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RESOURCES FOR THE FUTURE

RESEARCH THAT MAKES A DIFFERENCE

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FEATURE

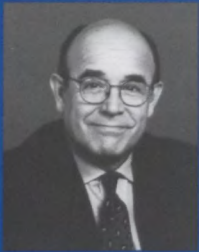
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Shaping the Future



Paul R. Portney

I generally attach no special significance to the turning of another page on the calendar—even when turning that page launches us into a new year. But milestones like the start of a new millennium do give us a useful excuse for taking stock of how far we've come, and to think about what the future will bring.

Accordingly (and probably foolishly!), I attempt to forecast the future of environmental policy and environmental quality in my article that starts on page 6 of this issue of *Resources*. Over the past three decades the environment in the U.S. and in much of Western Europe has improved by nearly every measure, and I believe that progress will continue virtually unabated throughout this century. At the same time, one cannot be so optimistic about environmental quality in the developing world, at least in the short run. We can hope that developing countries will learn from our success and failures in the U.S. RFF is committed to helping them in this effort.

Other authors in this issue have also taken an opportunity to examine what the future will hold for a host of issues familiar to readers of *Resources*. Kate Probst and Adam Lowe examine the first ten years of the Department of Energy's Environmental Management program—which is charged with the cleanup of our former nuclear weapons complex—and recommend what must be done to put the program on the right track. Picking up on a topic we covered last issue, RFF board member Mary Gade, former head of the Ozone Transport Assessment Group, offers her thoughts on the search for elusive common ground among states concerned about the transport of ozone across jurisdictions. Finally, RFF Senior Fellow Mike Toman and co-author Jean-Charles Hourcade look ahead to November, when world representatives will try to finalize their negotiations over the Kyoto Protocol and global climate change.

This issue also gives us a chance to thank the many individuals, foundations, and corporations that have supported our work over the past year. You will find their names listed beginning on page 20. I'd like to formally thank them here, and express my sincere hope that others will take this opportunity to join them in supporting RFF's research, outreach, and communications efforts. Through the generosity of our friends, we are able to do far more than just comment on the important environmental trends of the coming decades. We are able to shape them.

Paul R. Portney



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GOINGS ON

RFF Workshop Explores the Effectiveness of State Environmental Initiatives

State governments have made significant strides in environmental policymaking in recent years. Recent innovations at the state level run the gamut from permitting and pollution prevention programs in New Jersey, Wisconsin, and Massachusetts; to emissions trading schemes in California and Michigan; and voluntary compliance initiatives in Colorado, Illinois, and Missouri.

RFF held a workshop January 11 that provided visibility to a sampling of these initiatives, and offered a forum for government officials, environmental advocacy organizations, major business firms, and others to discuss their effectiveness. The event, organized by RFF's **Center for Risk Management**, drew more than 125 guests.

Representatives in attendance from several states lauded their regulatory initiatives as being more cost-effective and flexible than conventional command-and-control policies that form the basis of much of the federal government's approach.

Many of the programs presented at the workshop revealed significant environmental improvements. Massachusetts' Environmental Results Program, for example, has encouraged 80 percent of participating dry cleaners and photo processors to reach facility-wide compliance with applicable environmental standards through an annual process of self-certification, rather than through a case-by-case permit process administered by the state.

Another state initiative, New Jersey's Facility-Wide Permitting Program, attempted to integrate materials account-



DON BAKER PHOTOGRAPHY GROUP

Carolyn E. Apostolou, of the Senate Appropriations Committee staff, speaks about state environmental initiatives.

ing and pollution prevention in the permitting process. By tracking substances that facilities use through each step of a process, unknown sources of nonproduct output were found. At one participating metal press, for example, representatives from the New Jersey Department of Environmental Protection found that 101,000 pounds per year of air pollutants were emitted that had not been accounted for previously.

Jay Benforado, deputy associate administrator for EPA's Office of Policy and Reinvention, agreed that such permitting programs seem to be effective in solving some environmental problems, but expressed concern that legislation within individual states may not contribute to a broader system change, one that encourages people to comply with environmental regulations because it is the right thing to do, not just to comply with the law.

Additionally, some who attended the workshop expressed concern about the as-yet undefined role of public participation in many of the new innovations, about who is responsible for enforcement, and about what is being done to assess the outcomes of the new programs. Speakers pointed out that these initiatives should include an evaluation component that allows policymakers to decipher what works and what does not, because many of the initiatives are largely new and experimental.

Robbie Roberts, executive director of the Environmental Council of States, argued that a pervasive skepticism towards changes in the environmental regulation infrastructure has generated many questions about these state innovations—including some that are not asked of existing programs.

Speakers in the concluding panel of the workshop agreed



DON BAKER PHOTOGRAPHY GROUP

Steve DeGabbriale, director of the Business Compliance Division of the Massachusetts Department of Environmental Protection, touts that state's Environmental Results Program.



that a restructuring of the existing environmental regulatory system is in order. However, Rena Steinzor, associate professor at the University of Maryland School of Law, noted that it would be very difficult for state and federal governments to reach a consensus on exactly how the infrastructure should be changed. ☞

RFF to Examine Future Costs of Superfund

RFF has launched a year-long study that will weigh in on one of the most contentious issues in the recent congressional debate about Superfund: just how much money EPA needs to cover the costs of implementing the program. Congress has asked RFF to estimate the likely costs of the Superfund program to the federal government through 2010, and to detail the uncertainties in estimating these costs.

RFF researchers, led by Senior Fellow **Katherine Probst**, will examine the annual and cumulative costs to the federal government associated with administering and implementing the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as Superfund, which was established in 1980 to give the federal government the legal authority—and the financial resources—to clean up contaminated sites across the country.

Congress identified six key components of the program to

be included in RFF's study. These include the costs to EPA of completing work at all sites currently listed on the National Priorities List (NPL), which now totals over 1,200 sites; the costs associated with additions to the NPL anticipated for fiscal year 2000 through fiscal year 2009; the costs associated with federal expenditures for the operations and maintenance at both existing and new NPL sites; the costs of emergency removals; nonsite specific costs assigned to other activities, such as research, administration, and interagency transfers; and the costs associated with five-year reviews at existing and new NPL sites. The study will culminate in a report to be delivered to Congress by the end of the year. ☞

Fostering Interest Group Participation in Russia...

The development of environmental regulations in the United States is often the product of an intense—and occasionally contentious—public process. Many argue that this approach ultimately helps create “buy-in” from disparate interest groups and helps produce policies that are more responsive to the public's concerns.

Such a tradition does not exist in Russia, where the people's historic relationship with government and the nature of the nation's infant democracy act together to limit the number and types of people involved in environmental regulation. Russian environ-

mental actions are crafted by a smaller and more scientific or technically oriented group of experts, which may create problems when it comes time for implementation.

RFF Visiting Scholar **Ruth Greenspan Bell** and Fellow **Kris Wernstedt** hosted a two-day workshop in November that explored whether the kind of interest group involvement common in the United States may be fostered in Russia. Organized jointly with the Moscow-based Center for Russian Environmental Policy, the workshop featured an in-depth look at a voluntary pollution reduction plan in the Chesapeake Bay watershed that promotes vegetated buffer strips along shorelines and riverbanks to reduce the nutrients that flow into the bay and to improve habitat quality. This example was examined because of the prominent role environmental and other interest

groups played in shaping it and because it was thought to have the greatest resonance for our Russian partners and their experience.

