

Harnessing MARKET FORCES to Protect the Environment

By Robert N. Stavins

As we approach the last decade of the twentieth century, the United States and other nations around the world are facing a series of increasingly difficult and perilous environmental challenges. These challenges range from global climate change to widespread indoor air pollution, from stratospheric ozone depletion and acid rain to urban smog, from infectious wastes washing up on shorelines to invisible contamination of underground water supplies, and from the degradation of public lands to the sedimentation of streams.

To address these and other problems, Senator Timothy Wirth (D-Colo.) and Senator John Heinz (R-Pa.) initiated and sponsored Project 88, a bipartisan effort to find innovative solutions to major environmental and natural resource problems. A 50-member team

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drawn from academia, industry, the environmental community, and government worked on the Project 88 report, "Harnessing Market Forces to Protect Our Environment: Initiatives for the New President."¹ The report describes a variety of innovative measures designed to enlist the forces of the marketplace and the ingenuity of entrepreneurs to help deter pollution and reduce degradation of natural resources. The report emphasizes the practical employment of economic forces to achieve increased protection of the environment at a lower cost to society. The senators' sponsorship of the study has conferred a new political legitimacy on economic-incentive-based approaches to environmental problems.

At one time, only economists in academia, government, and the private sector gave serious consideration to market-oriented environmental-protection policies. A new environmentalism has now emerged that embraces such approaches.² Although the Environmental Defense Fund was the first of the major environmental organizations to advo-

cate incentive-based policies, other groups are now becoming interested in these approaches.³

The Project 88 report does not propose a free market in the environment. The study does recommend, however, that once tough environmental goals are set, mechanisms that take advantage of marketplace forces should be designed to achieve these goals. In order to concentrate on that design task, the Project 88 report steps away from ongoing debates over specific environmental stan-

dards and focuses instead on finding better mechanisms for achieving whatever standards are set. In their foreword to the report, Senators Wirth and Heinz state:

New directions are needed in the ways we think about managing our environment and natural resources and the ways we allocate responsibility for progress. Especially now, as a new Administration and a new Congress organize for action, the rising dangers to our environment and our heightened awareness of these threats call for new thinking, new inquiry, and, above all, new

approaches. Project 88 is a response to that need.

The specific policy recommendations in the Project 88 report are neither panaceas nor, in many cases, definitive answers to the problems considered. While the senators do not necessarily endorse every idea presented in the report, they have indicated that these ideas deserve serious and timely consideration. Because environmental issues continue to rank high among the priorities of Americans of all political persuasions, the

PREVIOUS USE OF ECONOMIC INCENTIVES FOR ENVIRONMENTAL PROTECTION

Economic-incentive approaches for environmental protection have been implemented on a limited scale in the United States and several European nations. These experiences can be used to develop improved policies.

EPA's Emissions Trading Program

In 1974, the U.S. Environmental Protection Agency (EPA) began to experiment with "emissions trading" as part of its program to improve local air quality. Firms that reduce emissions below the level required by law have been allowed to receive "credits" usable against higher emissions elsewhere. Under programs of "netting" and "bubbles," firms have been permitted to "trade" emissions reductions among sources within the firm as long as total, combined emissions have complied with an aggregate limit.

Firms have also traded emissions credits. Under the "offset" program begun in 1976, firms that wish to establish new sources of emissions in areas that do not comply with ambient standards have been required to offset their new emissions by reducing existing emissions by an equal or greater amount. They can do this with their own sources or through agreements with other firms. Finally, under the "banking" program, firms may store earned emission credits for future use, to allow either for internal expansion or for sale of credits to other firms.

Although these programs were codified in EPA's Final Policy Statement on Emissions Trading in 1986,¹ they have not been extensively used. States are not required to use them, and uncertainties about the future course of the programs have made firms reluctant to participate. Nevertheless, companies such as Armco,

Du Pont, USX, and 3M have traded emissions credits, and a limited market for transfers has arisen. Even this degree of participation in EPA's program has resulted in savings of more than \$4 billion in control costs, with no adverse effect on air quality, according to Michael Levin, director of regulatory reform and regulatory innovations at EPA from 1979 to 1988.

The Project 88 report suggests that an opportunity exists to build on this experience in two ways. First, emissions trading could be built into the Clean Air Act, which will be considered for reauthorization during the current session of Congress. This would reduce the uncertainty about the continued operation of the emissions-trading program that severely hampers long-term research and development of new pollution-control technologies. Second, emissions trading could be made an affirmative tool to achieve environmental objectives, building on the experience gained by using it to reduce control costs.

Tradable Permits for Water Pollution Control

Nonpoint sources, particularly from agriculture and urban run-off, now constitute the major U.S. water pollution problem. The experience of Dillon Reservoir, the major source of water for the city of Denver, Colorado, provides an excellent example of a trading approach that works effectively on nonpoint-source water pollution. In past years, nitrogen and phosphorus loading was causing the reservoir to become eutrophic, even though point sources from surrounding communities were controlled to "best-available-technology" standards. To pre-

serve and protect water quality in the face of rapid population growth, EPA and the state of Colorado jointly developed a "point/nonpoint-source control optimization" program to cut the phosphorus flows that mainly came from nonpoint urban and agricultural sources.

