From Pollution to Prevention: A Progress Report on Waste Reduction

June 1987

NTIS order #PB87-208062



FROM
POLLUTION
TO
PREVENTION

A PROGRESS REPORT ON WASTE REDUCTION



Recommended Citation:

U.S. Congress, Office of Technology Assessment, *From Pollution to Prevention: A Progress Report on Waste Reduction–Special Report OTA-ITE-347* (Washington, DC: U.S. Government Printing Office, June 1987).

Library of Congress Catalog Card Number **87-619838**

For sale by the Superintendent of Documents
U.S. Government Printing Office, Washington, DC 20402-9325
(order form on p. 55)

Foreword

Public interest in protecting health and environment by preventing the generation of hazardous wastes and environmental pollutants is rising. Some companies are discovering that prevention is easier than they thought and that its economic benefits come quickly. Much is happening; only eight months after the release of the Office of Technology Assessment's report, *Serious Reduction of Hazardous Waste,* a great deal of new information is available. In particular, the Environmental Protection Agency has delivered its report on waste minimization to Congress.

The Subcommittee on Environment, Energy, and Natural Resources of the House Committee on Government Operations requested this special report to bring into focus congressional policy options on reducing the generation of all hazardous wastes and environmental pollutants. The report examines the effectiveness of the limited Federal actions taken so far and summarizes what industry and State and local governments have done to implement waste reduction. These programs are encouraging, and they help us understand what congressional policy options might accomplish, This special report discusses in greater detail several options that first appeared in *Serious Reduction of Hazardous Waste.*

There is agreement between EPA and OTA on the basic benefits of waste reduction. However, OTA sees more waste reduction possible in the near-term and, if the Federal government is to become more engaged with prevention, more need for policy development, organizational change, and institutional commitment. OTA places greater emphasis on the benefits of applying waste reduction in a multimedia fashion to cover all wastes and pollutants regardless of whether or how they are regulated.

Results from an innovative 2-year waste reduction program in Ventura County, California, show how government can assist industry to reduce waste generation and demonstrate that success in waste reduction is possible without traditional, prescriptive regulations, This program, several State waste reduction programs, and a lo-year-old Federal energy conservation program prove that in-plant technical assistance is an effective way to overcome obstacles to waste reduction.

Both industry and government benefit economically from waste reduction. The study shows how the competitiveness of American industry *and* environmental protection can be improved by devoting more resources to waste reduction and thus quickly reducing the costs of pollution control.

Many people in industry and government assisted OTA in the preparation of this work. A number of people reviewed a draft of this special report. As with all OTA reports, however, the responsibility for its contents is OTA's alone.

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SUMMARY

There is now a historic opportunity for the United States to improve environmental protection while reducing industry's costs. Applying the concept of prevention to environmental protection is a major change in thinking for nearly everyone. The Federal Government, industry, and environmental interests have not yet committed themselves to preventing rather than controlling pollutants and wastes.

The conventional approach to improving environmental protection is to impose more regulations and enforce them more firmly. Progress has been made, but overall the environmental results of this strategy have been disappointing. Control technologies have failed to perform as expected, and human failures have compounded the problem. For example, it took a long time to recognize that land disposal of hazardous waste is usually not a safe option.

Economically, the conventional strategy increases government spending and adds to the competitive disadvantage of domestic manufacturing industries through high environmental spending. In 1980, for example, capital investments in pollution control by American industries as a percent of gross industrial domestic product was nearly four times greater for the United States than for Japan and France and nearly three times greater than for West Germany. Manufacturing industries in newly industrializing nations such as South Korea and Brazil have an even larger cost advantage because of far fewer environmental regulatory requirements.

OTA finds that a concerted national effort to reduce the generation of hazardous wastes and environmental pollutants at their sources, whether they are regulated or not, is a logical next step in the development of a comprehensive environmental protection system for the United States. According to recent reports by OTA and the Environmental Protection Agency, waste reduction is the acknowledged environmental option of choice and has unique and undisputed environmental and economic benefits. Studies by OTA, EPA, and others have found that many waste reduction opportunities remain.

The Reader Is Cautioned To Pay Attention To The Exact Use of Terms In This Report

Simply put, **waste reduction** always means cutting the generation of hazardous waste to avoid its handling, treatment, or disposal and **waste minimization** always is a broad umbrella term that includes waste reduction, recycling, and possibly waste treatment such as incineration.

As discussed in this report, definitions have policy implications.

Today waste reduction proceeds slowly—not because of a lack of technology—but because it is inhibited by human, organizational, and institutional obstacles in industry and government. Industry's attention and resources go chiefly to regulatory compliance. As the government presses companies to fix the mistakes of the past, it provides little help to prevent problems for the future. Companies having the worst competitiveness problems are the least likely to be able to examine and implement waste reduction, even though they need it the most. Potential economic benefits are not being understood or captured systematically in industry.

Moreover, recent changes in the Resource Conservation and Recovery Act and Superfund send ambiguous and contradictory messages to EPA and industry about the priority of waste reduction. Use of the term waste minimization, broadly interpreted to include waste treatment, and regulatory restrictions on land disposal are driving capital investments to new waste treatment capacity (e. g., incineration). These can inadvertently restrict waste reduction, which offers better environmental protection at lower costs. Uncertainty about waste reduction and concerns about strains on waste management capacity may lead regulatory officials to relax requirements for hazardous waste facilities.

Can enough waste reduction occur to decrease near-term waste treatment needs? Not always and probably not under present circumstances. Waste reduction can significantly decrease, but not eliminate, the need for waste treatment capacity. More explicit attention to waste reduction can help the public understand which new waste management facilities are truly needed.

Congress faces clear but difficult choices. However, nearly everyone agrees that prescribing waste reduction through regulation is technically infeasible and administratively impractical. The OTA and EPA reports to Congress help bring three fundamental policy options into focus:

Policy Option I:

Take no new action to directly help industry to reduce waste generation

Rely on current industry efforts. This implicitly discounts obstacles to waste reduction that confront nearly all waste generators, like poor information on the exact sources of their wastes and ways to reduce their generation. The valid basis for congressional and public criticism of regulatory programs weakens their positive impacts on waste generators. Regulatory programs that are ineffective for their designed purposes are even more ineffective in causing comprehensive waste reduction. Waste reduction does not typically prevail over other traditional responses to rising environmental costs and liabilities, such as changes in pollution control technologies, acceptance of high and avoidable costs, and, in exceptional cases, plant closings.

Policy Option II:

Institute a small Federal effort through existing environmental statutes and regulatory programs

This would limit reduction to certain regulated wastes, pose administrative problems because of many other congressionally mandated tasks to EPA, and have limited credibility because existing environmental programs are not expert about production processes and have shown little interest in waste reduction. It might not significantly change what is now occurring.

Policy Option III:

Through new legislation, establish a separate Federal program within EPA to support waste reduction and to provide national leadership. Fund it and State programs by allocating several percent of EPA's operating budget

A nonregulatory approach would address many obstacles. It would assist American industry to learn by experience that reducing the generation of all wastes is technically feasible and in its own economic self-interest to do as soon as possible. A 5-year seed grants program for State efforts could build on existing but limited State programs. Government funded in-plant technical assistance and central sources of information, for example, could overcome inertia and smooth a path from sole dependence on costly end-of-pipe regulations to a dual environmental strategy that includes voluntary, comprehensive waste reduction. Increased corporate profits from waste reduction savings are likely to result in sufficiently increased tax revenues to rapidly offset the cost of a Federal program, possibly in as little as 1 year.

INTRODUCTION

Background

After the Office of Technology Assessment (OTA) released its report Serious Reduction *of Hazardous Waste,*[1] the Environmental Protection Agency (EPA) delivered its mandated report *Minimization of Hazardous Waste*[2] to Congress. Congressman Mike Synar, the Chairman of the Subcommittee on Environment, Energy, and Natural Resources of the House Committee on Government Operations subsequently requested OTA to analyze the EPA report and to describe "how EPA's findings and conclusions differ from those of OTA" with the emphasis on "differences that either implicitly or explicitly support different congressional actions" on waste reduction. This OTA special report not only compares the OTA and EPA reports but also provides Congress with new information on waste reduction and a sense of the quickening national interest in it.

Both previous reports portray waste reduction as: 1) an option with many environmental and economic benefits compared to management and regulatory options that deal with waste that is already generated, 2) technically and economically feasible with current science and technology, and 3) in limited use by industry because of a number of obstacles in industry and government. Since this special report focuses on policy options, the policy summaries from the original reports have been reproduced. Box A is the summary of recommendations from the EPA report, and box B is the portion of the summary of the OTA report that deals with policy options.

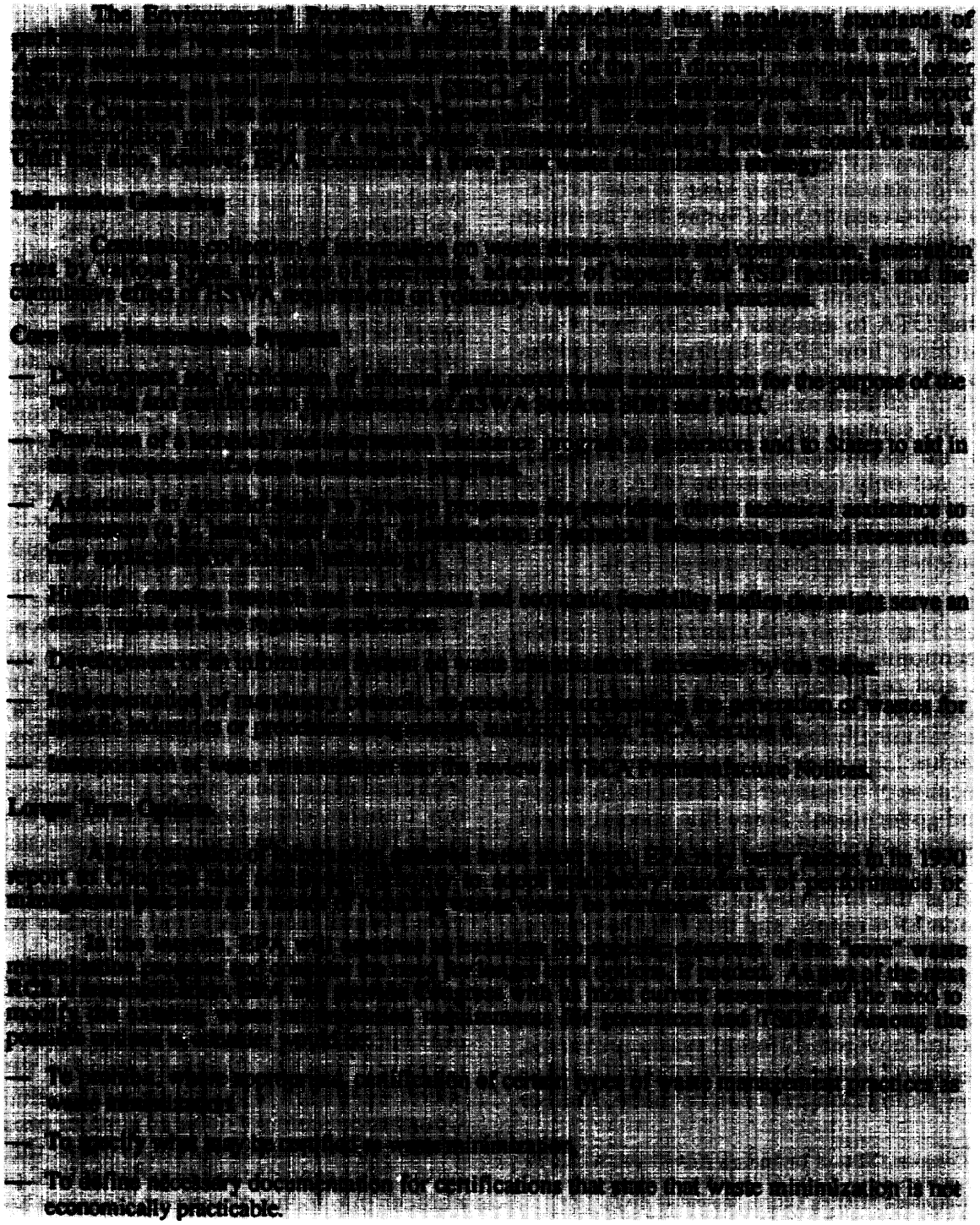
Even though the two reports used different terms and covered different waste universes, some general observations about public policy choices facing Congress can be made. Neither report supports the near-term use of a regulatory approach for waste reduction that would, in some way, prescribe industry actions. Both reports support the use of a nonregulatory technical assistance program to help industry reduce waste generation. EPA recommends technical and information assistance to industry and States, implemented by existing EPA programs, as its near-term waste minimization approach. In the long term, EPA recommends an assessment of the information collected in the short term so as to better inform Congress by 1990 on the need for authority to mandate ways to reduce wastes. As part of the next reauthorization of the Resource Conservation and Recovery Act (RCRA), EPA will suggest any necessary changes in the existing waste minimization reporting requirements. The OTA report provides specific policy options for the implementation of a major Federal nonregulatory waste reduction program, if the congressional goal is comprehensive and rapid waste reduction. It is based largely, but not exclusively, on in-plant technical assistance. The OTA options include ways to address institutional commitment and implementation at the Federal and State levels by, for example, establishing: 1) a Federal grants program to the States to support technical assistance, information and technology transfer, education and training, and generic R&D on commonly used processes and materials; and 2) an EPA Office of Waste Reduction with an Assistant Administrator to provide Federal leadership and advocacy within EPA.

Congress has not explicitly said that EPA's low priority for waste reduction is inconsistent with the regulatory programs EPA must carry out nor has Congress directed EPA to spend significant resources on waste reduction, Congress has not yet debated a major program of the type discussed by OTA, Thus, the purpose of this report is to bring the critical policy choices into focus. No attempt is made here to summarize the detailed technical results of the two studies; the original reports should be consulted for that purpose.

[1] U. S. Congress, Office of Technology Assessment, *Serious Reduction of Hazardous Waste,* OTA-ITE-317 (Washington, DC: U.S. Government Printing Office, September 1986).

[2] U.S. Environmental Protection Agency, *Report to Congress: Minimization of Hazardous Waste,* EPA/530-SW-033 (Washington, DC: EPA, Office of Solid Waste and Emergency Response, October 1986).

Box A.—Summary of Recommendations From EPA Report



The Environmental Protection Agency has concluded that mandatory standards of performance [illegible] are not [illegible] at this time. The [illegible] of the [illegible] and other [illegible] EPA will report [illegible] Until that time, however, EPA recommends a three-point [illegible] strategy.

Information Gathering

Continuing collection of information on waste stream volume and composition, generation rates by various types and sizes of generators, adequacy of capacity for RSD facilities, and the cumulative effect of HSWA [illegible] in voluntary waste minimization practices.

Core Waste Minimization Practices

— Development and [illegible] for the purpose of the [illegible] of HSWA [illegible] and 2003.

— Provision of a [illegible] program to generators and to States to aid in [illegible].

— Assistance to [illegible] technical assistance to [illegible] on new [illegible].

— [illegible] and economic feasibility studies that might serve an [illegible].

— Development of [illegible] by the States.

— [illegible] generation of wastes for [illegible] of [illegible] Section 8.

— [illegible] Notices.

Longer Term Options

[illegible] in its 1990 report [illegible] of performance or [illegible].

[illegible] waste [illegible] the [illegible] to [illegible] among the [illegible].

— To [illegible] of certain types of waste management practices [illegible].

— To [illegible].

— To define necessary documentation for certifications that state that waste minimization is not economically practicable.

Box B.—Policy Excerpt From OTA Report Brief

* * * *

So far government has not required waste reduction. **OTA finds that it would be extraordinarily difficult for government to set and enforce waste reduction standards for a myriad of industrial processes.** The impact on industry, particularly on troubled manufacturing sectors, could be substantial. Alternatively, the United States could move to an economically sensible environmental protection strategy based on **both pollution control** (waste management) **and pollution prevention** (waste reduction) with the Federal Government providing leadership and assistance in the following ways.

First, **through policy development, education, and oversight, Congress could help industry and the Nation profit from seeing waste reduction not as some unique technology, but as a field ready for innovation engineering and management.** These opportunities are embedded in every part of the industrial production system, There is no way to predetermine the amount of waste reduction that is possible; its technical and economic feasibility depend on the characteristics, circumstances, and goals of specific waste generators. Success in reducing waste depends on the ability of organizations to modernize, innovate, and cut costs, thereby increasing profits and reducing long-term liabilities. Thus waste reduction could be used as a measure of performance as energy efficiency and productivity often are.

Second, there are a number of possible legislative actions that could clarify the definition of waste reduction, spur better collection of information on waste reduction, and encourage waste generators to devote more attention to the subject. If the Federal public policy goal is rapid and comprehensive hazardous waste reduction, then a strategy based on government leadership and assistance rather than on prescriptive requirements is likely to be the most effective. For example, Congress could: 1) create an Office of Waste Reduction with an Assistant Administrator within EPA, 2) create **a** grants program to develop generic or widely transferable technical support for waste reduction, 3) through new comprehensive waste reduction legislation require detailed reporting by industry on past reduction actions and plans for future efforts, 4) reward and facilitate waste reduction by offering industry concessions from existing pollution control regulatory requirements, or 5) create and use independent State Waste Reduction Boards to implement programs. Setting a national waste reduction goal of perhaps 10 percent annually could help convert the long stated importance of waste reduction into a true priority and reduce annual environmental spending substantially, ultimately by billions of dollars.

Definitions Used in This Report

Waste Reduction:

In-plant practices that reduce, avoid, or eliminate the generation of hazardous waste so as to reduce risks to health and environment. Actions taken away from the waste generating activity, including waste recycling or treatment of wastes after they are generated, are not considered waste reduction. Also, an action that merely concentrates the hazardous content of a waste to reduce waste volume or dilutes it to reduce degree of hazard is not considered waste reduction. This definition is meant to be consistent with the goal of preventing the generation of waste at its source rather than controlling, treating, or managing waste after its generation.

Hazardous Waste:

All nonproduct hazardous outputs from an industrial operation into all environmental media, even though they may be within permitted or licensed limits. This is much broader than the legal definition of hazardous solid waste in the Resource Conservation and Recovery Act, its amendments, and subsequent regulations. Hazardous refers to harm to human health or the environment and is broader than the term "toxic." For example, wastes that are hazardous because of their corrosivity, flammability, explosiveness, or infectiousness are not normally considered toxic.

*Copies of the OTA report, *'Serious Reduction of Hazardous Waste: For Pollution Prevention and Industrial Efficiency," are available from the U.S. Government Printing Office. The GPO stock number is* 052-003-01048-8; *the price is $12.00. Copies of the report for* congressional use are *available by* calling 4-8996. Summaries of *reports are available at no charge from the Office of Technology Assessment.*

A discussion of agreement and differences between the two reports follows this introductory section. The third section analyzes some internal inconsistencies in the EPA report. The last section of this special report is a discussion of four critical policy choices confronting Congress. Included is an updated discussion of the same policy options presented in the OTA report.

Definitions

One important difference between the OTA and EPA reports needs to be understood at the outset. The OTA report on waste *reduction* defined that term as:

> in-plant practices that reduce, avoid, or eliminate the generation of hazardous wastes so as to reduce risks to health and the environment.

Waste reduction includes actions taken in industrial plants, such as changes in technology and processes, plant operations and procedures, and raw materials that reduce the amount and toxicity of waste *before* it is generated. The OTA definition excludes recycling as true waste reduction unless it occurs within the parameters of a specific process so that waste does not exit the operation. This in-process recycling, which is an integral part of a process or operation, is not what most people mean by waste recycling.

