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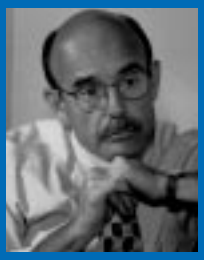
RESOURCES

RESOURCES FOR THE FUTURE RESEARCH THAT MAKES A DIFFERENCE

Touting the Market in the Marketplace of Ideas



Paul R. Portney

"I am an economist and economists like markets."

RFF Board Chairman Darius Gaskins makes this comment merely in passing during his conversation with J.W. Anderson in this latest issue of *Resources.* Many of us at RFF—economists and non-economists alike—find ourselves drawn to market-based approaches to environmental regulation.

Not surprisingly then, the contents of this issue have a lot to say about the merits of the market. Douglas Bohi, for example, shows how technologies stimulated by the very high oil prices of the 1970s contributed to their fall by half in the mid-1980s. Similarly, the three main feature articles show how market mechanisms can be used to deal with "lifestyle" environmental problems, ranging from unhealthy air to congestion on our roads to the effects of possible climate change.

As Anderson notes in assessing the new air quality standards that EPA issued this past summer, the forces for flexibility scored an important win. But the forces favoring "command and control" regulation scored some points, too. And EPA as well as the rest of us remain at the mercy of statutory language that keeps pushing the meaning of health and safety farther down Alice's rabbit hole.

Taking a market approach to environmental problem-solving is at the heart of the RFF survey that Winston Harrington and his colleagues designed. Drivers on Southern California freeways were asked which of several hypothetical plans they would support with their wallets to cut rush-hour traffic. While similar surveys have been vague about how the revenues from the "congestion tolls" would be used, this one may be the first to promise a private benefit in the form of cash rebates.

To combat greenhouse gas emissions, Duke University professor Jonathan Wiener touts the beauty of a worldwide cap and allowance-trading system, much like the one Americans have used to fight acid rain. But despite what he says are clear economic and environmental advantages, Wiener is obliged to devote much of his article to countering skepticism about the concept.

The allure of the market does not attract every analyst, of course, as these articles make clear. And uncertainty and factual disagreement about the nature of many problems mean that inquiry and analysis will always be with us. But in a democracy at least problems have to be sorted out and dealt with in public.

Ensuring that people receive enough information to debate the truth and consequences, say, of climate change in order to decide what to do about it is essential, as Darius Gaskins emphasizes. It is why the consequences of expanded public participation in policymaking is the subject of a brand new examination at RFF's Center for Risk Management.

It is also why—with your critical support—RFF is working hard to communicate the results of our work to all interested parties.

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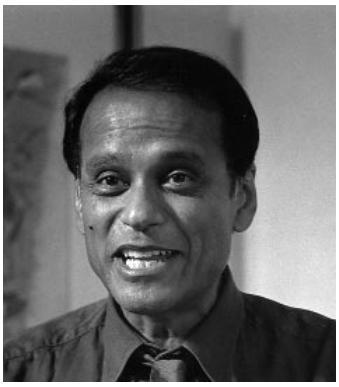
GOINGS ON

Resource economics and the poor

To commemorate the 45th anniversary of Resources for the Future, Partha Dasgupta delivered a special lecture at the October meeting of RFF's board of directors.

Speaking on "Environmental and Resource Economics in the World of the Poor," Dasgupta dealt with the complex relationship between economic development and environmental and natural resource protection. RFF will release a printed version of his lecture later this year.

PATRICK DEASON PHOTOGRAPHY



University Fellow Partha Dasgupta helped to mark RFF's 45th anniversary with a special address at the fall board meeting.

A professor of both economics and philosophy at the University of Cambridge as well as an RFF university fellow, Dasgupta has made what RFF President Paul R. Portney calls "truly path-breaking" contributions to development economics, natural-resource and environmental economics, and moral philosophy. He tied together these themes in his recent book *An Inquiry Into Well-Being and Destitution*.

Lawmakers study RFF climate plan

As Washington prepares for the climate change conference in Kyoto, Japan next month, RFF researchers have been informing the policy debate at the White House and on the Hill. What has caught attention is a compromise plan that Raymond Kopp, Richard Morgenstern, and William Pizer have devised. The idea is to begin reducing the greenhouse gas emissions that might hasten climate change yet ensure that the per/ton costs of doing so do not become unacceptably high.

The plan grew out of Pizer's study of the uncertainty that surrounds the costs of complying with different reduction measures. The model that he built suggests that emissions targets should be set with a built-in relief mechanism to stabilize compliance costs, should they skyrocket.

Pizer briefed the President's Council of Economic Advisers on his findings in September. He and his colleagues then discussed their resulting policy proposal with the staffs of Senators Max Baucus (D-MT), Robert C. Byrd (D-WV), John H. Chafee (R-RI), John F. Kerry (D-MA), Joseph I. Lieberman (D-CT), and Richard G. Lugar (R-IN) in October.

See "On the Web," page 24; see also *www.weathervane.rff.org* for a description of the plan and Pizer's underlying discussion paper, 98-02.

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A holistic look at forest dieback

A connection can be traced from the atmospheric pressure difference between Tahiti and Darwin, Australia on the one hand and the deaths of maple and birch trees in the northeastern United States on the other. This connection—and its implications for how forests are planted and how many jobs remain in the lumber industry—is among the topics that Senior Fellow Roger A. Sedjo has agreed to study as part of a multidisciplinary team under a three-year contract with the National Oceanic and Atmospheric Administration's Climate and Global Change Program.

Tropical pressure systems have a long and powerful reach. It seems that they can play havoc with the climate at mid and high latitudes in the Northern Hemisphere to the detriment of trees that depend on reliability in the climate cycle. Long-term studies already suggest that forest dieback would increase markedly with continued global warming.

Dieback is an injury to the conductive tissues of hardwood trees caused by extreme thaw-freeze cycles in winter followed by drought in summer. The damage is done when a tree is subjected to sudden freezing after losing its frost hardiness during a prolonged thaw. The tree's water transport system is consequently harmed, scientists believe, making it hypersensitive to drought, pathogens, and insects.

Once forests are mature, a warming phase in regional temperatures appears to be a key factor triggering dieback episodes. Sedjo and his colleagues will consider how to diminish that vulnerability. Harvesting might be increased, for example, and plans made for shorter forest rotations to achieve young age structure and species selection.

The see-saw mechanisms of the North Atlantic Oscillation and the tropical El Niño-Southern Oscillation and their impacts on weather worldwide have been studied in some detail. But data on climatic conditions remain unlinked and unused, for example, to predict forest damage or to decide how best to adjust management and economic decisions to minimize injury.

For that reason, developing a research approach that integrates science, adaptive management, and socioeconomics is key to the assessment that Sedjo and his colleagues are providing. NOAA wants a comprehensive assessment that makes the connections "end to end."

In addition to Sedjo, the project team includes researchers from Science and Policy Associates, the USDA Forest Service, and the National Center for Atmospheric Research.

NOAA awarded the contract last summer. The team expects to complete the project in the summer of 1999.

Climate's impact on food and water

No one really knows what will happen if global temperatures should increase markedly. But based on what we know now, researchers at RFF are cautiously optimistic that the effects on agriculture and water resources could be dealt with satisfactorily. On a darker note, they point to more immediate problems in global food production and access to water that, if not overcome, could make the threats posed by global climate change minor in comparison.

These conclusions appear in two recent issue briefs that senior fellows Pierre R. Crosson and Kenneth D. Frederick have contributed to RFF's Climate Economics and Policy Program series.

Food

In his paper, "Impacts of Climate Change on Agriculture," Crosson notes that current findings indicate that the world's northern latitudes will warm more than the tropics. This trend might actually improve agriculture in developed countries (DCs) like the United States where warmer temperatures might bring longer growing seasons and where adaptability is great. For precisely the opposite reasons, the models predict, climate change would reduce grain yields in less developed countries (LDCs) to the detriment of their already weak food supply systems. Yet the weaknesses among the LDCs may not last, Crosson observes.

Contrary to a widely held view, Crosson maintains that natural resource degradation is not an inherent threat to agricultural sustainability in LDCs. The critical issue, he explains, is rather whether over the next several decades these countries can expand the knowledge base embodied in people, technology, and institutions needed to achieve sustainable agricultural systems. Unfortunately, evidence suggests that the systems that have generated powerful increases in agricultural training and new technologies in the past are now in jeopardy.

Yet the "Asia experience"—the dramatic improvement in agricultural performance in east and southeast Asia over the last ten or fifteen years—offers inspiration, Crosson thinks, for improvement elsewhere in Asia, Latin America, and especially in Africa, where developing countries face severe problems in meeting rising demands for food and other agricultural commodities.

The time available offers hope as well. Significant climate change impacts on agriculture are not likely to be felt for thirty or forty years, according to current scientific understanding. Ample time apparently exists to develop technological and other needed responses, as long as agricultural research does not lag.

Crosson cautions that this relatively optimistic forecast is built on assumptions that ultimately might prove untrue. These assumptions are that the models used in climate change research give a reasonably accurate account of changes that might occur; that change will occur in a "linear"—as opposed to an abrupt and chaotic—way; that the amount of greenhouse gases in the atmosphere will no more than double by the second half of the next century; that LDCs

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will make good economic progress; and that the world trading system in agricultural products will be no less robust than it is now.

