

CHAPTER 5

Economic Efficiency and Regulatory Reform

OUR LIVING STANDARDS depend on more than just our monetary income. We benefit from open spaces and clean rivers and lakes. We gain a sense of security from safer airplanes, cars, food, and toys for our children. We benefit from safer workplaces and from safer financial institutions.

Over the years the U.S. Government has enacted a number of laws and issued a number of regulations designed to protect consumers, workers, and investors. These efforts are important for improving our environment, public health, and safety. Reducing the corrosion of factory equipment by polluted water, or the loss of agricultural productivity due to air pollution, also lowers business costs. In some cases, efforts to correct environmental or safety problems may stimulate other productivity improvements.

But regulation also inevitably imposes costs, and these can be substantial. They include not only direct expenditures to enforce and comply with regulation, but also indirect costs, such as loss of flexibility and choice for consumers and businesses, diversion of investment from other productive activities, and delays in redeveloping inner cities where hazardous waste sites are located.

To best serve the public interest, regulation should impose the least burden necessary to achieve its objective, and its benefits should justify its costs. A major theme of this Administration has been *reinventing regulation*: taking a new look at regulation and the regulatory process to ensure that regulations meet legitimate social needs, and where necessary changing both content and process to improve efficiency and effectiveness.

This chapter begins by surveying the broad and continuing debate over the scope and design of regulation. It identifies the rationales for regulation and the basic principles of effective and efficient regulation of threats to human health, safety, and the environment. The balance of the chapter then illustrates the application of these principles in the context of ongoing efforts to restructure regulations affecting the environment and natural resources.

RATIONALES FOR GOVERNMENT REGULATION

The fundamental strength of a market economy is that the pursuit of private gain serves the public interest by stimulating efficiency and innovation. But private gain and public interest are not always so firmly tethered: they can and do diverge. In the absence of regulation, polluters do not have an incentive to pay adequate attention to the environmental damage they cause. Workplaces may be unsafe. Consumers may be unwittingly exposed to defective or unsafe products and services.

Economists refer to such divergences between public and private interest as *externalities*, because in each case the amount paid for a good or service fails to reflect its full cost to society—some costs remain “external” to the transaction. Externalities are a form of *market failure*. Government action is needed to correct this market failure, by confronting economic actors with the full costs of their behavior. Correcting externalities improves economic efficiency and the quality of life. The United States has long used regulations as a way of better aligning public and private interests within the market. For example, legislation in the area of food and drug safety was enacted in the 1930s. Internalization of externalities is an important role of government in modern society, to be set alongside the provision of public goods like national defense and the maintenance of a social safety net.

Although this chapter focuses on regulation, governments have a variety of other tools to address market failure. These include direct changes in incentives through subsidies or fees; changes in legal liability standards; provision of information about products, markets, and technologies; support for the development of new technologies; and voluntary, cooperative ventures with the private sector.

Changes in our economy and our society call for changes in regulatory policies. When pressures mount for both land development and the preservation of undeveloped natural areas, new tensions in land use and resource protection policies will have to be addressed. As States demand a greater say over their own affairs, Federal-State partnerships grow, leading to tensions between the objectives of consistency and flexibility. Regulation also must adjust to reflect changes in technology. For example, it is important to focus on the risks posed by contaminants, not just the ability to measure their concentrations in human tissues and the environment.

The Administration’s strategy of reinventing regulation addresses these varied and sometimes conflicting concerns. It encompasses not just deregulation and reform of the content of regulation, but also a rethinking of *how* government regulates. The goal is to de-

wise a regulatory system that both works better and is more responsive to public concerns.

Efforts to reinvent regulation are taking a variety of forms. One important step is better targeting of regulatory efforts to where the need is greatest. Another is a shift in emphasis from prescribing methods of compliance to specifying desired outcomes. Still another is harnessing economic incentives through market-based regulatory mechanisms. The process of regulating can be improved through reduced paperwork burdens and streamlined reporting requirements, better dissemination of information to the public, and increased opportunities for public participation in the regulatory process.

EVALUATING REGULATORY PERFORMANCE: PRINCIPLES AND PRACTICE

Evaluating regulatory reforms requires consideration of the benefits and costs of alternatives. This can raise a number of questions. What range of consequences from regulation should be considered? How does one address benefits or costs that are uncertain or inherently difficult to quantify? How should concerns about fairness be dealt with? How should regulators balance the need for consistency in rulemaking with the advantages of flexibility? How can the assessment process itself obtain high-quality analysis without creating an excessive administrative burden, and without imposing excessive societal costs from the delay of necessary actions?

SETTING REGULATORY PRIORITIES

Executive Order 12866, which the President signed on September 30, 1993, reflects the Administration's basic philosophy and principles for regulatory planning and review. The order stipulates a number of criteria that should apply both to assessments of "significant" new regulations (including but not limited to regulations with an expected annual economic effect of \$100 million or more) and to reevaluations of existing regulations. The order requires that Federal regulations address real needs while avoiding undue economic burdens. In assessing the need for regulation, agencies should consider a variety of alternatives, including alternatives to new regulation. The assessment should use the best reasonably available information, including information about risks and costs and the uncertainties surrounding them, and it should encompass both quantitative and qualitative benefits and costs. To the extent compatible with existing statutes, agencies should show that the chosen regulatory approach maximizes net benefits (including economic, environmental, public health and safety, and other advantages, as well as distributional impacts and equity), and that those benefits justify the costs. The means of regulating should be cost-

effective, imposing the least possible cost on society to achieve the objective (after taking into account the potential for technical innovation, requirements for verifying compliance, and equity concerns). Federal agencies should also reduce regulatory inconsistency and overlap; they should coordinate their activities with State, local, and tribal governments; and they should provide significant opportunities for contribution by the public to regulatory review.