Both sides agreed that the workshop provided a useful first step in exchanging ideas about how to achieve effective environmental protection. The many challenges facing Russian leaders, however—from the financial to the political—make the implementation of any new regulatory approaches especially difficult. ☞

...And Helping Progress in the Former Soviet Bloc

Environmental progress has also been idiosyncratic since the fall of the Berlin Wall in the countries emerging from the Soviet Bloc, noted **Bell** in an essay prepared for the U.S. Agency for International Development (USAID). Now with the prospect of accession



Americans and Russian participants explore environmental progress on the Chesapeake Bay.

RUTH GREENSPAN BELL

to the European Union (EU) looming, many of these countries are faced with the difficulty of living up to EU environmental requirements.


Bell's essay, prepared along with the work of other scholars to mark the tenth anniversary of the fall of the Berlin Wall, argues that advice from western Europe and the United States has helped accession countries to write new environmental laws, but implementation of these laws has lagged, particularly in those countries that have had little experience with functioning, law-based societies.

One flaw of past assistance programs has been that they are devised with a largely western assumption in mind: that law is inherently and widely respected as a vehicle for social change. When countries in transition attempt to implement new policies simply through legal mandates to citizens suspicious of laws in general, often they have not been successful. The principal experience of these populations has been with laws that lacked basic legitimacy; thus, the simple introduction of new laws in the absence of a culture of compliance is not effective. However, among those countries where pre-Soviet, law-based societies have been revived, legal reform can be an effective policy tool, Bell said.

To reflect this reality, international assistance should be closely tailored to the targeted country, Bell said. More traditional legal assistance is appro-

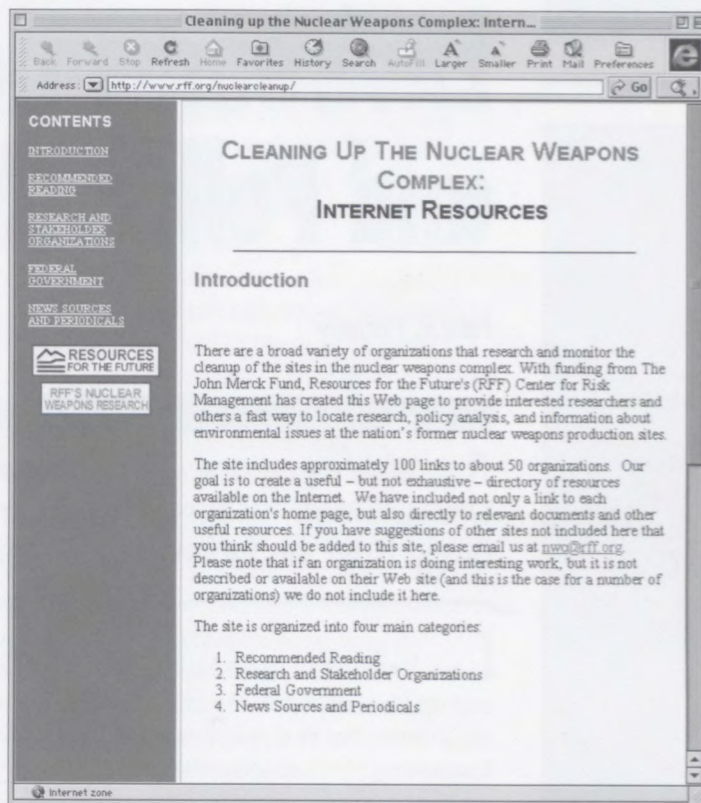
priate for countries with developed legal systems. In other countries, to try to inculcate respect for laws over the long term, there should be greater emphasis on implementation projects that are rooted in value systems, traditions, or needs of the community rather than centrally formulated laws.

One example of such a program, the Armenian Tree Project (ATP) of the Armenian Assembly of America, uses practical rather than legal measures to replace trees lost during the early-1990s Armenian energy crisis. As communities prove they can foster the growth of trees received from ATP, they are given informal incentives to continue meeting the goals of the program, such as additional trees, recognition in the form of donor visits, and marketing assistance for fruit farmers. As a result of ATP's emphasis on solutions based on value systems and community needs, more than 200,000 trees have successfully been planted in Armenia.

 Bell's essay and those of other participating scholars can be found at <http://www.envirodialogue.net/legpol.shtml>.

RFF Launches New Internet Site on Cleanup of the Nuclear Weapons Complex

In an effort to help researchers, policy analysts, and others find information about environmental issues at former nuclear weapons sites, RFF has created a Web site that pulls together





The screenshot shows a web browser window titled "Cleaning up the Nuclear Weapons Complex: Intern...". The address bar shows "http://www.rff.org/nuclearcleanup/". The page content includes a "CONTENTS" sidebar with links to "INTRODUCTION", "RECOMMENDED READING", "RESEARCH AND STAKEHOLDER ORGANIZATIONS", "FEDERAL GOVERNMENT", "NEWS SOURCES AND PERIODICALS", "RESOURCES FOR THE FUTURE", and "RFF'S NUCLEAR WEAPONS RESEARCH". The main content area features the title "CLEANING UP THE NUCLEAR WEAPONS COMPLEX: INTERNET RESOURCES" and an "Introduction" section. The introduction text states: "There are a broad variety of organizations that research and monitor the cleanup of the sites in the nuclear weapons complex. With funding from The John Merck Fund, Resources for the Future's (RFF) Center for Risk Management has created this Web page to provide interested researchers and others a fast way to locate research, policy analysis, and information about environmental issues at the nation's former nuclear weapons production sites. The site includes approximately 100 links to about 50 organizations. Our goal is to create a useful - but not exhaustive - directory of resources available on the Internet. We have included not only a link to each organization's home page, but also directly to relevant documents and other useful resources. If you have suggestions of other sites not included here that you think should be added to this site, please email us at www@rff.org. Please note that if an organization is doing interesting work, but it is not described or available on their Web site (and this is the case for a number of organizations) we do not include it here. The site is organized into four main categories: 1. Recommended Reading, 2. Research and Stakeholder Organizations, 3. Federal Government, 4. News Sources and Periodicals."

information from approximately 50 organizations—from the federal government to local community groups. The site can be accessed directly at <http://www.rff.org/nuclearcleanup>.

More than 50 years after the U.S. Department of Energy (DOE) and its predecessors began to fabricate nuclear weapons, DOE's Office of Environmental Management now is charged with cleaning up dozens of large, unusable tracts of land containing huge volumes of hazardous waste. It has been called the largest environmental project ever undertaken in the United States.

RFF's new site tracks the organizations and agencies that

have sprung up to research and monitor the cleanup. It includes links to important home pages of research and stakeholder organizations and relevant federal agencies and departments, as well as to a number of significant documents, news sources, and periodicals. 



Environmental Problems and Policy: 2000–2050

Paul R. Portney

The next fifty years will bring continued environmental improvement in the United States, wider use of incentive-based regulations, and a shift in power away from the federal government, RFF's president believes.

It is with great trepidation that one writes about the future. After all, it hasn't happened yet and one could end up looking pretty silly, depending on the acuity of one's vision. For that reason, and like many other forecasters, I have adopted the convention of choosing as the end of my forecast horizon a date sufficiently far in the future that there is no chance of my being around to be held accountable.

