


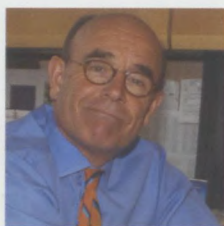
RESOURCES

RESOURCES FOR THE FUTURE  SPRING 2005 · ISSUE NUMBER 157

Post-Kyoto: Where Do We Go From Here?



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SPRING 2005 · ISSUE NUMBER 157



RESOURCES FOR THE FUTURE

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Published quarterly since 1959, *Resources* (ISSN 0048-7376) contains news of research and policy analysis regarding natural resources and the environment. The views offered are those of the contributors and should not be attributed to Resources for the Future, its directors, or its officers.

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Resources is sent to individuals and institutions at no cost. To subscribe, contact Scott Hase at RFF (hase@rff.org) or 202-328-5006. The publication is also available on the RFF website, www.rff.org.

Cover illustration by Randy Lyhus

Design and production: Meadows Design Office, Inc.

♻️ Printed with soy-based inks on 50% recycled (and recyclable) paper containing 15% post-consumer fiber; processed chlorine free.



PAUL R. PORTNEY

A Fond, Final Farewell

This will be my last *Resources* letter as RFF's president. Such occasions typically revert to retrospectives, rehashes, perhaps even a little regret. That will not be the case here. During my tenure, RFF has been blessed with an outstanding staff of researchers, the wherewithal to analyze significant issues, and the means to inject our findings into the public policy process.

In another section of these pages, I reflect on how that process has changed during my career at RFF and how our research agenda has moved to encompass an ever-changing policy environment. I hope those musings will be of interest to the many thousands of readers that this magazine reaches.

As I move to exciting new opportunities as dean of the Eller College of Management at the University of Arizona, I probably will not have the chance to meet my successor in this job immediately. If I did, I would offer three guiding suggestions:

First, realize that what makes RFF unique among think tanks is that we do *original* research—rather than synthesize the work of others into new products. Our scholars come to RFF precisely because they want to do seminal research, and it is important to understand the challenges and rigor that such work entails.

Second, RFF has performed a valuable service to the United States and the world precisely because we do not advance any party line or ideological agenda. Anyone who knows RFF—including people who will disagree with us vigorously from time to time—will acknowledge that our conclusions follow from where the facts lead us. That is the *sine qua non* for our success and reputation.

Third, RFF is filled with top-notch people who take their *research* very seriously, but in general don't taken *themselves* too seriously. The typical RFF researcher is informal but hard working—the antithesis of the Washington stuffed shirt. People here relate to those in government and in other policymaking bodies as peers and colleagues who are working toward improving the common good. That makes RFF a fun and friendly place, and I hope we will never lose that prevailing attitude.

All in all, it has been a joy to be associated with such dedicated people who both carry out and support RFF's mission. I leave with utmost confidence that even greater accomplishments will be attained in years to come.

Paul R. Portney

When It Comes to Climate Change, the Important Thing Is Simply to Begin, Says Major Mining Executive

Climate change is a long-term problem that requires immediate and constructive stakeholder engagement, Preston Chiaro, chief executive of the Rio Tinto Energy Division, said in a speech at RFF in February.

Chiaro delivered the 2005 Hans Landsberg Memorial Lecture with remarks titled "Adapting to a Changing Climate." Rio Tinto is the second-largest mining company in the world. The company considers itself a leader in sustainable development.

To illustrate his views on the climate change debate, Chiaro drew on a statement attributed to Alexander the Great about a major battle where his troops were completely outnumbered: "The obstacles may seem insurmountable. Our information is imperfect. We will probably make mistakes along the way. There is no assurance of success. The generals are offering conflicting advice. The most important thing is simply to begin."

Chiaro said there are no quick solutions to our energy situation, citing an International Energy Agency report that forecasted world energy demand to rise 66 percent by 2030, with fossil fuels meeting 90 percent of that increase.

"Coal use has increased every year for centuries, and energy experts will tell you that, although its proportional contribution to world energy

demand may diminish, its actual use is likely to continue to increase for the foreseeable future," Chiaro said.

There are a number of fundamental reasons for this, but the three most important are security of supply, availability, and affordability, Chiaro said. The world consumed about five billion tons of coal in 2004, and, of that total, the United States used about one billion tons. But China has overtaken the United States as the world's coal giant, he said. In 2004 alone, China expanded coal production by nearly 250 million tons, bringing its total for last year to almost two billion tons.

"On a simplistic level you might say the answer to coal's carbon dioxide emissions is simply to stop burning

the coal," Chiaro said. But developing countries like China and India are justifiably seeking the same quality of life that we in the developed world enjoy, he said.

Right now, coal fuels 90 percent of China's electricity demands and 70 percent of India's, and for good reason, Chiaro said. Proven coal reserves are vast in these countries, so it is affordable. And there are no ready alternatives to this basic reality, he said.

"Real change will take 20 to 50 years," Chiaro said, "not only because it will take that long for government policies to come to grips with the issue, but also because of the long capital cycles inherent in the energy industry. But I am certainly not advocating a go-slow approach."

"It is critical to act now," Chiaro said, "precisely because these developments will take time. Stabilizing concentrations of greenhouse gases in the atmosphere will require fundamental changes in the energy system worldwide."

The Hans Landsberg Memorial Lecture is an annual event dedicated to the memory of Landsberg, a pioneer in energy and mineral economics who was a devoted member of the RFF staff for nearly 40 years. ■

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Chiaro said, "not only because it will take that

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with the issue, but also because of the long

capital cycles inherent in the energy industry."

Sudden Catastrophic Change: Costing out the Challenge of Preparing for the Worst

Stopping asteroids from destroying the earth shouldn't only be the province of action heroes like Bruce Willis, according to Richard Posner, the author of numerous books and a judge on the U.S. Court of Appeals for the Seventh Circuit. He came to RFF in March to talk about his new book, *Catastrophe: Risk and Response* (Oxford 2004). In it, he explores how and why we should move public discussion about global disasters, such as a major bioterrorist attack or the abrupt onset of severe global warming, out of movie theater lobbies and into the halls of Congress and beyond. His focus is on "catastrophic" events, which he defines as those threatening the entire global population or very large parts of it.

The general public has a limited grasp of how new technologies, like gene splicing, can supercharge a terrorist's efforts, Posner said. Scientists are close to synthesizing smallpox and have already figured out the molecular structure of cholera. Add ready access to information through the Internet and the relative ease of international travel and you have a recipe for disaster, he said.

In an era where the means exist to possibly avert at least some disasters, such as by mapping the 200,000-plus asteroids that orbit our planet, Posner questioned why there is so little federal support. NASA's efforts toward



cataloguing the asteroids will likely take at least another decade.

Politicians as well as public citizens feel baffled when they try to think about events that have a very low probability of occurring. Part of the blame is due to what Posner called the "imagination cost." These kinds of hazards are "too weird for most people to take seriously," he said. Only when they see the results for their own eyes, like the ravages of the devastating tsunami last December, can they begin to grasp disasters on such a large scale and to take action. ■

Is Deregulating Electricity the Best Idea?

Challenges posed by introducing competition in the electricity market are unlike those in any other sector. Efforts to deregulate that market raise issues that have been discussed by economists for nearly 30 years, began Peter Van Doren, editor of *Regulation* magazine, at a recent RFF First Wednesday seminar.

The seminar, "Regulating the Electricity Sector: Time to Reconsider?" also featured Rod Gramlich, of the Federal Energy Regulatory Commission, and was moderated by Karen Palmer, an RFF senior fellow and expert on electricity policy.

Van Doren argued that the restructuring process put into place in the 1970s has not worked the way it was supposed to. Electricity prices are still wrong all the time, being too low on-peak and too high off-peak, and while the performance of wholesale electricity markets has improved, retail pricing has not. Additionally, the California market collapse in 2000–2001 created concern in other states that restructuring might cause them similar problems.

Prices vary greatly between regulated and deregulated states, from 4.3 cents per kilowatt-hour (kWh) in Kentucky (a regulated state) to 11.3 cents per kWh in New York (a deregulated state). The difference in pricing, Van Doren explained, comes from variations in the mixture of electricity sources, regulations established by the

Clean Air Act, and other factors that vary by location. Eliminating this price discrepancy, he continued, would result in a one-time increase in wealth for producers in places like Kentucky and in continued higher costs to consumers everywhere. Lawyers and politicians have not yet addressed the political problems that could result from such a situation, while states and utilities continue to focus only on their corner of the picture. However, he admitted, any gains in efficiency might not be large enough to cover the costs of the transfer payments that would be necessary to make all parties agree to the change.

Taking the opposing view, Gramlich argued that states are seeing the benefits of competitive regional markets. He advocated regional transmission organizations as a way to ensure that all companies have equal access to power lines. Gramlich disagreed that the system is no better off now than it was three decades ago. Companies are now trading power in wholesale markets, sometimes across large distances; generators are more efficient; and consumers have more choices. He noted that the hybrid approach taken in the gas and telecommunications industries—segments with monopolies were regulated and functions where competition was possible were deregulated—has worked and should be a model for electricity.

The two presentations, and questions that followed, often highlighted the starkly different views and possibilities facing the electricity sector. However, both speakers agreed that this industry is a challenging candidate for deregulation, with complicated issues and questions on the magnitude of the potential gains to society and, especially, who pays for deregulation and who ultimately benefits at the center of it all. ■

Increasing Fuel Economy Will Do More than Just Improve Air Quality, Portney Testifies

The importance of raising the corporate average fuel economy (CAFE) standards goes beyond the environmental benefits gained from reduced emissions, RFF President Paul Portney told the House Science Committee during a hearing in February. In a time of heightened national security and high oil prices, better fuel economy could help solve these problems, he said.

The focus of the hearing was specifically on whether improvements in fuel economy could only come through making vehicles lighter and therefore less safe. Portney was asked to testify because of his service as the chair of a National Research Council (NRC) committee on the effectiveness and impact of the CAFE standards, which produced a comprehensive report in 2001.

Summarizing the NRC report's findings, Portney said the CAFE standards "indisputably played an important role in maintaining higher fuel economy, especially during periods when gasoline prices were much lower than those prevailing today." But there were adverse consequences as well, he said: the majority of the NRC committee members concluded that design modifications prompted by the standards in the 1970s and '80s resulted in additional fatalities.

The committee stopped short of issuing specific recommendations about

whether or by how much the standards should be raised, according to Portney. These decisions were best left to Congress, the president, and appointed officials because of the trade-offs involved, in the committee's view. These caveats aside, the committee did determine that significant improvements in fuel economy are quite possible at reasonable cost.

New technologies exist—such as variable transmissions and variable valve lift and timing—to decrease fuel usage without resorting to downsizing and downweighting vehicles, Portney said. Manufacturers in Europe and Japan, where drivers face higher fuel prices than Americans do, already have these concepts under development, he said.