The fact that any or all of these assumptions may prove untrue must be kept "up front" in thinking about climate change, Crosson believes. Nonetheless, we must go with what we think we know now, he concludes, namely that agriculture in developed countries might benefit from a doubling in carbon dioxide. And that less developed countries face other immediate threats that far outweigh the ones that climate change may bring.

Water

Cause for concern already exists about the adequacy of world water supplies, even in the absence of human-induced changes in the climate, Frederick notes in his paper "Water Resources and Climate Change." (Frederick is also a co-editor of *Climate Change and Water Resources Planning Criteria*, a book just out from Kluwer Academic Publishers.)

Demands are outpacing supplies, water costs are rising sharply, and current uses are depleting or contaminating some valued resources. Population, technology, economic conditions, social and political factors, and the values society places on alternative water uses are likely to have more of an impact than climate change on the future availability and use of water.

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With regard to the impact of global warming, Frederick notes enormous uncertainties. One of the more likely impacts, however, would be felt in areas such as the western United States, where precipitation is largely in the form of winter snowfall and where streamflow comes largely from spring and summer snowmelt. Gradual warming in areas like this would likely result in a distinct shift in the relative amounts of snow and rain and in the timing of snowmelt and runoff. The resulting changes in runoff patterns could greatly increase the likelihood of flooding and reduce the availability of water during the spring and summer periods of peak demand for irrigation water.

Nonetheless, Frederick sees hope insofar as we build institutions that can facilitate adaptation and promote more efficient water management and use. The focus of water planning already has shifted in recent years from new construction to improved management of water demand and existing water supplies and facilities. This kind of management, Frederick writes, counteracts climate change impacts by introducing incentives to conserve water and opportunities to reallocate supplies as conditions change. Institutional measures that promote efficient resource use and management offer distinct advantages, he adds, requiring neither long lead times, large financial commitments, nor accurate information about the future climate.

Frederick does not rule out new infrastructure in the long run. New dams, reservoirs, and levees may prove appropriate eventually. But at the moment it is difficult to plan for and justify expensive new projects when the magnitude, timing, and even the direction of the changes at the basin and regional levels are unknown.

To order copies of these two papers, see page 22. For more information about RFF's Climate Economics and Policy Program, access *http://www.rff.org/research/programs/climprog.htm.*

Portney praises reg reform act

RFF President Paul R. Portney praised the proposed Regulatory Improvement Act of 1997 when he appeared before the U.S. Senate Committee on Governmental Affairs recently. He said S.981 is the very best in a long line of attempts at legislation to improve the efficiency and effectiveness of federal rules. What makes the act so good, Portney explained, is that it successfully walks the very fine line between requiring so little as to be vacuous and so much as to run the risk of making matters worse.

The act requires agencies to evaluate not only the benefits and costs of the major regulatory approaches that they choose, but also of a "reasonable number of reasonable alternatives." Portney called that latter provision a "sleeper" that has the potential to do a great deal of good.

If agencies take the requirement seriously—more seriously, incidentally, than they have comparable provisions in a series of presidential executive orders going back to the mid-1970s—the American public might be able to shave off a chunk of the nearly $300 billion that the Office of Management and Budget estimates we spend each year on environmental, health, and safety regulation, Portney said.

Since that amounts to more than $1,000 per person per year, he added, it is well worth being sure that we are choosing the least expensive means of accomplishing our regulatory objectives and that we are pursuing only those objectives that we believe do more good than harm.

In response to criticisms of the bill, Portney maintained that "very little" is asked of agencies that they are not required to do under executive order already. What the act does add is "statutory weight" to requirements imposed by the last four presidents.

Find the complete text of Portney's comments at *http://www.rff.org/testimony*

New Air Quality

Standards Are Tighter but Compliance Is Distant

by J.W. Anderson

The nation's latest air quality standards will tighten pollution emissions rules. But they also contain careful compromises, postponing compliance. And the margin of health safety to be ensured remains as hazy as ever, thanks to a flaw in the Clean Air Act that remains uncorrected.

In a directive signed on July 16, President Clinton ended the sharp debate between the Environmental Protection Agency and its critics in and outside the administration. EPA got, with only minor exceptions, the goals that it had originally proposed last November. But it gave some ground in the timetables for the standards and the process of achieving them.

The new standards do three things. They reduce the permissible concentrations of ground-level ozone. They continue the present rules for coarse particulate matter in the air. And they set a new standard for fine particulate matter—particles with a diameter of 2.5 microns ($PM_{2.5}$).

Long Lead Time on $PM_{2.5}$

In terms of public health, the new standard for $PM_{2.5}$ is by far the most important. The administration calculates that these fine particles cause some 15,000 premature deaths a year in this country. In contrast, EPA did not argue during the standard setting process that ozone causes deaths. Rather, ozone's best-documented effects are short term and reversible, although it can aggravate diseases like asthma and over years of exposure may damage people's lungs.

While there is good reason to consider $PM_{2.5}$ dangerous, actual monitoring data have been gathered in only a few cities. Some industries and scientists, in congressional testimony, urged a five-year delay for further research.

Over the spring, a compromise began to take shape in congressional hearings. Since in any case it would take several years to set up the complete national network of monitors to measure $PM_{2.5}$, and several more years to collect the baseline data that the standard requires, a delay for more research would not significantly hold up actual implementation.

President Clinton seized that idea and wrote it into his July 16 directive. The new $PM_{2.5}$ standard is now nominally in effect and states will immediately begin setting up monitors (with federal funding). But meanwhile EPA is to undertake another five-year cycle of health research and review. Until it has completed this process and formally considered whether to adjust the standard, the President said, it is not to require any state or local area to take action under it.

Under this schedule, in the years 2002 through 2005 EPA will identify the local areas that are out of attainment with the standard. The states will then have three years to submit implementation plans.

This long lead time raises an issue that the administration has not yet fully addressed. Since it believes a substantial death rate attaches to $PM_{2.5}$, it may want to consider taking action sooner than 2005. One possibility might be incentives for industries to begin curbing these emissions voluntarily, before the mandatory reductions take effect.

OTAG Option on Ozone

The new standard for ground-level ozone represents a significant tightening. When this year's ozone season began last spring, one hundred and six counties failed

to meet the old standard. EPA has calculated that about three times as many counties will fail to meet the new standard.

Some of those counties, and the states in which they lie, protested the tighter standards and charged that they would interfere with economic development. EPA replied that many of those counties would soon be brought into compliance by a separate initiative to reduce the pollution that blows from one state into another. In an organization called the Ozone Transport Assessment Group (OTAG), EPA worked with state governments throughout the eastern half of the country. Over the past two years OTAG has developed models to estimate the amounts of ozone and its precursor gases that the wind transports from one state into another, and EPA is now developing rules to reduce them.

President Clinton picked up this point. His directive said that in states cooperating with the OTAG strategy, no additional ozone controls will be required in those local areas where OTAG's models indicate that reductions in long-distance transport will suffice to bring them into attainment.

In any case, no area will be designated out of attainment with the new ozone standard before the year 2000.

With a focus on the long-distance transport of ozone and its precursors, EPA intends to implement the new standard primarily by requiring large industrial plants, especially electric utility generating stations, to reduce their emissions. The exhaust from their tall stacks contributes disproportionately to pollution transported on an interstate scale, according to EPA.

Reducing the emissions from those tall stacks further will be expensive, since the rules for them are already restrictive. But Washington has learned well that there is little public opposition to cleanup costs that are filtered gradually and invisibly through the regulatory system into people's electricity bills.

One question is whether this process will continue to operate quite so smoothly as the electric utilities are deregulated. Generating plants along the East Coast are under much heavier and more expensive restrictions than some of their competitors in the Midwest in areas already in attainment of the ozone standard. President Clinton's directive told EPA to reexamine its rules for new sources in nonattainment areas "in order to deal with issues of fairness."

Style Points

A basic issue in all environmental regulation is whether to be highly prescriptive, in what is often called the "command and control" style, or to allow people flexibility to work out their own ways of meeting goals. Each side of this continuing debate scored one important win in the new air standards.

Flexibility and efficiency won when the President's directive declared "a strong desire to drive the development of new technologies with the potential of greater emission reduction at less cost." EPA, the directive said, is to "encourage" concepts like a Clean Air Investment Fund, capping the costs of emissions control at $10,000 a ton. If a source—a factory or power plant—faces higher costs, it can comply by paying a set amount into the fund, which will use the money to stimulate new technologies by buying cheaper reductions from nontraditional and small sources.

But command and control won the esoteric struggle over Subpart 2 of Part D of Title I of the Clean Air Act. Subpart 2 was enacted in 1990 by a Congress that deeply mistrusted both the administration and the states to carry on the flagging campaign against ozone. It produced a set of legal requirements carried down to the finest detail and it allowed little administrative discretion. Under a legal interpretation offered earlier by EPA, Subpart 2 would have vanished altogether with the adoption of the latest standard. But some in Congress and in the environmental movement protested and, in another compromise, for those metropolitan areas with high ozone levels, Subpart 2 will continue in force until they finally attain the old standard. That gives Subpart 2 a very long life, since it appears to be impossible for some cities to meet the old standard, let alone the new one.

Pursuing Risk through the Floor?

But there is a greater flaw in the Clean Air Act—and, although widely acknowledged, the problem won't be addressed this year. Inaction was inevitable, given the mistrust between the Democratic administration and the Republican majority in Congress. However, the missed opportunity needs to be noted.

