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RESOURCES FOR THE FUTURE

RESEARCH THAT MAKES A DIFFERENCE

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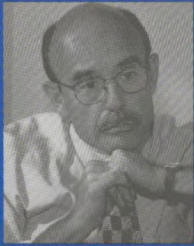
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Paul R. Portney

For more than four decades, Resources for the Future has enjoyed a solid reputation for creative thinking on important problems. Indeed, we are widely—and even formally—credited with having brought into existence the scholarly subdiscipline of environmental and resource economics and applying it to emerging policy issues.

I am gratified whenever individuals and groups come to RFF seeking help with vexing new environmental and resource problems. So it is that in this issue of *Resources* Terry Davies and Nicole Darnall recount their study of the environmental problems of the District of Columbia, conducted this past spring at the request of the Summit Fund. (Similarly, Davies is helping an organization called Project Learning Tree® to develop a high-school curriculum on environmental risk assessment—see page 4).

RFF Senior Fellow Alan Krupnick, coauthor of this issue's feature article on revising the ozone standard, draws from his experience as cochair of the ozone subcommittee of the Federal Clean Air Act Advisory Committee, a group assisting EPA in its work. And when legislation was passed this summer attempting to resolve a forty-year-old problem with food safety standards, people quickly began turning to RFF's Jim Wilson, former president of the Society for Risk Analysis, for expert assessment of its merits. He shares his views with *Resources* readers beginning on page 14.

Even our more speculative and open-ended research can be applied to help solve real-world problems. Many people scarcely saw where we were coming from (or going to) when RFF researchers first began combining economic science with matters of ecology. The kind of impact this sort of pioneering work can deliver over time shows up in the story on page 18 concerning RFF's early analysis of the radio spectrum from an economic perspective. (The article includes reflections from RFF's Molly Macauley, a leading light on another analytical frontier—space economics).

Our commitment to the future is further demonstrated in a number of the shorter news items in this issue of *Resources* that show RFF's work on the people side of problem-solving. Again this past summer, we invited a group of the nation's bright young graduate and undergraduate students to spend time here working alongside RFF's resident analysts and researchers. And two hotly recruited new Ph.D.s are presently settling into our community of scholars. A group of us are on the road, too, teaching a course on environmental economics and policy at Princeton University—yet another instance of RFF's willing response to a call on our institutional resources.

I hope you will enjoy and benefit from reading about all these activities and more in the fall issue of *Resources*.

Paul R. Portney

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GOINGS ON

Paying to move freely on American roads

Want the most efficient solution to urban traffic congestion? Charge drivers a user's fee during peak periods like rush hour, says RFF's Winston Harrington. For years, he explains, economists have been advocating the use of emission fees and congestion tolls to address the air quality and congestion problems caused by automobiles. In theory, such fees promise to encourage a more efficient allocation of scarce resources than other methods, but difficult technical problems and political resistance have forestalled their introduction.

Now many of the technical problems—involving the collection of tolls, primarily—have been solved, but the political difficulties remain. Because public opinion surveys have revealed strong public resistance to congestion and

emission fees, politicians are reluctant to embrace them.

"Most of these surveys have been vague about how the revenues from congestion fees would be used, or—when explicit—may have been offering public goods that the public didn't care for, such as enhanced transit," Harrington says. "Our conjecture is that congestion fees have been unpopular because people have perceived them as tax increases with no discernible benefit."

Harrington and Alan Krupnick, another senior fellow in RFF's Quality of the Environment Division, have been part of a study team funded by the Federal Highway Administration to help local officials in Southern California decide if charging rush-hour tolls is a viable way to solve their serious congestion and air pollution problems. "What we are examining," says Harrington,

"is the idea of returning to consumers a substantial portion of revenues raised by the fees. We want to see if the level of support is sensitive to the amount of revenue returned."

To test their hypothesis, the two researchers are now analyzing the results of the telephone survey they developed to determine which of three congestion pricing scenarios would be most likely to win public acceptance in Southern California. The first involves offering commuters an upfront rebate equal to some designated fraction of what they would pay to use a "pay" highway five days a week during peak periods. The idea is to see what happens to public receptivity to user fees if at least part of fee is put back into private hands rather than all of it going straight into the public coffers. The scenario is based on the assumption that most commuters would try to retain some of their rebate by car-

pooling, working at home, or finding alternative routes to work.

The second scenario involves gradually eliminating Southern California's gas tax and replacing it with a fee for highway use during rush hour. A third is to give drivers the option of using—for a fee—designated lanes for high-speed, congestion-free travel. Whether choosing the lanes or not, drivers would be introduced to the idea of improved highway access that is "pay as you go"—the rarely tried, efficient way to fight traffic. ☘

Climate change: Would the poor feel it worse?

Is a poor household more vulnerable to climate change than one in better financial shape? To explore this question RFF Fellows Kris Wernstedt and David Austin, along with research associate Robert Hersh, are examining how different populations in the Willamette River watershed in the Pacific Northwest might fare if climate change were to disrupt their livelihoods or their access to water. Working under a three-year grant from EPA's Office of Research and Development, the RFF researchers are exploring three main dimensions of vulnerability to the stresses of climate change: exposure, capacity to cope, and resilience. They began work on the project last fall and expect to have some



RFF is studying whether the public will accept rush-hour tolls as a way to solve congestion and air pollution problems.



GOINGS ON

preliminary results to show in mid-1997.

The study, Wernstedt says, injects a new element into the debate about possible climate change. He notes, however, that it is by no means certain that there will be any consequences of a serious social or economic nature. Still, the possibility that disadvantaged groups might shoulder a disproportionate share of whatever consequences might occur is something that politicians and other decisionmakers will have to consider from the standpoint of equity and pragmatism.

To study exposure, the RFF researchers are conducting a series of workshops with regional stakeholders. Using a model of the Willamette River basin, they are simulating a range of scenarios for how river flows might change in the face of climate change.

To understand coping capacity, they are using a geographic information system (GIS) to correlate indicators of that capacity (such as access to public water supply and level of education) with other dimensions of vulnerability and local socioeconomic characteristics.

To investigate resilience, they are developing a regional econometric model to estimate the effects of precipitation and temperature on income and employment in the last several decades. They are also developing a matrix that shows the income flows from each sector of the regional economy to each household income group. ☞

Risk management for teens

Terry Davies, director of RFF's Center for Risk Management, is guiding development of a "state-of-the-art" curriculum to introduce high school students to cost- and risk-benefit analysis when studying environmental issues. The curriculum is being designed for integration with high school science, math, social studies, economics, and environmental science classes.

Working in partnership with Project Learning Tree®, a pioneer in hands-on environmental learning, Davies helped organize and is chairing an advisory committee composed of risk experts and educators that is reviewing the first draft of the curriculum this fall. Once the curriculum is approved, Project Learning Tree® plans to distribute instructional materials to over 7,000 high school teachers. It estimates that, within five years, more than 20,000 teachers will use the curriculum to teach students about risk analysis.

The curriculum is being designed to teach students how to distinguish between those problems that risk assessment can help solve and those it cannot; to identify risks, costs, and benefits associated with environmental issues; to undertake simple risk- and cost-benefit analyses; and to apply these critical thinking skills to real-world consumer choices and policies. The educational materials are being designed to

help students understand risk as a continuum and to become familiar with risk assessment as a tool for helping set priorities; to help students assess tradeoffs and identify benefits (or risks) that are immediate and those that are not; to discuss whether analysis can really take into account such things as quality of life; and to study who is affected by risks, who enjoys benefits, who pays the cost, and who decides. Teaching materials will include ready-to-use lesson plans and suggested class activities; background information to explain the fundamentals of risk analysis; and references to additional resources.

Project Learning Tree® operates under the auspices of the American Forest Foundation and is cosponsored by the Council for Environmental Education. Through a fifty-state network of "train the trainer" workshops, the organization shows educators how to use the materials it develops to introduce scientific concepts and environmental issues to children in prekindergarten through twelfth grade. Since its inception in 1973, more than 400,000 teachers have received training and materials through the program, both in the United States and abroad. ☞

RFF at Princeton

RFF President Paul Portney and a team of RFF economists are teaching a course on environmental economics and policy at Princeton University's Woodrow Wilson School of Public and International Affairs. The course, which is being presented during the fall 1996 semester, was designed in collaboration with Michael Rothschild, dean of the Woodrow Wilson School, to expand the university's curriculum to include economic analysis of environmental issues.