Not everyone is so fortunate. In 1982, the Scientific Forecasting and Trends Staff of the Environmental Protection Agency's (EPA's) Office of Research and Development commissioned a consulting company to undertake an "environmental foresight study" to help the EPA anticipate future environmental problems and recognize emerging trends. The study report was completed in late 1984.¹ Among other things, it identified the ten highest priority environmental problems in the years to come, as well as a group of problems of "second order importance"—some thought to have been serious at the time, others viewed merely as potential problems. Carbon dioxide in the atmosphere—or global climate change, as it is now known—did not make the top ten list and was not even identified as a continuing or increasing problem of second order importance. Rather, it was identified as a *potential* second order problem, the effects of which "...are unlikely to be important by 2020." This

This article first appeared in the Journal of Economic Perspectives.

was only thirteen years before 130 nations met in Kyoto, Japan to craft a treaty aimed at dealing with what many of them viewed as the gravest environmental threat the world has ever faced.²

It is of interest to speculate about both the future of environmental regulation and the environmental problems that regulation will confront. We can be a bit more confident with respect to the former.

The Future of Environmental Regulation

While our regulatory system will no doubt be buffeted by many fads and fancies over the next fifty years, at least three changes are beginning to take shape that will endure. First, and of greatest interest to economists, incentive-based (IB) approaches to environmental protection will grow more and more prominent. Here I refer principally to Pigouvian taxes on externalities, the use of marketable permits (or quantity instruments) to limit pollution, and the use of deposit-refund systems—all in lieu of (or occasionally to complement) more prescriptive, often uniform technology-based standards. This change is farthest along in the United States, in part because we have always relied to a greater extent than most other countries on markets. Nevertheless, they are the future of environmental policy everywhere.

In a sense, this is a remarkable change. It is now more than thirty years since Allen Kneese and his colleagues at Resources for the Future, as well as a

number of university-based researchers, began making the case for IB approaches to environmental protection with both theoretical and empirical demonstrations of their static and dynamic efficiency. "A license to pollute," huffed legislators and their staffs at the time—virtually all of whom were trained in law but few of whom were exposed (as most law students are today) to the case for market approaches to environmental protection.

Today in the United States we have taxes on emissions of ozone-depleting chlorofluorocarbons, marketable permits sharply limiting emissions of sulfur dioxide from coal-fired powerplants, and municipalities levying waste-disposal charges on households based on the number or weight of garbage bags set out at curbside.³ Moreover, no discussion of international policy regarding global climate change—what to do about emissions of carbon dioxide and other greenhouse gases, in other words—is complete without a lively argument about whether this ought to be pursued via carbon taxes or through a system of marketable permits. Not a single serious proposal to control greenhouse gases has been advanced in international forums that is predicated principally on governments specifying "approved" production technologies or mandating the characteristics of consumer durable goods or other products. While it would be exaggerated to report the death of the command-and-control era, IB approaches to environmental regulation will be increasingly common in the years ahead; we will all benefit from this change in policy.

A second trend in environmental regulation that can only be expected to accelerate relates to requirements on firms to report publicly their emissions into air, water, and land. The first major program along these lines was contained in the 1986 amendments to the Superfund law in the United States and established something called the Toxics Release Inventory. Under this program an ever-expanding list of industries must report to the EPA their annual emissions of a comparably expanding group of substances; these reports are made public by the EPA, although many firms beat the EPA to the punch and announce their emissions themselves. Information provision requirements are beginning to be written into other federal statutes and also state and local environmental laws; they are also being used in developing countries where regulatory authorities are weak or nonexistent.

The reason for this proliferation is simple: experience has shown that when firms are required to make public their emissions, they feel pressure to reduce those emissions even when they are perfectly legal. The Environmental Defense Fund, arguably the most influential environmental advocacy group in the United States, has gone one step further. It takes the emissions information that firms report, couples it with Census data, and makes it possible, via the Internet, for each citizen not only to see how much of each pollutant is discharged in his or her neighborhood, but also to send an e-mail to the plant manager registering concern about these emissions. The spread of electronic communication makes it all but inevitable that governments will require more and more public disclosure about firms' environmental performance (including the amount of fines they may pay for accidents or noncompliance), their occupational safety and health record, and perhaps other dimensions of their operations.

It also seems highly likely that the next half-century will see both more decentralization of environmental authority to lower levels of government, but at the same time more international negotiation over and harmonization of certain environmental standards. There are several reasons for this apparent paradox. Domestically, the United States and other western democracies have effectively federalized all environmental policy. This makes sense for virtually all air and water pollution problems because of the likelihood of interstate (or provincial) externalities if regulation were handled at lower levels of government (one jurisdiction could export its pollution problems to others, in other words).

But there is no obvious reason why states in the United States should not have the authority to regulate the degree of stringency for solid waste landfills, for instance, or even for setting standards for drinking water contaminants, since in both these cases there is no obvious interstate externality that would be associated with one state's choosing a much weaker standard than that of its neighbor.⁴ Even under the current, largely federal system in the United States, important environmental regulatory responsibilities are delegated to the states.⁵ Given the growing budgets and sophistication of state (and in some cases even regional or local) environmental authorities, as well as the growing mistrust of the federal government, it would be most

surprising if we did not see in the future a devolution of even more authority from the federal government to regional, state, or even local governments. This possibility is only reinforced by the fact that many of the (increasingly minor) pollution problems that will remain in the United States are best handled at the sub-federal level. These include air pollution associated not so much with large factories or other stationary sources as with the effects of the decisions of small businessmen and women and individual motorists.⁶

At the same time, everyone is becoming increasingly aware that environmental problems like climate change, stratospheric ozone depletion, the overexploitation of fish stocks, and the loss of biodiversity due to habitat disruption require coordinated international action if they are to be successfully addressed. International trade negotiations can be expected to revolve increasingly around the kind of bilateral and multilateral environmental issues that arose in talks over the North American Free Trade Agreement. Pressures will increase for gradual harmonization of regulatory regimes, especially those of the western industrial democracies.

Very difficult issues will remain, however. First, developing countries generally will—and should—resist adopting the same standards prevailing in the developed countries. Especially for environmental problems that are more or less confined within one nation's borders, there is no reason why a country ought to hold its polluters to the same discharge standards as those of other countries, especially wealthier ones. Rather, it makes sense to allow each country to tailor its regulations to local economic circumstances and tastes—as countries' per capita incomes increase, so too will their demand for environmental quality. Also, even among the wealthier countries, we can expect to see bitter disputes over environmental issues. These will occur with increasing frequency as businesses under the threat of foreign competition seek protection under the guise of environmental concerns. For instance, German cattle growers have successfully protected themselves against beef imported from the United States by arguing that it contains hormones that, while lawful in the United States, pose risks that Germans are unwilling to bear. Clever lawyers everywhere will seek to use environmental law as a way to circumvent the breakdown of nontariff barriers to trade.

The Environment of the Future

At least at one level, one can speak confidently about environmental quality in the years to come. It is inconceivable that ambient environmental conditions in the United States, as well as in most other western democracies, will not continue to improve. The past record has been most pronounced in the United States with respect to air quality, which is significantly better in virtually every United States city along almost every dimension.⁷ Water quality has also improved substantially in most places, and there can be little doubt that both solid and hazardous wastes are being handled and disposed of with much greater care than in the past.⁸ Generally speaking, the experience of the OECD countries mirrors that of the United States.