Auto manufacturers need to be given enough time to incorporate these technologies, so industry won't feel that its only recourse is to reduce weight, Portney said. The committee also recommended that a moderate increase in fuel taxes, along with tradable fuel economy "credits," be considered in tandem with increasing fuel economy.

But, Portney stated, a lot has changed in the three years since the NRC report was issued that will continue to influence the fuel economy debate, well beyond discussions over vehicle weight and accident rates. "The events of September 11, 2001, and their ongoing aftermath have made us think much more seriously than before about

the consequences of U.S. oil consumption and our growing dependence on foreign oil.”

Oil prices have risen considerably since 2001, principally a reflection of growing demand in the developing world, Portney said. If sustained, these higher prices should be a stimulus for the production of more fuel-efficient vehicles, for the simple reason that people will demand better fuel economy. The externalities, or seemingly unrelated consequences, associated with increased oil consumption—environmental problems, national security—would still justify government intervention to further improve fuel economy, he said.

In its deliberations on new technologies, the NRC committee gave short shrift to either gas-electric hybrids or diesel-powered cars and trucks, Portney said. The former were seen to be too expensive to make a significant difference over the next 10 to 15 years, while the latter faced stiff challenges related to vehicle emissions standards. “We may have been too conservative in both these assessments,” he said. Hybrid vehicles sales have soared in the years since then and considerable progress has been made in the development of cleaner diesel engines, which is significant because they get 30 percent better fuel economy than conventional internal combustion engines.

And finally, Portney said, the NRC committee should have paid more attention to the rebound effect, where people tend to drive more because they get more miles to the gallon. Citing research by several RFF scholars, he said that the resulting increase in miles driven—with the corresponding effects on congestion, air pollution, and accident risks—would essentially cancel out the potential economic and environmental benefits



of the improvement in fuel economy. All these issues must be taken into account as the government moves for-

ward with examining fuel economy in general and the CAFE standards in particular. ■

RFF Researchers and Chinese Colleagues Exchange Ideas on Curbing Air Pollution

Ramanan Laxminarayan

Recent decades have been witness to remarkable advances in China's industrialization. While these advances have improved the economic well-being of many Chinese, the accompanying increases in industrial emissions and consumption of fossil fuels, and the rapidly expanding rate of private ownership of vehicles have been responsible for the degradation of air quality in many Chinese cities. Urban areas currently experience high ambient concentrations of particulates and sulfur dioxide (SO₂)—pollutants that have been implicated in premature death and serious illnesses.

Responding to deteriorating air quality, in 1996 the Chinese govern-

ment initiated the policy of “One Control and Two Compliances,” which set emissions standards in mass rather than concentration terms and required cities to implement so-called Total Emissions Control. Each province and city was required to bring its total emissions of particulates, SO₂, and other pollutants within the targets designated by the national government. The policy also required some key Chinese cities to meet the national ambient air quality standards by 2000, a deadline that was later extended until 2002 and later still to 2005.

The results of this policy have been mixed; some cities have achieved some gains in reducing emissions

while others are bearing witness to further increases. My RFF colleagues and I have been interested in why some cities have been more successful than others at improving air quality and how these improvements have come about.

In order to explore these questions, RFF researchers, in collaboration with their colleagues at the Chinese Academy of Environmental Planning (CAEP) organized a workshop in Sanya (Hainan Province) in November 2004. The two-day workshop featured participants from RFF, CAEP, U.S. EPA, state-owned enterprises, the Environmental Protection Bureaus of a number of cities (including Beijing, Taiyuan, Datong, and Hangzhou), and public health programs in Taiyuan and Datong.

The workshop focused both on Taiyuan's experience in implementing a system for improved monitoring and compliance, as well as on the approaches taken by a number of other cities in China. RFF researchers have

been working with Taiyuan officials on curbing air pollution for several years.

Day one of the workshop was directed at monitoring and compliance, in the context of Taiyuan's experience with implementing SO₂ trading. This led to an exchange of information and findings concerning performance measures for the SO₂ trading system, such as emissions reductions and ambient concentrations, number of violations, and fines collected. Day two dealt with broader policy questions related to the past experience of other cities and future expectations for improvements in air quality. Different cities have taken a variety of approaches to improving air quality and it was not clear that wealthier cities had necessarily done better than relatively poorer ones.

The workshop was funded by a grant from the U.S. National Institutes of Health as part of a larger program to study the linkages between health, environment, and economic development in low- and middle-income countries. ■

Headlines Don't Tell the Real Story About Food Safety

Sandra A. Hoffmann

Food safety problems are never out of the headlines for long. It may be an outbreak in Pennsylvania from bad luncheon meat or a trade dispute centered on whether Canadian cattle might carry bovine spongiform encephalopathy (BSE), also known as mad cow disease. The system we have for keeping our food supply safe dates back to the early 1900s. And many of the basic statutory provisions have not changed much since then, despite huge transformations in science, technology, and industry and consumer behavior. Too often in the United States, it's the most recent news stories or these century-old statutes that drive food safety priorities, rather than the best scientific information.

Everyone—from the National Academy of Sciences, to the Government Accountability Office, to both consumer and industry groups—agrees that we need to move to a system where decisions are instead driven by our best scientific knowledge. Despite repeated calls for a “science-based” food safety system in the United States, the idea remains a largely aspirational goal.

Progress is being made on many fronts. FDA, USDA, and the Commerce Department have adopted a new preventive approach to food safety regulation, called Hazard Analysis and Critical Control Point or HACCP. These new regulations require juice, dairy, seafood, and meat



RFF researchers Alan Krupnick, Richard Morgenstern, and Ramanan Laxminarayan with their Chinese colleagues at the Workshop on Policy Activities to Improve Urban Air Quality in Sanya, China.

and poultry processors to study their production systems, identify critical points where pathogen control is needed, and to take action to manage and monitor those points.

Another major effort has been the Centers for Disease Control's (CDC) work to improve monitoring of foodborne illness in the United States. Since 1995, CDC, together with local agencies and FDA and USDA, has been developing a new, active surveillance system called FoodNet, to monitor foodborne disease. In this new system, CDC proactively monitors selected clinical laboratories for foodborne illness rather than passively depending on laboratories to report to them through state health departments. CDC plans on gradually expanding the system from its current coverage of six states and five urban areas. Advances in microbiology have also enhanced public health officials' ability to trace outbreaks back to the food that caused them, as was the case in the recent *Listeria* outbreaks associated with luncheon meat.

Moving the Debate

But even with all of this progress, no one in the public health community thinks we have an adequate handle on food safety either in monitoring its incidence or in controlling it as well as possible, given the money being spent. Two major things are lacking. One is a modern food safety statutory framework that would allow agencies to focus resource use based on best scientific evidence. The other is an information system that would provide a comprehensive picture of where the hazards are in the food system and how private and public action can affect them. Even under our current statutory framework, this kind of information system could greatly increase the ability of food safety

agencies to identify how best to focus resources to protect the public's health.

Other industrialized countries are in the process of modernizing their food safety systems. The European Union is organizing a new food safety agency. Britain has completely reorganized its food safety regulatory structure in the wake of its BSE crisis. Australia and New Zealand have coor-

been working to address this problem. As a first step, we drew together leading food safety experts from a broad spectrum of fields in public health, microbiology, chemistry, and managerial sciences and from a broad range of institutions, including government, universities, industry, and consumer groups. We asked them to think about what steps need to be taken to develop the information sys-

Too often in the United States, it's the most recent news stories or century-old statutes that drive food safety priorities, rather than the best scientific information.

minated their food safety regulatory efforts and are now working to train Asian exporters on how to meet their requirements.

Because of the increasing extent of international trade in foods, many industrial countries and major players in the private sector are trying informally, as well as formally, to develop compatible approaches to food safety regulation and to setting food safety policy priorities. All of these stakeholders are working to develop an approach that bases food safety policy on current scientific evidence, while allowing for future advances. Again, one of the basic needs is a coherent, coordinated approach to organizing data on food safety to provide a more comprehensive picture of where risks are in the food system.

My RFF colleagues and I, along with our counterparts in the Food Safety Research Consortium, have

tem needed to support a science-based food safety system.

The outcome of this effort is a new book, *Toward Safer Food: Perspectives on Risk and Priority Setting* (RFF Press 2005). The book provides analysis by this group of experts on what is known and what needs to be known about where hazards are in our food system, how these line up with what we are currently doing to try to reduce hazards, and what tools are available for us to better track progress in reducing them. Our goal is to help move the debate about establishing a true, science-based food safety system from aspiration to reality at long last.

To learn more about the work of the Food Safety Research Consortium, visit www.rff.org/fsrc. To order *Toward Safer Food*, look for the RFF Press ad at the back of this magazine or visit www.rffpress.org. ■

PARTING THOUGHTS

PAUL PORTNEY REFLECTS ON 30 YEARS AT RFF AND
THE FUTURE OF ENERGY AND ENVIRONMENTAL POLICY

After more than 30 years at RFF, President and Senior Fellow Paul R. Portney will become dean of the Eller College of Management at the University of Arizona in June 2005. Resources sat down with him recently to talk about how RFF and the energy and environmental policymaking process in the United States have evolved during his tenure.

RESOURCES: How have you seen policymaking change over the past few decades?

PORTNEY: Two key constituencies, environmental groups and the business community, have become much more sophisticated and that's a positive development. Most environmental advocates now realize that some regulations can be quite expensive, and that they need to pay attention to those costs in designing policy.

At the same time, business executives, including some who at the outset of the environmental movement thought that they could hold their breath and see all this activism go away, now realize that environmental protection is something that the public cares about, and will continue to care about.