When written in 1970, the act was based on the assumption that each pollutant has a threshold below which it has no effect on human health. The act

The new standards

Ozone: The standard used to be a concentration of 120 parts per billion (ppb) in the air averaged over the highest hourly reading in a day. One exceedance per year was permitted over a three-year period, which meant that a local area—usually a city and its suburbs—was in compliance if, over three years, the fourth highest reading at any monitor was no higher than 120 ppb.

The new standard is an average concentration of 80 ppb over eight hours. Instead of counting exceedances, the new standard will take the fourth-highest eight-hour reading at each monitor each year and average it over three years. If that average is no higher than 80 ppb, the area will be in attainment. The reason for the change in method is to provide a more stable index that will be less likely to flip areas in and out of attainment with the vagaries of the weather.

Particulate matter: The old standard applied to PM_{10}, particles with diameters up to 10 microns. The annual limit was an average concentration of no more than 50 micrograms per cubic meter over three years. The daily limit was a concentration of no more than 150 micrograms per cubic meter. The new standard continues the rules for PM_{10}, with a slight adjustment of the computation procedure.

Much more important, it adds new rules for smaller particles with diameters no larger than 2.5 microns, $PM_{2.5}$. For $PM_{2.5}$, the annual standard is 15 micrograms per cubic meter, generally calculated as a three-year average of all the readings on all the monitors in an area. The area that attains this standard will probably also be in compliance with the 24-hour standard, designed to control hot spots. The 24-hour standard is 65 micrograms per cubic meter, calculated as a three-year average of the 98th percentile reading at each monitor separately. As in the case of ozone, violation of the 24-hour standard at any single monitor in an area will put the whole area out of attainment. That possibility can raise issues about the location of monitors.

directed EPA to find that threshold and set the standard for each of the common air pollutants below it, with "an adequate margin of safety." Over the years, with more sophisticated measurements and better epidemiology, scientists have found health effects at lower and lower concentrations of ozone and particulate matter.

As data appeared showing health effects for particulate matter below the previous standard, the American Lung Association sued EPA for failing to carry out the requirements of the act. A federal judge set a deadline for EPA to review the standard and, because the government was vulnerable to a similar attack on ozone, the agency began to move on both pollutants together. The new standards are not the result of EPA's initiative. As is often the case in environmental policy, they were forced by litigation.

The requirements of the act now raise a question about the next step. What happens when the next round of studies shows health effects at even lower concentrations? EPA observes that no one knows whether there is any threshold for $PM_{2.5}$. As for ozone, it is entirely possible that it produces health effects at background levels—that is, levels that occur naturally. The new standards for both $PM_{2.5}$ and ozone are not far above background levels.

EPA acknowledges that even the standards just adopted do not protect everyone from harm. It also emphasizes, in the ozone rule, the importance of increased protection for unusually sensitive people who experience distress at lower concentrations than the population as a whole.

But EPA declares that the act does not require standards that provide zero risk. Rather, it says, the act only requires standards that "protect health with an adequate margin of safety." The protection of health is undefined, and as the administration points out, with many legal citations, the courts give EPA great latitude in defining an adequate margin of safety.

In other words, the new standards protect health adequately because they protect health adequately—and anyone who wants a better definition of the term can go to court and let the judges write it.

In an ideal world, EPA would have gone to Congress and pointed out that the present language of the statute is pushing the standards down to background levels, at which point they will become unenforceable and merely aspirational. But the Clinton administration does not want to open up the Clean Air Act to revision, since it cannot control the consequences in Congress. For their part, the congressional Republicans have concluded that attacks on the environmental protection laws cost them votes in the last election and they do not want to repeat the process in the next one.

Meanwhile, EPA has put the standards more or less where the present flawed law requires, based on the present data as it interprets them. As for actual implementation, the White House has deferred that until the next administration—or in some cases to the one beyond.

J.W. Anderson is RFF's journalist in residence. For many years he was a member of the *Washington Post*'s editorial page staff.

Paying to Drive Freely

RFF Surveys Public Attitudes to Congestion Fees

by Winston Harrington

Jams, snarls, gridlock: These are traffic facts of life in metropolitan America, nowhere more so than in parts of California, home to some twenty-two million cars. Yet it doesn't have to be that way.

In grappling over the last twenty years to meet clean air goals, transportation analysts have come up with a number of workable schemes to reduce the number of cars on the road at any given time. These solutions include congestion pricing policies, whereby drivers pay to use freeways and major arteries during periods of peak demand.

As analysts and government officials have come to recognize, however, if and how traffic congestion is eased depends very much on those in the drivers' seats. Without public support, no plan to reduce congestion will work. For now, more drivers seem willing to sit in traffic than to pay to alter driving habits. But given time and more traffic, that attitude may change.

Meanwhile, interest in approaches like congestion pricing already is high among transportation planners, in large part because the old ways of dealing with traffic do not seem to be working any more. Building new roads to ease congestion, for instance, is no longer the obvious solution it once was. Public budgets are tighter and the environmental and quality-of-life repercussions of sprawl-induced travel are more in evidence.

These constraints pinch tightest in Southern California, where concerned groups across the political spectrum have established the REACH (Reducing Emissions and Congestion on Highways) Task Force to examine market-based alternatives for improving mobility rather than pouring more concrete. Organized by the Southern California Association of Governments, REACH includes representatives from local government, state environmental and transportation agencies, local business groups, and environmental and consumer groups.

Last year, RFF Senior Fellow Alan Krupnick and I, along with Anna Alberini of the University of Colorado, worked with REACH to develop a telephone survey, which the California survey research firm Godbe Research and Analysis then administered to a sample of Southern Californians. Essentially, we asked respondents if they would be willing—with and without several different incentives—to pay a "user fee" to drive on freeways during rush hour. This article presents the results of that survey.

Attractive but Unpopular

From an economic point of view, collecting user fees to drive busy roads during peak demand is by far the most attractive way to curb traffic. If we add up all the costs, including the inconvenience associated with restricted travel and/or having to find alternative routes or modes of conveyance, we find that no other rationing method provides a given level of road service at lower total cost. Other approaches to rationing roadway use, most notably "high-occupancy-vehicle" (HOV) lanes restricted to cars carrying two, three, or four occupants, are less efficient. Yet it is HOV lanes that have been implemented in many places, while time-of-day user fees are rare. In North America such fees are collected in only two places: SR91 in Southern California, a private road built on public land (in the median of an existing freeway) and Route 407 in Toronto, Canada, designed from the ground up for electronic fee collection.

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If they are so attractive economically, why are congestion fees so unpopular? Our conjecture is that people have perceived the fees as tax increases with no discernible benefit. Most surveys that have tested public support for congestion tolls on freeways have been vague about how the revenues collected would be used, although it is generally understood that they would be used for public transportation. In fact, such revenues could be used to compensate for reductions in other existing taxes, such as those on sales and gasoline. Because we suspect that support for congestion fees would grow if people received assurances that a portion of the money collected would be returned to them in some specific fashion, we took a different tack in our survey. Among other things, we wanted to see how sensitive the level of support was to the amount of revenue returned.

The RFF Survey

After focus group pretesting and consultation with the REACH Task Force, the survey that the RFF team developed was administered to 1,743 freeway users (ages 18 or older) in the California counties of Los Angeles, Orange, Riverside, San Bernardino, and Ventura during August and September 1996. The objective was to estimate how the respondents would vote in a hypothetical referendum on alternative congestion fee policies with and without various revenue recycling options. Those surveyed were asked for their reactions to a "base fee policy," which would entail levying a fee on freeway travel during rush hour, the amount to range between 5 and 10 cents per mile depending on the level of congestion.

Compared with similar surveys, this one was unusual in offering respondents explicit information about options that might be implemented and projected benefits (for example, travel time might be reduced by "x" minutes per day) as well as about the fate of the fee revenues collected. Respondents also received estimates of what their annual fee obligations would be under the hypothetical base plan. These estimates were calculated by asking respondents to supply information about their commuter travel times and other driving behavior. To personalize the fees in this way required the use of a Computer-Assisted Telephone Interview protocol so that interviewers could enter data directly into computers and then calculate the fees.

Reactions to the Base Fee

Of the motorists surveyed, 38 percent reported that they would support the base plan, with 56 percent opposed and 6 percent undecided. Thus the results suggest that nearly two out of five commuting motorists in Southern California will support congestion fees on the region's freeways even without being told with any specificity how the revenues are to be used. If we consider the intensity of preferences, however, we see that a much higher fraction of the opposition was "definite," suggesting that a congestion fee presented without rebate or other inducement will enjoy soft support and face hard opposition.

Support for Base Congestion Fee Policy

Support		Oppose		Don't Know
38%		56%		6%
Probable	Definite	Probable	Definite	
23%	15%	17%	40%	6%

The most common reason given for opposing the base plan was that it amounted to a new tax. Fully a quarter of all respondents gave this as their reason for opposition. Another 10 percent felt the time saved was not worth the estimated cost, and 8 percent were skeptical about the plan's ability to reduce congestion.

To isolate the influences on support, we built a

statistical model to indicate the probability that an individual would favor the fee given his or her personal characteristics and socioeconomic situation, as well as commuting habits. It seemed reasonable to expect, for example, that respondents with higher incomes would support congestion fees because they would tend to value the time savings more. Likewise, we expected that because educated respondents would better understand the arguments in favor of user fees, they would support the policy more than those less well-educated.

We were in for some surprises. We found no correlation at all between support for the fee and income, while education was *negatively* associated with support. Perhaps educated respondents were more skeptical of an untested economic theory or had more doubts about the competence of governments to implement such a plan. The strongest demographic indicator of respondent support for the base fee policy was having an Hispanic heritage. At this point at least, we have no explanation as to why.