The course consists of eleven lectures. The first five offerings are considered theoretical and the last six, applied. Sessions include an introduction by Portney to the economics of environmental policy, and discussions of the following: welfare theory and environmental policy, presented by Senior Fellow Winston Harrington; cost-benefit assessment of ground-level ozone control, by Senior Fellow Alan Krupnick; regulatory instruments, theory and applications, by Fellow Dallas Burtraw; economic valuation using contingent evaluation, by Senior Fellow Raymond Kopp; pollution taxes as instruments of environmental policy, by Fellow Ian Parry; climate change policy, by Senior Fellow Michael Toman; economic instruments and waste management policy, by Senior Fellow Molly Macauley; valuing biodiversity, by Fellow David Simpson; government decision-making on biodiversity and



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conservation, by Fellow Amy Ando; and a final wrapup session led by Portney and Kopp. ☞

RFF cosponsors conference on climate change, risk, fairness

RFF cosponsored "Climate Change: Cataclysmic Risk and Fairness" with the International Institute for Applied Systems Analysis in Austria this summer. The conference attracted some forty experts from around the world, mostly in disciplines other than economics, to explore two issues: the potential for large-scale adverse effects from climate change in the future, and how policymakers might respond with fairness to such risks across and within generations.

RFF Senior Fellow Michael A. Toman enlivened debate at the conference with a paper on the usefulness of economic analysis in addressing the two issues. He set off vigorous discussion, as well as some skepticism, when he argued that the conventional tools of economic cost-benefit and cost-effectiveness analyses have important roles to play in assessing climate-change risks and policies even though, as he acknowledged, the risks involved require attention to distributional issues and assessments of ecosystem health as well.

Among other topics discussed were the notions that individual values are formed by the social frameworks in which

people live, and that attitudes about climate-change risks vary depending on how questions about risk are framed and whether the proposed response is seen as fair. Moreover, participants noted, attitudes toward climate change may alter as additional information becomes available. Because of the presence of factors like these, most agreed, analysts need to use caution when interpreting assessments of climate-change risks and response costs. As to assessing risk across generations, conference participants concluded that such a complex expression of social values could not be addressed simply by adjusting the rate at which future benefits and costs are discounted.

Toman's paper, entitled "Climate Change, Cataclysmic Risk, and Sustainable Development: An Economic Perspective," will be available through RFF's Discussion Paper series later this year. ☞

Discounting down the ages

Recognizing that environmental policymakers are increasingly forced to map solutions whose costs and benefits are spread out over hundreds—perhaps thousands—of years, RFF and the Energy Modeling Forum (EMF), a research program supported by Stanford University, are cosponsoring a workshop in Washington, D.C. in November to address "Discounting in Intergenerational Decisionmaking."

In conventional discounting (see box for explanation), streams of future benefits and costs are converted to present values through the application of a discount rate. In the eyes of some, this approach is problematical at best and perhaps altogether inappropriate for problems whose resolutions will play out over many generations. These include environmental issues involving stratospheric ozone depletion, global climate change, and the disposal of low- and high-level radioactive wastes.

Invited to participate in the workshop were those economists and other scholars whose writing and thinking have most influenced the way policy analysts everywhere approach discounting. They include Kenneth Arrow, David Bradford, William Cline, Maureen Cropper, Partha Dasgupta, Robert Lind, Karl-Göran Mäler, Alan Manne, William Nordhaus, Thomas Schelling, Robert Solow, Joseph Stiglitz, Martin Weitzman, and John Weyant.

Rather than commission technical papers, EMF and RFF asked participants to write brief, nontechnical essays describing how they thought benefits and costs in the distant future should be analyzed. Should such temporally "far-flung" effects be discounted just like those effects that will occur, say, ten or twenty years from now? Alternatively, should such effects be discounted at a lower rate, or perhaps not at all? If they should be discount-

ed, how did the workshop participants think the discount rate(s) should be selected?

RFF will publish the collected essays in book form. The volume should interest not only economists and policy analysts but also policymakers and others who care how society approaches problems with important intergenerational effects. ☞

About discounting

Economists use discounting to frame a decision on whether to spend current (and possibly future) money on a project yielding benefits and costs into the future. The point of the exercise is to compare present with future costs and benefits on an equal basis.

Economists discount future costs and benefits by an appropriate rate to compare them with current figures. As long as the discount rate is positive, one dollar tomorrow is worth less than one dollar today. Take, for example, a project that twelve years from today will yield a return of \$200,000. At an annual discount rate of 6 percent (reflecting, for instance, the cost of borrowing money today versus next year), that \$200,000 is worth \$100,000 in present-day terms. What an economist will conclude, then, is that no more than \$100,000 at today's value should be used on such a project.



Revising the Ozone Standard

by Alan J. Krupnick and J. W. Anderson

The Environmental Protection Agency may soon tighten the standard for ozone in the air we breathe. Can lower levels actually be achieved? What might compliance mean for everyday living?

As the federal government struggles to revise its standard for ground-level ozone (the “bad” ozone, as opposed to stratospheric ozone that protects people from harmful radiation from the sun), it is on a track that will lead to more frustration, more litigation, and much higher costs. Part of the trouble lies with a law badly designed for the job ahead. Part of it lies with a public that wants complete protection but is reluctant to acknowledge that its habits, particularly on the highway, contribute to air pollution.

The Environmental Protection Agency must soon decide whether to tighten the standard. Current law requires it to be set with a margin of safety below the threshold at which people begin to suffer adverse health effects. The evidence clearly shows that, at the present standard, some people experience respiratory symptoms when exercising outdoors; there is less clarity about more severe and irreversible effects. Moreover, the evidence also indicates that there is no identifiable threshold below which some people may not suffer some symptoms.

Barriers to Ozone Reduction

Actually meeting a tighter ozone standard may well be impossible for some—and perhaps many—cities if a recent American Petroleum Institute study of ozone reduction costs and associated ozone improvements in the Lake Michigan area is representative. Ozone comes from many sources, and the wind can carry it from one city to another, or from one state to another. Beyond such physical limitations lies a political reality that clean air policy has so far largely avoided. Most of the gains to date have been achieved by imposing very

effective—but costly—regulations on big companies—utilities, oil refiners, auto manufacturers, steel producers, and the rest. Achieving further large reductions in emissions there would be both difficult and even more expensive. More promising targets for reductions now involve people’s travel, their recreation, and their lawns. The City of Baltimore has calculated that motorboats and lawnmowers alone currently contribute more ozone to its air than all of its industry put together—a startling example of the distance that industrial controls have gone. Automobiles produce a rising proportion of ozone. But public support for restrictions on what people see as their personal activities has never been great, and environmental policymakers have never done much to educate people about their individual responsibilities.

While ozone is perhaps a lesser threat to public health than particulate concentrations, both of which are controlled under the Clean Air Act, it has acquired vast symbolic importance. Over the years, most of the large metropolitan areas have continued to fall short of the federal ozone standard. An increasingly exasperated Congress, distrusting state and federal administrators, has enacted a hugely complex and detailed regulatory system to enforce it. This mechanism takes no account of a question that ought to be at the center of environmental policy: whether the next dollar spent on this purpose will produce greater benefits than if it were used elsewhere in other ways. To the contrary, the Clean Air Act in its present form seems designed to bypass entirely that kind of question.

The complexity of ozone policy is further increased by its chemistry and the fact that few pollutants, least

of all this one, can be managed in isolation from others. The oxides of nitrogen, one of the precursors of ozone, are themselves major pollutants controlled under the Clean Air Act. Worse, recent research indicates that the precursors of ozone also may give rise to fine particles that, when inhaled, lodge in the lungs. Great controversy surrounds the health effects of ozone and whether, for most people, it threatens more than temporary effects. But there is little doubt at all that fine particles are a serious menace to human health, capable of causing illness and death.

Policy Options

If the ozone standard is now tightened, the country—meaning Congress, state governments, and the EPA—must decide how to achieve it. Historically, the emphasis has been on command-and-control regulation of emissions. In the face of huge costs from this approach, attention is turning increasingly to “cap and trade” programs among industrial sources (like that for SO₂ emissions from utilities implemented under Title IV of the Clean Air Act) and various incentive measures for reducing mobile source emissions. These include pollution and congestion fee programs under consideration by the REACH Task Force (Reducing Emissions and Congestion on Highways) and programs targeting inspection and maintenance efforts to high emitters. Two subcommittees of the Clean Air Act Advisory Committee—the Subcommittee on Ozone, Particulate Matter, and Regional Haze Implementation Programs; and the Mobile Sources Technical Advisory Subcommittee—are looking into innovative approaches for meeting the new standards cost-effectively. Their effort is timely because, with the promulgation of new standards, the highly directive and inflexible requirements of the 1990 Clean Air Act may no longer apply.

Matters of Measurement

Attainment of the ozone standard is related to the way ozone levels are measured. Since ozone is created from other gases by bright sunshine and high temperatures, one concern is to find a method that relates it to actual health protection and welfare, rather than merely reflecting the vagaries of the weather. The present standard is 120 parts per billion of ozone, measured over one hour. Every metropolitan area has a number of monitors scattered over the city and its suburbs. An

exceedance of the standard at any monitor counts as an exceedance for the whole metropolitan area. If that area scores more than three exceedances over three years, it is out of attainment and has to come up with plans to reduce its ozone. Seventy-one metropolitan areas, including nearly all of the most heavily populated, are currently out of attainment.