Congress directed EPA to report on *waste minimization.* EPA said that, for purposes of its report, waste minimization includes waste reduction plus recycling of wastes that have been generated whether on or off the site of waste generation. That is, conventional waste recycling includes the handling and transport of waste to a facility where the waste, or part of it, is used beneficially as a material or sometimes as an energy source. However, EPA has interpreted the Hazardous and Solid Waste Amendments Act of 1984 (HSWA, also called the 1984 RCRA Amendments) definition of waste minimization to include waste reduction, plus all forms of recycling and treatment (such as incineration or other processes that destroy, detoxify, or reduce the volume of waste streams) that occur after wastes have been generated. In OTA's report such post-generation actions (recycling and treatment) are waste management. It is generally accepted that even good, improved, and necessary waste management offers less certain environmental and public health protection than waste reduction. Such waste management is particularly better than land disposal of untreated waste. Waste reduction, however, prevents pollution instead of controlling how *much* hazardous substance is released into the environment.

In this special report, waste reduction is used exactly as the OTA report uses the term. Waste minimization is used in this special report as the national policy statement in HSWA defines it (see box C). That is, the majority of waste generators believe that waste minimization covers actions that include waste reduction plus the recycling and treatment of hazardous wastes after they have been generated. These terms and their different definitions lead to different decisions by waste generators and different policy goals and implications, which are discussed at length later in this report.

The Nature and Primacy of Waste Reduction

This special report does not address recycling and waste treatment extensively. In an earlier report[4] OTA supported the shift in policy away from land disposal toward better waste management, later adopted by Congress in HSWA. However, in that earlier study OTA acknowledged that waste reduction was the option generators should pursue first, and only waste reduction was examined in OTA's recent report. Both the EPA and OTA reports support, by analysis and information, the unique benefits of voluntary waste reduction by industry. In fact, no one disputes waste reduction's wide-ranging advantages in principle. The issues are

[3] EPA primarily used the term *source reduction;* its definition of the term appears in table 1.

[4] U.S. Congress, Office of Technology Assessment, *Technologies and Management Strategies for Hazardous Waste Control, OTA-M-196* [Springfield, VA: National Technical Information Service, March 1983).

Box C.—Waste Reduction and National Policy

"The Congress hereby declares it to be national policy of the United States that, wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible. Waste nevertheless generated should be treated, stored, or disposed of so as to minimize the present and future threat to human health and the environment."

From the ***Resource Conservation and Recovery Act,*** as amended by the U.S. Congress in November 1984. This policy statement is supported by ***waste minimization*** provisions also added to the act.

all about practice: How much waste reduction is going on now? How much could go on, and when? Slow, token, or narrowly applied waste reduction can lead to a false sense of accomplishment; obstacles remain unaddressed and opportunities are missed.

Waste reduction is the best choice, when it is technically and economically feasible. As the environmental option of choice, waste reduction should be examined first. We need to create the climate in which the best mix of waste reduction and waste management will grow. The problem is that generators often assume rather than ascertain that waste reduction is infeasible and jump to recycling, the next solution to consider, or treatment, the third option in the hierarchy of choices. Demand for public accountability for decisions on waste reduction



Photo credit' Copyright 1985 Greenpeace/Lawrence (used with permission)

Example of public's concerns about toxic waste and reduction

is bound to increase because the issue is now on the agenda of many grassroots public interest groups. Waste reduction is an opportunity for public policy to combine the environmentalism of the 1960s with the economic sensibilities of the 1980s.

Waste reduction accomplishes one of the basic objectives of regulatory reform because it cuts industry's costs and reduces the amount of materials and situations that have to be regulated. Widespread waste reduction alleviates the negative environmental effects of technical inadequacies of regulations, loopholes in regulations, and poor compliance with regulations. It also alleviates private and public inefficiencies caused by a complicated web of different and sometimes inconsistent environmental statutes and programs. These problems are found in all environmental programs but are particularly acute for the RCRA program which every recent examination has found to be in trouble.[5] Problems in the regulatory system limit its ability to induce waste reduction as an alternative to increasing regulatory costs and liabilities. If the regulatory system is not meeting its stated environmental protection goals effectively, then it is unlikely to be effective in causing generators to comprehensively reduce waste generation. Decisionmaking often ignores the economic benefits of waste reduction, partly because they seem uncertain. A potential benefit is not necessarily an effective incentive for waste reduction. Generators stay in the regulatory system not only because they have to but also because they do not understand how to leave it, even if only partially, through waste reduction.

Waste reduction does not imply either outright or incremental elimination of the current environmental regulatory system or of hazardous waste and pollution. Waste reduction makes it easier to achieve environmental goals. Still, waste reduction has received little attention within the context of RCRA (or other environmental programs) by Congress, by EPA, or by critics. Except for a few pioneering companies, industry seems largely unaware of the immediate feasibility of waste reduction and the need to reexamine how it can be best used. Individual cases of successful waste reduction often cited today do not prove comprehensive waste reduction on a company or industry basis. And, the movement away from land disposal has not necessarily resulted in a broad or large shift to waste reduction. Despite some favorable conditions in the marketplace, waste reduction faces stiff competition from other responses to rising costs and regulations. **These other responses include building incinerators and not complying, or delayed compliance, with regulations.**

Waste reduction is more than just another environmental protection option. It offers American industry a positive return on investments that reduce environmental costs in the short term and large liabilities in the long term, but only if costs and liabilities are used correctly in decisionmaking. A few pioneering companies have shown waste reduction to be an effective way to modernize plants, to improve profitability and competitiveness, and to enhance the public perception that industry can act proactively to solve environmental problems. Dow Chemical, for example, in its new WRAP—Waste Reduction Always Pays—program sends a simple, unambiguous message to its employees: waste can be reduced, *you* can reduce waste, and you will be rewarded if you do. But waste reduction is a new public policy concept in the arena of industrial competitiveness.

Although it is not possible to accurately quantify current waste reduction or forecast future waste reduction, OTA, EPA, and several other major recent reports[6] conclude that substan-

[5] See U.S. Environmental Protection Agency, *Report to Congress—EPA Activities and Accomplishments Under the Resource Conservation and Recovery Act: Fiscal Years 1980 to 1985, EPA/530-SW-86-027* (Washington, DC: EPA, Office of Solid Waste and Emergency Response, July 1986); U.S. Congress, General Accounting Office, *Hazardous Waste: EPA Has Made Limited Progress in Determining the Wastes To Be Regulated,* GAO/RCED-87-27 (Gaithersburg, MD: U.S. General Accounting Office, December 1986); and James E. McCarthy and Mark E. Anthony Reisch, Library of Congress, Congressional Research Service, "Hazardous Waste Fact Book," 87-56 ENR, Jan. 30,1987.

[6] National Academy of Sciences, *Reducing Hazardous Waste Generation* (Washington, DC: National Academy Press, 1985); David Sarokin, et al., *Cutting Chemical Wastes (New* York: INFORM, 1985); The Environmental Defense Fund, *Approaches to Source Reduction* (Berkeley, CA: EDF, June 1986).

tial amounts of waste reduction are possible in the near term. However, with few exceptions, everybody in industry and government is so busy trying to manage wastes that are generated that they have little time and money to try to generate less. Although the environmental regulatory system contributes to this misplaced priority, it also results from insufficient focus on waste reduction by industry as an element of strategic planning, cost-cutting, and modernization. Government has not been as helpful as it could, Congress has not established the primacy of waste reduction, even though the HSWA national policy statement is consistent with it (see box C). There seems to be a feeling that waste reduction will happen on its own.

EPA's Present and Future Commitment

The OTA study found that the Federal Government spends very little money on waste reduction, less than 1 percent of its environmental budget. Almost all spending goes, instead, to controlling pollutants that are generated. And within the context of waste minimization, most of EPA's resources go to treatment and recycling as alternatives to land disposal, instead of supporting waste reduction. Industry follows EPA's lead,

The definition of waste minimization used by EPA (waste reduction and recycling) for the purposes of its report to Congress differs from previous EPA actions and from HSWA (waste reduction, recycling, and treatment). This dual definition can cause confusion, Waste minimization can include up to three distinctly different activities, and people in industry and government naturally give more attention to familiar treatment technologies and recycling than to waste reduction. A critical but often overlooked fact is that waste reduction must be implemented by production people and not by those with environmental responsibilities. But, not all production people feel pressured or required or are willing and able to tackle waste reduction, They are more familiar with treatment and recycling, which are marketed commercially as services or equipment. Production people focus on the product not on waste, and they find pollution control at the end **of the process more convenient than waste reduction in the middle.** Moreover, production people are reluctant—with good reason—to modify processes that are operating profitably. Only education and training and better information about the ways to reduce waste generation can overcome this inertia and fear.

Because waste minimization means many things, people in industry and government are not necessarily committed to waste reduction. EPA's future actions would be clearer if the EPA report had stated whether a *major* Federal waste reduction program is necessary because industry is not doing enough or if it had explicitly requested new statutory authority, funding, and organizational change in EPA to implement a waste reduction program.

Although EPA did not explicitly say that a major Federal waste reduction program was not necessary, the EPA report's recommendations are not consistent with a major program. Moreover, in the absence of a new congressional mandate, EPA is unlikely to undertake a major waste reduction program with the funding, institutional commitment, and organizational importance that would make it successful. To some extent this impression may be caused by the direction HSWA gave to EPA for the waste minimization study. Congress seemed concerned primarily with whether to use a traditional prescriptive regulatory approach for waste minimization (e.g., best production technology or percentage waste reduction requirements). HSWA said nothing explicitly about setting up a major nonregulatory Federal program to encourage and assist waste reduction or to identify how some government programs and industrial practices may hinder waste reduction. OTA, guided by specific committee requests for its study, examined these issues closely. EPA, however, guided by HSWA did not.

In its fiscal year 1988 budget request, EPA allocates only $398,000 for waste minimization. This amount is about 0.03 percent of EPA's total operating budget of $1.5 billion and is less than the approximate $550,000 that EPA spent in fiscal year 1986 on its waste minimization

report.[7] EPA first noted the environmental primacy of waste reduction (using that term) in 1976, but it has relied on the marketplace to implement the concept.

Although it has recognized the importance of State efforts, EPA has not concluded that a separate, comprehensive Federal waste reduction grants program is necessary to support and enhance those efforts. OTA examined State efforts and concluded that for them to be effective nationwide in reducing the generation of hazardous waste, there should be more of them, they should receive more financial support, and they should be focused on waste reduction rather than good waste management. State nonregulatory programs recognize important obstacles facing waste generators but would benefit from a Federal policy framework that provided national leadership focused on waste reduction.

To sum up, a major Federal program that addresses public and private obstacles to waste reduction could lead to more expeditious and comprehensive waste reduction. Many of the findings in EPA's report are consistent with results of other studies and could support a serious waste reduction effort.

Policy Issues

Congressional Action

Although waste minimization was added to RCRA in 1984, not much attention has been paid to waste reduction. From a public policy perspective, waste reduction is in the issue development stage at the Federal level, even though it has moved considerably beyond that at the State level—at least in a few States. No major Federal environmental statute or program has ever paid much attention to waste reduction.

Neither Congress nor EPA has integrated waste reduction with other tactics to achieve a balanced environmental protection strategy. There has been no congressional discussion of whether the Federal Government needs to design waste reduction policy differently from pollution control policy. In the recent reauthorizations of RCRA (HSWA, 1984) and Superfund (The Superfund Amendments and Reauthorization Act of 1986, or SARA), Congress directed EPA and the States to assess the Nation's future waste *management* capabilities. Congress did not, however, direct them to recognize or examine the potentially significant contribution of waste reduction.

The most significant Federal actions to date are the strong policy statement in HSWA on the merits of waste reduction (see box C) and several minor actions required of EPA and industry. Waste reduction is nearly entirely in the hands of the private sector, except in a few places where local or State governments have acted to persuade and assist industry to reduce waste generation.

The founder and director of the National Roundtable of State Waste Reduction Programs has addressed the need for Federal action:

> The states are clearly the leaders in this [waste reduction] effort and require high-level, well-funded and focused programs at the federal level. EPA has not met that challenge, . . . waste reduction] cannot be approached as a panacea for zero wastes and should not be entered into without a firm commitment to change the traditional pollution control mentality in recognition of reduction options. Government's role in this regard requires an innovative shift in environmental protection to include positive technical assistance and financial incentives in addition to regulations and enforcement. The need for this shift is particularly acute at the federal level.[8]

[7] 0TA estimated in its report that EPA spent a total of $1,8 million on waste minimization in fiscal year 1986. That amount included the cost of the EPA report, plus research funds spent by the Office of Research and Development or granted to outside research organizations and States, not all of which were officially labeled "waste minimization" funds. Of this total for waste minimization, OTA estimated that about $800,000 was spent by EPA on waste *reduction*.

[8] Roger N. Schecter, "Summary of State Waste Reduction Efforts," *Hazardous and Solid Waste Minimization and Recycling Report,* March 1987, p. 12.

Legislative Approach

Should Congress now decide to emphasize waste reduction, the important issues are whether to consider a legislative initiative and, if so, whether to do it within the context of RCRA or through a new statute,

New legislation may be appropriate because waste reduction is distinctly different from activities currently authorized and carried out under existing environmental statutes. Waste reduction is:

- an upstream or front-end pollution prevention strategy different technically from the end-of-pipe pollution control actions required by existing statutes;
- most effective when it applies to all hazardous wastes and pollutants, whether they are regulated or not, otherwise opportunities arise to shift waste among environmental media (air, water, and land) or out of the regulatory system;
- best addressed by policies aimed at assistance, persuasion, and institutional commitment since—as both OTA and EPA agree—it is not amenable to traditional regulatory or prescriptive approaches; and
- a bridge between environmental and industrial competitiveness issues and goals.

Timing of Waste Reduction v. Waste Treatment

The OTA report and—to a lesser extent—the EPA report draw attention to the importance for policy makers to unambiguously define waste reduction and its primacy over other options that manage and control hazardous wastes and pollutants, There is a choice to be made; whether to devote essentially all the government's environmental resources to fix inherent problems in the traditional pollution control system or to use some of those resources to pay significant attention to waste reduction. Congress, EPA, and industry worry a lot about a potential shortfall of waste management capacity because of the current shift away from land disposal practices under RCRA. As the EPA and OTA reports recognize, waste reduction could lower waste management needs in the near term, if it is given a high priority by government and industry. But what does high priority mean for waste reduction? Waste reduction has always had high *theoretical* priority, but its priority has never been made evident by industrywide actions. Industry by itself cannot overcome all the obstacles to waste reduction. Government's regulatory programs cause some of the critical ones. Other obstacles center around limited industrial resources and management's short-term perspectives and strategies.

A window of opportunity is opening for a historic shift in focus on environmental protection. Government programs dealing with clean air and water are maturing but have yet to deal effectively with such problems as air toxics, nonpoint sources of pollutants (e. g., pesticide use), and marine wastes.[9] The RCRA hazardous waste management program is in a particularly problematic state of flux. Congressional actions in 1984 directed EPA to move the hazardous waste management system away from land disposal. However, Congress did not give EPA specific instructions to move as forcefully toward waste reduction.

Industry is investing in waste *management* techniques (particularly incineration) which are familiar and which are marketed aggressively by vendors. Treatment equipment often requires large amounts of waste to operate efficiently, and capital investments in treatment facilities can take many years to amortize. Present public policy, therefore, is driving large investments in waste management facilities that can preclude, limit, or delay waste reduction.

This incremental strategy of first addressing waste management needs in order to satisfy regulatory land disposal deadlines appears reasonable at first. However, it could severely and permanently limit waste reduction and the more certain benefits it offers. Moreover, as important as regulatory deadlines that limit the use of land disposal are, they are less important *in the long term* than encouraging waste reduction. Enough flexibility could be introduced into

[9] See, for instance, U.S. Congress, Office of Technology Assessment, *Wastes in Marine Environments, OTA-O-334* (Washington, DC: U.S. Government Printing Office, April 1987).

the regulatory system to accommodate and encourage more waste reduction without compromising the environmental benefits of reducing the use of land disposal.

Siting and permitting difficulties, however, pose great barriers and long delays to new waste treatment facilities. Shortages in waste treatment capacity—even with increased investment in treatment facilities—might result. This situation could lead to pressures from within industry to restore greater use of land disposal or to engage in actions that might sacrifice environmental protection in order to build new waste management facilities. Serious Federal assistance for waste reduction could help to head off this potential problem.

Waste Reduction and Competitiveness

Waste reduction is more than an environmental issue; it is a way to improve industrial competitiveness. More environmental regulations and more effective enforcement raise environmental costs and increase liabilities (from Superfund, civil and criminal prosecutions, lack of adequate insurance, and limits on real estate transactions). From 1985 to 1986 there was a 20-percent increase in the number of pages of Federal environmental regulations to a total of 8,500 pages. The increase was the largest annual increase in history. These increased burdens, added to other conditions (e.g., higher wage rates), can contribute to permanent plant closings and relocation of plants to foreign countries. If it occurs early enough, waste reduction can help modernize industry and provide environmental protection while reducing these burdens and thus increase corporate net income.

Data from the Organization for Economic Cooperation and Development (OECD) on industrial environmental spending by the United States and its competitors seem to indicate a competitive disadvantage for the United States. Japanese manufacturing industries' capital spending in 1974 on pollution control was 100 percent more than that of American manufacturing industries. By 1977 these environmental investments were the same in Japan and the United States, but in 1978 and 1979 the United States was spending slightly more than the Japanese manufacturing industries.

In 1980, total industrial investments in pollution control as a percent of gross industrial domestic product were nearly four times greater for the United States than for Japan or France and nearly three times greater than for West Germany.

What data are available on relative reductions in environmental pollution indicate that our industrialized competitors have done as good or better than the United States.[10] In terms of economic efficiency, environmental protection in the United States appears more costly than in other industrialized nations. The reason seems to be not merely greater government regulation but less flexible environmental regulations in the United States that block effective and more economical and technologically advanced solutions. (Regulatory flexibility to encourage waste reduction is discussed later in this special report.) The environmental competitive disadvantage of the United States relative to newly industrializing nations, such as South Korea and Brazil, is even greater because such countries have fewer environmental requirements.

Another OECD report on the connection between technological innovation and environmental protection is quite significant .[11] OECD concluded that waste reduction is the only environmental protection tactic that *directly* benefits industry in the broader context of industrial efficiency and technological change but that so far none of the industrialized nations had adopted it in a big way. The report also highlights the results of a French study on waste reduction that revealed benefits not initially expected, such as, energy savings (in 51 percent of the 200 cases examined), savings in raw materials (47 percent), and improved working conditions (40 percent). At the present time, most industrial managers focus only on savings associated with waste management, pollution control, and regulatory compliance costs and lia-

[10] Organization for Economic Cooperation and Development, *OECD Environmental Data–Compendium 1985* (Paris: OECD, June 1985).

[11] Organization for Economic Cooperation and Development, *Environmental Policy and Technical Change* (Paris: OECD, 1985).

bilities. From a public policy perspective, the conclusion of the OECD report concerning the role of government is important, The report said:

> [waste reduction] may turn out to become increasingly an essential part of environmental protection. Public authorities have an important role to play in the management of this evolution for the best environmental protection.[12]

It is difficult for Congress to discuss the link between waste reduction and industrial competitiveness because the two are provinces of different committees and subcommittees. Moreover, environmental protection objectives have often been seen as counter to economic interests and a dragon society. However, a Federal program that helps industry to reduce its environmental costs and liabilities through waste reduction might avert some decline in the industrial sector. Marginal plants may be in particular need. They already have trouble dealing with production problems and may not have the technical or economic ability to evaluate and implement waste reduction options. As a means of improving industrial competitiveness and helping to renovate the American production system, waste reduction offers a low-cost legislative option that does not sacrifice environmental protection.