In these developed countries, this favorable experience has been a triumph of technology. That is, the ratio of pollution per unit of GDP has fallen fast enough in the developed world to offset the increase in both GDP per capita and the growing number of "capitas" themselves. There are reasons to believe that this will continue to be the case in the wealthier countries. First, natural gas is now the fuel of choice for virtually all new electricity generation capacity in many places; moreover, it is likely that over the next fifty years or so natural gas will gradually replace coal for much of the baseload generation that coal now provides. This will have positive effects on ambient air quality, and will reduce emissions of carbon dioxide, as well. Nuclear power is quite attractive on these grounds, as well, though it faces technological problems of its own regarding the disposal of radioactive wastes, as well as political opposition.

Second, and slightly more speculatively, it appears that cars, trucks, and buses will in the not-too-distant future be powered not by internal combustion engines but rather by fuel cells that extract hydrogen, initially from gasoline or methanol and eventually from even cleaner sources. Since these mobile sources, as they are called, are increasingly the major contributors to the urban air pollution problems that remain, this change bodes well for the future.

The picture is less bright in the developing world.⁹ First, that is where most of the five billion or so new inhabitants of the earth will be born and where they will live during the next century (in fact, in Japan and parts of western Europe, populations will fall unless

the decline in fertility rates is reversed). Second, inhabitants of the developing world will continue to migrate to already very crowded mega-cities. There they will want cars and electricity. It is hard to see how China, India, and other rapidly growing countries will meet their needs for electrification without making use of the vast coal reserves they have. And while these developing countries, too, will one day see cars powered by fuel cells, it seems more likely that they will much longer rely on gasoline-powered internal combustion vehicles. This spells trouble for air quality in developing countries. Moreover, the press of more and more people into cities will also overwhelm water supply and sewage treatment systems—where they exist—as well as transportation infrastructure.

Though this may seem Panglossian, there is reason to believe that even these serious problems to be faced in the decades ahead will eventually be overcome. After all, it was only thirty years ago in the United States that a major river spontaneously combusted and that air pollution would occasionally get so bad that motorists would turn their headlights on during the day to be seen. The rise in living standards here increased the demand for environmental quality to the point that people preferred to take additional increments in the quality of life in the form of a better environment, rather than a fatter paycheck. Evidence on the so-called “environmental Kuznets curve” suggests that this is also true in developing countries; that is, environmental quality may deteriorate during a period in which developing countries begin to industrialize, but at some point this deterioration is stopped and reversed as incomes rise.¹⁰ *The principal environmental challenge for the developed world today is helping the developing countries to increase their standards of living in ways that help them skirt, to as great an extent as possible, the pollution-intensive period the developed countries underwent.*

Even in the developed world, there is reason to be concerned about the problems caused by land clearing and other habitat disruption. While air or water quality degradation can eventually be reversed, we cannot resuscitate a species once driven to extinction or regrow (in any meaningful time scale) a redwood or other old-growth forest lost to logging, urban growth, or second-home development. While the forested area of the United States and a number of other western democracies is greater than it was a century ago,

forests are being lost at a rapid clip in many developing countries. As Waggoner, Ausubel, and Wernick have argued elegantly, this need not be the case.¹¹ They point out that if agricultural productivity could be lifted up around the world to the average level of today's U.S. corn grower, even a world inhabited by ten billion people would need only half as much acreage in agricultural production. This would greatly reduce pressure to convert forested areas to subsistence agriculture. Similarly, recent increases in forest productivity¹² could make it possible to meet the needs for wood of even a much more populous world while increasing, not decreasing, forested acreage. Here, too, the developed world could play a key role in the next fifty years helping the developing world take advantage of these more productive agricultural and silvicultural technologies. Whether they will or not is another question.

Other New Technologies

But what about the Internet? Won't the so-called communications revolution, as well as other technological and biomedical innovations, make it possible to neatly avoid all these environmental problems?¹³ Nope. Heretical as it sounds, life fifty years ago was in many respects not at all unlike life today. Our fathers (and a few mothers) drove to work, generally by themselves, as most of us do today; in fact, many more of them used public transportation than today. They worked in offices, factories, stores, or on farms that—while more labor- and pollution-intensive than today—aren't *all* that different. Similarly, we ate and recreated in ways not unlike we do today. The best guess we can make about the world of 2050 is that we'll recognize it easily (and be able to communicate this fact to others even more instantaneously than today).

To be sure, we will know much, much more about the genetic causes of death and disease, and it would be surprising indeed if lifespans did not continue to increase. This will mean that more goods and services will be consumed than would have been the case, of course. Genetically modified organisms will make it possible to further increase agricultural and silvicultural productivity, although plain old cultural objections may result in their potential never being realized. Still other such organisms will facilitate the cleanup of soil and groundwater contamination.

Nevertheless, even though the Internet may change how businesses and individuals communicate with one another, we'll all still need stuff. This stuff may be delivered to us as a follow-up to electronic commerce, but we'll probably make another trip using the time saved shopping. Other, as yet unimagined technological wonders will no doubt change to some extent what we eat (and how it is grown), how long we live, and what we do with our spare time. But unless these changes profoundly affect in ways unforeseen here the way we use energy—particularly for electricity generation and personal transport—and the incentives people have to clear land, the environmental problems we will grapple with, as well as the policies we use to address them, will be those described above.

Would that I could be here in 2050 to see how wrong I was!

Notes

1. Vary T. Coates, Joseph F. Coates, and Lisa Heinz, "Clues to the Future Environmental Agenda: An Environmental Foresight Study," December 1984, Office of Exploratory Research, U.S. Environmental Protection Agency, Contract Number 68-02-3762.

2. To be fair to the authors of the report, even those greatly concerned about global climate change would likely agree that the world has yet to see any of the adverse effects they believe it will eventually pose.

3. See Stavins, Robert N. Forthcoming. "Market-Based Environmental Policies" in *Public Policies for Environmental Protection*, 2nd edition. Portney, Paul R. and Robert N. Stavins, eds. Washington: Resources for the Future.

4. There are certain biological contaminants that can appear in drinking water for which even one exposure can make someone very sick or even die. For these contaminants, it makes sense for the federal government to set uniform national standards so that someone drinking from a water fountain at O'Hare Airport, for instance, can do so in confidence that the state of Illinois has not set a standard much weaker than that in his or her home state.

5. For instance, even where the federal government sets uniform national air or water quality standards, the states are given the responsibility to monitor compliance with the standards; the states also issue most operating permits and bring the majority of enforcement actions.

6. This does not mean, incidentally, that states are clamoring for these added regulatory responsibilities. In some cases, governors would prefer to be told what to do by the federal EPA rather than be forced to make difficult tradeoffs between environmental quality and economic growth. But if the effects are principally local, that is exactly where the buck ought to stop.

7. See U.S. Environmental Protection Agency. 1999. *National Air Quality and Emissions Trends Report, 1997*. EPA 454/R-98-016. Washington.

8. See *Pollution Control in the United States: Evaluating the System*. 1998. J. Clarence Davies and Jan Mazurek, eds. Washington: Resources for the Future.


9. For an excellent discussion of the environmental problems of the developing world, see *World Development Report 1992: Development and the Environment*. World Bank. 1992. New York: Oxford University Press.

10. See Grossman, Gene and Alan Krueger. 1991. "Environmental Impacts of a North American Free Trade Agreement." Princeton University. Princeton, NJ.