The EPA seems to be moving toward replacing the one-hour standard with an eight-hour average. Clinical studies seem to show health effects at ozone levels below the present standard if exposure is day-long rather than only during a brief spike in the afternoon. The next question is how many exceedances to allow. One issue is whether to create a new “too close to call” category for areas that registered between, say, two and five exceedances a year. Cities in that category would not fall under the expensive requirements of nonattainment status, but state authorities and EPA would watch them closely for movement toward or away from attainment.

Another possibility is to vary the number of allowed exceedances in proportion to the difficulty of achieving the standard. In some cities, the standard

Ozone Nonattainment Areas in the Extreme and Severe Ranges

Extreme

Los Angeles South Coast Air Basin, CA

Severe

Baltimore, MD

Chicago-Gary-Lake County, IL-IN

Houston-Galveston, TX

Milwaukee-Racine, WI

New York-N. New Jersey-Long Island, NY-NJ-CT

Philadelphia-Wilmington-Trenton, PA-DE-MD-NJ

Sacramento Metro, CA

Southeast Desert Modified AOMA, CA

Ventura Co., CA

The Clean Air Act Amendments of 1990 define a “nonattainment area” as a locality where air pollution levels persistently exceed National Air Ambient Quality Standards. Designating an area as “nonattainment” is a formal rulemaking process. EPA normally takes this action only after an area has exceeded the standard four times in three years. The legal status of a region may differ from its actual status while EPA reviews the region’s data and implementation plans. Effective date of this modified list: July 1996. For the latest complete list, see <http://www.epa.gov/oar/oaqps/greenbk/onc.html>

cannot even be approached without a major impact on the economy. In other places, the standard can be met relatively easily. Under this rule some cities' inhabitants would be exposed to slightly more ozone than others', just as in some cities—like mile-high Denver, for example—the inhabitants are exposed to slightly more ultraviolet radiation than in others.

Ozone Nonattainment Areas in the Serious and Moderate Ranges

Serious

Atlanta, GA
 Baton Rouge, LA
 Boston-Lawrence-Worcester, (E. MA), MA-NH
 El Paso, TX
 Greater Connecticut
 Portsmouth-Dover-Rochester, NH
 Providence (all RI), RI
 San Diego, CA
 San Joaquin Valley, CA
 Springfield (W. MA), MA
 Washington, DC-MD-VA

Moderate

Atlantic City, NJ
 Beaumont-Port Arthur, TX
 Cincinnati-Hamilton, OH-KY
 Dallas-Fort Worth, TX
 Kewaunee Co., WI
 Knox and Lincoln Cos., ME
 Lewiston-Auburn, ME
 Louisville, KY-IN
 Manitowoc Co., WI
 Monterey Bay, CA
 Muskegon, MI
 Nashville, TN
 Phoenix, AZ
 Pittsburgh-Beaver Valley, PA
 Portland, ME
 Poughkeepsie, NY
 Reading, PA
 Richmond, VA
 Salt Lake City, UT
 Santa Barbara-Santa Maria-Lompoc, CA
 Sheboygan, WI
 St. Louis, MO-IL

Local Conditions and Economic Competition

There are two crucial points here. The first is that the economic costs of regulation are an inescapable reality, and it is bad policy to pretend, as the present Clean Air Act does, that these costs can be ignored. What's more, additional health risks will be tiny, as even a small variation in exceedances can mean the difference between attainment and nonattainment in many cities. The second is that local conditions vary greatly in this large country, and the balance that is, on average, right for the country as a whole may be very wrong for cities with unusual climate conditions. A single national rule leaves some cities incapable of meeting the standard despite enormous regulatory efforts, with costs far beyond any corresponding benefits. Other cities would be able to go beyond the standard to provide still cleaner air with little additional cost, and the system ought to encourage them to do so.

For many cities, meeting any ozone standard will require more than reducing their own emissions. Ozone blows from one jurisdiction to another. An organization called OTAG—the Ozone Transport Assessment Group—has undertaken a huge project to model the chemistry and meteorology of ozone throughout all of the United States east of Colorado and come up with policies—such as a cap and trade program—to allocate emission reduction activities cost-effectively. Formally, OTAG is a partnership of the EPA, the Environmental Council of the States, the governments of thirty-seven states and the District of Columbia, and as many industries and environmental organizations as want to join its work. It is scheduled to present its findings and recommendations early in 1997.

OTAG represents, in political terms, a highly interesting test of the states' ability to resolve disputes among themselves in an area rich in implications for the economic competition among them. Both Congress and the EPA are understandably anxious to avoid becoming the referees in these conflicts. In a period with a strong current running in favor of federal decentralization and returning authority to the states, the OTAG experiment may have an importance that reaches well beyond ozone policy. But it is clear that ozone enforcement will become much more difficult nationwide if OTAG does not succeed. In any event the outcome of OTAG's work will not be known

COURTESY: SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT



Traffic in Los Angeles. A tighter federal ozone standard may be impossible to meet any time soon in an area that exceeds national air quality standards about 100 days a year. LA stands alone at the top of the nonattainment list with an "extreme" rating. (Rated "serious," Washington, DC exceeds the standards fewer than 10 days a year.)

until well after EPA's deadline, in late November, for its decision on the new ozone standard.

Voluntary Participation

Because ozone is entirely contingent on the weather, unlike most pollutants it offers one means of compliance that national policy has largely ignored and even discouraged. Public campaigns to limit ozone-producing activities on the hottest afternoons combat pollution directly with little cost and economic disruption. A number of cities have, at least on paper, programs like the Washington-Baltimore area's Endzone that signals alerts on the days forecast to have ozone-producing weather. On those days, the public is asked to hold down the use of cars, fuel them after dusk, defer using gasoline-powered garden equipment, postpone painting with oil-based paints, and not use lighter fluid to start the charcoal grill. The incentive for these voluntary programs is strong, particularly in areas that are close to violating the ozone standard.

But the present federal rules give no encouragement to voluntary programs, no credit for mandatory versions of them to reduce emissions, and no encour-

agement for using them to meet standards. That's a mistake. Not only are these programs inexpensive, but they provide a valuable opportunity to draw the public into the campaign against air pollution. It's a chance to educate people in the realities of ozone chemistry, and remind them that their own behavior is a major variable in the equation. Voluntary programs, in particular, are promising because they run into none of the political backlash that, for example, has met the increased requirements for automobile inspection.

The Clean Air Act has brought great benefits to this country over many years. It has drastically reduced the presence of many harmful pollutants. But ozone has proved more stubborn, with progress modest and uneven. It's time to reconsider fundamentally how standards are set and how they are implemented. ☞

Alan J. Krupnick is a senior fellow in RFF's Quality of the Environment Division. He cochairs the Ozone Federal Advisory Committee Act Subcommittee for Ozone, Particulate Matter, and Regional Haze Implementation Programs. J. W. Anderson is a former member of the *Washington Post's* editorial page staff and RFF's current Journalist in Residence.



Getting the City on the Hill to Shine

D.C.'s Environmental Priorities

by Terry Davies and Nicole Darnall

Through interviews with residents and stakeholders, RFF has ranked the District of Columbia's leading environmental problems and made some recommendations on how to solve them. While the city's institutional difficulties are unique, recommendations emerging from the study may help not only D.C. but also other municipalities to become better places to live and work.

At a time when the nation's capital is in dire straits, the city's environmental problems might at first seem beside the point. Yet when the Summit Fund, a private foundation, asked the Center for Risk Management to catalogue and rank the District of Columbia's environmental problems, RFF quickly contributed half the funding for the study, so intertwined do we see the city's environmental health with its other crises in finance, management, education, and public safety.

The city's aging and decrepit aqueduct system and its sometimes significant air pollution are but two indicators of the District's deteriorating environmental health. Some of the stakeholders we consulted for this study believe the city's drinking water system is susceptible to an outbreak of cryptosporidium similar to the one in Milwaukee, Wisconsin in 1993 that killed 100 people and made 400,000 others sick. As for air quality, D.C.'s ground-level ozone is a problem, even though the city is home to little industry.

In addition to the environmental problems that affect public health are those that relate to the city's quality of life. The ecological health of the District's creeks and rivers is threatened, and the accumulation

of trash is a problem. While some may argue that these types of issues are not as pressing as some others that affect public health, they are extremely important in terms of attracting and keeping both businesses and residents in the District, which in turn directly affects the District's tax base and financial health.

As the Summit Fund requested, we queried the public for their perceptions of environmental problems through interviews with residents and stakeholders. The stakeholders included environmental experts familiar with the District, representatives of federal and local government, the White House, and the U.S. Environmental Protection Agency. We then developed a very rough ranking of the city's environmental problems.

In no way "scientific," our ranking is intended to provoke some thought and raise some relevant questions. In addition, we made a few recommendations aimed at improving the environmental policy process in the District. These recommendations may also be helpful to other cities because, although the District's institutional problems are uniquely difficult, some of the recommendations could be usefully adopted in other localities.