The criteria for regulatory planning and review established in the order recognize that some benefits and costs are difficult to quantify but nevertheless important. The order acknowledges the importance and limitations of benefit-cost evaluations for obtaining good regulatory outcomes. The Administration opposes legislative changes that would burden the regulatory system with rigidly prescribed assessment methods, unnecessary costs and delay, and excessive opportunities for litigation.

DESIGNING EFFECTIVE REGULATORY POLICIES

To make regulation less burdensome, the order states that, wherever possible, agencies specify regulatory goals in terms of *performance standards*, which specify desired outcomes, rather than *design standards*, which prescribe methods of compliance. Performance-based regulation lowers the cost of compliance by allowing a variety of compliance options and encouraging technical innovation. In contrast, the input-oriented, design standards approach tends to raise the cost of achieving regulatory objectives by limiting flexibility. For example, standards for atmospheric pollutants could specify a desired reduction in emissions or in the damages caused by emissions, and a means for determining whether that reduction has been achieved. This obviates the need to mandate investment in specific pollution abatement technology such as scrubbers for power plants.

Performance standards may require greater effort on the part of regulators to ascertain the level of compliance. They also require public confidence in the approach. The applicability of performance standards in practice is limited by constraints on the ability to monitor compliance and public acceptance. Improved measurement capacities and increased confidence in the approach can be expected to increase its applicability, yielding significant improvements in the cost-effectiveness of regulation.

Even with performance standards in place, the total cost to the economy of complying with regulation may be higher than necessary. The total cost can be reduced if those who face lower compliance costs undertake more of the total effort required. Regulations can employ economic incentives toward this end, rather than rigid requirements. Society further benefits from incentive-based policies because they can provide a strong inducement to the devel-

opment of new technologies that reduce the cost of compliance for all.

Tradeable emissions allowances for pollution control illustrate these points. A tradeable emissions regime sets a limit on total emissions from all sources and a nominal emissions limit for each source. Sources can then vary their actual emissions above or below that limit through voluntary exchange of emissions allowances with other emitters. Those that can comply at lower cost can cheaply cut emissions below their nominal limit, then sell their unused allowances to emitters with higher costs, who can then exceed their nominal emissions levels. A further advantage of allowances is that they essentially put a price on allowed emissions, providing an incentive for the development of lower cost options for pollution control and prevention.

Although regulation is necessary to curb negative externalities such as pollution, in some cases government policy itself contributes to externalities. Then the challenge to designing effective policies includes reducing these government-induced distortions. For example, ill-designed subsidies can contribute to environmental harm. These include agricultural commodity programs that encourage overuse of soil, water, and chemical fertilizers, and access to forests on government land at less than their opportunity cost. Reducing or eliminating distorting subsidies offers an opportunity to improve the environment and market performance simultaneously.

REGULATION AND DEVOLUTION

The question of who should regulate can be as important as how to regulate. This question has no easy answer. Many of the arguments parallel those raised in Chapter 4 on the devolution of expenditure programs. If regulatory authority goes to that level of government whose jurisdiction best corresponds to the scope of the externality, this can help ensure a solution that is tailored to the problem. For example, plans to clean up and rehabilitate contaminated industrial sites might be better made at the State or the local level. State and local decisionmakers may be better able to assess the benefits and costs of additional cleanup—greater public safety, cleaner sites, but increased expense and delay—and to ensure that resources are used most efficiently.

Devolution of regulatory responsibility may not be appropriate, however, for several reasons. Broader, cross-jurisdictional environmental interests may be at stake. For example, protecting wetlands and endangered species habitats is a national as well as a local issue. The impacts of pollution may transcend local boundaries. Federal regulation of air and surface water pollution is intended in part to address the fact that some of these problems spill over city limits and State lines. State or local authorities might have a weak

interest in preventing or containing damages outside their jurisdictions. Devolution of regulatory authority might also compromise protection because of limits on local regulatory capacity (such as inadequate resources for monitoring or lack of enforcement experience), or because States or localities are in competition with each other for economic development opportunities. In addition, disparate State or local regulatory standards can increase costs of compliance by, for example, requiring excessive product differentiation.

Problems can arise when the impacts of externalities are felt by one group of people, but political decisions are made by others. By the same token, however, problems can arise when the beneficiaries of policies to address externalities do not have a stake in balancing the costs and benefits of policy intervention. This can happen when decisions are made by States or localities but costs are borne at the Federal level. Conversely, the imposition of requirements on State and local governments without the funding to meet those requirements—so-called unfunded mandates—has become a point of contention. Some mandates could be seen as undue restrictions on local discretion, but others may appropriately compensate for market or policy failures at the State or local level. For example, if a mandate restricts the ability of States or localities to impose externalities on others, it can be justified on the same economic grounds that apply to the regulation of private entities that generate externalities. It can be difficult in practice to ascertain into which category a particular mandate falls. In any case, the Federal Government should be aware of the costs it imposes on other levels of government. As noted in Chapter 4, legislation passed in 1995 ensures that this information will be available during congressional debates.