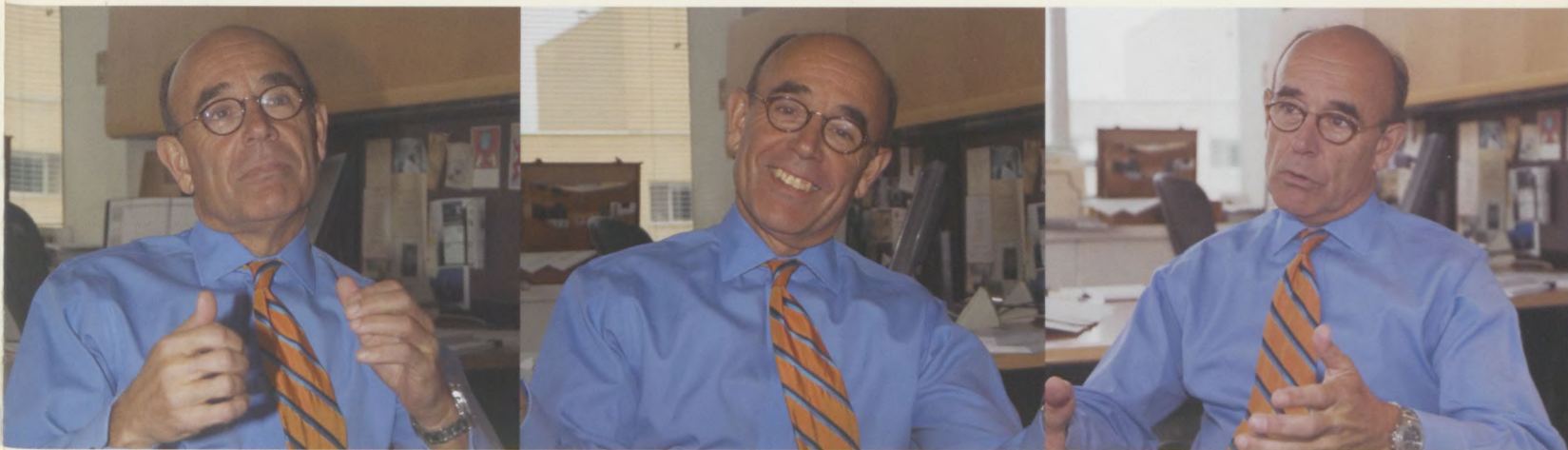
The other big change in recent years has been that debates have become bitterly partisan. Because we often have entrenched adversaries glaring at each other from the far ends of the spectrum, compromise is quite difficult and stalemate almost inevitable. Part of the reason for this has to do with legislative redistricting that has resulted in both parties' holding very safe seats in Congress. Without political competition,

there's no force that pushes legislators toward the moderate voters of both parties.

The environmental movement remains a force to be reckoned with, but in some corners it is viewed as just another special-interest group. Do you agree?

Yes and no. It *is* true in that environmental groups have a strong interest in conservation and environmental regulation and in using the political process to advance that point of view. In that sense, they're no different from grocery manufacturers or other special interests. There is one important difference, however, and it's an important one in the eyes of the public, and that is how advocates for business or the environment are perceived.

When corporations are active in the public policy process, the public views that as an effort to use the system to advance narrow and immediate economic interests. But when environmentalists engage in advocacy, they're more likely to come across as protecting a *common* good—and so it's not seen as an immediate pocket-book issue to green groups.



Do you think that environmental organizations are losing their clout?

At the federal level, most environmental advocates would agree that their influence is not as powerful as it was a generation ago. They must deal with a Republican Congress and a conservative Republican president who scarcely turn to them for advice and support.

On the other hand, the advocacy community has increasingly turned its efforts toward states and localities, which are being much more active on environmental matters such as land use, water quality, and wilderness preservation, along with other issues like climate change, that arguably ought to be left to the federal government. But like any good pressure group, environmentalists direct their efforts where they can be the most effective, just as the business community has done when it has been out of favor at the federal level. And, environmental advocates have had some conspicuous successes at local and regional levels that may eventually force the federal government to take actions that it wouldn't otherwise take.

As the balance of power in environmental policymaking has shifted to the right, there are new players in the game. Well-known conservatives are speaking up about how our dependence on foreign oil affects our national security. What's your take on this?

It's certainly true what they say about politics making for strange bedfellows! One of the more interesting new developments in energy and environmental policy is what previously would be considered a very unlikely or uneasy alliance between the environmental advocacy community and the fairly conservative national security lobby in the United States. Where they meet in the middle is over shared concern about how much gasoline is being used in the United States. Where they differ is over *why* this is a concern. The environmental movement worries about the global burden of greenhouse gasses, and the national security community is troubled by our increasing dependence on imported oil, particularly from countries that bear malice toward the United States.

A third group is now joining this debate. Some evangelical Christians in the United States have begun see-

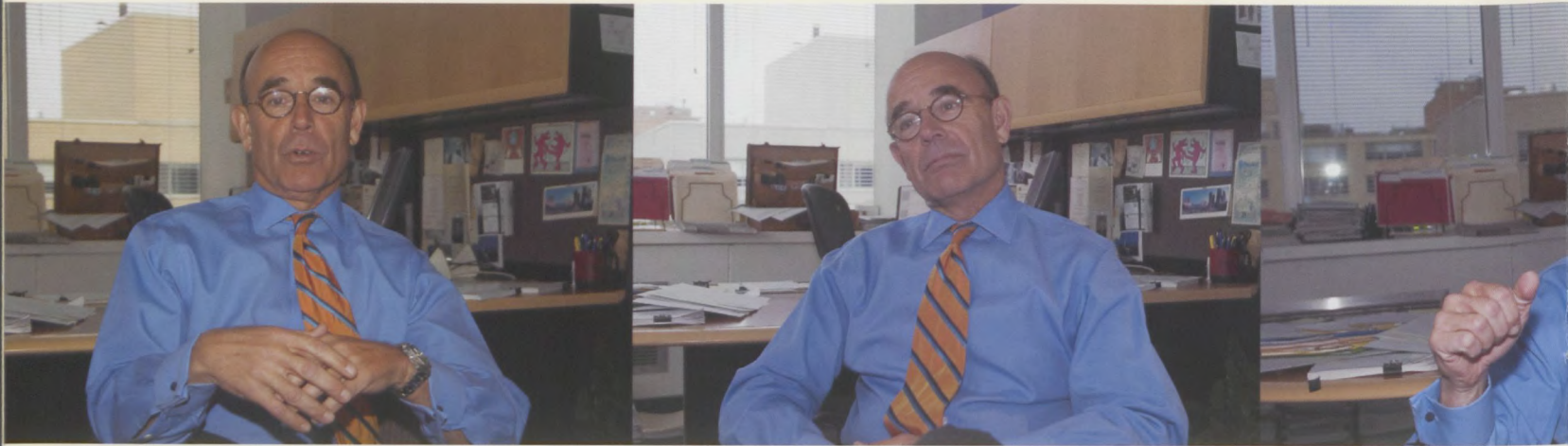
ing in the Bible a mandate for stewardship of our natural resources. And while a deep rift remains between evangelicals and environmentalists on many other issues, they are each focusing on the threats posed by climate change. What makes this new alliance noteworthy is the fact that the evangelical movement has many close ties to the Bush administration.

You suggest some optimism here.

Well, I'm congenitally optimistic about most things. I like to see parties come together that don't ordinarily find common cause. To me, the basis of good politics is fighting when you have different interests, but not being afraid to agree when you don't.

How optimistic are you that the United States and the global community will be able to meet the energy demands of the 21st century?

I'm optimistic, but barely so. I think this is really one of the biggest challenges facing the world today. From the standpoint of the developed world, and apart from security concerns, I think maybe the biggest task we face is helping developing countries achieve a higher standard of living, which will require much more



energy use on their part. I am hopeful they will be able to make this transition without making the same mistakes that we in the developed world made over the past 40 or 50 years. Something like two billion people in the world still live without electricity. Bringing power to them, while caring for the environment at the same time, will be a very tough challenge.

How and where has RFF helped shape public policy over the past five decades?

As I look back over RFF's now 53 years, there are a number of areas in which I'd like to think we've been extraordinarily influential. In RFF's first decade, most of the research that was done here was aimed at addressing the question, "Are we running out of fuel and non-fuel minerals?"

The research done at RFF convinced the world that as long as markets worked effectively, there would be price signals that would induce people to search for new sources, pay higher prices, or, when materials became scarcer, substitute other materials.

In the 1960s and '70s, the focus turned to broader environmental problems: air and water pollution control and solid and hazardous

wastes. Researchers at RFF demonstrated how economic analysis, especially cost-benefit analysis, could be part of the decisionmaking process. During that same time, our scholars demonstrated that you could use incentive-based approaches like marketable discharge permits or pollution taxes in lieu of more prescriptive command-and-control regulations. That certainly was an influence on the public debate and it's changed the direction of environmental policy worldwide.

In the 1980s and '90s, RFF began to focus on what are called risk management problems. By that I mean using quantitative risk assessment, economic and statistical analysis, and epidemiology, to identify the most pressing problems that the country faces, so that we can target our resources where they will do the most good.

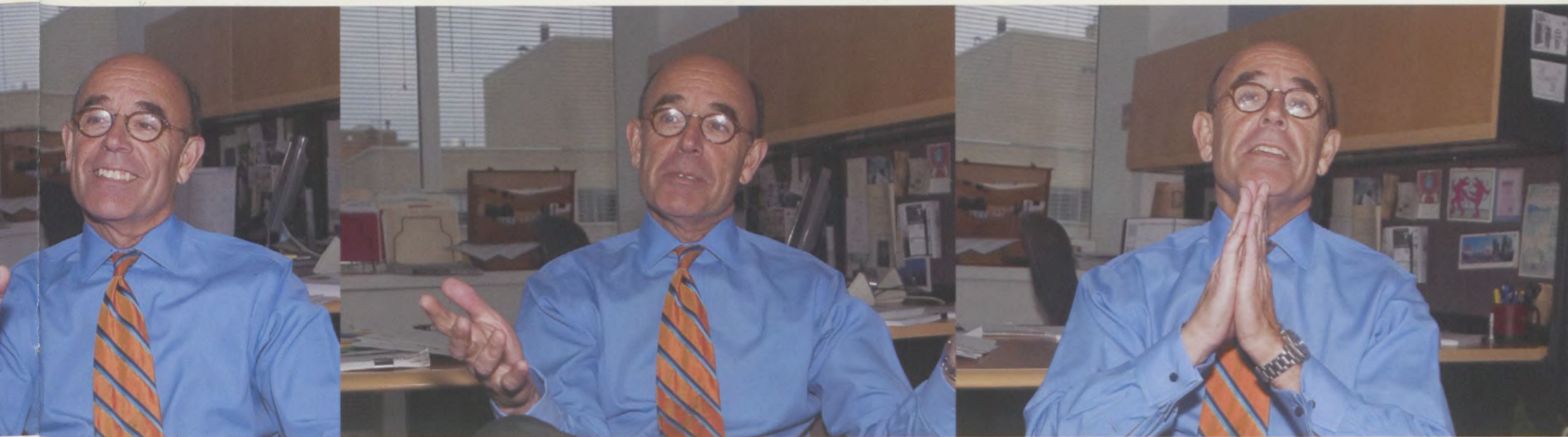
During these two decades, RFF scholars also did pathbreaking work showing how undeveloped wilderness areas could be valued in economic terms, so as to be able to compete on an even basis with proposed commercial development.

You're leaving Washington, and obviously the policy beat goes on. Looking forward, what do you think are the most important environmental or energy issues still pending?

We've done a relatively poor job of dealing with nonpoint source water pollution. What I mean by that is water pollution that comes not from an individual factory or a sewage treatment plant, but rather pollution that runs off of farmers' fields and city streets, not out of a single pipe. Those kinds of problems are difficult to deal with for three reasons.