Policy Options

While the OTA report provides Congress with three different, detailed broad strategies for a Federal waste reduction program, the EPA report outlines two parallel efforts, one near term and one long term, for waste minimization.

The OTA policy analysis examined how to shift the emphasis in environmental protection toward waste reduction without adding expensive new programs and how to address the obstacles to waste reduction within government and—just as importantly-within industry. Public policy must address both sets of obstacles to be effective in achieving national environmental protection goals.

EPA examined the incentives for and disincentives to waste reduction from the current waste regulatory and management system. EPA said that regulatory conditions are strong driving forces for waste reduction. But it did not recognize their indirect character, their role as obstacles, and that they can easily lead industry to responses other than waste reduction, such as changing waste management technology, taking advantage of opportunities within the regulatory system to avoid or delay compliance, or, in extreme cases, closing plants.

EPA's view of past waste reduction seems to have affected its policy analysis. OTA believes that EPA has overestimated the amount of waste reduction that has occurred in the past and thus underestimates the need for a major Federal effort to assist industrial waste reduction. New data on RCRA waste that was not available for use in the EPA or OTA reports show a higher level of annual generation; from the 250 million metric tons reported by various studies in the early 1980s to 569 million metric tons. *a This does not necessarily mean that waste generation has increased, but by basing its findings on the lower figures, EPA could have underestimated the potential targets for waste reduction. Some State data given later support OTA's less optimistic interpretation of past waste reduction.

The EPA report concludes that large companies can and will reduce waste but that smaller firms will not because of lack of information, technical knowledge, and access to capital. If this were the case, large companies should be able to show evidence of comprehensive waste reduction. But, by and large they cannot. Firm size, variations in corporate structure and culture, and the variable nature of production—inputs, processes, and products—affect what companies can do to cut waste generation. The OTA report shows that various obstacles exist

[12]Ibid., p. 95

[13]U.S. Environmental Protection Agency, "1986 National Screening Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities: Summary of Results for TSDR Facilities Active in 1985," prepared for the Office of Policy, Planning, and Information (Office of Solid Waste) by the Center for Economics Research by Research Triangle Institute, Research Triangle Park, NC, December 1986.

for all sizes of companies and that Federal waste reduction efforts can be designed to assist all of American industry. Individual facilities of large companies often face the same problems as small businesses when it comes to carrying out waste reduction.

The EPA report says that aggressive action and institutional advocacy are necessary to promote further waste minimization but provides no insight as to how EPA will provide either. The agency's fiscal year 1988 budget request of $398,000 for waste minimization and its longstanding low priority for waste reduction suggest that it is not prepared to be that advocate without congressional direction.

In the OTA report three broad policy approaches, each with many specific congressional actions, are described. If the Federal public policy goal is rapid and comprehensive hazardous waste reduction, then Policy Option III—to establish a new, highly visible waste reduction program–would be the most likely to attain that goal without harm to American industry. That approach would assist industry with voluntary waste reduction and would develop a planning and reporting system to track industrial progress. It would acknowledge the primacy of waste reduction over pollution control and would attempt to raise the use of waste reduction to a parity with pollution control. While this kind of a Federal program would firmly establish national policy, provide leadership, and give institutional priority and commitment to waste reduction, the States would be called on to do most of the work. In order of importance, major activities supported by Federal grants would be in-plant technical assistance, information and technology transfer, education and training, and generic R&D. [14]

As discussed later, a new Federal program might be funded by reallocating a small percent of EPA's operating budget specifically for waste reduction. This approach is consistent with waste reduction's priority which justifies shifting resources from less effective strategies for environmental protection. Two percent of EPA's operating budget would equal $3o million in fiscal year 1988—easily the cost of one Superfund cleanup. This level is low enough not to threaten or diminish the effectiveness of ongoing pollution control regulatory programs. However, this amount, which is almost 100 times that requested by EPA for waste minimization, would allow the creation of an effective grants program to be implemented at the State level. From a cost-benefit perspective encouraging and assisting waste reduction can pay in improved environmental protection, increased tax revenues, reduced or slower growth in governmental spending on regulatory programs, and avoided future Superfund cleanup costs. Information dissemination on alternative technologies for waste reduction and direct technical assistance to industries will increase regulatory compliance, reduce waste generation, and increase industrial efficiency.

Another point to consider is that, with no major Federal commitment to waste reduction, EPA could come under pressure to take shortcuts in siting, permitting, and delisting RCRA hazardous wastes to match waste generation with available waste management capacity. If this happened, public confidence in government environmental programs—already shaken—could worsen.

Finally, although congressional action on waste reduction would be a major change in environmental policy, it is also a logical next step in the development of a comprehensive environmental protection-waste management system. Governor James J. Blanchard of Michigan recently described the historical nexus of waste reduction:

> It is time for a revolution in our thinking about protecting the environment from pollution . , , The successful state and federal environmental legislation of the 1960s and 1970s attacked conventional pollutants by regulating their release into the environment. This forced the development of new pollution control technologies, but still permitted some discharge of materials . . . To meet the emerging challenge of toxic pollutants, we must realize

[14] The OTA study concluded that it was not feasible to give money to companies for waste reduction, as waste reduction is linked to so many industrial activities with broader objectives than waste reduction that government assistance could skyrocket.

> that it is far more effective and cheaper to prevent them from ever entering the environment than it is to clean up our mistakes . . . Our business economy, too, will benefit from the reduced material costs, slashed disposal fees, and increased efficiency that result from innovative waste reduction technologies . . . I will charge this [Waste Reduction Program] with designing programs for providing technical and financial assistance and information to businesses to reduce toxic pollutants, focusing initially on hazardous waste reduction , . . We will press for federal action setting national goals for pollution reduction and prompting this country to advocate pollution reduction as an international priority .15

[15]Governor James J. Blanc hard, *The Michigan Strategy: Report to the People of Michigan and the Legislature, 1987,* pp. 39-43.

COMPARATIVE ANALYSIS

An examination of the OTA and EPA reports shows that there are areas of agreement and disagreement on waste reduction. Both OTA and EPA agree on a number of technical issues and that traditional mandatory regulations to force waste reduction are not now appropriate. OTA and EPA do not agree on terms and definitions (and thus, the focus of potential Federal efforts), on the hazardous wastes that should be considered for reduction, or on how waste reduction is affected by various incentives and obstacles. OTA's analysis of EPA's report relies principally on its summary volume. However, there are discrepancies between the summary and subsequent volumes of the EPA report. EPA did not use some results of its own analyses that are in more agreement with the findings of OTA and others than EPA's highlighted findings and conclusions would indicate. Box D gives several examples of such unused EPA results.

Areas of Agreement

Technical

Despite the different waste universes studied by EPA and OTA (as discussed later), both reports attest to the availability of technology to reduce waste generation, the basic economic benefits of waste reduction, and the ability of industry (and government) to reduce waste generation. Both reports, moreover, give considerable attention to the lack of substantive information on waste generation *and* reduction: on what has occurred, is now occurring, or may occur in the future. The correct way to measure waste reduction, according to EPA and OTA, is to put changes in waste generation on a product output basis so that other contributions to changing waste generation levels (e.g., production rates) are eliminated. But only a few companies can supply data of this nature, and government has not yet clearly stated that there is a correct way to measure waste reduction that everyone ought to use.

Optimism about future potential does not mean that every waste generator can immediately reduce its waste generation. In some cases, R&D may first be necessary in order for economic benefits to be attained at specific plants. Some industries have less potential for waste reduction than others, either because of the age or type of their production processes, because of past reduction efforts, or because of variable capacity to innovate related to corporate styles, cultures, and strategies. Generally, EPA and OTA conclude that there are a number of problems, disincentives, and obstacles concerning institutions, organizational characteristics, information, and human attitudes and behavior that limit the use of technically feasible waste reduction options.

Within the agreements between the EPA and OTA reports, however, there is a point of disagreement that can have important policy implications. Years of unreliable waste generation data makes accurate accounting for waste reduction difficult, if not impossible, with current information collection systems. This is important for policy development; the greater the potential for future waste reduction the greater is the justification for a major Federal initiative aimed at helping industry reduce waste generation as soon as possible.

EPA and OTA answered the question of how much waste reduction has taken place in different ways. OTA discussed waste reduction extensively with industry people and concluded that while some waste reduction has occurred and more is occurring today, the bulk of feasible waste reduction (where waste is defined very broadly) lies ahead. OTA has not even tried to make exact calculations of past or future waste reduction, because the data are insufficient for that purpose. EPA calculated numbers that show relatively high reduction in the past with a methodology that probably overestimates waste reduction. EPA's calculations were based necessarily on critical subjective judgments, rather than actual data, which do not exist. Other factors (some of which lead to systematically overestimating the waste reduction that has occurred) cast great uncertainty on the EPA conclusion that most waste reduc-

Box D.—Unused Results in EPA's Report Appendices Agree With OTA's Findings

- **Policy should address obstacles to waste reduction rather than rely on the marketplace to provide indirect incentives**
  "Many of the hazardous waste generators subject to these pressures face obstacles to implementing waste minimizing processes or practices, because they lack awareness of the technical alternatives available, have inadequate capital to make the necessary investments, lack engineering expertise to redesign processes, or fail to understand the importance of considering compliance or disposal costs in time/cash flow calculations. " [p. **A-92]**
- **Current EPA efforts are limited; better organization and a comprehensive grants program are needed to support State programs**
  "EPA's current technical assistance effort is restricted, Few States receive direct support and the support that is available is limited. Research programs are selected and funded without any systematic determination as to whether their research might duplicate efforts of other States. " [p. A-108]
- **All sizes of firms face obstacles to waste reduction**
  "Direct financial assistance would presumably focus on small and medium-sized companies, not the largest generators, since the large firms tend to have greatest access to information and capital to support waste minimization programs. A sustained and well-publicized program would, however, help change the general climate within which firms make waste management decisions, exploiting peer pressure and creating a milieu in which firms can demonstrate technological leadership and innovation in a field where public anxieties are great." [p, **A-98]**
- **Waste reduction is a multimedia environmental protection strategy**
  "[Technical assistance programs] could encourage thinking about environmental problems on a cross media basis, Waste audits and technical assistance provided to companies generally focus on the entire pollution generation profile of a company—not just RCRA wastes. " [p. A-99]
- **Substantial unused waste reduction opportunities still exist**
  "It will be difficult to predict or to measure the impact of technical programs on waste generation rates, but the Agency believes it is potentially substantial . . . Technical assistance could potentially have a significant beneficial effect on the toxicity of wastes produced by large numbers of firms, " [P. A-98]

tion that can happen has happened. Those factors include:

1. extrapolation from approximately 20 production processes to the literally hundreds of thousands of processes in all of U.S. industry;
2. the picture of U.S. industry used in the estimate was static;*
3. the assumption of maximum use of best waste reduction technology is unrealistic because waste disposal costs were very low during most of the years used for the estimate and there was little incentive for firms to look beyond waste disposal to waste reduction or to concentrate process modification work on waste reduction rather than on product improvement; and
4. even today a waste stream can be counted as totally reduced when it moves from one regulatory system to another (e.g., instead of going to a RCRA facility it goes to a public wastewater treatment plant) or when it is only partially recycled.

The EPA report on waste minimization estimates that an additional 15 to 30 percent reduction in waste generation is possible in the next 25 years, over the 60 percent estimated for the past, In the OTA report, available company data on hazardous waste reduction was

*During the years covered by the estimate, new processes and new products were introduced in great number, some of which must have caused more waste to be generated than the processes and products they replaced. This phenomenon was not factored into the estimates.

used to support an average 10 percent year-to-year level of waste reduction for the next 5 years as a feasible goal, although individual companies and plants might accomplish less or more. In other words, the EPA report concludes that most waste reduction has already occurred; the OTA report, on the other hand, supported a greater potential for waste reduction in the near-term future.

An optimistic view of future waste reduction potential is supported by the following. First, the acknowledged leader in waste reduction, 3M, has reduced its hazardous waste generation by about 50 percent over the past 10 years and has said that it hopes to reduce by about another 30 percent over the next 5 years. It seems implausible to suggest, as EPA's report does, that all of American industry has been able to achieve what this large research-oriented company has done. Companies, such as 3M and Dow Chemical, that have given a lot of attention to waste reduction publicize the results of their efforts. These companies are few in number, suggesting that few have equaled 3M's performance, much less have reached EPA's 60 percent level.

Second, the OTA report's survey of people in 99 companies showed that about 50 percent believed technology available to them in 1985 could reduce their waste generation (all, not just RCRA wastes) by more than 25 percent. This indicates that much more waste generation could be reduced over a longer period with more extensive information dissemination, technology transfer, and government support.

Third, a recent OECD report concludes that penetration of clean technologies (processes that reduce the generation of wastes) into production has been small in the United States and elsewhere.[16] It found that 80 percent of U.S. spending on air and water pollution from 1973 to 1980 was on end-of-pipe pollution control measures. More detailed data from France, where the national government has promoted waste reduction, show that major waste generating industries have introduced clean technologies into only 1 to 3 percent of their plants (major exceptions were gas and electric plants at 72.7 percent and wood at 36 percent). In Denmark, which is very progressive in the environmental area, about one-third of firms adopted new production processes with environmental benefits between 1975 and 1980.

Still other recent information is consistent with OTA's conclusion that much more reduction in waste generation (broadly defined) is possible. New Jersey has perhaps the best State data on waste generation, and new data indicate an *increase* in waste generation of 50 percent over the past 3 years (when the effect of a major plant having closed down some operations is taken into account). Increases in production were not likely to have been the cause, because of a slow economy, but better information reporting could account for it.

New York officials have reported that out of some 2,000 biennial waste generator reports submitted in 1986 only 50 provided any information on waste minimization required by Congress in the 1984 amendments to RCRA. A reasonable interpretation of these numbers is that most generators did not reduce waste generation, since they could benefit from public acknowledgment of such efforts. The report format was not an obstacle because they could report their efforts in any narrative form they chose. According to Illinois officials, annual reports indicate that 50 percent of large quantity generators and an even greater fraction of small quantity generators have made no serious progress in waste reduction.

In California, the Metropolitan Water District of Southern California and the Environmental Defense Fund have embarked on an innovative program (supported by $300,000 from each for the initial program) to assist industry to reduce the generation of chlorinated solvents by up to 75 percent. This high goal indicates this industry has not pursued much waste reduction in the past.

Lastly, if EPA was correct about so much past waste reduction, then there should have been some observable effects on aggregate waste generation. Unfortunately data for RCRA waste

[16] Organization for Economic Cooperation and Development, *Environmental Policy and Technical Change,* op. cit.

have been undergoing change and remain suspect. Nevertheless, it is important to consider aggregate waste generation data because from a waste reduction perspective all generated wastes establish the potential for waste reduction. There is very little data from EPA's air and water regulatory programs on how much waste is generated. In the initial years of the RCRA program, EPA said that about 40 million metric tons of hazardous waste were generated annually. Then in the early 1980s, beginning with OTA, the Congressional Budget Office and an EPA contractor study raised the estimated level to some 250 million metric tons annually. However, a survey of 1984 practices taken by the Chemical Manufacturers Association (C MA) of its members suggested that total RCRA waste generation for the Nation might be as high as 1 billion tons annually .17

Now, a new EPA contractor survey has, for the first time, counted RCRA waste that is exempt from being managed in RCRA regulated facilities. All RCRA wastes, regardless of how they are managed, define targets for waste reduction. Preliminary data reported in December 1986 show that a total of 569 million metric tons of RCRA wastes were generated in 1985. While this survey covered more RCRA wastes (but only currently regulated RCRA wastes) than those in the past, it did not account for nonRCRA wastes that are handled exclusively by nonRCRA facilities (e. g, a wastewater treatment plant not requiring a RCRA permit). It should be noted that numbers for total amounts of waste generation are influenced by several factors, such as plant closings, changing production levels, or regulatory delistings, that can mask or distort changes due to waste reduction.

Data on the generation of hazardous waste (only RCRA wastes) by the chemical industry have been presented to show that waste reduction is occurring. 17 The reductions in the amounts generated over time for 301 plants have been correlated with changes in the industry production index published by the Federal Reserve Board. However, this approach does not necessarily provide an accurate measure of waste reduction. First, the problem is that the production index is for the entire chemicals industry. This is not the same as relating the changes in waste generation, on a one-to-one basis, to the actual production changes from those plants. There is considerable diversity in the chemicals industry for different industry segments (e.g., organic, inorganic, specialty) and for different companies within those segments. Second, the procedure hides changes other than production levels that can affect waste generation data.

In conclusion, OTA finds pent-up opportunities throughout industry for waste reduction; they await the removal of obstacles, the provision of information and technical means, and clear benefits to be provided by general regulatory and economic conditions. A slow, incremental approach to waste reduction unnecessarily prolongs avoidable environmental costs in industry and delays environmental benefits to the Nation.

Use of Regulations

Both reports recognize that a traditional regulatory approach to, in some way, prescribe industrial waste reduction is not now practical or feasible. Both reports also note the apparent effectiveness of State and foreign government waste reduction programs that have not been based on a regulatory approach. However that effectiveness is limited in scope, especially in the context of affecting national waste generation and management. That is, the nonregulatory approach to waste reduction has been found effective when used, but has not yet received broad and serious public and private support anywhere.

Both reports hold up the prospect of regulations in the future if better information demonstrates need and justifies the high implementation costs. This could happen if the nonregulatory approach is never fully supported or if it is and is found to be ineffective. EPA plans to con-

[17] Chemical Manufacturers Association, "Results of the 1984 CMA Hazardous Waste Survey," January 1986. The sample of companies represented one-half of the chemical industry and the chemical industry generates about half of the total for the Nation. The CMA total of about 247 million tons can, therefore, be roughly extrapolated to about 1 billion tons nationally.

[18] Chemical Manufacturers Association, " 1985C MA Hazardous Waste Survey, " April 1987.

tinue to examine mandatory controls in order to reach a final decision in 1990. However, it does not appear that there is any information now being collected at the Federal level on industrial practices that could justify, much less be the basis for, a major new regulatory program. By carefully designing new information collection within existing regulatory programs, it might take 5 to 10 years to get reliable systematic data on waste reduction nationwide. It is not so much that it could not be done faster but that organizational and administrative factors associated with using *existing regulatory programs* would slow down the process. As discussed later, a separate, new waste reduction office in EPA could perform the job more efficiently.

Areas of Disagreement

The differences between OTA and EPA regarding the use and definition of terms and whether waste reduction is best applied within a multimedia context are outlined in tables 1 and 2.

Operative Term and Definition

There is no standard term for actions that reduce the generation of waste and none of the terms in use cover a standard set of similarly defined activities. The term waste reduction, however, has roots in government activities and policy statements going back many years and has always referred to cutting down the generation of waste at its source. Therefore, it is consistent with the broad concept of pollution prevention as distinct from pollution control which deals with wastes and pollutants *after they are generated* and leave a production process.

OTA has placed utmost importance on this distinction because the historical record indicates clearly that there is a tendency in government and industry to opt for post-generation pollution control solutions instead of prevention. If one accepts the long-standing proposition that waste reduction is without doubt the option of choice, it is necessary to unambiguously distinguish it from pollution control and waste management options. Public policy that does not clearly identify and single out waste reduction and define it unambiguously is likely to lead to programs that underemphasize and undermine waste reduction relative to pollution control.

