The Greening of the Market: Making the Polluter Pay

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INTRODUCTION

The environmental movement is poised to enter a second generation. For two decades it has prompted significant improvements in the quality of our air, water, land, and natural resources, primarily through "command-and-control" regulations that essentially have told firms which pollution control technologies to use and how much pollution they could emit. Now, in an era of new environmental challenges and heightened sensitivity to regulatory compliance burdens, market forces can offer in many circumstances a more powerful, far-reaching, efficient, and democratic tool than centralized regulations for protecting the environment.

The progressive challenge for environmentalists in the 1990s is to harness the power of markets, which can be more effective and far-reaching than centralized regulations. Command-and-control regulations were powerful in the early battles against environmental degradation, but they have begun to reveal many of the same limitations that led to the collapse of command-and-control *economies* around the globe. They can be inefficient; they hamper innovation in pollution control methods; and they ignore important differences among individuals, firms, and regions. And command-and-control regulations tend to make the environmental debate a

closed, technical discussion among bureaucrats and vested interest groups rather than an accessible public dialogue.

Market-based policies start with the notion that the best way to protect the environment is to give firms and individuals a direct and daily self-interest in doing so. They aim to strengthen environmental protection not with more centralized rule making, but through decentralization—by changing the financial incentives that face millions of firms and individuals in their private decisions about what to consume, how to produce, and where to dispose of their wastes. As a result, market-based policies, which include "green taxes," tradable permit systems, and a range of other approaches, offer many important advantages:

- They enable environmental protection to be pursued at a lower cost of compliance to private industry, and thereby at a lower cost to consumers.
- They give firms a constant incentive to find new and better technologies for combating pollution rather than locking one kind of pollution-control technology into place.
- They can move environmental rules out of the exclusive domain of scientists, economists, lawyers, and lobbyists, and open the process to the public.
- They make the incremental costs of environmental protection more visible, and thus can focus public debate on the most efficient ways to protect the environment, rather than simply on the evils of pollution.
- Because some market-based approaches such as pollution charges raise substantial revenues, they enable government to reduce "distortionary" taxes—ones that reduce market efficiency by taxing *desirable* activities, such as investment and labor—and replace them with levies that discourage socially *undesirable* behavior, such as pollution and degradation of natural resources.

Despite these benefits of market-based approaches, their use has been widely resisted by environmentalists who view the market as the problem rather than the solution; by environmental bureaucrats who resist change from an old regulatory system that emphasizes highly technical specifications about pollution control devices and standards; by lobbyists on both sides of the debate whose role in the process could be endangered by this new approach to environmental protection; by elected officials who resist new ideas in general or who worry that the public will view these market-based

approaches as new taxes; and, of course, by those who oppose environmental protection altogether.

Market-based approaches to environmental protection have also become entangled in partisan politics. The Bush administration highlighted its promotion of market-based policies, such as the tradable permits system in the new Clean Air Act, as evidence of its environmental advocacy. But the Bush administration's failure to meet many of the deadlines in that law for implementing specific rules, together with the fact that many of its market-based programs are strictly voluntary, called into question the strength and sincerity of the administration's commitment.[1] Unfortunately, as a result of this record, many Democrats and environmental advocates have reflexively come to view market-based approaches as an evasive tactic or a capitulation to business interests.

Now, however, a confluence of forces has heightened interest in market-based approaches and raised the likelihood that the nation can move beyond the polarized environmental debate of the past decade. Sluggish economic growth, high public sector deficits, and concerns over international competitiveness have focused new attention on the private and public costs of environmental regulation. Changes of attitude within the environmental movement and bureaucracy also seem to herald a new openness to using market forces to regulate the market itself. And the emergence of new threats to the environment has combined with the stubbornness of old threats to spur the search for better ways to control pollution. These forces are likely to focus even more attention on market-based environmental policies, if not as a replacement for current regulatory approaches, then at least as a valuable new set of tools for pursuing environmental quality. The new administration should capitalize on these changes and seek to apply market-based approaches to a variety of environmental challenges, including municipal solid waste, recycling, hazardous waste disposal, air and water pollution, and international environmental threats such as global warming and the loss of biodiversity. If it does so, the new administration can move beyond the old questions of whether simply to spend more or less on environmental protection or on whether simply to raise or lower existing standards. It can focus the nation, instead, on how to set and reach our environmental goals in ways that are smarter, cheaper, and better for economic growth.

BEYOND COMMAND-AND-CONTROL REGULATION

The days when the U.S. could afford to consider environmental protection without regard to its costs have ended. The U.S. Environmental Protection Agency (EPA) estimates we now spend over $100 billion annually to comply with federal environmental laws and regulations.[2] There is heightened concern over the impact of these regulations on the strength of our national economy and on our ability to compete in international markets. As a result, policymakers are eager to hold regulatory burdens to a minimum.

Federal, state, and local budget shortfalls make it harder than in previous decades to spend more money on public environmental-protection programs. There is new sensitivity to private costs as well. The failures in 1990 of the "Big Green" referendum in California and a major environmental bond issue in New York State are just two examples of environmental initiatives that were defeated, in part, because compliance costs were perceived as too high. While there is strong and increasing support among the public for environmental protection, citizens and policymakers are giving increased attention to making the most of scarce resources and maximizing returns on the resources we invest—business costs, regulatory effort, political capital, taxes—to improve the quality of our environment.