Among the commuting behavior variables, only use of carpools and mass transit tended to translate into support, and only weakly. This weakness may be a consequence of the low frequency of transit and carpool use in the sample—on average only 0.12 and 0.56 days per week, respectively. Surveying a sample containing more carpoolers might yield a different outcome.

The variables of greatest interest to us were those that corresponded to the individual costs and benefits of congestion pricing policy: minutes saved and estimated cost per hour saved. We calculated the latter by taking each respondent's estimated congestion fee payments per week and dividing by the estimated time savings attributable to the fee policy, both quantities being determined by the computer-assisted telephone interview program. We found that an increase in price caused support for the policy to decline.

We also found that support declined as the "minutes saved" variable increased, a result that at first glance appeared counterintuitive. After all, saving time on the road would seem to be a good thing and hence something respondents would vote for. But given the survey's construct, respondents were presented with a fixed quantity of time, at a fixed price, and asked if they wanted to buy. Thus it was not surprising to see the level of support drop as quantity increased. An individual may be willing to buy 5 pounds of potatoes for a dollar, or even ten pounds for two dollars, but not at all eager to buy 500 pounds for $100. Respondents favored a fee that would save them up to about an hour per week. Beyond that point, support dropped rapidly.

We also asked respondents whether they thought congestion pricing would cause the flow of traffic to move faster on roads and highways subject to a congestion fee. Positive opinions in this case were by far the most potent variable increasing support for the base fee policy. Thus an effective campaign to educate the public on the benefits of congestion pricing might garner more support for such a fee plan.

Reactions to Added Incentives

After getting their reactions to the base fee, survey participants were split randomly into three groups and asked to indicate their support for one of the following enhanced plans:

Congestion fees with fee/tax reductions. A percentage of the fee revenues (25, 50, or 82 percent of a respondent's fee payment) would be used to reduce other taxes, such as those on sales or gasoline, or used to reduce vehicle registration and license fees.

Congestion fees with coupons. A percentage of the fee revenues (25, 50, or 82 percent of a respondent's fee payment) would be returned as coupons that could be used to pay for transportation-related expenses such as public and private transit.

Fast lanes. Only the leftmost lane would be subject to fees on freeways; either an existing lane would be so designated or a new lane constructed. No rebates were associated with this option.

Reaction to the base fee plan was by far the best predictor of how survey participants would respond to

Importance of Base Policy

Support congestion fees with tax reductions?

Support base policy?	No	Yes	Don't know
No	74%	20%	6%
Yes	10%	88%	2%
Don't know	22%	48%	30%
Average support for fees/tax reduction	46%	49%	5%

any of the three plans enhanced with monetary and other benefits intended to attract support.

Congestion fees with fee/tax reduction. Among opponents of the base plan, 74 percent likewise opposed the plan when it was combined with a reduction in motor vehicle fee or sales tax. However, 20 percent of the base plan opponents were willing to support a congestion fee if combined with the tax/fee reduction. Among supporters of the base plan, only 10 percent rejected the enhanced plan. Thus this policy received more support than the base policy; it appeared to increase support for congestion fees by about 7 percentage points.

Interestingly, support for congestion fees that were combined with a fee or tax reduction varied significantly from county to county. The plan was extremely popular in San Bernardino County—by better than a two to one margin—but not at all popular in Riverside, with the other three counties somewhere in between. We have no hypothesis to explain these regional differences.

Not surprisingly, the level of support for the plan was higher among respondents who would receive a rebate worth more than the fee paid. Thus support for congestion fees might increase by designing plans so that most people will not pay in more than they get out.

Congestion fees with coupons. Unlike the tax/fee reduction policy, returning a portion of the revenues to the public in the form of coupons to cover transportation-related expenses did not in the aggregate improve support for congestion fees. Support for coupons was 36 percent—lower than support for the base policy across the entire survey sample. However, support for the coupons increased substantially as the aggregate dollar value of the coupons increased from 25 to 82 percent of the fees.

Congestion fees on fast lanes. More than 45 percent of the respondents said they would support congestion fees if an existing lane was designated as a fee lane (with 48 percent opposed). But support jumped to 54 percent when the fee would apply to a newly constructed lane, leaving all current lanes untouched. This latter congestion fee policy was the only one examined that won the support of a majority of respondents.

Off in the Future

The results of our survey suggest that congestion tolls and vehicle emissions fees can attract majority support from the public in Southern California, at least in a hypothetical referendum and under some circumstances. The survey also revealed that providing a rebate of some portion of the fees to individuals can increase support, although in our case not by enough to win a majority. Moreover, support for all congestion fee plans was weak in this sense: many more supporters said that they would "probably" rather than "definitely" support a fee plan, while opponents said the reverse was true. A referendum or similar proposal to adopt a congestion fee plan might be vulnerable to such qualitative distinctions—to the ferocity, say, of the opposition's sound bites during a related political campaign.

As far as we know, this survey is the first to elicit support for congestion fees by promising respondents a private benefit, in the form of cash, rather than a promise of public investment. With more experience, it is likely that policymakers will design more attractive rebate packages than are described here. In doing so, they may benefit from some of the information gained through this survey. Findings, such as where geographical and demographic support and opposition to these plans can be found, should help to target further investigation as well as campaigns to publicize such plans and inform the public about them.

Actual implementation of congestion pricing is probably still somewhat off in the future. Influential members of the California legislature, for instance, appear to continue to be implacable in their opposition. But meanwhile in the broader public forum, interest in and acceptance of such economic incentive policies appear to be growing. Time—and traffic—are on their side.

Winston Harrington is a senior fellow in the Quality of the Environment Division.

Global Trade in Greenhouse Gas Control

Market Merits and Critics' Concerns

by Jonathan Baert Wiener

A world market for "greenhouse gas" emissions abatement services could lower the costs of preventing global climate change, widen the availability of climate-friendly technology, and engage more countries in emissions reduction efforts. So why is the United States having such a hard time getting other countries to like the idea?

Governments around the world are negotiating to reduce the amount of heat-trapping "greenhouse" gases (GHGs) we emit into the atmosphere. The challenge is to cut the emissions that may be changing the world's climate without hobbling the world's economies. One of the ways in which the international community could meet this challenge is to create a world market for emissions abatement.

Market Options

Any international treaty intended to prevent global warming would need to impose and enforce limits on nations' emissions of GHGs. One approach would be to require that each nation stay within its limit on its own. The market alternative is to require the same global limit while allowing flexibility across nations in the locations where actual reductions are achieved.

Two kinds of international markets for GHG emissions abatement can be envisioned. One is a formal "cap and trade" system similar to the one adopted by the United States in 1990 to control the sulfur dioxide (SO_2) emissions that cause acid rain. An international treaty would establish a global cap on aggregate GHG emissions for some period of time and specify shares of emission allowances for each participating country. The governments of these countries would allocate their allowances to the private sector. Worldwide allowance trading would reallocate abatement efforts to those who could do so most cost-effectively: emitters with high costs of abatement would seek to buy additional allowances, and emitters with low costs of abatement would undertake additional controls and seek to sell unneeded allowances. Organized exchanges would facilitate trades.

For each accounting period established by treaty, a country's report of its actual emissions (subject to monitoring and verification) would be compared with the allowances held by its emitters. If a country's emissions exceeded total allowances held, it would be out of compliance with the treaty.

The second kind of market envisioned is "informal." An international agreement would set national limits on emissions but not allocate formal allowances. Participating countries could meet their targets not only by investing in GHG emissions reductions at home but also by purchasing credits for emissions reductions in other countries, including in countries not subject to an overall emissions target.

This informal system is similar to the "pollution offsets" programs that the United States has employed for new emissions sources in certain areas. It is essentially the system of "joint implementation" (JI) outlined in the Framework Convention on Climate Change signed at Rio de Janeiro in 1992. In the sequel in Kyoto in December, the United States is expected to press other parties to the framework convention both to institute a formal international market in tradable GHG emissions allowances among countries with caps, and to recognize official credits for JI worldwide.

The Case for Emissions Trading

Why is the United States keen on establishing a market for international trade in emissions allowances? One of the key draws is cost-effectiveness. The cost of reducing GHG emissions varies significantly from place to place. Yet the global environmental benefits are essentially independent of where emissions are reduced. Numerous studies indicate that flexibility as to where GHG emissions abatement can take place would cut the estimated total cost of compliance with emissions caps considerably—perhaps by 50 percent or more.

The United States has used allowance trading to achieve some of its greatest environmental successes, such as phasing out lead in gasoline and cutting emissions of SO_2. The cost savings in the lead and SO_2 cases have been substantial—as much as 50 percent or more compared with a control policy in which no trades were allowed. The SO_2 policy has also stimulated energy efficiency investments and the use of new abatement technologies. And the SO_2 experience suggests that a more cost-effective, market-based policy enabled Congress to sign on to more pollution control than it would have if control were more expensive. Similarly, reducing the cost of GHG abatement would likely lead countries to undertake more abatement than they otherwise would.

Depending on how international GHG abatement responsibilities are allocated, allowance trading could direct the flow of substantial resources from richer to poorer countries, where abatement costs appear to be relatively lower. These resources—perhaps exceeding all current official development aid—would help developing countries shift to a more prosperous but lower-emissions development path, and would attract their participation in the GHG abatement regime at a time when their emissions will soon account for over half the world total. (And if developing countries do not participate, industrialized countries concerned about their economic competitiveness relative to developing countries are unlikely to sign on.)