REGULATORY ASSESSMENT IN PRACTICE

The capacity to estimate the consequences of regulation has grown enormously since the early days of benefit-cost analysis. And even imprecise analyses can at least be useful in placing bounds around potential benefits and costs. Nevertheless, a number of methodological questions persist and are addressed in newly updated guidelines issued by the Office of Management and Budget. The following examples illustrate these issues and the means available to address them.

The primary purpose of much regulation is to reduce an identified threat to human health, safety, or the environment. However, there are gaps in current knowledge about the nature and magnitude of the hazards that different substances and practices pose to different parts of the population, and about the costs of reducing those hazards. With limited information, analysts will be able to describe only a few possible scenarios; in other cases a more com-

plete characterization of outcomes and probabilities may be possible. Such information may include measures of central tendency (e.g., the median risk), upper and lower bounds, measures of the uncertainty of possible outcomes, and effects on different populations. Where the level of risk depends on more than one factor (e.g., both exposure and toxicity), statistical techniques can combine these factors in a way that accurately describes the overall risk without putting excessive emphasis on those outcomes that are very unlikely.

The valuation of risk reduction is an important element of many regulatory assessments. It is complicated, however, by the fact that typically there are no markets that directly value the reductions in risk achieved through regulation. Instead, indirect methods must be employed. For example, the assessment of many health and safety regulations centers on the question, By how much will this regulation reduce the risk of illness or premature death? It is possible in principle to assign an economic value to the reduced risk of premature mortality by posing the question, How much would members of the affected public willingly pay for this reduction in the probability of earlier death? This makes the issue analogous to the willingness to pay for insurance—and quite different from placing a monetary value on a specific person's life. (Even the notion of putting a monetary value on risk reductions of this kind remains controversial for many.) The question can be approached by examining, for example, how much more people pay for safer but costlier products, or by estimating the wage premiums offered for riskier occupations. However, debate continues about the reliability and applicability of this information to the assessment of other kinds of risks. Among the questions at issue are the degree to which the risks in question are assumed voluntarily or involuntarily, and the extent to which valuations should reflect the age of those affected and the latency of the risk (that is, the lag with which any ill effects are likely to occur).

Discounting future benefits and costs is another complicated methodological issue. Benefits received now or soon are generally worth more to people—have higher present value—than the same benefits received later. An important question here is the extent to which the costs of regulation displace private consumption or investment. Displacement of investment implies a loss of future consumption possibilities. Higher market returns on investment imply a larger consumption displacement. The weighing of long-term benefits and costs should also attempt to account for changes in the *relative* scarcity of resources and the potential for irreversible losses that result in a sacrifice of future as well as current benefits.

Analysis of issues with very long-term consequences, such as climate change and depletion of the stratospheric ozone layer, in-

volves yet another complicated issue: tradeoffs among the interests of different generations that may give rise to ethical considerations. One way to introduce ethical elements into the analysis is through intergenerational discount rates that explicitly reflect assumptions about society's attitudes toward such tradeoffs. Discount rates derived from ethical considerations about fairness to future generations were calculated in one study to range between 0.5 and 3.0 percent (in real terms) for an advanced industrial economy. This range is generally below rates of return to private capital, but not necessarily below real short-term yields on government bonds.

SETTING REGULATORY PRIORITIES FOR THE ENVIRONMENT AND NATURAL RESOURCES

Over the past 25 years environmental regulation has succeeded in reducing a number of threats to human health and the environment. For example, emissions of lead into the air, which pose serious threats to human health, have fallen sharply (Table 5–1), and lead paint has been banned. As a consequence, blood lead levels have dropped sharply. Air quality in many cities has improved considerably (Chart 5–1). The past quarter century has also seen efforts to protect valuable natural resources such as wetlands, and the ban on the pesticide DDT has reduced serious threats to species like the bald eagle. The agreement to phase out the production of substances that deplete stratospheric ozone is an important first step toward greater international cooperation in protecting the global environment. Nevertheless, concerns about local environmental quality remain. For example, the frequency with which concentrations of fecal coliform bacteria in rivers and streams are found to exceed standards shows little decline. And other regional and global problems have come to the fore, such as the global loss of biodiversity, marine pollution, stress on fisheries, and the threat of global warming.

It is important to consider the costs of environmental policies as well as their benefits. Direct public and private expenditures associated with the regulations of the Environmental Protection Agency (EPA) have been estimated to be between 1.6 and 1.8 percent of GDP since the mid-1970s, a small but significant share of total economic activity. In absolute terms, current-dollar expenditures in 1992 and 1993 were slightly over \$100 billion, or almost as much as total personal expenditures for religious and philanthropic activities. These estimates exclude indirect costs associated with environmental regulations, and the costs of other regulations to restrict land and natural resource use. They also do not indicate the marginal cost of stricter regulation.

TABLE 5-1.—*Atmospheric Emissions of Lead, by Source, 1970-94*
[Thousand short tons]

Year	Total	Non-transportation fuel combustion	Transportation	Industrial processes
1970	219.5	10.6	180.3	28.6
1975	158.5	10.3	135.2	13.0
1980	75.0	4.3	65.5	5.1
1985	20.1	.5	16.2	3.4
1990	5.7	.5	1.9	3.3
1994	5.0	.5	1.6	2.9

Note.—Detail may not add to totals because of rounding.
Source: Environmental Protection Agency.

Chart 5-1 **Air Quality in Urban Areas**
Air quality has improved markedly in just the last decade.



