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Report to the Chairman, Subcommittee on Deficits, Debt Management and International Debt, Committee on Finance, U.S. Senate

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ENVIRONMENTAL PROTECTION

Implications of Using Pollution Taxes to Supplement Regulation

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Resources, Community, and
Economic Development Division

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The Honorable Bill Bradley
Chairman, Subcommittee on Deficits, Debt
Management and International Debt
Committee on Finance
United States Senate

Dear Mr. Chairman:

This report responds to your June 5, 1991, request that we examine the feasibility of taxes as a mechanism to further environmental protection.

As arranged with your office, unless you publicly announce its contents earlier, we will make no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to the Administrator, Environmental Protection Agency. We will also make copies available to other interested parties.

This work was performed under the direction of Richard L. Hembra, Director, Environmental Protection Issues, who may be reached at (202) 275-6111. Other major contributors to this report are listed in appendix III.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

The Environmental Protection Agency (EPA) relies primarily on regulations to meet environmental goals by limiting how much pollution can be emitted by various sources. Since 1970, government and industry have spent over $1 trillion complying with these "command-and-control" regulations. The result has been substantial environmental improvements. Further progress in reducing pollution could be more difficult because remaining sources of pollution may be harder to control.

Concerned about ensuring future environmental improvements, the Chairman of the Subcommittee on Deficits, Debt Management and International Debt, Senate Committee on Finance, asked GAO to examine the implications of using pollution taxes as a possible supplement to traditional regulations. Specifically, this report discusses (1) opportunities in which taxes might be used to help bring about further environmental gains and (2) the design and implementation of such taxes to produce both environmental and economic benefits.

Background

After having achieved substantial environmental improvements over the last two decades, EPA is finding it more difficult to solve remaining pollution problems. The agency has limited resources, and some of the remaining problems, such as water contamination from urban runoff and pesticide use, are not easily controlled by command-and-control regulations.

One way to address remaining pollution problems is to make greater use of a regulatory approach that employs economic incentives. This approach differs from a command-and-control approach in which the regulator specifies how pollution must be reduced or what pollution control technology must be used. An approach employing economic incentives gives companies more flexibility in choosing how to reduce pollution and could lead to more cost-effective solutions to remaining pollution problems. This approach has also been studied as a possible remedy to address pollution from small, diffuse sources. An approach employing economic incentives can take several forms, including systems under which firms can buy and sell emission reduction credits (called "emission trading") and pollution taxes. A pollution tax is generally defined as a tax on the emissions of a pollutant or on harmful products or substances.

Results in Brief

Many pollutants of groundwater, surface water, and the air are identified in environmental laws as harmful and in need of further control. Pollution

taxes are one possible way to supplement existing command-and-control regulations to meet this need.

Pollution taxes would have to be carefully designed and implemented to be effective in achieving environmental and economic benefits. An accurate monitoring system would be needed to ensure that the tax was reducing pollution as intended. In certain cases, for some smokestack emissions, accurate monitoring technology exists, but in other cases, such as those involving fugitive emissions of dust, monitoring could be very difficult. It would also be important to ensure that the tax led to an overall reduction of environmental risks. The regulator would need to be alert to the possibility that taxing one pollutant might increase the use of a substitute pollutant that was just as toxic. For example, a tax on lead alone could result in greater use of cadmium in batteries. In addition, the tax rate that would be needed to reduce pollution to acceptable levels might not always be known. As a result, taxes might need to be implemented gradually and their effects monitored to determine whether pollution was being reduced to acceptable levels. Many of these design and implementation issues are not unique to pollution taxes; similar issues exist for any form of effective environmental regulation.

The economic and environmental benefits of pollution taxes would depend on how well design and implementation issues were addressed. Pollution taxes, if used, could also provide further benefits if their revenues were used to reduce federal taxes that can discourage economic growth and/or to reduce the federal budget deficit.

GAO's Analysis

Opportunities for Pollution Taxes Exist

Although substantial environmental improvements have occurred, GAO has recently reported instances in which EPA and state and local governments have been unable to effectively regulate harmful substances.[1] In such instances in which further control is needed, pollution taxes could supplement regulations to meet the objectives of existing environmental laws.

[1]See, for example, Pesticides: EPA Could Do More to Minimize Groundwater Contamination (GAO/RCED-91-75, Apr. 29, 1991), Water Pollution: Stronger Efforts Needed by EPA to Control Toxic Water Pollution (GAO/RCED-91-154, July 19, 1991), Air Pollution: EPA's Strategy and Resources May Be Inadequate to Control Air Toxics (GAO/RCED-91-143, June 26, 1991).

For example, in a July 1991 report on water pollution, GAO found that while EPA identified 126 "priority" toxic chemicals for control, stringent regulations were applicable only for "point" sources of these pollutants—such as factories and power plants. Yet according to EPA, runoff from unregulated "nonpoint" sources—such as mining and construction sites and farms—causes serious water pollution. EPA and state officials attributed many problems in implementing water pollution control programs to limited financial resources. These officials also maintained that the administrative costs of regulating thousands of nonpoint sources would be very high using command-and-control regulations. In such instances, pollution taxes might help. Besides reducing pollution, these taxes would raise revenues, some of which could be used to fund administrative costs associated with the taxes. It might also be easier to tax chemicals used by thousands of farmers rather than to limit each farmer's use of chemicals and to enforce such regulations.

In a June 1991 report on the 1990 Clean Air Act amendments, GAO found that EPA's budget requests were less than one-fourth the amount needed to regulate 189 toxic air pollutants under the act. GAO concluded that these resource constraints would likely result in significant delays of the act's implementation. In such instances, pollution taxes could be a possible way to further reduce emissions of these chemicals, and some of the tax revenues could be used to fund administrative costs.

Careful Design and Implementation Needed to Achieve Benefits of Pollution Taxes

Danger from pollution can arise in several ways, ranging from exposure to smokestack emissions of a pollutant to exposure from using a product containing that substance. Ideally, all forms of exposure would be evaluated in order to levy the tax where it could be most effective, be it a tax on emissions or on the product itself. However, designing a pollution tax to address environmental and health risks in this way could be complicated and result in increased administrative complexity and cost. For example, difficulties in monitoring could make levying taxes on the emissions of some substances impractical or costly. The taxed pollutant, whether emitted from a smokestack or used in a consumer product, would need to be accurately monitored to successfully implement and enforce the tax. While monitoring the emissions of some pollutants—such as sulfur dioxide from a smokestack—is feasible, it generally would be easier to monitor pollution taxes on products than on emissions. For instance, it would be easier to monitor the use of a product like lead metal than lead emissions from a smelter's smokestack. However, a tax on a product, such

as lead metal, would penalize all uses of that product, regardless of the risks posed by those uses.

Other tax design issues stem from the possibility that risks could be transferred, rather than reduced, if other toxic pollutants were used in place of a taxed substance. As a result, it might be necessary to tax or otherwise control toxic substances that could be used interchangeably. A tax on lead, for example, might encourage the use of batteries that substitute other toxic heavy metals, such as nickel and cadmium, for lead.

In addition, the tax needed to reach an acceptable risk might be unknown. Given the uncertainty over appropriate tax rates, pollution taxes could begin at low levels and be phased in, allowing polluters more time to adapt to the taxes and avoid unnecessary costs. The effects of these taxes could be monitored and their scope and rate changed if need be.

Many of these tax design and implementation issues—such as monitoring; controlling for unintended effects, including the increased use of substitute toxic substances; and determining appropriate tax and/or control levels—are not unique to pollution taxes. While difficult to address, these same issues also exist for any form of effective environmental regulation.

Added economic benefits could result if revenues from pollution taxes were used to reduce other taxes that discourage economic activity, such as taxes on capital and labor, and to reduce the federal budget deficit.

Recommendations

GAO is making no recommendations on the issues discussed in this report. Rather, this report provides information on the possible implications of pollution taxes as a pollution control mechanism.

Agency Comments

In commenting on a draft of this report, EPA said it was a well-structured, straightforward, and accurate analysis of the design and implementation issues regarding pollution taxes. EPA raised a number of points that were technical corrections and clarifications. They have been incorporated into the report where appropriate. EPA's comments are reproduced in appendix II.

Contents

Abbreviations

BMP	best management practice
CO_2	carbon dioxide
CBO	Congressional Budget Office
EPA	Environmental Protection Agency
GAO	General Accounting Office
MACT	maximum achievable control technology
MWC	municipal waste combustor
OECD	Organization for Economic Cooperation and Development
PCB	polychlorinated biphenyl
POTW	publicly owned treatment works
TRI	Toxic Release Inventory

Introduction

The Environmental Protection Agency (EPA) estimates that by the year 2000, pollution control costs for environmental programs meeting current legislative requirements will reach nearly $160 billion a year (in 1986 dollars), or about 2.8 percent of the gross national product.[1] Most of these costs will be borne by U.S. industry and consumers of its products and services. Costs will also fall on state and local governments, which are already pressed to finance other federal mandates. The federal government, with a budget deficit projected at over $300 billion for fiscal year 1993, will also be constrained in its ability to help address the nation's multibillion-dollar environmental problems.

As the costs for controlling pollution have increased—in 1986 dollars, from $26 billion in 1972 to $115 billion in 1990—there is a growing realization that government needs to find less costly ways to protect the environment. Many have concluded that a strategy combining the traditional regulatory approach with market-based incentives could be less costly to the economy and more effective in controlling pollution.

Current Approach to Controlling Pollution

Federal environmental protection regulations generally employ standards governing the amount of pollution that can be emitted or discharged by a single source (performance standards) or standards governing the pollution abatement technology and practices that companies must adopt (technology standards). Typical components of this regulatory system, commonly referred to as command-and-control regulation, include health-based standards for pollution levels in the environment, as well as construction and operating permits and enforcement procedures aimed at achieving these standards. For example, the Clean Air Act, as amended, authorizes EPA to develop health-based "national ambient air quality standards," which are allowable levels of pollutants in the outside air. States, in turn, are given the responsibility for developing and implementing plans for attaining these standards. On the basis of these plans, states will issue construction and operating permits to polluting facilities. The act also requires EPA to develop and issue technology-based standards to control pollution from all major sources of 189 toxic air pollutants identified in the act.

Our reliance on command-and-control regulation over the last 20 years has brought considerable environmental improvements, as this regulation has been generally effective in controlling pollution from large stationary

[1]Environmental Investments: The Cost of a Clean Environment, U.S. Environmental Protection Agency (EPA-230-11-90-083, Nov. 1990).

sources, such as factories, power plants, and municipal sewage treatment plants, known as "point" sources. Despite substantial economic and population growth, emissions of several significant air pollutants have fallen. According to EPA's estimates, between 1970 and 1988, emissions of particulate matter, carbon monoxide, volatile organic compounds, sulfur dioxide, and nitrogen oxides were 30, 43, 58, 58, and 72 percent, respectively, of what they would have been if controls had not been established. EPA also points out that discharges of water pollutants from municipal and industrial sources have declined, as the levels of total suspended solids in and the biological oxygen demand of industrial discharges—two traditional indicators of water pollution—declined by 96 and 93 percent, respectively, between 1973 and the period between 1982 and 1987.[2]

Though some successes have been large, the cost of implementing command-and-control regulation has been high, and this approach has not successfully addressed certain types of pollution. Command-and-control regulation frequently prescribes uniform performance or technology standards for pollution sources, without regard to the variability in different sources' costs of controlling pollution. In contrast, an approach employing economic incentives may achieve the same reduction in pollution but offers companies greater flexibility: Companies would have the choice of investing in different control technologies, changing manufacturing processes, or paying for unabated pollution. Moreover, by not giving companies such flexibility, the government takes on the costs of determining and imposing, for each source, emissions standards or technologies for abating pollution.