Identifying the Problems

In conducting our assessment, we divided the District's environmental problems into eight categories: air pollution, drinking water quality, water pollution in the Anacostia River, water pollution in the Potomac River, lead poisoning, hazardous waste, trash, and parks. Our task of explaining the District's environmental problems was a complex one, since these categories blur. For example, lead exposure comes from drinking water and air pollution, as well as from lead paint.

In subsequently ranking D.C.'s environmental priorities, we characterized the problems we analyzed in terms of four categories: severity of health effects, number of people affected, ecological and welfare effects, and public perception (see table on this page). Because we used only four categories, the level of priority assigned to each category reflects different kinds of considerations. For example, ecological and welfare effects are rated high for unsafe drinking water because of the cost to District residents of buying bottled water, the nuisance of having to boil water or take other precautions, and the general anxiety connected with the problem. Ecological and welfare effects are rated high for parks because of their importance for wildlife and for recreation.

Using just four categories also means that a number of criteria, especially those related to social values, are not separated out. Our hope is that most of these values are captured in the public ranking. We also limited the number of problem categories. When asked to identify the universe of environmental problems in the District, stakeholders named over thirty. We think, however, that the eight named here capture most of the concerns of D.C. residents.

Finally, our overall ranking implicitly weights each of the four categories of characteristics equally. In other words, we counted the importance of public opinion the same as ecological and welfare effects. We did give health effects, however, twice the weight of ecological effects by counting both the severity of the health effect and the number of people affected as two separate categories. Others are free to assign different weights to our categories, since there is no "right" way to determine them. We hope our report provides enough information to allow those who would use a different weighting scheme to draw their own conclusions.

Characteristics of D.C. Environmental Problems

Problem	Severity of Health Effects	# People Affected	Ecological and Welfare Effects	Public Ranking	Overall Ranking
1. Drinking Water	H	H	H	H	H
2. Air Pollution	H	H	L	H	H
3. Water-Anacostia	M	H	H	M	M+
4. Lead	H	H	L	M	M+
5. Trash	L	H	M	M	M
6. Water-Potomac	L	M	M	M	M
7. Hazardous Waste	L	M	L	M	M-
8. Parks	L	L	H	L	L+

Level of priority: H = High; M = Medium; L = Low

Priorities: How High and Why

Based on our analysis, District drinking water and air pollution clearly rank at the top of the priority list. In the middle range are lead poisoning and the surface water pollution of the Anacostia River, which runs through the southeastern part of the city and drains into the Potomac River. In the third category of importance are trash, the high algae concentrations in the Potomac, hazardous waste, and the declining condition of the city's parks because of such problems as deforestation and loss of wildlife.

Air pollution and impure drinking water each present both a health threat and a nuisance to all residents of the District. Periodic exceedance of the national air quality standards for ozone and carbon monoxide mean the District is classified by the EPA as a nonattainment area for both pollutants, although ground-level ozone is the area's primary air pollution problem. However, the District is exceeding the national standards less often than it used to and, in a typical recent year, exceeded them by a small margin only three or four times. The District's drinking water, whose source is the Potomac River, probably poses the more serious threat in terms of health. Since 1993, the city has issued several "boil water alerts" because officials detected unsafe levels of coliform bacteria in the drinking water system. This year, the city failed EPA inspections three months in a row when unhealthy levels of bacteria continued to be detected in the public drinking water supply. The District's drinking water also suffers from turbidity, or cloudiness, as a result of ineffective water filtration.

Yet it is probably easier for the city to ensure clean drinking water than clean air. Finding ways to battle the pollution produced by the many vehicles driven in the metropolitan area is harder than modernizing the city's drinking water system. Given political commitment and managerial competence, drinking water should not be a concern a decade from now; while air quality has improved significantly in the past decade, it is likely to continue to be a problem.

Surface water pollution in the Anacostia River and lead poisoning in homes are both serious health problems, but we deem them somewhat lesser concerns because they affect only a portion of the District's population. Lead is probably the more serious human health problem and, because it does not decay or biodegrade, will remain in soil for many years. Lead is also found in the District's drinking water. In 1993, the District announced that 25 percent of the water taps it tested contained lead amounts greater than the EPA standard. To reduce the public's exposure to lead, the city began in 1987 to replace some 28,000 lead-containing service lines that connect the city's water mains with private property. As of 1992, the Natural Resources Defense Council reports, 882 lines had been replaced with nonlead-containing materials.

Pollution of the Anacostia River poses a threat in terms of aesthetics, ecology, and health (because of the consumption of contaminated fish). As a result of the city's topography, rain water flows southward and thus the Anacostia River is the recipient of considerable storm water runoff. It is also a large recipient of the overflow from the District's combined sewers. After rainfall, the Anacostia regularly exceeds public health standards for coliform bacteria, typically associated with raw sewage. Meanwhile, EPA is seeking to include the entire river on its Superfund cleanup list because Washington's Naval Shipyard site abuts the river and contributes significantly to toxic contamination of the Anacostia.

The lower ranking we assigned to trash, the condition of the Potomac, hazardous waste, and the decline in the quality of city parks should not be interpreted to mean that these are not important. It simply means that, by our criteria, they are less critical than some other problems.

Our list did not include some broad categories like land use or transportation, in part because the public usually does not think of environmental problems in

broad terms. In addition, broader categories often combine many issues, such as air and water quality, and we tried to avoid overlap. However, underlying causes and the interrelatedness of problems are important when considering solutions.

Recommendations

Because our report had to be ready for the Summit Fund's board meeting in early September, we completed it in four months and within our relatively small budget. We doubt that additional time or effort would have made any significant difference in our ranking of the District's environmental problems. The same cannot be said with regard to policy recommendations, and the ones we make are largely byproducts of our primary effort to analyze priorities.

Financial constraints on the District are severe. The District's population has declined from 638,000 in 1980 to an estimated 559,000 in 1995 (Federal Bureau of the Census, 1996), and most of those who moved out were middle-income taxpayers. Combined with other financial troubles, this decrease in the tax base makes it difficult to meet the District's environmental needs. Yet lack of money is not the whole story. As we conducted our study, we repeatedly came across instances where the city had, or could have had, the money to address a problem, but lacked the capability either to obtain or spend it. Until the city's institutional and managerial problems are solved, money problems will remain secondary.

Because of our concern about the District's managerial and institutional problems, our recommendations focus on process. While these recommendations will not by themselves solve the District's environmental problems, they may make it easier to identify and implement solutions. We hope that they also will make the District a better place in which to live and work.

A D.C. Environmental Agency. The District of Columbia is unique in that its government functions simultaneously as city, county, and state. In addition to providing traditional municipal services such as mass transit, police protection, and education, the District must develop its own environmental protection programs without state support or expertise.

When examining the city's environmental problems, one of the first questions we asked is "where is the District's environmental agency?" Unlike most

cities and all fifty states, D.C. doesn't have one—not even one tucked under the larger umbrella of health. Most environmental functions are carried out by the city's Department of Consumer and Regulatory Affairs. Some, however, are carried out by the Department of Public Works as well as other city agencies. Such a scattered approach is counterproductive. The District's environmental problems are serious enough to warrant a distinct agency that could provide leadership and be held accountable for dealing with D.C.'s numerous environmental challenges.

Grant for Ranking Priorities. We think the District should apply for one of the grants that EPA provides to states and occasionally to localities to fund consideration of their environmental priorities. Such a grant would serve as a catalyst to bring together the political, educational, voluntary, and philanthropic institutions of the city to agree on the most important environmental problems and then to set to work solving them. The District could use this kind of grant to marshal political consensus behind a set of priorities so that action is taken to address the problems identified.

Institutional Cooperation. As an example of how an EPA grant could help, our study notes that there are many institutions in D.C. that could play important roles in solving environmental problems, but that generally they do not cooperate or even communicate with each other. While the Summit Fund supports efforts to bring the environmental groups together informally, this effort needs to be strengthened in ways that an EPA grant might make possible. Other groups, especially the District's educational institutions, need to be involved, and the whole concept of a cooperative effort needs to be strengthened and given focus.

Cooperation is necessary in part because the city lacks a formal governmental institution that is accountable for dealing with environmental problems. Cooperation is also desirable because different segments of the population have very different views about environmental issues (and indeed everything else). Working to deal with environmental problems can help to unify communities and could lay the groundwork for cooperation on other issues.

A D.C. Environmental Report. When tackling environmental problems, it is always helpful to have factual information about the severity of the problems and about whether the problems are getting better or worse. EPA will soon issue a report, prepared by the

Assessing Environmental Risk Elsewhere

While many of the problems that the District of Columbia faces are unique, RFF's recent assessment and ranking of its environmental problems is not. The Environmental Protection Agency has assisted in similar assessments through its sponsorship of Comparative Risk Projects.