Note: Data are averages for 23 urban areas.
Source: Environmental Protection Agency.

Satisfying public concern for protection of the environment and natural resources without imposing an undue burden on the economy is a challenge. Part of the Administration's response is through programs like EPA's Common Sense Initiative. This program is a pilot collaborative effort among government, business, and the public to identify areas for improvement in how regulations are structured and implemented, and how technologies can be improved to help protect the environment. Another new initiative is EPA's Project XL, which invites companies to propose their own

environmental performance standards, to increase flexibility and improve environmental performance. The Army Corps of Engineers has streamlined permitting procedures related to protection of wetlands to reduce regulatory burdens on activities involving small tracts of land.

Beyond these efforts, resources devoted to regulation can be used more efficiently through careful evaluation of benefits and costs, keeping in mind the uncertainties inherent in such evaluations and the need to consider qualitative or subjective factors such as distributional equity and environmental justice, as noted above. Three recent regulatory reform initiatives—the reauthorization of the Safe Drinking Water Act, the reform of waste management programs, and shifts in the focus of agricultural land retirement programs—illustrate efforts to target regulation better.

THE SAFE DRINKING WATER ACT

The unanimous reauthorization by the Senate of the Safe Drinking Water Act in the fall of 1995 is a good example of bipartisan legislative reform to increase the role of benefit-cost assessments in setting more rational priorities. The previous version of the act put EPA on a regulatory treadmill, requiring new standards for 25 substances every 3 years, regardless of the threat they posed. A study by the Congressional Budget Office estimated the cost of reducing cancer risk under standards that various administrations have been required to promulgate for different contaminants under the act. The estimates ranged from less than \$1 million to over \$4 billion per expected cancer death avoided. Although other important health benefits besides reduced risk of cancer are also tied to drinking water standards, a range this wide suggests that much could be gained from better targeting of regulatory efforts on those substances that pose the greatest risk.

The Senate revisions to the act would explicitly allow EPA to consider the balance between potential public health benefits and the costs when establishing drinking water standards. EPA would be able to target those threats to public health that scientific assessments indicate are more important. EPA could also modify standards whose benefits do not justify the costs, so long as the alternative standard chosen maintains or increases health benefits. This general approach—protecting public health and environmental values, but also providing greater latitude for balancing benefits and costs—is an instructive example of how such balancing provisions could be incorporated in other environmental laws and regulations.

HAZARDOUS WASTE

There are several important Federal programs for disposal of hazardous wastes and cleanups of waste contamination. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, otherwise known as the Superfund program) established a program to clean up major disused contaminated sites. CERCLA also requires those responsible to restore, replace, or provide compensation for the loss, injury, or destruction of natural resources (Box 5-1). The Resource Conservation and Recovery Act (RCRA) established a program that regulates ongoing management of hazardous and solid wastes, as well as cleanups of facilities covered by the permitting requirements of the act. The Federal Government also is subject to these laws and cleans up sites managed by Federal agencies or contractors.

CERCLA and RCRA require that cleanups and waste management protect human health and the environment. To achieve this goal, CERCLA currently contains a strong preference for remedies that are permanent and involve treatment of contaminants, as opposed to lower cost alternatives that contain the contamination and limit human exposure or environmental damage, without a full long-term cleanup. CERCLA currently puts only limited weight on cleanup costs as one of a number of factors to be balanced in selecting remedies. In addition, remedies must satisfy a variety of other Federal and State statutory requirements directly or indirectly related to site cleanups; these can impose stricter standards than CERCLA itself would require. Some standards for hazardous waste disposal under RCRA require threats to human health and the environment to be "minimized," regardless of the level of risk posed by the waste or the cost of compliance. This requirement could imply the need for waste management efforts to intensify as technical capacity improves, regardless of background environmental quality or the hazard posed by the material.

The advantages of reform in waste cleanup could be substantial. The Administration estimated that its 1994 CERCLA reform proposals (discussed below) could reduce cleanup costs by 19 to 25 percent (including savings at Federal facilities). A review of CERCLA cleanup decisions by researchers at the University of Tennessee found that increasing the flexibility of remedy selection could reduce the cost of actual site cleanup by anywhere from 20 percent to more than 50 percent without compromising the basic statutory goal of protecting human health and the environment. Since governments and private parties spend several billion dollars each year on CERCLA site remediation, the total savings could be substantial. Significant cost savings could also be realized from reforms of RCRA. For example, EPA has estimated that billions of dollars in cumulative cost savings could be obtained by increasing

the flexibility with which one category of materials—contaminated materials excavated during site cleanups—is handled, without an unacceptable increase in risk.

Improving the balance between the benefits of risk reduction, on the one hand, and the costs of cleaning up old waste and managing new waste, on the other, calls for both legislative and administrative changes. These should build upon the basic principles laid out earlier in this chapter. Cleanup remedies and regulations for managing new wastes should protect human health and the environment. Policies should reflect sound assessments of the risks involved. Decisionmakers should have greater flexibility in designing remedies and waste management policies, and greater weight should be given to costs than in the past. Decisions should take into account the concerns of affected communities and the potential for redevelopment of contaminated sites. And regulatory actions should be able to proceed without bogging down in red tape. The policy debate seems to center not so much on these basic principles as on how reforms should be implemented and how tradeoffs should be structured to achieve the stipulated goals.

