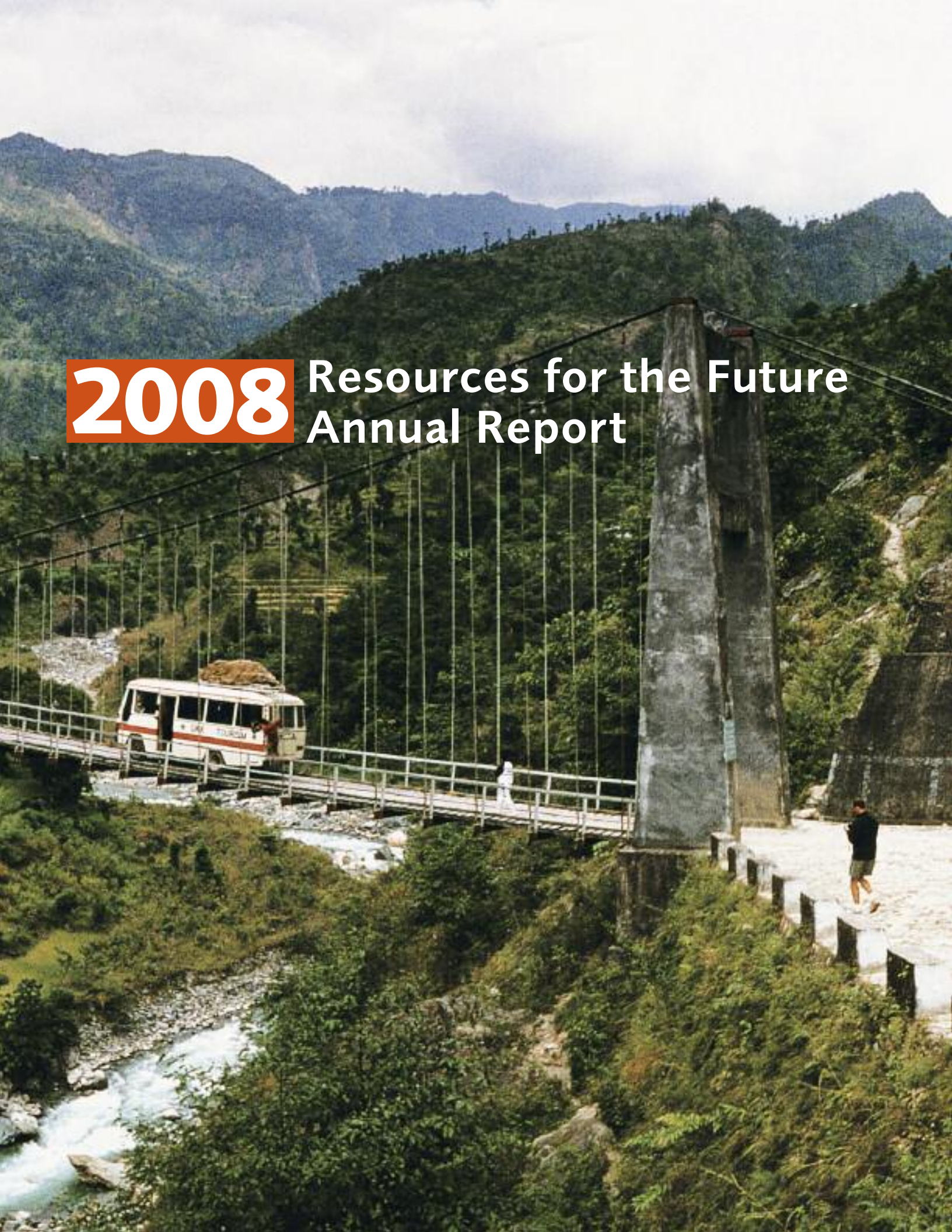
In general, sector-specific policies are more difficult to implement and can require hard-to-obtain data. Further, they create incentives for individual industries to seek special protection even if they are not at significant competitive risk. Nonetheless, there is a real prospect that a unilateral domestic carbon mitigation policy will cause adverse impacts on energy-intensive, import-sensitive industries. Thus, some policy response seems warranted. ■

This article is based on two RFF discussion papers: “Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates” by Carolyn Fischer and Alan K. Fox, RFF DP 09-02; and “The Impact of Carbon Price Policies on U.S. Industry” by Mun Ho, Richard D. Morgenstern, and Jhih-Shyang Shih, RFF DP 08-37. See also, “Addressing Competitiveness Concerns in the Context of a Mandatory Policy for Reducing U.S. Greenhouse Gas Emissions” by Richard D. Morgenstern in *Assessing U.S. Climate Policy Options* (Raymond Kopp and William A. Pizer, eds), RFF Report, November 2007.

See ► www.rff.org/climatepolicyandcompetition

2008

**Resources for the Future
Annual Report**



A Joint Message



Today, in Congress, in corporate boardrooms, in communities, and at dinner tables across the nation, there are urgent demands for a new generation of policy action on the intertwined issues of energy, the environment, and our economy.

As these issues have hit home for Americans, policymakers have increasingly sought nonpartisan research and expertise to heighten their capacity for informed decisionmaking. From cost-effective strategies for emissions reduction to smart growth, smart grids, and management of public lands, many local, state, and federal stakeholders recognize that policy decisions today will have far-reaching consequences.

In Resources for the Future, these audiences have found a distinguished community of experts, an institution committed to improving environmental policymaking, and an honest broker of research of the highest caliber.

2008: A WATERSHED YEAR

Given RFF's unique legacy and expertise, 2008 was a watershed year for our institution as public concerns in the areas of energy and climate in particular reached unparalleled levels.

In response, RFF in 2008 convened important, cross-sectoral dialogues as part of the Climate Policy Forum and the Harvard Project on International Climate Agreements, which assembled private-sector leaders, nonprofits, and climate and energy experts to provide legislators with well-vetted, detailed policy options from which effective domestic and international climate policy might be crafted.

In addition, RFF's report, *Assessing U.S. Climate Policy Options*, was widely disseminated and used extensively by Capitol Hill staff as legislative proposals were drafted during the 110th Congress. And, through long-term cooperative effort with states from Maine to Maryland, RFF researchers played a leadership role in the design of the first-ever U.S. emissions allocation auction through the Regional Greenhouse Gas Initiative.

In the area of energy policy, RFF launched a major new initiative to identify energy policy options that reduce greenhouse gases and improve energy security at the lowest possible costs. This effort brings in internationally recognized experts working toward a common goal and uses the Department of Energy's National Energy Modeling System as a unifying modeling core.

Further, RFF launched a seminar series at the request of the U.S. Environmental Protection Agency (EPA), focused on the economics of climate change. As the United States moves toward federal legislative action to reduce domestic greenhouse gas emissions, this series addresses the pressing need for experts to share ideas and discuss the technical details of policy choices.

Throughout the year, RFF scholars were invited to testify before congressional panels such as the House Ways and Means Committee; serve on advisory bodies for the California Market Advisory Committee, DOE, NASA, EPA, and National Research Council; and frequently brief congressional members and staff, the executive branch, and state and local officials on energy, climate, and other environmental issues of great public concern.

The collective result of these activities is that RFF has been propelled to the forefront of some of the most challenging and vital policy debates of our time.

We are also proud to report that two of our researchers have joined the administration: Billy Pizer is the deputy assistant secretary for environment and energy at the Treasury Department and Joe Aldy is now on leave, serving as special assistant to the president for energy and environment in the White House.

Finally, RFF is in sound financial condition, but is not, of course, immune to the financial problems facing every institution. Our reserves, on which we depend for a significant portion of our income, declined during the year. In response, we have tightened our expenses and are deferring some planned investments.