The point/nonpoint-source trading plan was developed with the active participation of environmental groups, industry, and local and state governments, and was approved in 1984 by the Colorado legislature and EPA. The program allows for publicly owned sewage treatment works (POTWs) to finance the control of nonpoint sources in lieu of upgrading their own treated effluent to drinking-water standards. The program is effective because the cost per pound of phosphorus removed via trading is \$67; the cheapest advanced treatment alternative developed for the POTWs would cost \$824 per pound. EPA has estimated that the plan has made aggregate savings of more than \$1 million per year, compared with the conventional workings of four fairly small POTWs. Furthermore, to provide a margin of safety, a 2-to-1 ratio on trades is used, requiring control over a minimum of two pounds of nonpoint phosphorus for one pound of credit for a point source. As a result, the plan not only saves money but increases the likelihood of achieving environmental improvements. The same type of program is currently being developed for nutrients and other pollutants at other sites in Colorado and elsewhere.

Innovative Water Transfers

One effective approach to water supply problems is to allow the voluntary exchange of water rights to increase effi-

new administration has the opportunity to forge a strong bipartisan consensus in favor of sensible environmental protection, wise use of natural resources, and protection of the public's health.

Context of Project 88

In the United States, policies on the environment and natural resources have evolved over the past two decades in response to an array of perceived threats. Now, new dangers have arisen,⁴ the cost

of enforcing existing policies has escalated, and the issue of how to share that burden has become a brake on urgently needed action. It is increasingly unlikely that we can improve environmental protection simply by spending more money on programs and policies already in place.⁵ Moreover, the focus of the Project 88 report is much broader than budgetary problems: The costs to the economy of environmental compliance are, as a whole, very high.⁶ It is therefore important to ensure that investment in en-

vironmental protection is cost effective if the United States is to build and maintain both international competitive strength and a better environment. The most promising approach is to harness market forces to spur both technological advance and sustainable management of natural resources.

The Project 88 report looks at ways to channel the forces of the marketplace into environmental programs and to use economic incentives (and disincentives) to make the everyday economic decisions of individuals, businesses, and government work effectively for the environment. The report does not endorse setting environmental goals by the use of economic criteria. It does not recommend using benefit-cost analysis or setting dollar values on environmental amenities or on human health. Indeed, for the most part, the report eschews judgments on goals and standards. These are important questions, but ongoing debates over specific environmental standards need to be set aside to carry out a separate examination of effective mechanisms for environmental protection.

Where mechanisms can be developed to make environmental goals part of economic decisions, the strong forces of the marketplace can work to reduce the costs of compliance and enlist the innovative capacity of entrepreneurs. The various recommendations in the Project 88 report are thus designed to increase environmental protection and economic productivity by providing incentives for businesses and individuals to go beyond what regulators can require.

It will be complicated and difficult to develop such proposals in detail and put them into action, but this challenge must be met. Public demand for environmental protection is strong and deep.⁷ Yet it is unlikely that either the federal government or our economy as a whole will be able to afford higher environmental standards unless we seek out means to get the most protection possible for every dollar. The conventional approach of setting uniform standards or requiring specific control technologies is an increasingly difficult and ex-

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ciency—most notably by creating economic incentives for water conservation. In the Imperial Irrigation District (IID) of California, farmers are paying as little as \$10 for enough water to irrigate an acre of cotton, while a few hundred miles away in Los Angeles local authorities of the Metropolitan Water District (MWD) are paying up to \$200 for the same quantity of water. A free market in water rights, allowing voluntary exchanges, would help both parties: Farmers would have a financial stake in conserving water, urban needs would be met without shrinking agriculture and without building new dams and reservoirs, and environmental protection would improve.

In March 1983, the Environmental Defense Fund (EDF) published a proposal calling for MWD to finance the modernization of IID's water system in exchange for use of conserved water.² In November 1988, after five years of negotiation, the two water giants agreed on a \$230 million water conservation and transfer arrangement,³ much like EDF's original proposal to trade conservation investments for water.

Could this southern California water swap be the harbinger of more enlightened western water policy? EDF attorney Tom Graff thinks so:

A voluntarily arrived at conservation deal in this context shows that it can be done on a significant scale. It opens the way for similar agreements elsewhere in California and for that matter throughout the west.

Graff's optimism is validated by reports of greatly increased interest in water marketing in Colorado, New Mexico, Arizona, Nevada, Utah, and California.⁴

Other Examples

Although increased attention on a national level has only been given to incentive-based environmental protection strategies during the past six months, additional examples exist of policies already in operation. Among these are EPA's tradable permit system for implementing the Montreal Protocol's stratospheric ozone-depletion restrictions and some experimental use of comprehensive least-cost bidding by electrical utilities.⁵ In addition, the Project 88 report's recommendation for a deposit-refund system for the management of containerized hazardous waste has ample precedent in the "bottle bills" enacted in a number of states. Finally, it should be noted that several European nations, including West Germany, France, and the Netherlands, have had substantial experience with the use of emission fees for the control of point-source water pollution.

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1. U.S. Environmental Protection Agency, "Emissions Trading Policy Statement: General Principles for Creation, Banking, and Use of Emission Reduction Credits," 51 Fed. Reg. 43814, 4 December 1986.