First, because the pollution doesn't come out of a single source, it's much more difficult to monitor. Second, because of that very same reason, there's no end-of-pipe technology that we can slap on to deal with it. And third, and in a way this is the hardest problem, we don't like to think of farmers or cities as polluters. We'd rather think of industries as the bad guys, the polluters upon whom we will slap fines or technology requirements.

Over the last 30 years, we've done a pretty good job of controlling large-scale industrial pollution. However we balk at pollution controls when they're aimed at individuals, for areas



where we have some personal responsibility—such as the types of cars we drive and the fuels we use.

If you had the ability to erase a public policy failure from the past 30 years, what would you expunge from the record?

Most people probably think I would say, “Well, we should have had incentive-based approaches for environmental policy in place starting in 1970 when we amended the Clean Air Act.” But if I were the czar of energy or environmental policy and got the chance to do something over, I would have instituted a better, more honest energy policy, not one focused solely on making sure that oil stayed cheap.

While there have certainly been benefits to keeping energy less expensive here than in other countries, there are also some very real costs. Our metropolitan areas have sprawled out, we’ve tended to buy bigger, less fuel-efficient cars, and we’ve become more dependent on petroleum in general.

Using as much oil as we do, particularly in transportation, has made us dependent on the big oil-producing countries that can be politically unstable and sometimes not particularly good friends of the United States. And so if I could make one change, I would have gradually taxed petroleum, but also coal and, to a lesser extent, natural gas. That way we wouldn’t be quite as reliant on fossil fuels as we are today.

RFF once stood alone but now there are many other advocacy and research organizations speaking out on resource-related issues. Aside from its independent and nonpartisan character, what makes RFF different from the rest?

Perhaps the best—and shortest—way to answer that question is to tell you a personal story. The year I started at RFF, 1972, I remember working on a very hard problem. I had my feet up on my desk and was looking out the window, for all the world appearing to be daydreaming. My boss stuck his head in my office to ask a question, and I immediately startled. I quickly took my feet off the desk and turned around. And he said to me in a very

gentlemanly way, “That’s okay, Paul, it’s all right to *think* at Resources for the Future.”

Any other concluding thoughts?

Part and parcel of the good fortune that I’ve had is the opportunity to work with an absolutely wonderful Board of Directors. The entire time that I’ve been at RFF, we’ve had support from individuals, foundations, corporations, and government agencies without which all of this wonderful work wouldn’t have been possible. And so to everyone who has helped RFF from the governance standpoint, with funding and financing, and providing encouragement and moral support over the years, and reminding us that this work is important and makes a difference, we all owe an awful lot. I’m profoundly grateful to everyone who has had RFF’s good interests at heart over the years, and that bodes very well for continued success. ■



Three Decades of Commitment: Highlights of Paul Portney's Career

Asked about his chief accomplishments during his more than 30 years at RFF, Paul Portney replied that he didn't think of himself principally as a researcher, but as a communicator. Many might disagree with the first assessment, but few would argue with the second. During his tenure, Paul wrote and edited books that have become standard college texts, oversaw the expansion of Resources magazine, and became the public face of RFF for policymakers, the media, the business and advocacy communities, and the general public.

Here are some key milestones in his career:

1971

As a dissertation fellow at Brookings, Paul has lunch with RFF staffers who are so impressed with him they ask him to assist in a major research project.

1972

Paul finishes his doctoral work at Northwestern University and joins Walter Spofford, Jr., Clifford Russell, Edwin Haefele, and others in analyzing environmental problems in the Delaware River Basin, using a model with 8,000 variables that examines 300 human activities.

1977

On sabbatical, Paul teaches at the University of California at Berkeley for the next year and a half.

1979

On the strength of his contributions to environmental economics, Paul is appointed as senior staff economist at the Council of Environmental Quality.

1980

Paul returns to RFF and goes on to become the director of two research divisions.

1987

Paul helps to establish the Center for Risk Management to help regulatory authorities identify, rank, and reduce threats to human health and the environment.

1989

Paul is promoted to vice president.

1990

With Paul as co-editor and principal author, *Public Policies for Environmental Protection* (RFF Press) becomes a popular textbook, later updated (with Robert Stavins) in 2000.

1995

Paul is appointed president of RFF.

1999

Paul is a leading force behind the establishment of RFF Press, which extends RFF's mission by publishing books that make a distinct, original contribution to scholarship, teaching, and policymaking.

2001

Because of his ongoing expertise in the automotive industry and the environment, Paul is asked to chair a National Research Council committee on the future of the CAFE standards.

2002

For RFF's 50th anniversary, Paul leads a highly successful \$25 million campaign, which culminates with a day-long symposium, a black-tie gala, and the establishment of four endowed chairs.

2004

Paul's strong belief that research should not exist in a vacuum prompts him to spearhead the development of a collection of memos to the President of the United States, *New Approaches to Energy and the Environment* (RFF Press), in which RFF scholars recommend a broad variety of proposed policy changes for the United States.

2005

Having stabilized the organization financially and overseen the growth of the research staff and the establishment of a professional Communications Department, Paul decides it is time to make a change. He leaves RFF to become dean of the Eller College of Management at the University of Arizona in Tucson.

WHERE DO WE GO FROM HERE?

FOUR RFF EXPERTS SHARE THEIR VIEWS ON LIFE POST-KYOTO

For over a decade, ratification and implementation of the Kyoto Protocol to the UN Framework Convention on Climate Change seemed like an elusive goal. Politicians and scientists from around the world clashed, negotiated, and eventually reached agreement on a plan for reducing greenhouse gas (GHG) emissions, which was ratified as a treaty on February 16 of this year.

Kyoto's lofty goals are turning out to be nearly impossible to achieve. Many European Union countries are struggling to meet their emissions targets; easy domestic solutions have turned out to be very few. Japan had hoped to meet its Kyoto requirements by greatly increasing its nuclear power generation capacity but this now seems highly unlikely.

The long-term effects of the treaty's ratification are nearly impossible to gauge, as three of the largest sources of GHG emissions are not covered: the United States never ratified it and China and India, considered to be developing countries, are not affected.

To set these developments in perspective, four RFF experts explain the technical, economic, and political obstacles that lie ahead. To learn more about RFF's extensive work in the climate change area, visit www.rff.org/climatechangeafterkyoto.

The last issue of *Resources*, Winter 2005, provide a comprehensive framework for understanding key energy options—visit www.rff.org/rff/Publications/Navigating-Energy-Choices-in-the-21st-Century.cfm.

What Follows Kyoto?

Since the world has had little experience with management of carbon emissions, it is altogether unclear how costly and disruptive the Kyoto limitations might be.

J.W. Anderson

When the Kyoto Protocol went into force in February 2005, it became a symbol of international cooperation to protect the climate. By imposing mandatory limits on the amounts of greenhouse gases emitted by 36 industrialized countries, it was the first serious effort to slow global warming.

But Kyoto is only a partial success. It does not include the world's biggest source of greenhouse gases—the United States—or any of the developing countries where emissions are rising rapidly.

The Kyoto commitments run only from 2008 through 2012. The treaty's authors assumed that by now negotiations would be under way to set subsequent, and presumably tighter, limits. Instead, the increasingly apparent shortcomings of the Kyoto system have started a much broader debate about the future of the treaty and climate policy. Of all the greenhouse gases generated by human activity, by far the most significant is carbon dioxide (CO₂). It is generated whenever fossil fuels—coal, oil, or natural gas—are burned, and those fuels provide more than 80 percent of the world's energy. The challenge is to cut emissions without slowing economic growth and reducing standards of living.

One basic choice is whether to rely on quantitative restrictions on emissions, as the Kyoto treaty does, or instead to look, as the Bush administration does, to rapid development and deployment of new technologies.

Since the world has had little experience with management of carbon emissions, it is altogether unclear how costly

and disruptive the Kyoto limitations might be. It was because of these concerns that President Bush pulled the United States out of the treaty. If its limits prove unexpectedly difficult, some governments may choose simply to let them go unmet. The Kyoto treaty has no enforcement mechanism.

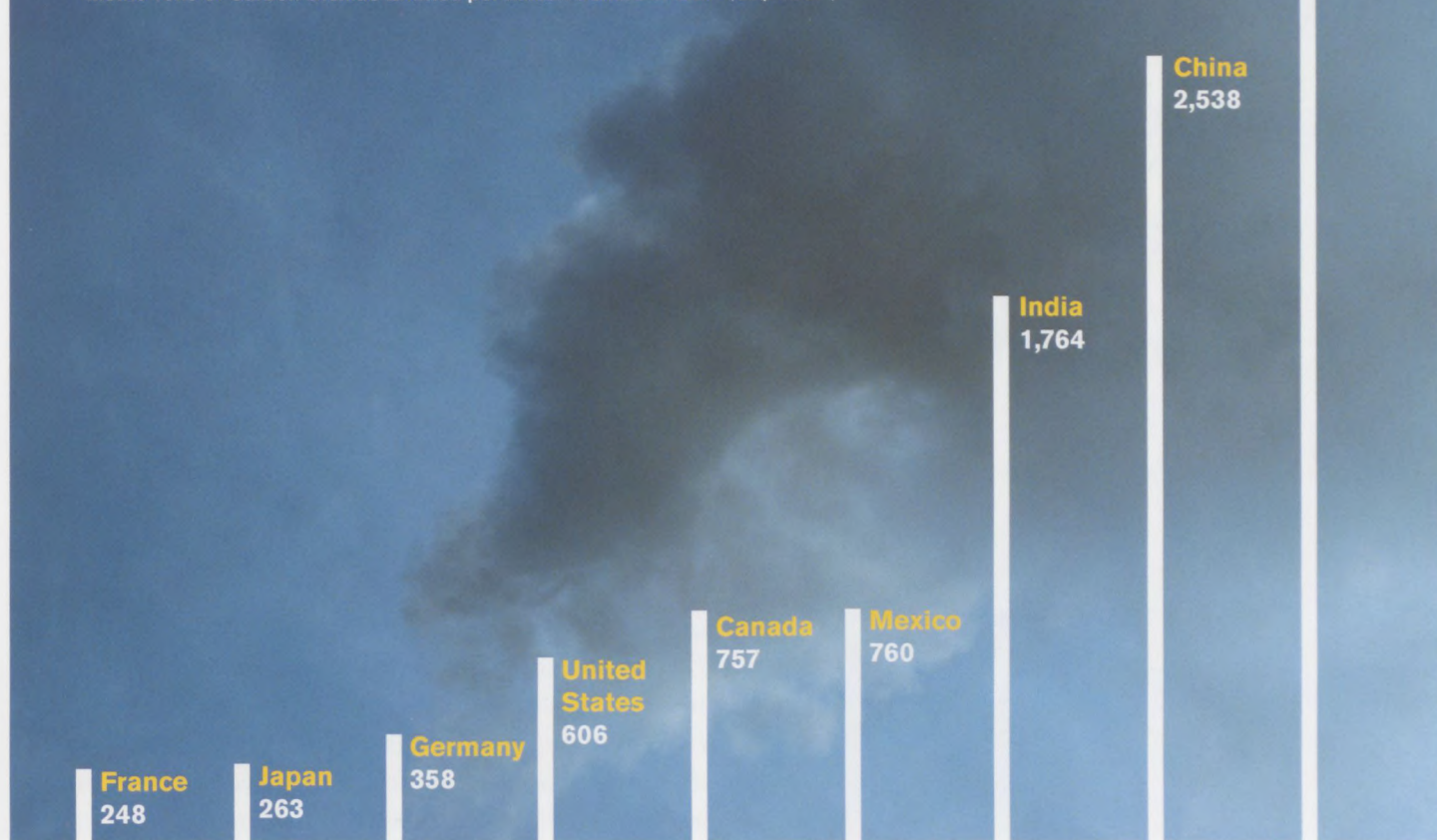
The Bush administration alternative, reliance on new technology, is under something of a cloud in the current debate because many other countries view it simply as a dodge by the United States to avoid taking any serious political action against a danger that others see as urgent. The administration has thus far refused to apply any mandatory standards and has set very loose national goals that are hardly different from the progress that business as usual would produce.