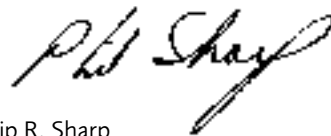
WHAT'S NEXT: 2009 AND BEYOND

RFF's knowledge base has never been more relevant or in greater demand. What may not be apparent is that our success flows from investments that the institution made many years ago. The lesson is that real impact depends on the ability to stay focused on important issues even if they are not yet at the top of the public agenda. As an institution, we will continue to focus both on near-term, urgent issues and the incubation of new ideas and solutions to challenges that may lie just over the horizon. The need for RFF's unique combination of independent, rigorous, and policy-relevant research extends to topics ranging from carbon sequestration to ecosystem management, and from food safety to public health.

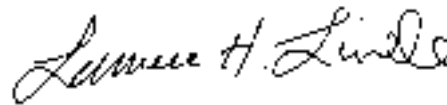
With this in mind, our work in 2009 will target four objectives:

- ▶ Generating new research to address some of the most pressing issues of our time
- ▶ Engaging policymakers and other leaders who will benefit from this new knowledge
- ▶ Fostering the next generation of thought leaders in the field of environmental policy research
- ▶ Exploring emerging frontiers that hold promise of enhancing the sustainability of our nation and society overall

On behalf of the RFF Board and staff, we invite the broader community of individuals and institutions that value rigorous academic inquiry, informed policymaking, and research-based solutions to join us as we work to make a discernible difference on the environmental policy issues that matter most to our society today.



Philip R. Sharp
President
Resources for the Future



Lawrence H. Linden
Chair
Founder and Trustee
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What We Do

The combination of scholarly and policy excellence remains the hallmark of Resources for the Future. No other think tank combines RFF's level of academic rigor with a commitment to informing policymakers in a nonpartisan way. It is our belief that not only does policy benefit from the highest quality research, but major intellectual advancements are most likely to arise from creative minds tackling important societal challenges.

Today our scholars are engaged in a broad array of issues, including helping policymakers understand the direct impact of proposed climate legislation on American households and businesses, crafting policy mechanisms to incorporate forest protection into a global climate strategy, developing innovative ways to extend the effectiveness of antibiotics and antimalarial drugs, and refining methods to measure and value ecosystems.

RFF AMONG TOP THINK TANKS

RFF continues to rank among the top institutions of its kind, as shown by a 2008 international survey published in *Foreign Policy*, encompassing nearly 170 nations. RFF was named as one of the top 25 U.S. think tanks in a field of more than 5,500 worldwide.

NEW ARRIVALS ENHANCE RFF ENGAGEMENT

This year RFF made two important additions to its leadership team. Mark Cohen joined RFF as vice president for research, a newly created position that will oversee all research programs and guide efforts to align RFF's mission with current environmental, energy, natural resource, and public health policy issues. He previously was a professor at Vanderbilt University's Owen Graduate School of Management and co-founder of the Vanderbilt Center for Environmental Management Studies. In addition, Lea Harvey, a long-time fundraising executive for leading environmental and nonprofit governing organizations, joined RFF as vice president for development. Before that, she held the same position at BoardSource, a Washington-based publishing and consulting service for nonprofit organizations. Earlier in her career she held several key positions at World Wildlife Fund from 1998 to 2005.

RFF has attracted to its ranks several individuals who combine research expertise with experience in a policy setting. These include Maureen Cropper, former lead economist at the World Bank; Stephen Brown, former director of Energy Economics and Microeconomic Policy Analysis at the Federal Reserve Bank of Dallas; and Arthur Fraas, former chief of the Natural Resources, Energy, and Agriculture Branch, Office of Information and Regulatory Affairs, Office of Management and Budget.

And with the advent of a changed political environment, RFF scholars often find the opportunity to assume influential positions in the U.S. government. In the past year, Fellow Joe Aldy began a leave of absence from RFF to serve as special assistant to the president for energy and environment in the White House. Former RFF Senior Fellow



TOP ROW FROM LEFT:
MAUREEN CROPPER,
STEVE BROWN, ART
FRAAS.

CENTER ROW FROM LEFT:
BILLY PIZER, JOE ALDY,
SANDRA HOFFMANN

FROM FAR LEFT:
ROGER COOKE, DALLAS
BURTRAW

Billy Pizer is now deputy assistant secretary for environment and energy at the Treasury Department.

PUBLIC SERVICE

RFF scholars have regularly served on prestigious government panels, and this year is no exception. To name just a few examples, RFF President Phil Sharp and former President Bob Fri serve on the NAS Committee on America's Climate Choices. Senior Fellow Dallas Burtraw was appointed to the California Market Advisory Committee to support the implementation of the state's first-in-the-nation greenhouse gas reduction program. Joe Aldy, Billy Pizer, and Roger Sedjo were among experts assembled by the GAO to assess policy options to address climate change. Molly Macauley was named to NASA's Applied Sciences Advisory Group, a congressionally requested external advisory panel. Roger Cooke was appointed to EPA's Science Advisory Board. Sandra Hoffmann is a member of the Institute of Medicine/National Research Council committee that is producing a report on biosurveillance.

ENVIRONMENT FOR DEVELOPMENT

To improve environmental policymaking in developing countries, RFF is working with the Environmental Economics Unit at the University of Gothenburg in Sweden to support national centers for environmental economic analysis in China, Costa Rica, Ethiopia, Kenya, South Africa, and Tanzania.

The Environment for Development (Efd) initiative was partly inspired by RFF's history of helping to improve policymaking by applying rigorous, objective economic analysis to important environmental and natural resource policy issues. The main activity of the Efd centers is international research collaboration. Policy instrument analysis, nonmarket valuation, and behavioral and experimental economics are used to analyze land management, forestry, fisheries, wildlife, climate change, and environmental fiscal reform. The centers also provide policy advice and training.

ENGAGEMENT WITH CONGRESS

In both formal hearings and private briefings, RFF researchers are in constant demand by members of Congress, key committees, and staff on Capitol Hill. Scholars are participating in a regular series of briefings for Senate staff on issues ranging from cost-containment options, policies to address leakage of carbon emissions and the distributional impacts of different climate policies on U.S. households.

Addressing Price Volatility in Climate Change Legislation

Dallas Burtraw

U.S. House of Representatives, Committee on Ways and Means

Competitiveness and Climate Policy: Avoiding Leakage of Jobs and Emissions

Richard D. Morgenstern

U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Energy and Environment

RESOURCES FOR THE FUTURE



Protecting Lower Income Families While Fighting Global Warming

Dallas Burtraw

U.S. House of Representatives, Committee on Ways and Means, Subcommittee on Income Security and Family Support

An Overview of the Economic Benefits of Cooperatives and Individual Fishing Quota Systems

James N. Sanchirico, RFF University Fellow

U.S. Senate, Committee on Commerce, Science, and Transportation, Subcommittee for Oceans, Atmosphere, Fisheries, and Coast Guard

The Public Policy Response

Raymond J. Kopp

U.S. Senate, Committee on Energy and Natural Resources

Review of DOE's Nuclear Energy Research and Development Program

Robert Fri

U.S. House of Representatives, Committee on Science and Technology

CONVENING AROUND MAJOR POLICY ISSUES

Economists, scientists, and policymakers come to RFF throughout the year to share insights and exchange ideas in seminars, technical workshops, and our monthly First Wednesday series.

Reforming Regulation of Food Safety

RFF Policy Leadership Forum with Treasury Secretary

Henry M. Paulson, Jr.

Organizing the Federal Government to Address Climate Change

Infrastructure Modeling for Climate Policy

Energy Policy Challenges: Is the Past Prologue?