Despite limiting pollution from stationary sources, command-and-control regulation has not been as effective in addressing pollution from indirect or dispersed sources, such as households, farms, and small firms, which account for much of the water pollution that stems from urban runoff and pesticide use. Indeed, many of these "nonpoint" sources of pollution cannot be readily addressed by the technical solutions offered by command-and-control regulation because the pollution stems from millions of economic decisions made by individuals. Even if establishing technology-based standards for nonpoint sources were possible, enforcement would be exceedingly difficult when so many sources are involved.

[2]Environmental Investments: The Cost of a Clean Environment.

Market-Based Incentives

Because of their inherently greater flexibility, market-based incentives can, in some cases, be both a less costly and more effective means of controlling pollution. In recent years, we have advocated the use of market-based incentives as a potentially efficient means of supplementing command-and-control regulation.[3] Interest in the Congress has been high as well. A recent bipartisan policy study entitled Incentives for Action: Designing Market-Based Environmental Strategies (Project 88—Round II)[4] offered a series of market-oriented approaches to prevent global climate change, manage solid and hazardous waste, and manage natural resources. Market-based incentives include, among others, trading systems under which firms can buy and sell rights to pollute (termed "emission trading"), deposit-and-refund systems, the public disclosure of information on firms' or products' environmental impacts, and pollution taxes.

While rarely used in the United States, market-based approaches to address pollution problems are increasing. EPA first used market-based incentives in 1974, in the form of an emission trading program to assist polluters in meeting the requirements of the Clean Air Act.[5] Beginning in 1982, EPA effectively used a trading program to reduce the domestic use of leaded gasoline. More recently, the 1990 amendments to the Clean Air Act introduced an emission trading program as part of the effort to reduce acid rain. Experience with market-based incentives for environmental protection is not limited to the United States. A 1987 review by the Organization for Economic Cooperation and Development (OECD) identified 150 different applications of market-based instruments in 14 countries.[6]

Emission Trading

Under emission trading, also known as a marketable permits system, an overall target for controlling pollution is established, and the government issues to existing firms permits allowing them specified levels of emissions. Firms that keep their emissions below their allowed level may sell their surplus allotments, known as emission reduction credits, to other firms. Firms that keep the emissions from some of their facilities below

[3]A Market Approach to Air Pollution Control Could Reduce Compliance Costs Without Jeopardizing Clean Air Goals (GAO/PAD-82-15, Mar. 23, 1982) and Environmental Protection: Meeting Public Expectations With Limited Resources (GAO/RCED-91-97, June 18, 1991).

[4]Timothy E. Wirth and John Heinz (Washington, D.C.: May 1991).

[5]EPA's emission trading program includes four components—the "netting" program, the "bubble" program, the "offset" program, and the "banking" program—contained in EPA's Final Policy Statement on Emissions Trading of 1986.

[6]OECD, Economic Instruments for Environmental Protection (Paris: 1989).

the allowed level may also use the resulting emission reduction credits to offset emissions from their other facilities. Under the emission trading program to reduce acid rain, permits for sulfur dioxide emissions will be issued to coal-fired electric generating facilities. Facilities' allotments are to be set at levels designed to reduce these emissions by 10 million tons from the 1980 level. It has been estimated that this program may reduce sulfur dioxide emissions in the United States at a savings of $2 billion to $3 billion over traditional forms of regulation.[7]

The potential of emission trading to reduce the cost of meeting standards for water pollution from point and nonpoint sources has also received increasing attention in recent years. Under such a system, trades can take place among dischargers of pollution from point sources or between dischargers of pollution from point and nonpoint sources. But in a June 1992 report on water pollutant trading, we found that only four projects nationwide have participated in such trades, each initiated by local communities.[8]

Deposit-And-Refund Systems

Under deposit-and-refund systems, purchasers of products that could pollute the environment pay a surcharge, which is refunded when the purchasers return the products to an approved center for recycling or proper disposal. Many states have enacted such a system for automobile batteries to encourage the recycling of lead. Nine states have enacted "bottle bills" to encourage the collection of beverage containers for recycling and to reduce the flow of solid waste to landfills. States with these deposit-and-refund systems report that 80 to 95 percent of the containers are returned for recycling.

Public Disclosure

Requiring the public disclosure of information on activities or products that may be environmentally harmful is intended to influence consumers' behavior and direct the resulting pressure in the marketplace to work in favor of environmental protection. An example of this type of market-based incentive is EPA's Toxic Release Inventory (TRI), created by the 1986 Emergency Planning and Community Right-to-Know Act. The act requires industries to annually report, to EPA and states, their estimated releases of hundreds of chemicals. EPA is required to collect this

[7]Timothy E. Wirth and John Heinz, Project 88: Harnessing Market Forces to Protect Our Environment (Washington, D.C.: Dec. 1988); and Paul R. Portney, "Economics and the Clean Air Act," Journal of Economic Perspectives, Vol. 4, No. 4 (Fall 1990).

[8]Water Pollution: Pollutant Trading Could Reduce Compliance Costs if Uncertainties Are Resolved (GAO/RCED-92-153, June 15, 1992).

information, compile it into the inventory, and make it available to the public through various formats, including a computerized data base. In a report to the Congress evaluating EPA's inventory, we found that the public availability of data prompted some large manufacturers to set goals for reducing emissions.[9] On the basis of our nationwide survey of industrial facilities that submitted reports to the inventory, we estimated that as a consequence of the inventory program, over half of all reporting facilities made one or more operational changes designed to reduce toxic emissions.

Another information-based incentive, which focuses on consumer products, is known as "environmental labeling" or "green labeling." Under programs using this incentive, private or public bodies evaluate the environmental impacts of consumer products. These groups then issue seals of approval for products that meet certain specified standards, thereby informing consumers and helping to promote these products. Labeling programs, such as the "Blue Angel" program, run by the German government, and the "Green Seal" and "Green Cross" programs, run by private groups in the United States, have become increasingly popular. OECD estimates that by the end of 1992, as many as 22 of its member countries could have on their markets' shelves products with environmental labels.[10]

Pollution Taxes

Pollution taxes, also known as green taxes or environmental taxes, which can be broadly defined as charges on pollution generated, are implemented as either emission charges or product charges.[11] Emission charges are levied on the discharge of pollutants into the environment, and product charges are levied on products that are harmful to the environment when produced, used, or disposed of. If set at a high enough rate, pollution taxes can create an incentive to reduce pollution.[12] A number of European countries have taxed leaded gasoline in order to

[9]Toxic Chemicals: EPA's Toxic Release Inventory Is Useful but Can Be Improved (GAO/RCED-91-121, June 27, 1991).

[10]OECD, Environmental Labeling in OECD Countries (Paris, 1991).

[11]The definitions of emission charges and product charges come from OECD, Guidelines for the Application of Economic Instruments in Environmental Policy (Paris: Jan. 1991).

[12]If firms are taxed on the amount of pollution they generate, it will make economic sense for them to reduce pollution up to the point at which their cost of further controlling pollution is equal to the pollution tax rate. For example, if the tax rate was $100 per ton of pollution and reducing the pollution by 1 ton would cost a firm $50, it would make economic sense for the firm to spend $50 to reduce the pollution by 1 ton and avoid the $100 tax. However, if reducing the pollution by 1 ton would cost the firm $150, the firm would be inclined to pay the tax.

reduce lead emissions from automobiles, and Austria has a tax on pesticides and fertilizers that has reduced the use of these materials 30 percent over a 2-year period.

On the other hand, pollution taxes have also been set at rates primarily intended to raise revenues.[13] For example, while taxes on discharges into the air and water have been adopted in France, Italy, and Germany, these taxes have not been set at rates sufficient to create much of an incentive to reduce pollution; these taxes have instead been used primarily to raise revenues. An update of OECD's 1987 survey of market-based incentives, conducted in 1991, found that the number of charge systems either implemented or being contemplated had increased almost threefold over the 4-year period and that these charge systems were being used in 21 countries.[14] The report noted that the motivation for using these systems has gradually changed, from raising revenues to controlling pollution.

Objectives, Scope, and Methodology

In June 1991, the Chairman of the Subcommittee on Deficits, Debt Management and International Debt, Senate Committee on Finance, requested that we review the feasibility of taxes as a tool to further reduce environmental hazards. On the basis of subsequent discussions with the Chairman's office, we agreed to focus on the following questions:

- What opportunities exist in which taxes might be used to help bring about further environmental gains?
- What factors should be considered in designing and implementing pollution taxes to ensure their effectiveness in achieving environmental and economic benefits?

In addition, we agreed to conduct a case study of a hypothetical pollution tax on lead in order to illustrate issues concerning the design and implementation of pollution taxes.

To identify opportunities in which taxes might be used, we reviewed lists of chemicals and materials either currently regulated or targeted for

[13]There can be a trade-off between the objectives of pollution taxes intended to both reduce pollution and raise revenues. For example, if the tax was set at a higher rate that created a substantial incentive to reduce pollution, the revenues might decay as polluters attempted to avoid the tax, either completely or in part, by reducing their pollution; however, if a tax was set at a lower rate that did not create as much incentive to reduce pollution, revenues would be less likely to decline because polluters would be more likely to choose to pay the tax rather than reduce pollution.

[14]OECD, Recent Developments in the Use of Economic Instruments for Environmental Protection in OECD Countries (Paris: Feb. 1991).

regulation under federal environmental laws, and by relying on previous GAO evaluations, we considered the adequacy of efforts to implement these laws. We also interviewed officials of EPA, the Centers for Disease Control of the Department of Health and Human Services, and nongovernmental organizations to get these officials' views on opportunities in which taxes might be used. To describe how pollution taxes could be designed and implemented to realize environmental and economic benefits, we reviewed and summarized relevant literature on pollution tax theory and tax design and talked to industry representatives and government regulators.

We performed our work in the Washington, D.C., area, from October 1991 to May 1992 in accordance with generally accepted government auditing standards. We obtained written comments from EPA on a draft of this report and included these comments in the final version of the report where appropriate. EPA's comments and our evaluation of them are in appendix II.

Opportunities for Pollution Taxes Exist

Hundreds of pollutants, including toxic water and air pollutants, have been identified in environmental laws as harmful and in need of control, but historically have not been well regulated by federal and state agencies. One important reason has been a lack of resources. For some of these pollutants, pollution taxes could, if carefully designed and implemented on the basis of the factors we consider in chapter 3, supplement existing command-and-control regulation and help overcome problems that have delayed or complicated regulatory efforts. In addition, pollution taxes would raise revenues that could be used to reduce either distorting federal taxes or the federal budget deficit. Pollution taxes offer advantages over other revenue options, such as taxes on income and profit, to the extent that these traditional taxes discourage desirable economic activities, such as work, saving, and investment. Pollution taxes, on the other hand, tend to discourage undesirable side effects of economic activities, namely, pollution.

Current Regulatory System Has Not Effectively Controlled Numerous Pollutants

In a number of program reviews over the last several years, we have found that EPA and state agencies responsible for implementing and enforcing federal environmental statutes have often been unable to effectively regulate substances identified by law as harmful. These substances include toxic water and air pollutants, such as heavy metals, pesticides, and chlorinated solvents, that have been linked to serious health problems, including cancer, birth defects, and lung disease. In many cases, regulatory problems have occurred because EPA's or states' budgets were too small to handle extensive administrative and regulatory responsibilities or because the pollution stemmed from sources that are small and diffuse and, therefore, difficult to control under existing regulation.