2. Robert N. Stavins and Zach Willey, "Trading Conservation Investments for Water," in R. J. Charbeneau, ed., *Regional and State Water Resources Planning and Management* (Bethesda, Md.: American Water Resources Association, 1983), 223-30.

3. Willy Morris, "IID Approves State's First Water Swap with MWD," *Imperial Valley Press*, 9 November 1988.

4. Sandra D. Atchison, "Where Water is Money in the Bank," *Business Week*, 15 August 1988, 50.

5. Maine held one such auction in 1988; Massachusetts and New York have announced their intentions to hold similar auctions soon.

Economic Incentives

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pensive way to achieve environmental improvements. Market forces can supplement the regulatory power of the government and create a setting for private-sector innovation and initiative in the pursuit of environmental quality.

Identifying Innovative Solutions

The Project 88 report considers a variety of possible policy responses to each of 13 major environmental and natural resource problems. Alternative policies were assessed according to nine major criteria:⁸

- Will the policy effectively achieve our environmental goals?
- Will the approach be cost effective; that is, will it achieve the environmental goals at the least cost (to society at large)?
- Will the policy provide relevant government agencies with the information they need?
- How easy (or costly) will monitoring and enforcement be?
- Will the policy be flexible in the face of change? When changes occur in tastes, technology, or resource use, will the policy accommodate these changes and remain effective or will it be in danger of becoming ineffective (or even counterproductive)?
- Will the policy give industry positive, dynamic incentives? For example, will it encourage firms to develop new, environment-saving technologies or encourage firms to retain existing, inefficient plants?
- Will the economic effects of the policy be equitably distributed?
- Will the purpose and nature of the policy be broadly understandable to the general public?
- Will the policy be truly feasible, in terms both of enactment by Congress and of implementation by the appropriate departments or agencies?

Based upon these criteria, effective new approaches to recognized problems were identified.

Common Threads

Consideration of the problem areas addressed led not only to specific recommendations but also to two more general policy conclusions: (1) because many environmental problems are interrelated, some of the most effective policies can help with several problems simultaneously; and (2) while conventional regulatory approaches have been effective, they need to be supplemented.

Inefficient natural resource use and environmental degradation can be reduced if consumers and producers face the true costs of their decisions—not just their direct costs, but the full social costs of the consequences of their actions. Economic-incentive systems provide various ways to do this: tradable permits for industrial pollutants; pollution charges; deposit-refund systems for containerized hazardous wastes; least-cost bidding at utilities for greater energy efficiency; removal of market barriers that promote inefficient resource use; and removal of unwarranted subsidies of environmentally destructive activities.

Charge systems impose a fee or tax on pollution, while tradable permit systems set a total allowable level of pollution and authorize firms to conduct market exchanges of permits. A pollution charge works simply: When the polluter pays, it is to the polluter's advantage to clean up. Tradable permit systems are generally preferable to pollution taxes. In the case of taxes, it is difficult to estimate how large a tax will result in how much cleanup, but with permits, it is possible to decide how much pollution is the limit, and then issue permits for only that amount. Such systems do not have to begin or stay at the status quo; permits can first be issued for some fraction of current emissions and permit holders can be given a deadline to reach that limit. Permits can also be designed to move toward stricter standards.

At a time of concern about international competitiveness, such incentive-based approaches can provide huge savings and increases in productivity. For example, a market-based approach to acid rain reduction could save \$3 billion

per year, compared with the cost of a dictated technological solution.⁹ In addition, incentive-based approaches need not cost the government more to administer than conventional, regulatory methods. Funds from tradable-permit auctions could, indeed, be used to help finance a bigger budget for the U.S. Environmental Protection Agency (EPA).¹⁰ Such systems also provide incentives for one firm to monitor activities of other pollutant-emitting firms—another manifestation of the discipline of a competitive market. This is not to suggest, however, that environmental protection can be achieved without significant government expenditures, since no program of controls can be effective without a commitment by government to monitoring and enforcement.

Most importantly, economic-incentive approaches allow greater levels of protection for any given aggregate cost of control. Rather than dictating to enterprises how they should manufacture their products, incentive-based systems impose a cost on pollution-causing activities, and individual firms are left to decide for themselves how to achieve the required level of environmental protection. Market forces will drive these deci-





Phasing out chlorofluorocarbons and other potential ozone-depleting chemicals with tradable permits is one recommendation of the Project 88 report. (Photo: Randy Ball)

and build step-by-step on the initiatives of the United States and other industrialized nations with market-based policies.¹¹ Clearly, market-oriented policies will not fit every problem; the best set of policies will involve a mix of market and more conventional regulatory processes.

Project 88 Recommendations

The policies recommended in the Project 88 report are practical and politically feasible. New policies that deliver improved environmental quality at reasonable cost and are consistent with U.S. traditions favoring voluntarism over government coercion should have a promising future.

The full report offers 36 policy recommendations for 13 major environmental and natural resource problems. Samples of those recommendations are briefly summarized below.