Sixth Annual Hans Landsberg Lecture with Sloan Foundation

President Paul Joskow

Federal Policies to Reduce Federal Greenhouse Gas Emissions

Challenges in Implementation of Environmental Protection Statutes

The Future of Climate Change—A Policy Preview

Managing Costs in a U.S. GHG Trading Program

Wildfires: Private Landowners, Nature, and Public Policy

COMMUNICATIONS AND OUTREACH

RFF researchers disseminate their findings through a number of forums, sharing results with their academic peers; giving reporters needed background on important policy matters; and reaching out to stakeholders in congressional offices, federal and state agencies, and nonprofit organizations, both here and abroad. All RFF publications are available on our website, www.rff.org.

RFF in the Media

In an increasingly varied media environment, RFF continues to be cited in major news outlets as well as key trade publications and the blogosphere. Researchers have regularly appeared in *The New York Times*, *The Wall Street Journal*, *The Washington Post*, National Pub-

lic Radio, Marketplace (American Public Media), *USA Today*, *Financial Times*, *US News & World Report*, *National Journal*, and *Politico*, among many others.

Journal Articles

Articles by RFF researchers have appeared in numerous peer-reviewed journals including:

Ecological Economics

Emerging Infectious Diseases

Energy Economics

Energy Journal

Environment and Development Economics

Environmental and Resource Economics

Energy Policy

Environmental Health

Environmental Science and Technology

Journal of Urban Economics

Journal of Environmental Economics and Management

Journal of the Air and Waste Management Association

Journal of Economic Perspectives

Journal of Toxicology and Environmental Health

Proceedings of the National Academy of Sciences

National Tax Journal

Science

Transportation Research—Policy and Practice

Transportation Research Record



Issue Briefs

To capture a current public issue in a succinct yet accessible form, RFF has revived its Issue Brief series. Covering a range of topics, *Issue Briefs* provide, in digestible format and no more than 8 pages, a useful overview of a policy topic. *Issue Briefs* seek to give timely information and analysis to a broad, nontechnical audience.

International Forest Carbon in Congress: A Survey of Key Congressional Staff

Lou Leonard, Raymond J. Kopp, Nigel Purvis

Federal Funding for Conservation and Recreation: Trails Funding by the Department of Transportation

Joseph Maher

Parks and Recreation in the United States: The National Park System

Margaret A. Walls

Parks and Recreation in the United States: State Park Systems

Margaret A. Walls

Federal Funding for Conservation and Recreation: The Land and Water Conservation Fund

Margaret A. Walls

Climate Change: Top 10 Precepts for U.S. Foreign Policy

Daniel Bodansky

Climate Change and Policy Considerations: New Roles for Earth Science

Molly K. Macauley

Incorporating Resource and Environmental Change in a Nation's Economic Accounts: Roles for Earth Science Applications

Joel Darmstadter

Resources

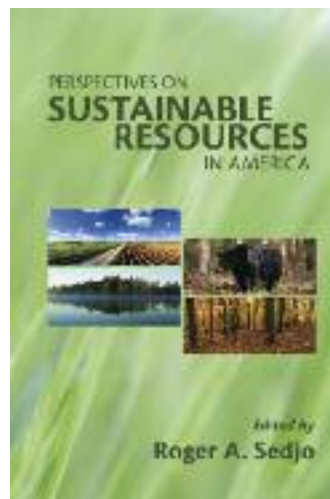
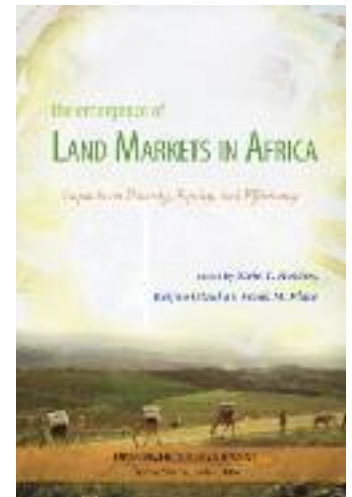
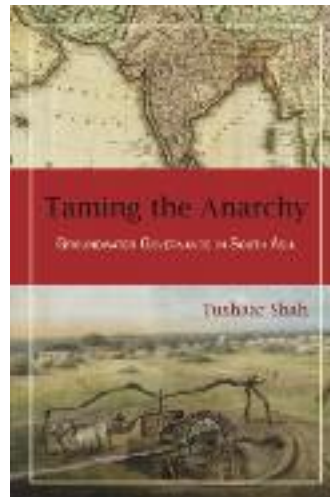
RFF's quarterly magazine provides in-depth feature stories by RFF researchers along with coverage of events here at RFF. Written for a lay audience and available free of charge, *Resources* serves as a gateway to the full range of issues and ideas that are explored here.

RFF Weekly Policy Commentary

RFF's Weekly Policy Commentary series provides an easy way for students, academics, journalists, policymakers, and the general public to learn about economic and other aspects of important environmental, natural resource, energy, urban, and public health problems. Each week, a leading expert gives a short, non-technical assessment of a particular policy topic, summarizing the current state of analysis or evidence on the issue, along with selected recommendations for further reading.

RFF Connection

RFF Connection is our regular electronic newsletter that alerts nearly 5,000 subscribers to new RFF research and policy analysis on environmental, energy, natural resource, and public health issues, forthcoming events, and selected media highlights.



RFF Press

For a comprehensive list of books published by RFF Press, please visit www.rffpress.org

Taming the Anarchy: Groundwater Governance in South Asia
Tushaar Shah

The Emergence of Land Markets in Africa: Impacts on Poverty, Equity, and Efficiency

Stein T. Holden, Keiji Otsuka, and Frank M. Place, editors

Perspectives on Sustainable Resources in America

Roger A. Sedjo, editor

Choosing Safety: A Guide to Using Probabilistic Risk Assessment and Decision Analysis in Complex, High-Consequence Systems