Like RFF's assessment of the District of Columbia, EPA's Comparative Risk Projects bring together diverse stakeholders to pinpoint and prioritize the risks to human and ecological health and to the quality of life in the areas where they live. Part of the purpose is to promote consensus on an environmental agenda and to encourage public input as environmental priorities are set. As of June 1996, EPA had completed—or was in the process of assisting or planning—a total of forty-eight projects in a range of states, tribes, territories, and localities throughout the country.

For more information, contact Debora Martin, Director, Regional and State Planning Division, EPA; 202-260-2699; Martin.Debora@epamail.epa.gov

consulting company Versar Inc., that contains baseline information on the District's problems. It would be relatively easy to update the report annually or biannually. Such a report would facilitate the priority-setting effort and foster institutional cooperation.

Environmental Education. The fact that 12 percent of those questioned in our survey could not name a single environmental problem suggests that environmental education might also need strengthening. We do not want to further burden the overtaxed D.C. public school system, but some private initiatives could be very useful. Educating both adults and children helps to convey the significance of environmental problems and encourages development of a realistic perspective on the relative importance of one problem vis-à-vis another. ☺

Terry Davies directs RFF's Center for Risk Management, where Nicole Darnall is a research assistant. To order a copy of their report, "Environmental Priorities for the District of Columbia: A Report to the Summit Fund," see page 22 and follow the directions for ordering discussion papers.



Resolving the "Delaney Paradox"

Congress Resets the Table for Pesticides on Food

by James D. Wilson

New legislation should enable the federal government to ensure greater food safety while assuring the availability of favorite fruit and vegetables. The cost? Higher prices.

Just before escaping Washington last August, Congress suddenly enacted the "Food Quality Protection Act of 1996" (FQPA). In doing so, Congress partially resolved a forty-year-old regulatory problem—the "Delaney Clause" and its paradox. The paradox arose from food safety law, which had treated carcinogenic pesticide residues on raw and processed foods differently (see "Food Safety Laws at a Glance," page 15), and from EPA's unsuccessful attempt to erase the difference (see "Making the World Safe for Strawberries," pages 16 and 17).

Policy Changes and Some Consequences

The 1996 legislation includes some interesting policy features. First FQPA recognizes that, unlike such food additives as coloring, flavor enhancers, and preservatives, pesticide residues are not intentionally added to achieve some useful purpose in processed food. Rather, such residues are like "indirect additives" and "contaminants." They appear in food as an inescapable consequence of their use—adjacent, as it were, to food. Under food law, contaminants can be tolerated if requiring their removal would harm the "quality and abundance of the food supply"; pesticide residues certainly meet this test. The new legislation defines

conditions under which the presence of these particular "contaminants" may be approved.

Second, the new statute replaces the Delaney Clause's scientifically obsolete distinction between "carcinogen" and "noncarcinogen" with a distinction between "threshold" and "nonthreshold" toxicants. In the process, Congress has reopened a science policy debate that long ago was abandoned as unprofitable. That debate concerns the meaning of "threshold": does it mark the boundary between "some risk" and "zero risk," or the transition between "discernable" and "insignificant" risk? If the risk involved in exposure to, say, a pesticide residue is too small to measure, biologists and other experimentalists consider the risk to be zero for all practical purposes. Mathematicians, however, beg to differ, asserting that there is an important difference between a substance's immeasurability and its absence. From their point of view, the absence of risk equals "absolute zero," that is, the total absence of the toxic substance. Such precision leads them to a much more stringent interpretation of what level of risk is then acceptable.

For purposes of standard setting, the Environmental Protection Agency will now have to decide which interpretation of "threshold" should

prevail. Over the past two decades, most government policy concerning exposure to substances labeled "carcinogenic" has been based on the experimentalists' theory that, if exposure to a carcinogenic substance is very small, the risk is negligible, if not truly zero. EPA's assertion that this theory was consistent with the Delaney Clause was struck down by the courts; it will be interesting to see what happens to the theory now. Meanwhile, the change in law creates an impetus for scientists to develop new lines of evidence that address the threshold question; they will very likely persuade their fellows and EPA that experimental criteria to determine these thresholds can be attained.

The 1996 FQPA also includes a concept that is new in food safety legislation. Pesticides for which it has not been possible to show the point or "threshold" at which they begin to have adverse health effects may be permitted on food at slightly higher levels than usual, if their use confers certain limited benefits (beyond those provided by all pesticides). Such benefits could include an overall reduction in risk to human health (as, for instance, might occur if a fungicide reduced occurrence of a dangerous fungus such as the rust that produces ergot). Another benefit might be production value to growers.

Yet to take advantage of this provision and obtain approval to leave a pesticide residue at a concentration not normally accepted, the producer must meet rather stringent requirements. The "lifetime" risk posed by the pesticide can be no more than ten times the risk level considered "safe." Further, in any one year the risk may be only twice what is considered safe. Typically, the data used to estimate pesticide intakes are not precise enough to allow such fine distinctions, so any pesticide producer seeking to make use of this new provision will have to invest in special studies to make calculations that scientists have been used to regarding as meaningless.

Pesticide manufacturers can choose to invest in research to show that their products act by a "threshold" process. That is, they can attempt to show that the points at which the ill effects of their products occur can be pinpointed at a certain level of intake. Alternatively, they can invest in research to greatly refine the estimated amount of pesticide a consumer might take in through their products.

If they opt for the first type of research and succeed, manufacturers stand to receive approval from

Food Safety Laws at a Glance

Food Quality Protection Act of 1996 (FPQA)

- The acceptability of noncarcinogenic pesticide residues on food were and are judged by the food additive standard, "reasonable certainty of no harm when used as intended." Under the new law, this standard now applies to all pesticide residues, whether carcinogenic or not.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

- Regulates pesticides
- Before passage of the 1996 act FIFRA also governed pesticide residues on raw foods, since they were not considered food additives. Such residues were judged by the FIFRA standard that is intended to maintain "an adequate, wholesome, and balanced food supply."

Food, Drug, and Cosmetic Act (FDCA)

- Regulates foreign substances—"adulterants"—in foods
- Provides means to exempt some substances, including food additives and pesticide residues, from regulation as adulterants
 - Processed food.* Before passage of FPQA pesticide residues on processed foods were treated as "direct food additives" subject to the Delaney Clause ban on carcinogens.
 - Raw food.* Before passage of FPQA pesticide residues at safe levels on raw foods were exempt from further regulation under FDCA. If a "tolerance" existed for a residue on raw produce, no separate tolerance was needed on derived processed foods unless the residue concentrated during processing.

Tolerances

- FIFRA and FDCA are enforced by means of "tolerances"—acceptable concentrations of additives or residues measurable in foods. In general, foods containing permitted substances at levels less than or equal to the tolerance are legal; those found at levels greater than the tolerance are "adulterated" and subject to recall, seizure, and destruction.

EPA for a pesticide concentration up to forty times above what they would receive for a product whose ill effects cannot be pinpointed above or below a certain "threshold." If they opt instead for the second type they can expect to gain no more than a twofold increase in their products' acceptable concentration. Manufacturers will almost always choose the first option. Thus it seems likely that this benefits-based "escape clause" in the law will seldom, if ever, be used.

New Protections for Infants?

Another new feature of the FQPA may have more

impact. The statute requires that an additional tenfold safety factor be added to provide more certainty that infants will be protected, absent information demonstrating it is not necessary. This provision derives from speculation in a National Research Council report, "Pesticides in the Diets of Infants and Children," that the very young may sometimes be exceptionally sensitive to pesticides. Its incorporation into the 1996 law is reported to have been a concession in exchange for the willingness of some members of Congress to support the exemption of pesticides from the Delaney Clause. Yet the scientific foundation for this requirement is weak. Testimony and evidence assembled by an EPA-sponsored study group (see "Similarities and Differences Between Children and Adults," ILSI Press, 1992) suggest that few substances will be sufficiently more dangerous to infants than to other segments of the population to justify any deviation from standard practice. Furthermore, even before FQPA's passage EPA had the authority to require the testing needed to ensure children's safety, and had required it. Thus the added safety provision would appear to be a symbolic victory rather than a real change.

Depending on how EPA interprets and implements this provision, however, we could find a truly paradoxical result: pesticides once regarded (by some) as unreasonably dangerous because they were

associated with tumors in animal tests may now be accepted as quite safe. And, conversely, noncarcinogenic pesticides formerly regarded as quite safe may now be considered unreasonably dangerous because of the adverse effects they may have on the very young.

Winners and Losers

The biggest winner under the new law is EPA. It now has an unambiguous and unified statute to administer. A heavy burden has been lifted from the agency's senior management no longer forced to operate under conflicting federal laws. Further, EPA's Office of Pesticides Programs will grow, funded by the increased licensing fees on pesticides also authorized by this bill. FQPA requires pesticide regulators to review all existing pesticide tolerances within ten years, something not possible with EPA's current scientific resources.

Other clear winners will be animal-testing and research labs and scientific consultants. Now there will be a very high value attached to being able to show that pesticides exert their effects on animals through a "threshold" mode of action, that is, that their ill effects occur only after some critical level of exposure is reached. The new law will greatly stimulate demand for the tests that provide requisite data on this subject.

