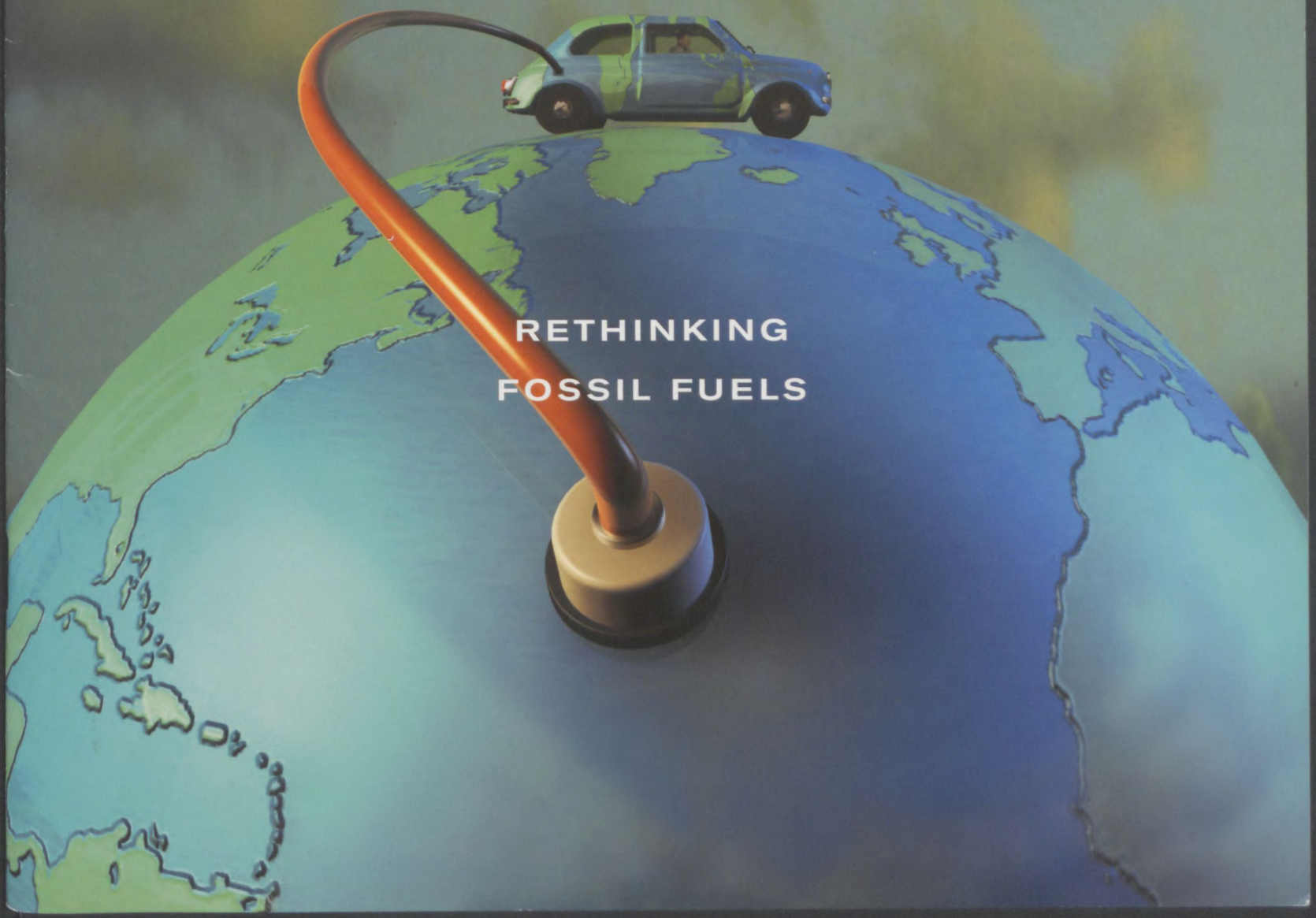
RESOURCES

RESOURCES FOR THE FUTURE SUMMER 2004 · ISSUE NUMBER 154

WHAT'S NATURE WORTH?

VALUING RISK TO CHILDREN'S HEALTH



RETHINKING FOSSIL FUELS

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RESOURCES FOR THE FUTURE
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PAUL R. PORTNEY

Why $2/Gallon Gas Is Still a Good Deal

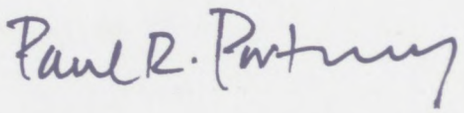
This letter will probably reach you in late July or early August—often referred to in the United States as "peak driving season." For this reason, you may be in no mood to hear me say that we shouldn't be complaining unduly about the recent increases in the price of gasoline. In fact, stop reading right now if you think the country needs gasoline price controls or, at the very least, a vigorous congressional investigation into prices at the pump. My message here will only spoil your day.

For at least three reasons, even gasoline at $2.10/gallon (the average retail price in the United States at the time of this writing) is *not* the calamity that the media and many politicians make it out to be. First, when adjusted for inflation, gasoline is 25 percent less expensive today than it was in 1981, when it hit $2.79/gallon. (Over this same period, real per capita income in the United States rose nearly 60 percent.) In fact, gasoline costs less today in real terms than it did in 1918 (when Henry Ford's Model Ts had to be refueled at $3.00/gallon). To put it differently, we still work many fewer hours to fill up our cars today than we have during most of the gasoline era.

Second, as anyone knows who's ever rented a car in Europe or Japan, gasoline looks positively dirt cheap, even at current prices, when compared to other Western industrial countries. There motorists pay $4–5/gallon and have for a long, long time. (Taxes explain all the difference, incidentally.) True, population density is greater in Europe and Japan (so that people drive less far on an average trip than in the United States), and public transit is much better developed in most European and Japanese cities, thus making the impact of higher gasoline prices there less dramatic than they would be in the United States. That's one reason why, in fact, the Europeans have elected to tax gasoline so heavily—it's not as painful, or politically unpopular, as it would be here.

There's a third reason why we shouldn't complain too much about the price of gasoline: it probably should be higher than it is now, especially if we factor in the high and growing costs of traffic congestion. The current price of $2.10/gallon covers the cost of the crude oil used to make gasoline (about $0.86/gallon), the cost of refining, transporting and marketing it (about $0.81/gallon) and the federal, state and local taxes levied on it (which average about $0.43/gallon). But it does *not* include any of the "external" costs associated with climate change, oil import dependence, or traffic congestion. These external costs may be harder to express in dollar terms than the costs of exploration, production, refining, and marketing, but they are real nonetheless. (See Ian Parry's attempt to value these costs in the summer 2002 issue of *Resources*.) Painful as it may be to be paying more at the pump, we're probably still not paying the full social costs associated with our use of this extraordinary versatile and valuable fuel.

I hope you enjoy this issue of *Resources*, and thank you for your interest in RFF. ■



Goings On

Long-time RFF Director Establishes Endowed Chair

DARIUS GASKINS

As a Department of Interior official in the early 1970s, Darius Gaskins first availed himself of what he calls RFF's "creative intellectual capital." His long association with RFF since that time has inspired him to provide $2 million to support an endowed chair that will bear his name.

"Time after time throughout my career, RFF research has expanded my thinking in useful ways," Gaskins said in an interview with *Resources*. "RFF sparks innovative thinking about the tradeoffs between development and environmental quality, and we need that today more than ever."

Gaskins was a member of the RFF Board from 1990 to 2002, serving as chair during most of that period. He currently is a partner at Norbridge, Inc., a consulting firm in Concord, Massachusetts, and his resume lists an array of leadership positions in government and industry. These include terms as president and CEO of Burlington Northern Railroad, chairman of Leaseway Transportation Corporation, chairman of the Interstate Commerce Commission, and appointments within the Department of Energy, Civil Aeronautics Board, and Federal Trade Commission.

"Much of RFF's valuable work has become so ingrained within the academic and policy communities that it almost isn't given proper credit," Gaskins says. He recalls that commodity and natural resource issues were buried within the Department of the Interior when he worked there in the early 1970s. "It was accepted wisdom among resource economists that RFF was the font of seminal work in this area, but at that time policymakers didn't realize how significant the role RFF played really was," he says.

Providing continuity for such work is the impetus behind Gaskins' creation of the new chair, which will not be restricted to any particular discipline within RFF. He regards a major impact of his tenure on the RFF Board as presiding over a broadening of the research agenda to one that today encompasses a wide spectrum of key policy issues—and without single-source funding.

Time after time throughout my career, RFF research has expanded my thinking in useful ways. RFF sparks innovative thinking about the trade-offs between development and environmental quality, and we need that today more than ever.

"It is absolutely vital that RFF have the wherewithal to soberly confront the environmental and energy challenges ahead—without too much dependence on government or industry support," he says. "Without independent and credible funding to support this kind of objective research, the nation and the world will be subject to political and emotional pressures that can lead in directions that aren't prudent."

Gaskins' career—spanning from his days as a West Point graduate and professor of economics at the University of California, Berkeley—has reinforced his general optimism about the world's ability to meet the resource and environmental challenges ahead. "You can cite lots of unresolved problems—water policy in the American West, climate change, energy supplies, fuel standards, growth and sprawl—that the political system seems unable to tackle. But I am convinced that good, hard thinking by RFF scholars is precisely what we need to successfully confront the inevitable crises that will arise," he says. ■

Environmental Power to the People in Asia

Ruth Greenspan Bell

Environmental protection is largely stalled in the developing world, especially in Asia. Numerous sophisticated studies have pointed out the harm inflicted by persistent air pollution. The international donor banks have committed funds and had law-drafting activities. But beyond such exercises, many of which seem to produce academic papers but little else, good results are few and far between. Most Asian countries have seemingly adequate environmental laws, government ministries with official responsibility for reducing pollution, and often plans to adopt extremely complex environmental instruments like emissions trading. But lasting change seems rare. How can this logjam be broken?

Perhaps the most encouraging news is to be found in increasing environmental activism. Citizens and NGOs are using tools at hand to bring these problems into public view and seek workable solutions. What is particularly interesting is that this activism is taking place in countries that historically haven't encouraged citizens to speak out.

In new research with Barbara Finamore of the Natural Resources Defense Council, I have been able to study the growing trend toward environmental public participation in Asia, with support from the U.S. Agency for International Development. Against all odds, especially traditional attitudes of deference to governments and authority, activists are taking cues from the U.S. experience of the 1960s and 1970s and finding ways to draw public attention to festering environmental problems.

How they do this depends very much on the circumstances in their own countries. At times, citizens and NGOs use legal actions to achieve their goals with varying results. Chinese lawyer Wang Canfa sues polluters, seeking damages for the impacts of their pollution. He does this in a country that has never been under a rule of law and where even today judges have great difficulty acting independently of the state.

One successful example of this method was the court case brought by M.C. Mehta in Delhi, India, that ultimately resulted in the switch from heavily polluting fuels to compressed natural gas in commercial vehicles. This case involved all levels of society from NGOs to the Supreme Court, which mandated the change after years of wrangling from the different sides. (For more information on this project, see *Resources*, fall/winter 2004, and www.rff.org/clearingtheair.)

But litigation is also the tool of choice in numerous Southeast Asian countries, where NGOs have brought lawsuits that mimic M.C. Mehta's groundbreaking Indian litigation. Not every result has been as happy as the one in Delhi. In some countries, the litigants are learning that even an order from a high court is not sufficient to change longstanding practices of polluters. Litigators in Pakistan, for example, have gone back to the drawing board, as it were, to develop multi-stakeholder processes that they hope will find solutions that can work.