Waste minimization is the term used in the EPA report because the report was mandated under the *waste minimization* section in the 1984 RCRA Amendments. In the statute a clear distinction is repeatedly made between waste reduction, the uncontested option of choice, and better waste management "of wastes nevertheless generated" as an alternative to land disposal. EPA's report divides waste minimization into three categories: source reduction, recycling, and waste treatment. Source reduction, if it is equivalent to OTA's waste reduction, is consistent with the first part of the national policy statement (see box C), while recycling and treatment processes manage waste that is generated. The EPA report says that "Source reduction measures can include some types of treatment processes . . . "[19] The inclusion of treatment is difficult to interpret. For example, if EPA considers in-plant incineration of waste as source reduction, then there is even greater disagreement between OTA's and EPA's definition. Thus, putting the term waste minimization aside, EPA's definition of source reduction alone could encourage waste treatment by industry instead of waste reduction.

However, for purposes of the waste minimization report to Congress, only source reduction and recycling are included because:

> . . . this report focuses on source reduction and recycling, the two aspects of waste minimization where basic options still remain open. [20]

Basic options here apparently refer to policy options since Congress has already directed EPA to consider treatment technology capacity but not waste reduction or recycling capability when implementing the RCRA land disposal bans. Later the report states:

[19] U. S. Environmental Protection Agency, *Report to Congress: Minimization of Hazardous Waste,* op. cit., p. ii.
[20] Ibid., p. iv.

Table 1.—Definitions Used in the Reports

EPA (for the report)	SPA (Interpreting HSWA)	OTA
waste minimization: "Waste minimization means the reduction, *to* the extent *feasible,* of hazardous waste that is generated or subsequently treated, stored, or disposed of. It includes any source reduction or recycling activity undertaken by a generator *that results in* either: 1) the reduction of total volume or quantity of hazardous waste; or 2) the reduction of toxicity of hazardous *Waste,* or both, so long as such reduction is consistent with the goal of minimizing present and future threats to human health and the environment." [p. 11 and p.	"In the broadest sense, the HSWA defines waste minimization as any action taken to reduce the volume or [sic] toxicity of wastes. That definition includes the concepts of waste treatment, which encompasses such technologies as incineration, chemical detoxification, biological treatments, and others." [p. ii] "In the broad context, HSWA recognizes three options for minizing wastes—treatment, source reduction, and recycling. Whichever method is used, the end result must be a reduction in the volume, quantity or [sic] toxicity of wastes generated and sent to land disposal." [p. 13]	Based its report on the statutory definition as provided by the national policy statement in HSWA. First, reduce the generation of waste (waste reduction); then, apply best waste management practices to wastes that are generated.
"This report focuses on source reduction and recycling, the two aspects of waste minimization where basic options still remain open." [p. iv] "Waste minimization, as defined in this report, includes the first four categories of this hierarchy . . ." [The font categories referred to above are: waste reduction, waste separation and concentration, waste exchange, and energy/material recovery.] [P, 6] "The two ma@ categories of waste minimization activities considered in this report are source reduction and recycling." [p. 43]		
Source reduction: "Any activity that reduces or eliminates the generation of a hazardous waste within a process." [p. 8] "Source reduction refers to the reduction or elimination of waste generation at the source, usually within a process. This is the type of waste minimization that moat closely corresponds to the concept of waste avoidance. Source reduction measures can include some types of treatment include procut they also process substitutions, feedstock or improvements in feedstock purity, various housekeeping and management practices, increases In the efficiency of machinery, and even recycling within a process. As used here, source reduction implies any action that reduces tha amount of waste exiting from a process." [p. 6. also p. H but sentence #2]		Term not used or defined by OTA but accepts EPA's definition as equivalent to OTA's waste reduction, if waste treatment is excluded.
Waste reduction: Not defined, but used intermittently throughout the report. Use varies and *doee* not necessarily urea with OTA's definition.		"In-plant practices that reduce, avoid, or eliminate the generation of hazardous waste so as to reduce risks to health and [the] environment." [p. 3]
Recycling: "A material is 'recycled' if It to used, reused, 0? reclaimed (40 CFR 261.1 (b) (7)." [p. 8] "Recycling refers to the use or reuse of a waste as an effective substitute for a commercial product, or as an ingredient or feedstock In an industrial process. It also refers to the reclamation of useful constituent factions within a waste material or removal of contaminants from a waste to allow it to be reused. As used here, recyclingnplies use, reuse, or reclamation of waste after It is generated by a particular process. It, too, can involve various types of treatment to facilitate the recycling process." (p, 7; also p. ii but Without the final sentence]		"When recycling is environmentally acceptable and is an integral part of the waste generating industrial process or operation OTA considers it waste reduction . . . But recycling is *not* considered waste reduction if waste exits a process, exists as a separate entity, undergoes significant handling, and is transported from the waste generating location to another production site (perhaps a part of a large plant) for reuse, or to an offsite commercial recycling facility or waste exchange." [p. 10]

SOURCES: Complied by OTA, 1987. For columns 1 and 2, U.S Environmental Protection Agency, *Report to Congress: Minimization of* Hazardous *Waste*, EPA/530 +3 W-86-033 (Washington, DC: EPA, Office of Solid Waste and Emergency Response, October 1986), pages as noted For column 3, U.S. Congress, Office of Technology Assessment, *Serious Reduction of Hazardous Waste*, *OTA.ITE.317* (Washington, DC U S. Government Printing Off Ice, September 1986), pages as noted,

Table 2.–Wastes Covered by Reports and HSWA

EPA	OTA	HSWA on **waste minimization**
Hazardous Waste:		
EPA does not explicitly say which wastes are covered by its use of the term "hazardous wastes." An assumption can be made that since the report deals within the context of RCRA and **was** mandated under RCRA that EPA considers waste minimization to cover only those solid wastes regulated as hazardous wastes under R6RA.	"All nonproduct hazardous outputs from an industrial operation into all environmental media, even though they may be within permitted or licensed limits. This is much broader than the legal definition of hazardous solid waste in the Resource Conservation and Recovery Act, its amendments, and subsequent regulations. Hazardous refers to harm to human health or the environment and is broader than the term 'toxicity.' For example, wastes that are hazardous because of their corrosive, flammability, explosiveness, or infectiousness are not normally considered toxic. " [p. 31]	The phrase used in HSWA was "hazardous wastes. " The assumption can be made, therefore, that the waste minimization regulations required by HSWA were intended to cover only those solid wastes regulated as hazardous wastes under RCRA. Some ambiguit exists, however, due to the legislative history. Senate Report No. 98-284 on waste minimization provisions in S. 757, voiced concerns about ". pollutants contained in effluents, emissions, wastes or other pollution streams. "
Differing views of a multimedia approach: Waste minimization is RCRA:		
Ail incentives/disincentives (barriers) are framed within the RCRA context. The one exception is: "Commercial recycling facilities that wish to increase their operations might be reluctant to do so if the expansion were to require a revision of their NPDES water pollution permit to authorize a change in the composition of their discharges or allow for larger flows." [p. 29] Almost all information/data reviewed for report and assessment of needs for future concerns RCRA hazardous waste generation and management.		
Waste minimization is multimedia:	*Waste reduction is multimedia:*	
EPA lists protecting human health and the environment as a key role for waste minimization because ". . none of EPA's environmental control programs can fully eliminate all the risks that they attempt to control." [p. 9] "To achieve its purpose, waste minimization like other pollution control measures, must look comprehensively across all environmental media; reductions in hazardous waste must not be made at the expense of increases in air or water pollution . . . Waste minimization programs must therefore be carefully designed to avoid cross-media transfers and to protect human health and the environment in a comphrensive sense. The need to design a waste minimization program that addresses both of these goals provides a framework for integrating the objectives of all environmental programs." [p. 10] "EPA believes that waste minimization must be implemented **as a** general policy throughout the hazardous waste management system and, ultimately, more broadly throughout all of EPA's pollution control programs." [p. 121]	"Reduction-applied to a broad universe of emissions, discharges, and wastes—is the best means of achieving pollution prevention." [p. 7] "OTA has concluded that a comprehensive multimedia (air, water, land) definition for hazardous waste is necessary . . . 1) to avoid creating opportunities for shifting waste from one environmental medium to another possibly unregulated or less regulated medium . . . and 2) to include wastes that are not currently regulated, such as most toxic air emissions. If the term hazardous waste is defined or applied narrowly, waste reduction measures can be ineffective. " [p. 11]	

SOURCES: Complied by OTA, 1987. For column 1, U.S. Environmental Protection Agency, *Report to Congress: Minimization of Hazardous Waste*, EPA/530-SW-86-033 (Washington, DC: EPA, Office of Solid Waste and Emergency Response, October 19S8), pages as noted. For column 2, U.S. Congress, Office of Technology Assessment, *Serious Reduction of Hazardous* **Waste,** OTA-ITE-317 (Washington, DC: U.S. Government Printing Office, September 1988), pages as noted.

> Waste minimization, as defined in this report, includes the first four categories of this hierarchy . . . [21]

The four categories referred to are those in EPA's 1976 hierarchy statement and include waste reduction, separation and concentration, waste exchange, and energy/materials recovery but exclude waste treatment and land disposal.

The EPA report can give the impression that waste treatment is not part of waste minimization. But there is a clear statement in the report by EPA that waste minimization includes waste treatment:

> That [HSWA] definition includes the concept of waste treatment, which encompasses such technologies as incineration, chemical detoxification, biological treatments, and others. [22]

Moreover, subsequent to the EPA report, a letter on April 24,1987, from a senior EPA official to the EPA Science Advisory Board says that waste minimization is "generally defined as any reduction of wastes going to disposal whether through source reduction, through on-site or off-site recycling or even **through treatment of wastes to reduce volume, mass or toxicity."** [emphasis added]

By defining waste minimization in two ways, confusion results: 1) Does *every* waste minimization statement in the report exclude waste treatment? and 2) Does *any* waste minimization activity by EPA and its commitments to future activities, outside of the boundaries of the report, exclude waste treatment? This fundamental uncertainty is highlighted by the EPA report's statement of intent to issue "informal guidance to generators concerning what constitutes waste minimization under the reporting and certification requirements of RCRA. "[23] The importance and consequences of defining waste minimization are critical, and EPA should quickly and definitively tell industry what the government means (see box E).

The term *waste reduction,* which is not defined by the EPA report, is widely and unevenly used in that report. At various times it appears to be equivalent to: 1) EPA's source reduction or OTA's waste reduction, or 2) waste minimization, sometimes with and sometimes without treatment. For example:

> Though some of these treatments, such as incineration, are very effective at solvent waste reduction, the costs have been prohibitive.[24]

In this EPA statement, waste treatment is clearly considered part of waste reduction, but the use of the term waste reduction is only sensible in this context if it is equivalent to waste minimization.

The aforementioned letter to the EPA Science Advisory Board says that waste reduction is "defined generally as waste elimination through in-process changes. "

To recap, EPA has two definitions for waste minimization and has not defined but uses the term waste reduction in a variety of ways. This confusing pattern of language creates considerable uncertainty for Congress and industry about EPA's future policies or programs. EPA initiatives to expand waste minimization may not necessarily focus on what OTA calls waste reduction if waste minimization includes any type of recycling and waste treatment. Moreover, when EPA says:

> . . . mandatory standards of performance and required management practices are not feasible or desirable at this time.[25]

does this refer to all three components of waste minimization? Clearly, waste treatment is already regulated, Recycling of generated waste that is not a part of an industrial process is and should be regulated. The OTA report's statement on the infeasibility of traditional command-and-control regulations clearly refers only to waste reduction.

In summary, OTA's waste reduction includes a host of actions taken by waste generators

[21] Ibid., p. 6.
[22] Ibid., p. ii.
[23] Ibid., p. 129.
[24] Ibid., p. 17.
[25] Ibid., unnumbered first summary page.

Box E.—Recent Examples of Obstacles in the Private Sector to Waste Reduction

Current, traditional attitudes in industry keep attention and resources away from waste reduction even when the primacy of waste reduction is explicitly recognized.

A major industrial trade association says". . . while the semiconductor industry recognizes waste reduction at the source (i.e., source reduction) to be the ultimate goal, current practice still emphasizes end-of-pipe management of hazardous waste. " Despite this recognition, a definition of waste minimization that includes waste treatment is used "since it is more reflective of current conditions in industry. "

—Steve Pedersen and Mary Ann Keen, "Waste Reduction in the Semiconductor Industry," *Proceedings of Conference on Hazardous Wastes and Hazardous Materials* (Silver Spring, MD: Hazardous Materials Control Research Institute, March 1987).

Waste reduction is not undertaken because the generally accepted broad definition of waste minimization and the way it is promoted encourage generators to satisfy waste minimization reporting regulations with traditional methods of waste management.

A major consulting firm to industry and government acknowledges the unique, critical benefit of waste reduction—reducing the generation of waste—but attributes lower generation of wastes to waste *minimization,* which is defined, "in order of preference [as] (1) source reduction, (z) recycling, and (3) treatment. " But the firm says that waste minimization reduces the "volume and/or toxicity of hazardous waste. " With this interpretation, waste treatment that simply concentrates a wastestream's hazardous components counts as waste minimization, without lowering risks to public health and the environment.

—Stephen W. Kahane, "Waste Minimization Audits," *Proceedings of California Solvent Waste Reduction Alternatives Symposia* (Sacramento, CA: Department of Health Services, October 1986).

Analyses, even those now being developed for waste minimization purposes, can be biased against waste reduction. In addition, such systems are viewed as a less complicated company policy than direct policies to remove recognized, but diverse, obstacles to waste reduction.

One of the country's leading, large, diversified manufacturers says ". . . waste reduction is the best situation of all; no waste, no liability!" Its "approach has been to develop a financial analysis workbook and companion computer software program which will allow plant personnel to determine total waste management costs including future liability considerations." But it is not clear that waste reduction would be explicitly examined at all. Although the methodology raises the costs of land disposal techniques to better reflect their total long-term costs, it assumes virtually no liability for incineration and, thereby, places incineration on a par with waste reduction. Thus, even though the direct costs of incineration maybe high, they maybe low relative to total land disposal costs which is the base case and not waste reduction. This might be the case especially if onsite incineration or existing industrial furnaces or boilers are chosen (see box F). Plant management can use this dollar savings to support incineration and other similarly evaluated treatment technologies instead of waste reduction because there is a focus on reducing liabilities: "Those programs that reduce all liabilities and are the best accordin$_g$ to established financial proceedings are to be implemented. "

The company financial analysis "method offers several advantages over company policies such as an end-tax on waste or a five-year waste reduction plan. " The company believes that such direct "policy approaches are difficult to administer" for large, highly decentralized and diversified firms. Why? Because of differences between corporate divisions, differences among treatment options and wastes, allocation of resources to other shorter term needs, and a lack of technical expertise at some plants. Clearly, these conditions exist for many companies and constitute obstacles that must be directly addressed if waste reduction is to be systematically chosen instead of traditional waste management.

—Richard W, MacLean, "Financial Analysis of Waste Management Alternatives, " *Proceedings of Conference on Hazardous Wastes and Hazardous Materials* (Silver Spring, MD: Hazardous Materials Control Research Institute, March 1987).

within the confines of their production operations to cut the generation of waste, This language is consistent with the concept of pollution prevention. **Any activity by which hazardous waste is handled, managed, or transported poses risks and costs, requires complicated regulation, offers less certain environmental protection than waste reduction, and contributes to industrial inefficiency and heightened public concern about the environment.** EPA has defined waste minimization to refer to all options other than land disposal, consistent with statute, but has excluded waste treatment in its report on waste minimization, EPA has not clearly stated that certain actions should be shown infeasible before a generator steps down the hierarchy. Recycling and treatment, instead of waste reduction, may be emphasized in future waste minimization activities by EPA. Based on EPA's report, it is impossible to predict to what extent future EPA waste minimization actions will focus on waste reduction.

Appropriate Wastes To Cover

In OTA's report waste reduction applies to all hazardous wastes and environmental pollutants whether they are regulated under the air, water, or RCRA programs or not. (The term multimedia is often used to describe this broad coverage,) The alternative, waste reduction applied to any particular category of waste, might lead to: 1) less waste reduction than is feasible, and 2) abuse because some actions might do little more than transfer waste among environmental media or from one regulatory class to another.

Since all of EPA's waste minimization activities stem from the 1984 RCRA Amendments, the EPA report is concerned with hazardous wastes defined as such under RCRA. There are two important limitations to this definition. First, it is not clear that any EPA waste minimization effort would apply, for example, to discharges to waterways covered by the Clean Water Act or air emissions covered by the Clean Air Act, The strongest statement in the EPA report in this regard is:

> EPA believes that waste minimization must be implemented as a general policy throughout the hazardous waste management system and, ultimately, more broadly throughout all of EPA's pollution control programs. [26]

But this statement is not reflected in EPA's long-term policy option.

Second, it is highly likely that EPA has not yet officially recognized large amounts of industrial wastes as hazardous. GAO has recently studied this problem and its findings are consistent with those of other studies, including OTA's 1983 report on hazardous waste. In its report GAO said:

> EPA does not know if it has identified 90 percent of the potentially hazardous wastes or only 10 percent, according to the division director responsible for hazardous waste identification . . . Ten years after the Congress mandated the identification and control of hazardous wastes, EPA cannot say what portion of the universe of hazardous wastes it has identified and brought under regulation, or even if it is regulating the worst wastes in terms of potential impact on human health and the environment.[27]

This should be borne in mind when figures on the amount of RCRA generated waste are considered by policy makers, such as the new number of 569 million metric tons annually. All such figures refer to only those wastes EPA has already officially designated as hazardous and therefore, underestimate the universe of hazardous waste that pose risks to health and environment. **Thus, OTA has found it important to say explicitly that waste reduction must apply to all hazardous wastes, whether regulated by EPA under RCRA or not. Otherwise, a Federal nonregulatory waste reduction program will inherit the limitations of the RCRA regulatory program.**

Even if a multimedia perspective were eventually adopted by EPA, delay could cause significant environmental and economic costs. While there might be bureaucratic reasons not to consider multimedia waste reduction now,

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[26] Ibid., p. 121.

[27] U.S. Congress, General Accounting Office, *Hazardous Waste: EPA Has Made Limited Progress in Determining the Wastes To Be Regulated,* op. cit., pp. 19 and 23.

there is no reason to assume that it would be harder for industrial production people to apply waste reduction to all of their wastes and pollutants than only to those regulated under RCRA. Indeed, some companies already do so. But systematic adoption of multimedia waste reduction in industry will require overt government policy support.

The merits of multimedia coverage and the long time the RCRA program is taking to determine all the wastes that should be regulated as hazardous support the option of new legislation by Congress rather than a continuation of waste reduction being confined to RCRA.

Incentives and Disincentives v. Enhancements and Obstacles

The EPA report devotes considerable attention to market incentives that can drive industry toward waste minimization. However, **general conditions that can lead to a range of responses are not necessarily an effective incentive for any particular response.** Intentional and purposeful design are crucial for developing effective waste reduction incentives and disincentives and in developing public policy options.

An effective incentive is a specific action or condition that is likely to elicit a specific desired response. A disincentive causes parties to purposefully avoid a specific response. A general condition that elicits a range of positive responses, including the desired response, can be called an enhancement to the desired response. One that leads people away from the desired response or makes the desired response less attractive can be called an obstacle. For development of policy options it is necessary to focus on obstacles and problems relative to a desired outcome, such as waste reduction. Government is not needed if things are going well.