The Greenhouse Effect

The global climate change that is anticipated to occur during the next several decades is attributed to the greenhouse effect, associated with emissions of carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons (CFCs). It has been predicted that global temperature increases caused by the greenhouse effect may produce climate changes unprecedented for their speed of occurrence, including massive changes in global precipitation patterns, storm intensities, and ocean levels.¹² The report's recommendations include:

- *Funding research on causes and consequences of global warming and on specific adaptation and prevention strategies.* Increased federal support of basic scientific research on the greenhouse effect and climate change is needed. The long-term goal should be to identify the most effective, efficient, and politically

viable strategies, whether based upon prevention, adaptation, or on some combination of the two approaches.

Stratospheric Ozone Depletion

Anthropogenic emissions of CFCs and other potential ozone depleting (POD) chemicals are causing the depletion of stratospheric ozone. As a result, increased ultraviolet radiation will reach the Earth's surface, potentially elevating human skin-cancer incidence; promoting cataracts; suppressing immune responses; and causing other adverse effects to animals, plants, and valuable materials. The report's recommendations include:

- *Phasing out potential ozone depleters with tradable permits.* To implement the restrictions set by the Montreal Protocol to the 1985 Vienna Convention for the Protection of the Ozone Layer, EPA has promulgated a system of nationwide tradable permits in order to achieve specified control levels at far less cost and with less disruption than would be caused by direct bans or controls. This market-based approach will stimulate firms to adopt measures tailored to specific circumstances and will provide industry with incentives to develop substitute chemicals, industrial processes, and consumer products.¹³

Local Air Pollution

As a result of 20 years of federal attention to local air pollution problems, air quality has substantially improved in most parts of the United States. Nevertheless, more than 100 million U.S. residents are still exposed to excessive smog (ambient ozone) levels and some 70 urban areas still lack adequate local plans to reduce these levels. The report's recommendations include:

- *Implementing tradable permits for stationary sources.* EPA's initiatives with "emissions trading," whereby firms that reduce emissions below the level required by law receive "credits" that can be used to allow greater emissions elsewhere, have already saved the country an estimated \$5 billion in the cost of air pollution control over the last several years, with equal or better environmental progress, according to the

sions toward least-cost solutions and toward the development of new pollution-control technologies and expertise by the private sector.

Incentive-based approaches have an added benefit; they can make the environmental debate more understandable to the general public. Because they do not dictate a particular technology, these approaches can focus attention directly on what our environmental goals should be rather than on difficult technical questions concerning technological alternatives for reaching those goals.

When market forces are utilized to achieve environmental goals, market barriers and government subsidies that promote economically inefficient and environmentally unsound practices must be eliminated. By removing these obstacles, it is possible simultaneously to foster environmental protection, promote a stronger, more competitive economy, and reduce government budget deficits. But in removing unwarranted subsidies the federal government should not abandon to the marketplace all provision of goods and services.

If we are to design and implement economic-incentive programs, we must adapt, not abandon, present programs

Because the detailed evolution of the expected changes cannot at present be predicted, *policies should seek to enhance the resilience, robustness, and range of options of the sectors likely to be affected.*

... Options for adaptation are numerous for rich, technologically advanced nations ... but [are] fewer for poor nations. It will be in the interests of all to assist the poorer nations in reducing their vulnerability to environmental change by developing an effective range of adaptations.

Improving Understanding of Global Environmental Change

We still lack sufficient scientific understanding to predict confidently the detailed evolution of global and regional change in the environment. Obtaining this knowledge will require *strong support for research already under way, nationally and internationally, and support for new long-term programs of interdisciplinary, international research.* Monitoring global change will involve coordinated, long-term observations, both from space and on the ground. Long-term commitments must be made for resources that will make uninterrupted observations possible over the decades to come. ...

- ***Institutional Needs.*** However, current institutions and mechanisms in government and in the scientific community—both in our country and in the international community—need strengthening to assure a strong scientific program for understanding the global environment and developing timely, well-coordinated, and effective policies. *The existing mechanisms for coordination between government agencies are not adequate to address the complex scientific and policy implications of global change.*

Mechanisms exist within the federal government that could play a major role in directing the massive and diverse resources of government on this problem, notably, the interagency Committee on Earth Sciences of the Federal Coordinating Council on Science, Engineering, and Technology. However, effective direction of these governmental resources cannot be achieved solely by the normal processes of interagency coordination. Even more complex issues are posed by the need for collaboration between sovereign nations. Effective leadership and direction in this area is clearly required. The issue of global environmental change must have a prominent place on the scientific, political, and foreign policy agendas of the United States.

U.S. Government Accounting Office.¹⁴ A logical extension is a comprehensive system of marketable emissions permits.¹⁵ Firms that could reduce discharges below their permit levels would be allowed to sell their unused emission permits to others; firms for which compliance would be relatively costly could meet standards by buying additional permits. Under this approach, firms would have continuous financial reasons to reduce emissions beyond (not merely to) required levels. Air quality goals would be achievable at lower overall cost.¹⁶

Acid Rain

The environmental consequences of acid rain appear to be escalating, but with the exception of the Clean Coal Technology Program—research into developing technologies for burning high-sulfur coals with reduced sulfur dioxide emissions—and related programs, Congress has been unable to enact explicit and effective policy responses. Though many factors lie behind this failure, major concerns are cost considerations and attendant social disruption, especially for high-sulfur coal-mining and coal-burning communities in Appalachia and the Midwest. The report's recommendations include:

- ***Initiating an Acid Rain Reduction Credit (ARRC) program.*** This economic-incentive approach to acid-rain control, patterned after EPA's emissions trading program,¹⁷ offers a cost-effective and equitable solution to this seemingly intractable problem. Any companies whose emissions contribute to acid rain could use or sell "excess" reductions of, for example, sulfates, (beyond those required by law) to meet further emission reduction requirements applicable to other sources. With this approach—which would complement, not replace, the traditional approach—acid rain reduction goals could be met at much lower cost than would otherwise be possible, saving up to 50 percent annually (\$3 billion per year), according to EPA.¹⁸ If initial permits were auctioned, revenues could be used both to finance the installation of retrofit and clean-coal

technology through federal cost-sharing arrangements (in areas that currently utilize high-sulfur coal) and to finance research and development for the same technologies. The cost-effectiveness properties of the ARRC program could thus be combined with equitable protection for communities that are economically dependent upon the high-sulfur coal industry.

Indoor Radon Pollution

EPA has identified radon as one of the most serious environmental risks facing the nation, causing between five thousand and twenty thousand deaths from lung cancer each year. Because most radon exposure occurs in private homes, it has not been feasible to use the conventional regulatory approach of setting and enforcing health-based exposure standards.¹⁹ The report's recommendations include:

- Considering a number of possible approaches such as tax incentives, subsidized loans, construction codes, soil tests, testing requirements for real estate transactions, and accelerated dissemination of information.

Energy Security and Environmental Quality

Crude petroleum accounts for over 40 percent of the nation's energy needs; during the past 20 years, an increasing proportion of the crude oil used in the United States has been imported. Attempts to obtain domestic energy security through higher production of fossil fuels will run up against serious environmental problems. Instead, the United States can make significant gains in energy security and environmental protection by pursuing strategies of increased energy efficiency and use of alternative fuels. The report's recommendations include:

- ***Providing incentives for vehicle efficiency and alternative fuels.*** Attention should be given to increasing the efficiency of motor vehicles because the transportation sector almost totally relies on petroleum and its derivatives. Any regulatory initiative should be coupled with a program to increase the tax

on “gas guzzlers,” and use the revenues to provide rebates to purchasers of very efficient vehicles, “gas sippers.”

- *Increasing energy efficiency with comprehensive least-cost bidding at electrical utilities.* Some states have begun to take the market-oriented approach of opening U.S. power markets to allow methods of demand-management to compete head to head with power production. Systems of comprehensive least-cost bidding will substantially increase the efficiency of energy production.²⁰

Water Supplies

If current practices continue, water shortages may become commonplace in the United States during the next two decades. Current policies do not give users appropriate incentives to take actions consistent with the economic and environmental value of water resources. The lack of appropriate incentives results in grossly inefficient use of existing supplies, since decision makers do not experience the true costs of their water-use decisions. The report's recommendations include:

- *Removing barriers to water markets.* Measures that facilitate voluntary water transfers promote more efficient allocation and use of scarce water resources and curb the need for more (expensive and environmentally disruptive) water supply projects.²¹ The government should begin to remove barriers to voluntary water marketing by validating voluntary sales of water and by establishing rules to protect public and other third-party uses of water.²²

Surface and Groundwater Quality

Most water pollution control laws and regulations in the United States have been directed exclusively at point sources, such as factories and municipal waste-treatment facilities. Dispersed, nonpoint sources, including farms and urban run-off, have not yet been adequately addressed, in part because these sources are much more difficult to control, particularly by conventional methods. An increasingly serious problem is the contamination of groundwater supplies by seepage of hazardous chemicals

stored in dump sites and municipal landfills, leaks from underground storage tanks, highway run-off, and infiltration of pesticides and fertilizer residues. The report's recommendations include:

- *Focusing the U.S. Department of Agriculture's Conservation Reserve Program (CRP) on water quality problems.* This would be an important step toward control of nonpoint-source water pollution from agricultural run-off. Eligibility criteria for CRP should be broadened to include lands that are important in terms of water pollution. States and private trusts should be encouraged to pay bonuses above federal contributions to attract lands into the reserve that meet state water-quality goals.²³

- *Implementing tradable discharge permit systems for point sources.* Existing approaches to point-source control, while holding each source to specified limits, do not restrain the total volume of discharges within a basin. Where this is a concern, the establishment of an overall watershed limit and the implementation of tradable permits within it will be the most effective and efficient way of achieving water quality goals.

Public Land Management

The federal lands of the United States contain valuable natural resources, such as timber, minerals, oil, natural gas, and forage for livestock. They also hold a precious endowment of environmental resources, including wilderness, fish and wildlife and their habitats, free-flowing rivers, scenic beauty, outdoor recreational opportunities, and untapped scientific information. At the least, public lands should be managed to provide those benefits that private lands are unlikely to produce in our market economy. Sound management of these public lands is seriously impeded, however, because costly subsidies exist for a few extractive industries at the expense of the public's interests in environmental values and outdoor recreation. The report's recommendations include:

- *Reducing government subsidies.* The largest subsidy, and the one most in conflict with environmental values, is

that given to timber sales in remote, unroaded areas of national forests, particularly in the Rocky Mountains, Alaska, and the East. Low-value timber is frequently sold in areas where building roads to reach and harvest timber is expensive and damages environmental and recreational values.²⁴ Below-cost timber sales (where the Forest Service does not recover the full cost of making timber available) have cost the U.S. Treasury more than \$400 million annually over the past six years. Gradual removal of the subsidies would foster protection of the environment, decrease federal expenditures, and increase net revenues.