But the administration has introduced a concept, carbon intensity, that could be extremely useful if applied more vigorously. Carbon intensity is the relationship between an economy's total output, measured as its gross domestic product (GDP) and the amount of carbon dioxide generated to produce it. A fall in carbon intensity means a rise in energy efficiency—and raising efficiency is a much more appealing goal than cutting fuel use at any cost. While the large, fast-growing developing countries, led by China and India, are deeply suspicious of emissions limits as a threat to their expansion, the promise of higher efficiency is much more likely to draw them into a climate regime. And a climate regime that does not include those countries is hardly worth having.

The enormous variations in carbon intensity, from one country to another, suggest the magnitude of the potential reductions in emissions from the present trajectories (see opposite). The U.S. Energy Information Administration reports

CARBON DIOXIDE INTENSITY

Metric Tons of Carbon Dioxide Emitted per Million Dollars of GDP (us\$ 1997)



Source: U.S. Energy Information Administration, 2001.

that, in 2001, the United States emitted 606 metric tons of CO₂ to produce each million dollars' worth of GDP. Germany emitted 358 tons of CO₂ to produce the same amount of GDP, and Japan emitted only 263 tons. At the other end of the scale, China emitted 2,538 tons per million dollars of GDP, and Russia emitted 3,425 tons.

While the worldwide debate over climate policy continues, warnings from scientists about global warming and the resulting risks are growing stronger. In November 2004, the Arctic Council—an intergovernmental research agency supported by eight countries including the United States—reported that the Arctic climate is now warming rapidly and larger changes are projected.

In February 2005, British Prime Minister Tony Blair convened a symposium at his government's meteorological center to tell him at what point the rise in CO₂ concentrations in the atmosphere will become dangerous.

The scientists replied that the danger point is a political judgment. But some said that even an increase of 2 degrees Celsius (nearly 36 degrees Fahrenheit) could result in large ecological changes. To limit the increase in temperature to no more than 2 degrees Celsius with high certainty would require keeping the concentrations of CO₂ in the atmosphere below 400 parts per million (ppm), the symposium concluded. Before the industrial revolution began around 1750, the concentration had been around 280 ppm for centuries. Currently it is slightly above 375 ppm, and the rise seems to be accelerating. That rise is produced by the basic structure of the world's expanding economy, and most analysts believe that holding the concentration of CO₂ below 400 ppm will prove almost impossible. ■

Business Planning in a Post-Kyoto World: For U.S. Firms, Which End Is Up?

Robert W. Fri



Now that the Kyoto Protocol has gone into effect, Japan, Canada, and much of Europe are struggling to figure out how to comply with its new requirements. But they are not the only ones who are confused: U.S. firms have to contend with their own murky set of circumstances.

While the United States refused to ratify the Protocol, U.S. firms—and not only those with multinational ties—are nonetheless directly affected by the increasingly likely prospect that U.S. greenhouse gas (GHG) emissions will sooner or later be controlled. The absence of a clear U.S. policy for curbing GHGs is making today's business decisions more costly and risky than they need to be.

For example, companies making long-term capital investments, like electric utilities, must consider what might happen to those investments if GHG controls come into effect over the next two or three decades. But different designs of a control strategy make a huge difference in future costs—by a factor of five or more. This uncertainty in the size of control costs greatly complicates strategic planning for long-term investors.

Another problem is that U.S. companies with GHG emissions in Kyoto countries still have to comply with GHG reduction requirements in each country. Because the United States is not a signatory to the treaty, however, reducing such emissions in the United States won't count toward their foreign targets, even if doing so is the least costly response. That could increase the compliance cost to U.S. companies and put them at a competitive disadvantage.

And even within the United States, the situation is unnecessarily confusing. U.S. companies are already subject to a variety of state and local requirements imposed because of climate change concerns. Over 20 states have implemented renewable portfolio standards, which mandate varying levels of renewable energy use, especially for electric utilities. California Gov. Arnold Schwarzenegger has proposed cutting his state's GHG emissions by 2050, a group of states in the Northeast has proposed its own regional GHG cap-and-trade scheme, and 131 mayors recently formed a bipartisan coalition to fight global warming. This diver-



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sity of regional and local GHG requirements almost certainly drives up the cost of compliance for companies operating in several states.

The time is therefore ripe to design and implement a GHG control strategy for the United States that is fair and efficient for U.S. companies. It's important to have a thorough discussion about this strategy because the design details make a huge difference to both the total cost and who pays it. All of the design options create winners and losers, so the trade-offs needed to find the fairest approach are properly the stuff of political debate. Once a system is agreed upon, both government and business will need operational experience with it to ensure it works in practice as well as in theory. For this reason, the control system must actually be implemented, not merely modeled by experts.

And the time to start this discussion is now. Doing so will reduce the uncertainty—and therefore the cost and risk—that the prospect of future GHG controls imposes on today's business decisions. Moreover, knowing what control system works best for our economy strengthens the U.S. position in the ongoing international debate about climate control strategies beyond Kyoto. Those deliberations will happen with or without us, but either way it's unlikely that anyone else will worry about our interests.

Some costs would be involved in implementing an initial GHG control system now, of course, but they can be minimized in several ways. For example, the initial system should require only modest GHG reductions at the start, and it could include a safety valve that would ensure that costs would be limited to an acceptable amount. Researchers, including several at RFF, have already begun investigating and designing such systems. As this work goes forward, the initial focus should be on getting the rules right, not on the size of the reductions they impose.

In sum, a key policy issue is how to balance the cost of doing nothing with the cost of doing something. The costs of doing nothing are real, and policymakers should address them sooner rather than later. ■



Is There a Role for the United States to Play in Future Climate Negotiations? Maybe.

Raymond J. Kopp

No one quite knows what's going to happen after 2012, the end of the first commitment period under the Kyoto Treaty. Negotiations are expected to begin shortly on the next round, but the United States won't be seated at the table. U.S. opposition to Kyoto is not based solely on partisan politics, however. While early on the Clinton administration played an active role in the negotiations, White House officials realized that the high economic cost of meeting the Kyoto targets was politically unacceptable and never presented the protocol to the Senate for ratification. The Bush administration has never wavered from its position that Kyoto poses too heavy a burden on the U.S. economy.

So where do we go from here? Can the United States take a leadership role in future global agreements on climate change? For this to come about, many hurdles will have to be overcome in the short run.

Frankly, the absence of domestic U.S. climate policy that is viewed as credible by our trading partners will make it difficult, if not impossible, for the United States to play any kind of serious role in the development of global policy in the near term. To say that the United States lacks standing in global discussions and negotiations of climate policy is an understatement.

That said, should the United States be judged credible in the future it could provide leadership on at least three important issues: developing-country participation, the process employed to reach global agreements, and the proper balance between establishing long-term goals and setting current policy.

Developing-Country Participation

It matters little what the European Union, the United States, and the rest of the developed world do if we cannot entice the developing world—countries like China, India, and Brazil—to reduce emissions as well.

We must recognize that these countries place a high priority on economic development and for good reason. Wide-scale international participation in efforts to mitigate climate change will be facilitated if global climate agreements are discussed and negotiated as a part of larger—perhaps much larger—international policy packages that cover trade, development, international finance, and technology transfer.

The larger the set of policies under discussion, the more degrees of freedom exist with which to craft compromises

and satisfy competing political and economic needs. This form of “policy linking” is not a new idea, but unfortunately it lies outside the current Kyoto framework.

Treaty Negotiation, UN Style

If the key to developing-country participation lies in broadening the negotiations to include things like development, technology, and global trade, then the current UN treaty process, involving some 190 member countries, is too cumbersome.

A more reasonable approach would involve a smaller number of nations, perhaps along the lines of the “Leaders 20 Summit” suggested by Canadian Prime Minister Paul Martin. This group would include the largest emitters (now and in the future) and the major economic and political powers. While not as inclusive as the UN process, the L20 would be a more manageable and perhaps more cohesive group and would still account for the majority of the world’s greenhouse gas emissions now and into the future.

In this new negotiating realm of broadened policy packages, the emphasis will likely be on economic development, giving trade and finance ministers center stage while climate policy might have secondary importance and environment ministers would play supporting roles.

Long-Term Goals

Finally, there is the issue of the proper role of long-term targets, and here I am referring to concentration targets.

Undaunted by the difficulty of meeting their current Kyoto emissions targets, the European Union has gone on record setting a long-term greenhouse gas (GHG) concentration target of 550 parts per million (ppm) for all GHGs. This is equivalent to a carbon dioxide concentration of 470 ppm. These are extremely aggressive goals to say the least—many would argue that they can’t be met. Presumably this long-term goal will be reflected in the European Union’s negotiating stance as discussions of Kyoto second commitment period targets begin later this year.

I would argue that adopting such specific long-term goals as the basis for near-term policy development—without knowing the technical, economic, and political feasibility of the targets—is fruitless and, in fact, dangerous.

Ultimately, global GHG concentrations will not be determined by government proclamation. Rather, they will be determined by the perceived risks of climate change balanced against the technology available and the economic and political cost of GHG control. We will learn about all these costs

and benefits over time and will adjust domestic policies and international agreements accordingly.