In the EPA report the terms incentive and disincentive are used in confusing ways. The Federal RCRA regulatory program was emphasized and conclusions drawn about its impacts on waste minimization instead of examining the benefits which might accrue from proceeding with waste reduction as a program itself. This perspective systematically biases decisions against major new Federal efforts aimed directly at promoting systematic waste reduction. For example, EPA and others consider rising waste management costs and liabilities, difficulties in siting waste management facilities, and regulatory burdens as incentives for waste minimization.[28] But none of these conditions were purposefully designed to elicit a waste reduction response nor is there any evidence that they have done so systematically, and it is misleading to call them incentives for waste reduction. **Since current regulatory programs are not purposeful incentives, policymakers should be cautious about their value to increase waste reduction.** Increasing regulations and improving their enforcement have their own merits, but they are unlikely to offer as effective and efficient a way to increase waste reduction as do policies designed to promote waste reduction. It is a mistake to believe that nothing other than attempts to fix the current regulatory system has to be done to spark a major movement by industry to comprehensively reduce waste generation. Existing regulatory conditions provide motivation and potential benefits for waste reduction but not necessarily the means to reduce waste generation and reduce the obstacles in the way.

There is also another fundamental problem. **General regulatory conditions are not necessarily effective incentives or enhancements for waste reduction because many other more familiar, intended, and unwanted responses (e.g., waste treatment, regulatory compliance, and illegal disposal, respectively) can displace or limit waste reduction.** Environmental costs may rise faster than generators can reduce waste generation. Responses other than waste reduction by all sizes and types of companies include:

[28] An example of this perspective in the private sector is: "Once a manufacturer is forced to confront the realities of proper hazardous waste management, and in turn the higher cost associated with that treatment, management, then you will force an assessment of the production practices and waste reduction. " [Richard C. Fortuna, Executive Director, Hazardous Waste Treatment Council, testimony before the House of Representatives, Energy, Environment, and Natural Resources subcommittee, Sept. 24, 1986].

- regulatory compliance that maintains an end-of-pipe approach for regulated wastes;
- payment of higher waste management costs to continue use of commercially available pollution control technologies;
- plant closings or relocation to foreign sites;
- changing waste management technology because of regulations or to reduce liabilities (see box F);
- internalizing waste management to reduce liabilities and costs by reducing the use of offsite facilities;
- finding regulatory, legal, and political opportunities to avoid or delay compliance; and
- noncompliance, illegal disposal, or acceptance of fines and penalties as a cost of doing business.

Moreover, the regulatory system: 1) does not apply to all hazardous wastes and environmental pollutants, 2) is unevenly enforced, and 3) often undergoes changes that send contradictory messages to generators that foster a wait-and-see attitude,

General regulatory conditions, therefore, may have positive or negative consequences with regard to waste reduction and, depending on specific company circumstances, may be enhancements for or obstacles to achievable waste reduction. Clearly, some generators will always be positively affected by regulatory conditions. However, the regulatory system, by itself, has and will not motivate *widespread* waste reduction unless one or more of the following are found to be valid:

- Generators facing rising environmental costs and liabilities do not at the same time face significant obstacles to waste reduction.
- The current regulatory system is comprehensive and effective.
- The merits of waste reduction can be used to expeditiously expand and fix the regulatory system so that environmental costs for generators increase and cause them to reduce waste generation.

Some recent research has verified that concerns about liabilities stimulate responses other than waste reduction.zg The mere expression of concern about liabilities does not mean that it will affect decisions. While 10 of 13 waste managers interviewed said that their firms were "very concerned" about hazardous waste liability, only three said that it was a significant waste reduction factor. In speaking to a large number of people in industry, including people in large companies who work at the plant level, OTA has found this situation to be very prevalent. Decisionmakers seek optimal choices within the limits of their knowledge and analytical resources.

The EPA report does not include a discussion about the dual nature of general regulatory conditions (of their role as obstacles as well as enhancements) but concludes that regulations are more effective as enhancements than as obstacles. While the EPA report appendices give some attention to industry, there is no discussion in the summary volume of how widely differing factors (e.g., management style, process type, and age) can affect the way companies adopt waste reduction.

OTA conducted a survey of industry to gain insight into the duality of general regulatory conditions. The results served as the basis for a discussion in the OTA report of why the current regulatory program is likely to act as an obstacle to waste reduction. Briefly, some of the key reasons why responses other than waste reduction are likely are:

- greater familiarity with waste management and pollution control by workers, managers, and advocates in companies and trade associations;
- a belief (which is, in fact, incorrect) that waste recycling and treatment technologies are, or can be made, safe enough to minimize liabilities as much as waste reduction can;

'Robert E. Deyle, "Source Reduction by Hazardous Waste Generating Firms in New York State, " Syracuse University Technology and Information Policy Program Working Paper No. 85-010, as cited in Robert Deyle and Rosemary O'Leary, "Small Quantity Generator Liability and Regulatory Compliance," *Proceedings of the National Conference on Hazardous Wastes and Hazardous Materials* (Silver Spring, MD: Hazardous Materials Control Research Institute, March 1987).

Box F.—Burning Waste in Industrial Furnaces and Boilers Can Reduce Interest in Waste Reduction

Premise

Land disposal restrictions in RCRA and limited availability of high-cost commercial incinerators increase interest in using onsite or offsite furnaces and boilers. Interest is especially strong for liquid organic hazardous waste such as spent solvents. The waste serves as a substitute for fuel.

Level of Interest

Industry .—Waste generators want to use either their own furnaces or commercial cement kilns, lime kilns, and iron-making blast furnaces. For the latter costs are said to be one-quarter to one-third of prices charged for hazardous waste incinerators.[1]

Government.—EPA and State regulatory officials, for the most part, support and encourage use of industrial furnaces and boilers. It is seen as a way to allow implementation of land disposal bans and still allow industry to generate waste.

Regulations

EPA is establishing regulations for burning hazardous waste in industrial furnaces and boilers which thus far have escaped regulation because they have been considered as recycling or recovery operations. EPA's proposed regulations, however, will not pose serious problems. For example, no test burn may be necessary, no routine measurement of discharged solids for hazardous metals with regard to leachability, nor testing for specific toxic air emissions will be imposed. Moreover, for small quantity wastes there will be a regulatory exemption and for many cases the solids discharged will not be considered hazardous until shown otherwise, as is now the case for incinerators. The net effect of all this will be to speed up permitting of facilities and to give them a competitive advantage over conventional incinerators whose only function is to burn hazardous waste. z

Issues and Concerns

- Government regulation may be ineffective. For example, solid products produced by furnaces that may contain hazardous substances, such as lead, may pose risks when in use.
- Generators may have more liability than proponents suggest due to handling and storage of waste, residual waste in product, and toxic air emissions.
- There is a strong economic motivation for furnace operators to use far more waste than is necessary for fuel purposes. This could reduce furnace reliability and effectiveness, result in contaminated products, and cause unsafe storage and handling which has often occurred in the past at "sham" recycling facilities. More money can sometimes be made from burning waste than from making product. And wastes with no fuel value are also being talked about for burning in industrial furnaces.[3]

Impact on Waste Reduction

The promotion of industrial furnaces and boilers as an environmentally acceptable, low cost, and convenient alternative to land disposal is an obstacle to waste reduction. Compared to land disposal, generators with insufficient interest in or knowledge of waste reduction see an economically attractive, government-sanctioned option for their waste management. Ironically, many of the wastes targeted for industrial furnaces are the easiest to reduce the generation of by in-process recycling and raw material changes. Moreover, the risk of sham recycling or ineffective burning makes this waste management option a particularly poor alternative compared to the benefits of waste reduction.

I Michael Benoit, "The Use of Industrial Furnaces for the Destruction of Organic Hazardous Wastes, " proceedings of conference on *Minimizing Liability for Hazardous Waste Management* (Philadelphia, PA: American Law Institute and American Bar Association, April 1987).

[2]Lisa Friedman, oral comments at conference on *Minimizing Liability for Hazardous Waste Management,* Apr. 3, 1987.

[3]Benoit, op. cit.

- inability of companies to simultaneously devote resources to legally demanded regulatory compliance and to voluntary waste reduction;
- lack of a technical support structure and rewards for production people who must implement waste reduction and lack of time to do it;
- a mistaken belief that no waste reduction opportunities remain;
- lack of technical information to pursue waste reduction, including the exact linkage between waste generation and specific industrial operations; and
- lack of accounting systems that allocate environmental costs to specific production operations, where waste reduction must occur, in order to provide the economic motivation to assess waste reduction.

These reasons (see box E for recent examples) for nonwaste reduction responses to general regulatory conditions are obstacles and can be addressed by public policies and corporate actions, Even though they result in less waste reduction, they are not disincentives since they do not purposefully move decisions away from waste reduction. This may explain why these obstacles are often ignored or discounted. Moreover, it is not possible to generalize as to their presence and effect with regard to company size or type of industry or product. Nor is OTA suggesting that the above reasons are caused by the regulatory system. For example, EPA and others point out that a lack of capital in smaller companies is a reason why they do not practice waste reduction. **But many companies, both small and large, with capital to invest are more likely to allocate it to product development, plant expansion, or diversification rather than waste reduction. Moreover, although waste reduction projects may offer attractive paybacks (in the majority of cases in less than one year), they may still be less than some product-related projects.**

An important new piece of information supports the view that government intervention must overcome existing obstacles to waste reduction and provide direct assistance to generators. Ventura County in California has just completed a 2-year innovative program in waste reduction, It has obtained evidence of substantial waste reduction as a result of a proactive program that sends county inspectors into plants to conduct waste reduction audits and make recommendations to generators. so What is important for national policy development is what the Ventura County has concluded:

> The government, so far, intends no further public intervention and assumes that companies have the motivation, finances and informational resources that are necessary to develop and implement their own hazardous waste reduction program. The Ventura County Program results, however, reveal that this assumption is not the case and that generators are not fully aware of all waste reduction methods and opportunities.
>
> Local programs, through established relationships with hazardous waste generators and involvement in land use processes, can provide incentives, information and other assistance that is necessary to achieve significant hazardous waste reduction in their communities.[31]

Ventura County also conducted a survey of the 75 companies it worked with and found that:

> A large component of corporate resistance to volume reduction comes from the managerial level. Attitudes toward changing existing "habits" affect the implementation of strategies to reduce waste generation. Management, it appears, will often select "proven methods" of waste disposal rather than trying to innovate new methods to reduce volume of waste generated. Companies, we

[30] Although OTA finds that the definition of waste reduction used by Ventura County, like the term waste minimization, poses problems because it includes recycling and treatment and that the data reported does not measure waste reduction correctly, there is little doubt that the program has resulted in significant waste reduction. However, the figure generally quoted of 70 percent waste reduction over the 2-year program may overstate or understate waste reduction as defined by OTA. It was based on aggregate generation data of wastes shipped offsite and not waste reduction data from specific companies on a production output basis.

[31] Ventura County Environmental Health Department, "Hazardous Waste Reduction Guidelines for Environmental Health Programs," draft, prepared for the California Department of Health Services, March 1987.

found, were reluctant to take risks with unproven technologies or recyclers, were not aware of alternatives and in several cases were not interested in changing habits.[32]

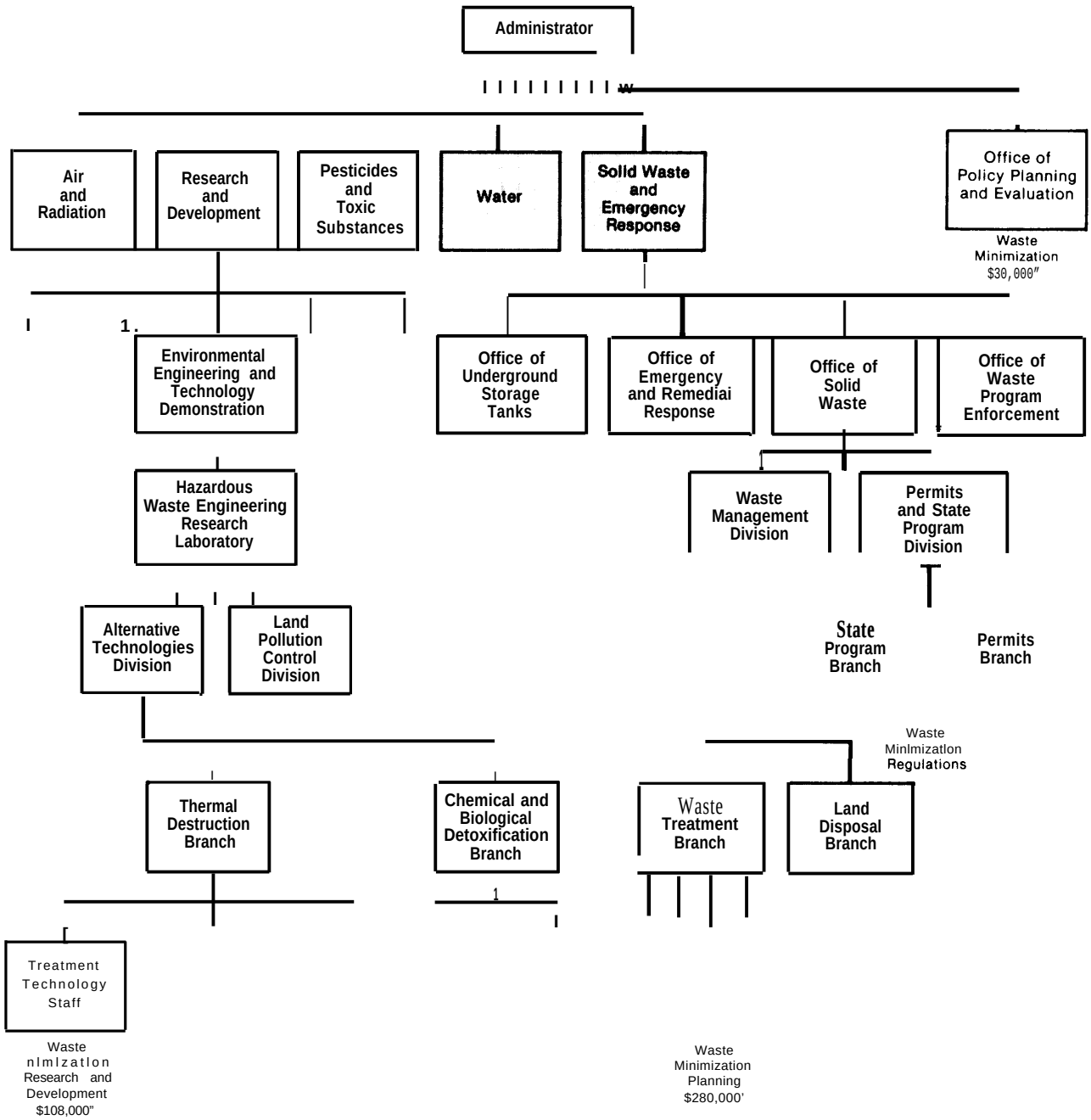
In Summary

Recent information and the OTA analysis provides strong support for a Federal waste reduction initiative designed to address multiple obstacles through a nonregulatory program. The Federal Government has done very little intentionally aimed at promoting waste reduction. This includes the RCRA waste minimization certification and reporting requirements because their intent is not to *encourage* waste reduction but to *discourage* land disposal practices. Existing EPA programs are chiefly concerned with compliance with end-of-pipe regulations. These regulations have incidental and unintended secondary impacts on waste reduction, which have probably not been sufficiently positive to justify concluding that nothing more has to be done by government. Only those companies and individuals with desire, necessary information, and means can translate potential benefits created by the regulatory system into specific waste reduction actions.

Moreover, EPA's definitions and scope for a future waste minimization program, as well as its current regulatory programs, often channel private sector efforts away from waste reduction to traditional pollution control activities. The EPA report assumes effective positive influences on waste reduction from existing regulatory programs and has embedded waste reduction activities within a regulatory framework that has historically given no priority or serious support to waste reduction. (See figure 1 on EPA organization and waste minimization.)

[32] Ventura County Environmental Health Department, *Progress Report on Ventura County Hazardous Waste Volume Reduction and Alternative Technology Program,* April 1986, p. 26.

Figure 1 .—EPA Organization and Funding for Waste Minimization



" FY88 budget request

SOURCE" Office of Technology Assessment

AMBIGUITIES IN THE EPA REPORT

EPA's position on several important waste reduction issues is unclear, because separate statements in the EPA report appear to support either side of questions likely to be posed by policymakers. These ambiguities can affect congressional policy options and the success of any national effort to encourage systematic waste reduction. Three questions are examined:

1. Does EPA regard waste reduction as the option of choice?
2. Does EPA require a new congressional mandate?
3. Has EPA made a strong commitment to a major waste reduction effort?

Does EPA Regard Waste Reduction as the Option of Choice?

Do those who generate waste and pollution have a responsibility to fully explore waste reduction before deciding on less environmentally effective and less economically sound options such as waste treatment? OTA found that waste reduction has traditionally had primacy, but more in theory than practice. Nevertheless, theoretical primacy is a basis for public policy development. If EPA does not give such primacy to waste reduction, then the agency is unlikely to give waste reduction priority in its waste minimization efforts. And, if EPA does not give primacy to waste reduction, industry as a whole will not.

A further issue is a subtle change in language in EPA's report that would sanction as waste reduction actions that did not reduce toxicity (see box G). In changing HSWA's "volume or quantity and toxicity" to "volume *or* toxicity," the environmental benefits of waste reduction are reduced or, in some applications, negated. In the OTA report actions that merely reduce waste volume are not waste reduction. An exception is when a generator changes a production process so that less waste of the same concentration (or toxicity) is generated. But, this differs from volume reduction *after waste has been generated,* such as dewatering sludge. These actions are often attractive to waste generators because they reduce waste *management* costs and to government because of lower use of land disposal, but they do not offer the same environmental or economic benefits as waste reduction, as EPA's report agrees (see below). Dewatering is not waste reduction, it is waste concentration.

The American public increasingly sees waste reduction as key to hazardous waste management. One of the most active groups, the Citizens Clearinghouse for Hazardous Wastes, has said:

> Of all the ways to manage hazardous waste, waste reduction is the most logical and attractive with the ideal being waste elimination at the source. If you don't produce wastes in the first place, you don't have to worry about landfills, incinerators or injection wells. If there's no waste disposal problem, nightmares like Love Canal, Times Beach, MO and Woburn, MA don't recur.[33]

As early as 1976, EPA put waste reduction at the top of the hierarchy of hazardous waste options but relied on the marketplace for its implementation. That early endorsement of the hierarchy concept is acknowledged in EPA's waste minimization report, which contains statements similar to those in the OTA report to support the primacy of waste reduction. EPA's report says:

> Both Congress and EPA believe that preventing the generation of a waste, when feasible, is inherently preferable to controlling it after it is generated. [34]
>
> Preventing the generation of a waste is the only way to eliminate risk rather than reduce it.[35]

It is clear that the second statement does not apply to recycling and waste treatment but only to waste reduction. The following comment

[33] Citizen's Clearinghouse for Hazardous Wastes, Inc., "Reduction of Hazardous Waste: The Only Serious Management Option," December 1986, p. 2.

[34] U.S. Environmental Protection Agency, *Report to Congress: Minimization of Hazardous Waste,* op. cit., p. *v.*

[35] Ibid., p. *7.* Italics in original.

Box G.—What Language Best Protects the Environment: Volume *and* Toxicity, Volume or Toxicity, or Degree of Hazard?

HSWA on Waste Minimization

Throughout HSWA Section 224 on Waste Minimization, Congress used the phrase "reduce the volume or quantity and toxicity. " [underline for emphasis] In one instance, paragraph (a)(3), the phrase is shortened to "reduce the volume and toxicity. " As a consequence of this language, EPA wrote and promulgated regulations requiring the affected generators and permit holders to certify and submit reports to EPA that wastes are being reduced both by volume and toxicity. In addition, in HSWA Congress requested EPA to report to Congress on the feasibility y and desirability of establishing standards or other actions to require generators to "reduce the volume or quantity *and* toxicity" of their hazardous wastes.