We also learned about other approaches beside legal proceedings. In Indonesia, an independent research organization, Pelangi, undertook a study to determine why the country's more than 75 air pollution control regulations were not more effective in

improving air quality. They used interviews, panels, and focus groups to both collect and spread information, and a public dialogue and radio campaign to disseminate their findings. The next phase of their work will involve brokering legal and practical solutions.

Six hundred Asian air quality experts met in Manila at our invitation in December 2003, as part of an annual region-wide gathering, the Better Air Quality meetings. In addition to a rare opportunity for these practitioners to share experiences, the purpose of the meeting was to start a discussion about whether it was possible to transfer lessons from those efforts between these countries and these experts. The workshops featured six case examples, which we grouped into three categories from the 80 examples that we had collected from 17 countries.

I hope that future such regional meetings occur and more attention will be paid to environmental public participation, in general, and to effective processes for encouraging public involvement processes in specific. The audience for these important discussions should not be confined to NGOs, but should also include government, industry, and academics. Each of these stakeholders needs to learn to work together toward more effective environmental regulation.

Asian environmental advocates could also benefit greatly from a continuing process that would allow them to share experiences and better understand the techniques and skills that are being used by their neighbors. Sharing can improve environmental public participation in each of their countries and perhaps deliver the lasting results everyone is seeking. ■

Regulatory Risk Influences Utilities' Strategy, Cinergy Chief Says

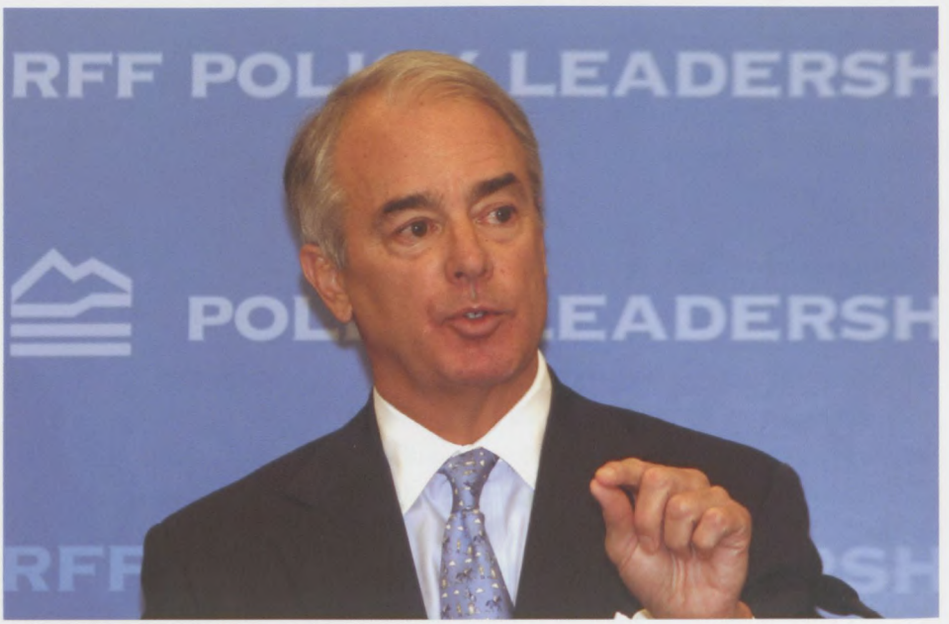
Regulatory uncertainty puts a premium on flexibility when electric utilities make decisions on fuels and technologies, said James E. Rogers, chairman and chief executive officer of Cinergy Corp., at RFF's most recent Policy Leadership Forum.

The electric utilities, he said, bear a greater "stroke-of-the-pen" risk than any other industry—the risk that a sudden change in state or federal regulation can sharply change the economics of their operations. Cinergy burns 30 million tons of coal a year to provide power to two million consumers in the Midwest.

The company will use coal gasification technology for its next expansion, Rogers reported. While gasification presently is somewhat more expensive than burning pulverized coal, he explained, the technology can be adapted to comply with the more demanding pollution regulations that may be imposed in the future.

In Congress, legislation on utility emissions is caught in a deadlock over whether new limits on three pollutants—sulfur dioxide, nitrogen oxides, and mercury—should be accompanied by restrictions on carbon dioxide, the most important of the gases causing global warming. At least in the short term, federal regulation of this gas seems unlikely. But to prepare for different rules in the longer future, Rogers said, Cinergy has set a goal of a five percent reduction in carbon emissions over the next 10 years, the equivalent of taking half a million cars off the road per year.

"I live with the vision we will live in a carbon-constrained world some day," he observed. With the coal gasification technology it is possible—although not inexpensive—to remove and sequester carbon dioxide rather than emitting it into the sky. ■



James E. Rogers, speaking at the RFF Policy Leadership Forum.

Measuring Superfund's Success

Superfund cleanup efforts have been among the nation's most controversial and most visible environmental initiatives since the program began in the 1980s. Defining success for the program continues to be a vexing problem because of the lack of established criteria and up-to-date and dependable data. Even for sites on the National Priorities List (NPL), such information can be scattered throughout many places on the Internet or hard to come by at all.

In a new report, RFF Senior Fellow Katherine N. Probst and Research Assistant Diane Sherman address these issues and outline a systematic approach for organizing and disseminating the critical data to stakeholders. The report, *Success for Superfund: A New Approach for Keeping Score,* was funded by the Environmental Protection Agency's (EPA) Office of Solid Waste & Emergency Response.

To correct the lag in accurate and timely information, the authors recommend implementation of three separate Internet tools that would be easily available to the public:

- a one-page report card, summarizing key information about a site, such as status of cleanup activities and major contaminants present;
- a standardized six-page Scorecard that expands on the report card data, with more information on completed, ongoing, and future actions, drinking water and groundwater, risk-reduction accomplishments, and post-construction activities; and
- a Superfund Annual Report that summarizes information on progress for all NPL sites and contains other indicators of program performance.

The authors conclude that if EPA provided more reliable, consistent, accessible, and transparent information about the Superfund program, it might then be possible to create more realistic expectations about what can and cannot be achieved. The debate about Superfund needs to "take place in the context of facts, not a war of anecdotes," they say.

For more information on this report and to read about Probst's other research on Superfund, visit www.rff.org/rff/Superfund.cfm. ■

NPL Site Report Card – Mockup

Information last updated: 7/1/2003

Site name: ABC Corporation Landfill
EPA region: 3
ID: XYZ123456789
Mega site? No
Federal facility? No
Type of industrial operation (if applicable) Landfill
Site in environmental justice community? Yes
Site sacred to tribal community? No
Sensitive ecosystem? No
National Priority List (NPL) proposal date: 2/25/1990
NPL final listing date: 1/5/1991

Current human exposure under control? Yes
Contaminated groundwater migration under control? Insufficient data

Current status of each Operable Unit (OU)

OU 01 - Remedial investigation/ feasibility study finished (responsible parties-lead: ABC Corporation Landfill Group, City of XX), Remedial design underway (responsible parties-lead: ABC Corporation Landfill Group, City of XX)

OU 02 - Remedial investigation/ feasibility study finished (EPA-lead), Remedial design underway (responsible parties-lead: ABC Corporation Landfill Group, City of XX)

OU 03 - Remedial investigation/ feasibility study underway (EPA-lead)

Construction complete status: Not construction complete
Construction complete date or estimated date: *Estimated 2015*

Major contaminants

Metals (arsenic, lead, chromium); nitrate; Volatile Organic Compounds - VOCs (benzene, toluene, ethyl benzene, xylene), cyanide, Polycyclic Aromatic Hydrocarbons - PAHs, pesticides

Estimated size of population living on-site: 0
Estimated size of population working on-site: 25
Estimated size of population within 1 mile site buffer zone: 1,500
Source of drinking water for population living on-site or within site buffer zone:

Previously municipal water supply, but currently bottled water

Risk reduction accomplishments	Groundwater	Soils	Sediments	Surface water	Air
Exposure reduced	No	No	Not applicable	Not applicable	Not applicable
Exposure controlled	Yes	Partial	Not applicable	Not applicable	Not applicable
Exposure eliminated	No	No	Not applicable	Not applicable	Not applicable
Contamination reduced	No	No	Not applicable	Not applicable	Not applicable
Contamination contained	No	No	Not applicable	Not applicable	Not applicable
Contamination eliminated	No	No	Not applicable	Not applicable	Not applicable

Are institutional controls a component of remedy at site? Yes
Have institutional controls been implemented? Yes
Date of last five-year review: Not applicable
Date of next five-year review: Not applicable
Is remedy functioning properly? Not applicable

Total cleanup costs to date: $3,151,000
Total expected future cleanup costs: *$32,259,000*
Expected total costs of cleanup: *$35,410,000*

Finding a Cost-Effective Policy to Promote Renewable Energy Sources

Karen Palmer and Dallas Burtraw

Electricity generators that burn fossil fuels such as coal are responsible for close to 40 percent of all U.S. carbon dioxide emissions, a pollutant believed to contribute to global warming. One way to reduce these emissions would be to generate more electricity using renewable energy sources, such as windmills or geothermal plants that emit no carbon dioxide. However, despite growing popularity in parts of Europe, renewables are not expected to make substantial inroads into electricity generation in the United States, largely due to their relatively high costs.

To help promote renewables, governments at several levels have proposed or enacted various policies. One important federal policy has been the Renewable Energy Production Credit (REPC), a tax credit for electricity generated using specific types of renewables. This policy expired at the end of 2003 but is likely to be reauthorized in this session of Congress.

At the state level, a popular policy tool is a renewable portfolio standard (RPS) that requires a minimum percentage of electricity be produced using renewable technologies. In some states, the RPS includes a tradable credit provision, which means that every kilowatt of electricity generated using an eligible renewable technology results in the creation of a tradable renewable energy credit. With a trading provision, companies can comply either by generating with renewables that they own, by purchasing electricity directly from renewable generators, or by purchasing renewable energy credits. Currently 16 states have renewable portfolio standards, which vary in targets and timetables, what types of renewables are included, and whether or not trading is allowed.