While it is important to know how the climate system will react to various long-run concentration levels, current policy should not be solely dictated by such uncertain information. Rather, it should be directed at two tangible goals: first, reducing the cost of GHG control worldwide, and, second, providing incentives for the advancement of alternatives to carbon-based technology. The task for decisionmakers is to foster the development and implementation of economically efficient and equitable policies to attain these twin goals. ■

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What Is the United States Doing About Climate Change? Everyone Else Is Coping with Kyoto



William A. Pizer

While the rest of the world is struggling to figure out how to meet its Kyoto commitments, the United States is taking a different approach toward controlling greenhouse gases (GHGs). Against a backdrop of an existing voluntary, technology-driven response, proposals have arisen at the national and regional levels that either seek to strengthen the current technology approach or contemplate mandatory emissions programs.

The current energy bill, which passed in the House of Representatives and is now being debated in the Senate, falls into the first category: support for current technologies. While not directly addressing climate change, there are a number of provisions that have potential climate change consequences. Nuclear power, clean coal (with eventual capture

and sequestration), renewable energy, and ethanol all have the potential to reduce emissions. Yet, none represents dramatic changes from the status quo, and the renewable energy and ethanol provisions, which were passed last fall as part of a bill to amend the tax code, would simply continue existing subsidy programs. Sizeable incentives exist to expand conventional fossil energy supplies—potentially increasing emissions. Still, there are elements that can and should be viewed as supporting climate-friendly technologies. (For a more detailed analysis, see www.rff.org/multipollutant.)

Senator Hagel's recent proposal also belongs in this group. While it might put more money on the table to encourage specifically climate-friendly technologies, the mechanisms are not significantly different—tax incentives for emissions-reducing technologies. Climate provisions from

earlier energy bills that would create various programs and offices for climate change, as well as some provisions that would have created emissions registries—lists of what companies release what emissions—similarly fall into this group. None of these would place a requirement, burden, or economic incentive directly on emissions or energy use itself.

The second category, involving mandatory programs, prominently includes the McCain-Lieberman bill as well as multipollutant bills targeting power plant emissions of carbon dioxide (CO₂) and bills aimed at tightening corporate average fuel economy (CAFE) requirements for light-duty vehicles. The McCain-Lieberman proposal would require power plants, industrial sources, and large commercial facilities, along with producers of transportation fuels, to obtain permits for each ton of gas they emit in 2010 and thereafter. A fixed number of permits—equal to a source's emissions in 2000—would be given out, or auctioned, and sources could freely trade those permits, such that those who really needed them could always buy more in a market. McCain-Lieberman would also allow sources to gain additional credits for emissions-reduction projects in developing countries.

Economists generally like this kind of approach because it (a) applies the incentive directly to the thing we care about—emissions; and (b) is flexible, allowing the market, rather than a regulator, to find the cheapest emissions reductions.

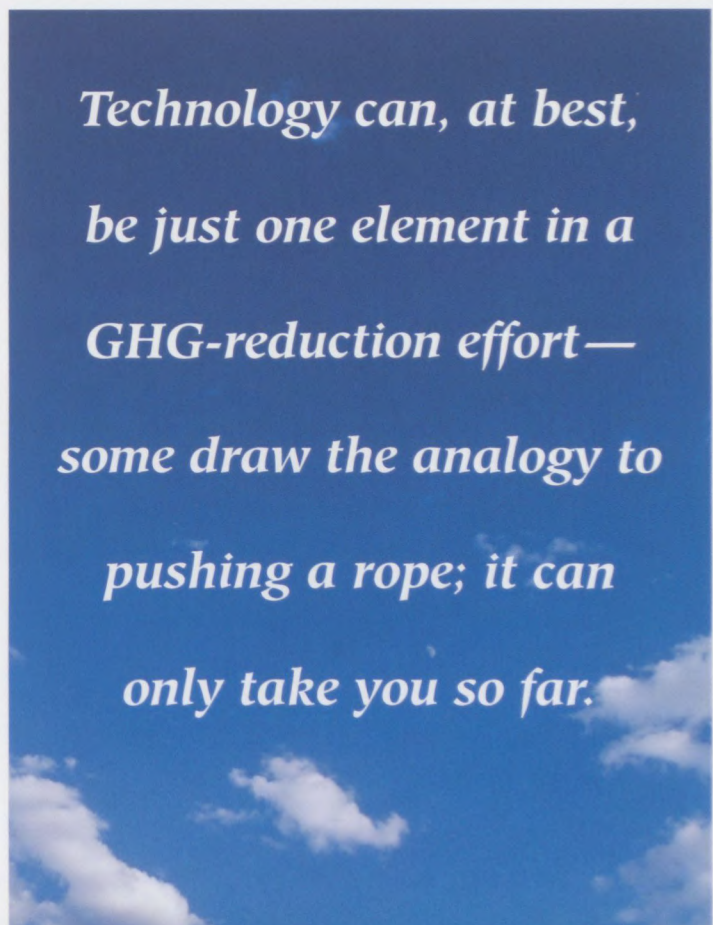
Other mandatory proposals include those by Carper and Jeffords-Lieberman that would address GHGs from just the power sector in the context of a multipollutant program—simultaneously establishing trading programs for sulfur dioxide, nitrogen oxides, and mercury, as well as CO₂. (This is in contrast to President Bush's Clear Skies proposal, which does not include CO₂.) Proposals to tighten the CAFE standards, such as S794 in the last Congress, fit here because while they target oil use and are often motivated by security concerns, they would also have a substantial impact on emissions.

While it is not formally included in legislation right now, the National Commission on Energy Policy, a nongovernmental, bipartisan group that I was involved with, recently published a major report, *Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges*. The commission wants to encourage lawmakers to consider blending elements of both technology and emissions-focused policy. Specifically, the commission recommendations include not only a mandatory emissions trading program, but also incentives to develop and deploy carbon-friendly technologies. In fact, the policies are actually linked in that a small auction of allowances in the trading program finances the technology incentives. Another somewhat innovative element, compared to the McCain-Lieberman proposal, is that the al-

lowance price—and indeed the overall cost—is capped.

Finally, the climate policy landscape in the United States is not exclusively federal. A number of actions are occurring at the state and local levels that bear mentioning. One is the effort in California to establish GHG emissions standards for cars and light trucks. Should they succeed, it would effectively establish tighter fuel economy standards. Another is an effort by nine northeastern states, initiated by New York Gov. George Pataki, to establish a CO₂ emissions trading program for power plants in those states. Such a program, if successful, could provide a blueprint for a national policy. Most recently, mayors from across the country have declared their commitment to see their cities abide by the Kyoto rules, but the impact of this effort remains to be seen.

Despite the variety of federal climate change policies on the table and their very uncertain future, and despite the apparent zest of states to fill the policy vacuum at the federal level, I think most people believe that climate change must and eventually will be dealt with by the federal government, in ways that are both comprehensive and mandatory. It is hard to see how state policies can succeed against a problem that is fundamentally global and requires international negotiation. Similarly, technology can be, at best, just one element in a GHG-reduction effort—some draw the analogy to pushing a rope; it can only take you so far. For these reasons, the relevant question for meaningful federal policy is probably how, what, and when, not so much if. ■



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A Glossary of Key Climate Change Terms

Atmospheric Concentrations.

Expressed in parts per million (ppm), the quantity of greenhouse gases relative to the global volume of the atmosphere. Atmospheric concentrations are often cited for carbon dioxide (CO₂) alone or for CO₂ equivalents, in which case they are adjusted to reflect all greenhouse gases. (See entry under CO₂ below.) Rising atmospheric concentrations can occur even with unchanged levels of annual greenhouse gas emissions.

Carbon Dioxide. The major greenhouse gas implicated in global warming, usually expressed in terms of carbon. One metric ton of carbon equals 3.667 metric tons of CO₂. Other greenhouse gases are often given as carbon or CO₂ equivalents, based on their respective global warming potentials.

Carbon Intensity. Shows the relationship between the amount of carbon dioxide emitted by a country and what its economy produces, measured by the gross domestic product. A lower number implies that the economy functions well without emitting many pollutants. Conversely, a higher number indicates that in order to run its economy, a country emits a great deal of pollutants.

Carbon Sequestration. A process by which carbon is sequestered or captured, usually in a natural formation such as the ocean, forests, or soil, to keep it out of the atmosphere.



Clean Coal. Refers to methods to reduce pollutants emitted when coal is burned, either by using coal with lower sulfur content or by using various methods to reduce the amount of sulfur emitted into the atmosphere.

Emissions Trading. A regulation that grants a certain number of permits to release a given pollutant. Companies may keep their permits and emit the pollutants or reduce their emissions and sell the permits, providing a financial incentive to decrease pollution.

First Commitment Period. Under the terms of the Kyoto Protocol, the time at which signatories are to reach their targeted emissions reductions. Generally understood to be between 2008 and 2012.

Greenhouse Gases. Gases, either natural or man-made, that trap heat in the Earth's atmosphere. Some, such as water vapor, are harmless. Others have the potential to raise average temperatures or affect the environment negatively in other ways.

Kyoto Protocol. A 1997 agreement in which 159 nations pledged to reduce emissions of six greenhouse gases, including carbon dioxide, methane, and nitrous oxide. Countries in transition to a market economy, such as Russia, were to reduce less and those in the process of becoming industrialized, such as China and India, were to be exempt. The protocol, without the signature of the United States, among other nations, was ratified in February 2005.