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Generic Concerns

Despite its advantages, many countries express concerns about creating an international emissions trading system. Most of the concerns they cite, however, would apply to any internationally based emissions control regime. Some are problems that trading could actually ease.

A fundamental challenge for any treaty is deterring "free riders"—nonparticipating countries that benefit from efforts to reduce emissions without adhering to limitations themselves. If free riding were not deterred, the entire collective regime might unravel. Adding allowance trading to a GHG treaty could make free riding less tempting. For industrialized countries, it would lower the treaty "price of admission" by allowing them to cut GHG emissions in the most cost-efficient way. For developing countries, allowance trading would raise the profits to be made from treaty participation, since industrialized nations would purchase allowances and credits from them.

Emissions "leakage" is another problem that would afflict any subglobal treaty, whether it employed trading or not. The problem occurs when reductions achieved in one place only encourage emissions to grow where caps do not apply. Such leakage could arise in the short term as emissions controls lowered world fossil fuel prices, and in the long term as industries relocated to avoid emissions controls.

Informal JI projects probably could lead to some leakage on a local scale, if credits purchased from a project resulted in emissions growth elsewhere in a country not subject to a cap. Care would be needed in project design and the calculation of JI credits to account for such leakage. (Formal allowance trading among capped countries poses no such local leakage concern.) On a global scale, however, both JI and formal trading could reduce total emissions by inhibiting free riding and attracting more global participation in emissions control. By lowering abatement costs, GHG markets would give industries less reason to relocate to escape controls.

Another concern is the effect that a market would have on the ability to forecast "baselines"—what amount of emissions might occur in a given time and place and how much abatement actually was achieved. Under JI it might be difficult to gauge what emissions otherwise would be in a host country not subject to an emissions cap. (A formal trading market among capped countries does not raise this concern.) But prohibiting JI credits because of uncertainty would eliminate the opportunity to engage countries without national emissions caps in early GHG control efforts, as well as the opportunity to obtain low-cost abatement services in those countries. A better approach is to allow both cap-and-trade *and* JI, and to use benchmark rules to assign uncertainty-adjusted credit to JI projects. Investors could seek extra credits for providing more reliable emissions accounting, thus creating incentives to improve measurement capabilities in developing countries.

Critics also worry that it would be difficult to allocate emissions allowances among countries. But this problem is unavoidable in any climate agreement; emissions trading just makes allocations explicit. And without trading, dispositive national caps would be much harder to negotiate. If they had flexibility to reallocate emissions allowances through trading after a treaty had been signed, negotiators would face less pressure to devise ideal, permanent allocations in the treaty itself.

Tax v. Trade: The Pros and the Cons

How does imposing a tax on greenhouse gas emissions compare with instituting a market for allowance trading? In economic theory, the two could achieve identical results. In practice they could be quite different.

A tax would offer more certainty about the costs involved in emissions reductions, since the tax rate would be fixed in advance, whereas the price of emissions allowances could vary. But a tax would offer less certainty about the amount of emissions control achieved, since it would not establish emissions caps.

A tax would not incur the transaction costs of allowance trading, but it would incur administrative costs to collect.

A tax system could be circumvented: national subsidies could be funneled to high-emitting industries to buffer the tax, distorting competition and increasing emissions.

And a tax would not create an automatic mechanism for transfers of resources and technology from richer to poorer countries. Such transfers are critical to getting developing countries engaged in GHG emissions reductions, and thus to getting competitiveness-conscious industrialized countries to act as well.

Specific Concerns

Some concerns do apply with special force to market-based emissions trading regimes. First, should the costs of arranging transactions in an emissions abatement market be high, they would impede trades and raise total costs. These "transaction costs" include searching for trading partners, negotiating deals, securing regulatory approval, monitoring and enforcing deals, and insuring against the risk of failure. Evidence from previous U.S. "environmental markets" such as the lead phasedown, the Los Angeles smog control program, and the Fox River water pollution control program suggests that such costs can determine the success or failure of a trading system.

The transaction costs of JI appear to be very high. Partners are hard to identify, each negotiation is novel, each project must be approved by the host and investor governments, and each investor must monitor its own projects. Moreover, JI typically involves investors' supporting and bearing the risk of entire projects. JI transaction costs could be reduced, however, through brokers (many of which are emerging), information exchanges, streamlined approval processes, accredited monitoring agents (including environmental

nongovernmental organizations), mutual funds and other means of risk diversification, and official credit.

The costs of transacting in a formal allowance trading market would be much lower, especially if fungible allowances were traded on organized exchanges. Indeed, reducing transaction costs would be a central goal of a formal system.

Second, a global allowance market could be impeded if national governments interfered in global trading. To be fully cost-effective, the entities actually responsible for GHG abatement must do the trading. Assigning allowances and credits to these entities will galvanize decentralized competition, creativity, and flexibility. But this approach might not be carried out well (or at all) in countries where the state is an active supervisor or owner of industry.

And national governments might try to influence the world abatement market to their advantage, obstruct allowance trades, or otherwise depart from the conditions of well-functioning markets assumed in the estimates of cost savings. Such meddling might be limited by international trade law, depending on how this law ends up applying to GHG allowances.

Third, concentrated power over allowance or credit prices could arise—on the sellers' side through a cartel or a large state-run energy company, or on the buyers' side through a sole-purchasing agent for industrialized countries. Unlike domestic antitrust law, international law has no basic framework to combat such "market power." Climate treaty features such as less-than-unanimous voting rules for admitting new participants into the abatement market, or automatic phased inclusion of countries upon meeting pre-set criteria, could thus be crucial.

Understanding the Opposition

On balance, international GHG emissions trading appears to offer compelling advantages—lower emissions-reduction costs, valuable resource and technology flows, and greater participation in emissions reduction efforts. So what explains the opposition?

Clearly, some of it is due to misunderstanding and to genuine doubts that the system will work as envisioned. And some of it reflects a fear that such a market would lead to "carbon colonialism," if wealthy investors could depress allowance and credit prices, leading poorer countries to sell out their futures at a loss. This is a sincere concern about market power and must be addressed on its merits.

But other motivations appear to be at work as well. Some may feel it is unfair to include poor countries in a market-based control regime; but allowance trading would benefit (not harm) poor countries, and excluding developing economies would invite leakage and undermine a treaty's environmental effectiveness. Others may reject trading because their objective is not so much to protect the climate as it is to combat what they view as immorally extravagant lifestyles and excessive energy consumption. Some bureaucrats may disfavor private market transactions because they gain from their ability to manipulate official government aid more adroitly.

Wealthy countries with comparatively low abatement costs (say, in Europe) may prefer a less flexible control regime than emissions trading. Although less flexibility would cost them a little, it would cost their trade rivals (the United States and Japan) even more—a new global version of the "predation by regulation" phenomenon.

Opposition might also mask a desire to gain leverage over the greenhouse gas emissions reduction goal (target or cap). Advocates of aggressive climate protection may be withholding support for trading until it is paired with a stringent cap—risking a costly treaty or no agreement at all. Meanwhile, skeptics of aggressive climate policy may fear that cost-effective policy tools are an all-too-enticing "fast train to the wrong station," inducing premature adoption of an overly stringent cap. Of course, the goal of climate policy should be chosen with great care. Yet these skeptics' gambit of urging a higher-cost "slow train" (in the hopes that it will derail any GHG limitations agreement) may just invite "Murder on the Orient Express"—a treaty that is both higher in cost and less environmentally effective—a "lose-lose" luxury train to the wrong station.

Jonathan Baert Wiener is associate professor at the Law School and the Nicholas School of the Environment at Duke University. Previously he was the senior staff economist for environmental issues at the President's Council of Economic Advisers, as well as a senior aide on environmental policy issues at both the Office of Science and Technology Policy and the Department of Justice. In those capacities he helped draft and implement the Framework Convention on Climate Change.

High-Tech Leads to Uptick in U.S. Petroleum Supply

Exploring for oil and natural gas has changed a great deal since the days when prospectors looked for surface seeps and roughnecks stood around waiting for a gusher. Indeed, the technologies used today to explore and develop petroleum deposits rival in imagination and expense those used to explore outer space. Most significant among these breakthroughs are three-dimensional seismology, horizontal drilling, and new deepwater production systems.

Despite their expense, these technological advances have reduced the costs of finding and developing oil and natural gas resources dramatically. They have shored up the U.S. petroleum industry in the process.

Douglas Bohi makes these observations in a recently issued report in which he traces changes in the productivity of the U.S. petroleum industry over the last decade. In terms of productivity, he writes, the consequences have been remarkable. To wit: 3D seismology costs roughly twice as much as 2D but raises the petroleum discovery success rate from 20 to 50 percent and the development drilling success rate from 70 to 90 percent. These productivity improvements translate into 40 percent reductions in average finding costs and over 20 percent reductions in average development costs.

Likening the improvement of 3D over 2D to that of Magnetic Resonance Imaging over X-rays, Bohi notes that three-dimensional seismology makes it possible to find resources that would otherwise be overlooked and to increase recovery rates from known reservoirs. Advances in high-speed computing are what have made the use of 3D possible. Geologists and geophysicists generate mountains of data that are then fed into supercomputers via satellites to build the complex models used to study sound waves and thus help locate oil and gas deposits deep within the Earth.

Now that it is possible to drill well bores at all angles and to sense their location with respect to the target, resource recovery has increased by a factor of two to five. New drilling systems that operate remotely and production platforms that float make it possible to extract oil and gas in water thousands of feet deep.