EPA Report on Waste Minimization

While EPA has not requested Congress to amend the wording adopted in HSWA, statements are made throughout its report that imply such a change is appropriate depending on the goal chosen for waste minimization or to ease the implementation of a waste minimization program.

The following statements represent a major change in language that could substantially alter the nature of technical activities carried out by waste generators. Instead of aiming at activities to reduce the generation of waste, generators could place emphasis on reducing their waste management costs by focusing on reducing the volume of wastes only after they are generated, without regard to the toxicity of the waste.

Page ii: The definition of waste minimization for purposes of the report to Congress reads: . . . activity undertaken by a generator that results in either (I) the reduction of total volume or quantity of hazardous waste *or (2)* the reduction of toxicity of hazardous waste, *or both, so* long as such reduction is consistent with the goal of minimizing present and future threats to human health and the environment. " [underline for emphasis]

Page iv: "Section 1003 of HSWA [that should be SDWA; HSWA has no such section] establishes the general national policy in favor of waste minimization and refers to the need to reduce the 'volume or quantity and toxicity' of hazardous wastes. EPA does not interpret this language to indicate that Congress rejected volume reduction alone (with no change in the toxicity of hazardous constituents) as being a legitimate form of waste minimization, A generator that reduces the volume of its hazardous waste, even if the composition of its waste does not change, is accomplishing beneficial waste minimization. "

Page iv: "Because both volume and toxicity of wastes present dangers to human health and the environment, measuring the effectiveness of waste minimization will be complex. "

Page 13: ". . . the end result [of waste minimization as defined by HSWA] must be a reduction in the volume, quantity, *or* toxicity of wastes generated and sent to land disposal, "

Page 13-14: "By calling for simultaneous reduction in both volume and toxicity, Congress expressed a clear desire to avoid defining dewatering and other processes which merely concentrate wastes as being primary methods of waste minimization. EPA supports this Congressional concern, but also believes that Congress did not intend entirely to disqualify volume reduction by itself (with no change in toxicity) as a waste minimization technique, For example, EPA considers it beneficial if a firm can change its processes to produce less waste per unit production, even if the composition of the waste does not change. EPA also believes that waste concentration may occasionally be a useful approach to waste minimization, such as in relation to ameliorating shortages of land disposal or treatment capacity, or in preparing materials for recycling. The key concept is that waste minimization must enhance protection of human health and the environment. "

Page 39: "Policies that focus on reducing the overall volume of hazardous waste may not necessarily be best from the point of view of protecting human health and the environment. On the other hand, if the overriding priority in waste minimization is to lower burdens on treatment capacity, the Agency might want to focus on a different set of waste streams than if the main goal is to reduce high toxicity streams. "

OTA Report on Waste Reduction

Page 21:". . . actions that reduce waste volume by concentrating the hazardous content of a waste or that reduce hazard level by diluting the hazardous content are not considered waste reduction in this report."

Thus, the OTA report concurred with Congress that both reduction in volume and toxicity was necessary to reduce risks to health and the environment, But, OTA then expanded the issue of toxicity by discussing 'degree of hazard' so that those wastes hazardous because of their inflammability, corrosiveness, or explosiveness are also properly considered. In certain circumstances such characteristics can be as significant as toxicity if waste is mismanaged.

Page 22: "If a waste is not totally eliminated, however, actions taken to reduce waste may also change the chemical composition and the concentrations of the components of the waste. Therefore, examining changes in just the amount of waste generated relative to production may not reveal whether there has been a change in the degree of hazard of the waste. Without a decrease in the degree of hazard of the waste, the action is not considered waste reduction. " However, OTA does regard a decrease in the amount of waste generated per unit of output, with no change in composition, as waste reduction.

Page 23: "The best way to measure waste reduction is to determine the changes in the absolute amounts of hazardous components . . . Without guidance on the relative degrees of hazard for specific hazardous substances, waste generators could face burdensome analytical costs for periodic measurements of the complete chemistry of their wastes, which may be highly complex and vary over time. The current regulatory system has, for the most part, done little to differentiate hazard levels among the many hundreds of common hazardous substances. Therefore, if the government is to encourage effective waste reduction, it may have to assist generators in selecting the most hazardous components of wastes for measurement and reduction. "

about the limits of regulated pollution control also supports the primacy of waste reduction:

> However, control technologies are never 100 percent efficient, and compliance with regulations under any environmental program can never be perfect, even with the most stringent enforcement program.[36]

Other EPA statements are not as clear because of confusing use of the term waste minimization. For instance, EPA stated:

> Waste minimization helps protect human health and the environment because it reduces the total amount of waste that is generated and managed , . . Waste minimization is a constructive approach to avoiding the risks of breakdowns in the waste management system—wastes not generated cannot be illegally disposed or emitted by faulty or inefficient equipment.[37]

In a policy context, EPA says:

> Waste management deals with wastes after they are created; waste minimization deals with avoiding the generation of wastes altogether . . . in the long term, waste minimization must take on a priority of its own.[38]

These statements are correct, for *waste reduction,* not *waste minimization*. Waste minimization for purposes of EPA's report includes waste reduction and recycling; the HSWA definition also includes waste treatment. But, only waste reduction *prevents* the generation of waste.

EPA, in its report, examines but does not decide on the primary goal of waste minimization. EPA statements on goals include the following:

> . , . if the overriding priority in waste minimization is to lower burdens on treatment capacity, the Agency might want to focus on a different set of waste streams than if the main goal is to reduce high toxicity streams . . . Actions may be very different depending upon whether the goal of waste minimization is to relieve capacity shortages, reduce risks to human health or the environment, or minimize economic inefficiencies.[39]

[36] Ibid., p. v.
[37] Ibid., p. 10.
[38] Ibid., p. 29.
[39] Ibid., p. 39.

The goal of relieving waste management capacity shortages undercuts the primacy of waste reduction as a preferred environmental and economic option. There are other ways of relieving possible shortages, including: 1) allowing continued use of land disposal, 2) delisting waste as being hazardous, 3) not adding more wastes to the RCRA system, and 4) speeding up permitting for waste management facilities.

Because it has not decided on the primary goal of waste minimization, EPA has not been able to use the primacy of waste reduction to develop policy options in its report. primacy, unambiguously stated, could justify significant levels of commitment and funding for waste reduction programs, although the regulatory programs would continue, because of their nature, to require the bulk of EPA's resources. Although the policy consequences of acknowledging the primacy of waste reduction are missing in EPA's report, EPA could still develop policy options comparable to but different from a major regulatory reform effort, seek comparability with pollution control programs, address the merits of facilitating a transition from regulated pollution activities to voluntary waste reduction, and could stress the need to act quickly when it says:

> Once made, these commitments [to waste management] will be difficult to change.[40]

In summary, EPA's report strongly suggests that waste reduction has primacy over waste management from an environmental protection standpoint, This is consistent with the existing congressional statement of national policy. But the EPA report's statements about the goals of waste minimization and its policy options do not address the fundamental difference between waste reduction and waste management, The basis for OTA's waste reduction policy options is an emphasis on the primacy of waste reduction. Policy direction is needed to clarify this important issue of the primacy of waste reduction.

Does EPA Require a New Congressional Mandate?

Congress is at an early stage of considering options for waste reduction. Therefore, it is important to know whether EPA is able to make a strong commitment without further legislative action. EPA's requirements or goals are not clear from its report. EPA has not explicitly requested any actions of Congress,

Regarding its "strongest option . . . to promote waste minimization, "[41] EPA says:

> No new legislative authority would be required to launch such a technical assistance effort, but adequate and sustained support by Congress would be necessary over the next ten years if it were to achieve its potential , . . Unfortunately, non-regulatory programs have often failed at EPA for lack of statutory or regulatory deadlines and institutional advocacy. For such a program to work, it must be given strong organizational support within the Agency. EPA is willing to make this commitment, and seeks support from Congress to ensure its success . . . but intensive implementation of a strategy relying on nonregulatory approaches will demand strong support and direction from Congress.[42]

It is not clear whether these statements are a request for new legislation or if "strong support and direction" is a request for funds. EPA may be saying that it needs further congressional policy statements, authorization, and appropriation to give the necessary commitment to waste reduction.

Regarding waste reduction and recycling, the focus of its report, EPA says:

> These are the areas where national policy is still evolving and where findings of the desirability and feasibility of specific options still need to be made.[43]

So Ibid., p. xxiii.

411 bid., p. 116.
[42]Ibid., pp. xx, xxvi, and 124.
[43]Ibid., p. 13.

Again, EPA may feel that it needs further direction from Congress. This may well be true, as several parts of the 1984 RCRA Amendments do not directly implement the national policy statement that gives primacy to waste reduction.

Regarding an EPA option to impose mandatory waste audits:

> Requiring a waste audit of all generators would probably require additional legislative authority, although it might be argued that authority already exists under Section 8 of TSCA,[44]

Mandatory waste reduction audits may or may not require new legislation. However, EPA has not committed itself to this option. As with mandatory waste reduction regulations, the agency will offer "its next formal report on this subject in December of 1990."[45] Depending on what it has found, it might then seek congressional authority to pursue mandatory waste reduction audits.

Thus, it is not clear whether EPA is making a commitment to waste reduction (or waste minimization) unconditionally or is asking Congress for more detailed and explicit direction. EPA's budget requests suggest that it is waiting for new congressional direction to make a strong commitment.

OTA's report presented three major policy strategies for congressional consideration: one that requires no new congressional waste reduction action, one that would employ a traditional regulatory approach and would require congressional action, and one that would create a major new Federal effort through new legislation. A government-supported technical assistance program makes the last OTA option the most consistent with what EPA may pursue in the near term. But the OTA report discusses a much wider range of actions and a much higher level of funding than does EPA.

[44]Ibid., p. 114.
[45]Ibid., p. 132.

Has EPA Made a Strong Commitment to a Major Waste Reduction Effort?

This is a critical question from a congressional viewpoint. If EPA has already embarked on a program that is broadly supported by Congress, then no further action may be deemed necessary by Congress (or others) interested in promoting more waste reduction. If not, then Congress may need to act if it concludes that present conditions will not cause industry to expeditiously reduce waste generation to the maximum feasible level.

EPA has recommended a core waste minimization program in the near term. This nonregulatory program would principally support passive information transfer and technical assistance implemented through the States. But the report does not discuss several factors important to the program, such as the level of funding, whether—and how much—money would be available to the States, and whether there would be changes in EPA's organization and structure.

The following representative statements in the report are not specific enough to answer these questions.

> Aggressive action in favor of waste minimization is clearly needed .. .48

> To make a significant impact on waste generation, such [nonregulatory] programs would have to be intensive and well directed.[47]

> Despite the strong existing incentives for waste minimization discussed earlier in this report, EPA's role could be considerably expanded into an active, aggressive, and sustained program of technical information.[48]

> An expansion of Federal involvement in this aspect of waste minimization could go far toward increasing the efficiency and pace of industry's natural inclination to reduce waste generation.[49]

*Ibid., p. xxv.
[47]Ibid., p. 124.
[48]Ibid., p. 115.
[49]Ibid., p. 11.

EPA intent is not clear in the following statement under the heading of "The Outlook for Federal Waste Minimization Policy":

> EPA still has much to learn about the specifics and potential of waste minimization, and is only beginning to develop an active strategy for studying and promoting it . . . Because the data are insufficient and because it is still too soon to assess the effects of HSWA requirements, EPA can do little more in this report than to suggest the principal issues of concern. [50]

The principal action EPA recommends, a nonregulatory technical assistance effort, is an example of "non-regulatory programs [that] have often failed at EPA for lack of statutory or regulatory deadlines, and institutional advocacy. "[51] The last factor is crucial to successful implementation of any waste reduction program. However, EPA's report does not describe how it will provide institutional advocacy for waste reduction.

The OTA report examined the pollution control culture, the traditional environmental protection system that has evolved over the past two decades and found that waste reduction poses a major shift in thinking—a paradigm change—about how to best achieve environmental protection. Given natural inclinations to resist change, institutional advocacy for waste reduction will be difficult unless waste reduction has a prominent place in EPA's organization and significant funding. And industry is unlikely to emphasize waste reduction unless EPA does.

EPA's focus on technical assistance consisting of passive information transfer, for the most part, is inconsistent with its conclusion that there has been a great deal of waste reduction in the past. If this were correct, then the easiest waste reduction measures would have been taken already by many waste generators and options other than the simplest forms of technical assistance would be needed now. Waste generators would need help in how to use complex and capital-intensive waste reduction methods; government might need to support expensive technology demonstration programs. The OTA report emphasizes State grants to support in-plant technical assistance and also suggests a way to shift resources from legally mandated regulatory compliance to voluntary waste reduction.

A recent EPA report, *Unfinished Business: A Comparative Assessment of Environmental Problems,* on environmental problems and EPA priorities, also bears on EPA's commitment to waste reduction. [52] There is a strong indication in the report that EPA sees its spending on hazardous waste regulatory programs as high when the risks posed by hazardous waste are compared to those from other environmental problems. Although the methodology used to reach that conclusion has problems, it suggests the alternative of shifting spending on hazardous waste from costly regulatory programs to relatively inexpensive nonregulatory waste reduction efforts.

Although the EPA report has many positive qualitative statements in favor of waste reduction, they are not backed up by budgetary or other quantitative measures of EPA's plans. Since the release of EPA's report, the agency has released its fiscal year 1988 budget request, Funds for waste minimization total $398,000 for activities in the Office of Solid waste, the Office of Research and Development, and the Office of Policy Planning and Evaluation. This budget request is less than what was spent in fiscal year 1986 and the same as in fiscal year 1987. It is 0.03 percent of the total EPA operating program budget of $1.5 billion. [53] Four States (California, Illinois, North Carolina, and New York) have budgets for waste reduction or minimization programs greater than EPA's request.

This low level of support for waste minimization—presumably only some fraction is allocated for waste reduction—is in puzzling contrast to the many statements in the EPA report

[50] Ibid., p. 29.
[51] Ibid., p. xxvi.
[52] U.S. Environmental Protection Agency, *Unfinished Business: A Comparative Assessment of Environmental Problems* (Washington, DC: EPA, Office of Policy Analysis, February 1987).
[53] The operating program budget excludes Superfund, the underground storage tank trust fund, and the construction grants program.

about need and commitment for a major Federal waste minimization effort to assist industry and the States. This low funding level may be particularly troubling since, as EPA states, actions taken in the near term in the waste management area that are driven by the 1984 RCRA Amendments are likely to preempt waste reduction actions. Money spent for building or using waste treatment facilities will not be spent for waste reduction.

Without a major Federal program to assist industrial waste reduction, the government may be pressed to retreat from the policy of greatly limiting the use of land disposal. Because of extensive problems in siting and permitting new waste management facilities, industry could argue that the government relax its restrictions on land disposal to avoid disrupting industrial operations or a comeback of illegal waste disposal. Alternatively, the government could respond by making it easier to delist wastes as hazardous under RCRA and by siting and permiting new waste management facilities over the objections of affected communities. Such actions might be much easier than implementing a new waste reduction effort, but they do not offer the same level of environmental protection and economic benefit. One way to begin to prevent such a regressive situation is to embark rapidly on a major waste reduction program that aids industry to turn its attention and resources to waste reduction as soon as possible. But this cannot be done on $398,000 per year or even a few million dollars per year. (Table 3 presents statements from the EPA report on the agency's past and future waste minimization activities and compares those statements with actual budgets and with the activity evaluations that were included in the OTA report.)

Table 3.—Funding Levels and Evaluations of EPA Waste Minimization Activities

EPA report: **descriptions of** activities	Budget commitments: past and future	OTA report: evaluations of EPA activities
General commitment:		
"Reduction of waste has long been a goal of EPA. This is, in fact, the third report to Congress on the general subject, the other two having been submitted in 1973 and 1974 regarding the reduction of non-hazardous 'post-consumer' wastes ." [p. 15]		"Government spending on waste reduction reflects a general lack of priority for pollution prevention government [Federal, State, and local] spent almost $16 billion in 1984 on pollution control. OTA estimates that government spending on waste reduction totaled only $4 million in fiscal year 1986."
Looking ahead: "An active, aggressive, and sustained program for technical assistance appears to be the strongest option available to promote waste minimization, especially in the near term." [p. xx]	EPA FY 88 waste minimization budget request OSW ... ...$260,000 ORD . . . . . 108,000 OPPE . . . . . 30,000 Total ., .. .$398,000	
Existing waste minimization activities:		
Office of Solid Waste and Office of Research and Development "Consistent with HSWA objectives to foster waste minization practices The Office of Solid Waste (OSW) has, over the past 2 years, attempted to design an efficient intergovernmental division of labor among EPA Headquarters, the **EPA Regional Offices, and the State** hazardous waste programs. " [p. 65]	*OSW's* waste minimization budget FY 86...$550,000 (est) FY 87 . . . 260,000 FY 88. , 260,000 (request)	"In keeping with Congress' initial low-key approach to waste minimization, OSW has not assumed a leadership role and considers waste minimization a low-priority item on its agenda. If considered at all, waste minimization is something for the future." [p. 161]
"EPA Headquarters and the Regional Offices are taking a leading role in support of the Federal-State partnership by conducting three essential functions: regulatory control; technical and financial assistance; and information sharing and management. " [p. 65]		"It is a reflection of the lack of any focus on waste minimization that responsibility for the current requirements of the 1984 RCRA Amendments [HSWA] is shared by many portions of OSW. " [p. 162]
Regulatory *control:* "EPA has implemented [the three regulatory] waste minimization provisions of HSWA," [p. 66]		"As of March 1986 (8 months after the regulations were promulgated) little oversight was being provided by EPA. OSW was not aware of [the extent of adoption of waste minimization provisions of HSWA at the State level]" [p. 164]
Technical and financial assistance: EPA's role has been principally one of providing financial support through a number of EPA programs to promising State waste minimization efforts. It also provides research support for developing technologies that might facilitate waste minimization by selected industries. " [p. 68]		"Waste minimization research and development is a low-priority item within EPA. It received about $1.2 million—half of 1 percent of EPA's fiscal 1986 estimated $213.8 budget for all R&D . . . OTA estimates that much less than 50 percent of EPA's funding for waste minimization R&D applies to waste reduction, even though the agency has identified waste reduction as one of two categories of waste minimization. " [p. 183]
EPA provides the following as examples of its technical and financial assistance efforts: . "Congress has allocated $4.75 million in supplemental grant funding to the EPA Regional Offices for State and local government hazardous waste management activities. " [p. 68] EPA lists the eligible activities for these grants; but does not list or evaluate the projects that resulted from the program.	Section 8001 add on grants funds FY 85. , .$4.50 million FY 86 . . . 4.75 million FY 87 . . . 0 • FY 88 . . . 0 •	single largest group of projects that resulted and most of the funding [for FY 85] went for Small Quantity Generator (SQG) education and assistance projects. A review of the summaries of 80 such projects reveals that most dealt with compliance needs. Only three projects included waste reduction . . it is unlikely that waste reduction will become a higher priority during **[FY** 86)." [P. 172]

"EPA did not request funds for program

Table 3.—Funding Levels and Evacuations of EPA Waste Minimization Activities—continued