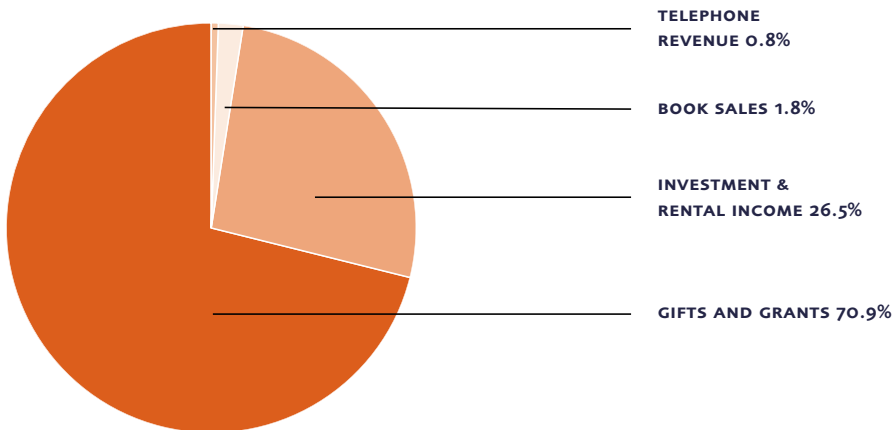
Michael V. Frank

Financial Statements

ASSETS	YEAR ENDING SEPTEMBER 30	2008	2007
CURRENT ASSETS			
Cash and cash equivalents		\$ 225,425	\$ 178,596
Grants and contracts revenue receivable		947,390	1,221,083
Contributions receivable		529,767	548,698
Other receivables		44,058	189,777
Other assets		676,928	841,535
Total current assets		\$ 2,423,568	\$ 2,979,689
Contributions receivable, net of current portion		\$ 358,370	\$ 586,228
INVESTMENTS			
Investments at fair value		26,779,483	38,379,193
Investment in land		8,900,000	8,900,000
Investment in RCC		4,184,876	4,264,773
Total investments		\$ 39,864,359	\$ 51,543,966
Fixed assets—net of accumulated depreciation		6,844,776	6,943,985
Assets held under charitable trust agreements		355,779	523,198
TOTAL ASSETS		\$ 49,846,852	\$ 62,577,066
LIABILITIES AND NET ASSETS			
CURRENT LIABILITIES			
Tax-exempt bond financing, current portion		\$ 210,000	\$ 200,000
Grants and awards payable		20,250	33,750
Accounts payable and accrued liabilities		2,017,406	1,817,536
Deferred revenue		106,224	140,411
Total current liabilities		\$ 2,353,880	\$ 2,191,697
Tax-exempt bond financing, current portion		6,345,000	6,555,000
Liabilities under split-interest agreements		384,810	587,296
Funds held for others		48,899	80,068
Total liabilities		\$ 9,132,589	\$ 9,414,061
NET ASSETS			
Unrestricted		31,953,005	44,359,901
Temporarily restricted		2,845,763	2,991,156
Permanently restricted		5,915,495	5,811,948
Total net assets		\$ 40,714,263	\$ 53,163,005
TOTAL LIABILITIES AND NET ASSETS		\$ 49,846,852	\$ 62,577,066

REVENUE

In fiscal year 2008, RFF's operating revenue was \$11.2 million, 70.9 percent of which came from individual contributions, foundation grants, corporate contributions, and government grants. RFF augments its income by an annual withdrawal from its reserve fund to support operations. At the end of fiscal year 2008, the reserve fund was valued at \$26.8 million.



CHANGES IN UNRESTRICTED NET ASSETS**REVENUE**

Individual contributions	\$ 465,559	\$ 750,648
Foundation grants	1,993,928	2,832,347
Corporate contributions	2,011,001	1,151,500
Government grants and contracts	2,016,661	2,359,512
Other institution grants	1,451,450	873,177
Rental income	2,584,937	2,318,789
Investment income net of fees	382,165	1,685,782
Telephone revenue	89,680	109,311
Book sales	201,386	318,419
Total operating revenue	\$ 11,196,767	\$ 12,399,485

EXPENSES**Programs**

Research	\$ 8,301,918	\$ 7,189,252
Academic Relations	192,838	396,162
RFF Press	531,678	564,501
Communications	1,071,225	1,003,731
Other direct	203,236	283,243
Total program expenses	\$ 10,300,895	\$ 9,436,889

Fundraising	649,236	727,413
Management and administration	1,687,278	1,659,049
Building operations and maintenance	1,238,104	1,334,026
Total functional expenses	\$ 13,875,513	\$ 13,157,377

Change in unrestricted net assets from operations	(2,678,746)	(757,892)
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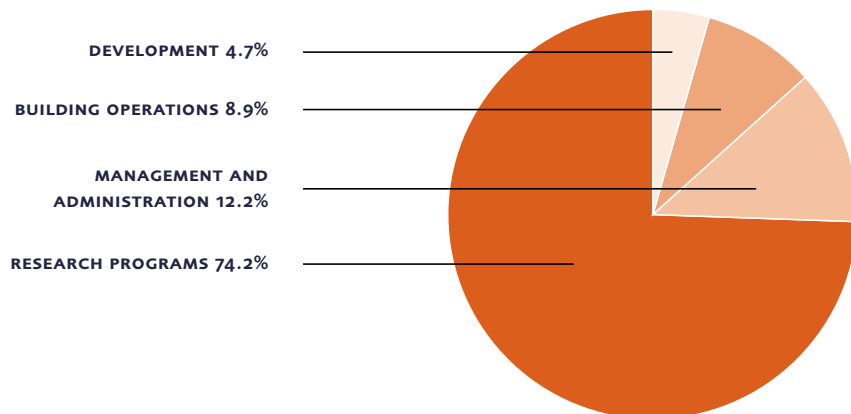
Non-operating revenues (expenses)

Realized and unrealized gains (losses) on investment transactions	(9,769,996)	3,520,063
Other	—	109,000

INCREASE (DECREASE) IN UNRESTRICTED NET ASSETS	(12,448,742)	2,871,171
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NET ASSETS AT BEGINNING OF YEAR	53,163,005	50,291,834
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NET ASSETS AT END OF YEAR	\$ 40,714,263	\$ 53,163,005
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**EXPENSES**

RFF research and educational programs continued to be vital in 2008, representing 74.2 percent of total expenses. Management and administration, and development expenses combined were only 16.9 percent of the total. The balance is related to facilities rented to other nonprofit organizations.

Individual Donors

Resources for the Future gratefully acknowledges gifts received from the following donors of \$100 and above during the 2008 fiscal year (October 1, 2007 through September 30, 2008). Donors are listed according to the cumulative total given during this period. Donors who made gifts of at least \$5,000 are designated members of RFF's Council and receive special benefits, including complimentary copies of all RFF publications, special access to RFF researchers, and invitations to Council meetings and other RFF invitation-only events.



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RFF is especially grateful to the following individuals who have included our institution in their estate plans.

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Corporate Contributors

RFF would like to thank all of the corporations and associations that supported our research and outreach efforts in 2008. These organizations share RFF's interest in informing the public policy debate—and their contributions provide much of the general support required to run our day-to-day operations. This marks the second year of our President's Circle, which recognizes those corporations and associations that donated \$50,000 or more annually. Since its founding in 1991, the RFF Council has recognized corporations and associations that contribute at least \$25,000 annually to RFF.

The individuals listed in each of these two categories represent their respective organizations on the President's Circle and Council, and make up a valuable community of corporate stakeholders on whom we rely for honest feedback on our work.

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RFF would like to thank the many philanthropic foundations and other independent organizations that provided support in 2008. These gifts help diversify our funding base, advance key projects, and extend our research on important policy issues.

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- World Wildlife Fund

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RFF receives approximately 18 percent of its total operating revenue in the form of project grants and contracts from government agencies. Government-sponsored research must be nonproprietary. That is, RFF insists on the right to share the results of the work with all participants in the policy process.