Surface Water Pollutants

EPA estimates that 554.7 million pounds of toxic pollutants were discharged to surface waters in 1987. The pollution from point sources, which are discrete and identifiable sources, such as municipal and industrial facilities, is wastewater discharged directly to surface waters. The pollution from nonpoint sources, which are multiple and diffuse, includes the runoff from urban and agricultural areas and from mining, construction, and hazardous waste sites and emissions that have settled from the air into receiving waters. Toxic pollutants discharged from these sources pose serious threats to aquatic life and people who consume fish or swim in the polluted waters. The toxic pollutants include organic chemicals such as solvents, dioxins, and PCBs (polychlorinated biphenyls); metals such as mercury, lead, copper, chromium, and cadmium; and

pesticides. In addition to these toxic pollutants, there are from these sources other, conventional pollutants, such as sediments, bacteria, and nutrients, that also seriously impair water quality.

In 1972, the Congress enacted the Clean Water Act to control the amounts of harmful pollutants that facilities can discharge directly into the nation's receiving waters and indirectly into these waters through sewage treatment plants. As a result of subsequent amendments, EPA developed a list of 126 "priority" toxic chemicals and promulgated national guidelines to control toxic effluent from certain types of industries. In the last set of amendments, the Water Quality Act of 1987, EPA and states were required to identify waters impaired by toxic pollutants and nontoxic pollutants. States were also required to identify point sources causing pollution problems and to develop strategies to control toxic discharges.

In a July 1991 report on water pollution, we found that for a number of reasons, many of the nation's impaired waters were not identified and targeted for cleanup as required by the Water Quality Act.[1] Most states had monitored the quality of less than half of their surface waters. Furthermore, we found in our review that stringent regulatory controls applied only to point sources discharging any of the 126 priority pollutants—an approach that did not account for other pollutants and pollutants of any sort from nonpoint sources. These unregulated sources, however, cause serious water pollution problems.

EPA and state officials attributed many of their problems in implementing water pollution control programs to financial constraints. To ease these financial constraints, at least 30 states have used alternative financing mechanisms, such as fees and taxes paid by dischargers, to generate additional revenues for the states' programs. But given the widening gap between the needs of programs and the available resources, we suggested in our report that the Congress consider directing EPA to develop a pollutant-based fee system that would serve as an incentive for dischargers to reduce or eliminate their toxic discharges.[2] Because of the high administrative costs of regulating the large number of pollutants

[1]Water Pollution: Stronger Efforts Needed by EPA to Control Toxic Water Pollution (GAO/RCED-91-154, July 19, 1991).

[2]In Reducing the Deficit: Spending and Revenue Options (Feb. 1992), the Congressional Budget Office (CBO) estimates that taxing pollutants contained in wastewater would create incentives for additional abatement and raise a substantial amount of revenue. CBO estimates that the revenue from such a tax—based on the biological oxygen demand of discharges and applied to publicly owned treatment works (POTW) and large industrial dischargers—could amount to $9.1 billion over 5 years. CBO suggests that POTWs could recover costs by raising residential and commercial sewer bills and by increasing the fees charged to industrial sources that pipe wastewater to the POTWs.

through traditional command-and-control regulation, a fee system could be cheaper and more effective.

Drinking Water and Groundwater Pollutants

Many of the pollutants that have been discovered in surface waters have, despite the treatment that sometimes occurs, found their way into drinking water supplies. The pesticides that have leached into groundwater also represent a threat to drinking water, as about 40 percent of the population in the United States—over 90 percent of the population in rural areas—depends on groundwater for its drinking water.

To protect the nation's drinking water, the Congress enacted the Safe Drinking Water Act in 1974. The act requires EPA to establish drinking water standards, covering certain contaminants, to be met by the nation's 58,000 community water systems. The act also requires water systems to monitor the water delivered to consumers to detect whether it exceeds the standards. In 1986, the Congress amended the act, significantly increasing the number of contaminants to be regulated and strengthening EPA's enforcement authority. The amendments directed EPA to, among other things, establish treatment techniques or standards called "maximum contaminant levels" for 83 specific contaminants.

Despite reports by EPA that water systems were largely meeting monitoring requirements and drinking water standards, in a June 1990 report we found substantial evidence that (1) violations were probably going undetected and unreported by water systems and (2) violations were going unreported by states to EPA.[3] In our report, we pointed out that the addition of the 1986 regulatory requirements to the drinking water program would make an already complex program more difficult for EPA, the states, and water systems to implement. EPA estimated, for example, that these new requirements, which affect nearly all community water systems, would add about $2.5 billion in annual compliance costs. EPA and the states expected that the increasingly stringent requirements would substantially increase their own regulatory costs.

Problems also exist in protecting the nation's groundwater. Prior to the discovery of two pesticides in groundwater in 1979, it was generally believed that pesticides did not leach into groundwater as a result of normal agricultural use. Since 1979, studies by EPA have identified 46 pesticides that contaminate groundwater as a result of normal

[3]Drinking Water: Compliance Problems Undermine EPA Program as New Challenges Emerge (GAO/RCED-90-127, June 8, 1990).

agricultural use. Some of these pesticides are known to cause cancer or other adverse health effects.

Because cleaning up groundwater is extremely costly and difficult with current technology, EPA's policies advocate preventing groundwater contamination. However, in an April 1991 report, we found that years after identifying several pesticides as groundwater contaminants, EPA had made limited progress toward protecting groundwater from them.[4] We noted that EPA officials cited insufficient resources as a reason why the agency had made limited progress in regulating these contaminants.

Pollution taxes on some drinking water contaminants and groundwater pollutants may reduce the complexity and cost of controlling them. Some pollution of drinking water and groundwater is from nonpoint sources that are difficult to deal with using the command-and-control approach. In such instances, the level of pollution may be directly related to the use of products such as pesticides, fertilizers, and solvents. Taxes on such products would reduce their use. In addition, some of the revenues from such taxes could be earmarked to administer the program, as would also be the case with taxes on surface water pollutants. In other words, a portion of the pollution taxes could be considered user fees imposed on the polluters to cover administrative costs.[5]

Toxic Air Pollutants

In 1988, industry released over 2.4 billion pounds of toxic chemicals into the nation's air—including arsenic, cyanide, chloroform, and formaldehyde. These chemicals cause serious health problems including birth defects, lung disease, liver damage, and cancer. Sources of toxic air pollutants include chemical plants, steel mills, electric utilities, refineries, textile and furniture manufacturers, pulp and paper mills, dry cleaners, and automobiles.

While section 112 of the Clean Air Act, as amended in 1977, required EPA to establish emissions standards for toxic air pollutants, EPA regulated only seven of these pollutants. Title III of the Clean Air Act amendments of 1990 deleted the section and replaced it with a new section 112 that requires EPA to control 189 of the most prevalent and hazardous toxic air pollutants.

[4]Pesticides: EPA Could Do More to Minimize Groundwater Contamination (GAO/RCED-91-75, Apr. 29, 1991).

[5]Administrative costs are not the primary determinant of the tax rate set on a pollutant because the purpose of a pollution tax is to reduce health and environmental risks, not pay program costs. If the tax revenue generated by the pollution tax did not cover administrative costs, the rate should not be increased to a level that would cover costs.

As noted in chapter 1, the amendments require EPA to establish pollution control standards—known as maximum achievable control technology, or MACT, standards—for these pollutants. After the standards are in place, EPA is required to assess the remaining health and environmental risks and, if warranted, impose further controls. The act also allows EPA to add or to delete from this list of 189 if data on a pollutant's health and environmental effects warrant such action.

In a June 1991 report on EPA's progress in establishing these pollution control standards, we found that EPA's budget requests fell far short of the amounts needed to carry out the statutory mandate.[6] For fiscal years 1991 and 1992, EPA's requests were 23 and 16 percent, respectively, of the funds agency officials believed were actually necessary to implement the program for controlling these air pollutants. On the basis of EPA's documents, we concluded that these resource constraints would likely result in significant difficulties in meeting the act's scheduled implementation.

As with the previous examples, pollution taxes could be used to further control these pollutants. Many of the 189 substances targeted for control under the Clean Air Act are also included in EPA's TRI, and the agency has suggested that a tax on releases—to the air, land, and water—of the toxins contained in the inventory could reduce pollution at less cost than command-and-control regulation.[7] According to EPA, a charge per ton of reported releases could be applied to all or to some subset of the chemicals in the inventory. EPA cautions, however, that such a tax system could be difficult to implement, given the problems in ensuring the accuracy of data on the releases. EPA notes that since the inventory is currently based on self-reporting of estimated releases, a tax on these releases may create an incentive to underreport releases. EPA also warns that such a system, if not designed properly, may result in unintended effects, as the following example illustrates. A given volume of releases of pollution to the air may pose greater risk than the same volume of releases to the land. A tax based only on volume could actually increase the overall risk if facilities find it cheaper to reduce releases to the land than releases to the air and therefore shift from releasing pollutants to the land toward releasing them to the air. EPA points out, however, that such taxes could be adjusted to reflect differences in risks from releases to different media, as well as differences in the toxicity of individual chemicals.

[6]Air Pollution: EPA's Strategy and Resources May Be Inadequate to Control Air Toxics (GAO/RCED-91-143, June 26, 1991).

[7]Economic Incentives: Options for Environmental Protection, EPA (EPA-21P-2001, Mar. 1991).

As with the other examples, part of the revenues from taxes on air pollutants could be earmarked to administer programs protecting the air. Again, the justification for earmarking the revenues is that the taxes would be user fees to cover administrative costs.

Pollution Taxes Offer Potential Economic and Environmental Benefits

Pollution taxes, both emission taxes placed directly on the discharge of pollution and product taxes, could be used to address some of the water and air pollution problems described above. While little experience with the use of taxes to control pollution exists, a system of pollution taxes could possibly result in significant benefits for the environment and the economy. These benefits include lowering the cost of controlling pollution, addressing pollution that historically has not been well controlled, and generating possibly significant revenues.

Lowering Costs

Pollution taxes can lower the cost to society of controlling pollution by allowing polluters to select the least expensive way to limit pollution. This is particularly true when the cost of limiting pollution varies considerably among polluters. For example, if a chemical plant can reduce emissions of a certain pollutant more inexpensively than a steel factory, it follows that an overall reduction in the emissions of this pollutant can be achieved at less cost by having the chemical plant reduce emissions more than the steel factory, rather than having both the plant and the factory reduce emissions an equal amount.

As noted in chapter 1, if firms are taxed on the pollution they produce, they will tend to reduce pollution up to the point at which their cost of further controlling pollution is equal to the pollution tax rate. Under such a tax system, firms will reduce pollution to different degrees, as firms with high abatement costs will likely control pollution less and pay more taxes, while firms with low abatement costs will likely control pollution more and pay less taxes. In addition, pollution taxes may encourage technical innovation, as polluters seek new ways to reduce pollution. As a result of these taxes, objectives for controlling pollution could be met at a lower overall cost to society.[8]

Given the growing costs of controlling pollution under command-and-control regulation, coupled with limited resources available at the federal and state levels to implement this approach, a system of

[8]Expenses for particular firms could be higher because they would be paying a tax not present under command-and-control regulation.

pollution taxes could allow these limited regulatory resources to be directed more effectively. Under a system of pollution taxes, the government resources could be devoted to oversight and monitoring rather than to determining and prescribing pollution control technologies and strategies for pollution abatement. While implementing pollution taxes would require monitoring, review, and enforcement by regulatory agencies, such requirements might not be significantly different from those under a command-and-control system designed to achieve the same level of environmental quality. On the other hand, there would be some costs uniquely associated with a tax system, namely, costs to design tax forms and instructions, educate taxpayers, process forms, and collect delinquent taxes.

Addressing Poorly Controlled Pollution

A number of serious pollution problems remain unaddressed, partly because they arise from many nonpoint sources that simply cannot be effectively regulated by the "end of the pipe" solutions offered by traditional regulatory approaches. Pollution taxes may be more appropriate than traditional regulatory approaches to address the water pollution that results from such things as the runoff from urban and agricultural areas and the air pollution that frequently results from the toxic emissions of dry cleaners, gas stations, and even consumer products used in households. This is because pollution taxes, either in the form of emission taxes or product taxes, could incorporate the cost of pollution at the time the pollution takes place, enabling producers and consumers to weigh the cost of pollution in their economic decision-making. Producers and consumers may switch to less polluting products or alternatives if the tax rate is high enough to induce the change.