During the 1994 debate on CERCLA reform, the Administration proposed legislation that would have given more weight to cleanup costs in choosing remedies, limited requirements for more stringent cleanups due to other statutes, and required greater consideration of the likely future uses of the site (e.g., residential versus industrial) in assessing risks and selecting remedies. The reforms would have limited the preference for permanent treatment to so-called “hot spots,” such as portions of sites with high concentrations of contaminants. Under this approach, greater use could be made of remedies that prevent the spread of contaminants or avoid human exposure without requiring the more expensive removal or destruction of contaminants. Although this legislation was supported by industry and environmental interests, the 103d Congress failed to vote on it before adjourning.

Legislation introduced in the 104th Congress proposes more sweeping changes to the remediation process. The Administration opposes changes to the remediation process that provide inadequate protection, fail to give due weight to State and community interests, or pose an excessive administrative burden. Meanwhile the Administration is pursuing a number of administrative reforms to strengthen the reliability of risk assessments, put greater emphasis on sites of greater risk, and compare the potential risk reductions and costs of alternative remedies. For example, high-cost remedies will be subject to additional review to determine whether a lower cost remedy would meet the cleanup goals. A finding of high cost and limited risk reduction would provide a rationale for waiving more restrictive remedy requirements.

The Administration organized public discussions on reinventing RCRA. These generated a variety of suggestions for the management of newly created wastes: disposal restrictions could be made more risk-based, barriers to economically and environmentally sound recycling could be lowered, and there could be more flexibility in determining what substances will be regulated as hazardous wastes. The Administration currently supports carefully targeted legislative efforts to relax restrictions on certain low-risk types of waste disposal. Through rulemaking, EPA is attempting to exclude certain low-risk materials from RCRA hazardous waste requirements.

As indicated previously, cost savings also can be obtained from increased regulatory flexibility in handling materials produced in the course of cleanups. Even if these materials have low levels of contamination, under current law they must be treated the same as the most hazardous industrial process wastes. When large volumes of these materials become subject to strict cleanup standards, they can pose a significant cost burden. Reform can be achieved without jeopardizing human health and the environment by combining some relaxation of waste disposal requirements with a requirement that a cleanup plan be approved by Federal or State regulators.

AGRICULTURAL LAND RETIREMENT PROGRAMS

Over the last decade, agricultural policies have reflected a broadening of priorities to include concerns for environmental quality and market efficiency as well as farm income. This can be seen in changes in commodity programs that give farmers greater planting flexibility and provide greater incentives to respond to market prices rather than government support prices. Removal of market price distortions and planting restrictions can stem the overuse of chemicals and fertilizers on program crops and can encourage the adoption of environmentally beneficial crop rotations.

Concern for environmental quality is also reflected in government programs to idle cropland. These programs have been used since the 1930s both to control agricultural output and to achieve environmental goals. Program eligibility guidelines requiring the removal of land from production impose costs on society by reducing output, raising consumer prices, and distorting agricultural input markets. But idling certain tracts of land can also provide environmental benefits, for example by maintaining soil productivity through erosion control, reducing water pollution from sediment and chemical runoff, and increasing area for wildlife habitat. The net benefits of land retirement programs depend on whether they are designed primarily to control agricultural production or to protect the environment.

Box 5-1.—Natural Resource Damages

In addition to authorizing the cleanup of contaminated sites, CERCLA provides authority for certain “trustees” (Federal agencies, State governments, and Indian tribes) to seek compensation on behalf of the public for damages to public natural resources and ecosystems caused by contamination with hazardous substances. The 1990 Oil Pollution Act provides similar authority to address damages from oil spills. The laws require trustees to restore, replace, or acquire the equivalent of the damaged or destroyed resources. Trustees must also obtain compensation for interim losses incurred by the public while recovery, restoration, or replacement is taking place.

Natural resources and ecosystems support recreation and commercial ventures (such as fisheries) and provide a variety of important ecological functions such as waste absorption and species habitat. Beyond these more or less tangible benefits, the very existence of natural areas can be a source of value for people. However, quantifying the economic value of natural resource damages can be challenging. Even where the physical effects on ecosystems (such as fish kills or beach contamination) can be measured with some precision, the corresponding loss of benefits to people may be much more uncertain. The EPA and the National Science Foundation are supporting a research program to improve our understanding of the value of ecological resources, as part of the Administration’s larger effort to expand and strengthen environmental research. The Administration has also issued revised rules for assessing damages under the Oil Pollution Act. Under these rules, economic assessment would determine the scale of investment when direct comparisons are not possible between the damaged resources and the resources being provided to compensate for the damages.

The Department of Agriculture’s annual acreage reduction programs (ARPs) have historically required farmers to set aside a portion of their assigned crop base acreage in order to receive direct government payments and other benefits. Current law, however, gives the Secretary of Agriculture limited discretion over how and when planting restrictions are imposed. In many years, over 10 percent of U.S. cropland has been idled under the ARPs. By limiting supply and raising market prices, ARPs reduce deficiency payments and shift the cost of farm income support from taxpayers to consumers. The use of acreage restrictions to limit supply can also cause overuse of other inputs. By raising prices, ARPs create incentives to farm the land remaining in production more intensively.

This can have unfortunate environmental consequences if more fertilizer and pesticide are applied to the remaining acreage.