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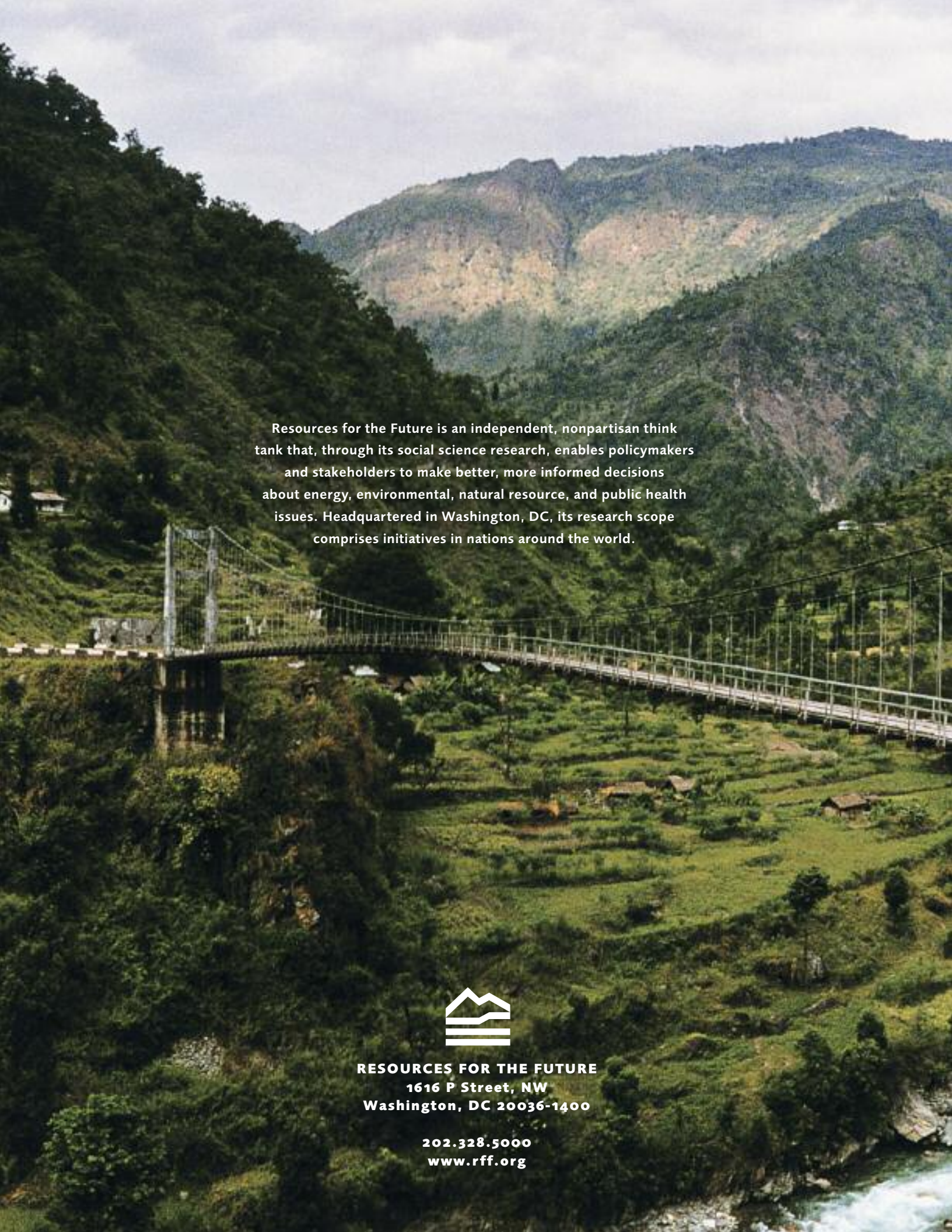
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Enormous Challenges, Enormous Rewards

10 PRECEPTS FOR U.S. CLIMATE POLICY

Daniel M. Bodansky

Climate change is a key issue for Europeans and other U.S. allies, and it was discussed at the U.S.–E.U. summit in April. It will come up again at the G8 summit in July. These negotiations, which will lead to a new international framework to succeed the Kyoto Protocol, are currently scheduled to conclude at the December 2009 Conference of the Parties in Copenhagen. In addition, congressional action on climate legislation this year will have major implications for our foreign policy stance. The need for objective analysis of the various foreign policy options and priorities is great.

Daniel Bodansky, a professor of international law at the University of Georgia, has prepared a new paper for the U.S. Global Leadership Initiative of RFF's Climate Policy Program. He identifies fundamental precepts that should guide U.S. foreign policy, based on his 15 years of experience in the climate change process as a U.S. negotiator, academic observer, and adviser to international organizations and nongovernmental groups.

A successful U.S. climate change policy promises enormous rewards. But achieving it will be an equally enormous challenge. International cooperation is essential. It will require fundamental changes in the ways that countries produce energy, transport people and products, grow food, and manufacture goods.

Many countries are still reluctant to act, and existing international institutions to organize and enforce cooperation remain weak. Breaking the international logjam on climate change is not going to be easy.

To guide U.S. climate policy as it evolves over the crucial coming months, I propose 10 fundamental precepts.

1 Seek Domestic Action First.

That means reversing past practice. When the United States negotiated the Kyoto Protocol in 1997, it lacked any meaningful domestic climate change policy. The unstated assumption was that the in-

ternational agreement would provide the impetus to domestic action—in retrospect, a fundamental miscalculation.

Effective American foreign policy depends on a strong domestic base. That is particularly true for an issue like climate change that is intertwined with virtually every aspect of domestic policy involving energy, transportation, and agriculture.

American leadership is also necessary to persuade developing countries to act. If U.S. domestic legislation were to offer a greater American effort in response to other countries' reciprocal actions, that would give the United States needed leverage in international negotiations.

2 Insist on Mitigation Commitments by all the Major Economies.

Perhaps the greatest failing of the Kyoto Protocol is that its emissions targets cover less than a third of global emissions of greenhouse gases. The United States refused to participate, and the Protocol excludes developing countries from any emissions limits. But under a business-as-usual scenario, developing countries would account for 80 percent of the growth in energy-related emissions over the next two decades.

Failure to achieve worldwide coverage of emissions restrictions would also create the potential for what's known as leakage. Activities that create emissions, like many kinds of manufacturing, would have an incentive to migrate from countries with emissions limits to those with none, undermining the effectiveness of commitments anywhere.

To some degree, developing countries have begun to recognize that they will need to take further action to address climate change. China, India, and South Africa have already put forward national plans. Of course, a new world climate agreement cannot reasonably expect developing countries to do as much as the developed. The UN Framework Convention on Climate Change (UNFCCC), the basic

legal instrument in this field, to which nearly every government in the world (including the United States) has agreed, establishes the principle that commitments should be differentiated according to states' responsibilities and capabilities. But that doesn't mean that developing countries are exempt from making any effort at all to constrain their emissions. They can be allowed different types of limits, such as targets indexed to a country's economic growth, or targets with longer timetables.

Establish a Long-Term Objective for Internal Planning Purposes, Without Seeking Agreement On It.



For many negotiators, the starting point in developing a climate policy is to set a long-term goal, expressed either as a target concentration of greenhouse gases in the atmosphere or as an overall reduction. The European Union's climate policy, for example, aims to stabilize the global concentration of carbon dioxide at 450 parts per million (ppm), whereas the G-8 in 2008 adopted the goal of a 50 percent reduction in worldwide greenhouse gas emissions by 2050.

A long-term goal can be articulated in either of two ways: internally and informally as part of the policy planning process, or by a binding international agreement. The first makes more sense. The second would probably have higher costs than benefits. An internal goal would help organize and guide decisions. It would also provide a benchmark for success. In contrast, a binding international agreement on a goal, as apparently envisioned by the UNFCCC process, would be problematic. Developing countries resist the concept, fearing that it would limit their economic growth.

Just 25 countries
account for more
than 80 percent of
global greenhouse
gas emissions.

Pursue a UNFCCC Deal Outside the UNFCCC Negotiating Process.



Ever since the UN General Assembly decided in 1990 to begin work on the UNFCCC, the negotiations have been a UN process open to all its 192 members. That has provided legitimacy, but at the expense of complicating the negotiations and making agreement more difficult.

In fact, just 25 countries account for more than 80 percent of global greenhouse gas emissions. In developing American foreign policy on climate change, it is important to recognize that the UNFCCC process is bogged down in highly ritualized discussions that involve little real negotiation, and it includes countries with a strong interest in obstructing progress. Although the UNFCCC could play a useful role in exploring options and preparing the ground, it is almost inconceivable that it can produce the key political decisions necessary to move forward. A new climate agreement will require sustained involvement by top political leaders and will need to be negotiated informally before being taken to the UNFCCC's forum for formal adoption.

Support a Flexible, Multitrack Architecture that Allows a Variety of Mitigation Approaches.



Kyoto's architecture has proved unduly narrow from a political perspective because it allows only a single type of commitment—that is, an economywide emissions target tied to historical emissions levels. States unwilling to accept a fixed target—because, for example, they fear it would put a straightjacket on their economic growth—are unable to make commitments along other lines.