11. See Waggoner, Paul, Jesse Ausubel, and Iddo Wernick. 1996. "Lightening the Trend of Population on the Land: American Examples." *Population and Development Review*. 22.3, pp. 531-45.

12. See Sedjo, Roger. 1999. "Land Use Change and Innovation in Forestry," in *Productivity in Natural Resource Industries*. Simpson, David, ed. Washington: Resources for the Future, pp. 141-74.

13. See Cohen, Nevin. Forthcoming. "Greening the Internet: Ten Ways E-Commerce Could Affect the Environment." *Environmental Quality Management*.



The \$200 Billion Question: Does Anyone Care about Cleaning Up the Nation's Nuclear Weapons Sites?

by Katherine Probst and Adam Lowe

The United States stopped building nuclear weapons in the late 1980s, but the contamination from five decades of weapons production poses a threat that will last for decades to come. Changes are needed now to make sure that the \$200 billion cleanup of our former nuclear weapons facilities will be successful.

Cleaning up the nation's former nuclear weapons sites is the largest environmental undertaking the United States has ever faced. Fifty billion dollars has already been spent on this effort. The Department of Energy (DOE), which leads the cleanup through its Office of Environmental Management (EM), estimates that addressing the contamination resulting from five decades of nuclear weapons production will cost the nation at least another \$150 to \$200 billion—and will take seventy more years to complete.

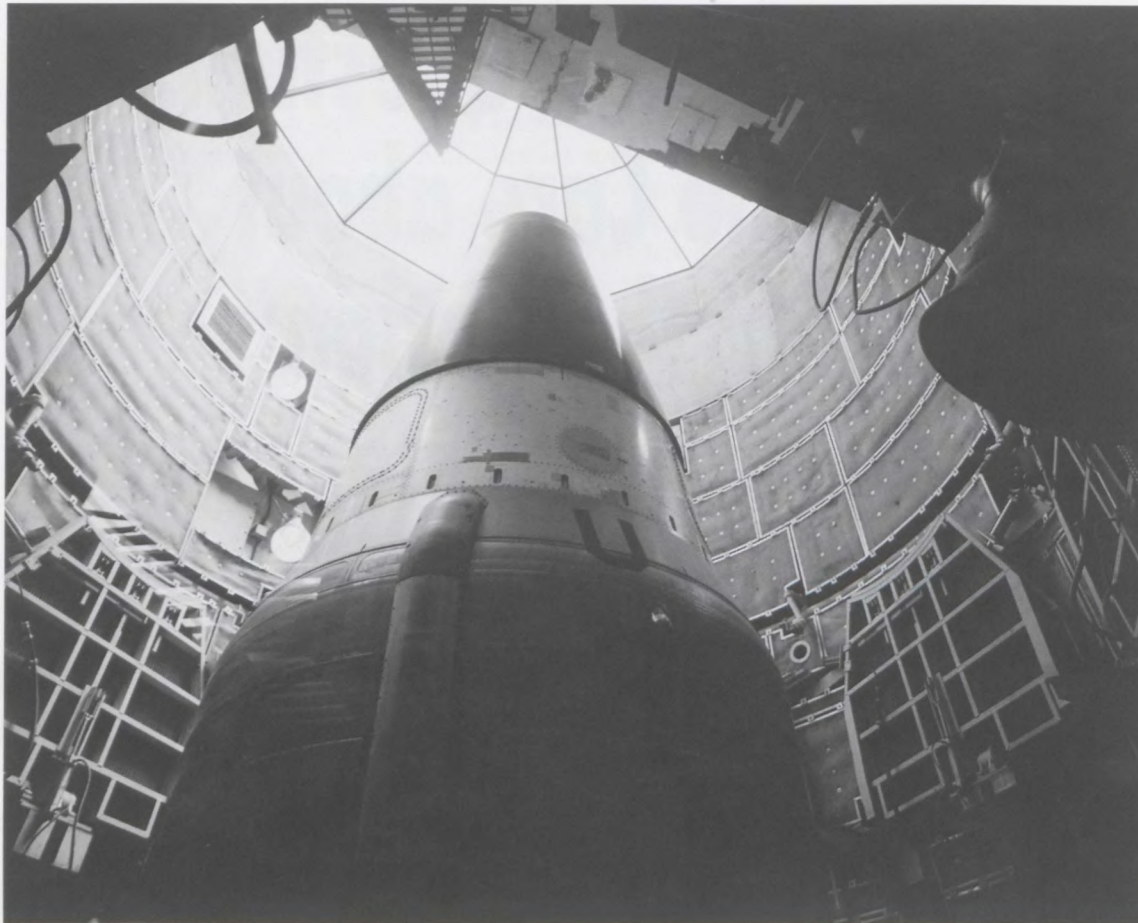
And, even after all this money is spent, long-term stewardship will be required at most of the 100 sites affected, to assure that people do not come into contact with the hazards that will remain.

Given the threat posed by this Cold War legacy—and the huge sums of money and time required to

address it—one might expect that cleanup of the weapons sites would be near the top of the nation's environmental agenda. So why don't presidential candidates debate it on the stump? Why doesn't Congress probe this issue in the same detail as Superfund, which costs taxpayers far less? The fact is that except in those communities close to contaminated sites, cleanup of the nation's nuclear weapons sites registers barely a blip on the nation's environmental radar.

A new paper we released in late January, *Cleaning Up the Nuclear Weapons Complex: Does Anybody Care?*, concludes that it is time for senior leaders in the executive branch and Congress to fully scrutinize the costs and effectiveness of DOE's Environmental Management program. Given that most of the task of

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cleaning up these sites still lies before us, embarking on meaningful change today could bring benefits for many decades to come.

Although there have been sporadic attempts by Congress and others to hold DOE's feet to the fire, there has been little sustained effort to address fundamental questions, such as whether the EM program is focused on appropriate goals, whether it is effective in meeting them, or whether the \$50 billion expended on the EM program since 1989 has been wisely spent. In fact, the program has largely escaped the kind of sustained scrutiny paid to other environmental issues by advocates, the media, Congress, or administrations of both parties.

There are many reasons for this lack of attention. First, it is difficult to focus on an environmental problem that is so large in scope and so technically complex that it almost defies comprehension. Adding to

the inattention is the fact that most of the former nuclear weapons production facilities are in remote areas, far from major population centers. Funding and much of the oversight of DOE's environmental program fall under the defense committees in Congress, where even huge environmental outlays pale in comparison with other defense programs. And DOE's environmental management program has become an important job-creation engine in the communities that once employed many in the nuclear weapons enterprise, making it a politically popular program, and reducing the incentives to ask tough questions.

Increased scrutiny is long overdue, however.

The 100-plus sites in EM's portfolio harbor contamination that will remain hazardous for thousands of years, and billions of dollars will be spent to reduce these risks in the coming decades. Already, mismanaged or misguided projects have cost taxpayers millions of dollars in the past ten years, as documented by many investigations by the General Accounting Office and others. Unless the environmental management program is held accountable, we as a nation may never know what we are buying for \$6 billion per year—a budget nearly as high as that of the entire U.S. Environmental Protection Agency.