This increased sensitivity to compliance costs and burdens has focused, in large part, on the conventional command-and-control approach to environmental regulation in the U.S. Command-and-control regulations tend to force all firms to behave the same way when it comes to pollution, shouldering identical shares of the pollution-control burden regardless of their relative costs. Holding all firms to the same target can be expensive, because this approach typically forces some firms to use unduly expensive means of controlling pollution.[3] The reasons are simple: The costs of controlling emissions can vary greatly among and even within firms, and the right technology in one situation may be wrong in another. Indeed, the cost of controlling a given pollutant may vary by a factor of 100 or more among sources, depending upon the age and location of plants and the technologies available to them.[4]

This regulatory approach also tends to freeze the development of technologies that could provide greater levels of control. Command-and-control standards typically give firms little or no financial incentive to exceed their control targets and create a bias against experimentation with new technologies. A firm that tries

a new technology subsequently may be held to a higher standard of performance, without significant opportunity to benefit financially from its investment. As a result, dollars that could be invested in technology development are diverted to legal battles over what are, or are not, acceptable technologies and standards of performance. For example, under Best Available Control Technology (BACT) standards for water-pollution control, a firm that adopted an improved control technology would likely face a stricter standard as a result. Thus, the unintended consequence of such policies is to reduce the demand for new and better pollution-control technologies, and hence to reduce the market for, and development of, those technologies.

Command-and-control policies seek to regulate the individual polluter, whereas market-based policies train their sights on what is, in most cases, our real target of concern: the overall amount of pollution for a given area. What we care about, after all, is not how many particulates the local factory emits, but the quality of the air we breathe while walking downtown or sitting in our backyards. Thus, under a market-based approach, government establishes financial incentives so that the costs imposed on firms drive an entire industry or region to reduce its aggregate output of pollution to a desired level; then, as in any regulatory system, the government monitors and enforces compliance. In policy terms, market-based policies achieve the same *aggregate* level of control as might be set under a command-and-control approach, but they permit the burden of pollution control to be shared more efficiently among firms.

Market-based incentive systems do not represent a laissez-faire, free-market approach. They recognize that market failures are typically at the core of environmental degradation. At the same time, an incentive-based policy rejects the notion that such market failures justify scrapping the market and dictating the behavior of firms or consumers. Instead, they provide freedom of choice to businesses and consumers in determining the best way to reduce pollution. By ensuring that society's environmental costs are factored into each firm's (or individual's) decision making, incentive-based policies harness rather than impede market forces and channel them to achieve environmental goals at the lowest possible cost to society at large.

Despite these benefits, which economists have highlighted for decades, several sources of resistance have slowed the adoption of market instruments for environmental protection.[5] The first is the adversarial attitude that characterized the beginning of the envi-

ronmental movement.[6] Throughout much of the 1960s and 1970s, that movement typically characterized pollution more as a moral failing of corporate (and political) leaders than as a by-product of modern civilization that can be regulated and reduced, but not eliminated. While the former characterization may have been necessary and successful from a political standpoint, it resulted in widespread antagonism toward corporations and a suspicion that anything supported by business was bad for the environment. Thus, for many years, market-based incentives were characterized by environmentalists not only as impractical, but also as "licenses to pollute."

A second source of resistance to market-based approaches has been the self-interest of segments of the environmental bureaucracy whose work routines, organizational power, or even existence might be threatened by such market-based approaches. Within the EPA, resistance has come from staff whose expertise in setting technology-based standards would become obsolete if the rules of the game were changed. There has also been resistance to market-based approaches from players in the legislative system who, having learned to use their influence to fine-tune a command-and-control regulatory system, are understandably reluctant to allow any major changes in the rules of the game. Thus, lobbyists for both environmental organizations and the private sector, as well as some legislators, resist market-based approaches in part to protect the value of their own expertise. The resistance from some industry lobbyists to putting these ideas into practice is especially notable given that CEOs and other leaders of the business community have long endorsed the *theory* of cost-effective, market-oriented approaches to environmental protection.

There are other sources of resistance to market-based approaches. Many policymakers resist pollution charges, for example, because such charges can be characterized as taxes (even if all the revenues raised are returned, as will be discussed). And there is resistance, of course, from those who simply oppose all attempts at environmental protection.

Over the past several years, however, there has been a rapidly growing recognition among policymakers and activists that market forces, once characterized solely as the problem, are also a potential part of the solution. Part of the new interest in these ideas emerged from within the Executive Office of the President. Some in the environmental community, notably the Environmental Defense Fund, responded by participating actively in the development of such ideas.[7] Much of the academic and political interest

in these new approaches coalesced around the release of a report from the bipartisan *Project 88*, an effort co-chaired by Senator Timothy Wirth of Colorado and the late Senator John Heinz of Pennsylvania, which proposed a range of market-based policies to prevent pollution and reduce the waste of natural resources.[8] And much of the business community continues to speak in support of cost-effective, market-oriented approaches to environmental protection.[9]

The new interest in market-based approaches has resulted in several important new policies. The best known of these is the creation of a tradable permit system to combat acid rain, as part of the 1990 amendments to the Clean Air Act. But there have been other market-based initiatives as well, including other tradable permit systems,[10] congressional efforts to reduce government subsidies that can distort markets and harm the environment,[11] and efforts to remove barriers to the negotiation of voluntary water transfers in the western U.S.[12]

The new President can avail himself of a range of market-based tools for protecting the environment. We focus on three in particular: pollution charges, deposit-refund systems, and tradable permits. Different ones will be better for tackling different problems. For some problems, such as regulating pesticides that cannot pass basic thresholds of safety, traditional command-and-control approaches may remain the best remedy. But the new administration can and should act to place more reliance on market-based strategies.

POLLUTION CHARGES AND SOLID WASTE

The first category of market-based policies is pollution charges, or green taxes.[13] Pollution poses real costs to society (for example, health consequences, property damages, and aesthetic degradation), but firms typically do not have to pay for these damages and hence face little or no incentive to take them into account in production decisions. Pollution charges force firms to pay for the external costs of pollution and to incorporate these added costs into their daily decision making. Despite the intuitive appeal of this approach, the U.S. has little experience with green charges at the federal level.[14] Charge mechanisms could be used to address a range of environmental challenges, from air and water pollution to various forms of solid and hazardous waste, and they can work at various levels of government. They work best when the central

question is not *whether* but *how much* emission of a pollutant is acceptable, when emissions can be monitored reliably and at reasonable cost, and when the health hazards of moderate variations in emissions are not extreme.