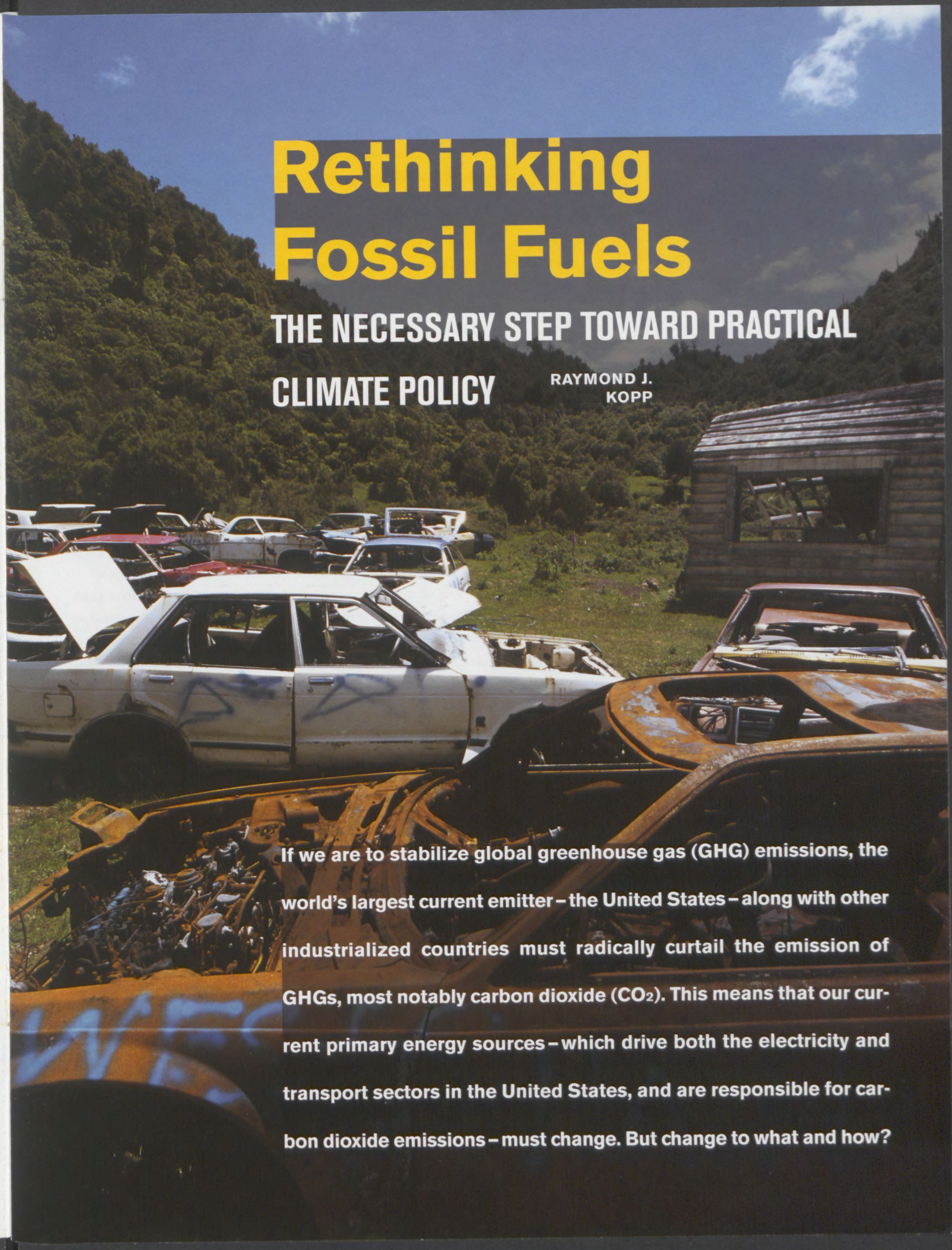
In a new report, *Electricity, Renewables, and Climate Change: Searching for a Cost-Effective Policy*, we evaluate the extent to which these approaches encourage greater use of renewables. Applying RFF's simulation model of regional electricity markets, we analyze how different policies affect technologies and fuels used to produce electricity, the price of electricity, its social cost, and the level of carbon dioxide (CO_2) emissions.

The results of our study indicate that an REPC policy is a potent tool for encouraging renewables generation, but that it is more costly than an RPS and not as effective at reducing CO_2 emissions. An RPS policy could increase renewables from a three percent share to a 15 percent share by 2020 without major increases in electricity prices; after that threshold, however, renewables become much more expensive. The higher the RPS target, the greater the carbon emissions reductions ensuing from the policy. However, renewables tend to replace natural gas generation more readily than coal, leading to less reduction in CO_2 emissions than if only coal use was decreased.

In researching this report, we also learned that a policy that caps annual emissions of CO_2 from electricity generators is a more cost-effective tool for reducing carbon emissions than either an RPS or an REPC. A carbon cap also leads to expanded use of renewables.

Our results suggest that the appropriate policy depends upon the objective. With a narrowly defined goal of trying to promote renewables, an RPS may be the most cost-effective approach, holding carbon emissions constant. However, if one is trying to achieve climate policy goals, a carbon-focused policy is preferred. If policymakers are trying to reach both goals, perhaps the two approaches should be combined.

For more information on our work on renewable energy, see our website, www.rff.org/renewables, where you can download the report. ■



Rethinking Fossil Fuels

THE NECESSARY STEP TOWARD PRACTICAL CLIMATE POLICY

RAYMOND J. KOPP

If we are to stabilize global greenhouse gas (GHG) emissions, the world's largest current emitter – the United States – along with other industrialized countries must radically curtail the emission of GHGs, most notably carbon dioxide (CO_2). This means that our current primary energy sources – which drive both the electricity and transport sectors in the United States, and are responsible for carbon dioxide emissions – must change. But change to what and how?

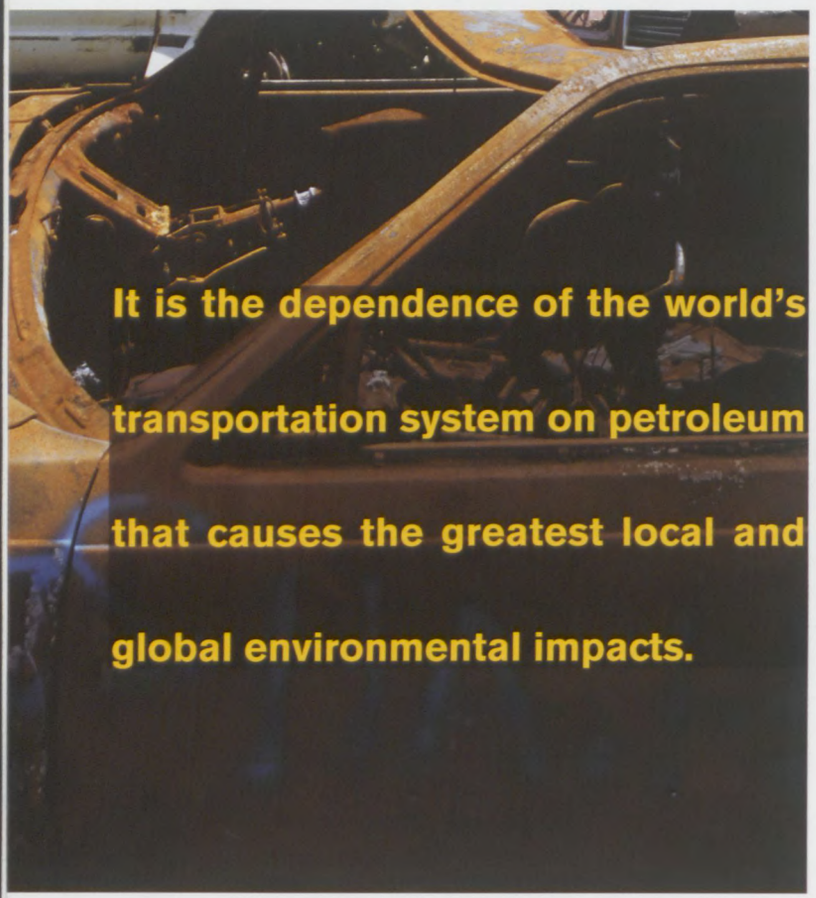
These two questions, what and how, are at the core of the domestic and, to a large extent, international policy debate about climate policy. What changes to the electricity and transport sectors are practical, technically feasible, and economically and politically viable over the next several decades? Given we can answer the first question, how do we formulate a constellation of domestic and international policies that will provide the proper incentives to undertake the desired changes?

These questions are quite a bit different from the issues surrounding international discussions of the Kyoto Protocol or domestic debates over tailpipe standards in California and federal greenhouse gas legislation like that introduced by Senators John McCain and Joseph Lieberman. While these other discussions concern near-term reductions in greenhouse gas emissions, the questions posed here relate to the fundamental problem of providing the incentives and resources necessary to transform the global energy system over the next half-century.

Rethinking Coal

For many the answer to the "what" question is obvious. We must dramatically reduce reliance on fossil fuels, especially coal and petroleum, and expend the resources necessary to develop and deploy noncarbon energy technologies, namely renewables. As the old saying goes, "easier said than done." Current reliance on coal and oil is the result of past and present economics and technology, and the answer to the "what" question requires us to rethink our approach to these fuels.

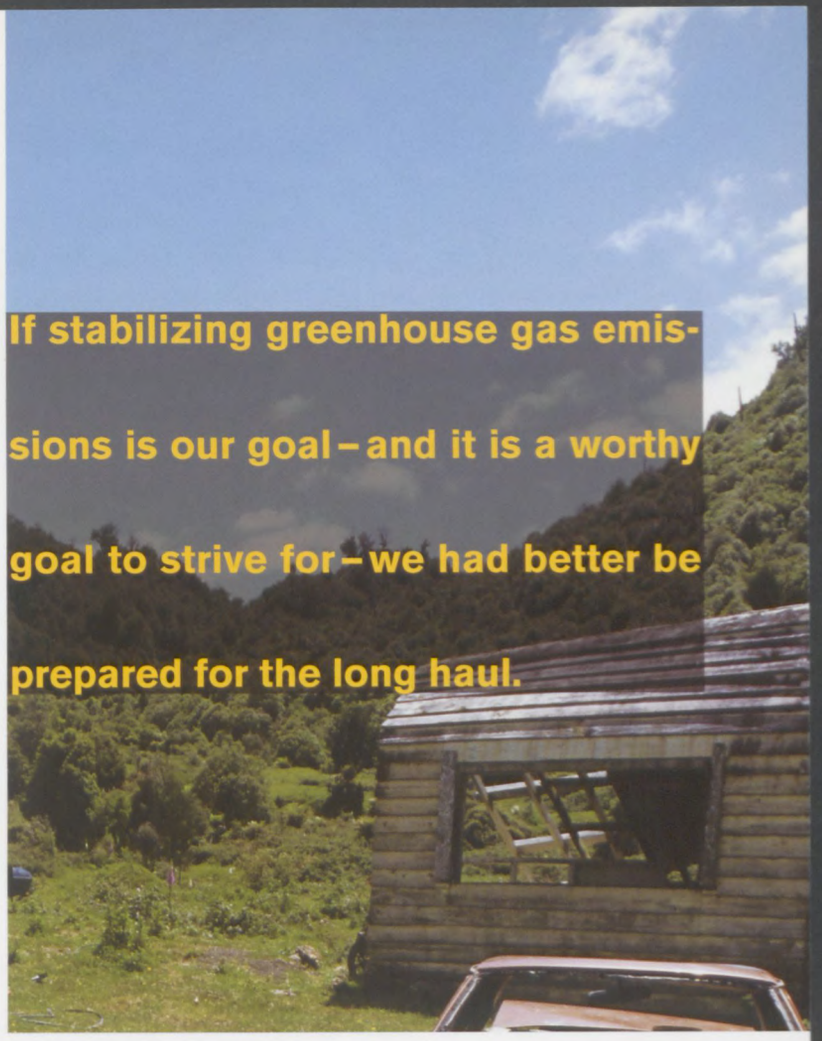
Rethinking fossil fuels begins with coal and recognition of these facts: there is a lot of coal, it is spread widely around the globe, and it's cheap. Add to this the political clout that coal interests have in the United States—and a perception that the Chinese are anxious to use their coal reserves and fear growing dependence on foreign oil—and you have a picture of two very important CO_2 emitters that are wedded strongly to coal. While renewables such as wind, solar, and biomass will likely be a part of the energy future, the coal reality—its abundance, price, and political power—suggests that it is it naïve to think of a world where coal is not a large part of the energy system.