EPA report: descriptions of activities	Budget commitments: past and future	OTA report: evaluations of EPA activities
• "The Office of Research and Development's Small Business/Small Quantity Generator's Research Program provides financial support . . ." [to]:	ORD small business/SQG funds FY 86. . .$326,000 FY 87. , . 103000 FY 88 . . . O*	
(1) ". . . Government Refuse Collection and Disposal Association clearinghouses for information on waste management options . ."	Contract per year: FY 66...$126,000 FY 87 . . . 103,000	OTA did not evaluate this contract because it was not relevant to reduction.
(2) ". State technical assistance and educational programs for applied research on waste minimization . . . Funding is currently provided to North Carolina and Minnesota. " [p. 69]	Contracts per year: NC: FY 85...$100,000 FY 86 . . . 100,000 MN: FY 86...$100,000	HWERL "has funded two Small Business Initiative projects in fiscal year 1966 through State waste reduction programs (North Carolina and Minnesota). Minnesota's MnTAP will administer $100,000 in grant on applied research project to assist small business in complying with regulatory problems. The grant will apply primarily to RCRA hazardous waste and will not be restricted to waste minimization." [p. 209] The EPA grants to North Carolina's Pollution Prevention Pays Program are used along with State funds to create a comprehensive research and education grant system. [see pp. 218-219]
. "The Office of Research and Development also supports research and development or recycling technology and clean manufacturing processes at the Industrial Waste Elimination Research Center at the Illinois Institute of Technology." [p. 70]		. . is the EPA center [of Excellence] where work is most directly related to waste reduction. Its annual budget is based on the EPA grant [$540,000 per year] . . . specific projects have focused on [research with some relevance to waste reduction] . . . The center would like to pursue waste reduction more directly but does not do so because the subject lacks priority at EPA . . . [p. 185]
• Other Office of Research and Development activities are listed by EPA as (1) "The regional support services staff serves as a clearinghouse . . . by fielding requests for technical information or technology transfer. . ."		OTA did not evaluate these activities.
(2) "The Hazardous Waste [Engineering] Research Laboratory is undertaking research on waste reduction and recycling . . ."	HWERL'S Alternative Technologies Division Waste minimization research funding: FY 86....$235,000 FY 87 . . . . 108,000 FY 88 . . . . 108,000 (request)	"Despite claims that HWERL is 'working to foster increased use of . . . waste reduction' OTA could find little work specifically directed toward this objective . . . Funding for fiscal year 1986 is . . . being used for one contract . . . [on waste reduction auditing procedures]." [p. 184]
(3) ORD "administered funding for applied research recently conducted for OSW in cooperation with Tufts University. The Tufts Center for Environmental Management conducted a [waste minimization] foreign practices study ." [p. 70]		"The Center for Environment Management at Tufts University is funded principally by EPA at a cost of $2 million per year . . . Waste Reduction and Treatment is one of four 'clusters of concentration' [at the Center]. Two projects [relevant to waste minimization or waste reduction] have been completed: a study of foreign government waste minimization practices and the organization of a conference." [p. 188]
Information Sharing and Management: "EPA can draw upon several existing sources of information in order to further the dissemination and sharing of knowledge about hazardous waste generation and waste minimization policy . ." [p. 70]		OTA did not directly evaluate the information-sharing aspect of EPA's waste minimization efforts in its report because they had little focus on waste reduction. The activities have concerned EPA's Report to Congress or were not contingent on EPA funding.

"EPA did not request funds for program

Table 3.—Funding Levels and Evaluations of EPA Waste Minimization Activities—Continued

EPA report: descriptions of activities	Budget commitments: past and future	OTA report: evaluations of EPA activities
EPA lists the following examples of information sharing: (1) Sponsorship of two waste reduction conferences held at Woods Hole in 1985 and 1988. (2) Co-sponsorship and assistance in coordinating three workshops for State Waste Reduction Programs, (3) Waste minimization presentations by EPA staff at seven conferences. (4) Support to the Environmental Auditing Roundtable.		
In the information management category, EPA discusses the value of "existing mechanisms [that] afford a significant basis upon which to develop a comprehensive overview of the use, movement, and fate of all chemicals and wastes of concern and to determine the changes resulting from altered economic and regulatory conditions. " [p. 73]		OTA devoted a chapter in its report to information needs and availability for waste reduction in setting policy goals and in implementing and evaluating potential regulatory and nonregulatory programs. Primarily because waste reduction is a process specific endeavor, little was found in the existing information gathering capability of EPA that significantly satisfied those needs.

SOURCES For column 1, U S. Environmental Protection Agency, *Report to Congress Minimization of Hazardous Waste*, **EPA/530-SW-88-033** (Washington, DC: EPA, Office of Solid Waste and Emergency Response, October 1988), pages as noted. For column 2, OTA 1987. For column 3, U.S. Congress, Office of Technology Assessment, *Serious Reduction of Hazardous Waste, OTA-ITE-317* (Washington, DC: U.S. Government Printing Office, September 1988), pages as noted

POLICY IMPLICATIONS

The main purpose of this report is to assist the looth" Congress with its deliberations about waste reduction. In this section the important conclusions of the first three sections of this report are drawn together to identify and analyze four critical policy choices on waste reduction:

1. Is there a need for legislative action?
2. Are there advantages to a completely new type of legislation?
3. What could new waste reduction legislation include?
4. What might be an effective level and source of funding?

Is There a Need for Legislative Action?

A significant body of waste reduction literature now exists extending beyond the EPA and OTA reports. Waste reduction is seen by nearly everyone as:

- offering substantial environmental and competitiveness benefits;
- an option that is technically, economically, and organizationally feasible in the near term and that has many opportunities yet available;
- not being amenable to a traditional prescriptive regulatory approach where the government tells industry what to do and when to do it; and
- as facing diverse obstacles in both government and industry.

The findings and conclusions of the EPA report to Congress on waste minimization are consistent with all of the above statements. Without a congressional directive to do otherwise, however, EPA plans limited activities, no institutional or organizational change, and very low funding. This course is consistent with a historical low priority and support for waste reduction and EPA's optimism about the positive effects of its regulatory programs on waste reduction. EPA's proposed small effort would probably not alter substantially the incremental increases in waste reduction now occurring. In the meantime, within the next few years actions and investments may occur that could displace waste reduction actions.

Congress itself caused a major reexamination of waste management and set the stage for this scenario through some of the 1984 Amendments to RCRA (HSWA). It directed EPA to move the Nation's hazardous waste management system away from land disposal with very strong mandates to EPA to examine, regulate, and promote alternative waste *management* technologies, such as incineration. The move to widespread incineration is occurring despite the unknown environmental risk that may follow. At the same time, Congress has not given explicit instructions for comparable measures to move industry to waste reduction, even though national policy states that waste reduction is the preferred environmental option. EPA only considers the availability of waste treatment capacity—not waste reduction potential—in reaching decisions on land disposal bans, including whether to delay the bans. This situation probably developed because of concerns about intrusive regulations to encourage reexamination of and change in upstream processes and operations in industry. Indeed, such concerns are warranted, but would not apply with a nonregulatory Federal waste reduction program. This approach was not considered when Congress reauthorized RCRA in 1984.

Superfund was similarly changed in 1986 without considering the potential benefits of reducing the generation of hazardous waste. Section 104(k) of the Superfund Amendments and Reauthorization Act of 1986 exerts pressure on States to assure the availability of hazardous waste treatment or disposal facilities to handle all hazardous wastes expected to be generated within the State during the next 20 years. Again, Congress did not require examination of waste reduction as a way to help create a comprehensive waste management system. However, there is now some discussion of using capacity credits to recognize State waste reduc-

tion programs.[54] This is a worthwhile way to integrate waste reduction into assessments of hazardous waste management capacity needs.

The ultimate decision not to use a waste-end tax to help fund the Superfund program may also be significant. That option had received considerable analysis, discussion, and support over some years.[55] Several States have large hazardous waste taxes or fees. One of the intended benefits of imposing a substantial tax on hazardous waste sent to land disposal and perhaps even waste treatment facilities is the promotion of waste reduction. For example, Judith Enck, the Executive Director of Environmental Planning Lobby in New York, said:

> Increasing regulatory fees is one way to encourage source reduction, for instance. I think getting companies to reduce the amount of toxic waste they generate out of the goodness of their heart isn't going to happen, If they can be convinced on economic grounds that reducing the amount of toxic waste that is generated is in their interest, they'll come around. I think the whole key is economics. so

Proponents of waste reduction have seen the decision to not use a Federal waste-end tax as a lack of interest in and support for waste reduction.

Moreover, there is rapidly increasing interest in waste reduction within the Nation's grassroots, citizen-based environmental movement that merits attention. People concerned about hazardous waste and environmental pollution are not concerned with statutory and regulatory subtleties. They focus on goals and results and recognize waste reduction's unique ability to offer the most certain and broadly defined environmental and public health protection. Such a preventive approach could extend beyond RCRA industrial waste to household hazardous waste and even to the elimination of hazardous materials in products. To these groups, lack of action on waste reduction signals a difficulty in moving incrementally toward a society with minimal use of and exposure to toxic and hazardous substances. s'

The EPA report concluded that enough information was available to say that much waste reduction has already occurred but that not enough information was available to make a decision on imposing waste minimization regulations on industry, Meanwhile, the report recommended some type of waste minimization technical assistance. The likely result of EPA's proposed program is a continuation of a slow increase in the reduction of the generation of hazardous waste; too slow to prevent a potential major shortage in waste management capacity, if it is going to occur. This development could cause the government to back away from its goal of greatly restricting land disposal.

The OTA report to Congress offers a range of broad policy approaches grouped according to probable outcome. It identified and discussed abroad range of obstacles that exist in both government and industry which block many companies from examining and thoroughly implementing waste reduction. These obstacles explain why a bold Federal nonregulatory initiative is necessary if the United States is to gain the environmental and competitiveness benefits of waste reduction in the near term. If Congress wants to increase the pace and scope of industrial waste reduction, where hazardous waste is defined in the broadest terms, it could adopt a strategy that would establish a strong Federal nonregulatory program that would not burden industry. **Waste reduction will proceed even without a major program at the Federal level, but slowly. Some companies may stop reducing the generation of waste after the easiest, most obvious ways are adopted. Others may not discover the benefits of waste reduction for some time.**

[54] See, for instance, "Development of State Capacity Certification Requirements under the Superfund Amendments and Reauthorization Act of 1986 (SARA), " draft prepared by the Center for Policy Research of the National Governor's Association, Mar. 15, 1987.

[55] See, for instance, U.S. Congress, Office of Technology Assessment, *Superfund Strategy,* OTA-ITE-252 [Washington, DC: U.S. Government Printing Office, April 1985).

[56] *Toxics in Your Community Coalition Newsletter,* February/March 1987, p. 5.

[57] One major national organization, the National Campaign Against Toxic Hazards, has already designed model legislation addressing this broader view of toxics use reduction that includes waste reduction. It has been introduced in several States.

Information and analysis from EPA, OTA, and several other studies now available to Congress could support a decision to move ahead with a nonregulatory legislative initiative focused on waste reduction instead of waste minimization, as defined by HSWA. The timing of government action is just as important as its nature. Even though waste reduction is a major change in strategy and thinking, it is also a logical and immediately available next step in the development of a comprehensive environmental protection-waste management system. Waste reduction combines the environmentalism of the 1960s with the economic sensibilities of the 1980s.

Are There Advantages to a Completely New Type of Legislation?

A decision to act legislatively on waste reduction would require a critical choice whether to act within the framework already existing under RCRA, the only environmental statute that has focused some attention on waste reduction, or to establish an entirely new statute.

The following reasons support new legislation:

1. **First and foremost, waste reduction is upstream pollution prevention that is different technically and philosophically from the end-of-pipe pollution control basis of existing statutes.** Almost all of the governmental and industrial apparatus established over many years for environmental protection depend on strategies, technologies, principles, policies, and environmental specialists that are not appropriate for waste reduction.
2. **Tacking waste reduction onto existing legislation, such as RCRA, has not resulted in waste reduction receiving priority.** It has not been defined clearly nor given focus in contrast to waste treatment options. (See figure 2 for an example of how the current regulatory system shifts pollutants among media compounding environmental problems and increasing costs to both government and industry.) waste reduction and even waste minimization are often ignored

Figure 2.—End-of-Pipe Approach: Regulating the Regulations

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part SO

[AD-FRL-3163-61

Standards of Performance for New Stationary Sources VOC From Petroleum Refinery Wastewater systems

AGENCY Environmental Protection Agency **(EPA).**

ACTION: Proposed rule and notice of public hearing.

SUMMARY: The **proposed standards would limit emissons of volatile organic compounds (WC) from new, modified, and reconstructed refinery wastewater systems. The proposed standards implement section 111 of the Clean Air Act and are based on the Administrator's determination that VOC emissions from petroleum refinery fugitive emission sources cause, or contribute significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare. Refinery wastewater systems are part of the refinery fugitive sources category. The intent is to require new, modified, and reconstructed refinery wastewater systems to control emissions to the level achievable by the best demonstrated system of continuous emission reduction, considering costs, nonair quality health, and environmental and energy impacts,**

A public hearing will be **held, if requested, to provide interested parties an opportunity for oral presentations of data. views, or arguments concernin, the proposed standards.**

This example of a proposed regulation shows how controlling, rather than reducing, pollutants can shift pollutants around and become an unending process. In this instance, the petroleum industry was initially required under the Clean Water Act to build wastewater treatment facilities to treat oily water from its refinery process units rather than release the untreated water into the Nation's waterways. Subsequently, it has been discovered that the treatment processes emit volatile organic compounds (VOCs) into the air, and now the VOCs must, in turn, be controlled. Thus, EPA is proposing that new, modified, and reconstructed refinery wastewater systems regulated under the Clean Water Act be further regulated under the Clean Air Act section 111. This proposal will not control those VOCs emitted from *existing* **wastewater systems.**

A *waste* **reduction approach would have been to conduct waste audits of the various refinery processes that generate the oily wastewater and to devise methods of reducing that generation. Many waste reduction case studies have shown that substantial amounts of wastewater produced from process cleaning operations can be reduced by relatively simple changes in those operations. By not generating the oily wastewaters, the VOC problem would not exist and require subsequent attention.**

SOURCE: Federal Register, vol. 52, No. 65, May 4, 1987, p. 16334.

when the RCRA program is examined. The linkage between waste reduction and what many people regard as higher RCRA priorities (e. g., enforcement and compliance issues) is rarely considered. Moreover, should Congress assign a substantial waste reduction program to the Office of Solid Waste (OSW), which implements RCRA, it is likely either that OSW's priority for treatment and disposal programs would interfere with its implementation of waste reduction or that current programs would suffer.

3. **Waste reduction must address all hazardous wastes and environmental pollutants or opportunities will open up to shift waste between environmental media.** While it is possible to superimpose waste reduction without conflict on the various environmental programs, it could be difficult to incorporate a multimedia approach solely from within RCRA or any other existing environmental statute. No matter what might make technical and economic sense, if the government said that waste reduction only applied to a narrow class of regulated waste, then much of industry's actions might be similarly focused. The temptation, and perhaps legal need, to address waste reduction comparably among all major environmental statutes would probably delay action.
4. **Waste reduction is best addressed by government policies aimed at assistance, persuasion, and institutional commitment.** Both EPA and OTA have said it is not amenable to traditional regulatory or prescriptive approaches. This is in stark contrast to existing environmental statutes which rely, almost exclusively, on command-and-control regulations. The success of the Ventura County waste reduction program supports the use of technical assistance.
5. **waste reduction bridges the environmental and industrial competitiveness areas of national concern.** The traditional regulatory approach to environmental protection results in increasing costs to government and industry. Waste reduction offers both government and industry a near-term opportunity to reduce their environmental costs and liabilities even as the government finds it necessary to promulgate more environmental regulations.

Reasons for maintaining the RCRA context for a congressional initiative on waste reduction include:

1. Congress can more easily amend an existing statute than create a new one;
2. RCRA, which has already dealt with the subject of waste reduction, is a timely vehicle since it is scheduled for reauthorization in 1988; and
3. RCRA involves fewer committees and subcommittee whereas a waste reduction statute might result in shared jurisdiction with committees with an interest in industrial competitiveness.

Overall, it would seem more effective and efficient for Congress to use new legislation if it chooses to move ahead with a major waste reduction initiative. However, a more modest initiative similar to what now exists could fit into the RCRA framework.

What Could New Waste Reduction Legislation Include?

There are a host of potentially effective policy instruments for Congress to consider.

Assistance to Industry

The environmental and economic benefits of waste reduction can be used to justify technical assistance by government to industry. Such actions by government include:

- **In-plant technical assistance** to deal with site-specific situations. Experts could provide help to identify waste reduction opportunities and techniques, establish waste reduction audit and accounting systems, and suggest organizational changes that foster waste reduction.
- **Information and technology transfer** through passive databases and catalogs of case studies and interactive (expert system)

databases. These would make relevant waste reduction data and information available to plant personnel nationwide.
- **Development and in-plant use of education and training** activities that help build waste reduction expertise among production people.
- **Generic R&D on commonly used processes and materials** that can assist many generators across different industries.

These efforts address existing obstacles in both government and industry and constitute purposeful incentives for waste reduction. They could be funded in part by the Federal Government and implemented mostly through State governments with the help of Federal grants. OTA found that State agencies and other parties close to industrial facilities can more efficiently and effectively implement such an assistance program than can EPA. **Existing State and sometimes local waste reduction programs are a nucleus on which to build a national program.** Their focus on waste reduction and their effectiveness could be rapidly increased through Federal assistance and a common definition, method of measurement, and policy framework.

In January 1987, North Carolina researchers conducted a survey of 50 States. The results on siting hazardous waste management facilities support OTA's findings about the need to stimulate more State activity on waste reduction. Although OTA found only 10 State programs with any focus on waste reduction, this survey revealed that 28 States believe that they have a "statutory mandate or program to encourage nonsiting alternatives, such as waste reduction at the source. "[58] However, when regulatory officials were asked "How much effect do you expect waste reduction measures will have in reducing the need for future siting of facilities?" only 21 States said moderate to significant, 22 said none to very little, and 7 didn't know. This result seems an outcome of: 1) minimally funded State and Federal programs designed to focus on waste reduction, and 2) studies that have often underestimated future waste reduction potential (discussed in detail in the OTA waste reduction report). A Federal grants program to States, therefore, could make waste reduction an ally of siting efforts by reducing siting needs in the near term to publicly acceptable levels.

California has recognized this concept. It recently passed legislation to facilitate the siting and permitting of hazardous waste facilities. Known as the Tanner process, it includes a provision for local governments to analyze waste reduction potential with the State Department of Health Services providing supporting waste reduction information. [59]

EPA Organization

Creating an Office of Waste Reduction with an Assistant Administrator in EPA would be a major change. Independence from existing EPA pollution control programs is key. This option takes on more importance because EPA has said that a nonregulatory waste reduction program requires institutional advocacy. Waste reduction is not a new idea, but past history also makes clear that if waste reduction is to achieve parity with pollution control as a major means to environmental protection, it must have organizational commitment, public visibility and accountability, and institutional advocacy at the highest levels. EPA is, like any other institution that deals with the environment, a member of the pollution control culture that has developed over 20 years in the United States. **If EPA is to implement an effective waste reduction program, its organization should reflect the primacy of waste reduction.** The lack of such organizational change has already caused waste reduction to be overshadowed by existing regulatory programs, as shown in figure 1.

A major new bureaucracy that would add to the administrative burdens of EPA would be unacceptable and unwise to many. In terms of

[58] Richard N.L. Andrews and Phillip Prete, "Trends in Hazardous Waste Facility Siting and Permitting," Workshop on Negotiating Hazardous Waste Facility Siting and Permitting Agreements, Conservation Foundation, Mar. 11-13, 1987. Emphasis in original.