The new administration should focus, in particular, on the use of charge mechanisms for reducing the volume of solid waste generated at the state and local level. The increasing volume of such waste has emerged as a pressing problem in many parts of the U.S. over the past decade. Many areas are running out of landfill space, and many communities have effectively blocked the construction of new facilities. While some communities have turned to incineration of these wastes, concerns exist that garbage burning contributes to air pollution and that the ash it generates poses its own disposal problems.

Faced with the difficulties of providing safe and adequate disposal, many communities have sought to reduce the amount of solid waste generated. Most waste reduction efforts to date have used conventional command-and-control regulations. In some cases, states and municipalities have enacted strict measures such as product bans or across-the-board recycled-content standards for packaging with little regard for costs or consumer preferences. These policies have raised costs, despite having little effect on the amount of solid waste generated. Indeed, a lack of markets for old newsprint caused many communities with mandatory separation requirements to store or even dump their collected newspapers into local landfills.

What is needed to reduce the volume of municipal solid wastes is not stricter regulation, for the most part, but a better means of pricing waste disposal. Most individuals and firms never directly "see" the costs of waste disposal. In many communities, these costs are simply imbedded in local property or income taxes. Some cities have made the costs of waste disposal more apparent to consumers by "unbundling" these costs from other municipal services; that is, citizens pay a separate charge for waste collection. Unfortunately, even these charges do not provide incentives for decreasing the amount of waste; they are typically fixed, *flat* monthly payments that *do not vary* with the quantity of waste generated.

With such pricing systems, it is not surprising that the throwaway ethic has thrived. The cost of throwing away an additional item of refuse is essentially zero; residents merely place their empty bottles, cans, lawn clippings, and other wastes in a trash chute or at the curbside and they magically disappear when the municipal-

ity or a contractor picks them up. Imagine what kinds of cars we would buy and how much we would drive if our total annual bill for gasoline were *independent* of the quantity of gasoline we used. This is essentially what is happening today with municipal solid-waste management in almost all communities in the U.S. Effective waste-management strategies must "get the prices right"—they must communicate to consumers the true, total social cost of throwing things away.

In many communities, the best market solution for reducing the volume of residential solid waste will be to charge citizens for the specific quantity of waste they put out at the curb—an approach known as "unit charges." These volume-based fees motivate households to reduce the quantities of waste they generate, whether through changes in their purchasing patterns, reuse of products and containers, or the composting of yard wastes. Furthermore, placing different unit charges on unseparated refuse and specified, separated recyclables can induce households to separate the recyclable components of their trash.

In Seattle, which has adopted a unit charge system, customers choose from four sizes of receptacles, ranging in price from about $11 per month for a 19-gallon container to almost $32 per month for a 90-gallon container. The program appears to be having its intended effect: in 1979, the average family was setting out approximately four 30-gallon containers per week; by 1989, 87 percent of households subscribed to one 32-gallon container or less.[15]

One potential problem with per-can pricing is that customers are charged for a full can even if it is not used or only partially filled in a particular week. "Bag and tag" systems avoid this problem. Under such systems, households dispose of unseparated refuse only in specially designated trash bags sold by the municipality. Another approach involves the sale of stickers that are placed on cans or bags of specified dimension. In Perkasie, Pennsylvania, where the bag-and-tag approach was adopted, the total amount of solid waste collected fell by 60 percent in the program's first year of operation, and total collection and disposal costs decreased by 40 percent.[16]

While experience with unit pricing to date indicates that it can significantly reduce waste generation, concern naturally arises about the policy's fairness to low-income households that, some argue, would pay greater shares of their income for pickup services than would higher-income households. Surprisingly, unit pricing tends to be *less* regressive than conventional payment systems, although there is substantial variation among communities.[17] The

Seattle system uses a tactic similar to the low "life-line rates" provided by electrical utilities for initial blocks of power usage—customers pay only the fixed cost of curbside pickup for their first 32-gallon container.[18]

In addition to unit charges for trash disposal, there are other market-based mechanisms to reduce the volume of solid waste generated. These include retail disposal charges, which add a surcharge to goods based on their disposal costs, and virgin material charges, which raise the cost of a product if it uses a high level of virgin (unrecycled) materials. Separately, and possibly in combination, these policies could help reduce solid-waste disposal costs and preserve natural resources while ensuring a high level of individual choice.[19]

Carbon and Gasoline Charges and the "Greening" of America's Taxes

One major by-product of charge systems is a flow of money from polluters to the government. These revenues, which would be considerable for some pollution charges, create the opportunity for a "double dividend": At the same time the pollution charge is providing an incentive to reduce pollution, the revenues raised make it possible to *lower other taxes*, such as payroll and income taxes.[20] By replacing taxes on socially desirable activities, such as labor and investment, with taxes on socially undesirable activities, such as environmental pollutant emissions, the new administration can use revenue-neutral pollution charges to make the overall tax code more supportive of economic growth.[21]

In particular, the new administration should consider two key examples of this potential double dividend: charges on greenhouse gases and gasoline. Concern over greenhouse gases, particularly carbon dioxide (CO_2), relates to global warming: Many scientists believe that if greenhouse-gas emissions continue to grow at current rates, global mean temperatures may rise by two to five degrees Fahrenheit over the next century. Such an increase could cause widespread changes in precipitation patterns, storm frequencies and intensities, and ocean levels. International negotiations have focused on how much to limit emissions and how to allocate the control burden among nations. If truly enforceable national targets are agreed upon, the U.S. will need to find ways to achieve its national emission-reduction goals.

There are currently a range of mechanisms in use or planned

that could help the U.S. achieve many greenhouse-gas reduction goals, such as reducing emissions to 1990 levels by the year 2000. But for longer-term goals, or if additional tools are eventually needed to meet short-term goals, one of the best alternatives is a properly designed CO_2 charge system. Such a system would tax carbon-based fuels in order to make CO_2 emissions more expensive. The charge would vary by type of fossil fuel—coal, oil, or natural gas—depending upon the CO_2 emissions associated with it. In particular, a tax based on the carbon content of fossil fuels could be imposed at the point of entry for imports and at the point of primary production for domestic sources. This would reduce direct demand for fossil fuels, encourage conservation, lead to a better mix of resources, and stimulate the development of new, less-carbon-intensive technologies.