Other winners will be pesticide manufacturers

Making the World Safe for Strawberries

When Congress passed the Food Quality Protection Act of 1996, strawberries were due to become rare, seasonal, and very expensive. EPA was poised to cancel all food-use applications for pesticides that left residues shown to be animal carcinogens, including the fungicides that growers of fresh fruit depend on. Corn and soybean farmers also would have seen a steep decrease in their yields, since they depend on "pre-emer-

gent" herbicides—almost all of which are carcinogens—to increase their harvest fourfold. EPA was ready to take this drastic action in its ongoing effort to put to rest a legal conundrum blocking acceptance of improved—though not risk-free—food.

Fortunately for the strawberry, FQPA eliminated the problem before EPA made its move.

Until FQPA passed, pesticide residues on processed food—applesauce and baby food, for instance—were treated by law as food additives. As such, these residues were subject to the Delaney

Clause, a 1958 amendment to the Food, Drug, and Cosmetic Act (FDCA) that banned carcinogenic additives. Within the legal maze, however, pesticides on processed food could duck Delaney if they passed muster on raw food, such as fruits and vegetables.

Avoidance was possible for two reasons. First, pesticide residues on raw foods were not considered food additives, so Delaney did not apply to them. Second, if EPA had granted approval—what is known as a "tolerance"—for a certain residue concentration on a raw food such as apples,

it was not necessary under FDCA for an applicant to obtain a separate tolerance for the processed applesauce. The only caveat was that the residue on the apples could not become more concentrated during processing. For most food-residue combinations that is the case. Thus, until very recently, trace residues of many carcinogenic pesticides appeared in processed foods quite legally, coming in on piggyback through the back door of the FDCA.

Reflecting the state of the science over the years, EPA

whose most profitable products are carcinogenic in animals only beyond some threshold concentration. Common fungicides seem likely to fall into this set. Ironically, manufacturers of pesticides that are not carcinogenic may be losers under FQPA if product use levels approach the limits of safe exposure. At best, they will have to invest in research to show that infants are not especially susceptible to residues of their products in processed foods.

Farmers and food processors will win by having staved off a big loss: the chemicals on which they will depend will remain available. Any changes in their costs that result from the increased testing requirements will be incremental and probably passed along in higher prices.

Then there are the rest of us. We can be a bit more confident that the food supply is safe; newer, probably safer pesticides will replace some existing ones. We gain also by not suffering the disruption in our food supply that would have resulted if EPA had canceled licenses for all carcinogenic pesticides. Some of us will even appreciate the fact that the kerfuffle over pesticides will start to settle down.

On the other hand, food prices are likely to increase somewhat because of FQPA. The increase directly attributable to the costs of testing and analyzing for pesticide residues will not mean much to those

willing to treat themselves to Oregon blackberries at \$3.99 the half-pint, but to the poor it will matter. Many are already unable to afford the fruit and vegetables needed for a healthy diet; higher costs will just add to that burden. As a result, their health may suffer further. ☞

James D. Wilson is a senior fellow and resident consultant in RFF's Center for Risk Management. See page 22 to order a copy of his discussion paper 96-21, "Thresholds for Carcinogens: A Review of the Relevant Science and Its Implications for Regulatory Policy."

had granted quite a number of tolerances to pesticides mistakenly thought not to leave residues on raw food or not to be carcinogenic. As time went by and science advanced, many of these approved pesticides were found to cause cancer in animal tests and to leave small but detectable residues in foods. Similarly, as time went by, EPA began receiving applications to approve new pesticides that were ostensibly safer and often left smaller residues than the older products they were intended to replace. Their drawback,

however, was their detection as possible carcinogens.

The agency was caught in a Catch-22. If it approved the new pesticides, EPA would increase confidence in food safety, but because of the contradictory law, some carcinogens would end up in processed food. EPA decided it could not violate the spirit of Delaney by approving tolerances for these new pesticides, even though it could do so legally for raw foods. The paradox sprang from the fact that EPA could not cancel pesticide residues whose dangers had surfaced after

their approval unless they posed an "unreasonable risk," something very difficult to prove. Thus the seeming contradiction: apparently safer alternatives could not be registered while less safe pesticides remained on the market. Along with the paradox came an irony: in championing Delaney, EPA could be accused of shortchanging food safety.

In late 1988, EPA announced a new "negligible risk" policy, under which it would treat processed-food and raw-food pesticide residues alike, approving

those that posed an insignificant cancer risk. Environmentalists promptly sued EPA, asserting that the proposed policy violated the Delaney Clause's total ban on carcinogens in processed food. The court agreed.

Believing it had no other choice, EPA then announced it would cancel all food-use applications for pesticides that left residues shown to be animal carcinogens in toxicology tests. The agency was moving with all deliberate speed to carry out this policy when FQPA passed. ☞



RFF Redux

Revisiting *The Invisible Resource: Use and Regulation of the Radio Spectrum*

This past January, the Telecommunications Act of 1996 was passed with wide and enthusiastic support. The act, its supporters touted, would unleash the telecommunications industry, generating millions of jobs and allowing the U.S. to realize the full potential of the Information Age.

Back in 1964, however, taking an in-depth look at the radio spectrum from an

economic perspective was quite "far out." At least that's how one member characterized the RFF Board of Directors' decision to fund Harvey J. Levin's research into the economic value of the spectrum—that portion of electromagnetic waves used to relay information through the air. By the time Levin published his findings in 1971, RFF and the Brookings Institution had cosponsored the first-ever conference on spectrum use and regulation. As a practical matter, however, market considerations still played almost no part in the spectrum's allocation. Levin's book was the comprehensive treatment of this new economic perspective, which influenced young

scholars, among them Molly Macauley, now an RFF senior fellow exploring the economic values of outer space. "In the world of economists, his ideas were not radical," she says, "but in the world that would need to use them, they were."

Today Levin's notion of realizing the spectrum's true market value via auctions is occurring, but not without controversy.

Auctioning off certain portions of the spectrum has brought in \$20 billion to the federal treasury since the Federal Communications Commission began the practice in 1993. Heralded by some, auctioning is denounced by many who view the spectrum as a motherlode to which they should be given access.

Why is auctioning now taking place despite resistance? For starters, it produces revenues that help in deficit reduction. Also, as Macauley notes, not all spectrum is in play: The portion used by radio and television broadcasters remains off limits. To date, most of the spectrum auctioned has been for highly specialized services such as direct-to-home television via satellites, taxicab dispatching, and paging. Another reason for increased acceptance, Macauley thinks, may be the rise of a new generation of government officials, some of whom were introduced as students in the 1980s to the then-novel idea of using market incentives in resource allocation. While she is pleased to see the ideas of a mentor gaining acceptance, Macauley does regret that Levin did not live to see auctions take place. In many ways his book can now be considered quite "up to the moment." ☞

Today and Twenty-five Years Ago

Excerpts from *The Invisible Resource: Use and Regulation of the Radio Spectrum* by Harvey J. Levin (RFF, 1971) remain pertinent today for what they say about the spectrum as a public asset and as an economic commodity.

Overriding Public Value of Spectrum

Few natural resources have been as frequently or exclusively viewed from a strictly social vantage point as has the spectrum. Public waterways and national forests have recreational uses; public lands, educational uses; strategic materials, military value. But in each case there are strictly economic or business uses, too...With the spectrum, however, there is no organized market...The absence of a market tends to exacerbate the...sense of "spectrum scarcity."

Why the spectrum managers have, almost from the outset, minimized or neglected the economic aspects of their allocational decisions...may reflect in part those elaborate congressional directives which underline the public character of the spectrum and in part also a longstanding recognition of the resource's "unique" potential for social, political, cultural, and military purposes.

The public's demand for recreation or education may be hard to estimate, but tentative estimates along with other relevant data will surely help us avoid the anomaly of using highly valuable resources to meet public needs of relatively little importance. So too with the radio spectrum, too long and incorrectly viewed as a free good, at least by favored classes of users.

A Regulated Market-Type System with Prices

Now is the time to pay far more attention to the mechanics of promising middle-range options which lie between the polar extremes of a complete market and the present framework. . . . It may be that we shall always want to preserve unified management and to allocate the spectrum in line with social priorities...[But] managers ought to be able to state what a decision costs in opportunities for other uses foregone. Only with such knowledge can intelligent decisions be made...Short of a full-fledged market in spectrum, other devices can allow prices to be set. Among them are rentals and auctions.