For example, pollution taxes could be used to reflect the costs of surface water and groundwater pollution to the users of fertilizers and pesticides. As noted in chapter 1, Austria has a small tax on pesticides and fertilizers. This tax has reduced the use of these materials by 30 percent over a 2-year period even though the tax was not designed as an incentive. EPA has suggested that a tax-and-rebate system for pesticide containers could create an incentive to limit some of the pesticide residues found in surface water and groundwater.[9] EPA estimates that more than 100 million pesticide containers are discarded annually by commercial and agricultural applicators and that approximately 1.1 million pounds of pesticide residues (active ingredients) are discarded along with these containers. The incentive program would place a tax on the active ingredients used in

[9]Economic Incentives: Options for Environmental Protection.

pesticides and rebate this tax once pesticide containers were returned to stations for recycling or disposal.

Generating Revenues

Estimates of revenues from pollution taxes vary, depending upon how large the taxes are, how widely they are applied, and the extent to which their revenues decline over time as polluters respond to the incentives created by the taxes and reduce pollution. One estimate, produced by the Congressional Budget Office (CBO) in a February 1992 report to the Senate and House Committees on the Budget, projected that revenues from pollution taxes on air and water pollutants could reach an average of approximately $50 billion annually over fiscal years 1993 to 1997.[10] While this amount is not large in comparison to the revenues raised through federal income, social insurance, and corporate taxes—which produced about $467 billion, $396 billion, and $98 billion, respectively, in fiscal year 1991—such revenues from pollution taxes would be significant nonetheless.

Aside from generating some revenues, pollution taxes may also have a role to play in improving the efficiency of the federal tax system.[11] Pollution taxes can lead to a more efficient tax system because they discourage undesirable side effects of economic activity, namely, pollution, whereas taxes on income and profit may discourage desirable economic activities, namely, work, savings, and investment. Revenues raised through pollution taxes could be used to reduce taxes that discourage beneficial activities or, alternatively, could be used instead of raising these other taxes to reduce the budget deficit.[12]

Conclusions

The benefits of pollution taxes could be substantial. Pollution taxes could result in savings over the cost of traditional regulation; may be able to address intractable pollution problems that stem from small, diffuse sources; and would generate revenues that could be used to improve the

[10]Reducing the Deficit: Spending and Revenue Options. Pollution tax revenue options include a carbon-based excise tax on fossil fuels and excise taxes on water and air pollutants.

[11]Efficiency in this case relates to the extent to which taxes harm social welfare by discouraging activities that are beneficial to society and the economy. For example, taxes on income can create, at the margin, a disincentive to work, and taxes on investment income can create a disincentive to invest.

[12]Tax systems are evaluated not only by their efficiency, but also by their fairness. If pollution taxes were to fall disproportionately on low-income groups, these inequities could be balanced by reductions in other taxes that these groups pay. Since some people in low-income groups pay no personal income tax, a negative income tax could be introduced or refundable tax credits could be increased.

efficiency of our tax system. Given these potential benefits, pollution taxes could be seen as a promising supplement to existing command-and-control regulation, particularly where the command-and-control approach has been unable to regulate substances clearly identified as harmful. However, these taxes have not been "field tested" on a large enough scale to know how easily such benefits could be realized. As EPA notes in its study on economic incentives,[13] and as we point out in chapter 3, considerations about pollution tax design and implementation would need to be addressed before the benefits of these taxes could be attained.

[13]Economic Incentives: Options for Environmental Protection.

Careful Design and Implementation Would Be Required to Achieve Environmental and Economic Benefits

Pollution taxes would have to be carefully designed and implemented to realize their potential advantages as a supplement to traditional environmental regulation. Ideally, pollution taxes would be designed to directly penalize pollution or polluting activities on the basis of the environmental and health risks they produce. Some means of monitoring this pollution or these activities is, of course, essential not only to provide a basis for levying taxes, but also for evaluating the environmental and economic impacts of the taxes. In addition, pollution taxes would need to be designed and implemented in a manner that does not create an incentive to substitute dangerous alternatives for what is taxed.

However, several factors complicate the task of designing and implementing pollution taxes. Sometimes, precisely targeting the risks posed by polluting activities may be problematic because a means of monitoring the activities would be costly or difficult to implement. In addition, once a tax is in place, polluters may respond in ways that reduce the targeted risks but also create new ones; for instance, polluters could stop using one toxic chemical and substitute another that is no less toxic. Finally, the tax rate needed to elicit the desired behavior, a reduction in pollution, may be uncertain because the benefits and costs of pollution reduction may not be known very well.

When precisely targeting environmental and health risks is difficult, a pollution tax will need to balance the ideal and the practical, adopting a compromise that targets the risks as closely as possible and yet is feasible. Other complications, such as the uncertainty regarding the substitution of one chemical for another and regarding the proper rate of taxation, could be addressed by carefully designing and implementing taxes in a way that allows flexibility in adjusting their scope and rate. Moreover, these complications and the need to overcome them are not unique to pollution taxes. The same complications or closely related ones exist for any form of effective environmental regulation.

Ideally, Pollution Taxes Would Be Designed and Implemented to Reduce Risks at the Least Cost

The primary purpose of a pollution tax is to create an incentive to reduce the environmental and health risks that stem from pollution. Pollution taxes can achieve greater benefits, relative to costs, if the taxes reduce health and environmental risks without placing unnecessary burdens on relatively safe uses of taxed substances and without entailing substantial implementation costs for regulators. To provide the strongest signal to reduce these risks, pollution taxes would need to be targeted as closely as possible at the source of risk and would need to be of sufficient size to

encourage a desired change in behavior. In addition, adequate monitoring systems would need to be in place to provide an accounting basis for levying pollution taxes and to evaluate the impacts such taxes have on overall pollution levels and on those paying the taxes. Importantly, any pollution tax revenues would need to be used in a manner that does not dilute the incentive created by these taxes to reduce pollution in the first place.

Pollution Taxes Need to Target Risks

Ideally, pollution taxes would signal polluters that their tax burden is directly linked to the environmental and health risks resulting from their actions.[1] Risk analysis, an essential first step in designing a pollution tax, would involve examining the life cycle of a pollutant—how it is produced, used, and disposed of—in order to identify the activities posing significant risks. These activities are the most desirable targets for a tax.

Pollution taxes would need to avoid placing unnecessary burdens on relatively safe uses of taxed substances. For example, if the use of lead in radiation shields is judged to pose little risk of exposure to lead, a pollution tax on lead ideally should not make this use uneconomical. Since the environmental and health risks of toxic substances can vary depending upon how and where these substances are used, pollution taxes may need to be specific in order to target risk without burdening safer uses.

Finally, once risk analysis identifies where in a substance's life cycle substantial environmental and health risks occur, and a decision is made to tax the sources of the risks identified, a rate of taxation has to be chosen. The tax rate should be of sufficient size to reduce pollution to a desired level.

Monitoring Systems Would Be Needed for Assessing, Enforcing, and Evaluating Taxes

In order to implement pollution taxes, systems for monitoring or measuring pollution are needed. Such systems are necessary in order to calculate the amount owed and to enforce the taxes. Monitoring systems would need to calculate the amounts of pollution either emitted from specific sources or the amounts of toxic substances sold or used. An emission tax would be levied on the units of a pollutant released into the environment, while a product tax would be levied on the units of a toxic

[1]Ideally, the amount of the tax per unit of pollutant should be equal to the value of the expected damage that an additional unit of pollution will cause. However, estimating such costs is exceedingly difficult. A more practical approach is for regulators to determine target levels of pollution reduction and set pollution taxes to achieve these targets. As polluters' responses may not be known with certainty, regulators may have to change rates in order to attain the desired results.

substance sold, used as production inputs, or contained in products.[2] Monitoring systems are also needed to measure the degree of success of the tax in reducing pollution and the economic impact of the tax. The information yielded from this effort would give regulators the option to either adjust the scope or rate of the pollution tax in order to meet planned objectives.

Some systems that require polluters to directly measure and report their pollution levels are currently in use. For example, the National Pollutant Discharge Elimination System requires firms that release pollutants into surface waters to sample their effluent regularly and report to environmental authorities each month the amount of each pollutant emitted. Also, some states require major stationary sources of gaseous pollutants, such as sulfur dioxide, to operate systems that continuously monitor these pollutants. States then rely on the measurements from these systems to enforce existing emissions standards. Other monitoring systems rely on indirect methods of estimating emissions. As noted in chapter 1, the Emergency Planning and Community Right-to-Know Act requires certain manufacturing facilities to estimate emissions of over 300 toxic chemicals into the air, water, and soil and report these emissions to EPA for inclusion in the TRI.

Whether a given pollutant is regulated through the use of taxes or a traditional command-and-control approach, adequate monitoring is needed. In some cases, monitoring requirements may be quite similar irrespective of the regulatory approach. In other cases, monitoring requirements will differ, as will the attendant administrative costs. For example, if the command-and-control approach is based on a given quantitative standard for emissions from a source, monitoring requirements are likely to be about the same as for an alternative approach using an emission tax; on the other hand, if the command-and-control approach is based on a technology standard, monitoring requirements will be quite different from what they would be for an approach using an emission tax.

Incentives to Reduce Pollution Need to Be Considered

The incentive pollution taxes create to reduce pollution could be weakened if some or all of the resulting revenues are returned to firms as assistance for abating pollution or if the taxes are eroded through inflation. Programs designed to assist polluters in abating pollution may

[2]In some cases, the toxic substance may be an input that is mined or otherwise produced and never sold by one firm to another. In other cases, a toxic substance may be incorporated in a product overseas and thus never sold in the United States.

weaken this incentive because pollution taxes serve as a price signal to polluters to guide decisions on levels of pollution control. Rebates of pollution taxes, in the form of program funds or subsidies to help polluters cover pollution control costs, may reduce the effectiveness of this signal.

Also, earmarking pollution tax receipts for particular programs may create an incentive to set tax rates according to the programs' needs for funding, rather than at levels to reduce pollution to some desired amount. If any earmarking of pollution tax revenues is to occur, in order to not weaken the incentive created by the tax for reducing pollution, only a portion of proceeds from the tax, sufficient to cover the costs of administering the tax itself, should be dedicated for this purpose. At a time when government deficits discourage new regulations that can increase government expenditures, a pollution tax, part of which pays for its administrative costs, may be preferred over other approaches that drain government finances.

The incentive created by a given tax rate to reduce pollution could be eroded over time because of inflation. The rate would have to be adjusted periodically to account for inflation; otherwise, the effectiveness of the tax would be reduced.

Several Factors Would Need to Be Considered in Designing and Implementing Pollution Taxes

Designing and implementing pollution taxes to reduce pollution at the least cost depend on a number of factors. Precisely targeting risks may result in increasing administrative complexity and costs. Risks may be transferred, rather than reduced, if, for instance, undesirable alternatives are used in place of the taxed substance. Lastly, the tax rate needed to achieve the target level of pollution may be unknown.

Accurate Monitoring of Emissions Can Be Difficult and Costly

Targeting risks associated with a given pollutant may result in monitoring and enforcement difficulties that may add to the costs of administering a pollution tax. For a given toxic substance, a pollution tax may require targeting a specific use, or the tax may require targeting emissions associated with production activities or waste incineration. Such a tax, however, may be more difficult and costly to administer than a general tax on the toxic substance at the point of sale. A general tax, however, may be less effective in targeting risks.