The impact of a carbon charge on U.S. economic activity cannot be overlooked; if a phased-in $100/ton charge were adopted *unilaterally* by the U.S., it could lead to a 2 percent annual loss in GNP (from baseline projections) by the time it was fully implemented. But the impact would be substantially less if other nations acted in concert. And rebating the revenues from this CO_2 charge by reducing other taxes could offset any projected loss in GNP altogether.[22]

We also believe the new administration should endorse a revenue-neutral gasoline tax to address a broader set of environmental and economic concerns, from urban smog to highway congestion to excessive dependence on imported oil as an energy source.[23] Numerous studies suggest that even a modest increase in the gasoline tax would significantly reduce gasoline consumption, oil imports, and air pollution, and would generate significant new revenues.[24]

It is important that any change in gasoline taxes be revenue neutral. Revenues collected should be transferred to the Social Security Trust Fund and credited to current workers, as a way of reducing their payroll taxes. This use of the revenues should address the greatest concern about higher gas taxes—they can hit hardest on working families and particularly on workers who must drive to their jobs. If the revenues from a federal gas tax were paid into Social Security, the payroll tax—the employee contribution to Social Security—could be cut proportionately, and workers would take home (and retain) larger paychecks. Most important, the extra income would more than offset the cost of the gas tax, except for those who continued to drive the greatest distances in the least

fuel-efficient cars. Such a tax could be phased in gradually, allowing individuals and firms to adjust their consuming and producing behavior.

These are just some of the many examples of how charges and fees can deal with environmental problems; many other potential applications exist. For instance, a charge could be placed on the sales of pesticides and other agricultural chemicals to encourage farmers to use these chemicals more efficiently and to provide incentives for manufacturers to find less environmentally harmful substitutes (although in some cases the use of such substances clearly must be tightly regulated or banned altogether). Similarly, the U.S. could follow the example of Germany and impose effluent charges on water pollution. Such charges could encourage firms to reduce emissions below levels currently allowed through discharge permits. Emission charges could also be used for some air pollutants, even where standards are already in place. One such example proposed by the EPA Economic Incentives Task Force is for imposing fees on major stationary sources of volatile organic compounds (VOCs), precursors of urban smog.[25] A set of related policies could help address environmental problems associated with automobile use in major cities. In particular, "congestion pricing" could be used to charge drivers a toll for rush-hour trips, based upon existing electronic-scanner technology.[26] Other mechanisms that could reduce the total miles traveled in automobiles and therefore air pollution include employee parking charges, increased charges for public parking, and smog taxes, as described above.

DEPOSIT-REFUND SYSTEMS

We noted earlier that improved price signals can reduce the volume of waste reaching landfills and incinerators. In some cases, however, the problem is the toxicity of the waste, not just its volume. Front-end taxes (virgin materials taxes and retail disposal charges) give firms and individuals incentives to find safer substitutes and to recover and recycle taxed material. But such charges, if levied on hazardous materials, may encourage some firms to circumvent the process through illegal emissions ("midnight dumping"). And such systems do not provide incentives to change disposal methods. There is a second category of market-based policies—deposit-refund systems—that potentially represents a cost-effective way to manage these and other categories of toxic

wastes. Deposit-refund systems create incentives for firms and individuals to dispose of wastes properly and to search for more benign substitutes.

These systems combine a special front-end charge—the deposit—with a refund payable when quantities of the substance in question are turned in for recycling or proper disposal. This is the concept behind the bottle bills many states have adopted.

Although deposit-refund systems have been applied primarily at the state level, a federal approach is advisable for some substances and problems. This is true when firms face national markets with easily transportable products and when the consequences of improper disposal do not vary significantly from one location to another. Geographic homogeneity of charges also reduces the cost and complexity of control, both to firms and to administering agencies.

The new administration should adopt a federal deposit-refund policy for one problem in particular: the disposal of lead-acid batteries. The amount of lead that enters landfills and incinerators is a major hazard. Contamination of groundwater aquifers below landfill sites and emissions of lead oxides and particulates from incinerators can pose real threats to human health. The linkage between lead exposures and childhood learning disabilities is one well-documented example.[27] Most of the new lead entering the environment each year is from the improper disposal of storage batteries. Although a substantial amount of lead from motor-vehicle batteries is recycled each year, the share of batteries recycled has been decreasing during the last 30 years. At present, over 20 million unrecycled batteries enter the waste stream annually and this number may increase by more than 30 percent by the year 2000.[28]

Under a deposit-refund system, a deposit would be collected as a tax when manufacturers sold batteries to distributors, retailers, or original equipment manufacturers; retailers would collect their deposits by returning their used batteries to redemption centers; and these redemption centers, in turn, would redeem their deposits from the administering agency. A national program could be designed to accommodate existing deposit systems for batteries, such as those found in Maine and Rhode Island. The deposit must be large enough to encourage a substantial level of return but small enough to avoid a significant theft problem.