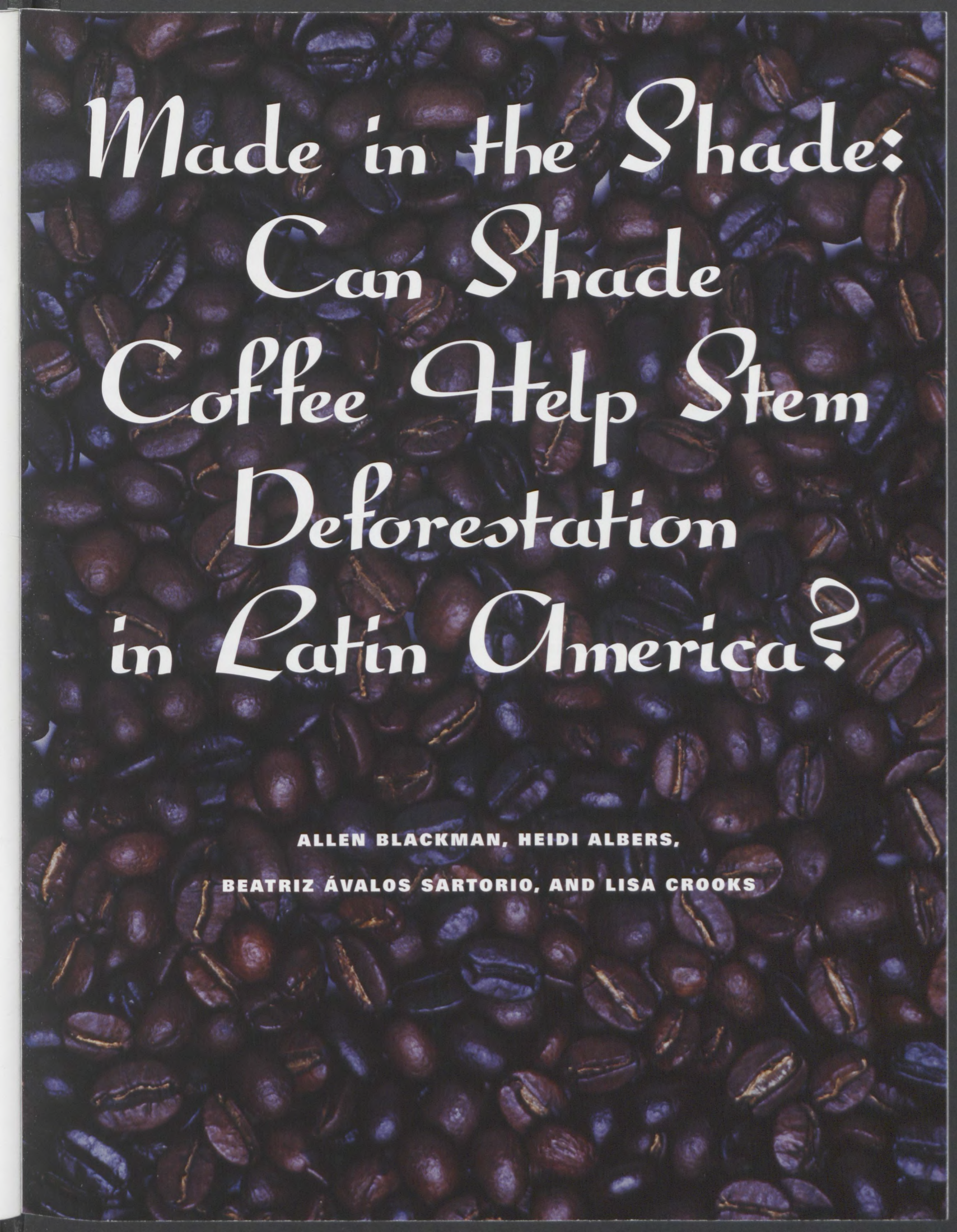
Contributors to our feature on life post-Kyoto:

J.W. Anderson is a former staff writer for *The Washington Post* who serves as RFF's journalist in residence.

Robert Fri, a former president of RFF, most recently served as director of the National Museum of Natural History. He is an expert on climate change, particularly issues related to international business.

Senior Fellow **Raymond J. Kopp** studies the environmental aspects of energy policy and technological responses to environmental issues and geopolitical stability.

William A. Pizer, an RFF fellow, studies the design of policies to address climate change risks caused by man-made emissions of greenhouse gases. He also is a senior economist at the National Commission on Energy Policy.



*Made in the Shade:
Can Shade
Coffee Help Stem
Deforestation
in Latin America?*

ALLEN BLACKMAN, HEIDI ALBERS,

BEATRIZ ÁVALOS SARTORIO, AND LISA CROOKS



Like petroleum, coffee is a widely traded global commodity, mostly consumed in developed countries and produced in developing countries. But while petroleum producers have recently seen international oil prices rise steeply, coffee growers have experienced the opposite. Structural changes in the coffee market during the 1990s—including the collapse of the international coffee cartel and greatly expanded production in Vietnam and Brazil—drove bulk coffee prices to a 100-year low in 2001. The ongoing “coffee crisis” has caused widely reported economic hardship in Latin America where small-scale farms predominate. Less well known is that the crisis has damaged forest ecosystems in this region. Why?

Unlike “sun” coffee grown elsewhere, a sizable percentage of Latin American coffee is grown under natural or managed tree cover, often in coastal areas that are quite rich ecologically but that face mounting population pressure. Because it preserves tree cover in these areas, shade coffee provides important environmental services including harboring biodiversity, sequestering carbon, and preventing soil erosion.

Unfortunately, in Mexico, as in other Latin American countries, the coffee crisis has jeopardized these environmental benefits. Faced with low prices, shade coffee growers have been forced to find alternative sources of income. Some have migrated to cities to find employment, abandoning their farms and leaving them vulnerable to encroachment by conventional farmers, ranchers, and loggers. Others continue to grow coffee but have cleared forest on and around their farms to sell the timber and plant conventional crops. Whatever the specific cause, ecological damage from deforestation in shade coffee regions has been significant, and some of it—notably species loss and soil erosion—may be irreversible or nearly so.

Policymakers are increasingly concerned about the environmental fallout of the coffee crisis. A number of international organizations have established high-profile programs to stem the loss of Mexican shade grown coffee. For example,

Conservation International, Starbucks, and the World Bank have joined forces to promote shade coffee near the El Triunfo Biosphere Reserve in the state of Chiapas. In addition, the Commission for Environmental Cooperation, a tri-national organization set up under the North American Free Trade Agreement, has established a program to study and promote Mexican shade coffee.

The Oaxaca Project

Despite international efforts, deforestation in Mexico’s shade coffee growing areas remains poorly understood. To help fill this gap, our research team (based at RFF and the Universidad del Mar, a public university in Oaxaca, Mexico) undertook a three-year study funded by the Tinker Foundation and the Commission for Environmental Cooperation. We focused on a 600,000-hectare subset of the Sierra Sur y Costa region in the state of Oaxaca where shade farms produce about one-fifth of Mexico’s coffee. We addressed the following specific questions:

- Prior to the coffee crisis, what factors explained spatial patterns of deforestation in “shade coffee forests” (that is, forests in the altitude range where coffee grows) and how did these patterns differ from those in nearby natural forests?
- How much deforestation occurred in shade coffee forests after the onset of the coffee crisis between 1993 and 2001 and what factors explain spatial patterns of this deforestation?
- What drove growers to abandon shade coffee plantations, and how could abandonment be prevented?

Before the Crisis: What Was Happening?

To answer this question, we assembled a geographic information system (GIS) with detailed data on: land cover (obtained from 1993 aerial photographs); institutional features (such as the percentage of coffee growers who belonged to coopera-



tives); geophysical attributes (for example, altitude, soil type, and distances to urban centers); socioeconomic characteristics (such as population and poverty levels); and the size of the farms. We used statistical techniques to determine which of these characteristics were associated with tree clearing.

We found that, in general, characteristics that tended to lower the profitability of shade coffee compared to the profitability of activities that require direct sunlight (like growing corn) promoted tree clearing. For example, we found that areas farther from cities were more likely to have undergone deforestation. Coffee farms far from cities are less profitable than those close to them because growers incur significant costs to transport goods over the areas' abysmal local roads.

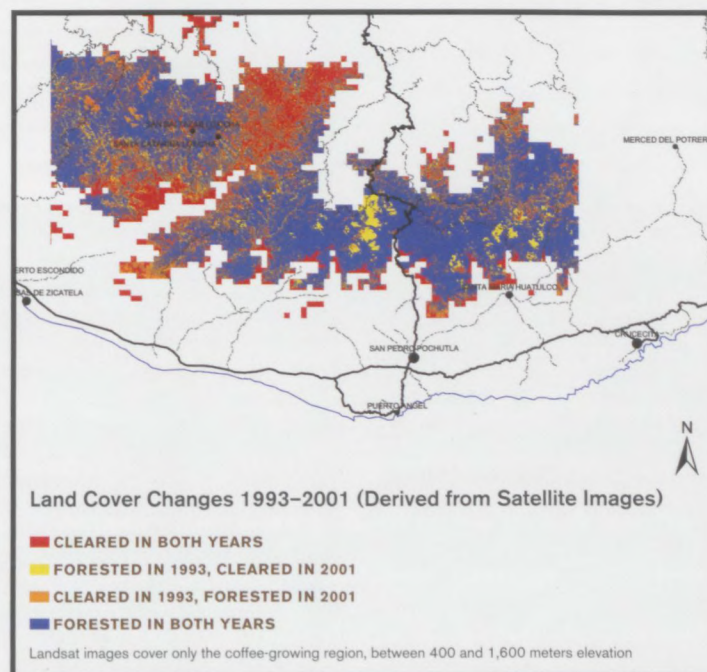
We also found that clearing tended to occur in areas where few coffee growers were organized into marketing cooperatives, where coffee farms were small, where indigenous peoples were prevalent, and at lower altitudes. Coffee farms in areas that are underserved by marketing cooperatives are relatively unprofitable because growers receive lower prices for their beans and pay higher prices for farm inputs. Small farms tend to earn less because growers lack the bargaining power needed to negotiate advantageous prices with local buyers. Farms in indigenous areas often receive lower returns because growers do not have equal access to state-provided agricultural services. Finally, farms at low altitudes earn less because they produce lower-quality coffee.

Having analyzed spatial patterns of clearing in shade coffee forests, we examined those in nearby natural forests and compared the results. We determined that, all other things being equal, clearing was less likely to occur in the shade coffee forests than in natural forests. In addition, we found that in natural forests, clearing tended to occur close to cities because conventional farms want to have easy access to urban markets.

After the Crisis: What Changed?

To address this question, we created new land cover data using satellite images of our study area from 1993 and 2001 and used this new data, along with the GIS described above, to analyze changes in forest cover during this time. We found that roughly 8,000 hectares of tree cover, representing three percent of the shade coffee forest in our study area, were lost during this period. As for spatial patterns of clearing, we found that during the coffee crisis, clearing in shade coffee

forests tended to occur in areas where economically vulnerable small farms were prevalent. Clearing also occurred near cities, the opposite of the pattern that predated the crisis. The reason for this change may have been that when coffee prices plummeted, coffee growers near cities were more likely to clear land to raise conventional crops because markets were close by. Also, such growers may have been more likely to abandon their farms because the cost of migrating to a city was relatively low.



Stopping a Downward Spiral

By conducting interviews with growers and collecting agronomic data, we learned that a coffee grower's decision to abandon his or her farm is typically the last stage of a long downturn touched off by a decline in coffee prices. When prices decline, many growers migrate to cities after harvest season to supplement their incomes. In doing so, they forgo important farm maintenance, such as pruning coffee plants after harvest. When this occurs, the yields from coffee plants decline significantly in the next season. Lower yields imply growers will again need to find off-farm work and will again forgo maintenance. As a result, bad prices in one year can set in motion a downward spiral of falling incomes and yields. Eventually, coffee yields drop so low that growers are forced to clear trees to grow subsistence crops and, ultimately, to abandon their plantations.

We built a numerical simulation model to analyze the effect of a variety of popular policies on a grower's abandonment decision. These include: improving access to credit, establishing a price floor for coffee, paying the grower for the environmental services her coffee provides, and certifying her coffee as environmentally friendly so that it commands a price premium (a strategy that has shown considerable promise elsewhere but that is rarely used in our study area). We found that although all of these policies have the potential to prevent abandonment, whether they actually do depends on putting them in place quickly after a price shock. Once a downward spiral has begun, they will have little impact.