The United States should seek a middle ground by supporting a multitrack approach, under which all major economies would agree to undertake commitments, but they need not all assume the same type of commitment. In addition to fixed Kyoto-style targets, the agreement might offer a wide variety of different tracks. One might be emissions targets tied to variables like a nation's gross domestic product. They could include safety valves that relax the target if the costs of compliance exceed a certain expectation. Instead of adopting emissions targets, countries could commit themselves to adopt specific policies such as carbon taxes, domestic cap-and-trade systems, efficiency standards, sustainable forestry laws, removal of energy subsidies, or funding for technology R&D.

If the United States were to decide on a target reduction of, say, 20 billion tons of carbon globally from 2010 to 2020, it could then develop a portfolio of foreign policy measures to achieve that goal.



Pursue a Legally Binding Agreement, but Seek Congressional Buy-In First and Be Open to Nonbinding Approaches.

A nonbinding agreement suffers from several significant disadvantages. It would reflect a diminished level of commitment, in turn sowing doubt about compliance. But legally binding agreements have liabilities of their own. In the United States, a treaty requires the approval of two-thirds of the Senate. That raises the real possibility that even a good treaty might fail to be ratified by the United States.

On balance, the United States should support a legally binding agreement to reduce emissions. But it should seek an agreement requiring approval through congressional action—that is, a majority in each house of Congress—rather than a treaty requiring two-thirds of the Senate. And it should seek as much buy-in from Congress as possible, perhaps through some type of fast-track authority like that used for trade agreements.



Explore Opportunities for Progress Outside the UNFCCC.

A tremendous variety of activities contribute to global warming, and there are many ways outside the UNFCCC negotiations to respond to the challenge. For example, the Montreal Protocol to protect the Earth's ozone layer governs the production of a class of chemicals that are also powerful contributors to warming. The parties to the Montreal Protocol decided last year to accelerate the phase-out of these chemicals and, by some estimates, their action will have a substantially bigger impact on the climate than the Kyoto Protocol's first commitment period, 2008 through 2012.

If the United States were to decide on a target reduction of, say, 20 billion tons of carbon globally from 2010 to 2020, it could then develop a portfolio of foreign policy measures to achieve that goal. It could include measures under the UNFCCC process, under the Mon-

treil Protocol, by the International Maritime Organization to address black carbon from ships, and by the International Civil Aviation Organization on aircraft emissions.

There will be opportunities for international cooperation on the development of the technologies needed to restrain or, conceivably, offset global warming. Geoengineering—the term refers to a variety of techniques to control warming either by reducing incoming solar radiation or removing carbon dioxide from the atmosphere—raises understandable concern about the potential for unintended consequences. But given the magnitude of the risks posed by global warming and the difficulties of reducing emissions, geoengineering could ultimately prove necessary, particularly as a means of buying time.



Vigorously Support Adaptation Efforts.

Adaptation measures include planning exercises to develop risk-reduction strategies, capacity-building efforts, and financial assistance for adaptation projects. Several arguments support increased assistance by the United States. It is the right thing to do morally, given its historical contribution to global warming. It would garner good-will among developing countries and facilitate discussions of

mitigation. And it would reduce the risk that poor, vulnerable countries might collapse in the face of climate change, producing environmental refugees and regional insecurity. The United States should, in particular, develop a comprehensive strategy to address the adaptation needs of developing countries.

9 Use Financial Support as an Incentive for Action and Commitment from Developing Countries.

Although the climate change regime has prompted the creation of a number of funds to help developing countries, the total has been small, in the low billions of dollars, relative to the threat. The United States and other developed countries could reduce emissions at much lower cost by financing projects in developing countries rather than at home.

The Kyoto Protocol's Clean Development Mechanism (CDM) seeks to encourage emissions reductions by granting credits on a project-by-project basis. But its effectiveness has been limited by the high transaction costs of documenting reductions. The United States should support expanding the CDM to allow crediting reductions on a sectoral basis or as a result of general policies, such as energy efficiency standards. Credit should also be given for reductions in emissions from deforestation and degradation.

Although the Kyoto Protocol's compliance system is generally considered one of the strongest to date in international environmental law, it depends on the assumption that countries will feel sufficient international and domestic pressure to meet their targets.

10 Keep Trade Measures on the Table to Promote Participation and Compliance.

Given the public goods character of climate change mitigation, countries have a significant incentive to seek a free ride on the efforts of others. Although the Kyoto Protocol's compliance system is generally considered one of the strongest to date in international environmental law, it depends on the assumption that countries will feel sufficient international and domestic pressure to meet their targets. Whether that assumption is correct remains an open question.

Trade-based approaches constitute a credible and effective tool to encourage countries to join the regime and to promote compliance with it. Levying a fee on imports from countries that fail to comply, based on the carbon dioxide emitted to produce the goods, would protect domestic firms from unfair competition.

Even raising the threat of trade measures is not without risk. It could create a contentious negotiating dynamic and help legitimize the possible use of trade measures against the United States. But given the stakes involved in climate change policy and the lack of strong alternatives to promote participation and compliance, the advantages of having the trade option on the table outweigh those risks.

These ten precepts do not address all the questions confronting policymakers. But they provide a firm base from which American negotiators can begin. Negotiators will have to navigate between two competing positions. On one side, developing countries, notably China and India, are reluctant to accept commitments to cut their own emissions. And on the other, the European Union is pressing all developed countries for sharp cuts that go well beyond the domestic consensus in the United States.

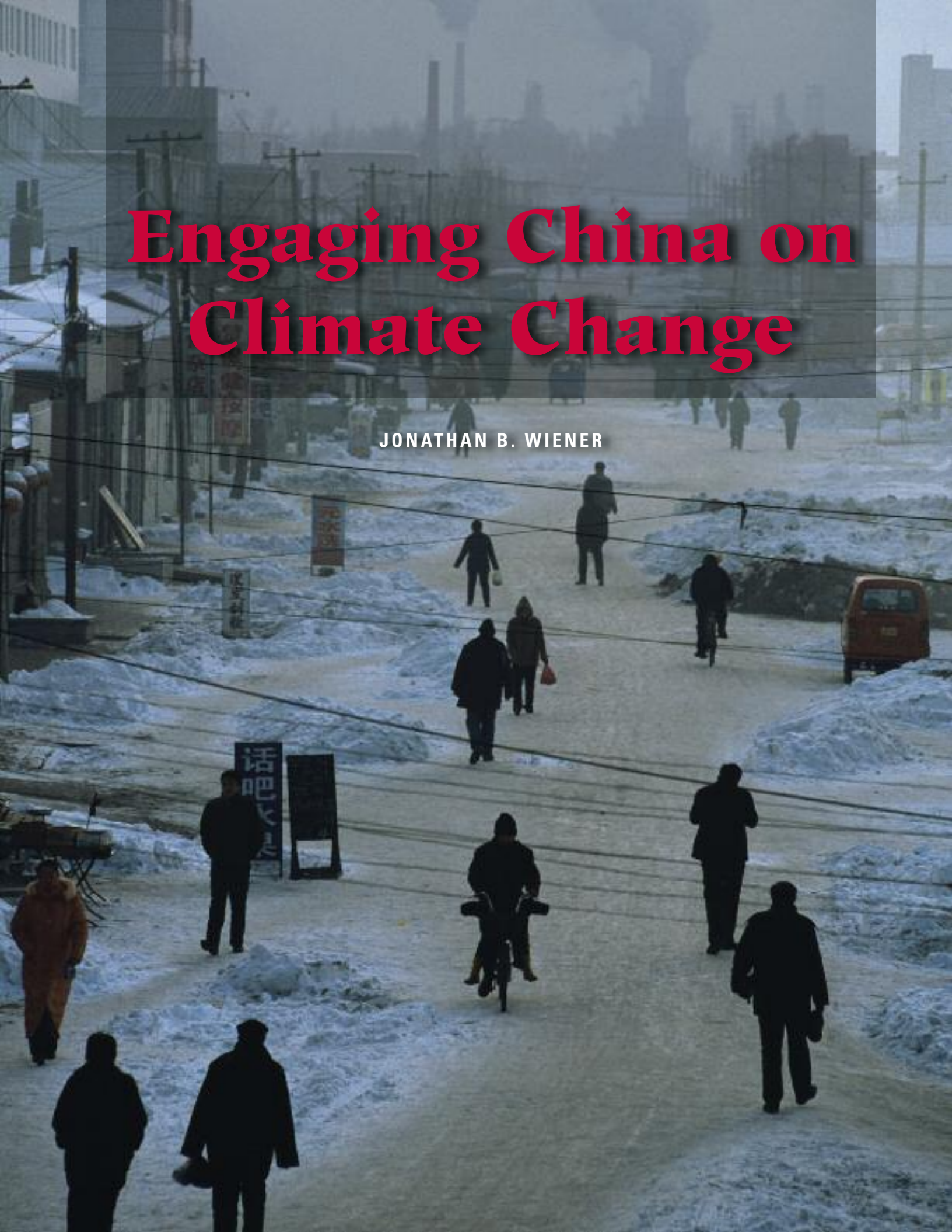
Meeting the climate change challenge will require a full-court press, not just action under the UNFCCC. And it will require not only the application of existing models, such as fixed emissions targets and trading, but the development of creative alternatives. ■