The federal government should also investigate a deposit-refund system for ensuring safe management and disposal of certain "containerizable" hazardous chemicals—for the most part, liquid

chemicals stored in metal drums. About 30 percent of industrial wastes are types which may be generated in small enough quantities per unit to be containerized. One category of such chemicals is chlorinated solvents. While most chlorinated solvents are recycled to some degree by the thousands of firms using them, substantial amounts still reach the environment. Some of the solvents escape in the production process and are released into the atmosphere; more seriously, highly contaminated spent solvents are often not economical to recycle and may be illegally dumped to avoid disposal costs.[29]

Another potential application of the deposit-refund approach is to used lubricating oil. The improper disposal of lubricating oil, currently unaddressed by federal regulations, has both health and ecological consequences. When used oil is dumped into storm sewers or placed in unsecured landfills, it can contaminate groundwater and surface-water supplies; when it is burned as heating fuel, it produces air pollution. Enforcing proper disposal of lubricating oil through conventional regulations would be exceedingly costly, since hundreds of thousands of firms and millions of consumers would have to be monitored. A deposit-refund system promises to be much more cost-effective.[30]

TRADABLE PERMITS FOR RECYCLING AND OTHER CHALLENGES

A third market-based approach, tradable permits, allows the government to specify and efficiently achieve a given target of aggregate pollution control. The total quantity of allowable emissions, consistent with that target, is allotted in the form of permits distributed among polluters. Firms that keep their emission levels below the allotted level may sell or lease their surplus allotments to other firms, or use them to offset excess emissions in other parts of their own facilities. Such a system tends to minimize the total societal cost of achieving a given level of pollution control. It is important to note that both charges and permit systems can be used to improve environmental quality—that is, to achieve steadily lower pollution levels—not just to maintain the status quo.[31]

As noted, the 1990 Clean Air Act Amendments used a tradable permit system to combat acid rain. The new administration should apply this concept to promote corporate use of recycled materials, as a response to growing demands for recycling. Policymakers increasingly view recycling as an important element of viable

waste-management strategies, but as more states and municipalities have adopted recycling programs, the increased supply of recovered materials has often outpaced demand for recycled, or "secondary" materials. In some instances, this glut has resulted in the subsequent landfilling of separated, recyclable materials. In order to bolster demand for recycled materials, several states have enacted legislation requiring manufacturers in certain industries to increase the use of secondary materials in their products.

Recycled-content regulations in isolation could lead to significant economic inefficiencies because such uniform standards ignore the great degree to which the costs of compliance will vary among firms. Some manufacturers, for example, may not have the capacity to use recycled materials effectively with their existing production technologies; for some of these firms, new capital investments would be prohibitive. Conversely, other firms with different technologies might be able to meet and even exceed minimum-content requirements at relatively low cost. Thus, recycled-content requirements could be made more cost-effective through the use of permits that are tradable among firms.

Under such a system, the federal government would set an industry-wide recycling rate (or recycled content standard) which individual firms could meet in one of two ways: They could use the required percentage of secondary materials *or* they could use fewer secondary materials and buy permits (credits) from other firms that exceeded their recycling requirements. To ease potential disruptions, standards could start low and increase gradually over time. The result of a tradable permit program would be that the same amount of total recycling would occur as under a uniform standard, but the total costs of compliance would be less, since those firms in the best position to recycle (or use recycled materials) would essentially be paid by other firms to undertake the bulk of the recycling burden. Recycling credit systems could conceivably be used for a variety of products, including newsprint and used lubricating oil.[32]

Local air pollution problems can also be addressed through the use of tradable permits. First, a logical extension of the EPA's initiatives with "emissions trading" would be a comprehensive system of marketable emissions permits, as is now being explored in the Los Angeles region. Since mobile sources, such as cars, play a major role in air pollution problems in most cities, offset and tradable permit programs ought to include motor vehicles wherever possible. "Cash-for-clunker" programs, in which major stationary sources, such as factories and electric utilities, can offset

their own emissions by purchasing and retiring high-polluting, pre-1971 vehicles, are a promising route. Finally, the EPA's initial forays into permit-trading programs to control point-source and non-point-source water pollution need to be improved and expanded.

A related, international application of the tradable permit principle is the notion of preventing deforestation through "debt-for-nature" swaps. Concern in developed nations about tropical deforestation is associated both with the role of forests as reservoirs of carbon (and hence CO_2) and as the habitats of plant and animal species. The world's less developed countries are the main repositories of the planet's tropical forest resources. Many of these countries have found that they can no longer meet their massive debt obligations and invest adequately in growth at home. The developed and less developed nations thus share a common interest in the tropical forests. This common interest can and should be furthered by extending the concept of offsets through debt-for-nature swaps, several of which have already been arranged.

THE ROLE OF RISK ASSESSMENT: ESTABLISHING OUR PRIORITIES

So far, we have only discussed the *means* to achieving our environmental protection goals. But before society selects an instrument to achieve its environmental goals, it must first determine what those goals are. In this choice, too, there is an important opportunity to improve our policy making in ways that are more efficient and that transcend the old, adversarial relationships.

The staggering costs of controlling today's environmental threats make it abundantly clear that we must focus our attention on those problems which pose the greatest risk. At present, government attention and action on environmental threats is seriously out of alignment with scientific, let alone economic, estimates of relative risks.

In 1987, a major EPA study found that the federal government's spending on environmental problems was almost *inversely correlated* to the ranking of relative risk by scientists within the agency.[33] A recent EPA Science Advisory Board study has confirmed these findings; its primary recommendation was that the "EPA should target its environmental protection efforts on the basis of opportunities for the greatest risk reduction."[34] Going one step further, a 1991 report from the U.S. General Accounting

Office recommended that the "EPA work with the Congress to identify opportunities to shift resources from problems of less severe risk to problems whose risks are greater."[35]

Scientific rankings of risk, of course, are not the only relevant factors in establishing environmental-protection priorities. Many others deserve consideration, including the disproportionate impact of some risks on certain populations, such as minorities and the poor; public perceptions of risk; aesthetic and spiritual values; intergenerational considerations; and political and historical questions about who is responsible for environmental damage. Still, assessments of relative health and ecological risks should be a major consideration.

Some environmental advocates and legislators, however, have long been hostile to the idea of weighing relative risks, insisting instead that all environmental threats are of the highest order. This view was perhaps understandable during an era when the executive branch was repeatedly hostile to environmental protection. But this absolutism is scientifically wrong and may prove to be politically shortsighted because it will ultimately undermine the credibility of the nation's enviromental-protection efforts. Refusal to establish priorities among environmental problems has resulted in a misdirection of our efforts. Whether we are concerned with risks to human health or threats to ecological integrity, we can accomplish far more by targeting our efforts at those problems where we can achieve the greatest impact.