Conclusions and Extensions

The coffee crisis of the past decade has weakened the ability of Mexican shade coffee to serve as a bulwark against deforestation, according to our research. But there are steps that

policymakers can take to reverse this trend. Our statistical analysis of land cover data indicates promoting coffee marketing cooperatives can help stem deforestation in shade coffee areas. It also suggests that road building and other investments that cut travel time will likely have countervailing impacts on deforestation. When coffee prices are strong, transportation investments promote shade coffee and, therefore, forest cover. However, when coffee prices decline, such investments may encourage coffee growers to abandon their land or to clear trees to plant conventional crops. In addition, our research shows that heavily indigenous shade coffee areas and those with many small farms are experiencing relatively rapid deforestation and therefore may be good targets for assistance. Finally, our numerical simulations suggest that often-used interventions like price supports and coffee certification need to be put in place expeditiously to make a difference.

Our team is pursuing several projects that build on the Oaxaca study. One analyzes the effectiveness of a recent Mexican coffee price-support program in stemming the loss of shade coffee. A second project uses the empirical methods we developed in our Oaxaca work to analyze the impact of the coffee crisis on deforestation in El Salvador, a densely populated country that has already lost more than 95 percent of its original forest and where virtually all of the remaining tree cover is associated with shade coffee. ■

Allen Blackman, an RFF fellow, is an expert on environmental economics in developing countries, with a focus on natural resource issues and industrial pollution. Heidi Jo Albers, a former RFF fellow now at Oregon State University, studies land use management and biodiversity conservation. Beatriz Ávalos Sartorio, a leading Mexican agricultural economist, is on the faculty at Universidad del Mar. Lisa Crooks is a former RFF research assistant. This article is based on three RFF papers by the authors, available at www.rff.org/rff/Events/Shade-Grown-Coffee.cfm

Because coffee grown under tree cover provides important ecological benefits including harboring biodiversity and sequestering carbon, environmentally conscious consumers are willing to pay a price premium for it. Passing this premium on to growers can help ensure that they survive price shocks and maintain the tree cover on and around their farms. This compelling logic underpins ongoing efforts to certify coffee as "shade grown." RFF research suggests that in order to have the biggest environmental bang for the buck, such efforts should target small growers who are most vulnerable to price shocks and most likely to clear forest cover. To do so, however, stakeholders must find ways to lower the transaction costs involved in certifying thousands of small-scale growers.

Inside RFF

Foundations

Recognize RFF's Role in Illuminating Tough Policy Issues

Only six months into the 2005 fiscal year, RFF has recorded an all-time high in foundation grants—its most successful in 25 years. Lesli Creedon, RFF's vice president for external affairs, attributes this to an enhanced appreciation by foundation board members, presidents, and program officers for the unbiased, independent research and policy recommendations put forth by RFF scholars.

"Given the polarized atmosphere in Washington, the highly contentious issues on the country's agenda, and many potentially pathbreaking policy experiments being designed here and abroad, RFF is increasingly called upon to assist government officials and members of the advocacy and business communities with objective, pragmatic ideas," said Creedon. "Foundations recognize how RFF's research can play a role in informing discussions and formulating innovative policy measures—and are supporting our efforts at record-high levels," she added.

Grants awarded so far in fiscal year 2005 include:

\$500,000 from the Andrew W. Mellon Foundation to continue the awarding of RFF Fellowships in Environmental Regulatory Implementation for two more years

\$270,000 from The Robert Wood Johnson Foundation to analyze policies that affect antibiotic resistance, \$100,000 to

analyze the benefits and costs associated with higher taxes on alcohol, and an additional \$60,000 to examine the potential for converting urban brown-field sites into recreational areas

\$200,000 from the Smith Richardson Foundation to compare, contrast, and evaluate U.S., European, and Japanese voluntary approaches to managing environmental problems

\$100,000 from the Energy Foundation and \$70,000 from The New York Community Trust to provide analytical expertise and modeling requested by the Regional Greenhouse Gas Initiative

\$75,000 from the Lounsbury Foundation to help support the work of the first holder of the Chauncey Starr Chair in Risk Analysis at RFF

\$50,000 from the G. Unger Vetlesen Foundation to support communications and public education activities around climate change

\$50,000 from The German Marshall Fund of the United States for The German Marshall Fund Transatlantic Fellowship at RFF

\$50,000 from the Center for Global Partnership to fund a workshop in Japan for policymakers and analysts to enhance U.S.–Japanese dialogue on climate change

\$25,000 from the Henry M. Jackson Foundation for a series of Congressional briefings on the future of U.S. energy policy, which will be held in conjunction with GLOBE USA

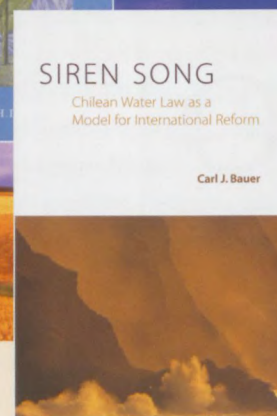
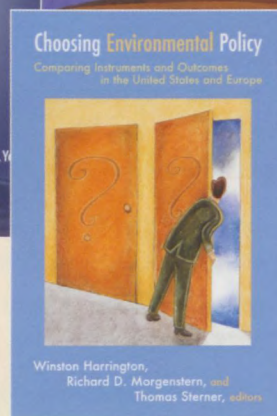
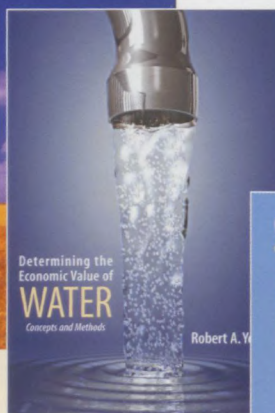
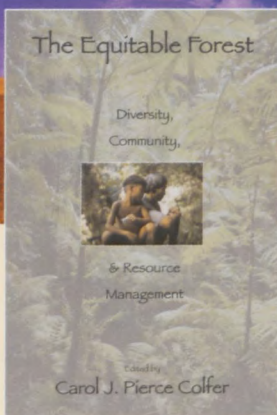
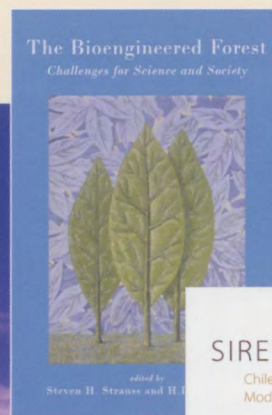
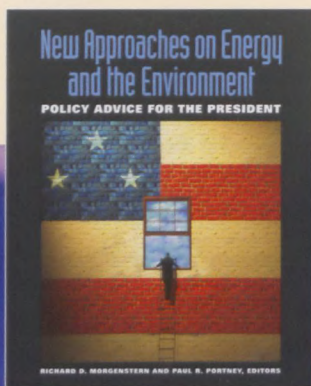
\$5,000 from the Cadeau Foundation for communications and public education activities of RFF's Electricity and Environment Program

For information on any of these projects or on ways you can assist RFF in furthering its research, please go to www.rff.org or contact Lesli Creedon at creedon@rff.org or (202) 328-5016. ■



At the recent RFF Council meeting in San Francisco, Chauncey Starr was honored for his great generosity to RFF. He has donated \$2 million to fund an endowed research chair in risk analysis, a field he helped pioneer. Starr, who founded the Electric Power Research Institute, now serves as president emeritus at age 93 and is working on a new book. He is shown here, seated, surrounded by his wife and immediate family.

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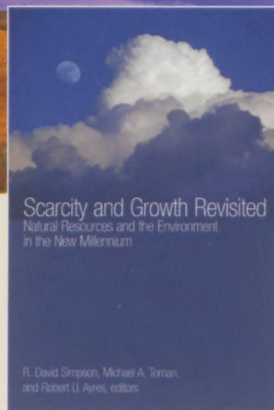
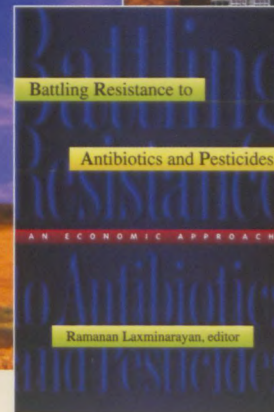
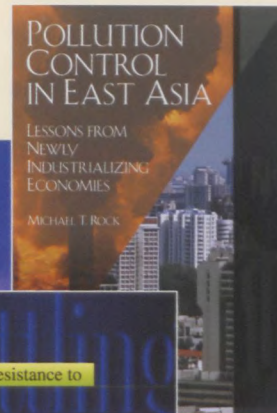
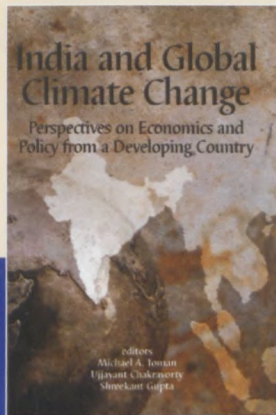
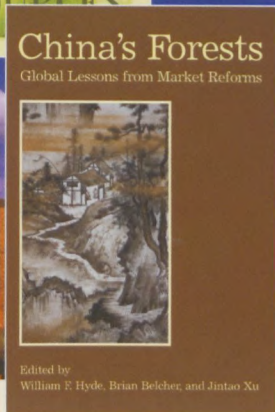
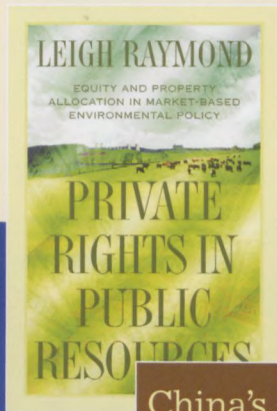
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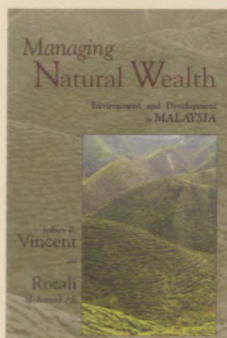
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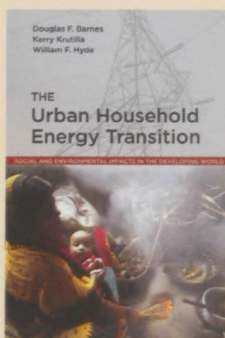
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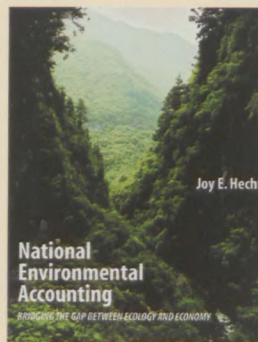
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