Action should come at several levels. First, the DOE must clarify the mission of the EM and separate DOE's "job creation" and economic transition functions from EM's environmental management activities. Since the winding down of the Cold War, EM's mission has evolved not only to include environmental

restoration and waste management, but also, indirectly, to create jobs and ease economic transition at former nuclear weapons production sites. All of EM's current individual missions should be evaluated, and core missions clearly stated. Changes are also needed in internal accounting and budgeting processes to clarify how money is spent and to improve the accountability of the program's federal employees as well as its 36,000 prime contractor employees.

One of the most important actions Congress and the Administration should take is to begin to decide which EM sites will, and which will not, have a future DOE mission. The United States stopped producing nuclear weapons ten years ago, yet we have not decided which former weapons sites and facilities will have a future use and remain in operation. This uncertainty hampers cleanup efforts. Congress should enact legislation, modeled on the Base Closure Realignment Act, that defines a process for deciding which sites will have future missions, and which will be closed, a step that ultimately could speed cleanup and help crystallize appropriate environmental goals at each site.

While there are myriad reporting requirements on the books, Congress should require the development of useful annual reports on the EM program. Even though \$50 billion has been spent on environmental management activities since 1989, it is still difficult to determine the extent of contamination at some of the major sites, and to understand the possible alternatives for addressing them. At some sites, it is also difficult to understand what progress has been made. Congress should require DOE to provide annual reports that detail progress made to date, identify how resources at each site were spent, and estimate future costs of cleanup and stewardship. Congress will need to ensure that this reporting is taken seriously. These reports are important, because they can provide a foundation for effective congressional oversight.

Even though \$50 billion has been spent on environmental management activities since 1989, it is still difficult to determine the extent of contamination at some of the major sites, and to understand the possible alternatives for addressing them.

Finally, Congress or the president should create an independent commission to evaluate the current EM organizational structure and identify needed reforms. This commission should focus on establishing a clear mission, streamlining lines of authority, encouraging greater internal and external accountability, and protecting the environmental management program from parochial interests. One key question it should address is whether the environmental management of former nuclear weapons sites truly belongs in the Department of Energy.

What will it take to accomplish these goals? Something that cannot be legislated: leadership. The steps we recommend above are critical to increasing the program's credibility and ensuring cost-effective achievement of critical environmental goals. For this to happen, Congress and senior officials in the executive branch need to be committed to true reform of the nation's largest environmental program, and to making what are sure to be difficult decisions to achieve that reform.

To help those interested in finding out more about DOE's

environmental management program and some of the important policy debates regarding the nuclear weapons complex, RFF has created a new web site—<http://www.rff.org/nuclearcleanup>—that pulls together approximately 100 links to 50 organizations that have done analysis of issues related to the cleanup. There are links to official government reports, and independent analyses from environmental groups and other nonprofits. Our hope is that this site will make it easier for those interested in the cleanup of the weapons complex to find the information they need. Look for more information on the site on page 5 of this issue of *Resources*.

Katherine Probst is a senior fellow in RFF's Center for Risk Management. Adam Lowe is a former research assistant in the Center.



From Bonn to The Hague, Many Questions Remain

by Michael Toman and Jean-Charles Hourcade

Negotiators from around the world will meet next fall to try to find elusive common ground on the Kyoto Protocol. One key unresolved issue concerns how industrialized and developing countries will work together to reduce emissions.

With three years of international negotiations on climate policy set to culminate next fall, key questions remain. One of the most important aspects of the ongoing negotiations over implementation of the December 1997 Kyoto Protocol involves what rules should govern the use of the so-called "Clean Development Mechanism," or CDM. In a nutshell, the CDM is designed to facilitate international financing of reductions of greenhouse gas emissions in developing countries, which do not have quantitative emissions targets under the Kyoto Protocol. Entities in developed countries that finance such reductions create "emissions credits" they can use to meet future obligations to control greenhouse gases or to sell to others.

The point of the CDM is to provide advantages to developing and developed countries. Developed countries would take advantage of cheaper opportunities to limit their net emissions than are available to them domestically. (Greenhouse gas reductions have the same long-term impact wherever they occur.) Developing countries would enjoy the economic and environmental benefits of investments made in their countries that reduce greenhouse gases—for example, upgrading the electricity generating system, or plant-

ing trees to trap some carbon dioxide (the principal greenhouse gas) while also arresting land degradation.

Under the Protocol, CDM projects and emissions credits were supposed to begin at the start of 2000. However, while international disagreements on the mechanism seem to be shrinking, agreement on how to implement the CDM is at least a year away.

International Negotiations

At the Fifth Conference of the Parties to the Kyoto Protocol (COP-5), the fall 1999 round of international climate negotiations in Bonn, there was very little obvious progress on the practical details of the CDM. Among the industrialized countries, disagreements remain about the implementation of policies for greenhouse gas trading generally, and internal differences in views and interests among the developing countries implied a wait-and-see position for all.

However, beneath the surface, some real progress was made. The discussions in Bonn generally were much more businesslike than at the negotiations in Argentina a year before. Developing countries demonstrated an increased interest in the potential use of the CDM. Moreover, the technical and other sources of

dispute surrounding the CDM appear to be more clearly understood than a year ago, and there is some increase in shared understanding about what the CDM can do and how. For example, there is increased agreement about the valuable role of the private sector in identifying, financing, and operationalizing CDM.

By the time of the Sixth Conference of the Parties, currently slated to be held in late 2000, the international community is supposed to have reached agreement on how the CDM would work in practice. This means working out details on a number of issues, including who could initiate projects, how they would be financed, and how the emissions credits would be calculated and verified by some independent auditor. At a multinational experts' workshop on the CDM that we convened last fall, just a few weeks before COP-5, two days of frank but friendly discussion led us to conclude that the issues that follow are among the key concerns surrounding the CDM that negotiators must address over the next year.

Credible Benefits for Developing Countries

In earlier discussions some developing countries expressed concern that they would be disadvantaged by the fact that CDM projects would allow the cheapest greenhouse gas reduction opportunities to be sold to the developed world. That concern has not entirely gone away, but it is now part of a more sophisticated and legitimate concern about how developing countries that host CDM projects can equitably share in the benefits. Developing countries recognize that, in principle, they will be able to exercise sovereign authority over CDM investments. The question is whether the CDM is designed to provide the greatest possible opportunities for mutually beneficial trade.

Some worry that opportunities for CDM investment will be unevenly distributed across developing countries, leaving those that are least developed at a particular disadvantage. The negotiation of the CDM

included a provision for taxing the proceeds of projects and redistributing the proceeds. However, at least some of this tax would be borne by host developing countries, not just by rich international investors.

Another way to address the issue of unevenly distributed benefits is to enhance prospects for investing in carbon dioxide sequestration projects, like reforestation, which could benefit the least developed countries. However, international negotiators remain at odds on how or even whether to count the effective greenhouse gas reductions from such projects. Doing this involves myriad technical complexities. If these complexities reduce eligibility for these investments, then some developing countries will lose their best opportunities for participating in the CDM.

Another concern is the extent to which developing countries can launch CDM projects on their own and the kinds of government-promoted projects that might be eligible, especially those chosen primarily on the basis of development objectives. For example, would infrastructure investments (like refurbishment of public facilities) that reduce energy use and carbon dioxide be eligible, or would the view be taken that the government was obligated to its

citizens to do this anyway so the emission reductions were in some sense not "additional" to what would (or should) have occurred anyway? An even more formidable challenge is deciding whether financial payments from outside investors to encourage policy reforms like a reduction of existing energy price subsidies could be deemed eligible.