Calling for higher and higher levels of standards and spending on each and every environmental problem is not by itself a useful agenda for action. Indeed, it can be a cause of inaction. As some sectors of private industry argue that no environmental threat is serious, and as some environmental advocates refuse to set priorities, the environmental debate becomes polarized and paralyzed. The time has come to begin setting real environmental priorities for real action, drawing not simply upon political and popular perceptions of risk, but also upon the best scientific and economic evidence we can develop. Rather than opposing risk assessment as a threat, progressives and the new administration should support responsible risk assessment and the research on which it depends as a way to heighten public understanding, inform the debate, and improve the democratic process. In addition, it is time to make a major effort to bring scientists and citizens together in a national dialogue to improve mutual understanding and evaluation of environmental risks.

MARKET MECHANISMS IN THE POLITICAL ARENA

No single policy mechanism can be an environmental panacea, but market-based instruments can provide more cost-effective solutions for some pressing environmental problems, while spurring important technological advances. Ultimately, the greatest service that market mechanisms for environmental protection may render is to bring environmental policy formulation "out of the closet." Americans have always been shielded from many of the very real trade-offs involved in establishing our environmental goals, programs, and standards. Policy formulation has been shrouded in technical complexity, which frequently obscures the more basic question of whether we are getting our money's worth on our choice of environmental goals and the means for achieving them. Conventional regulatory approaches impose costs on industry that are not readily visible (but are partially passed on to consumers). Because neither policymakers nor citizens can see how much they are really paying for given levels of environmental protection, they have little basis for weighing relative risks or alternative policies that might yield more environmental quality for the same investment of public and private resources.

Pollution charges and other market-based instruments can bring these important questions into the open by making the incremental costs and advantages of environmental protection explicit. As a result, policy discussions can move away from a narrow focus on technical specifications to a broader consideration of goals and strategies. This shift should help get the American public involved in constructive debates regarding the desirable level and types of environmental protection. In this way, the public can recapture the critical decisions of environmental goal setting from bureaucrats, technicians, special interest groups, and politicians specializing in spreading fear rather than information.

But good ideas are not self-adopting. Even if the 1990 Clean Air Act provisions signaled the beginning of a new era of environmental policy, that does not mean that all resistance to market-based approaches has disappeared. In addition to opposition from those who simply oppose environmental protection, new market-based proposals will have to overcome the same combination of self-interest and suspicion from those *within* the environmental-protection process that has obstructed market-based approaches for decades.

Promoting the selective use of market-based mechanisms will

require political courage, but it is the right thing to do for a variety of environmental problems—for both environmental and economic reasons. Furthermore, market-based approaches offer potential political dividends: Most Americans will agree with the common sense that underlies these approaches—"the polluter ought to pay."

MANDATE FOR ACTION

1. **Create a tradable permit system to promote solid-waste recycling, and explore its application for water pollution and other environmental challenges.** A tradable permit system would induce firms to recycle, and to use recycled materials in their production processes. Generally, by using this policy instrument to allocate the pollution-control burden among firms, the total costs of control can be reduced dramatically.
2. **Create national deposit-refund systems for lead-acid batteries and some solvents.** By applying the approach already used by a number of state "bottle bills" to the health threat posed by illegal disposal of lead-acid batteries, we can reduce significantly, and cost-effectively, the number of batteries that wind up in landfills and incinerators.
3. **Promote "unit pricing" for trash pickup at the state and local level.** By charging households more if they produce more trash, municipalities can reduce solid-waste disposal costs, encourage recycling, and reduce the use of virgin materials, while preserving a high degree of individual choice.
4. **Enact carbon charges domestically, with revenues recycled to consumers by lowering other taxes, if needed to achieve internationally established and enforceable long-term goals for controlling greenhouse gases.** By reducing taxes that discourage desirable behavior such as labor and investment and relying more on taxes that discourage undesirable behavior such as pollution, we can protect the environment and increase the efficiency of the tax structure.
5. **Enact a moderate increase in the gasoline tax to reduce air pollution and traffic congestion, with revenues used to reduce Social Security payroll taxes.** By

dedicating the revenues from federal gas taxes to the Social Security Trust Fund, we can reduce workers' payroll taxes while providing important incentives for increased fuel efficiency.

6. **Expand scientific research on, and use of, risk assessment as part of a national effort to set environmental priorities.** In an era of constrained resources, we need to target our environmental-protection efforts (and limited dollars) at those problems that will yield the greatest reductions in risk, whether to human health or ecological conditions.

Chapter 9

1. One example is the high priority the administration has given to its Green Lights program to promote certain kinds of voluntary energy conservation measures within private industry. Although we certainly have no objection to voluntary approaches per se, it is important to recognize the severe limitation that is imposed by failing to take advantage of the awesome power of the market to achieve environmental goals through appropriately designed incentive-based policies. Private industry will inevitably respond most aggressively (and most efficiently) when environmental requirements show up in the proverbial bottom line.
2. See U.S. Environmental Protection Agency *Environmental Investments: The Costs of a Clean Environment,* Report of the Administrator to the Congress of the United States (Washington, D.C., Dec. 1990). This estimate excludes environmental activities not directly associated with pollution control or cleanup, such as wildlife conservation and land management. The $100 billion estimate covers spending by private business (63.0%), local governments (22.5%), the federal government (11.0%), and state governments (3.5%).
3. In eight empirical studies of air pollution control, the ratio of actual, aggregate costs of the conventional command and control approach to the aggregate costs of least-cost benchmarks ranged from 1.07 for sulfate emissions in the Los Angeles area to 22.0 for hydrocarbon emissions at all domestic DuPont plants. See T.H. Tietenberg, *Emissions Trading: An Exercise in Reforming Pollution Policy* (Washington, D.C.: Resources for the Future, 1985).
4. Numerical examples of the variance of incremental costs of air pollution control are provided by Robert W. Crandall, "The Political Economy of Clean Air: Practical Constraints on White House Review," in *Environmental Policy under Reagan's Executive Order: The Role of Benefit-Cost Analysis*, ed. V. Kerry Smith (Chapel Hill: Univ. of North Carolina Press, 1984), 205-25.
5. For example, President Lyndon Johnson's proposal for effluent fees and President Richard Nixon's recommendations for a tax on lead in gasoline and a sulfur dioxide emission fee were dismissed with little consideration.
6. For an analysis of past sources of resistance to market-based approaches to environmental protection and an assessment of why changes have occurred over recent years, see Robert W. Hahn and Robert N. Stavins, "Incentive-Based Environmental Regulation: A New Era From An Old Idea?" *Ecology Law Quarterly* 18(1991): 1-42.
7. A number of other prominent environmental organizations—including the Wilderness Society, National Wildlife Federation, National Audubon Society, Sierra Club, and Natural Resources Defense Council—now support at least selective use of market-based instruments.
8. See Robert N. Stavins, ed., *Project 88: Harnessing Market Forces to Protect Our Environment—Initiatives for the New President* (Washing-