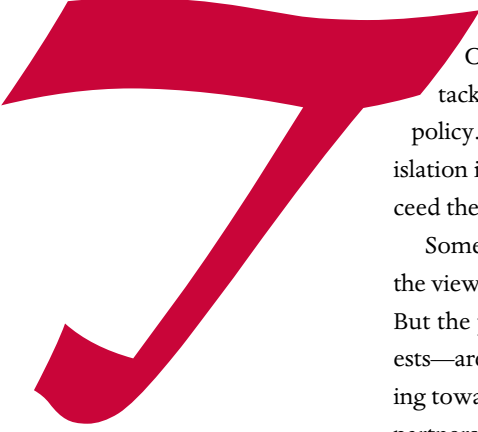
This article is adapted from an issue brief by the author, "Climate Change: Top 10 Precepts for U.S. Foreign Policy," RFF Climate Policy Program, RFF 18-09-01, January 2009.

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Engaging China on Climate Change

JONATHAN B. WIENER





o reduce global emissions of greenhouse gases, the United States must act, and it must engage China in serious action. But can this be done? The challenge is great, yet too important not to tackle. Indeed, we need to address it promptly. The year 2009 may be pivotal for climate change policy. The Obama administration has taken office and must face this question head on. Climate legislation is pending in Congress. And the Bali Action Plan calls for negotiations on a new treaty, to succeed the Kyoto Protocol, to be completed by the end of this year.

Some have argued that China cannot be persuaded to limit its greenhouse gas emissions, based on the view that China's leaders see such action as harmful to China's national interest in economic growth. But the prospects for engaging China in climate policy—by appealing to China's own national interests—are brighter than this view implies. China's domestic and international interests appear to be shifting toward support for limiting its emissions, provided the United States engages China in a respectful partnership through an effective international climate regime. Here I examine six key factors driving this shift: rising climate impacts, public health co-benefits, distributional impacts and extreme events linked to political instability, falling costs of abatement, China's rise to great power status, and the design of the international climate policy regime itself.

Global Emissions and China

Though the United States had long been the world's top emitter of greenhouse gases (GHGs), China's emissions have been growing rapidly. A decade ago, around the time of the Kyoto Protocol negotiations, China and other developing countries were predicted to surpass the United States and other industrialized countries in carbon dioxide (CO₂) emissions by about 2030. But by late 2006, experts at the International Energy Agency forecast that date advancing to 2009; just a few months later, in early 2007, they updated the timing to 2007 itself. (Although America's cumulative contributions since 1800 still exceed China's, that gap is narrowing quickly.) China is now the world's largest CO₂ emitter, and its emissions continue to grow faster than those of other major countries. A recent Electric Power Research Institute study projects that GHG emissions from China and other developing countries are growing so fast that they would push global atmospheric GHG concentrations beyond 450 parts per million (ppm) by the year 2070 (up from a level of 275 ppm about two centuries ago, and 380 ppm nowadays), even if all emissions from industrialized countries such as the United States and those in Europe were reduced to zero today.

Moreover, there is a further reason to engage China: the phenomenon of international emissions "leakage." Emissions limits adopted by the United States alone (or even in concert with Europe) would not only fail to restrain China's rapidly growing emissions, but worse: in a dynamic global economy, such partial regulatory coverage would induce transnational leakage of emissions-intensive activities from more-regulated to less-regulated countries. Changes in world prices for resources such as fossil fuels and timber, spurred by partial GHG limits, can also yield increased emissions in less regulated countries. Studies at MIT and elsewhere suggest that such leakage could be quite significant. There is even anecdotal evidence that leakage from Europe to China (such as in steel manufacturing) may have contributed to part of China's faster-than-expected emissions growth over the last few years.

Leakage shapes politics as well. The fear of emissions leakage draining international competitiveness and jobs can sap the political will needed to adopt emissions limits. This fear was a key factor in the U.S. Senate's unanimous rejection of the Kyoto Protocol in 1997. Although Congress is more supportive of climate legislation today, it is still less likely to act without at least some corresponding action by China and other major emitters. Meanwhile, leakage makes China's economy more emissions-intensive, raising the cost of persuading China to adopt emissions limits.

Persuading China

Our challenge is to achieve the global public good of climate protection—averting a tragedy of the global commons—through consensual action by heterogeneous national actors. How can the United States act and engage China on climate change, as well as on other major issues, based on our common interests and despite our significant differences?

As with many other social problems, there are at least two basic approaches one might take to influence behavior: accept people as they are and try to change the incentives and institutions that guide their behavior; or try to change the people, their preferences, values, and internal norms, so that they think differently. That is, one can design external incentives or inculcate internal norms (or both): change the rules or change the players.

In international relations theory, as strategies to persuade national governments to act, these two approaches are termed “realism” with “thin persuasion” through incentives, information, and bargaining; and “constructivism” with “thick persuasion” through changing deeper preferences, norms, and identities. (Realist persuasion can include appeals to domestic institutions and interest groups. The state is not a monolith; successful international strategies often must look beyond national aggregate net benefits to address key elements of the domestic distribution of interests.)

A constructivist strategy to reshape norms may accomplish some results over time in the United States, but trying to push China (or other countries) to adopt new norms may achieve little, or could even prove counterproductive. Humility in a world of cultural pluralism counsels caution. Inculcating norms could backfire if it were seen in China as patronizing or an “eco-imperialist” throwback to colonial hubris. A culture clash might mean more coal combustion in China, not less. Past zeal for a cultural transformation in China, such as China’s “cultural revolution” and its “great leap forward,” driven by appeals to ideological orthodoxy, are hardly inspiring precedents. The real advances in recent Chinese development have come from liberal economic policies—specifically from reformed incentives.

Even in U.S. environmental policy, championing virtue over incentives has led, at least at times, to absolutist approaches that neglected pragmatic incentives and trade-offs. The old notion that pollution is a sin to be expiated by costly absolutist controls is now progressively being succeeded by the use of economic incentive instruments (such as cap-and-trade systems) that internalize harms and reconstitute markets to prevent pollution, achieving more environmental protection at less cost. For climate policy, these cost savings are highly significant, roughly on the order of 75 to 90 percent less to limit GHG emissions through a comprehensive cap-and-trade approach than to adopt narrow inflexible policies. And lower cost also means more likely adoption and enforcement by governments worried about their struggling economies.