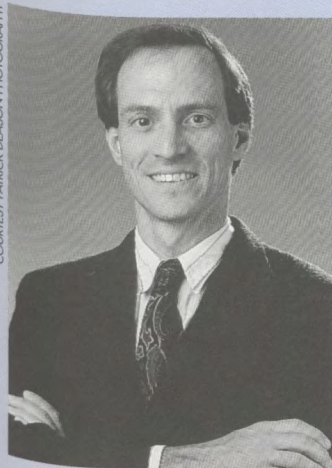
The Invisible Resource is out of print, but paper copies are available at \$132.90 each through University Microfilms, Inc., Ann Arbor, MI (tel. 313-761-4700, ext. 3781)



INSIDE RFF

To Siberia with YIP

RFF fellow Kris Wernstedt spent much of July in Nizhnevartovsk, a Siberian city in the heart of Russia's oil and gas producing region, studying ways to safeguard the potability of the drinking water there. Oil pumping and thousands of breaks each year in the region's 11,000 kilometers of oil pipelines threaten drinking water supplies



Kris Wernstedt

already under the stress of a fifteenfold increase in population since 1970.

Wernstedt made his visit as a participant in the Young Investigator Program (YIP) established by the National Academy of Sciences and the National Research Council in 1991. The goal of the program is to create a cadre of American experts in technical areas critical to development in Russia and Central and Eastern Europe, as well as in other areas of the globe.

Wernstedt was chosen to participate in this year's program not only for his expertise in urban water quality management but also for his familiarity with environmental problems in the former Soviet Union and Eastern Bloc countries. His several recent visits include a stint as a visiting faculty member in the environmental studies program at the Central European University in Budapest, Hungary.

While in Nizhnevartovsk, Wernstedt and four other YIP participants pooled their knowledge with researchers from the Russian Academy of Sciences. Among other things, they recommended that the region prioritize its environmental goals to make the most of limited funds. Creating a modern sanitary landfill for the city's quarter-million residents and developing a better system to monitor pipelines might be put near the top of the list, they suggested.

Next summer some of the Russians with whom the YIP cadre conferred in Nizhnevartovsk and also in Moscow may travel to the United States to continue the collaborative research that is a long-term goal of the YIP. ☞



Find out more about YIP through the Office for Central Europe and Eurasia (FO214), National Research Council, 2101 Constitution Ave, NW, Washington DC 20418, tel. 202-334-2644; oce@nas.edu



Pollution from oil production in western Siberia has degraded water quality in Nizhnevartovsk and throughout the area.



The oil industry in western Siberia is both the primary contributor to water quality pollution and a major source of revenues for water quality improvements.

COURTESY K. WERNSTEDT

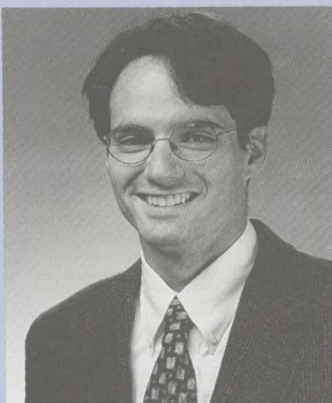
COURTESY K. WERNSTEDT



Two new fellows

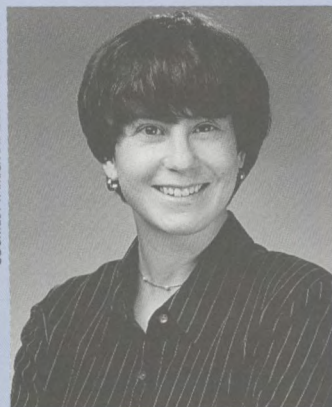
Two newly minted Ph.D.s in economics joined RFF's Quality of the Environment Division this fall. Amy Ando and Billy Pizer are beginning their research careers at RFF by following through on the subjects of their respective doctoral theses. In Ando's case, the subject is endangered species protection and national forest timber sales. In Pizer's, it is exploring techniques for simulating uncertainty in climate change models and

COURTESY PATRICK DEASON PHOTOGRAPHY



Billy Pizer

COURTESY PATRICK DEASON PHOTOGRAPHY



Amy Ando

applying the results to policy questions.

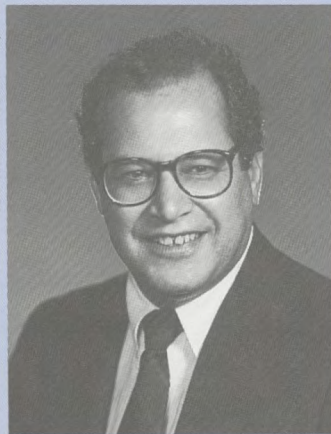
Ando's fields of interest include environmental and natural resource economics and industrial organization. She received her doctorate from the Massachusetts Institute of Technology this past September. Pizer's fields are econometrics, public finance, and environmental economics. He received his doctorate from Harvard University in June of this year. ☞

Abdo elected to RFF board

Richard A. Abdo, who heads the Wisconsin Energy Corporation, is the newest member of the RFF board of directors. Serving as the corporation's chairman of the board, president, and chief executive officer since 1991, Abdo has long been involved in electric power management. He joined the Wisconsin Electric Power Company in 1975 as director of corporate planning. Over the next fifteen years he received a series of promotions as WEPCo's vice president, senior vice president, and executive vice president, culminating in his 1990 promotion as the power company's chief executive officer. In that same year Abdo was also named executive vice president of the Wisconsin Energy Corporation, and six months later became the CEO of all of the corporation's subsidiaries.

In addition to chairing the

COURTESY CARROLL STUDIOS, INC.



Richard A. Abdo

Wisconsin Energy Corporation's board of directors, Abdo serves on the boards of M&I Marshall & Ilsley Corporation, Sundstrand Corporation, United Wisconsin Services, Inc. and numerous civic, educational, and community organizations. A member of the American Economic Association and a registered professional engineer, Abdo holds a bachelor's degree in electrical engineering from the University of Dayton and a master's degree in economics from the University of Detroit. ☞

RFF, Smithsonian renew seminar series

Resources for the Future and the Smithsonian Institution have recently announced plans to cosponsor for a second year the Ecology and Economics Seminar Series. The initial seminar of the 1996-97 series featured Boyd Gibbons and Robert H. Nelson discussing "Dissonance Between Private Lands and Wildlife." Gibbons

is author of the book *Wye Island* (RFF, 1977) as well as numerous books and *National Geographic* articles, and has served as director of the California Department of Fish and Game. Nelson is a professor at the School of Public Affairs at the University of Maryland and a senior fellow at the Competitive Enterprise Institute.

The monthly seminars bring together an economist and an ecologist to address emergent environmental issues such as biodiversity, population growth, sustainability, forestry, and the value of natural ecosystems and wetlands. The seminars are held at the Smithsonian Institution in Washington, D.C. and are free and open to the public. No RSVP is necessary. Further information is available from the Smithsonian's Sarah Boren (telephone 202-357-4282, fax 202-786-2304) or by visiting the two institutions' websites: www.rff.org or www.si.edu. To subscribe to an electronic discussion group on the seminars, email to: LISTSERV@SIVM.SI.EDU Leave the subject line blank and in the body of the message type SUBSCRIBE SIRFF-1 and your first and last name. ☞

Portney testifies on regulatory review

In September RFF President Paul R. Portney gave Congress his perspective on the federal government's oversight of regulatory review activities.

Testifying before the Subcommittee on Financial Management and Accountability of the Senate Committee on Governmental Affairs, Portney said he thought such oversight was extremely important because he put the price tag for all federal regulation of corporations, individuals, and governments at about \$300 billion annually. "For every single dollar of the \$1.6 trillion spent directly by the federal government each year," he told subcommittee members, "we spend nearly \$0.20 more in a much less visible and accountable way through regulatory mandates."

Portney urged Congress to pay the same attention to the annual compliance costs mandated by federal regulation, and to the benefits that result, as it does to on-budget spending. Members of Congress, he added, should ask themselves the question, "how do we ensure that the right amount of resources are being devoted to regulatory goals?"

One way to get an answer, Portney suggested, is to think analogously. Few people would spend \$20,000 to buy a new car without first spending \$50 in time and money to learn which one might be best for them. Nor would they spend \$200,000 on a house without spending \$500 for an engineering report, a termite inspection, and the like.

Likewise, if federal regulation imposes an annual compliance cost burden on the economy of \$400 billion, as




Each year, RFF selects about a dozen college students (mainly graduate students working on advanced degrees) to spend the summer working as research assistants on various RFF projects. Pictured here with RFF President Paul R. Portney (front row, center) are the summer interns for 1996. **Back row, left to right:** Ann Marie Holbrow, Susan Burke, Federico Mini, Mitchell L. Mathis, Nicole Darnall, and Wei Liu. **Front row, left to right:** Jesse Schwartz, Amy Beth Craft, Doug Harris, and Robertson C. Williams III. **Not pictured:** Curtis P. Carlson and Sabina Shaikh.

some have argued, Portney said it would not be extravagant to spend \$1 billion per year analyzing whether resources are being devoted to the right problems, whether the benefits of regulations exceed their costs, and whether the goals of federal regulatory programs could be met less expensively

than is currently the case.

Portney said he was "willing to bet" that the combined budgets of OMB's Office of Information and Regulatory Affairs and the policy offices of all federal regulatory agencies do not exceed \$50 million annually. "If I'm right," he added, "we spend proportion-

ately far less analyzing the consequences of federal regulations than we do on much more mundane decisions."