The problem with coal is the harmful by-products released into the atmosphere when it is burned. Of these, CO_2 is the most significant global pollutant, but mercury, sulfur dioxide, nitrogen oxides, and particulates cause serious problems as well. A sensible solution exists: avoid burning coal directly and convert it to natural gas instead, using oxygen and steam, then clean it of impurities such as mercury and sulfur. The natural gas can be further processed to increase its hydrogen content and convert carbon monoxide to carbon dioxide. This CO_2 can then be separated and stored underground while the remaining hydrogen is used for carbon-free electricity generation.

At present, there are no actual demonstrations of this process, and it sounds a bit like science fiction. But we do know how to make this work. What we don't know is how to

do this on a grand scale and do it cheaply. If the technology—everything from the gasification, to the CO_2 separation and storage, to hydrogen production—could be commercialized and available at a competitive cost, coal can be an environmentally benign and important part of the world's energy future. Of course, simultaneous research would have to be done to improve the environmental impact and safety of coal mining itself.



Rethinking Petroleum

Transportation and petroleum use poses a number of important public policy questions ranging from local issues such as traffic congestion, land use, and highway safety to international ones such as foreign policy and of course global climate change. When rethinking petroleum, three facts must be kept front and center.

First, from the perspective of climate policy, all issues concerning transportation revolve around fuels, and, at present, that fuel is petroleum. It is the dependence of the world's transportation system on petroleum that causes the greatest local and global environmental impacts.

Second, the transportation sector is growing in virtually every corner of the world and with it, the combustion of petroleum and resultant emissions. Without a doubt, the greatest growth is in the developing world, with China leading the way. In the decade of the 1990s, China doubled its petroleum consumption. Even in the developed countries of the European Union, where gasoline is highly taxed, aggressive programs to increase fuel efficiency and subsidize public transportation are, at best, flat with respect to petroleum consumption during the same decade. In some countries, like France and Germany, consumption has in fact increased.

Third, one does not simply switch quickly to another more environmentally friendly transportation fuel. Both vehicles and the necessary infrastructures are designed solely around petroleum and internal combustion engines using gasoline and diesel. From a technical point of view, there is no alternative fuel ready for prime time. The hope that battery-powered electric vehicles would be the wave of the future seems to have faded, along with the visions of a vehicle fleet powered by compressed natural gas. The jury is still out with respect to the feasibility of large-scale transformation of waste products and crops other than corn into fuels, also called second-generation biomass. Even if vehicles can be created that use an alternative fuel in a reasonable amount of time, the petroleum infrastructure (oil fields, pipelines, refineries, and retail outlets) represents an enormous amount of very long-lived capital.

What is on the table are alternatives, like hydrogen, fuel cells, and electric motors. Existing electric motor technology is sufficient for our needs. If we have hydrogen, the missing piece of technology is the fuel cell that turns hydrogen into electricity to drive the motors, along with a cost-effective way to store hydrogen on vehicles. Fortunately, fuel cell research is on an upswing. To be sure, there are difficult technical issues to master, but the future seems bright. It appears the truly difficult technical part will be the development of safe and low-cost on-board hydrogen storage.

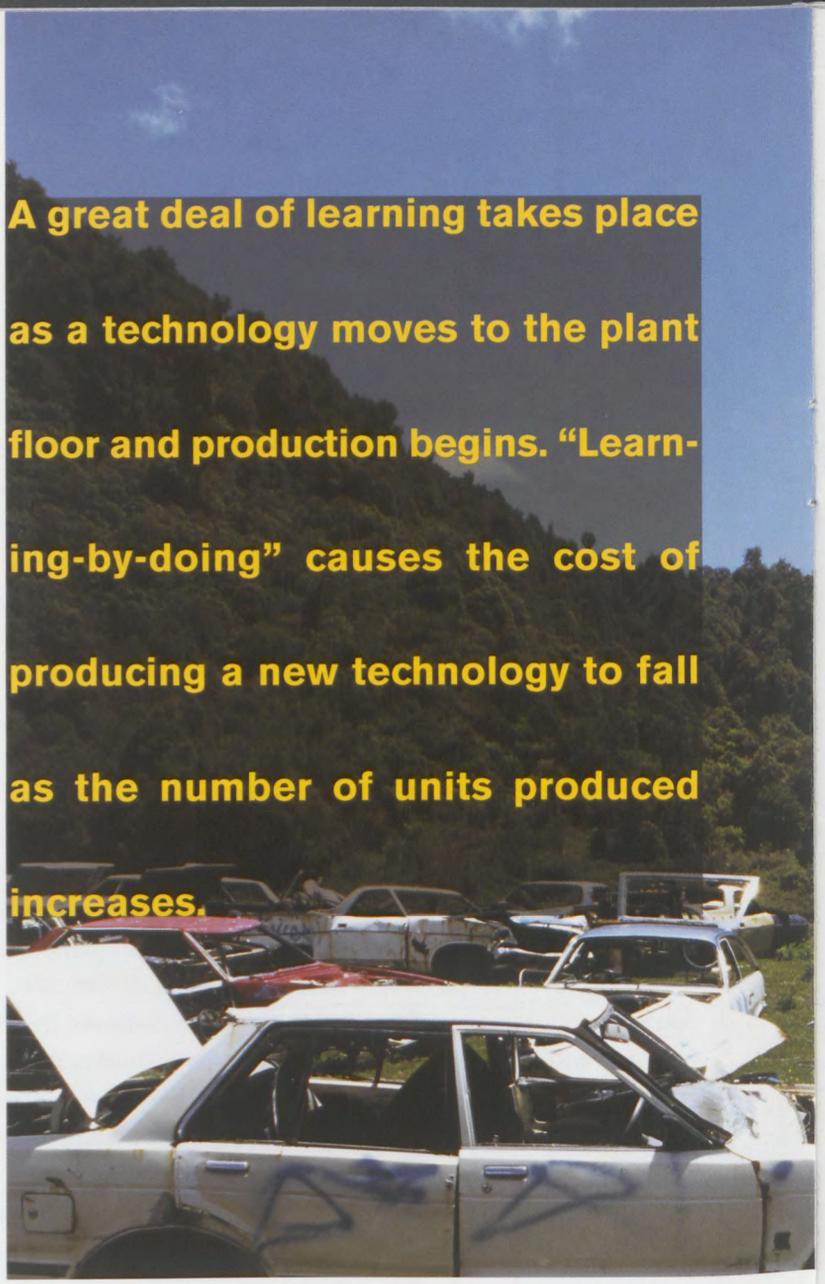
The next technological challenge will be bringing hydrogen to the marketplace. Moving and storing hydrogen is not as easy as petroleum. We may need entirely new pipeline systems (although some portions of the existing natural gas transmission system may work), distribution networks, and of course hydrogen stations. To complicate matters, hydrogen will displace petroleum as a transport fuel slowly as the internal combustion engine stock (namely, billions of cars and trucks) rolls over to fuel cell electric motors and as the hydrogen transportation system develops. So, at the same time we will have petroleum competing with hydrogen in the marketplace.

There may be as many answers to the "what" question as there are technologists. For example, there is much talk about production of hydrogen by electrolysis using nuclear power as the ultimate hydrogen production method. Similarly, second generation biomass liquid fuels hold real potential. There are those who argue that conservation combined with enhanced end-use efficiency will reduce energy needs enough that they can be met by wind and solar. All of these areas deserve further investigation. But the facts surrounding two of the three dominant fossil fuels remain. Coal's low market cost and abundance make it difficult if not impossible to ignore, and petroleum's current preeminent position as the only viable transport fuel suggests its environmental problems will remain with us (and perhaps get worse) unless we find a suitable alternative.

The Obstacles Ahead

Moving the U.S. energy system (that is, the electric power and transport sectors) to a coal-driven hydrogen future faces a series of obstacles. The country has a sizable investment in carbon-based energy technologies. Scrapping that capital precipitously and replacing it with something else will cost a significant amount of money. And, with a few exceptions, a good portion of the hydrogen technology needed is still on the drawing board. Thus, the dilemma is twofold: how to not only bring down the price of delivered hydrogen to a point where it is competitive with natural gas in electricity generation and with petroleum in transport, but also how to bring the cost so low that it will cause a rapid turnover in the existing energy-related capital stock.

To accomplish this feat, a new, integrated energy policy must do the following: hasten the development and commercialization of the necessary technologies, reduce their cost, and provide incentives to the private sector to replace the current carbon-based capital with the new hydrogen capital before the existing stock is fully depreciated. Funds will



A great deal of learning takes place as a technology moves to the plant floor and production begins. "Learning-by-doing" causes the cost of producing a new technology to fall as the number of units produced increases.

have to be directed to research and development (R&D) and spread across a number of different technologies ranging from coal gasification to hydrogen generation, among others. Each technology will have a different pace of development, so funding policies should be targeted differently to each technology or class of technologies.

Spurring R&D

While government may in fact undertake some of this research (perhaps through the system of National Laboratories run by the Department of Energy), the bulk of the R&D must be accomplished by the private sector. One might then ask why government policies are necessary for the private sector to undertake this work. The answer is quite straightforward. Absent any government policy, there are simply no incentives for the private sector to make the large investments needed to transform the energy system. Environmental problems

aside, from a business perspective the current carbon-based energy system functions fairly well, and few firms would make massive investments to change it without external pressure.

Some would argue that all that is needed is for the government to "get the prices right," that is, set a price on carbon emissions either through a carbon tax or a cap-and-trade permit system and let the private sector react to the price signal. This view makes sense and should be part of a portfolio, but if a single, price-based policy had to do all the "heavy lifting" the resulting high price would be politically unacceptable.

It is common knowledge that commercial firms underinvest in R&D because they are never able to appropriate all the benefits for themselves. This "market failure" is the primary justification for government policy to stimulate R&D in private markets through such things as tax incentives, grants, and private–public partnerships, as well as government support of research at universities and other public institutions. While firms would no doubt increase their R&D expenditures in carbon-free technologies in response, say, to a $100/ton carbon tax, they would be investing less than the socially optimal amount. Rather than raise the tax to, say, $200 to bring forth more R&D, it is more efficient from a policy perspective to augment the tax with other policies that induce firms to invest more in R&D.

Learning by Doing

Once nearly commercialized technologies are available, a second set of policies is needed to buy down their cost. History has revealed that a great deal of learning takes place as a technology moves to the plant floor and production begins, and this learning lowers cost. This phenomenon, called learning-by-doing, causes the cost of producing a new technology (say a fuel cell) or the cost of production from a new technology (for example, tons of hydrogen from coal gasification) to fall as the number of units produced increases. A variety of these buy-down policies can be put in place to expand the production rates for new technologies, thereby lowering their cost and hastening the time when they can compete in the marketplace. These policies usually take the form of government purchase commitments or a subsidy, where the subsidy is used to lower the cost of production in the future.

Perhaps the most important part of this three-policy trilogy in getting the "prices right" is a carbon cap and tradable permit system. This policy acts to alter the economic playing field by disadvantaging carbon-emitting energy sources, causing their cost to rise, and thereby promoting carbon-free sources. Lowering the cost of the latter will help "pull" the nascent coal-to-hydrogen technology and all its other components (carbon separation and storage, fuel cells, and hydrogen-based transportation infrastructure) into the commercial marketplace.

Also, a system in which carbon permits are auctioned by the government provides the crucial revenues to fund the likely expensive and long-lived R&D and cost buy-down policies discussed above. The importance of a dedicated revenue stream to the funding of long-term basic research cannot be understated.