Wetland Resources

For 200 years, wetlands have been drained, cleared, and filled for agricultural, municipal, and industrial uses. In their natural state, wetlands also produce significant benefits—regulation of water flows, filtration and purification of water, and provision of habitat for flora and fauna. Wetlands are being lost at an average rate of 450,000 acres annually—an area half the size of Rhode Island. Agriculture accounts for nearly 90 percent of recent conversions. The report's recommendations include:

- *Instituting market incentives to reflect wetland values.* Government subsidies that promote economically inefficient and environmentally unsound development should be removed. Policy initiatives to consider include ending totally subsidized construction of federal flood-control and drainage projects, eliminating favorable tax treatment of wetland conversion, and implementing cross-compliance legislation linked to the receipt of federal commodity program payments.

- *Improving use of environmental impact statements.* Federal flood-control and drainage projects provide financial incentives for private landowners to convert their wetland holdings to dry croplands.²⁵ Such impacts should, therefore, be candidly assessed through the environmental impact statement process. Impact areas must be correctly defined to include all areas that would be affected by subsequent drainage and

clearing and not limited to the area in which the project is constructed.

Solid Waste Management

Throughout the country, old landfills are filling up, and sites for new landfills are becoming increasingly difficult to find. Giant garbage incinerators are bringing with them equally giant bond issues representing burdensome investments for many communities; and now it is becoming clear that incinerators produce their own set of significant environmental hazards. The report's recommendations include:

- *Implementing policies that allow recycling to be competitive.* The vast majority of our garbage is recyclable. The answer to the critical question of whether recycling makes economic sense is that the most important benefits of recycling typically result from a reduction in the quantity of garbage that otherwise must be collected and disposed of, not from revenue from sales of recycled materials.²⁶ If communities are to adopt efficient solutions to their solid waste management problems, recycling must be considered on an equal basis with other alternatives. The bidding process for municipal waste management should be opened to all techniques by specifying outputs and results rather than individual techniques.

Toxic Substances

Although federal legislation nominally encourages toxic-waste source reduction, the actual focus of regulation has been on controlling pollution at the "end of the pipe." The report's recommendations include:

- *Providing incentives for source reduction.* In order to finance the cleanup of hazardous waste sites, the Superfund program imposes a "front-end" tax on the chemical and petroleum industries that is unrelated to the toxicity of products or services. This tax provides no incentive for firms to switch to less hazardous substances or to recycle wastes. A "waste-end" tax could induce industries to reduce the toxicity of their products and processes and could also provide an incentive to consumers to substi-



Extremely difficult hazardous waste problems are posed by wastes generated in quantities small enough to be shipped, stored, or dumped virtually anywhere. (Photo: Environmental Protection Agency)

tute safer products. But waste-end taxes provide incentives for illegal dumping. In some cases, the answer to this quandary will be a deposit-refund system, discussed below. Another approach to source reduction is through labeling requirements, which compel producers to inform consumers about the presence in products of known toxic substances that may present significant risks.²⁷ This approach must be used only in limited cases, however, since excessive labeling may simply cause people to ignore signs or labels that warn of genuine risks.

Hazardous Waste Management

Among the most difficult of hazardous waste problems are those posed by wastes generated in quantities small enough to be stored, shipped, and dumped more or less anywhere in the

environment. The report's recommendations include:

- *Implementing a deposit-refund system for containerized wastes.* The Project 88 report recommends that containerized hazardous waste should be managed by a front-end tax that works as a deposit, with a refund payable when quantities of toxic substances are turned in to designated facilities, whether for recycling or disposal.²⁸ This refund provides three important incentives for toxic management: (1) an incentive to follow rules for proper disposal and to recapture would-be losses from the production process; (2) an incentive for producers to look for nonhazardous substitutes; and (3) an elimination from agencies' monitoring problems of the nearly impossible task of preventing illegal dumping of small quantities of wastes at dispersed sites in the environment.

Toward a New Era

A strong consensus throughout the United States continues to favor effective environmental protection. In many cases, our environmental goals are clear—the question is how to get there. A theme of the Project 88 report is that the choice of policy tools does make a difference.

Although conventional regulatory policies have often worked well, they have also tended to pit economic and environmental goals against each other. These goals should complement one another in the long run if either of them is to be achieved. The Project 88 report deals with this problem by applying economic incentives to the work of environmental protection.

Private-sector innovation, which market-oriented environmental policies will encourage, is essential if the United States is to maintain both economic growth and good environmental quality. In fairness to future generations, we should begin to deal with our long-term problems, both economic and environmental. We need sustainable solutions to today's problems because the debts we incur today—whether economic or environmental—will some day have to be paid.