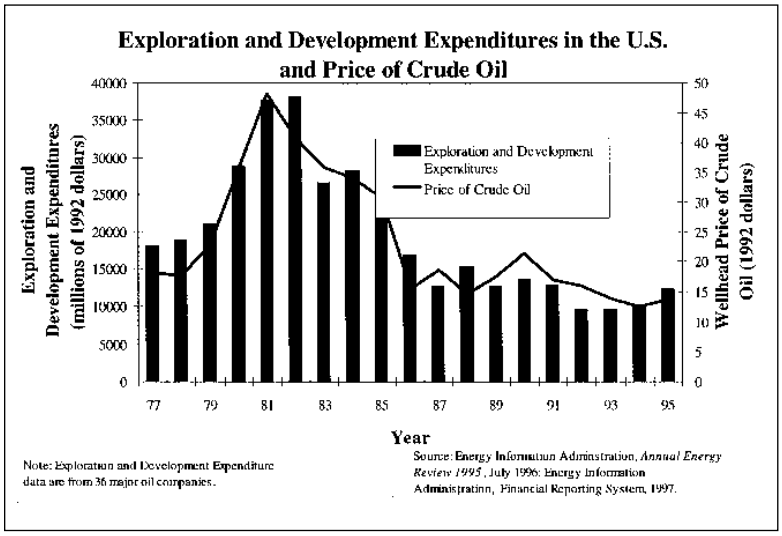
The 3D models facilitate these major new advances. In the case of horizontal drilling, high-quality 3D information is used to locate small and thin deposits that the new type of drilling is often able to recover. In deepwater exploration, 3D seismology provides more accurate estimates of subsurface configurations and helps reveal ultimate reserve potential. These advances can offset some of the risk associated with any large investment in deepwater production.

Perhaps 3D's most exciting application is in the detection of petroleum deposits below salt formations in the Gulf of Mexico. More access to deep water has opened up some of the most productive petroleum-bearing areas in the United States: the success rate in the gulf is twice the national average; wells drilled in over 500 feet of water on average produce five times as much as wells drilled in shallower spots. In 1994, industry spent more money on offshore than onshore activity in the United States for the first time in history. The payoffs warrant the focus, Bohi writes, despite the fact that exploratory wells offshore are five to six times more expensive to drill than onshore.

Bohi describes the advent of these technological advances within the context of how the industry has operated traditionally and how it has changed over the last ten years. The changes that have occurred, he says, are very much the consequence of industry responding to the pressure to reduce the costs of production after the price of oil fell by half in 1986. The prospect that the price would not rebound anytime soon meant that firms had to find new ways of doing business beyond downsizing. So while technology undoubtedly contributed to rising productivity, the industry also helped itself by exercising greater selectivity to draw on higher quality prospects than in the past. The industry made some organizational and institutional changes, too.

Still, Bohi concludes, it is the technological innovations that deserve most of the credit for keeping the United States competitive in the world oil market and for easing adverse effects on returns domestically.

Bohi's study is part of a two-year project that RFF is conducting with the support of a $350,000 grant from the Alfred P. Sloan Foundation. The project's purpose is to better understand the sources of productivity change in the energy, forestry, and mining industries—major contributors to the U.S. economy.



INTERVIEW

Environmental Policy Is the Public's to Make—and the Market's to Shape

Darius W. Gaskins Jr. is a senior partner with the Boston-based management and investment firm High Street Associates Inc. He has chaired RFF's board of directors since 1994. Gaskins has the advantage of a diverse set of perspectives from his days as president and chief executive of the Burlington Northern Railroad, as chair of the Interstate Commerce Commission, as a deputy assistant secretary of policy analysis at the U.S. Department of Energy, and as a professor of economics at the University of California–Berkeley. In August he and J.W. Anderson, RFF's journalist in residence, had the following conversation.

RFF: Economists push policy toward market solutions. Are there drawbacks of which economists ought to take account?

Gaskins: In our daily lives there are certainly aspects of family life, aspects of our community life in which we don't do everything entirely on an economic basis, and that will always be the case, I think. But what we are talking about here are philosophic and practical approaches to environmental regulation. When the problem is obvious and immediate, we have historically used command-and-control regulation.

But what we have increasingly found is that the evolution of technology is an important aspect of successful environmental regulation. Moreover, some environmental problems involve the economic behavior of thousands or millions of our citizens. When you have lots of individuals and when you have technology evolving, out of sight of the regulator, market-based approaches make more and more sense.

I am an economist and economists like markets. I think we have seen some very good applications recently, and on the horizon some even more significant use of market-based approaches to environmental regulation.

A recent success story, which I think is widely hailed by economists as well as many environmentalists, is cleaning up SO_2 emissions. The use of tradable permits to achieve a ten-million-ton reduction has been quite a success. It has achieved a lot of cleanup at a much lower cost than had been anticipated.

RFF: Despite that, there is a suspicion of economics among many of the environmental organizations. The argument is that

environmental values can never be fully translated into dollars, so they'll always come out with the short end of the stick in cost-benefit analysis. How can economic analysis respond to that?

Gaskins: My response is that there is an element of truth to it, but that's not a reason not to use markets to achieve objectives.

Some aspects of the benefits may well be nonquantifiable even though RFF, as you know, has done a lot of work to come up with various methods of trying to quantify benefits from environmental amenities. But in the final analysis, the appropriate evaluation of benefits may really be the citizens' individual perceptions.

In fact we may have to say these things are beyond our ability to quantify, but we leave that to the body politic to decide. The public is intelligent and if you balance things in terms of presentation I think that they will come up with the proper weighting.

What I do think is an ethical issue for all of us involved in the environmental policy debate arises when we do things to keep the public out of the process. When we obfuscate the costs, we obfuscate the benefits. We avoid telling the full story. That is an issue that I feel very strongly about. As we ponder some of the environmental problems we face going forward, like global climate change and standards for particulates and things like that, I think it is increasingly important that we all be very open and clear with the public about the two hands—the benefits on the one side and the costs on the other side.

RFF: The global warming issue is a place where two of the great interests of RFF intersect—energy policy and environmental policy—and it's coming to a decision of some sort later this year at the Kyoto conference. What advice would you give to the administration?

Gaskins: I think it's probably a little early for the administration to lock themselves into a course of action with respect to climate change. That's because our understanding of the problem is still evolving, certainly the public awareness is still evolving, and this is an extremely difficult problem we're talking about.

There is the need for leadership by the developed countries, clearly, but this is very, very difficult—more difficult than anything we have faced before.

Let's think about this problem in terms of evaluating the costs and benefits. There has been a fair amount of work done on what it might cost to limit CO_2 emissions. Only recently are we beginning to see some work that begins to quantify what it might cost to hit certain CO_2 concentration levels. But we know very little about the consequences of global climate change.

Personally, I think it's improbable that we'll take on a costly abatement program until we get a clearer picture of the consequences of not doing it.

I also think that it's unethical for our government or any others to take on a fairly draconian program of CO_2 abatement until you've brought the public into the discussion and explained to them that this is what it's going to cost and this is why we're doing it.

RFF: Do you think there's time to bring the public into the debate between now and [the Kyoto conference in] December?

Gaskins: No, clearly not. I don't think the man on the street knows much about this thing at all. He has no concept of what's going on. In fact, the administration is currently talking a little bit about a free lunch—that we'll abate CO_2 by just voluntary activity and it'll pay for itself. I don't think any serious student of this problem thinks that you can achieve a worldwide leveling off of emissions anytime in the next hundred years unless you embark on some program that begins to bind.

But it is part of a much longer term problem that we have, the energy problem. Eventually we have to make the transition from a fossil-fuel-based economy on a worldwide basis to something that's based on some other source of energy, whether it be solar or nuclear or something else. The world is ill-prepared for that change.

It's unethical for our government to take on a draconian program of CO_2 abatement until the public is brought into the discussion and it's explained to them that this is what it's going to cost and this is why we're doing it.

RFF: You've become a very active and very generous chairman of RFF's board. What do you think RFF's responsibilities are over the next ten years?

Gaskins: I have known RFF for twenty years or more, and it obviously has a great history and has performed vital service to the nation and to the world in terms of expanding the knowledge base we use to respond to environmental and resource problems.

When I was in Washington in the early 70s, I felt that RFF's work was too little in evidence as we embarked on the control of domestic oil prices as a response to the Arab embargo. The Clean Air Act of 1970 was not well thought out in terms of its use of economic incentives to drive technology and control of emissions. RFF became more involved in energy policy in the latter part of the 70s, but clearly was not there at the onset.

Ideally, RFF going forward will have looked in some depth at the next environmental problems that we face. That's why I'm quite pleased with what I see going on with respect to climate change and implementation of the Clean Air Act. RFF is really living up to its potential. Its people are grappling today with the problems we have today and will have tomorrow.

RFF must also communicate its research findings with the rest of the world. RFF has done a superb job of communicating with the academic world. I have a daughter who is studying economics at Wesleyan University and she is very familiar with RFF's work. Everybody I talk to in the environmental community is familiar with what people at this institution are doing. But there are other audiences that are relevant.

I think that RFF is doing a better job in interacting with the environmental policy process in Washington and internationally. Communicating with the general public is tough. We have a modest annual budget of $7 million; so we are not going to do everything for everybody. But these issues are becoming increasingly important to citizens the world over. RFF's work is too valuable not to be fully shared as we all grapple with difficult environmental and resource issues.