The pull policy alluded to above can act like an accelerator pedal in a car. If new climate science suggests that we must move to a noncarbon energy system more quickly than anticipated, the number of permits is reduced (causing auction revenues to rise). The rising permit price further advantages the commercial adoption of the noncarbon technology while at the same time generating more revenue that can be used to hasten technology development.

If stabilizing greenhouse gas emissions is our goal—and it is a worthy one to strive for—we had better be prepared for the long haul. New technologies such as electric- and hydrogen-powered motors will eventually be readily available. New techniques for deriving energy from coal and other fossil fuels will eventually be standardized and in greater use. Since the transformation of the global energy system to one that emits zero greenhouse gases can be expected to take half a century or more, the sooner the transformation begins, the lower the accumulated greenhouse gases in the atmosphere will be. ■

Raymond J. Kopp, a senior fellow, is an expert in techniques of assigning value to environmental and natural resources that do not have market prices, which he uses in cost-benefit analysis and to assess damage to natural resources.

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valuing risk to health

CHILDREN ARE NOT LITTLE ADULTS

Sandra Hoffmann and Alan J. Krupnick

When it comes to environmental health risks, children often have the worst of many worlds. Facing the same concentration of a pollutant, children's exposure may be greater than that of adults. Because they have a higher metabolism rate than adults, children take in more food, water, and air for their body weight. Next, they engage in activities—like crawling on the floor and playing in dirt—that may bring them into closer contact with toxins. Also, because their bodies are still developing, children can be more vulnerable to pollutants and less able to detoxify and excrete them. Finally, children also have more years of life ahead of them than adults, so they have longer to develop chronic diseases from exposure to environmental toxins.

Only in the past 20 years have policymakers faced up to these issues. In the mid-1980s, the scientific community began insisting that environmental regulations designed to protect adults (primarily adult men) were not adequate to protect children. Governments all over the world, including in the United States, are now recognizing the need to develop standards that specifically protect children. For example, the 1996 Food Quality Protection Act (FQPA), which amended federal pesticide law, explicitly required that a tenfold safety factor be used in setting pesticide tolerances in food because of their uncertainty about the impact on children. In the mid-1990s, the administrator of the U.S. Environmental Protection Agency (EPA) directed that risk assessments for all environmental regulations consider the specific needs of children. This summer, environmental ministers from the European Union member states are meeting to draft an action plan for legislation, research, implementation, and evaluation of new programs to protect children from environmental hazards.

existing approaches don't quite work

Health benefits valuation plays an important role in enabling environmental agencies and ministries to evaluate prospective and current programs. Environmental programs address health risks as different as cancer and asthma. Benefits valuation provides a common measure—based on people's preferences regarding different diseases and mortality risks—by which a wide range of physical outcomes can be compared. Environmental policymakers often want to gain a quantitative understanding of how the benefits of a program compare with its costs. Monetary valuation of health benefits makes this possible.

Techniques for determining adults' preferences for various health improvements and expressing them in monetary terms are reasonably well established, if controversial. However, these techniques cannot be directly applied to children nor can they be adapted simply.

Economists have used two basic approaches to valuing reductions in risk to adults' health. The human capital approach looks at direct financial costs associated with illness—primarily medical expenses and lost wages. This approach is relatively easy to implement, but provides an incomplete measure of the value of protecting health. A theoretically more satisfying measure is willingness to pay (WTP) to reduce health risks. WTP measures are based on the trade-offs individuals make, or are willing to make, between protecting their health and other things they need or want.

Both approaches have obvious flaws when applied to children. Human capital measures can be even more incomplete or challenging to use because it can be more difficult to estimate the value of the time young children lose to illness because they are not engaged in the labor market. Estimates of WTP are conventionally based on adults' actions or statements reflecting their judgments about the worth of protecting their own health. As anyone who has chased after a three-year-old running toward a busy street knows, however, children do not have mature judgments about their own health.

Governments all over the world, including in the United States, are recognizing that specific attention needs to be given to whether environmental law and regulation are doing a good enough job with respect to children.

finding better approaches

Government agencies in the United States and other industrialized countries have been working with economists to develop more appropriate measures of the benefits of environmental regulation to children's health. In 1999, EPA brought together in a workshop leading economists working on environmental health valuation to identify major problems and research needs. A follow-up conference was held in 2003 at which economists presented research on family decisionmaking regarding children's health, valuing protection of fetal and infant health, variation of health valuation estimates by age, and valuation of the benefits of asthma reduction policies. In conjunction with the 2003 conference, EPA published its *Children's Health Valuation Handbook*. Because valuation of children's health is a rapidly developing area of knowledge, the *Handbook* is specifically designed to be an easily updateable reference tool, rather than a prescriptive guide. And in fall 2003, the OECD (Organisation for Economic Co-operation and Development) Environment Directorate held a workshop to help it design guidance for its member countries.

major questions identified

While these efforts have resolved many questions, several basic ones are still being debated. One of the most basic is whose benefits should be counted. The goal of any effort to value the benefits of a public program is always to reflect its full value to all in society who benefit from it. In valuing benefits from programs that protect adult environmental health, standard practice is to measure only the direct benefit to affected individuals. Counting the preferences of others who care about affected individuals' well-being would lead to double counting under certain circumstances. In the case of children, some economists argue that what should be counted is not only the direct benefit to children themselves, but also the benefit to others, such as parents or even general taxpayers, who care about children's health outcomes. One thing everyone agrees upon is that the value to the child itself of improved health is an important part of total benefits. The problem is how to accurately measure these benefits, which is true for both WTP and human capital measures.

At first glance it may seem difficult to apply the human capital approach to reduction in risk to children's health, because children don't work and their life outcomes are highly uncertain. But at a population level it is possible to project expected longevity, income, and disease rates and to estimate how they change in response to illness induced by environmental hazards. Because children's environmental health policy is often concerned with chronic disease, birth defects, or permanent disabilities over an entire lifetime, there may be greater uncertainty about these estimates than for an adult population. More attention may also need to be given to economic trends. For example, there is some evidence that exposure to neurotoxins, like lead, in early childhood is associated with an increased risk of not graduating from high school. But the economic consequences of not graduating from high school are greater today than they were in 1950 and can be expected to be even greater in the future.

With WTP measures, the problem is who should speak for children. EPA's practical solution is that their parents should. On its face, this seems like a commonsense solution. After all, parents bear the emotional, financial, and time costs of caring for their ill children. They are personally affected when their children are ill. But it is difficult to know what is captured in parents' valuation of children's health. Several empirical studies have resulted in the consistent finding that parents' WTP to reduce children's health risk is two times adult WTP to reduce their own health risk. No one yet knows quite what this result means. Do they perceive children's health to be twice as valuable as their own, or are parents

counting the impact on their children and the impact on themselves? One possibility is that adults' retrospective preferences for protecting their own health as children should be used or that it is worth reexamining a bit more deeply whether, after all is said and done, adults' WTP to protect their own health may not be a reasonable measure of the benefit of protecting health in childhood.

Even if there were agreement on whose benefits count and whose assessment of those benefits should be measured, serious questions remain about how to get reliable estimates of those measures. Research is being developed along several lines. A significant amount of work is being done to better understand parents' WTP to reduce their children's health risk (see sidebar next page). Other work is examining methods of valuing prevention of disease with long latency peri-

Several studies have resulted in the consistent finding that parents' WTP to reduce children's health risk is two times adult WTP to reduce their own health risk.

family decision-making about risks to children's health: does father knows best?

Federal agencies, such as the U.S. Environmental Protection Agency (EPA), must quantify the benefits of major regulations both for OMB and for Congress. To do this, EPA frequently relies on studies that estimate how much people would be willing to pay to protect themselves from environmental health hazards, such as exposure to lead paint. But what do you do if the person protected is a young child? One of EPA's answers is to turn to the child's parents. After all, parents hold the family purse strings and have legal responsibility for their children's health.

Most existing studies of parents' willingness to pay to reduce children's risk from exposure to environmental hazards assume the household has one decisionmaker who determines how all of the family's financial and time resources are allocated. This is called a unitary model of household decisionmaking. But this "Father Knows Best" view of how decisions are made does not seem to fit today's family—if it ever did.

Research on household economics, pioneered by 1992 Nobel Laureate Gary Becker, has led to the development of alternative models of how families choose to spend money and time. These models of household decisionmaking treat the family as a collection of individuals each with influence on the family's decision. The basic premise is that the adults in a family pool their financial resources and think about time available to the family as a shared resource. However, the adults are considered to have their own ideas of what is best for the family and bargain to reach a mutually agreeable allocation of resources.

Children's health is of particular concern because individual parents may have different attitudes toward children's health risks, be affected differently by children's illnesses and have responsibility for different parts of the household budget. Cognitive psychology studies show fairly consistently that women are more risk averse than men with regard to health and safety hazards. If this were coupled with women generally having greater responsibility for childcare or expenditures affecting children's health,

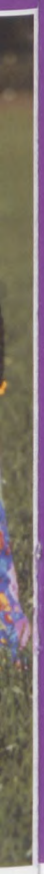
current valuation methods that do not take this into account could result in inaccurate (and possibly low) estimates of parental willingness to pay (WTP) to protect children from environmental health hazards.

We are conducting a study to see if there is a difference in estimates of parents' WTP to protect children's health using a unitary or collective model. The study, conducted with Ann Bostrom from Georgia Institute of Technology and Victor Adamowicz of the University of Alberta, focuses on parental decisions to protect children from lead paint hazards. It is one of the first to use a survey of individual's statements about their preferences to estimate a collective household model.

Our goal is to gain a better understanding of differences in parents' perception of risks their children face from environmental hazards and of the role each parent plays in family decisions about protecting children from these risks. We focus on lead poisoning from paint because it remains a serious public health concern for children, even though lead paint was banned for residential use in 1978 and because it primarily affects children.

Looking at how each member influences family decisionmaking is more complicated than looking at the household as an aggregate unit. As a result, we are using an innovative multidisciplinary approach that combines the theory of "mental models"—meaning the way people perceive the world and model it in their heads—with more standard surveys. The first stage of the study involves in-depth interviews with a small number of couples to examine parents' perception of risk to the child, their definition of prevention alternatives, and their priorities as individuals and as a couple. The results of this phase will be used as the basis for the second phase of the research: developing a survey of parents' willingness to pay to reduce children's risk from lead paint.

Support for this project has been provided by the Environmental Protection Agency's STAR Grant program.