In the case of lead, for example, pinpointing the risks of different uses of the metal and taxing different products at different rates depending on the relative risks could be difficult and costly. On the other hand, imposing a pollution tax on all lead metal at the point of sale would be relatively easy. Our case study on lead shows that a tax on all lead metal also would be easier to implement than a tax on lead emissions because of difficulties in accurately and fully accounting for these emissions from major sources. Continuous measurement of lead particulate emissions is not technologically possible now. Alternative methods of measurement may be less accurate or may pose administrative difficulties. Generally speaking, the availability of data on production and transactions makes taxes on products easier to implement than taxes on emissions. However, while it may be administratively easy to impose taxes at the point of sale, such a scheme is not directly related to any resulting environmental risks.

Taxes May Create an Incentive to Transfer, Rather Than Reduce, Risks

Even if environmental and health risks from the use of the substance are successfully identified and taxed, risks may be transferred, rather than reduced, by the polluters' responses to a tax. Polluters may, for instance, respond to a pollution tax by reducing their use of the taxed substance or limiting the taxed activity, only to substitute another substance or activity, and such substitutions may not always result in an overall improvement in health or the environment. Although a tax on a pollutant may encourage the use of a less hazardous substitute, the tax could also make another substance that is at least as hazardous as the taxed substance more economical. In some cases, chemical manufacturers may respond to a tax on an existing chemical by manufacturing another that serves the same function but differs slightly from the first in its chemical composition and in the risks it poses. For example, one study indicates that the state of California's regulation of certain chlorinated solvents led to higher production and emissions of unregulated substitute solvents, increasing risks posed by these substitute solvents.

Risks may also be transferred by shifting pollution from one environmental medium to another—from air to water, for example—or by shifting pollution from one stage in a substance's life cycle to another stage. In response to a tax on toxic emissions into the air that result from the production of a substance or a product, polluters may use pollution removal equipment, such as scrubbers, but the sludge that results from using this equipment may also pose a serious hazard in the form of solid or liquid waste. Our case study on lead indicates that the removal of lead from a smelter's flue gas as a result of a tax could yield sludge that

pollutes soil, surface water, and groundwater. In some cases, the presence of a given pollutant in one medium poses greater risk of exposure than in another medium. Emissions of a given pollutant into the air, for instance, may pose a greater threat to human health than the same pollutant in solid waste that can be disposed of under controlled conditions. Consequently, a pollution tax on emissions into the air could be set higher than a tax on the same pollutant in solid waste.

Finally, a tax may create an incentive to transfer polluting activities overseas. For example, an excise tax imposed on lead metal produced in the United States could result in lower production of lead metal in this country and greater production of the metal overseas. As a result, some of the pollution problem could shift to other countries. This shifting of risks could be serious if the other countries' environmental regulation controlling exposure to lead was less strict than the United States'.

Tax Rate Needed for Desired Reduction May Be Unknown

The level of tax needed may often be unknown because of uncertainty regarding polluters' responses. In the case of emission taxes, regulators generally cannot rely on existing sources of data. The tax rate that is necessary to result in a targeted reduction in emissions of a given pollutant is unlikely to be known and could be costly to determine. In contrast, market data on products can be used to estimate price elasticities, that is, the degree to which the demand for and supply of a product will change because of changes in its price. However, even in the case of product taxes, the long-term responses to taxes may be uncertain, depending on the potential for substitutes to replace the taxed substances. In the case of some applications of lead, for example, the responses to a tax will depend on how much of an incentive it provides for technological innovation to search for economical substitutes.

Design and Implementation Issues Could Be Addressed

In practice, designing pollution taxes may require sacrificing some effectiveness associated with directly targeting risks in order to gain a practical and cost-effective means of administrating the taxes. Other complications, having to do with the uncertainties regarding substitutes and appropriate tax levels, could be addressed by allowing flexibility in tax design and implementation. This flexibility would allow for undesirable outcomes, such as the substitution of a harmful substance for the taxed substance, to be addressed as they are identified. These issues or closely related ones are common to any form of environmental regulation.

Tax Design Could Reduce the Potential for Transferring Pollution

To the extent possible, pollution taxes should be designed to account for the substitution of one pollutant for another, the shifting of pollution from one environmental medium into another, and the shifting of pollution across borders. Tax design can take various precautions to account for such shifting of risks.

For example, to deal with the possibility that another harmful substance could be substituted for the taxed pollutant, regulators should identify, to the extent possible, harmful substitutes and also tax or otherwise control them.[3] Also, precautions can be employed to guard against the shifting of risks from one medium to another. If, for instance, taxing emissions of lead into the air results in the generation of additional hazardous sludge, the sludge could be taxed as well or the disposal of the sludge could be carefully regulated. If emissions into the air are more harmful than the sludge, then the taxes on the former could be set higher than those on the latter.

Finally, tax design can take into account risks being borne in the United States as a result of potentially hazardous imports and the production of exports. A tax on lead metal produced in the United States, for example, could be accompanied by a tax on imports and exports. A tax on imported lead metal and imported products containing significant quantities of lead would reduce the potential for the risks from imports of lead to displace the risks posed by domestic production of lead. If imports were not taxed, producers in other countries could increase their production of lead and lead-acid batteries for the U.S. market. Any risks in the United States from using and disposing of domestically produced lead and lead-acid batteries could be replaced by similar, if not identical, risks from using and disposing of foreign-produced lead and lead-acid batteries. A tax on lead metal exports would also be needed to prevent domestic producers from simply replacing the risks in the United States from production for domestic use with risks from production for exports.

Pollution Taxes Would Need to Be Implemented Gradually and Predictably

Because the level of pollution taxes needed to reduce health and environmental risks to acceptable levels might not be known, pollution taxes might need to start at relatively low rates, with the understanding that they could rise gradually until target reductions were reached. This approach would give decisionmakers time to monitor the environmental

[3]This strategy of taxing harmful substitutes raises in turn a series of questions concerning implementation. For instance, would the taxes on these substitutes be of the same magnitude as the tax on the originally targeted substance? Where does the need to address substitutes end?

and economic impacts of pollution taxes and alter their rates accordingly. This approach might also allow polluters time to adapt to taxes.

The need for flexibility is further underscored by the problem that would arise if taxes were left unadjusted for inflation. If inflation were at 5 percent a year, for example, a tax would lose 5 percent of its value each year, effectively reducing the incentive to abate pollution. Also, if overall levels of a taxed pollutant in the environment remained above target levels after the implementation of the tax, then the tax rate would need to be adjusted upward. Consider the hypothetical case of using emission taxes on primary and secondary lead smelters to meet the national ambient air quality standard for lead. Monitoring of lead levels in the air would be required to determine whether the initial tax rate was high enough to meet the standard. If the rate were too low, some plants might choose to continue to pollute at prior levels and simply pay the tax. The tax could then be increased gradually while the levels of lead in the ambient air were monitored. As the tax increased, some firms would find it cheaper to reduce emissions than to pay the higher tax. This process of incrementally adjusting the tax rate, supported by monitoring of the level of the pollutant in the environment, would continue until the standard was reached.

Changing tax rates over time might have adverse effects on companies that would prefer certainty regarding long-term plans. For example, a firm that undertakes a large investment in pollution control equipment in response to a given tax rate might not be able to easily adjust to a significantly higher tax rate.

The problem of uncertainty about appropriate tax rates is not unique. Other approaches to environmental regulation face similar problems of uncertainty about how to reach goals. For example, command-and-control emissions standards for specific sources of pollution may need to be changed over time to reach the desired quality for ambient air.

Taxes May Not Be Sufficient to Protect Local Communities

In certain cases, pollution taxes may be advantageous but not sufficient to reduce risks effectively for local communities. A tax may reduce the overall environmental and health risks from a pollutant but not adequately reduce risks to a local community that has more immediate exposure to them. This could happen if most companies reduced pollution in response to a tax, but some opted to pay the tax and continue to pollute at previous levels. In such a case, the local community may have to be protected by other means. Alternatively, a tax could be used to safeguard the local

community from unacceptably high risks from pollution. For instance, one pollution tax rate could be applied up to a certain level of emissions and a much higher rate applied above this level.

Another example relates to hazards at the workplace. A pollution tax may be successful in reducing the overall health and environmental risks posed by a pollutant, but may not be sufficient to control risks to workers handling the pollutant. For example, a tax on a pesticide may reduce the threat it poses to drinking water, but standards requiring adequate protection for farm workers may still be needed.

Conclusions

The obstacles to implementing pollution taxes and realizing their benefits could be significant. In this chapter, we have identified issues that would need to be addressed in designing and implementing pollution taxes and offered several strategies that could be employed to address these issues. The effectiveness of these strategies would determine the extent to which the potential benefits of pollution taxes, which we outlined in chapter 2, could be realized. Importantly, many of these issues of pollution tax design and implementation, such as monitoring and unintended side effects, are not unique to pollution taxes. The same issues or closely related ones exist for any form of effective environmental regulation.

Case Study on the Use of Pollution Taxes

The purpose of this case study is to illustrate generic issues that arise in designing and implementing pollution taxes. We selected lead for our case study because the substance has been the subject of a substantial amount of analysis relating to these issues. It is important to point out that how these issues play out for a hypothetical lead tax may be different from how they play out for taxes on other pollutants. For example, emissions monitoring—a generic consideration in designing emission taxes—may be more problematic for lead than for, say, sulfur dioxide. Where appropriate, we present examples of how tax design considerations for certain pollutants differ from those for lead.

Our case study underscores an important trade-off that can exist in designing and implementing pollution taxes. Taxes that directly penalize lead emissions, which are a proxy for risk, and risk-based differential taxes on lead-containing products are more difficult to implement and enforce than a tax on all lead metal.[1] On the other hand, a tax on lead metal may not result in substantial benefits because it penalizes all uses of lead, regardless of the relative risks they pose.[2]

Designing a Tax Requires Identifying Risk-Producing Activities

Designing and implementing a pollution tax on lead would require an understanding of health and environmental risk factors in the life cycle of lead and the underlying economics that govern the production of the metal, its use in products and consumption, and the recycling and disposal of it. Figure I.1 provides a graphic presentation of lead's life cycle, its production, use and consumption, and disposal.

Among the activities that currently release the most lead into the environment are smelting and refining by both primary and secondary lead metal processors, manufacturing lead-acid batteries, and incinerating municipal waste containing lead. The smelting and refining of lead release the pollutant into the environment through emissions into the air and discharges of wastewater and solid wastes. Primary processing of other nonferrous metals, such as copper, also results in lead pollution if the metal ore contains lead compounds. Secondary processing of lead, which relies largely on the recycling of lead-acid batteries, also generates lead in emissions into the air and in liquid and solid wastes. The manufacture of

[1]Ideally, pollutants could be taxed according to the amount emitted and the relative harm they cause. It could be difficult, however, to estimate their relative harm.

[2]In the case of lead, a uniform emission tax also may not discriminate among differences in risk associated with "downstream" products, suggesting the possibility of risk-based differential taxes on lead-containing products.

lead-acid batteries, accounting for about 80 percent of the demand for lead in the United States, releases lead pollutants in the course of the melting and casting of the metal. The disposal of lead-containing products in landfills and the incineration of these products by municipal waste combustors (MWC) also release lead into the environment.