These kinds of issues underscore that concerns about the CDM cannot be divorced from the larger ongoing debate about foreign investment and financial assistance in developing countries. Developing countries have worried that the developed world would simply relabel existing foreign aid and call it support for the CDM, rather than providing new resources to help stimulate emissions limits. However, this issue is



fading somewhat in importance as direct assistance to developing countries is declining anyway and is being superseded by private investment. Foreign trade and investment are increasing worldwide, though some countries embrace it more warmly than others. Developing countries now seem more concerned with whether foreign private investment will serve their own needs in practice, given the relatively weak institutions for oversight in a number of developing countries.

Environmental Integrity and Cost-Effectiveness

Another long-standing CDM debate has been over the integrity of the resulting credits. Because the reductions are measured against an inherently counterfactual baseline of what otherwise might have been, how can we be sure that we are not awarding "phantom" credits? A related question is how can we be sure that, whatever baseline is assigned, the proposed reductions from projects actually occur?

There are no perfect answers to these questions; the mechanism is inherently "leaky." The degree of potential error from misspecifying the baseline before the fact, or awarding unearned credits after the fact, can be reduced by greater project-by-project scrutiny. But this level of scrutiny would greatly increase the costs to project participants and reduce the economic viability of projects, especially smaller-scale investments that may be of particular importance to the least developed countries.

One consequence of this would be to deprive developing countries of potential benefits they would have received, thereby limiting the opportunity for a large-scale technological transfer from industrialized to developing countries. Moreover, industrialized countries would have fewer opportunities to take advantage of the most cost-effective means of reducing emissions. By driving up the cost of abatement, this could reduce support for the Protocol in some industrialized countries.

There are a number of possible approaches for addressing these issues. They include establishing general versus project-specific baselines, perhaps with periodic revision of baseline rules according to known

rules; spot checking of project performance after the fact, with more rapid crediting for those participants that undertake more diligent oversight; and some form of shared liability between host country and any foreign investors for the failure of a project to produce the credits promised. A period of experimentation is needed to test out different approaches. It is important that international negotiators agree on some approaches and allow this experimentation to begin.

Broader Policy Linkages

Finally, concerns were expressed in Bonn and in other venues about how the CDM relates to other aspects of the Kyoto Protocol. For example, the CDM is part of the larger debate over whether there should be limits on the use of this and other "flexibility mechanisms," as espoused by the European Union and some developing countries, and opposed vigorously by the United States and some others. And some developing countries continue to worry that participation in the CDM now could prejudice their position in future negotiations about national greenhouse gas limits.

Without expressing a view here on the merits of these various points, we simply note again that under the Kyoto Protocol it was supposed to be possible to start accumulating CDM credits in 2000. While far from perfect, this mechanism does seem to have considerable promise for lowering industrialized countries' compliance costs, providing tangible economic and environmental benefits to developing countries, and enhancing the international flow of climate-friendly technology in a way that could slow global emissions growth in the future. We therefore believe that progress on an implementing framework for the CDM is urgently needed, even while larger issues surrounding international climate policy are thrashed out. There is much to be gained from letting the experimentation begin.

Mike Toman is a senior fellow and director of the Climate Economics and Policy Program at RFF. Jean-Charles Hourcade is the research director of the Centre International de Recherche sur l'Environnement et le Développement (CIRED-CNRS), France.



INSIDE RFF

Sedjo Appointed President of Environmental Literacy Council

Roger A. Sedjo, senior fellow of the Energy and Natural Resources Division and director of the Forest Economics and Policy Program at Resources for the Future, has recently been appointed president of the Environmental Literacy Council.

Dedicated to improving the quality of environmental materials reaching educators, teachers, and students—particularly from a scientific and economic standpoint—the Environmental Literacy Council is a nonprofit organization comprised of experts from the science, social science, and education communities who work on projects related to environmental education.

The Council hosts a Web site (www.enviroliteracy.org) that provides a wealth of links to informative environmental resources available on the Internet. In addition, the Council evaluates textbooks to help publishers and teachers make informed decisions when choosing effective teaching materials. ☰

RFF Board Member Robert Solow Wins Nation's Highest Science Honor

President Clinton has awarded RFF Board Member Robert M. Solow the National Medal of Science, which the White House characterized as “the nation's highest science honor.”

The National Medal of Science, established by Congress in 1959 and administered by the National Science Foundation, honors individuals for contributions to the present state of knowledge across a variety of scientific disciplines. Including this year's recipients, the medal has been awarded to 374 distinguished scientists and engineers.

Solow, a Nobel Laureate and Institute Professor Emeritus at Massachusetts Institute of Technology, was honored “for creating the modern framework for analyzing the effects of investment and technological progress on economic growth, which has greatly influenced economics and economic policy worldwide.” ☰

Two New Fellows

RFF's Energy and Natural Resources Division has recently hired two new fellows.

Urvashi Narain received her M.A. in Economics from the Delhi School of Economics and Sociology in India and her Ph.D. in Agricultural and Resource Economics from the University of California at Berkeley.

While a graduate student at Berkeley, Urvashi worked as a research assistant on projects focusing on community forestry in India and global climate change. As a postdoctoral researcher, Urvashi worked on a project to study the relationship between natu-



Urvashi Narain

ral resource quality and human fertility decisions.

At RFF, Urvashi plans on continuing her research on global climate change and issues at the intersection of environment and development. She will also analyze common property resource management, the environmental Kuznets curve, and child labor.

Ramanan Laxminarayan comes to RFF from the University of Washington, where he held the position of Sloan Dissertation Fellow in the Department of Economics and worked as an instructor in the Department of Interdisciplinary Arts and Sciences. Additional work experience includes a stint as a consultant for the World Bank in Cambodia.

At RFF, Ramanan will continue his research in the area of “resistance economics,” specifically as it pertains to problems dealing with bacterial resistance to antibiotics and pest resistance to genetically modified crops.

His other research interests



Ramanan Laxminarayan

lie in the intersection of environmental quality and public health, including social and environmental determinants of infectious disease transmission within households and villages, and valuing health costs of air and water pollution.

Ramanan received his undergraduate degree in engineering from the Birla Institute of Technology and Science in Pilani, India. He received both his master's degree in public health in epidemiology and his Ph.D. in economics from the University of Washington in Seattle. ☰



INTERVIEW

Last issue, Resources wrote about the difficult regulatory issues that arise due to the drift of ground-level ozone across state lines. This issue, we follow up by interviewing Mary Gade, who was chair of the Ozone Transport Assessment Group (OTAG), an unprecedented venture in federal-state environmental cooperation. Bringing together the federal EPA, 37 state governments, and industrial and environmental organizations, OTAG mapped and quantified the movement of ozone to provide a base for national policy. Ms. Gade, who now practices law in Chicago, is a member of RFF's board. The interviewer is J. W. Anderson, RFF's journalist in residence.

Q: OTAG was a unique federal-state experiment. What did it achieve?

Gade: It achieved something that had never been done before in this country. It established a technical database for a difficult scientific problem and did it collaboratively so that it actually had the support of industry, the environmental community, and the government. And because of that database, the group was able to assess control measures and strategies to address this problem of ozone transport.

Q: Interstate transport is inherent in a lot of pollution control policies, particularly air, particularly water. Is OTAG a good precedent for other interstate problems with pollution?