ton, D.C., Dec. 1988), a public policy study sponsored by Senators Timothy E. Wirth (D-CO) and John Heinz (R-PA), December 1988. Two years later, Senators Wirth and Heinz sponsored a follow-up effort, Project 88/Round II, focusing on the design and implementation of effective and practical market-based environmental policy mechanisms. See Robert N. Stavins, ed., *Project 88/Round II: Incentives for Action: Designing Market-based Environmental Strategies* (Washington, D.C., May 1991), a public policy study also sponsored by Senators Wirth and Heinz.

9. See, for example, Stephan Schmidheiny, *Changing Course: A Global Business Perspective on Development and the Environment* (Cambridge, Mass.: MIT Press, 1992). Similarly, General Motors has endorsed the adoption of a broad-based carbon fee to limit emissions of greenhouse gases. See George C. Eads, comments prepared for a workshop on "Economics of Sustainable Development" sponsored by the United Nations Economic Commission for Europe and the U.S. Environmental Protection Agency, Washington, D.C., January 25, 1990.
10. Two other federal examples of tradable permit systems are EPA's Emissions Trading Program for local air quality and the nationwide phasedown of leaded gasoline. While state impediments and uncertainty about the future course of the Emissions Trading Program have sharply limited trading by firms, the limited trading that has occurred has saved more than $4 billion with no adverse effect on air quality. According to EPA, the lead program, with much higher trading among firms, reduced overall compliance costs by approximately 20% (about $200 million annually). See U.S. Environmental Protection Agency, "Costs and Benefits of Reducing Lead in Gasoline," Final Regulatory Impact Analysis VIII-31 (Washington, D.C., 1985).
11. For example, Congress has moved to reduce the federal subsidy given to U.S. Army Corps of Engineers flood-control projects (which provide incentives for individual landowners to convert forested wetlands to agricultural cropland), and there have been discussions in Congress regarding the U.S. Forest Service's "below-cost timber sales," which recover less than the cost of making timber available. See Robert N. Stavins and Adam B. Jaffe, "Unintended Impacts of Public Investments on Private Decisions: The Depletion of Forested Wetlands," *American Economic Review* 80 (1990): 337-52; and Michael D. Bowes and John V. Krutilla, *Multiple-Use Management: The Economics of Public Forestlands* (Washington, D.C.: Resources for the Future, 1989).
12. The most notable transfer plan to date has been the $223 million agreement between the Imperial Irrigation District of California and the Metropolitan Water District of Los Angeles. See Robert N. Stavins, *Trading Conservation Investments for Water* (Berkeley, Calif.: Environmental Defense Fund, March 1983).
13. This and the following two parts of this chapter draw upon Robert N. Stavins and Bradley W. Whitehead, *The Greening of America's Taxes:*

Pollution Charges and Environmental Protection (Washington, D.C.: Progressive Policy Institute, Feb. 1992).

14. A few federal policies have embraced some pollution charge characteristics, but they have aimed primarily at generating revenue rather than discouraging pollution. In 1989, Congress enacted an excise tax on chlorofluorocarbons (CFCs), which deplete stratospheric ozone and are potent greenhouse gases. The tax does *not* materially affect either the level or rate of the CFC phasedown. It simply ensures that any windfall profits associated with constrained supply flow to the government rather than to private industry. Likewise, the chemical and petroleum feedstock taxes that finance the cleanup of abandoned hazardous waste sites under the Superfund law (the Comprehensive Environmental Response, Compensation, and Liability Act, or CERCLA) are also not pollution charges; Superfund levies taxes on production (i.e., it is revenue based), not emissions. As a result, no direct link exsists between environmental controls undertaken and taxes paid and therefore no direct incentive for pollution control.
15. See Seattle Solid Waste Utility, Public Information Dept., *Municipal Solid Waste Management Program Description* (Seattle, 1991).
16. Bill Paul, "Pollution Solution: Pennsylvania Town Finds a Way to Get Locals to Recycle Trash," *Wall Street Journal,* June 21, 1989, Al.
17. See Roger Bolton, "Equity in Financing Local Services: The Case of Residential Refuse," *Resources and Conservation* 11 (1984): 45-62. Furthermore, the deductibility of local property tax payments from federal income tax liability is significant in this regard. Given the progressive nature of federal income taxes, a change from the status quo financing approach (through property taxes) to increased reliance on unit charges will tend to reduce the regressive nature of the overall system.
18. Unit charges could also lead to increased illegal dumping. The experiences of Seattle, Perkasie, and other communities suggest, however, that properly designed systems can prevent this problem. New programs can be introduced incrementally, with charges rising gradually until they equal the true costs of disposal. Municipalities can remove much of the incentive for illegal dumping by providing free or very low-cost disposal at transfer stations.
19. Retail charges can act as a *substitute* for unit curbside charges when the latter are impractical (for example, in a community with many large, multi-unit residences). Retail charges can also serve as a *supplement* to curbside charges for specific products whose cost of disposal are well in excess of the costs associated with their volume. They might include household products whose ingredients have significant environmental consequences when they find their way into landfills or incinerators. Examples include electrical-appliance batteries, inks, paints and paint solvents, and household pesticides. See Peter Menell, "Beyond the Throw-Away Society: An Incentive Approach to Regulating Municipal Solid Waste," *Ecology Law Quarterly* 17 (1990): 655-739. Virgin-material taxes ought to be viewed as potential substitutes for unit curbside

charges or retail disposal charges; a system that added one on top of the other could create double taxation.