As anyone who has chased after a three-year-old running toward a busy street knows, children do not have mature judgments about their own health.

ods, such as cancer. The OECD is sponsoring studies in several member countries to examine how values differ across countries. In the United States, the Department of Health and Human Services and EPA are planning a major long-term epidemiological effort, the National Children's Study. Steps are being taken to assure that this study includes questions relevant to understanding the trade-offs parents make to protect their children's health. ■

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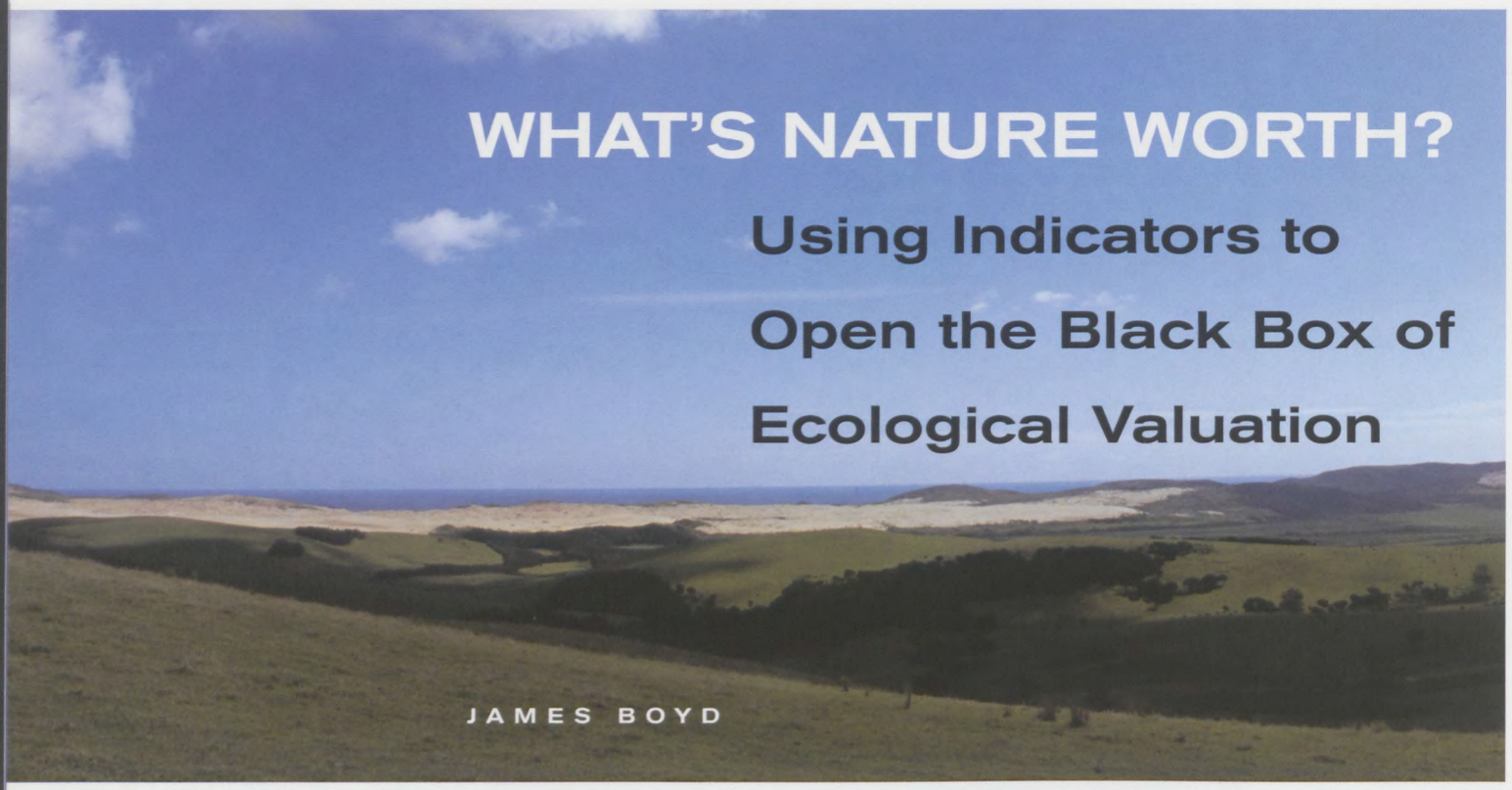


WHAT'S NATURE WORTH?

Using Indicators to Open the Black Box of Ecological Valuation

JAMES BOYD

What is the value of nature? This difficult question has motivated much of the work done at RFF over the last 52 years. If it seems odd that such a question could occupy an institution for half a century, consider both the importance and difficulty of the challenge. Nature and the services it provides are a significant contributor to human well-being, and society makes decisions every day about whether we will have more or less of it. Knowing nature's value helps us make those decisions. The difficulty is that nature never comes with a convenient price tag attached. Ecosystems aren't automobiles, in other words. They are like factories, however. They make beauty, clean air, and clean water, and they feed and house species that are commercially, recreationally, and aesthetically important.

Over the past decades, economic approaches to the "value of nature" question have become ever more sophisticated and accurate. This sophistication has a downside, however: noneconomists rarely understand how estimates are derived and frequently distrust the answers given. To noneconomists, environmental economics presents a set of black boxes, out of which emerges "the value of nature," such as a statement that "beautiful beach provides $1 million in annual recreation benefits" or "wetlands are worth $125 an acre."

How do economists arrive at such conclusions? For one thing, they examine the choices people make in the real world that are related to nature and infer value from those decisions. For instance, how much more do people spend to live in a scenic area as opposed to a less attractive one? How much time and money do they spend getting to a park or beach? The translation of such real-world choices into a dollar benefit estimate is complicated and requires the use of sophisticated statistical techniques and economic theory.

Problems

Economic valuation is met with skepticism in part because of the "black boxes" that are used by environmental economists; "black box" being useful shorthand for statistical or theoretical methods that require math or significant data manipulation, stock and trade for economists and some ecologists.

The technical and opaque nature of economic valuation techniques creates a gulf between environmental economists and decisionmakers that fosters distrust. Such studies can also be quite expensive and demand the expertise of a relatively small number of economists trained in ecological valuation. The complexity of the studies undermines the ability of economists to contribute—as they should—to the analysis of priorities, trade-offs, and effective ecological management.

Another criticism of economic valuation is that values are "created" through political and other social processes and are not something that can be simply measured or derived by "objective" experts. Technical analysis—the black box—fosters this criticism because it produces results that can only be interpreted and evaluated by an elite cadre of experts.

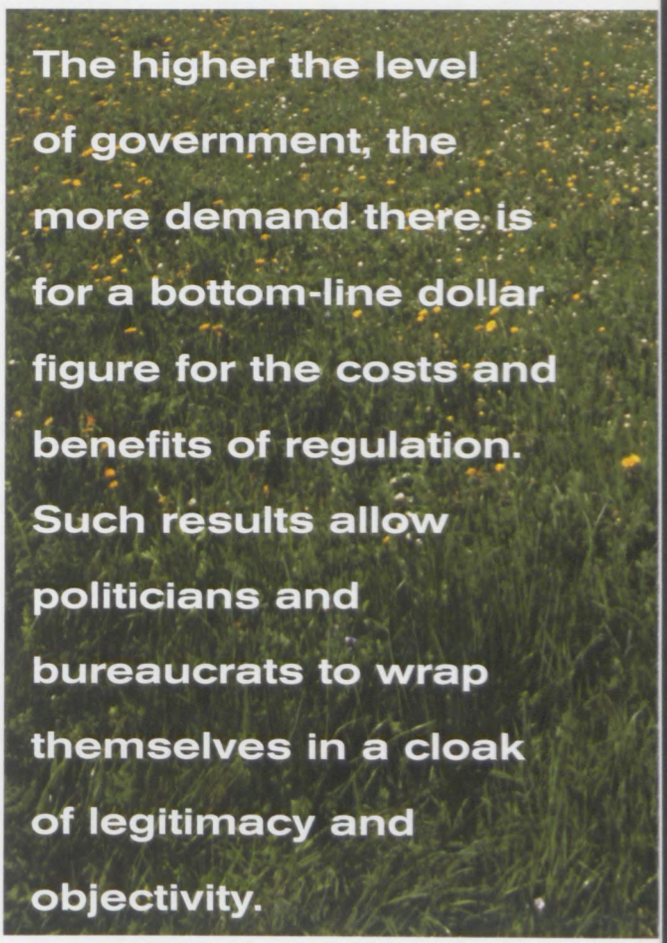
Opening the black box

RFF's mission is not only to advance the methodology of environmental economics and other disciplines but also to ensure that its technical research affects policymaking. RFF researchers continue to push the scientific frontiers of ecological valuation and always will. But an additional task is increasingly necessary: communicating to decisionmakers what we as economists and scientists already know and agree upon. As a group, environmental economists need to improve the ways in which they communicate the value of nature.

Unfortunately, better communication involves removing (or at least de-emphasizing) much of the technical content of economic methodology. We economists hate doing this. After all, much of the truth may be lost if the discipline of technical economic analysis is removed. But much of the truth is also lost when economists deliver answers that are not trusted or understood by the real-world audiences we must reach.

Here I will talk about a method designed to make ecological valuation more intuitive and thereby address some of the criticisms of economic valuation. Working with colleagues at the University of Maryland Center for Environmental Science, we are studying environmental benefit indicators (EBIs), which are a quantitative, but not monetary, approach to the assessment of habitats and land uses. EBIs strip environmental valuation of much of its technical content, but do so to reach a much wider audience and convey economic reasoning as it is applied to nature. Like purely ecological indicators, they summarize and quantify a lot of complex information. And like monetary assessment, they employ the principles of economic analysis. Our argument is that indicators can help noneconomists think about trade-offs.

We also believe that indicators can improve the way economists communicate ecological benefits and trade-offs. But it should be emphasized that we do not see indicators as a way to simplify assessment. The value of nature is inherently complex; rarely is there a clear-cut, "right" answer to questions such as which ecosystem is most valuable or which ecosystem service provided by a given habitat is most important.



The value of nature is inherently complex; rarely is there a clear-cut, "right" answer to a question like which ecosystem is the most valuable.

What are indicators?

At the simplest level, indicators can be the number of individuals in a biological community or species present in a habitat. They may also be a measure of the number of days a piece of land is under water or the presence of nearby invasive species that may threaten an ecosystem. These indicators tell us something about the health of a species or ecosystem.

Organized around basic environmental and economic principles, benefit indicators are a way to illustrate the value of nature. A collection of individual indicators about a given ecosystem can capture the complex relationships among habitats, species, land uses, and human activities, resulting in a more comprehensive picture (see the map on page 21). Regulators could use indicators to identify locations for ecological restoration that will yield large social benefits, and land trusts could use them to identify socially valuable lands for protection. Other applications include evaluation of damages from oil spills or environmental impact studies.

The techniques we are developing will be relatively affordable and easy to use. Dozens of the indicators we have been collecting are readily available in geospatial data formats. States, agencies, and regional planning institutions increasingly have high-resolution, comprehensive data on land cover and land use, built infrastructure, population and demographics, topography, species, and other data useful to the assessment of benefits.

What matters the most?

Indicators should act as legitimate proxies for what we really care about: the value of an ecosystem service. For example, wetlands can improve overall water quality by removing pollutants from ground and surface water. This service is valuable but just how valuable? To answer this question we can count a variety of things, such as the number of people who drink from wells attached to the same aquifer as the wetland. The more people who drink the water protected by the wetland, the greater its value.

But other things matter as well. For example, is the wetland the only one providing this service or are others contributing to the aquifer's quality? The more scarce the wetland, the more valuable it will tend to be. There may also be substitutes for wetland water-quality services provided by other land-cover types such as forests or by man-made filtration systems. Mapping and counting the presence of these other features can further refine an understanding of the benefits being provided by a particular wetland. Does mapping and counting these things give us a dollar-based estimate of the wetland's value? No. But it does lead to a more sophisticated, nuanced appreciation of the wetland's value than we would get if we ignored socioeconomic factors and economic principles.

Traditional regulatory and ecological ecosystem assessment techniques typically ignore socioeconomic factors, such as the number of people benefiting from an ecological function. And they never include assessment of concepts like the service's economic scarcity or the presence of substitutes. This highlights the second important function of benefit indicator systems—they can be used to convey basic economic concepts that speak to value.