The Conservation Reserve Program (CRP), established in 1985, allows farmers to enter into long-term land retirement contracts with the Agriculture Department. Farmers receive “rental payments” from the government for taking environmentally sensitive land out of production. The primary goal of the legislation was to reduce soil erosion and its adverse environmental consequences, although control of agricultural output was also a key objective at the time (about one-quarter of the land enrolled in CRP may not be highly erodible, although much of this land provides wildlife habitat and other environmental benefits). Landowners bid competitively for CRP contracts. Bid selection is based on the cost of the rental payments and on an environmental benefit index. Tracts of land receive an index score that indicates the potential environmental benefits of idling those acres.

Agricultural land idled under all Federal programs has declined considerably since the late 1980s, and the CRP has supplanted annual ARPs as the main land retirement program. The 1990 Farm Bill extended the CRP, placing greater emphasis on curbing water pollution and other environmental problems. It also established the Wetlands Reserve Program (WRP) to protect and restore wetlands through long-term and permanent easements. These targeted programs complement the conservation efforts of private land trusts (Box 5-2).

Recent Administration initiatives have continued to emphasize the goal of environmental protection over that of controlling agricultural supply. For the current Farm Bill the Administration recommended that ARPs be made a discretionary tool to be used only when supply and demand are critically out of balance. Eliminating annual ARPs could also reduce the costs of operating the CRP and the WRP if the annual set-aside programs bid up the price of agricultural land, making environmental easement contracts more costly to acquire. In 1995 the Department of Agriculture allowed the early release of over 683,000 acres from CRP contracts, using a new bid selection system to replace those acres with more environmentally sensitive cropland.

How costs and environmental benefits are weighed in ranking CRP bids also affects the geographic distribution of land enrolled in the program. Most CRP acreage is currently in the Great Plains, the Mountain States, and the Corn Belt. But as more recent signups have placed more weight on water quality and habitat protection, enrollment has shifted toward the Great Lakes States, with the Corn Belt also still accounting for a large share. If funding for the CRP is reduced, decisionmakers may face more difficult tradeoffs between targeting the program for greater environmental bene-

fit and maintaining income support for current beneficiaries. Research to estimate the economic value of environmental improvements from land retirement can provide better information on the nature of these tradeoffs.

CREATING COST-EFFECTIVE POLICIES: ECONOMIC INCENTIVES FOR ENVIRONMENTAL PROTECTION

Policymakers can create and enhance economic incentives for protecting the environment in a number of ways. Laws that specify liability for environmental damages, such as those in the Superfund program, can create incentives for increased care before the fact. Economic theory also has long advocated the use of charges or fees that induce more sparing use of nonmarket environmental resources.

The use of tradeable allowances or harvest quota shares is another approach for limiting the use of environmental resources (in this case limiting pollution discharges) or the use of natural resources such as ocean fisheries that are subject to excessive exploitation. As described earlier, this approach sets a limit on total use of the resource (a limit on the total fish harvest or waste discharge) and nominal limits on individual users. Users can, however, exceed their nominal limit by purchasing allotments from others, who then use less than their allotments. The market price that emerges for the use of the resource creates incentives to limit that use, just as a user fee does. Unlike a fee, however, trading can be used without a revenue transfer from the private sector to the government. The ability to trade allotments helps to ensure a cost-effective outcome, since those who can comply with the constraint on total resource use most economically—that is, those with the most efficient harvesting operations or lowest pollution control costs—assume the greatest share of responsibility for meeting the limit. The approach also creates incentives to devise new technologies that lower compliance costs, since all participants would like to reduce their allowance purchases or increase their allowance sales. Finally, regulators can use their flexibility in the initial allotment of allowances or quota shares to treat distributional or equity concerns that may arise from the limit on resource use.

This section discusses several examples of the use of pollution trading or tradeable harvest quotas in practice. The discussion focuses on the use of emissions trading for air pollution control and tradeable fishing quotas for regulation of overfishing. However, the approach has a number of other potential applications. For example, the Administration's 1994 assessment of the Clean Water Act reauthorization estimated compliance cost savings of several hun-

Box 5-2.—Land Trusts and the Tax System

Land trusts are private, voluntary, nonprofit conservation organizations that complement Federal and State programs by preserving 14 million acres of scenic areas, farmland, and wildlife habitat—more land than is held in State parks and recreation areas in the entire United States. Land trusts are established by national organizations such as the Nature Conservancy, the Conservation Fund, and the National Audubon Society as well as by groups at the local, State, and regional levels. Land is preserved through outright purchase, purchase of development easements, leases, and land management agreements.

Land acquired by land trusts is often purchased later by Federal resource management agencies. This acquisition sequence has several advantages. Local organizations may have better information about the environmental characteristics of particular tracts of land and more flexibility in conducting timely transactions with private landowners. Resale of land to the Federal Government, in turn, provides trusts with revenue to continue their preservation activities. Federal tax policy also affects land preservation activities. Land trusts try to acquire land through donations or below-market-value purchases, relying on incentives provided by the income, property, and estate tax codes to obtain properties or land use rights.