20. See, for example, Dale W. Jorgenson, Daniel T. Slesnick, and Peter J. Wilcoxen, "Carbon Taxes and Economic Welfare," *Brookings Papers on Economic Activity*, Microeconomics 1992 (Washington, D.C.), 393-454. Studies indicate that, on average, U.S. personal and corporate income taxes generate distortions or pure losses of 20 to 50 cents for every new dollar of tax revenue collected. See, for example, Charles Ballard, John Shoven, and John Whalley, "General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States," *American Economic Review* 75 (1985): 128-38.
21. Of course, the revenues from green charges could be used in other ways. First, they could be used to reduce the federal budget deficit. This alternative has obvious appeal in an era of unprecedented levels of government borrowing. For example, Paul O'Neill, of the Aluminum Company of America (Alcoa), suggested in the summer of 1990 that energy taxes could accomplish most effectively the dual goals of reducing pollution and reducing the budget deficit. See *Environmental Policy Alert* (June 27, 1990): 33. A second option would be to use the tax revenue to finance other programs related to environmental protection. Such programs might entail further cleanup or mitigation of pollution. They might also be directed to assisting those who are economically hurt by the change to a system of green charges. However, in order to overcome the natural political aversion to taxes, and to ensure pollution charges are progressive *and* pro-growth, we advocate using the revenue from these charges to lower other taxes, such as regressive payroll taxes.
22. For a summary of studies carried out as part of the Stanford Energy Modeling Forum analysis of greenhouse gas mitigation (EMF 13) and the related research sponsored by the U.S. Environmental Protection Agency, see Neil A. Leary and Joel D. Scheraga, "Lessons for the Implementation of Policies to Mitigate Carbon Dioxide Emissions," in *Reducing Carbon Dioxide Emissions from the Energy Sector: Cost and Policy Options*, ed. Darius Gaskins and John Weyant (Cambridge, Mass.: MIT Press, forthcoming 1993).
23. Other, more direct ways can be used to internalize the "national security externality" associated with imported oil, for example, import levies.
24. See, for example, Daniel J. Khazzoom, "The Impact of a Gasoline Tax on Auto Exhaust Emissions," *Journal of Policy Analysis and Management* 10 (1991): 434-54.
25. See U.S. Environmental Protection Agency, Office of Policy, Planning, and Evaluation, *Economic Incentives: Options for Environmental Protection*. Report 21P-2001 (Washington, D.C., 1991).
26. This and the following mechanisms, intended to increase the overall efficiency of urban transportation systems, are described in detail in Michael Cameron, "Transportation Efficiency: Tackling Southern California's Air Pollution and Congestion," (Oakland, Environmental De-

fense Fund and Regional Institute of Southern California, March 1991).

27. See U.S. Environmental Protection Agency Science Advisory Board, *Reducing Risk: The Report of the Human Health Subcommittee, Relative Risk Reduction Project,* Appendix B. EPA SAB-EC-90—021B (Washington, D.C., September 1990).
28. U.S. Environmental Protection Agency, *Characterization of Products Containing Lead and Cadmium in Municipal Solid Waste in the United States, 1970-2000* (Washington, D.C., January 1989).
29. The administrative complications associated with such a program should not be underestimated. Verification would be an important issue, as a deposit-refund system could encourage users to dilute solvents.
30. For an examination of deposit-refund systems and other incentive-based policy mechanisms for used lubricating oil, see Robert C. Anderson, Lisa A. Hofmann, and Michael Rusin, *The Use of Economic Incentive Mechanisms in Environmental Management*, Research Paper #051 (Washington, D.C.: American Petroleum Institute, June 1990).
31. Many important administrative choices pertain to tradable permit systems. If the number of regulated sources of emissions is great, the administrative (transaction) costs of these systems can be very high. On the other hand, if very few sources are involved, problems of concentration in the permit and product markets could arise, with consequent inefficiencies introduced by noncompetitive behavior. Finally, regulators must decide how to allocate permits among sources: Should they be given away as an endowment, or should they be sold through an auction? If they are distributed free of charge, what criteria should be used in the allocation?
32. For detailed discussions of tradable permit systems for these three products, see Stavins, ed., *Project 88/Round II.*
33. Among the higher-risk problems EPA cited were indoor air pollution (including radon gas), exposure to chemicals in consumer products, and surface water pollution; government spending in these areas is at relatively low levels. Among the lower-risk problems EPA cited were hazardous waste sites and underground storage tanks, both of which receive very high levels of federal funding. See U.S. Environmental Protection Agency, Office of Policy Analysis, *Unfinished Business: A Comparative Assessment of Environmental Problems*, Overview Report (Washington, D.C., Feb. 1987). Trace amounts of dioxin in surface waters is another example of a lower-risk problem that receives a relatively high level of regulatory attention, John Graham Harvard School of Public Health, personal communication, Oct. 15, 1992.
34. U.S. Environmental Protection Agency, Science Advisory Board, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection* (Washington, D.C., Sept. 1990).
35. See U.S. General Accounting Office, *Environmental Protection: Meeting Public Expectations with Limited Resources*, Report to the Congress, GAO/RCED-91-97 (Washington, D.C., June 1991).