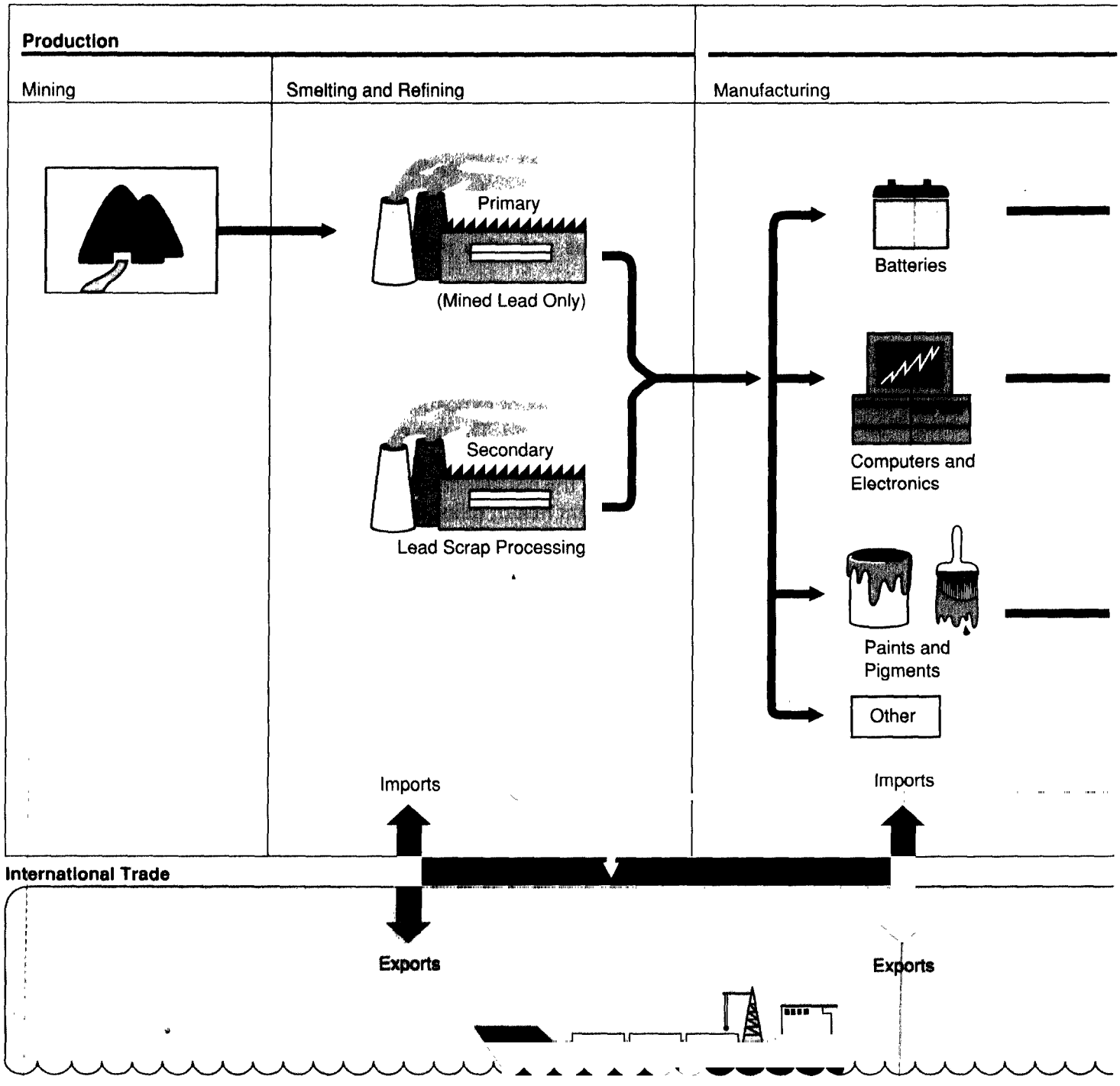
Lead is also released into the environment through other means. For example, lead is used in the manufacture of some exterior paint, so the dust from these paints on buildings and bridges pollutes air and soil. Lead in paints and pigments used by hobbyists, in ceramic wares, bronze plumbing fixtures, and other products also results in releases into the environment.

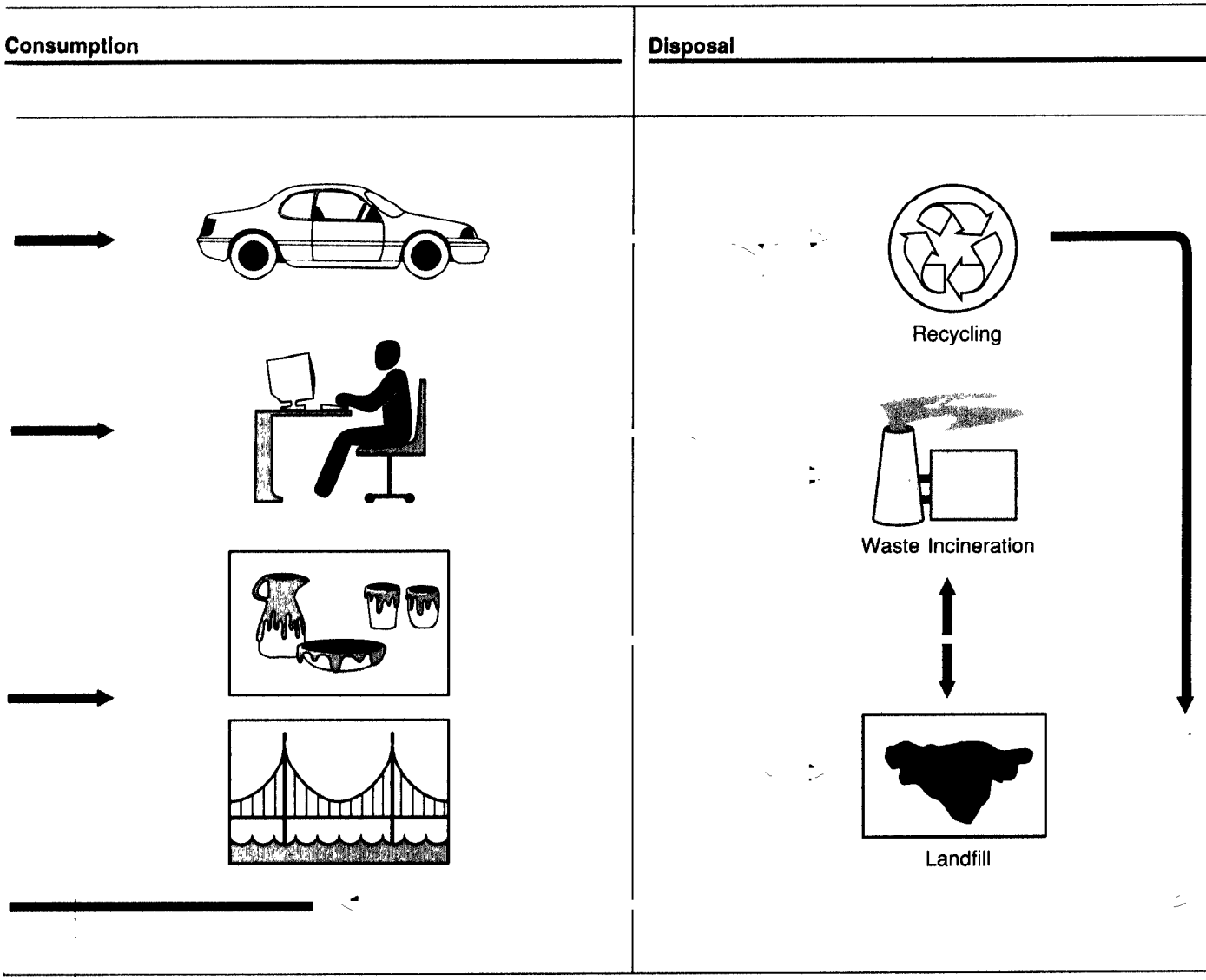
Some past uses of lead have also released and continue to release lead into the environment. The federal government virtually banned the use of lead in interior house paint by 1976, but lead-based paint still exists in many older homes. The risk of exposure to lead in this form is greater than any other risk posed by lead. The use of lead in gasoline and drinking water systems has also been largely abandoned because of government bans and restrictions, but the persistence of lead from these historic uses continues to pose significant health risks. However, a tax as an incentive to prevent pollution is not well suited for addressing such risks because the applications that introduced them have largely been discontinued.

Because of evidence of lead's toxicity at very low levels of exposure, in October 1991 the Centers for Disease Control lowered the "threshold for concern" in blood tests for lead, from 25 micrograms per deciliter (μg/dl), the threshold established in 1985, to 10 μg/dl. Reducing exposure to lead, particularly among children, has been a priority for the Environmental Protection Agency (EPA) and other government agencies.

Lead taxes could take the form of emission taxes, product taxes, or some combination of both. Taxes on lead emissions would consist of charges per unit of lead contained in facilities' emissions into the air, discharges into the water, or solid waste. Taxes on lead emissions would directly target releases of lead into the environment. In other words, the tax burden would be directly related to the amount of lead emissions, and the tax could create an incentive to reduce these emissions into the environment.

Figure I.1: Lead's Cycle of Economic Activities




Consumption
Disposal
Recycling
Waste Incineration
Landfill

Product taxes could also be used for controlling the amount of lead released into the environment. Taxes could be levied on lead metal, the lead-content of products, or products that contain significant amounts of lead, with the expectation that these taxes will reduce the risks from lead by reducing the demand for it.

Emission Tax Targets Current Pollution From Lead but Could Be Difficult to Implement

A tax on lead emissions targets pollution from current activities, but its implementation poses administrative difficulties. In contrast to a product tax, which penalizes goods whose production or use results in pollution, an emission tax directly targets the pollution.

Implementing a Lead Emission Tax Requires a Reliable Monitoring System

A reliable system to monitor releases of lead into the environment is necessary for administering an emission tax. A system to monitor a facility's lead emissions should be reasonably accurate because exposure to small amounts of lead emissions can be harmful.

The importance of measuring emissions varies, depending upon the approach for controlling pollution. For example, command-and-control regulations that impose quantitative standards on lead emissions necessitate monitoring for enforcement purposes as much as a lead emission tax does. On the other hand, a performance standard that requires the operation of certain air pollution abatement equipment to remove particulates, including lead, may not require as much actual monitoring of emissions.[3]

The task of measuring lead emissions, particularly those into the air, poses difficulties. According to EPA officials, the technology for continuously measuring the total suspended particulate matter, including lead, in emissions into the air does not yet exist commercially in the United States. Not knowing the proportion of lead in the total particulate emissions from a given smokestack further complicates the problem of measuring lead emissions. That is, current technology does not permit a continuous, accurate accounting of lead emissions from a facility's smokestacks. Furthermore, emissions from the smokestacks do not always constitute the majority of a facility's lead emissions into the air. According to EPA,

[3]In the latter case, enforcement relies not so much on monitoring emissions, but rather on ensuring that the equipment is in place and working properly. Whether such an approach is more effective than monitoring emissions is unclear.

"fugitive" emissions that escape during various stages in the production process and fugitive emissions from the facility's open areas can constitute a greater proportion of the total emissions. Measuring fugitive emissions is considerably more difficult than measuring emissions from the smokestacks.

In contrast to lead emissions, the emissions of a number of gaseous pollutants can be measured on a continuous basis. For example, "continuous emissions monitors" exist for sulfur dioxide, nitrogen oxides, carbon dioxide (CO_2), and carbon monoxide. As we reported in a September 1990 report, a 1988 EPA survey of continuous emissions monitoring at large facilities in Pennsylvania indicated that it directly measured and recorded accurate readings of sulfur dioxide emissions over 92 percent of the time.[4]

The difficulty of minimizing fugitive emissions is not unique to an approach employing taxes. Current regulations rely heavily on "best management practices" (BMP) to control fugitive emissions. In the case of lead smelters, BMPs include unloading ore and other materials in covered areas and various measures to suppress and collect dust. Dealing with fugitive emissions may require maintaining some standards and BMPs alongside the use of taxes.

Short of continuous emissions monitoring, other means of measuring and estimating may be used. It is possible to estimate a facility's lead emissions using frequent sampling and laboratory analysis. Such estimating is required for some facilities under current regulations.