Climate policy should not be about ideology, but about what works—how to design and aim incentives. Constructivist cultural change may be too slow. Decisions about long-term investments in energy generation are being made now. Changing incentives now can affect those choices; inculcating a mass cultural transformation may take too long. The last three decades of Chinese leadership—from Deng to Jiang to Hu—show that the Chinese economy can respond rapidly and creatively to changes in rules and incentives.

Aligning National Interests and International Incentives

China’s national interest in climate policy is no longer as negative as had been supposed. China’s perceived benefits of climate policy appear to be rising and its perceived costs appear to be falling. The United States can seize this opportunity by designing a cost-effective international climate policy regime that engages cooperation by China.

China is now the world's largest CO₂ emitter, and its emissions continue to grow faster than those of other major countries.

China's leadership is concerned not only about aggregate impacts but also about the distribution of impacts across the country and their influence on political stability.

The aggregate impacts of climate change on China now look more serious. In the 1990s, some studies found that some changes, including longer growing seasons in northern China, could be benign. These studies could well have influenced the Chinese government's perception of the payoffs from a climate treaty regime and militated against its joining. But more recent studies, some conducted by Chinese experts, have started to show more negative impacts from climate change in China, including drought in northern China, flooding along southern rivers as glaciers melt, and sea level rise along the coast.

Second, climate policy could yield co-benefits in control of local conventional pollution, which has become severe, estimated by a World Bank study to kill perhaps 400,000 to 750,000 people per year and to cost about six percent of Chinese gross domestic product. If it also reduces emissions of conventional air pollutants from fossil fuel combustion, climate policy to reduce GHG emissions could simultaneously deliver important improvements in public health. (Some GHGs themselves, such as black carbon soot, appear to be culprits in both climate change and local public health effects.)

The Chinese leadership has put a high priority on reducing pollution, under the rubric of President Hu Jintao's official principles of "harmonious society" and the "scientific concept of development." In February 2008, the leadership reorganized the Chinese government into five "superministries," one of which is devoted to the environment. China has also set targets for greater energy efficiency, renewables, and for reducing pollution.

Third, China is concerned not only about aggregate impacts but especially about the distribution of adverse environmental impacts across the country, and about their influence on political stability. In every country, national net benefits are not monolithic, but interact with domestic political institutions and structures, which may help account for national action. Within China, the stunning rate of economic growth has brought with it widening income inequality and a huge wave of internal migration, with some 300 to 400 million people trying to move from rural areas to cities. China is especially worried about water availability (drought in the north, flooding in the south), water pollution, and air pollution. The Chinese leadership may plausibly fear that health and pollution problems amidst rising expectations may yield unrest.

Research in climate history has begun to suggest that rapid climate changes in China in past millennia have been associated with wars and the ends of ruling dynasties. Along similar lines, traditional Chinese beliefs (expounded by the ancient philosopher Dong Zhongshu) linked extreme environmental events to impending political upheaval. Although modernization may have reduced the intensity of these beliefs in China, gradual political liberalization may have allowed these ideas to become more prevalent, or at least more openly acknowledged. One recent example is public mention of the Tangshan earthquake that killed 250,000 people just before Mao Zedong died in 1976. And during the Lunar New Year in February 2008, strong snowstorms blocked railroad transportation, stranding millions of workers trying to head home from cities to rural areas for the holiday. Prime Minister Wen Jiabao personally appeared at a train station to apologize for the government's failure to handle the problem—evidently the first such personal apology in decades.

These historical records and traditional views coincide with the recent rise of environmental advocacy groups in China. Although far more limited than in the United States, pressure groups in China are increasingly seeking redress for environmental injury through protest and litigation (though limits on litigation can yield more protest). Frustration with government decisions is a common factor behind recent protests, including the outcry over the recent chemical facility project in Xiamen and the collapse of schools in the Sichuan earthquake.

The tensions within China—between urban and rural, rich and poor, wenbao versus huanbao (jobs versus environment), and explosive economic growth partly offset by costs of pollution—all illustrate the deep internal and distributional problems confronting China's leaders in the environmental arena. Climate change adds the potential for even more acute distributional tensions and upheaval.

Fourth, at the same time that the benefits of climate protection are rising, marginal emissions abatement costs may be declining. Technological change is improving the availability of options such as wind



energy and carbon capture and storage (ccs), and China is beginning to set aside space for ccs systems at its coal-fired power plants. The international climate treaties to date appear to assume that technological innovation occurs in the United States, Europe, and Japan, and must be transferred to developing countries. But China itself, like Korea and Taiwan, is becoming a more active arena of technological innovation (such as solar photovoltaic cells and batteries). And emissions abatement costs may also fall due to institutional innovation, such as the use of market-based cap-and-trade systems, which are now (with assistance from RFF, Environmental Defense, and others) being applied in China to control local air pollution.

Fifth, the net benefits to China from forestalling climate change are not limited to the physical impacts occurring within its borders. China's peaceful rise to great power status and hence its greater economic and political interdependence with other countries makes those external relations impacts all the more salient. For example, flooding, coastal dislocations, or food shortages in South Asia could pose problems for China in the form of refugee migrations, lost commerce, and even national security. The mid-1990s famine in North Korea drove hundreds of thousands of refugees into China. And if India and Africa suffer serious losses from climate change, then China, the world's largest emitter and a leader of the group of developing countries, might prefer to be part of the solution rather than part of the problem.

China's leaders may envision their role involving greater global responsibility and initiative. During the 1997–1998 Asian financial crisis, China acted to help pull other Asian countries out of their downward spiral, suggesting that China might undertake some economic sacrifice to build its role as a world leader. More recently, China's agreement on the phase-out of hydrochlorofluorocarbons (HCFCs) in September 2007, its cooperation with the United States on the Asia-Pacific Partnership for Climate Change and Development and climate-friendly technology, and its agreement to “measurable, verifiable and reportable” emissions reductions in the Bali Action Plan provide continuing evidence of its growing interest in taking a leadership role on global environmental issues.

Lastly, the design of the international climate change treaty itself can be crucial in engaging China. Treaties bind only countries that consent. Treaty designs that impose net costs on a country are unlikely to attract consent. An international comprehensive cap-and-trade system with equitable allowance allocations can both reduce costs to the United States (compared to a unilateral U.S. policy or a treaty with no trading), and offer net gains to China (even compared to no emissions limitation obligations), while helping to protect the planet from dangerous climate change. Such an incentive-based treaty could be developed through a new and mutually respectful partnership between these two global powers. ■

This feature is adapted from a longer article by the author, “Climate Change Policy and Policy Change in China.” *UCLA Law Review* 55: 1805–1826 (2008).

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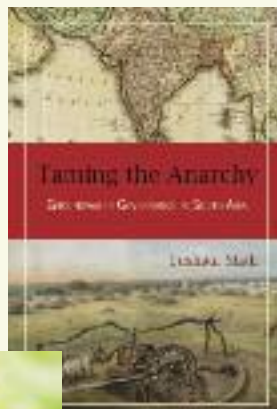
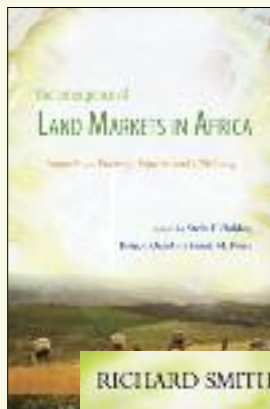
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