Federal interaction with land trusts raises two policy questions. First, do Federal agencies pay fair market value for land purchased from trusts? A recent report by the General Accounting Office suggests that they do. Second, should incentives for land preservation be altered directly through targeted programs such as the WRP, or more indirectly through changes in tax codes? Direct land retirement programs have some advantages over increases in broad-based tax incentives in their ability to target properties and set priorities for land preservation. For example, the WRP ranks easement bids according to cost, significance of ecological functions, and geographic location, among other criteria. In contrast, income or property tax credits or estate tax deferrals are available to all owners of eligible lands. Eligibility can be conditioned on providing environmental benefits, but the lands eligible for the tax incentive may not be the most ecologically desirable or cost-effective locations for such efforts. On the other hand, the greater budgetary visibility of direct programs may make them more difficult to sustain.

dred million to several billion dollars per year from expanded water pollution trading. EPA is developing a framework for expanded use of effluent trading. Expanded use of trading programs to protect wetlands and species habitats, provided they are ecologically sound, can also achieve regulatory goals while providing cost-reducing flexibility in the timing and location of protection efforts.

AIR POLLUTION TRADING

Precursors of today's air pollution emissions trading programs were established in the 1970s. An example is the "offset" program, which allows new pollution sources in areas with poor air quality, provided they reduce other emissions sources in the area by more than their own emissions. Another example is the "bubble" program. This program subjects a group of individual sources in close proximity to a single common limit on total emissions, and allows the sources to trade emissions rather than comply with individual limits. Even though subject to numerous restrictions, these programs have delivered emission reductions at lower cost.

A more comprehensive approach to emissions trading was implemented in the national program that allows power plants to trade sulfur dioxide emissions (a precursor to acid rain) under the 1990 amendments to the Clean Air Act. This program, whose initial phase began in 1995, allows firms to save money by complying with performance standards rather than strict emissions controls requiring the use of specific technologies. The shift to performance standards makes possible a broader range of cost-effective compliance strategies, such as blending coals with different sulfur contents. This flexibility has also created competition among compliance options, lowering the costs of both fuel switching and removal of sulfur from stack exhausts. These benefits have been achieved even though the initial phase of the program has so far resulted in limited trading of allowances among firms. This phase requires only a limited number of plants to participate and sets sulfur dioxide standards that are less restrictive than standards in the second phase will be. Under these circumstances, electricity producers have been able to achieve the benefits of more flexible regulation without extensive reliance on allowance trading with other producers. In the second phase of the program, beginning in 2000, performance standards will be tighter and more plants will be involved. Consequently, emissions trading among firms seems likely to become more important.

Local and regional efforts along these lines are emerging as well. In 1994 Southern California implemented a regional emissions trading market for nitrogen oxides, which also cause acid rain and contribute to haze and ground-level ozone pollution. Known as the Regional Clean Air Incentives Market, or RECLAIM, the Southern

California program is broadly similar to the national market for sulfur dioxide emissions discussed above, but with some distinctive features. For example, the program sets limitations on the location of emissions that are traded, to help prevent “hot spots.” The RECLAIM program for nitrogen oxides is part of a larger compliance strategy that seeks to lower total emissions in the region toward levels needed to achieve mandated air quality standards. Under such an approach, regulators can simultaneously improve the environment, enhance cost-effectiveness, and provide flexibility for economic growth in the region. Other areas (notably the Northeast) are in the process of developing their own nitrogen oxide trading programs.

Programs like the national sulfur dioxide allowance market and RECLAIM, which establish an aggregate emissions limit for a whole class of emitters, entail setup costs to establish allowable aggregate emissions limits, initial allocations of allowances, and trading rules. EPA has proposed an “open markets” system for trading of allowances for both nitrogen oxides and volatile hydrocarbon emissions in the absence of these elements. Under this approach, various types of emitters can participate in a variety of cost-reducing trades. For example, a paint shop switching to a lower volatility paint for 6 months could sell the short-term emissions reductions to a refinery with a temporary need to cover surplus emissions. A similar approach to bilateral trading could be an important complement to international efforts aimed at protecting the stratospheric ozone layer (Box 5–3).

Regulators face an important challenge in using the open market approach: how will Federal and State air quality regulators obtain adequate assurance that proposed emissions reductions are credible? EPA’s proposal reflects several approaches. The agency’s preferred approach is a “buyer beware” plan whereby the user of an open markets emission reduction credit ultimately is responsible for the quality and integrity of the credit. This approach provides maximum environmental security by giving buyers strong incentives to check the legitimacy of credits, but it could also deter buyers from participating in the market, since they would incur a liability if sellers fail to live up to their obligations. EPA has identified alternative liability arrangements, such as placing more liability on sellers (with a system of spot checks to detect inadequate performance) and using third-party verification through brokers, who would be able to absorb legal liability for the quality of credits and provide warranties to buyers.

TRADEABLE FISHING QUOTAS

Overfishing—the consequence of unrestricted access to ocean fish stocks—has put heavy pressure on many of the world’s fisheries.

Box 5-3.—Protecting the Stratospheric Ozone Layer: An Incentives-Based Approach

Methyl bromide is a pesticide that is damaging to the stratospheric ozone layer which shields the earth from harmful ultraviolet radiation. Recent adjustments to the Montreal Protocol, the international treaty governing ozone layer protection, place the first global limits on methyl bromide. Industrial countries must phase out methyl bromide production and use by 2010, except for certain essential uses such as treatment of imports and exports (currently less than 10 percent of global use). Use by developing countries (currently about 20 percent of the world total) will be frozen in 2002, with additional controls to be negotiated in the next 2 years.

Interim reductions by industrial countries en route to a phaseout will also be required. By limiting the total quantity of methyl bromide available, rising methyl bromide prices will automatically and cost-effectively allocate the remaining supply to more highly valued uses. The signatories to the Montreal Protocol will review the expanded use of market-based measures for controlling methyl bromide. One option, an international trading system, could allow some countries to reduce their methyl bromide use more slowly, by purchasing allowances from countries that have reduced use ahead of schedule.