A copy of Portney's written submission to the subcommittee is available at <http://www.rff.org/testimony>. 



ANNOUNCEMENTS

Ordering books and reports

To purchase books and reports, add \$3.00 for postage and handling per order to the price of books and send a check payable to Resources for the Future to: Resources for the Future, Customer Services, P. O. Box 4852, Hampden Station, Baltimore, MD 21211

Books and reports 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.

To order discussion papers, 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.

Additional information about RFF books and discussion papers may be obtained on the World Wide Web (<http://www.rff.org>).

Applicants sought for RFF award programs


Resources for the Future is seeking applicants for its two award programs—the Joseph L. Fisher Dissertation Awards and the Gilbert F. White Postdoctoral Fellowship Program.

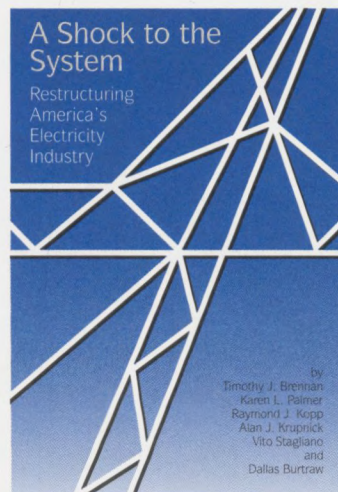
In honor of the late Joseph L. Fisher, RFF president from 1959-74, RFF will award fellowships, each in the amount of \$12,000, for the 1997-98 academic year in support of doctoral dissertation research. To be eligible for the awards, students must be writing dissertations in economics or policy sciences on issues related to the environment, natural

resources, or energy, and must have completed the preliminary examinations for the doctorate no later than February 1, 1997.

To honor Gilbert F. White, retired chairman of the RFF board, RFF will award two resident fellowships for the 1997-98 academic year. The fellowships are intended for postdoctoral researchers who wish to devote a year to scholarly work in the social or policy sciences in areas related to the environment, natural resources, or energy. The fellowships are open to individuals in any discipline who will have completed their doctoral requirements by the beginning of the 1997-98 academic year. Gilbert

F. White Fellows are normally in residence at RFF for eleven months.

Applications for the Joseph L. Fisher Dissertation Awards and the Gilbert F. White Postdoctoral Fellowship Program are due by March 1, 1997. Awards will be announced no later than May 1, 1997. For more information about the award programs, write to the Assistant for Academic Programs, Resources for the Future, 1616 P Street, NW, Washington, DC 20036-1400; telephone 202-328-5067. Or access RFF's World Wide Web home page at <http://www.rff.org>. 



July 1996 • 160 pages
\$18.95 • Paper

A Shock to the System: Restructuring America's Electricity Industry

Timothy J. Brennan, Karen L. Palmer, Raymond J. Kopp, Alan J. Krupnick, Vito Stagliano, and Dallas Burtraw

"At last—a book that makes it possible for interested laymen to understand the enormous stakes and complicated issues involved in restructuring America's electric utility industry. Both economic and engineering jargon are avoided; the pros and cons of contentious issues are laid out; and the principles to be followed in selecting sensible solutions are clearly explicated."

Irwin M. Stelzer, Resident Scholar, American Enterprise Institute

"Legislators and regulators will deal with few issues that are as complex and as important as changes in the American electricity industry. Accordingly, they need clear and impartial analysis of how increased competition will affect the industry, its customers, and the environment. *A Shock to the System* provides that information. It is important reading for anyone charged with formulating, interpreting, or implementing utility and environmental policy."

Anthony S. Earl, former governor, State of Wisconsin



DEVELOPMENT

The RFF Gift Fund

As the year draws to a close, this is a good time to seriously consider contributing to the RFF Gift Fund. Individuals facing significant tax burdens can set up accounts through the Gift Fund that qualify for immediate income-tax deductions and also cover their charitable giving for many years to come. What's more, setting up

an account with the fund is simpler than establishing a private foundation, offers a larger tax deduction, and lets you designate the beneficiaries of your fund assets.

How It Works

Contributions to the RFF Gift Fund are placed in individual accounts under professional investment management. All

income generated from a contribution remains in a donor's account and compounds tax-free until distributions are made. As a donor, you advise RFF on the distribution of fund assets. You may recommend disbursement to any tax-exempt charitable organizations under Internal Revenue Service code sections 501(c)(3) and 170(c). There are no other annual distribution requirements. No distribution from your Gift Fund to RFF General Fund is required, although of course it is welcome.

Other Advantages

In addition to obtaining the benefit of an immediate tax reduction, making a contribution to the RFF Gift Fund offers several advantages that setting up a private foundation does not. First and foremost, the tax deduction you receive is bigger since you can no longer claim the full market value of appreciated stock when setting up a private foundation. What's more, you avoid the administrative and reporting requirements involved in establishing such a foundation.

Tip

Gifts of appreciated securities are an especially attractive way to establish an RFF Gift Fund because they enable you to deduct the market value of the securities but avoid the capital-gains taxes you would otherwise pay. ☺

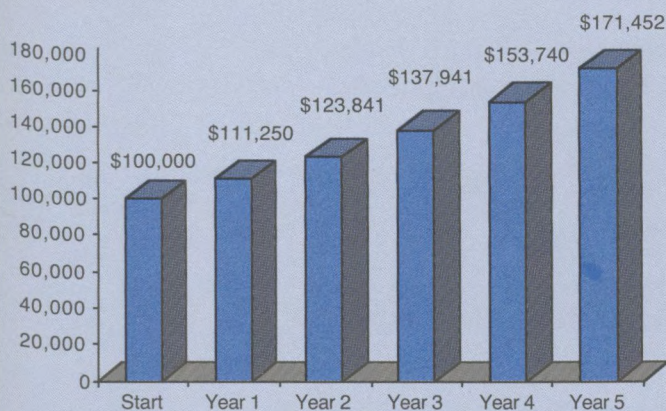
Other Facts about the RFF Gift Fund

- Minimum initial contribution is \$50,000; subsequent minimum is \$2,500.
- Contributions may be made in cash or securities, including appreciated stocks, bonds, or mutual fund shares.
- Contributions are deductible at full fair-market value.
- Donations are excluded from the donor's estate and avoid probate.
- A tax carry-forward is permitted for up to five years.
- Assets may be transferred by outright gift, from an existing foundation, by bequest, or from a charitable remainder trust.
- Fund assets may be designated for disbursement to multiple beneficiaries.

Building an Endowment through an RFF Gift Fund Account

The RFF Gift Fund permits a donor to build toward an endowment by offering tax-free compounding with no distribution requirements. The chart below shows the significant potential for charitable asset growth.¹ In this example, a tax-deductible contribution of \$100,000 is placed under professional management for maximum long-term growth, and no distributions are made within the five-year compounding period. The returns are net of fees and expenses are assumed to be 9.5 percent per annum.

After five years of compounding, your gift fund would have over \$71,000 available for charitable purposes. At these rates of return, the assets would double in six and one-half years.



¹Past returns do not guarantee future performance.

For more information about charitable trusts as well as the RFF Gift Fund, 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, or check the appropriate box on the enclosed reply envelope for individual contributions.



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RFF discussion papers convey to interested members of the research and policy communities the preliminary findings of research projects for the purpose of critical comment and evaluation. Unedited and unreviewed, they may be ordered from RFF (see page 22).
The following papers have recently been released:

- "The Cost of Reducing Municipal Solid Waste" by Karen Palmer, Hilary Sigman, and Margaret Walls (96-35)
- "Who's in the Driver's Seat? Mobile Source Policy in The U.S. Federal System" by Winston Harrington, Virginia McConnell, and Margaret Walls (96-34)
- "The Social Value of Using Biodiversity in New Pharmaceutical Product Research" by R. David Simpson and Amy B. Craft (96-33)
- "Economic Incentive Policies under Uncertainty: The Case of Vehicle Emission Fees" by Winston Harrington, Virginia McConnell, and Anna Alberini (96-32)
- "The Choice between Emissions Taxes and Tradable Permits When Technological Innovation Is Endogenous" by Ian W. H. Parry (96-31)
- "The Social Costs of Electricity: Do the Numbers Add Up?" by Alan J. Krupnick and Dallas Burtraw (96-30)
- "The Second-Best Use of Social Cost Estimates" by Dallas Burtraw and Alan J. Krupnick (96-29)
- "Fuel Economy and Motor Vehicle Emissions" by Winston Harrington (96-28)
- "Valuation of Biodiversity for Use in New Product Research in A Model of Sequential Search" by R. David Simpson and Roger A. Sedjo (96-27)
- "Banking on 'Green Money': Are Environmental Financial Responsibility Rules Fulfilling Their Promise?" by James Boyd (96-26)

Find the complete text of discussion papers as close as your computer. Search the RFF home page for books and reviews, seminar information, testimony, and more.



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