Gade: It's an outstanding model for many of the environmental problems that we are going to face in the future: not just air problems—anything that crosses state boundaries or regional boundaries. It's going to be incredibly important as a model for issues like regional haze, mercury, issues in the Clean Air Act like new source review—issues in which people have a lot at stake.

Q: As chair of OTAG, you were presiding over a big roomful of people representing very different interests. What were the problems in running OTAG?

Gade: Surprisingly, there were not as many

problems as you would think. And I can say that as chair, because I had such excellent people working with me to help run this behemoth organization. I had superb help from people like Bob Shinn, the environment commissioner for the state of New Jersey, who took over the modeling and assessment effort, the technical side of



Mary Gade

the equations; and Don Schregardus, the Ohio commissioner, who took up the control and strategy approach; and all the people who worked under them.

But it was a huge logistical problem. One of the things that was a hallmark of

OTAG, and something I recommend strongly to those who take up this kind of effort in the future, is that it was considered open in every respect. There were no secret meetings; there were no forums in which people were excluded from the action.

So consequently we spent literally hundreds of thousands of dollars a month on conference calls in which any person could join. We spent lots of money doing transcripts of meetings so that they could be put up on a Web site and anybody could find out what was going on, to ensure the openness of the process.

Q: Was OTAG a success?

Gade: Absolutely. It was a huge success. OTAG commenced its work in May of 1995 and concluded it in the first week of June 1997. So within a two-year span it did this immense amount of scientific research and an immense amount of pulling together technical and economic analyses of control measures. But its mission was directed at the one-hour [national ambient air quality] standard [for ozone], the 120 parts per billion standard. And one month after OTAG completed its work [the United States Environmental Protection Agency] in essence changed the entire universe and proposed an eight-hour standard at 80 parts per billion.

Q: During the process, some of the people who were taking part expressed concerns

that EPA at the end of the day would take your technical results and simply dismiss your policy recommendations. Did the EPA keep faith with this process?

Gade: That's a very difficult question, and the reason it's difficult is because the entire framework switched the moment EPA proposed a different standard. We had quite conscientiously and persistently kept the dialogue to the one-hour standard. Even when EPA started making noises that they were going to be recommending an eight-hour standard, and actually discussed at OTAG meetings some of the health effect issues and the questions about where they would put that standard, OTAG single-mindedly adhered to the mission in its charter, which was to try to find mechanisms for meeting the one-hour statutory requirements. So I continue to be saddened, I guess, by the fact that we never got to find out whether EPA would have adhered to the recommendations we made in OTAG, and whether they would have worked, whether the various entities that had collaborated and agreed with this process would have continued to collaborate and allow it to move forward. But we will just never know, and that's the problem.

Oh, by the way, I don't think there was any Machiavellian scheme.

Q: It was simply that one standard was overtaken by another on a different track?

Gade: Precisely.

Q: What advice would you have to another OTAG experiment in dealing with interstate pollution, other than maintaining openness?

Gade: I really think it is key to identify the stakeholders, the interest groups that need to participate, and make sure that you facilitate that. One aspect that was very

important in OTAG was making sure that the environmental community was represented and could afford to be represented. It was hard for the environmental community because there were so many meetings taking place. Literally there would be dozens in any given month on various important topics and for the environmental community it was very difficult to participate in all of them. That's something that has to be addressed the next time this kind of large effort is undertaken. We did try.

One of the things I think was good about OTAG was that it not only pulled in the national environmental groups: we made a concerted effort to pull in grass roots groups that would be representative. We had people from Wisconsin, we had people from the Northeastern states at these meetings, and I think that's really important.

But another thing to understand is that although government may be taking the leadership role, it becomes essential actually to allow, and meaningfully allow, industry to participate. I got excited at the point in OTAG when industry started running with things.

Q: The transport turned out not to be as long-distance as many people had thought and argued going into this.

Gade: I think it was one of the incredibly important things that came out of it. Some people want to say, "Oh, it was a bunch of noise for nothing." It's not true.

Q: The upshot is that we have a good series of recommendations that EPA did not quite follow. How important are those variations? EPA has gone to a slightly more restrictive standard and it cut off the last round of modeling that you recommended. How important was that?

Gade: That was really significant to the trust and faith element of this whole thing. It was those two things that you just men-

tioned that in some ways were the reason we were able to achieve consensus on such a difficult issue. The Northeast desperately wanted the most stringent standard uniformly across the domain, across the states that were participating in this. But it was willing to concede that perhaps the South and the Midwest might actually have different numbers [for power plants' emissions limits]. That was an immense achievement.

At the same time, it was equally difficult for the South, who had, based on their analyses, their own concerns. They were convinced that they didn't want to be connected with anything that had that most stringent number in it. For them to concede that yes, perhaps others had to do that, and to put themselves in that same basket was a huge concession. And so when EPA, several months after OTAG completed its work, said it's a uniform number across the entire domain of 22 states that we are regulating and that is the most stringent number, and, by the way, forget all that regional modeling and state modeling you were going to do to refine this data—that was extremely disappointing.

Q: What can RFF do usefully as this process goes on, of interstate analysis and increasing reliance on scientific data on which to base recommendations?

Gade: One of the most impressive things about RFF is its economic grasp of these difficult policy and technical issues. And OTAG could have really benefited from input from such sophisticated groups as RFF when we were considering the possible control strategies—ones that were currently in place, ones that were anticipated. It would have been immensely complicated to do a matrix to try to put values on them and compare costs, a Herculean effort. But I think we could have really benefited from further analysis and some better parameters to frame those kinds of decisions for policymakers. ☺

**DEVELOPMENT**

The generous financial support of our many donors and contributors enables us to fulfill our mission to conduct independent, objective, and nonpartisan research and policy analysis. We are honored to recognize our many generous benefactors for their contributions in 1999, and would like to extend a special thank you to the members of the RFF Council.

Council membership is extended to those organizations that provide \$25,000 annually and individuals who contribute at least \$5,000 annually to RFF. Members receive complimentary copies of all RFF publications and invitations to both public and members-only events, including the semi-annual Council meetings. Beyond regularly scheduled events, Council members meet informally with RFF staff members on issues of importance to their business and civic interests and participate on RFF advisory boards. If you would like more information on the RFF Council and how you can become involved, please contact Russell Ray at 202-328-5154 or ray@rff.org.

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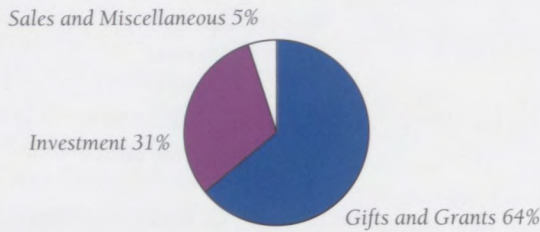
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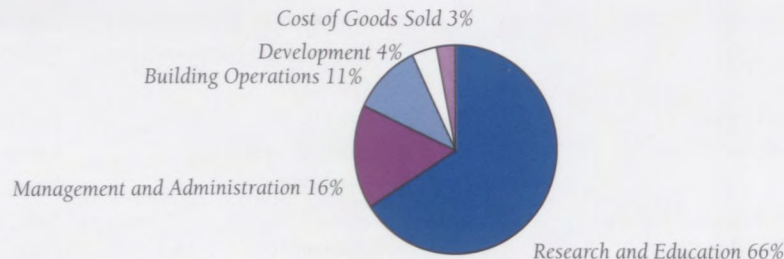
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