In addition to sampling and laboratory analysis, another approach to measuring particulate emissions is the "materials balances" approach. This approach accounts for the quantities of materials that enter into a production process and the quantities that emerge in products. Given knowledge of the physical and chemical processes of production, the differences between the inputs and outputs may be used to estimate emissions. If, for example, X tons of lead enter the production process to produce 1,000 lead-acid batteries, and the total amount of lead in the batteries is Y tons, the residual amount of lead is X minus Y tons. If pollution control equipment is used and its efficiency is known, estimating uncontrolled emissions is possible as well. These include fugitive emissions, which, as noted, are often very difficult to measure directly.

[4]Air Pollution: Improvements Needed in Detecting and Preventing Violations (GAO/RCED-90-155, Sept. 27, 1990).

The accuracy of the materials balances approach depends on the completeness of information on the particular production process. In primary lead smelting, for example, the amount of lead produced per ton of ore may vary from one facility to another and even for the same facility over time. The accuracy of estimates from using the materials balances approach may also differ for different receiving media. That is, estimates of the lead-content of solid waste may be more accurate than estimates of lead emissions into the air.

Whether the materials balances approach can be accurate enough for assessing pollution taxes is a question that regulators need to examine for individual pollutants or groups of pollutants. The approach is used by many companies that report their emissions to the Toxic Release Inventory. These emissions include lead. As noted in chapter 2, an EPA study on the use of economic incentives for environmental regulation considered, as an option, placing charges on pollution reported to the inventory.

Finally, using the materials balances approach is difficult when the inputs of materials at a given polluting facility change considerably over time, as might be the case for MWCs. The amount of lead that an MWC incinerates may vary considerably depending on the number and types of discarded products containing lead.

Tax on Lead Emissions Should Account for Possible Transfer of Pollution From One Medium to Another

Another issue that arises in designing a tax on lead emissions is the potential for transferring pollution from one medium to another. If a monitoring system was deemed adequate and a tax on lead emissions into the air was imposed, the tax might succeed in reducing these emissions but result in greater amounts of lead in solid waste. The use of air pollution control equipment to remove lead from a smelter's flue gas can result in toxic sludge that requires proper disposal.

Environmental and health impacts of lead pollution are not necessarily uniform across media. If the risk profile varies considerably across media, pollution tax design ideally should reflect this, with higher tax rates for pollution in the more threatening media.

The problem of transferring pollution from one medium to another is not particular to an approach employing pollution taxes. Command-and-control regulations also face the same problem.

Tax Design Needs to Account for Risks to Local Communities

If a lead emission tax resulted in some sources abating pollution less than others, regulators might need to pay particular attention to protecting local communities from potentially hazardous effects. If a tax on lead emissions into the air was imposed, conceivably some sources might choose to pay the tax and continue to pollute. In such a case, it might be desirable to combine the tax with standards establishing some maximum level of emissions. Alternatively, one pollution tax rate might be applied up to a certain level of emissions and a much higher rate applied above this level. Another possibility for addressing risks to local communities would be a set of emission taxes applicable to specific localities.

Some pollutants' environmental impacts are felt regionally or globally, and not so much locally. The environmental threat associated with CO_2, for example, is global. The taxation of such a substance may not pose a localized problem. If a CO_2 emission tax was used as part of a strategy to cope with the threat of global warming, the possibility that some sources would reduce their emissions less than others, choosing to pay more in emission taxes, might not matter. The tax would succeed if overall emissions of CO_2 were reduced.

Emission Tax Rate Could Be Changed to Reduce Emissions

A tax rate that would sufficiently reduce lead emissions would depend on the price elasticity of these emissions, that is, how responsive firms discharging emissions would be to a tax.[5] However, since emissions are not normally traded in markets, it may be difficult to forecast the responsiveness to a tax. One way to deal with this uncertainty is for regulators to start at a relatively low tax rate, monitor sources' responses, and then raise the rate until the level of overall emissions is reduced the desired amount.

Product Tax on All Lead Metal Is Easier to Implement but Does Not Focus Attention on Reducing Emissions

A tax on lead metal is easier to implement than a tax on lead emissions, but the former tax does not focus attention on harmful lead emissions. A tax on lead metal is easier to administer because lead producers routinely keep accounts of their production and transactions. Similar accounting for emissions does not exist. Also, it may be easier to estimate the effects of a tax on lead metal than the effects of a tax on lead emissions, given the availability of market data.

[5]The price elasticity in the expected price range is the key variable.

A tax on lead metal could reduce lead emissions to the extent that the tax would reduce the amount of lead metal produced.[6] For some uses of lead, however, even a large tax on lead might result in relatively small reductions in lead consumption, as the following example shows. According to an EPA study, there are no acceptable substitutes for lead-acid batteries, which account for about 80 percent of the demand for lead in the United States. A significant increase in the price of lead would be reflected in the price of motor vehicle batteries, but even a large increase in the price of batteries would not likely result in an appreciable change in the demand for motor vehicles. The same EPA study suggests that there are physical, chemical, and cost factors that limit the availability of substitutes for lead in tin-lead solder in electronic products and for lead in glass and ceramic products. In the long run, however, a tax on lead metal might provide an incentive for technical innovation to replace lead in some products.

For some uses of lead, however, substitution could be relatively easy. According to EPA, aluminum-epoxy and aluminum-plastic can replace lead in collapsible tubes that are used for artists' paints and for corrosive glues. Lead in curtain weights could also be replaced by a variety of other materials.

Tax on Lead Does Not Differentiate Between Safer Uses and Riskier Uses

A tax on lead metal will variously affect the demand for lead in different applications, and the changes in demand may or may not have any relationship to the level of health and environmental risk associated with these applications. It may be economic to switch to a substitute for lead in curtain weights if a lead tax is relatively small, but not economic to switch to a substitute for lead used in lead-crystal unless the tax is relatively high. If lead-crystal bowls pose a greater risk than lead curtain weights and a lead tax is imposed, the less risky of the two uses will decline more. Generally, a tax on lead metal does not distinguish between relatively safe and unsafe uses of lead. All uses, regardless of their risk, are burdened by the tax. As a result, such a tax might not result in substantial benefits.

Product taxes could be a fairly direct way of penalizing pollution in other cases. In the case of chlorofluorocarbons, for example, the product itself is the pollutant of concern, and the risk it poses is uniform.

[6]For most pollutants, emission levels are not a constant proportion of output alone, but depend on output and pollution abatement. In those cases, a product tax will not give as much incentive to reduce emissions as an emission tax because even if the product tax reduces the amount of the product demanded, emissions may not fall. A product tax, by itself, does not provide an incentive to increase the use of abatement technology.

Tax on Lead Metal Could Encourage Use of Substitutes That Pose Risks

A pollution tax can be judged effective if it encourages companies to substitute less toxic substances for the taxed substance, but some substitutes for lead could also be as harmful. A pollution tax on lead could encourage the use of nickel-cadmium batteries, but cadmium could be more toxic and less suitable for recycling than lead.

If policymakers were to decide that the costs of using pollution taxes to encourage the development of safer batteries were justified by the potential health and environmental benefits, taxes on cadmium as well as on lead might be needed.

Differential Tax Favoring Secondary Lead May Be Difficult to Enforce

To reduce the amount of new lead produced and encourage the recycling of lead, one approach is to tax primary metal at a higher rate than secondary metal, or to tax primary metal but not secondary metal. Such an approach could be difficult to enforce and could have undesirable effects.

In 1970, secondary lead metal constituted 47 percent of the lead metal produced in the United States. By 1991, that figure had risen to 71 percent. According to an EPA study, producing secondary lead from a scrapped lead-acid battery emits one-third as much lead into the atmosphere as producing an equal amount of primary lead and discarding the battery. But because the percentage of lead that is recycled by secondary smelters is already very high according to the industry's estimates, the environmental benefit that would result from using a differential tax to increase recycling further is unclear.

In order to be effective, a differential tax would also have to apply to imported lead metal and imported goods containing lead. However, enforcing the tax on imports is probably impractical. Importers would have an incentive to claim that theirs is secondary metal when it may not be, and verifying such claims could be difficult.

A differential tax might reduce pollution in the United States but increase pollution in those countries increasing their exports to this country. This shifting of pollution could be serious if environmental regulation controlling exposure to lead in other countries was less strict than in the United States. Already, some scrapped lead-acid batteries collected in this country are shipped to be recycled in other countries, including Mexico and Taiwan. A differential tax on lead might result in more of this pattern of trade.

Risk-Based Differential Taxes on Lead-Containing Products Could Be Difficult to Administer

A set of taxes on lead-containing products, with different rates based on the products' associated health and environmental risks, could be difficult to implement. The idea behind such a set of taxes would be to impose a higher tax burden on lead-containing products that pose higher environmental and health risks and a lower tax burden on those products that are less toxic. For example, the tax rate could be higher, per unit of lead contained, if the product is more likely to end up being incinerated in an MWC than sent for recycling. The rate could also be higher if the risk of human exposure is greater than for other lead-containing products. However, designing such a set of taxes would require analyzing the risks posed by the various uses of lead, and regulators would have to monitor new products containing lead and anticipate their environmental and health risks in order to set appropriate tax rates for them. In addition to information on risks, information regarding price elasticity (i.e., how the products are likely to "respond" to taxes) and potential substitutes would be needed. Implementing such a system of differential tax rates could be quite complex.

Impact of Taxes on Lead-Acid Batteries Is Uncertain

As lead-acid batteries account for roughly 80 percent of the lead used in the United States, regulators have already paid particular attention to them. A tax on lead-acid batteries would have to be very large because the demand for them is primarily determined by the demand for new cars and the rate at which batteries in cars need to be replaced. However, such a tax could be expected to encourage research and development of batteries that use a material other than lead.

Because of the price inelasticity of lead-acid batteries, a tax on them might be designed to increase their efficiency. A tax levied on the lead-content of batteries or a differential tax that applied a higher rate for batteries with shorter expected lifetimes might provide an incentive to battery manufacturers to produce batteries that deliver the same power with less lead and to increase the useful life of batteries.

Comments From the Environmental Protection Agency

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC 1 1992

OFFICE OF
POLICY, PLANNING AND EVALUATION

Mr. Richard L. Hembra
Director
Environmental Protection Issues
Resources, Community, and Economic Development Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Hembra:

On October 7, 1992, the General Accounting Office (GAO) issued to the Environmental Protection Agency (EPA) a draft report examining the feasibility of taxes as a mechanism to further environmental protection. The report is entitled "Environmental Protection: Implications of Using Pollution Taxes To Supplement Regulation" (GAO/RCED-93-13). The Agency appreciates the opportunity to review and provide comments on the draft report.

The draft report presents a well-structured, straight forward review of how market-based approaches can be implemented as a substitute for command-and-control environmental regulation. The Introduction is clear, concise, and balanced. The case study of pollution taxes on lead was well-researched and written. The Agency appreciates the detailed information and thoughtful analysis contained in this section of the report.

See comment 1.

It might be helpful, however, to emphasize at the outset that the specific focus of the report is tax incentives and not the broader topic of economic incentives, even though background on other incentives is provided in Chapter 1.

See comment 2.

The Agency also believes that the report would be more effective if it contained more extensive discussion on the wide variety of pollution control taxes that have been used or proposed, the distinction between revenue generation and pollution control incentive taxes, and the diversity of political and geographical jurisdictions that can accommodate this approach. Similarly, the Executive Summary would be more instructive if it summarized the arguments as to why incentive taxes may be superior in economical effectiveness or efficiency to the more conventional direct control approaches. As now written, a discussion of these arguments does not appear until the middle of the report.

One last general comment before getting into specifics is that there should be an emphasis on the taxing jurisdiction as a major issue in the discussions of tax design and strategy. Potential taxing jurisdictions vary widely, from national to state to local government, and include regional air shed, ground water shed, or river basin pollution control authorities. The scope and extent of the taxing authority has an immense impact on the efficiency and effectiveness of any tax strategy. For example, as the report points out on page 41, a nationwide uniform emission tax is not efficient in fine-tuning local risk hot spots. Similarly, state and local jurisdictions may not find it administratively cost effective to undertake a general product charge strategy.