If Theodore Roosevelt's conservation ethic at the beginning of this century represented the first important era of environmental concern in the United States, then the decade of major new laws and regulations following Earth Day in 1970 was the second era. Our challenge now is to move aggressively into a third era—when practical and economically sensible policies will provide more effective and efficient management of natural resources and protection of the environment. The sponsorship of Project 88 by Senator Timothy Wirth and Senator John Heinz represents an important step in that direction.

ACKNOWLEDGMENT

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NOTES

1. "Project 88: Harnessing Market Forces To Protect our Environment," is available from the offices of Senator Wirth (telephone: 202-224-5852) and Senator Heinz (telephone: 202-224-6324) in Washington, D.C. 20510.
2. See Frederic D. Krupp, "New Environmentalism Factors in Economic Needs," *Wall Street Journal*, 20 November 1986, 34.
3. For a description of Project 88 and other third-wave approaches, see Jeremy Main, "Here Comes the Big Cleanup," *Fortune*, 21 November 1988, 102.
4. A discussion of future environmental challenges can be found in Milton Russell, "Environmental Protection for the 1990s and Beyond," *Environment*, September 1987, 12.
5. Federal expenditures for all environmental and natural resource programs in 1985 were about \$13.4 billion (1.4 percent of all federal outlays). See U.S. Office of Management and Budget, *Budget of the U.S. Government, Historical Tables, Fiscal Year 1987* (Washington, D.C.: U.S. Government Printing Office, 1986); and U.S. Council of Economic Advisors, *Economic Report of the President* (Washington, D.C.: U.S. Government Printing Office, 1986).
6. In 1984, total U.S. expenditures on pollution control amounted to about \$65 billion—63 percent by businesses, 21 percent by all levels of government, and 16 percent by consumers. Total pollution control expenditures were about 1.8 percent of the gross national product. See Kit D. Farber and Gary L. Rutledge, "Pollution Abatement and Control Expenditures," *Survey of Current Business* 66(1986):100-103.
7. Public opinion polls consistently show that public concern over environmental quality has remained firm during energy crises, economic downturns, and tax revolts. See Riley E. Dunlap, "Polls, Pollution, and Politics Revisited: Public Opinion on the Environment in the Reagan Era," *Environment*, July/August 1987, 6; E. C. Ladd, "Clearing the Air: Public Opinion and Public Policy on the Environment," *Public Opinion*, February/March 1982, 16-20; and Richard D. Lamm

- and Thomas A. Barron, "The Environmental Agenda for the Next Administration," *Environment*, May 1988, 17.
8. This set of criteria is partly based upon a similar set of criteria described by Peter Bohm and Clifford S. Russell in "Comparative Analysis of Alternative Policy Instruments," in Allen V. Kneese and James L. Sweeney, eds., *Handbook of Natural Resource and Energy Economics, Volume I* (Amsterdam: North-Holland, 1985), 395-460.
 9. See ICF, Inc., *Analysis of Six and Eight Million Ton 30-Year/NSPS and 30-Year/1.2 Pound Sulfur Dioxide Emission Reduction Cases* (Washington, D.C.: ICF, February 1986; U.S. Congress, Congressional Budget Office, *Curbing Acid Rain: Cost, Budget and Coal-Market Effects* (Washington, D.C.: U.S. Government Printing Office, 1986); and Roger K. Raufer and Stephen L. Feldman, *Acid Rain and Emissions Trading: Implementing a Market Approach to Pollution Control* (Totowa, N.J.: Rowman & Littlefield, 1987).
 10. For further discussion of such possibilities, see Bruce A. Ackerman and Richard B. Stewart, "Reforming Environmental Law: The Democratic Case for Market Incentives," *Columbia Journal of Environmental Law* 13(1988):171-99.
 11. For a description of EPA's experience with incentive-based approaches, see Michael H. Levin, "New Directions in Environmental Policy: The Case for Environmental Incentives," in *Proceedings of Annual Mid-winter Meeting, American Bar Association, Section of Natural Resource Law* (Keystone, Colo.: American Bar Association, 1988). For a brief summary of European nations' experiences with market-oriented environmental-protection systems, see Robert W. Hahn, "Economic Prescriptions for Environmental Problems," School of Urban and Public Affairs, Working Paper 88-4 (Pittsburgh, Pa.: Carnegie Mellon University, 1987).
 12. See Jill Jäger, "Anticipating Climate Change," *Environment*, September 1988, 12; and Daniel J. Dudek, "Assessing the Implications of Changes in Carbon Dioxide Concentrations and Climate for Agriculture in the United States," in *Preparing for Climate Change, Proceedings of the First North American Conference on Preparing for Climate Change: A Cooperative Approach* (Washington, D.C.: Government Institutes, Inc., 1988), 428-50.
 13. For further reading, see J. K. Hammit, *Timing Regulations to Prevent Stratospheric-Ozone Depletion*, R-3495-JMO/RC (Santa Monica, Calif.: The RAND Corporation, April 1987); J. K. Hammit et al., *Product Uses and Market Trends for Potential Ozone-Depleting Substances, 1985-2000* (Santa Monica, Calif.: The RAND Corporation, May 1986); and A. S. Miller and I. M. Mintzer, *The Sky Is the Limit: Strategies for Protecting the Ozone Layer*, Research Report 3 (Washington, D.C.: World Resources Institute, November 1986).
 14. U.S. General Accounting Office, *A Market Approach to Air Pollution Control Could Reduce Compliance Cost Without Jeopardizing Clean Air Goals*, Report PAD-82-15 (Washington, D.C.: U.S. General Accounting Office, 1982). For an examination of EPA's experience, see Richard A. Liroff, *Reforming Air Pollution Regulations: The Toil and Trouble of EPA's Bubble* (Washington, D.C.: The Conservation Foundation, 1986). Shortcomings in EPA's original emission trading rules have largely been remedied; on this point, see Daniel J. Dudek and John Palmisano, "Emissions Trading: Why Is This Thoroughbred Hobbled?" *Columbia Journal of Environmental Law* 13(1988):217-56.
 15. For further discussion, see Robert W. Hahn, "Innovative Approaches for Revising the Clean Air Act," *Natural Resources Journal* 28(1988):171-88.
 16. Some environmental groups have expressed concerns regarding emissions trading and similar incentive-based approaches. For a comprehensive response, see Richard B. Stewart, "Controlling Environmental Risks through Economic Incentives," *Columbia Journal of Environmental Law* 13(1988):153-69.