Ecosystem services and economic principles

Ecologists and economists have identified a wide variety of very important ecological services, including water-quality improvements, flood protection, pollination for fruit trees, recreation, aesthetic enjoyments, and many others. Indica-

This map illustrates how a wetland can contribute to drinking water quality. The wetland in question is hydrologically connected to nearby drinking wells. It is also in an area where wetlands are scarce and where water quality may be impaired by agricultural activity.

tors should be organized around these specific services to help convey a deeper understanding of the service itself. Also, from both an ecological and economic standpoint, services should be analyzed independently. A typical ecosystem will generate multiple services, but not all services should be assessed using the same data or at the same scale.

The analysis of a service's scarcity and the importance of substitutes are important economic concepts that can be conveyed. Another is the role of complementary assets, which is particularly important to the assessment of recreational benefits. Access via trails, roads, and docks is often a necessary—or complementary—condition to the enjoyment of recreational and aesthetic services. These things can also be counted and relate intuitively to value.

Finally, an indicator system can also feature proxies for risk to an ecosystem service. For example, an ecosystem service may be threatened by an invasive species that can overwhelm more valuable native species, by a rise in sea level if the habitat is in a low-lying area, or by human encroachment if the ecosystem is sensitive to the human footprint. To foster a disciplined communication of results, we are develop-

How Do Environmental Benefit Indicators Work?

Environmental benefit indicators (EBIs) are a way to illustrate the value of nature in a specific setting. An individual EBI might be the presence of invasive species or the number of acres under active cultivation. A collection of indicators about a given area can portray the complex relationships among habitats, species, land uses, and human activities. EBIs are drawn mainly from geospatial data, including satellite imagery. Data can come from state, county, and regional growth, land-use, or transportation plans; federal and state environmental agencies; private conservancies and nonprofits; and the U.S. Census.

Regulators and planners can use EBIs to address specific questions, such as which wetland site, among many, is the most valuable? Coming up with an effective answer requires looking at many factors: on-site characteristics, such as the type of wetland; off-site characteristics, including the presence of wetlands in the larger area; and socioeconomic indicators, such as the number of people dependent on wells in the area for their drinking water.

The map above graphically portrays how a set of these factors relate to one another in the target area. One of the great virtues of this approach is that unforeseen relationships – such as the amount of A in relation to B – is quickly made apparent.

ing indicators for demand, scarcity, substitutes, complementary assets, and risk that are specific to particular services.

The importance of landscape and scale

Ecology emphasizes the importance of habitat connectivity and contiguity (or proximity) to the productivity and quality of that habitat. Terms like connectivity and contiguity are inherently spatial and refer to the overall pattern of land uses, surface waters, and topographic characteristics in a given region. Species interdependence and the need for migratory pathways are additional sources of "spatial" phenomena in ecology. The health of an ecosystem cannot be assessed without an understanding of its surroundings.

From an economic standpoint, ecosystem benefits depend on the landscape for an additional reason: because the social and economic landscape affects the value of nature. Where you live, work, travel, and play all affects the value of a particular natural setting. And the consumption of services often occurs over a large scale; examples include recreation and commercial harvests of fish or game, water purification, flood damage reduction, crop pollination, and aesthetic enjoyment.

To ignore, or minimize, the importance of off-site factors misses much that is central to a complete valuation of benefits. How scarce is the service? What complementary assets, such as trails or docks, exist in the surrounding landscape that enhance the value of a service? These questions relate to the overall landscape setting and are, accordingly, spatial in nature.

What the audience wants

Some audiences interested in the value of ecosystems crave the answer typically provided by economists: a dollar value. Government agencies are regularly called upon to demonstrate the social value of programs, plans, and rules they oversee. Generally speaking, the higher the level of government, the more demand there is for a bottom-line dollar figure for the costs and benefits of regulation. Such results allow politicians and high-level bureaucrats to wrap themselves in a cloak of legitimacy and objectivity.

Less cynically, putting things in dollar terms makes it easier to analyze trade-offs. The dollar benefit of program A can be directly compared to the dollar benefit of program B. Assuming the dollar figures are correct, we know which program is better, and this is why economists prefer this approach. Only by expressing benefits in a consistent framework can the apples of ecological protection be compared to the oranges of alternative actions.

Conclusion

Environmental economists need to better communicate trade-offs and the value of nature in a way that educates and confers legitimacy on their own economic arguments. EBIs are an underutilized way to do this. Because indicators avoid technical complexity and the expression of value in dollar terms, however, too many economists reflexively dismiss their value. But the alternative—formal econometric benefit analysis—is unlikely to ever generate results that are holistic enough, transparent enough, credible enough, and cheap enough to get widespread practical use. Scientifically sound, econometric analysis should continue to be conducted, of course. But agencies and planners should know that there are alternatives.

Instead of burying the principles of economics in their methodology, economists need to better communicate those principles in ways that resonate with "normal" people. Benefit indicators can help do this by concretely and quantitatively illustrating the relationships that are important to economic analysis. Communicating even a qualitative understanding of economic principles and relationships would be a huge advance for economic thinking in regulatory decision contexts.

Indicators can also be used to track the performance of environmental programs, regulations, and agencies over time—something that gets surprisingly little attention from environmental agencies or economists. To do so would require consistent and large expenditures of time, money, and expertise. But instead of trying to calculate the dollar benefit of a regulatory program over time, agencies could more easily measure things like the number of people benefiting from ecosystem services protected by their programs. This doesn't yield a dollar benefit, but does yield an intuitive number that conveys valuable information.

Given these benefits, indicators are underutilized in local, regional, and executive-level environmental decisionmaking.

Important New Grants Won by RFF Researchers

Major foundations and government agencies have recognized the high caliber of RFF's research by recently awarding significant grants to our scholars. Winston Harrington's analysis of transportation and its effect on the environment, Ramanan Laxminarayan's in-depth studies of health care polices in developing countries, and Kris Wernstedt's research into the environmental impact of hardrock mining have all attracted grant support.

RAMANAN LAXMINARAYAN

WINSTON HARRINGTON

KRIS WERNSTEDT

Winston Harrington has done several studies on how land use, vehicle ownership, and traffic congestion interconnect in the Washington, DC, area, working with colleagues Elena Safirova, Peter Nelson, and Kenneth Gillingham. No complete model exists that integrates these three elements and takes into account their constantly changing nature. The Environmental Protection Agency's Science to Achieve Results (STAR) program has awarded the team a grant to create such a model. The researchers hope their work will lead to improved policies regarding traffic congestion, air pollution, and the protection of open space.

Ramanan Laxminarayan was chosen as the lead author for the section of the World Bank book *Disease Control Priorities in Developing Countries* that deals with cost-effectiveness in health care. His research examines the major causes of death and disability in developing countries, region by region, and outlines a $10 million health package that will maximize results for each region. This novel approach also highlights current expenditures that are "bad buys" and suggests a model package of interventions for a population of one million. Support for this project came, in part, from the National Institutes of Health, with funds provided by the Bill and Melinda Gates Foundation.

Kris Wernstedt turns to hardrock mining in new research to be conducted with Robert Hersh of the Center for Public Environmental Oversight. Extensive mining for valuable metals—including gold, platinum, and silver—and the abandonment of these mines has resulted in the pollution of some western U.S. rivers and threats to drinking water supplies, aquatic organisms, and livestock. Yet, the country lacks a coherent nationwide program to identify abandoned mines, let alone well-coordinated policies and funds to tackle the problems they pose. Wernstedt and Hersh have received an RFF Fellowship in Environmental Regulatory Implementation, which is supported by a grant from the Andrew W. Mellon Foundation, to put together an account of the various federal and state efforts that address the environmental effects of these abandoned mines. ■

U.S. and EU Approaches to Environmental Regulation Focus of Spring Council Meeting

Top, from left: Stephen Harper, manager of environmental health and safety, Intel Corp.; and Robert Donkers, counselor for environmental affairs, EU Commission to the United States. Bottom, from left: Daryl Ditz, senior program officer for toxics, World Wildlife Federation; Peter Molinaro, director of government affairs, Dow Chemical; and, Karlyn H. Bowman, resident fellow, American Enterprise Institute, who gave the keynote speech on polling and the upcoming election.

RFF researchers, policymakers from the federal government and European Union (EU), and representatives from industry and environmental organizations debated two major EU environmental regulatory initiatives at the spring RFF Council meeting. Both policies directly address climate change and chemical safety—and could indirectly influence the behavior of U.S. firms.

Composed of corporate representatives and concerned individuals, the Council provides much of RFF's general support. Members come together twice a year for a forum on important environmental, energy, and natural resource issues.

EU Carbon Cap and Trade

Europe's ambitious plan to reduce its carbon dioxide emissions confronts a wide range of political and administrative challenges. The EU program's successes and setbacks will strongly influence future policies to combat global climate change worldwide, especially in the United States, said William Pizer, a fellow at RFF and a moderator of the first panel. Global climate change is a problem that eventually requires a global solution.

On January 1, 2005, the European Union will impose carbon emissions caps on some 12,000 industrial plants and utilities as part of a plan to meet their collective commitments under the Kyoto Protocol. To provide flexibility in the system and cut costs, plants will be allowed to trade emissions permits in a market modeled after the American sulfur dioxide emissions trading program. But, Pizer pointed out, the European trading market will be 10 times the size of its American prototype and far more complex. The panel agreed that the most difficult challenge will be the allocation of emissions quotas to the firms.

Joseph Kruger—a visiting scholar at RFF, who is on leave from the Environmental Protection Agency where he last served as head of the Market Policy Branch, Clean Air Markets Division—explained that each of the 25 EU countries has a national emissions quota under the Kyoto Protocol. Individual countries must decide how much of that quota to assign to industries that will be under the cap-and-trade program and how much to other sectors—notably automobiles—that will remain outside it at least in the early stages. Once each sector has a quota, it must then be subdivided for each company.

One immediate question, Kruger said, is whether the European Union can get the administrative structure up and running by early next year.

Another issue for the European Union is the possibility that member countries will attempt to manipulate the quotas to give advantages to some of their own companies, in respect to their competitors in other countries, which may be under tighter caps. Robert Youngman of Natsource LLP, a consulting and brokerage firm, pointed out that the initial proposal for quotas on British industry are tight, while the

German government has given much looser quotas to its firms.

Chris Leigh, deputy head of the global affairs division of the United Kingdom's Department for Environment, noted that in addition to allocation, difficult decisions have to be made on the processes of reporting and verification of emissions.

Some EU member countries have the administrative strength to handle these requirements, Kruger commented, but some—especially the new members, mostly in Eastern Europe—will find them difficult to meet.

Many member countries missed the deadline, at the end of March, for their allocation plans. At this point much uncertainty surrounds the emerging market, Youngman reported.

Chemical Regulation in Europe

Late last year, the European Commission approved a new chemical regulation scheme for the European Union, the Registration, Evaluation and Authorization of Chemicals (REACH) proposal, which has now gone to the European Parliament for further review. Under the proposal, chemical producers would be obliged to register substances with a new central European chemicals agency and provide safety data on substances imported in amounts over one metric ton.

The RFF panelists had diverging points of view about the need for such a system and the burden it would place on U.S. manufacturers, especially with regard to trade issues.