INSIDE RFF

GE Fund internship

The GE Fund contributed $10,000 to RFF in 1997 to bolster participation by students underrepresented in the field of environmental policy analysis.

In accepting the gift, RFF President Paul R. Portney noted that relatively little diversity exists in the backgrounds of economists and other policy analysts, especially those studying environmental and resource issues. Part of the reason for this underrepresentation appears to be economic. According to a 1994 National Research Council survey, African-Americans, Native Americans, and Hispanics reportedly rely less on grants and scholarships and significantly more on personal sources of money to finance doctoral degrees than do Ph.D. graduates overall.

Having to pay out of your own pocket as you go to school can be a real obstacle to finishing a degree, Portney noted. For instance, self-supporting students often must settle for employment outside their fields of study in order to cover their costs and so lose an opportunity to apply and refine their professional skills. While clearly benefiting the recipient, the new internship will likewise benefit RFF by providing much-needed assistance in carrying out projects and developing new areas of research, Portney observed.

The new program will support one student this year and will operate much like RFF's general internship program, begun in 1988, in which more than a hundred students have taken part. Thus depending on the environmental intern's policy interests, he or she will work directly with researchers in one of RFF's three divisions.

For more information about the GE Fund Environmental Internship, contact RFF's Assistant for Academic Programs at 202–328–5067.

New fellows in ENR

Carolyn Fischer and Richard G. Newell have joined the RFF staff this fall as fellows in the Energy and Natural Resources Division. In announcing their arrival, ENR Division Director Michael A. Toman noted Newell's clever explorations of how firms go about the business of innovating energy-efficient technologies and Fischer's fresh insights into the relationship between procrastination and the use of depletable resources. Both fellows completed their doctoral degrees and received RFF Joseph L. Fisher Dissertation Award fellowships earlier this year.

PATRICK DEASON PHOTOGRAPHY

Carolyn Fischer

In addition to depletable resources, Fischer has a wide variety of interests related to public finance, environmental policy, and land management. At RFF, she will continue studying resource use and decisionmaking over time. One goal is to understand better the costs of procrastination when it comes to slowing the production of greenhouse gases and developing new technologies to help with emissions reduction.

Fischer will also be looking at the impact of tax policy on resource use and the environment.

Fischer received her doctorate in economics from the University of Michigan after completing her undergraduate studies in international relations and economics at the University of Pennsylvania, where she graduated magna cum laude.

Newell received his Ph.D. in public policy from Harvard University, where he focused on environmental and natural resource economics. His strong interest in policy is also reflected in his training at Princeton University's Woodrow Wilson School of Public and International Affairs, from which he received a master's degree in public policy and urban planning.

Newell already has substantial experience assessing ways to improve environmental and natural resource management in industry through the use of alternative types of policies. He has conducted econometric analyses of technological

PATRICK DEASON PHOTOGRAPHY

Richard G. Newell

changes in such energy-intensive goods as air conditioners, gas water heaters, and farm tractors. Aspects of the research should have implications for modeling the costs of climate change policies.

At RFF, Newell will continue to build on his understanding of energy-saving technological change, studying the impact on firms of economic incentives in contrast to direct regulation. He will look at how differences across firms in pollution control costs affect the benefits of using incentive-based policies.

New associate; new CRM project

As its newest research associate, Thomas C. Beierle is helping the Center for Risk Management to launch one of its newest projects: an ambitious examination of public participation in environmental policy decisionmaking. CRM is taking on the task at the collective behest of its advisory council, the Environmental Protection Agency, and other interested experts and stakeholders. As CRM Director

PATRICK DEASON PHOTOGRAPHY

Thomas C. Beierle

Terry Davies notes, from the outset the project will have to resolve difficult methodological issues and answer value-laden questions, such as who is the public and how are legitimate representatives of particular interests identified?

Once the conceptual framework is settled on, the center plans to look at the whole gamut of methods used to engage Americans in decisions that affect air and water and other aspects of their environs. Among the project's several goals is to clarify the relationship between people's willingness to insert themselves into the process of making public policy and their trust in institutions, especially governmental ones.

Beierle is well-equipped to help in the venture, having recently received a master's degree in public affairs from Princeton University's Woodrow Wilson School of Public and International Affairs, where he focused on economics and public policy and edited the *Journal of Public and International Affairs*.

His experience includes internships with the United Nations Development Program's Global Environment Facility and the White House Council on Environmental Quality.

Beierle received a bachelor's degree in history, cum laude, from Yale University, where he also received the Walter McClintock Writing Prize and a Pacific Northwest Bell scholarship for academic achievement.

BP America CEO joins RFF board

Steven M. Percy, chairman and chief executive officer of BP America, Inc., is RFF's newest board member. Elected at the fall board meeting last month, Percy has had a long career in the petroleum industry as both an analyst and manager.

In 1976, he joined the Standard Oil Company, where in a series of posts he managed American flagged transportation, Eastern crude oil, and downstream strategic planning. Additionally, he directed operations analysis and the executive office.

Steven M. Percy

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Each year, about a dozen students spend the summer working as research assistants at RFF. Most are in the midst of pursuing advanced degrees in environmental economics and related fields. Pictured here in a staircase swirl are the summer interns for 1997 along with RFF President Paul R. Portney: ***Front row, left to right:*** *Diahanna Lynch, Portney, Xun Wu, and Joyce Luh.* ***Second:*** *Puskar Wagle and Xiaohang Liu.* ***Third:*** *Aaron Andalman, Rebecca Long, and David Hauri.* ***Fourth:*** *Eric Schupper, Paula Fetterman, and Andres Lerner.* ***Top:*** *Michael Taylor and Jeremy Fireston.* ***Not pictured:*** *Curtis Carlson and the first recipient of the Walter O. Spofford, Jr. Memorial Internship, Shugin Liu.*

Following the merger of Standard Oil and BP in 1987, Percy moved to London to manage oil planning and control for BP Oil International. Percy was president of BP Oil in the United States from 1992 until assuming his current position in 1996. During the same years, he also was executive vice president of BP America.

In addition to serving as its chairman and CEO, Percy serves BP America as a director and sits on the company's advisory board. He is a member of the American Petroleum Institute, the Ohio Business Roundtable, and the corporate advisory board of the University of Michigan's business school.

Percy received a law degree from Cleveland Marshall College of Law and a B.S. degree in mechanical engineering from Renssalaer Polytechnic Institute.

ANNOUNCEMENTS

Applicants sought

RFF is seeking applicants for the Joseph L. Fisher Dissertation Awards and the Gilbert F. White Postdoctoral Program for the 1998–99 academic year.

To honor the late Joseph L. Fisher, RFF president from 1959–74, fellowships will be awarded in his name to support doctoral dissertation research. To be eligible, students must be writing dissertations in economics or policy sciences on issues related to the environment, natural resources, or energy, and must have completed their preliminary examinations for a doctoral degree no later than February 1, 1998.

To honor geographer Gilbert F. White, retired chairman of the RFF board, fellowships will be awarded in his name to two postdoctoral researchers. The fellows selected will each devote a year to scholarly work at RFF in social or policy science areas related to the environment, natural resources, or energy. The fellowships are open to individuals who will have completed their doctoral requirements by the beginning of the 1998–99 academic year.

Applications are due by February 27, 1998. All awards will be announced by May 1. For more information, call 202–328–5067 or access the RFF web site.

For more information, write to RFF's Assistant for Academic Programs (telephone 202–328–5067); or access *http://www.rff.org*.

Recent RFF Books on Environmental Policy

Regulating Pollution: Does the U.S. System Work?
J. Clarence Davies and Jan Mazurek
Concise and manageable, it summarizes the results of a three-year research project. The book's goal is a critical understanding of the pollution control "system," thus laying the foundation for its reform. Ideal for college and graduate courses in environmental policy.

"This report is exactly on target in its criticism of current environmental policies, in the many thoughtful questions posed, and in its well-considered recommendations for policy change."—**Michael Kraft,** *University of Wisconsin-Green Bay*

56 pp., paper • ISBN 0-915707-85-3 • $9.95

Comparing Environmental Risks: Tools for Setting Government Priorities
J. Clarence Davies, ed.
"Provides a brief, yet insightful guide to the major challenges and issues of concern and sheds much light in the process."—*Comparative Risk Bulletin*

"Building on objective analysis of the history of comparative risk, this book will become an indispensable and recognized template for future debate and policy development."—**James Strock,** *former California Secretary for Environmental Protection*

176 pp., hardback • ISBN 0-915707-79-9 • $27.00

Economic Analyses at EPA: Assessing Regulatory Impact
Richard D. Morgenstern, ed.
For years EPA has conducted economic analyses, also known as Regulatory Impact Analyses (RIAs), to assess the effects of environmental regulation. Twelve original case studies reveal how EPA has designed and executed those analyses and how it has used the results in decisionmaking.

"A thoughtful and thorough examination of economic analysis as a tool for environmental policymakers. This book should be required reading for anyone interested in sound environmental policy."
—**Jonathan Lash,** *World Resources Institute*

496 pp., paper • ISBN 0-915707-83-7 • $49.95

The Swedish Nuclear Dilemma: Energy and the Environment
William D. Nordhaus
Renowned economist Nordhaus models the potential effects of Sweden's proposed phaseout of nuclear energy, particularly in light of recent factors such as climate-change policy.

"Nordhaus's treatment of the Swedish nuclear question is an excellent piece of applied environmental economics. It is also an insightful analysis of an issue that has played a significant role in Swedish economic and energy policy for over fifteen years."—**Lars Bergman,** *Stockholm School of Economics*

184 pp., hardback • ISBN 0-915707-84-5 • $39.00

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Books may be ordered by telephoning 410–516–6955. MasterCard and VISA charges may be made on telephone orders.