Current U.S. law requires more stringent control on methyl bromide use than do the adjustments to the Montreal Protocol. The Clean Air Act bans, without exemption, all U.S. methyl bromide production and use by 2001. U.S. agricultural producers have expressed concern that they will be placed at a competitive disadvantage if other countries are allowed to continue methyl bromide use. The Administration supports legislative changes necessary to allow for continued methyl bromide use beyond 2001, in cases where alternatives do not exist, to safeguard U.S. agricultural competitiveness.

Without limits on access, anyone with the necessary skills and financing can enter the industry. The exercise of individual self-interest in this case leads to serious economic waste from excess entry and damage to the resource, since individual boat operators do not take into account the long-term consequences of depletion in their own harvesting decisions. Any unilateral exercise of forbearance simply expands the catch available to others.

Traditionally, fisheries management has attempted to cope with this problem through such measures as limited fishing seasons and restrictions on allowable gear. These efforts slow depletion of stocks in a costly manner by requiring the use of less efficient technology

and creating market gluts during the abbreviated fishing seasons. And in any event these efforts often are overwhelmed by technical advances in harvesting methods.

A promising alternative is the use of individually transferable quotas (ITQs). In a manner analogous to air pollution trading programs, ITQs operate by setting a limit on the total allowable harvest and creating tradeable rights to a share of the harvest. With trade in ITQs, the harvest is undertaken by the most efficient operators, and since the quota rights can be used at any time during the year, the harvest rate does not glut the market. The sale of ITQs also provides a temporary financial buffer for less efficient operators, who are induced to leave the industry as overcapitalization declines.

Several challenges must be addressed in establishing an ITQ program. These include determining the initial size of the quota, allocating the quotas, and addressing the effects of an ITQ for one fish species on others; setting up a monitoring program; and dealing with the plight of fishing communities whose residents might not remain competitive in the ITQ market.

ITQs are currently being used by two East Coast regional fishery management councils, on a larger scale in an Alaskan fishery, and in other countries. The effects of harvest limits and pressures to increase harvest efficiency are shown in the decline of excess capital applied in the East Coast fisheries: the number of vessels has decreased by more than 50 percent. Similarly, in one application in British Columbia the decreased economic waste is indicated by an increase in the net overall economic return to the fishery of 65 percent.

TECHNOLOGY DIFFUSION FOR POLLUTION CONTROL IN AGRICULTURE

Government can play a role in improving environmental quality not only by internalizing externalities, but also by correcting market failures in the provision of information. Improved production techniques and management practices can improve efficiency and cut waste and pollution, in effect substituting one clean input—information—for other, polluting inputs. However, information has certain aspects of a public good—it is difficult for individual suppliers to restrict its use to those who have paid for it. As a result, private markets may undersupply information about environmentally beneficial technologies. Information problems can also constrain the adoption of new technologies by farmers. In such cases, the government may be able to improve efficiency by collecting and providing information about resource-conserving practices.

U.S. agricultural policy has a long tradition of emphasizing education, technical assistance, and subsidies to achieve economic and environmental goals. Technology transfer programs dating back to the 1930s have encouraged farmers to adopt soil conservation practices to maintain soil productivity through erosion control. The traditional extension and technology transfer system has increasingly emphasized technologies aimed at off-site environmental damages. Integrated pest management and conservation tillage are examples of the environmentally beneficial practices that have been promoted.

More recent programs have aimed at curbing water pollution from agriculture through provision of public information and financial incentives for farmers. Demonstration programs have been set up to encourage the adoption of best management practices (BMPs). An assumption underlying such voluntary environmental programs is that technological options can reduce both production costs and pollution. In theory, if these practices do reduce costs through more efficient use of water, fertilizer, and pesticides, demonstration programs will encourage their long-term adoption. Programs frequently include short-term subsidies to encourage initial adoption.

The adoption of BMPs has yielded some impressive results. For example, one study found that depending on field conditions, corn farmers in Nebraska who adopted soil nitrogen testing could reduce their use of fertilizer up to 25 percent with no loss in yields. In this case, the soil testing procedure substitutes information for chemical fertilizer applications. Moreover, farmers who participated in the Department of Agriculture's educational programs appeared to have made more effective use of nitrogen testing results than did nonparticipants.

Although the history of government programs to promote BMPs is still somewhat limited, useful lessons have already emerged. First, familiarity with new management practices has been found to encourage adoption, especially for BMPs that represent minor changes in current operations. Second, although profitability is a prime consideration in BMP adoption, it is not the only one. The belief that a BMP improves water quality has been found to be an important incentive for adoption, particularly in areas where agriculture has impaired ground water used for drinking. Third, significant regional differences exist in the perceived profitability and adoption rates of BMPs. Thus, no single set of practices may be widely adopted, and a decentralized approach may be needed to promote environmental technologies in agriculture. There may also be a role at the State level for research that tailors BMPs to local environmental conditions.

CONCLUSION

Without regulation to protect health, safety, and the environment, the quality of life Americans enjoy would be significantly lower than it is today. At the same time, regulation and the regulatory process must keep pace with changes in knowledge, technology, the economy, and social priorities. Reinventing regulation to work more cost-effectively and to address the greatest needs is a crucial step down this path. The efforts made thus far to enhance the performance of environmental regulation illustrate how broad are the opportunities for improvement.