17. See Tom Tietenberg, *Emissions Trading: An Exercise in Reforming Pollution Policy* (Washington, D.C.: Resources for the Future, 1985).
18. See ICF, Inc.; U.S. Congress, Congressional Budget Office; Raufer and Feldman, note 9 above.
19. Additional sources of information on indoor radon pollution include: U.S. Environmental Protection Agency, Office of Air and Radiation, U.S. Department of Health and Human Services, and Centers for Disease Control, *A Citizen's Guide to Radon: What It Is and What To Do About It*, OPA 86-004 (Washington, D.C.: U.S. Government Printing Office, 1986); U.S. General Accounting Office, "Indoor Radon: Limited Federal Response to Reduce Contamination in Housing," GAO/RCED-88-103 (Washington, D.C.: U.S. Government Printing Office, 1988); F. Reed Johnson and Ralph A. Luken, "Radon Risk Information and Voluntary Protection: Evidence from a Natural Experiment," *Risk Analysis* 7(1987):97-107; V. Kerry Smith, William H. Desvousges, Ann Fisher, and F. Reed Johnson, "Communicating Radon Risk Effectively: A Mid-Course Evaluation," EPA-230-07-87-029 (Washington, D.C.: U.S. Environmental Protection Agency, 1987); and "Radon: Reports from States," *Environment*, January/February and March 1987.
20. In order to provide the proper incentives for energy conservation programs and an appropriate basis for the comparison of demand-side programs with conventional supply-side options, it is important that an "unbundled bidding system" be used. See Charles Cicchetti and William Hogan, *Including Unbundled Demand Side Options in Electric Utility Bidding Programs*, Energy and Environmental Policy Center Discussion Paper E-88-07 (Cambridge, Mass.: Harvard University, August 1988).
21. See Robert N. Stavins and Zach Willey, "Trading Conservation Investments for Water," in R. J. Charbeneau, ed., *Regional and State Water Resources Planning and Management* (Bethesda, Md.: American Water Resources Association, 1983), 223-30.
22. For further discussion of some of these ideas, see Zach Willey and Tom Graff, "Federal Water Policy in the United States—An Agenda for Economic and Environmental Reform," *Columbia Journal of Environmental Law* 13(1988):325-56. Proposals for institutional reform are provided by Charles H. W. Foster and Peter P. Rogers, *Federal Water Policy: Toward an Agenda for Action*, Energy and Environmental Policy Center Discussion Paper E-88-05 (Cambridge, Mass.: Harvard University, August 1988).
23. See Tim Phipps, "The Conservation Reserve: A One Year Progress Report," *Resources*, Winter 1987.
24. See H. Michael Anderson and Craig Gehrke, *National Forests, Policies for the Future: Volume 1, Water Quality and Timber Management* (Washington, D.C.: The Wilderness Society, 1988); and David S. Wilcove, *National Forests, Policies for the Future: Volume 2, Protecting Biological Diversity* (Washington, D.C.: The Wilderness Society, 1988).
25. For an analysis of how federal programs and projects provide economic incentives for private landowners to convert their forested wetlands to agricultural cropland, see Robert N. Stavins and Adam B. Jaffe, *Forested Wetland Depletion in the United States: An Analysis of Unintended Consequences of Federal Policy and Programs*, Energy and Environmental Policy Center Discussion Paper E-88-08 (Cambridge, Mass.: Harvard University, December 1988).
26. Environmental Defense Fund, *Coming Full Circle: Successful Recycling Today* (New York: Environmental Defense Fund, 1988).
27. See David Roe, "Barking Up the Right Tree: Recent Progress in Focusing the Toxics Issue," *Columbia Journal of Environmental Law* 13(1988):275-83; and Melinda Haag, "Proposition 65's Right-To-Know Provision: Can It Keep Its Promise to California Voters?" *Ecology Law Quarterly* 14(1987):685-712.
28. For further discussion of this proposal, see Clifford S. Russell, "Economic Incentives in the Management of Hazardous Wastes," *Columbia Journal of Environmental Law* 13(1988):257-74.