Ordering discussion papers

Discussion papers may be ordered through RFF. The price per paper covers production and postage costs and is based on delivery preference: domestic, $6 for book rate and $10 for first class; international, US$8 for surface and US$15 for air mail. Canadian and overseas payments must be in U.S. dollars payable through a U.S. bank.

Please send a written request and a check payable to Resources for the Future to: Discussion Papers, External Affairs, Resources for the Future, 1616 P Street, NW, Washington, DC 20036-1400. Recent discussion papers are accessible electronically at *http://www.rff.org*.

DEVELOPMENT

RFF needs your support

By virtually any standard—research quality and productivity, policy impact, or effectiveness of outreach—1997 has been a good year for RFF. This success has led, in turn, to RFF's best year ever for fundraising. To everyone who helped make that possible, we extend a sincere "thank you."

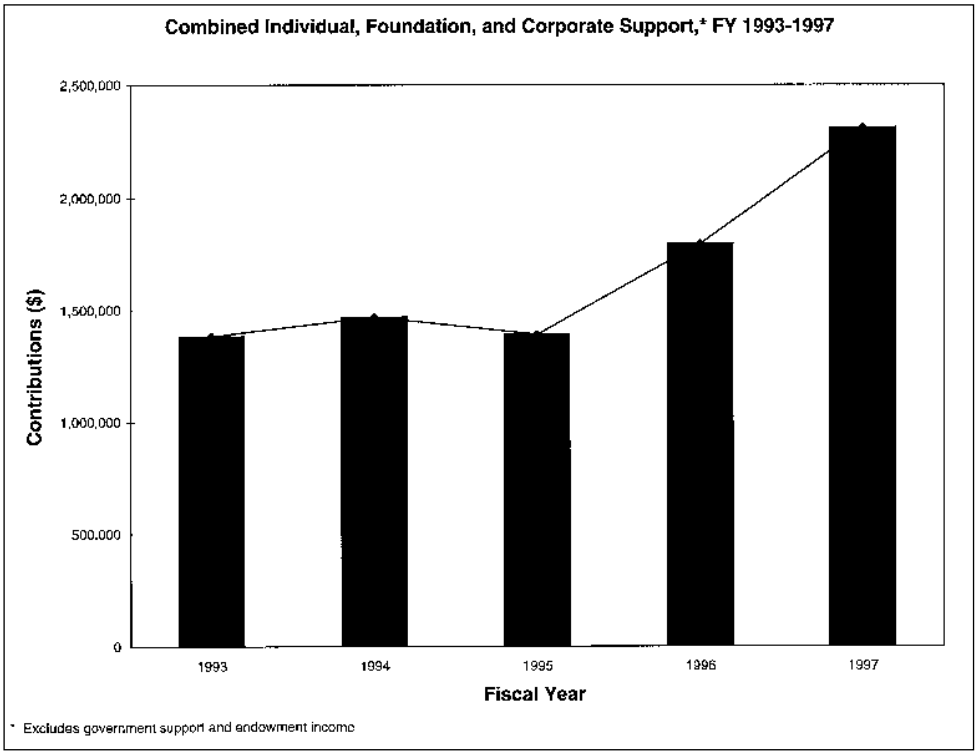
As 1997 gives way to 1998, we invite readers of *Resources* to take this opportunity to make a year-end contribution to RFF. A return envelope is folded into this issue for this purpose. Because RFF is committed to running a lean and effective organization, this appeal is the only general one we will make this year. We value your support and want to assure you that your gift will be used wisely.

RFF's analytical agenda will be quite ambitious in 1998. You can expect the same independent, nonpartisan approach that has characterized RFF's work as we continue to address such vital issues as climate change, electric utility restructuring, forest policy, transportation, and regulatory reform. Also, look for RFF to give even greater attention to the interaction between economic growth and environmental quality in the developing world.

While you may be familiar with RFF's research, you may not realize the emphasis we place on putting it into the hands of people—like you—who we hope will use it. That is why we are committed to providing *Resources* four times each year, free of charge, to all those wanting to keep up to date on our work. An even more timely way to keep tabs on RFF is right at your fingertips. The RFF website, located at *www.rff.org*, is a synthesis of organizational news and events, research in progress, congressional testimony, and job openings. Here you will find, among many other things, our on-line collection of discussion papers, which you can download to your own computer. Dating back to 1992, these papers detail research in progress and are circulated to stimulate thought, discussion, and debate of important environmental and natural resources issues.

In response to the contentious debate surrounding international climate change, RFF created a new Internet site—*Weathervane*—which debuted in mid-July. On the first and third Monday of every month, the new electronic site tracks domestic and global policy initiatives to limit greenhouse gas emissions and brings to you a variety of perspectives on the climate change debate. We encourage you to take a look. Just point your browser to *www.weathervane.rff.org*.

We hope these efforts on your behalf convince you that RFF is worthy of your support. Please take a moment to enclose your tax-deductible contribution in the enclosed envelope. And while you are at it, tell us what you think we are doing well and what we could be doing better. We appreciate your interest in RFF and your support. Thank you and best wishes for a happy and prosperous 1998!



If you would like to receive RFF's newsletter on planned giving options or information about charitable trusts, gift annuities, gifts of appreciated securities, bequests, and other types of planned gifts, please contact RFF Vice President–Finance and Administration Ted Hand at 202–328–5029; hand@rff.org

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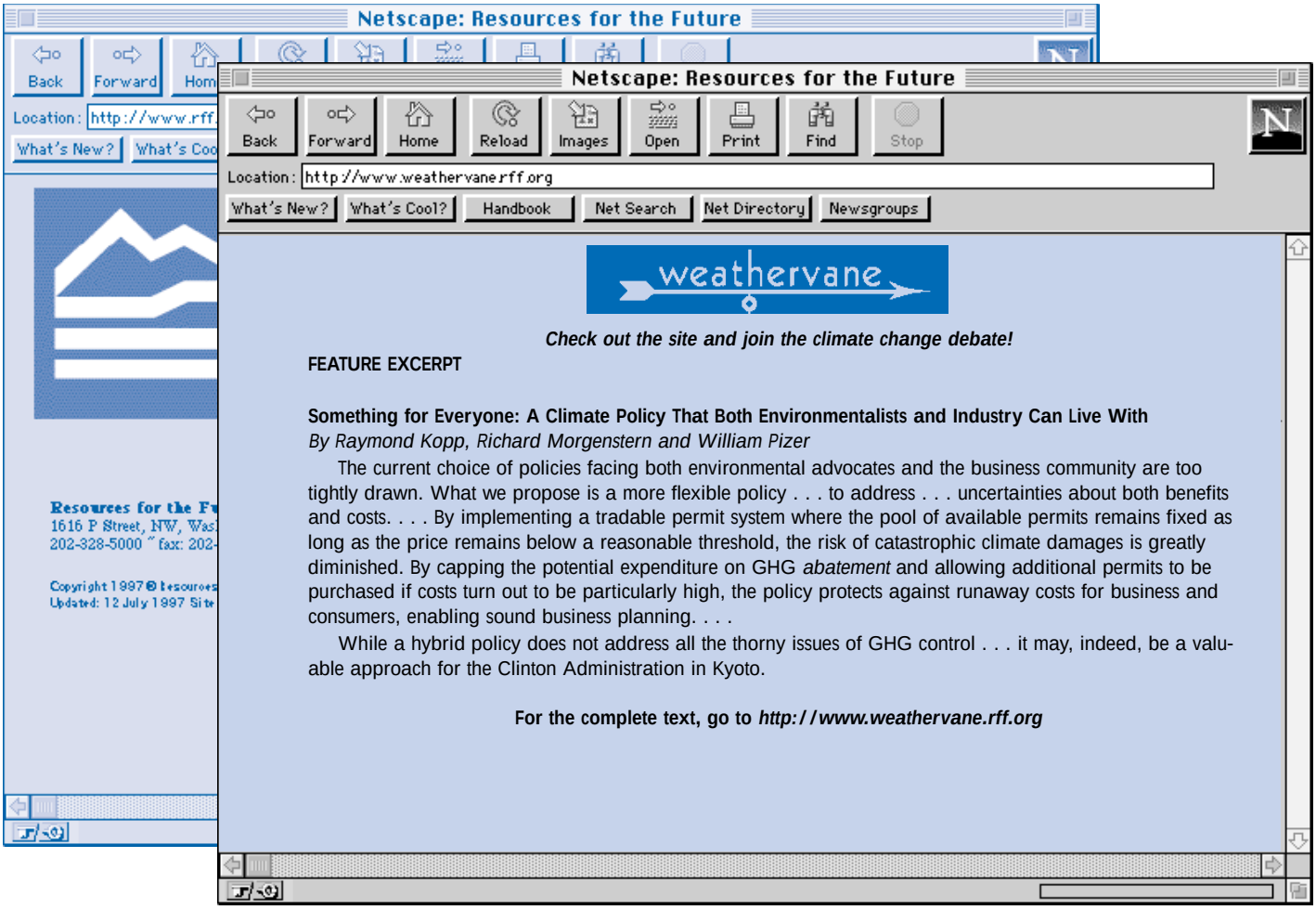
http://www.weathervane.rff.org



See the RFF home page (http://www.rff.org) for discussion papers, issue briefs, seminar information, testimony, and more.

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