Robert Donkers, counselor for environmental affairs of the EU Commission to the United States, explained the value of the REACH program, saying the existing EU approach for regulating chemicals is inefficient and lacks any incentives for manufacturers to change. Given the lack of publicly available safety data on many basic chemicals, "We can't manage what we don't know." The burden of proof regarding a chemical's safety rightly belongs with the manufacturer, he said.

But under REACH, good chemical stewardship—in the form of research into controlling factors such as toxicity—would go unrewarded, said Stephen Harper, manager of environmental, health, and safety policy at Intel Corporation. Given that about 20% of the chemicals cause about 80% of the problems, he said, taking a precautionary approach and focusing more on the actual risks from certain chemicals would be far more efficient than issuing a call for extensive safety data about a broad range of chemicals.

Daryl Ditz, senior program officer for toxics at the World Wildlife Federation, said the drivers for chemical policy reform are coming from increasing consumer demand and the growing body of evidence regarding the risks of direct exposure and the more subtle effects of certain chemicals on the endocrine systems of animals.

U.S. chemical producers might face a 10% increase in compliance costs should REACH go into effect, Ditz said, but that could be more than offset by the access to new EU markets. The policy paradigm needs to shift, he said, from "no data, no problem" to "no data, no markets."

Penelope Naas, director, Office of EU and Regional Affairs, International Trade Administration, Department of Commerce, had a different take on the market access question. Real questions remain about the program's workability and the impact it will have on innovation and the global economy, she said. For example, the United States and the European Union are the two largest export markets for developing countries, which would face formidable compliance challenges, she said.

REACH is the archetype of what's to come in the world of chemical management and control, said Ernie Rosenberg, president and CEO of the Soap & Detergent Association. The focus is shifting from chemicals to processes and there are new sources of regulation in the broad sense, with NGOs both here and abroad coming to play an increasingly influential role in "deselecting" chemicals. In the European Union, environmental regulations are more nominal in nature, he said, with governments and companies having a lot of latitude regarding how they are implemented. However, U.S. firms will face greater challenges in effectively competing overseas, he said, because of our stiff product liability laws and the ability of NGOs to seek legal remedies. Nobody in the system—government or industry—is empowered "to do anything but carry out the letter of the law or risk being sued," he said.

Panelists agreed that Europe clearly is positioning itself in the vanguard of aggressive environmental policy. Other nations—particularly the United States—will closely monitor the progress of EU actions in deciding whether they should follow suit. ■

Probst Named Division Director

KATHERINE N. PROBST

Senior Fellow Katherine N. Probst has been promoted to head RFF's Risk, Resource, and Environmental Management Division, making her the first female division director in the organization's history. Probst, who has been a senior fellow at RFF since 1994, has worked in the field of environmental policy for almost 25 years.

Her work has centered on improving the implementation of Superfund and other hazardous waste management programs. She is the lead author of *Superfund's Future: What Will It Cost?*, a report commissioned by Congress (RFF Press, 2001).

In her latest report, *Success for Superfund: A New Approach for Keeping Score*, Probst says the Superfund program is being hampered by a lack of up-to-date and reliable data and measures of success. To correct that situation, she and co-author Diane Sherman of RFF recommend that the Environmental Protection Agency (EPA) create standardized sets of data and information that will help policymakers gauge progress at Superfund sites and inform the public about whether cleanup goals are being met. (For more details, see related story on page 5).

Probst also has investigated issues related to the cleanup of sites in the nuclear weapons complex, including the federal government's long-term responsibility to ensure that these sites remain protected over time.

She frequently speaks on issues related to Superfund, land use and institutional controls, cleanup of the nuclear weapons complex, and implementation of hazardous waste programs.

Before joining RFF, Probst had a varied career, working as a project manager at EPA and the New York City Department of Environmental Protection, and as a program director for the Environmental and Energy Study Institute. She also was a senior policy analyst at Clean Sites, an organization that worked to accelerate the cleanup of contaminated sites. She holds a master's degree in city and regional planning from Harvard University. ■

RFF sponsors a summer internship program to allow students to work directly with researchers on ongoing projects or to assist them in developing new areas of research and policy analysis. RFF also offers an internship in the name of Dr. Walter O. Spofford, Jr., who helped establish RFF's China Program, and an internship with RFF Press, our book-publishing arm. Pictured here are some of this year's interns. ■

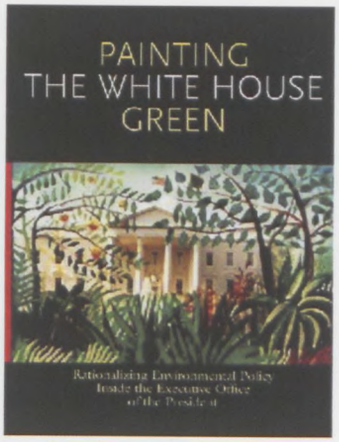
Bottom row, from left: Graham Bullock, Russell Toth, Francisco Aguilar, RFF President Paul Portney, and Caleb O'Kray. Top row, from left: Maria Schriver, Robyn Meeks, and Susan Kurkowski. Not pictured: Anita Chaudry, Darren Greve, Lauren Rauch (RFF Press), Juliana Qiong Wang (Spofford), and Fan Zhang.

Book Notes

Painting the White House Green: Rationalizing Environmental Policy Inside the Executive Office of the President

Randall Lutter and Jason F. Shogren, RFF Press

Paul R. Portney



This book is about environmental policymaking in Washington, a process in which conflicts of interest are... well... not rare, let us say. That being the case, I've got two such conflicts of interest of my own. First, I'm president of Resources for the Future, so you need to weigh my favorable reaction to this book accordingly. Second, I myself spent the better part of two years working in the Executive Office of the President. Though I was at the Council on Environmental Quality, rather than the Council of Economic Advisers, where the chapter authors served as senior staff economists under three administrations. So I admire economists who ply their trade in government service from time to time.

Having laid my cards on the table, I can say that Lutter and Shogren's edited volume is both interesting and informative. Especially for those who have spent some time in government practicing the dismal science, it's occasionally even fun! The chapter authors provide firsthand accounts of what went on behind the scenes as key decisions were made about new standards for ozone and particulates, proposed federal legislation on electricity restructuring, the Kyoto Protocol, and so on. Although environmental policy "wonks" will dwell on the technical details, most of the material is quite accessible to noneconomists (and even non-academics!).

Of much greater interest to me, and I suspect to most other readers, will be the descriptions of the *limits,* as well as the power, of economics in environmental policymaking. For example, almost all of the chapters show how easily redistributive politics (and what, in a few cases, might be called "retributional politics") trumps economists' traditional interest in the efficient allocation of resources. Commendably, none of the chapter authors believes that economics should be anything more than one input to environmental decisionmaking, but each talks about how hard it is for economics to play even that circumscribed role. In several of the chapters, particularly Lutter's dealing with the establishment of an air quality standard for smog, the frustration is palpable.

In his quite interesting chapter, Shogren describes economics as a "speed bump on the road of bad ideas." Great imagery—and maybe we should be content that that speed bump has prevented the road from becoming a superhighway. ■

The president's most important tasks include preservation of the environment and protection of the economy. This book offers state-of-the-art analysis of how the White House has attempted to carry out these tasks. Filled with valuable insights and provocative discussions, *Painting the White House Green* should be indispensable reading for everyone interested in the real world of environmental protection.

—Cass R. Sunstein,
Karl N. Llewellyn Distinguished Service Professor, University of Chicago Law School

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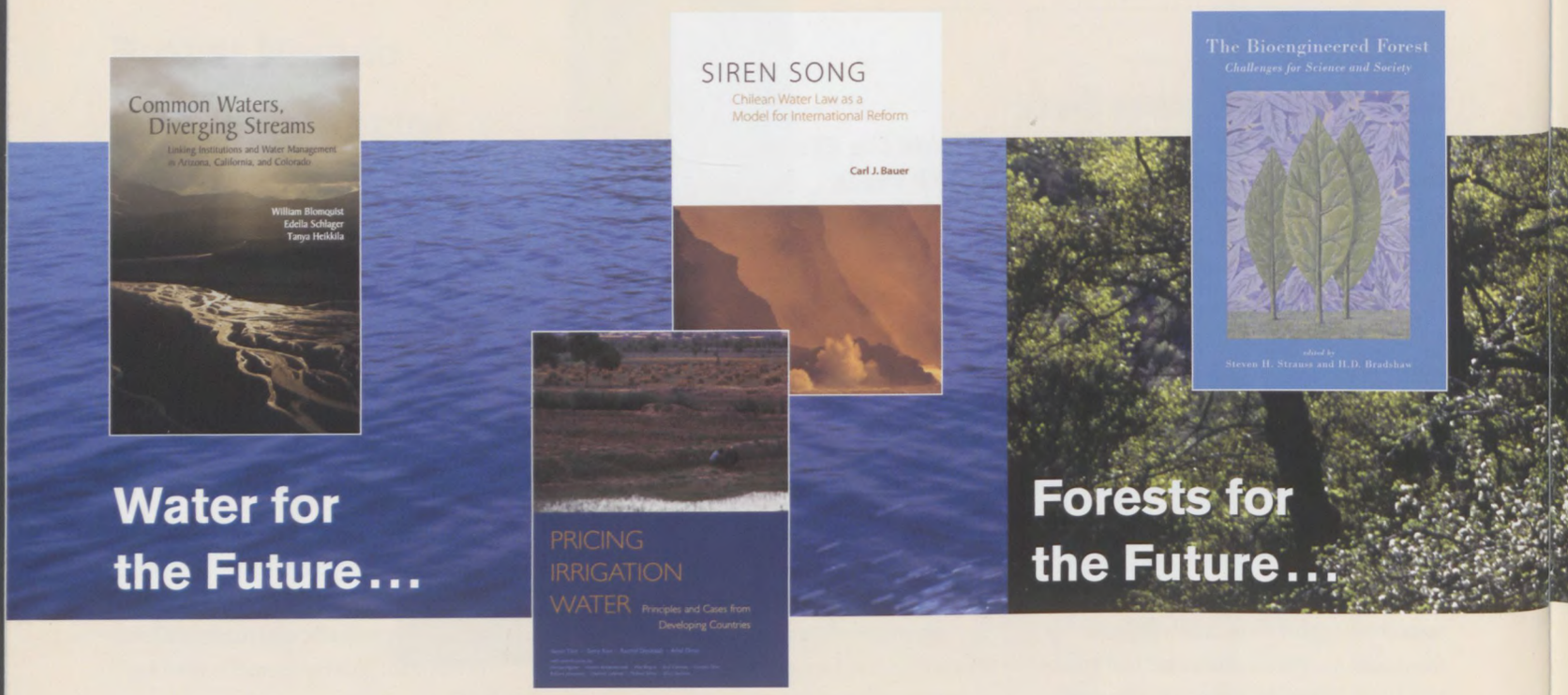

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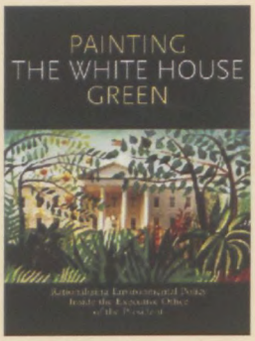

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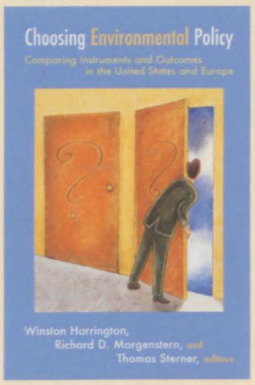

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