Now on p. 31.

See comment 3.

Again, thank you for the opportunity to review the draft GAO report on pollution taxes. The report is well-organized and to the point. While the Agency generally believes that the draft report is accurate and contains useful findings, we have indicated in the enclosure specific points that need clarification.

Sincerely,

for Richard D. Morgenstern
Acting Assistant Administrator

Enclosure

"Environmental Protection:
Implications of Using Pollution Taxes
to Supplement Regulation"
(GAO/RCED-93-13)

Specific Comments from the Environmental Protection Agency (EPA)

Now on p. 11.

o **Page 13** - The report discusses emissions trading as an economic incentive that applies to the air program. EPA suggests that GAO consider adding to this section a brief discussion of the Agency's ongoing effort to promote point-nonpoint source trading of nutrients. This program was the subject of another recent GAO report, "Water Pollution: Pollutant Trading Could Reduce Compliance Costs If Uncertainties Are Resolved." While the program and implementation to date are modest, they fit this category of market approaches perfectly and deserve mention.

See comment 4.

Now on p. 13.

o **Page 15** - There is reference on this page to an Austrian tax on pesticides and fertilizers which is responsible for a 30 percent reduction in use of these materials over a two-year period. It would be helpful if GAO could separate the fertilizer from the pesticide reductions and provide citation for the study. Studies provided to EPA to date indicate that fertilizer is so cheap that unless the tax is exceptionally high, the tax would not be sufficient to substantially reduce fertilizer use.

See comment 5.

Now on pp. 15-16.

o **Pages 18 - 19** - The discussion entitled "Current Regulatory System Has Not Effectively Controlled Numerous Pollutants" gives the impression that remaining water quality problems in general and nonpoint source pollution in particular are primarily problems with toxics. The text should be revised to reflect that much of the remaining water quality impairments of the U.S. and the nonpoint source problem are related to conventional pollutants such as sediment and nutrients.

See comment 6.

Now on p. 21.

o **Page 27** - The third paragraph on this page mentions only groundwater pollution. The discussion also applies to surface water, which in many cases will be the primary resource affected by fertilizers and pesticides.

This page contains insufficient detail regarding implementation issues associated with pollution taxes. The discussion of pesticide taxes barely touches on implementation. There is no description of how a pesticide container collection program would work; e.g., who would collect the containers, disburse the rebates, recycle or dispose of the containers, etc. These matters need serious attention before proceeding with this approach. The lack of detail precludes a well-informed debate of the pesticide recycling idea.

See comment 7.

Now on pp. 26-27.

o Page 34 - 35 - Since pollution abatement is one of the primary goals in instituting taxes on pollution, then perhaps there is some merit in considering earmarking tax receipts to programs that work toward this goal. The discussion in this report refers almost entirely to the problems of earmarking taxes, not to its merits.

See comment 8.

Now on p. 27.

o Page 35 - The discussion of measuring taxable emissions and discharges is very well taken. With water, it is difficult to determine nonpoint source loads and to measure their environmental impacts. Both factors vary over time for a given activity and site. Thus, tying such activities to environmental risk in an equitable, reliable manner would be very difficult, if not impossible. The point made about lead (bottom of page) applies to nonpoint source pollution as well. As the report notes, it may be administratively easy to impose taxes at the point of sale, but this is not directly related to any resulting environmental risk.

See comment 9.

Now on p. 30.

o Page 38 - Again, the discussion dealing with implementation issues is thin. This section provides some ideas for resolving implementation problems, but it does not address any of them in sufficient detail. For example, it is simply not enough to say that the way to deal with a shift to other, non-taxed alternatives is to tax those alternatives, because this step raises another series of questions: Would the corresponding taxes be of the same magnitude? Where does this taxation connection end? How does the Agency identify "harmful" substances versus "non-harmful" substances?

See comment 10.

Now on pp. 30-31.

o Pages 40 - 41 - The discussion of inflation impact and the need for flexibility in structuring the tax scheme is good. However, EPA again makes the point that the report fails to address the other, more serious factor that would cut into revenue gains - adoption of non-taxed, non-polluting alternatives. This would have the beneficial environmental effect, but would cut into the revenue base anticipated by GAO.

See comment 11.

Miscellaneous (By Topic)

Taxes and nonpoint sources - It is stated or implied in the Executive Summary and at other points that traditional approaches may not be effective or capable of controlling nonpoint sources such as pesticides or fertilizers, and that tax approaches may be particularly useful in this area. The assertion needs more development to be convincing. Historically, direct controls in the form of bans on chemicals or products (e.g., DDT and phosphate detergents) have been extremely effective, and other controls such as licensing particular activities (e.g., pesticide spraying) may also work. The real question is whether taxes or some other form of financial incentive (such as deposit refunds on pesticide containers) can do a more efficient and equitable job in at least some circumstances.

See comment 12.

See comment 13.

See comment 14.

See comment 15.

Taxes as a revenue source - In the discussions of taxes on pollution sources as revenue to fund controls, the primary U.S. example is Title II of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the tax levied on petroleum and certain chemical products to fund the Hazardous Substances Superfund.

Product taxes vs. emissions taxes - For most pollutants, emission levels are not a constant proportion of output alone, but are dependent upon both output and abatement activity. In those cases, a product tax will not give the proper incentive for emissions reductions, because even if the product tax causes the product's demand to be reduced, emissions can vary for a fixed level of output. Without some incentive to maintain and/or increase abatement technology, firms may try to cut costs by not spending anything on abatement. The result may be little or no environmental improvement.

One possible solution is to announce to firms that at a future date an emissions tax for each firm will be calculated based on the level of emissions that each firm demonstrates it has. The time between the announcement and the actual measurement of emissions should be sufficient to allow firms to invest in and assimilate abatement technology. Instead of continuous monitoring of emissions, once every year, for example, an emissions demonstration can occur. This will give firms the incentive to maintain and/or upgrade their technology. Firms then have the choice of what type and quantity of abatement technology to incorporate.

The lead case study - Product charges do become more complicated and costly to design and administer as their point of application moves downstream from original ingot production (primary or secondary) to finished individual product production. However, at the ingot level, a pollution incentive tax cannot discriminate effectively among the many downstream products in terms of riskiness, and neither could a uniform nationwide emission tax on smelters and refineries. An optimal tax incentive strategy might thus require a combination of different taxes at different levels to take advantage of particular strengths and avoid the weaknesses of specific alternatives.

For example, at the ingot level, a nationwide differential tax on virgin ingot could be a powerful incentive to increase overall recycling of non-dissipative durable lead products like batteries and demolition products, by giving a market advantage to secondary smelters and their suppliers. A virgin ingot tax would not in itself control dissipative uses such as leaded gas or paints, but here a targeted downstream tax on a selected list of specific products may be more appropriate. To control emissions at smelters and refineries, a set of locally specific, risk-based emission, effluent, and solid waste charges would be in order. With respect to recycling of final consumer goods (a special kind of nonpoint

source pollutant), the tax incentive system might be supplemented by various deposit-refund schemes to achieve more efficient collection and diversion from the solid waste landfill and incinerator.

Thus, there is no simple, single-tax approach to deal with a complex system of pollution problems of the type posed by the system-wide lead problem. A combination of well-designed taxes, however, might yield superior results.

The following are GAO's comments on EPA's December 1, 1992, letter.

1. We have clarified that the subject of the report is pollution taxes, rather than all market-based incentives for pollution control. The report's objective of reviewing design and implementation issues regarding pollution taxes is stated in the first section of the "Executive Summary."

2. Our report identifies and discusses the experience of other countries in using pollution taxes but points out that this experience, while growing, has nevertheless been limited. In this context, we observe the difference between using pollution taxes for generating revenue and using them for controlling pollution. The focus of our report was limited to pollution taxes that could be introduced at the national level. However, we believe that important issues of pollution tax design and implementation, identified in chapter 3, are applicable regardless of the political or geographical jurisdiction. In chapter 3, we discuss the issues of monitoring emissions, the substitution of untaxed substances for taxed substances, and uncertainty regarding the appropriate level of taxation. All of these issues would be as important in designing and implementing pollution taxes at state, regional, or some other local level as they are in doing so at the national level. The "Executive Summary" contains a brief discussion as to why market-based incentives, which include pollution taxes, may be superior to more traditional command-and-control approaches.

3. As we note in comment 2, we believe that important issues of pollution tax design and implementation identified in the report apply regardless of the taxing jurisdiction.

4. In chapter 1 of the report, we have incorporated information regarding EPA's efforts to promote water pollutant trading.

5. The information contained in our report was drawn from EPA's publication Economic Incentives: Options for Environmental Protection (Mar. 1991), pp. 1-4. The report states that Austria's nominal fee on pesticides and fertilizers reduced consumption of these materials by 30 percent over a 2-year period.

6. We have revised the text in chapter 2 of the report to indicate that conventional pollution from nonpoint sources, in addition to toxic pollution from these sources, causes serious water quality problems. In chapter 2, the discussion of toxic pollution from nonpoint sources summarizes recent GAO reports on water quality issues.

7. While we do not include in the noted section a discussion of the implementation issues regarding a pesticide tax, we cite the EPA report that provides a discussion of these issues. Both chapter 3 and appendix I focus on design and implementation issues regarding pollution taxes, regardless of whether they are applied to pesticides or other pollutants. We have also added that surface waters, in addition to groundwater, are affected by fertilizers and pesticides.

8. As we explain in chapter 3, pollution taxes could achieve their greatest benefit if the taxes provide an incentive for reducing pollution and if revenues from the taxes are used to reduce other federal taxes that discourage beneficial activities or, alternatively, are used instead of raising other taxes to reduce the budget deficit. We note that earmarking pollution tax receipts to particular programs may create an incentive to set tax rates according to programs' funding needs, rather than at levels to reduce pollution to some desired amount.

9. We agree with EPA's observations.

10. We have expanded the noted section of chapter 3 to mention the implementation issues EPA raised in its letter.

11. We agree that the adoption of nonpolluting alternatives that are not taxed would reduce pollution tax revenues. A discussion of this point appears in chapter 1.

12. We agree with EPA's observation that direct controls over nonpoint sources of pollution, in the form of bans on chemicals or products or in the form of licensing restrictions, may be preferable to market-based incentives in some instances, particularly those in which the chemicals or products are known to cause an immediate threat. We do not mean to suggest that traditional regulation has no role to play in addressing pollution from nonpoint sources. We believe that while traditional regulation may succeed in addressing particular toxins or sources of conventional pollutants, pollution from nonpoint sources is less susceptible to traditional regulatory remedies because it stems from multiple, diffuse sources.

13. The focus of our work was the use of taxes to provide an incentive to reduce pollution, rather than as a source of revenues to fund pollution control activities. For this reason, we did not include a discussion of

previous efforts or existing programs that raise revenues for pollution control through taxation.

14. As we note in chapter 3, a product tax, while in some respects easier to administer, may not, in some cases, target environmental and health risks. One potential problem with the solution offered by EPA in its letter is that such a system presents the possibility that some firms might choose to "turn off" their pollution abatement technology when not subject to the emissions test. Or, alternatively, some firms might have an incentive to ensure that their pollution controls were operating as designed only during the inspection period.

15. We agree that, in theory, an optimal strategy employing taxes to reduce risks from lead might require a combination of different taxes at different levels. However, we note that such a complex system may become administratively burdensome, thus weakening the merits of either using or relying solely upon tax incentives to address health and environmental risks stemming from the production and use of lead. We agree with EPA's comment that no simple, single-tax approach exists to address complex pollution problems of the type posed by lead. We have added statements, where appropriate, in the case study on lead to clarify this point.

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