[59] California State Assembly Bill 2948 (Tanner).

staff, budget, and responsibilities, however, an Office of Waste Reduction would always be a small part of EPA. A nonregulatory program would not have the kinds of responsibilities that define most of EPA's operations. The issue is not one of size but of providing unambiguous institutional commitment to a worthy objective. **With people committed to waste reduction and expert about industrial production, even a small office can supply critically needed national leadership.** A waste reduction program that is submerged within EPA is not likely to have credibility with industry and the public, An Assistant Administrator can explain and promote not only EPA's waste reduction effort but that of the entire Federal Government and of State programs, **Currently, although EPA participates in many conferences and workshops conducted on waste reduction, no senior EPA official represents the agency, is a visible advocate of waste reduction, or is attempting to unite national interest in waste reduction.**

Even though EPA has only a small effort on waste minimization, a lack of coordination and consistency among different groups has already surfaced. EPA itself noted that: "Some waste minimization options may require extensive internal cooperation among EPA programs. "[60] There have already been significant differences among the Office of Solid Waste, the Office of Research and Development, and the Office of Policy Planning and Evaluation that help explain the inconsistencies and ambiguities of EPA's report to Congress on waste minimization. Both ORD and OSW seem to acknowledge the primacy of waste reduction over regulated pollution control activities more than does EPA's policy office. These internal tensions may explain the small fiscal year 1988 budget request for waste minimization that is inconsistent with EPA's report. **With the almost inevitable increase in interest in waste reduction, bureaucratic problems are likely to get worse in the absence of a central EPA office with overall responsibility for waste reduction.**

The activities that an EPA Office of Waste Reduction might undertake to shift the balance between the use of waste reduction and traditional pollution control in industry are many and varied. They are summarized below in order of decreasing priority and need, amplifying the discussion in the OTA report:

- **National Leadership:** A key function of the office would be the administration of waste reduction grants to the States. Emphasis could be placed on expanding existing programs that have shown effectiveness and providing seed money for new programs, setting necessary policies and criteria for selection and funding (including perhaps assisting the formation of State waste reduction boards), establishing standard methods of measurement and a standard definition of waste reduction to focus State actions,[61] evaluating the performance of funded programs, and transferring successful ideas among State programs. The chief objective would be to develop and implement a cost-effective national support system for very large numbers of waste generators (i.e., many tens of thousands).
- **Information Analysis:** The establishment and operation of a national waste reduction database would make it possible to assess progress nationwide. Annual reports could provide information on whether voluntary goals established by Congress are being met nationwide and across all industries and analyze unsatisfactory results. Industry waste reduction plans could be analyzed to see if sufficient commitments are being made to meet national goals. Gross waste generation and environmental spend-

[60] U. S. Environment] Protection Agency, *Report to Congress: Minimization of Hazardous Waste,* op. cit., p, 89.

[61] BIA need for a standard definition to focus implementation is made clear by a recent example from New York State. An April 1987 staff report of the Joint Legislative Commission on Toxic Substances and Hazardous Wastes, "Hazardous Waste Reduction: Obstacles and Incentives, " contains a clear definition of *waste reduction* that is consistent with OTA's definition and discusses the need to address obstacles to increase waste reduction in the State. Several bills have been introduced in the State legislature as a result of the report. One bill (S. 5192) sets waste reduction as the preferred hazardous waste option in New York, Two others (S. 5190 and S. 5191) establish loan guarantee and waste audit programs. Their stated purpose is to encourage waste reduction but the bills are inconsistent with the definition and priority given waste reduction, They allow appropriated waste reduction funds to be spent on recycling and treatment, options that can divert industry's attention from waste reduction,

ing data could be analyzed to detect whether waste reduction is having a positive impact on waste management nationwide. Use of information gathered from other EPA programs would also be examined.

- **Information Transfer:** Industry would be assisted, directly or through State programs, either by the establishment of an accessible database of technical information on waste reduction or by fostering nationwide use of an existing system. The office could design an expert system (i.e., an interactive computer system that provides answers to questions) to assist waste generators explore waste reduction options. Information would be obtained from the grants program and from past and ongoing technical activities outside the Federal effort. **Information transfer is not a substitute for in-plant technical assistance (provided by States) because the mere availability of information provides no certainty that a generator will obtain it and be able or willing to act on it effectively.** The first priority of this Federal information transfer effort would be to provide support for State (or even county) programs and secondly to assist individual companies.
- **Outreach:** A major obstacle to waste reduction is convincing **people** that it is a viable, near-term option. This obstacle would be overcome if the office played a lead role in outreach programs, such as workshops, to educate industry, regulatory officials, and the public at large about waste reduction. The office could also publicly recognize industries that practice waste reduction and encourage still more waste reduction by others. An ongoing, high level industry liaison group to provide major guidance to the office could be established. A similar liaison group for the educational community could promote the introduction of waste reduction principles into engineering and business management curricula. A third liaison group of the general public, environmental, public health, labor, and public interest groups would provide important input to the Federal program.
- **Regulatory Analysis:** Elements of the current environmental regulation system serve as obstacles to waste reduction but also sometimes move industry slowly in the direction of waste reduction. A critical need is to purposefully seek ways to use existing regulatory programs to promote waste reduction. For example, permits could be made contingent on explicit commitment to waste reduction. Such measures are not likely to be a high priority of regulatory programs. Independent expertise on waste reduction would be needed in any event. Regulations to force waste reduction in industry are a potential for the future. The office could analyze the impact of the current system on waste reduction, work closely with EPA's enforcement and regulatory programs to help define and analyze opportunities for regulatory concessions to ease the adoption of waste reduction, and study the feasibility of waste reduction regulations in case information should show that the nonregulatory efforts to promote waste reduction are not successful. By analyzing and reporting on the waste reduction impacts of regulatory actions within the formal regulatory activities of EPA, the office could prevent the creation of more obstacles to waste reduction. This should be a high priority of EPA, and the office could provide the necessary technical expertise and objectivity for this task. Bias for waste reduction from this office would, at the least, balance the existing bias for pollution control within current regulatory programs. (See box F for a current example; the agency's decisions on regulating industrial furnaces and boilers for burning hazardous waste).
- **Research and Development:** The office could provide and monitor funding to EPA's Office of Research and Development, as the current regulatory programs do, for waste reduction research identified as necessary to reduce significant amounts of waste. It could also disseminate R&D results from EPA and other sources to industry. R&D would also be possible through the State grants program.

- **Implementation of Related Federal Activities:** Congressionally mandated activities that relate mostly to waste reduction could be implemented by the office. An example is the information gathering aspects of the new Superfund program (Title III of SARA) having to do with crude mass balances of some industrial facilities. (Note, however, that these new data reporting requirements will not provide the government with a measure of national waste reduction because waste generation will be reported in several broad ranges only. Moreover, waste generation will not be reported in terms of production output. In addition, data on only some 300 chemicals from a fraction of industry are to be collected.) Another example is the Superfund requirement for State assurances for long-term hazardous waste treatment or disposal facilities of State wastes. Implementation will require an ability to review and assess such assurances and the analytical bases used. Waste reduction is a key variable that should be included in such State analysis.
- **Federal Government Coordination:** By working with other branches of the Federal Government, the office could promote and measure waste reduction at Federal facilities;[62] remove obstacles to waste reduction, such as inflexible procurement and product specification policies of the Department of Defense and the Food and Drug Administration that prevent waste reduction; and use waste reduction performance as a criterion to select vendors and contractors. Coordination with agencies such as the Department of Commerce could help to establish waste reduction as part of economic growth and industrial competitiveness.
- **Issue Development and Liaison:** Government has, for the most part, avoided the issue of toxic and dangerous materials in non-food and non-drug products. The office could play a lead role in EPA and work with other Federal agencies and the public on this issue and that of expanding waste reduction to solid waste (i. e., household and commercial garbage). Toxics use reduction is rapidly becoming a broadly supported concept.

As difficult as organizational change can be, creating an independent Office of Waste Reduction offers advantages over several other options and what the EPA report says has been a problem for the agency—the administration of nonregulatory programs. For example, an expanded waste reduction effort within EPA's Office of Solid Waste would face tough competition from existing OSW programs. Credibility would also be a problem, particularly for establishing a national database on waste reduction, since in 10 years OSW has not established a reliable database on RCRA waste generation. Establishing a separate waste reduction division within EPA's solid and hazardous waste program comparable to OSW would hamper developing a multimedia basis for waste reduction and, here too, would face very strong competition from existing hazardous waste management efforts. Creating a waste reduction effort within each major regulatory program (air, water, and waste) would also likely result in duplication of effort, overwhelming competition from existing regulatory programs, and great difficulties in achieving expeditious and consistent actions.

Another alternative, already receiving some attention within EPA, merits discussion. The Office of Research and Development (ORD) has shown increasing interest in waste reduction.[63]

[62] As in industry, the Department of Defense readily acknowledges that "the financial and legal incentives to reduce or entirely eliminate the generation of hazardous wastes are becoming more attractive. " However, it too uses waste minimization that includes waste treatment and also speaks of the need to reduce "volume or toxicity" of wastes, thus allowing actions that reduce volume and concentrate hazardous components. [Michael J. Carricato, et al., "Department of Defense Hazardous Waste Minimization, " *Proceedings of the National Conference on Hazardous Wastes and Hazardous Materials* (Silver Spring, MD: Hazardous Materials Control Research Institute, March *1987),* p. *328.]*

[63] As this special report was near completion, the Hazardous Waste Engineering Research Laboratory of ORD released a proposal in April 1987 to develop a program to "contribute to the reduction of technical barriers . . . impeding the adoption of waste minimization , . . " [U.S. Environmental Protection Agency, "Waste Minimization Strategy, " undated.] A funding level of about $3 million for 1988 has been discussed. The major shortcoming of the ORD proposal is a lack of attention to and support of in-plant technical assistance to increase the use of existing waste reduction information and technology.

There is undoubtedly a role for ORD in overseeing and carrying out waste reduction research and development and perhaps in the development and establishment of necessary central information systems, as discussed above. To have the EPA waste reduction activity centered in ORD, however, is not an effective way to overcome present obstacles to the use of waste reduction in industry. A program operated by ORD could not conduct a full range of activities and would not have the organizational stature of an agencywide Office of Waste Reduction. ORD has no experience in managing nonregulatory programs, such as in-plant technical assistance. Some problems and limitations of ORD taking the agency lead in waste reduction are:

- technology per se is not the limiting factor for more widespread industrial waste reduction and ORD has little experience in addressing nontechnical obstacles and problems;
- no study of waste reduction has revealed any particular need for a major government technology demonstration program for waste reduction;
- ORD would have difficulty in establishing credibility and effectiveness for a nonregulatory program aimed at assisting industry, because its experience is mainly in end-of-pipe pollution control, not in upstream manufacturing processes, and its work is mostly in support of regulatory programs; and
- there could be a tendency for ORD to carry out lengthy **studies on waste** reduction, rather than to actively assist industrial waste generators of all types to use existing technology through onsite technical assistance.

Reporting and Planning Requirements

Even though nonregulatory programs do not require extensive, detailed data to function, information on correctly measured waste reduction and the cost savings relative to pollution control is necessary. Eventually, EPA will have to evaluate the effectiveness of a Federal program and will need such data to do so.

One of the key obstacles to waste reduction within companies is that it is not usually a high priority with top management. Some people in industry are troubled by a policy option suggested in OTA's report that would compel publicly owned companies to inform investors, through reports filed with the Securities and Exchange Commission, of their waste reduction efforts and progress. It raises the spectre of yet another burdensome government requirement to gather more detailed information. However, that same information is necessary for companies to evaluate waste reduction possibilities and, in more detailed form, could be reported to EPA and serve useful purposes for national policy implementation and evaluation.

New industry reporting requirements—on past waste reduction actions and detailed plans for future efforts-is another policy option suggested by OTA that would require new legislation. *Government required plans could stimulate the kind of attention that would make waste reduction a commonly used option in industry. Plans must specify what actions generators will examine and take in the future to maintain the priority of waste reduction.*

However, reporting and planning requirements by themselves do not address lack of interest, poor information, and lack of technical resources to reduce waste. Nor would they be effective unless there was a standard way of measuring waste reduction based on the need to put changes in waste generation on a production output basis for specific processes and facilities. Without in-plant technical assistance and other active efforts by government and other organizations, a generator may be complacent or incorrectly assume that there are no additional waste reduction opportunities. Therefore, **reporting and planning requirements are best seen as but a part of a more comprehensive government program that identifies and removes obstacles to waste reduction and assists industry to reduce waste.** But reporting and planning requirements are important for government programs to assess progress and for motivating and maintaining the interest of generators.

Voluntary Goals

Another option, a 10 percent *year-to-year* voluntary goal over 5 years for waste reduction, has not been suggested as a surrogate or antecedent to regulatory requirements.[64] Setting goals would draw attention to waste reduction and provide a simple way to measure progress and justify actions.

Some are unconcerned about such a goal because they already use goals for the same reasons. Moreover, OTA arrived at an annual goal of 10 percent by using data from several companies that showed such a level of performance over the past few years.

Nevertheless, some people are nervous that voluntary goals might presage regulations and might penalize innovative and progressive companies that have already substantially reduced waste, Since the first waste reduction opportunities tend to be the cheapest and easiest, companies that have not adopted waste reduction could quickly make progress that might prove difficult for those with a long-standing commitment to waste reduction. However, companies whose commitment to waste reduction preceded the adoption of national goals would be able to show that they have already significantly reduced their generation of hazardous waste.

A Long-Term Option: Flexibility in the Regulatory System

Companies who pursue waste reduction beyond the first easy and inexpensive opportunities face increasing technical complexities and costs. The current regulatory system imposes costs and places demands on a company that can limit its resources for waste reduction. This may be a significant problem for large companies that generate and manage large amounts of waste onsite and therefore, can face substantial capital costs for pollution control facilities to comply with regulatory requirements. To address these two obstacles to continuing, comprehensive waste reduction, OTA presented the concept of regulatory concessions, an option that could be implemented in 3 to 5 years, rather than immediately.

Waste reduction might achieve more of its technical potential if flexibility were introduced into the current regulatory system. Trade-offs between pollution control regulatory requirements and specific waste reduction plans and actions could facilitate the expenditure of industrial resources on waste reduction, which provides more certain environmental protection and enhanced industrial competitiveness. Concessions, such as delayed regulatory compliance, would be granted only for projects that would provide a net gain in environmental protection and public health. Valid concerns arise about this policy creating opportunities to avoid or escape regulatory compliance. These concerns and ways to deal with them are discussed in the OTA report.[65]

In its study of environmental protection and technological change OECD came to important conclusions about regulatory flexibility:[66]

> ... flexible enforcement of the regulations according to a time schedule and procedures negotiated between industry and government are largely responsible for the firm's technological reaction.
>
> A certain flexibility and adjustment to the special circumstances of each industry can pay in the long run.
>
> It is better to have regulations that are strict but flexibly enforced, than undemanding regulations hastily enforced.
>
> An exemption which allows industry sufficient time and latitude to develop new technologies is usually favorable for technological change. There may, however, be a conflict

[64] There has been some confusion over the 10 percent annual voluntary goal figure, Note that over *5* years a year-to-year 10 percent level of waste reduction, where each year's generation serves as the basis for the following year's goal, results in a total of 41 percent reduction relative to the amount generated at the start of the 5-year effort and 65 percent after 10 years. Because the base is declining, waste reduction in terms of amount of waste per unit of production output is declining also, This means that if production levels remain constant, progress seen as changes in the the total amount of waste generated slows down.

[65] Concessions are not a new idea. Both the Clean Water Act and the Clean Air Act have had such provisions; they are also discussed in the OTA report.

[66] Organization for Economic Cooperation and Development, *Environmental Policy and Technical Change,* **op. cit.**

between the desire to facilitate technical change [what OTA calls waste reduction] and the urgent need to protect the environment, which often means a conflict between urgent short-term measures and greater efficiency in the longer term.

OTA concludes that as difficult as it may be to introduce flexibility into the regulatory system, the long-term environmental and economic benefits of doing so may more than justify the attempt. As the earlier discussion of U.S. industry's relative competitive disadvantage showed, other nations seem to have done a better job of introducing regulatory flexibility. Historically, there have always been reasons for granting some U.S. companies regulatory concessions, but waste reduction may be the best reason.

A Long-Term Option: State Waste Reduction Boards

To deal with concerns about implementing regulatory concessions and **a** number of other **waste** reduction policies, OTA suggested that State waste reduction boards, similar **to exist**ing State hazardous waste siting and management boards, assess waste reduction benefits and work with regulatory agencies **on** regulatory concessions. State boards could also play a major role **in implementing any Federal grants program and could provide expert panels to help answer a key question: has a company already made a good faith, documented effort to reduce generation and does it have a plan to do more? Since the OTA report, the Michigan Toxic Substances Control Commission has recommended the creation of a State waste reduction board.[67] Some existing State waste management boards as well as some States' active divisions that focus on waste reduction could, of course, be alternatives to new organizations.**

[67]The Michigan Toxic Sustance Control Commission, "White Paper: Investigations and Recommendations for the Development of a Comprehensive Michigan Program in Hazardous Waste Reduction," prepared by Waste Systems Institute of Michigan, Inc., October 1986.

What Might Be an Effective Level and Source of Funding?

Even **at** the earliest stages of discussion about **waste** reduction programs, **current budget deficits make it necessary to deal with financing of a Federal waste reduction program. It is important to see a Federal waste reduction program as different from a traditional regulatory program. To overcome inertia and smooth a path from pollution control to pollution prevention** may *not* require major, long-term funding.

Considering the environmental priority of waste reduction, a small percent of the normal operating program budget of EPA might be reallocated to establish and operate an Office of Waste Reduction. As an example, 2 percent of EPA's fiscal year 1988 budget request of $1.5 billion (excluding Superfund, underground storage tanks trust fund, and construction grants programs) would provide $3o million for waste reduction.

A funding level of $3o million, achieved by a 2 percent **cut in all of EPA's existing programs and operations, would be small enough not to threaten the effectiveness of those other efforts. The cut might be across the board, or it might be made at the discretion of EPA, or Congress might direct that cuts be made in certain areas.**

This method of funding could generate $255 million for a 5-year program by increasing the figure to 3 percent in the second year and 4 percent ($60 million annually in terms of the fiscal year 1988 request) in the subsequent three years. This level of funding might seem too low in comparison to the benefits of expeditious and systematic waste reduction. However a new, separate Federal waste reduction program could encourage and assist in a national transformation carried out by industry and would not be an activity where the government has a major operational role. Thus, these figures are consistent with government action that stimulates widespread private actions in the public good.

Federal waste reduction grants to States probably would account for most (80 to 90 percent) of the money appropriated. EPA has said:

> . . . only the States have the close knowledge of local industry that would be necessary to **ensure successful implementation of non-regulatory programs.**[68]

This level of funding to States is equal to about 10 percent of current grants to States in pollution control regulatory programs. Yet it would provide about 10 times the money now being spent by some States on waste reduction, making a 10 percent matching fund requirement a feasible option. It would increase in-plant assistance from a tiny fraction of the Nation's waste generators to between 50,000 to 100,000 companies over five years. From the national perspective, spending $200 million for 5 years on State waste reduction grants could result in annual savings by industry of billions of dollars in avoided waste management costs.[69] As has been shown by a federally supported energy conservation technical assistance program, increased tax revenues from corporate profits resulting from waste management savings would likely be greater than the Federal cost of the waste reduction grants.[70] Thus, as with the energy conservation technical assistance program, Federal spending **on waste** reduction might pay for itself. Moreover, the savings from waste reduction **are more certain than from energy conservation because waste management costs increase steadily while energy costs sometimes decrease. Hence, increased tax revenues are more certain from a Federal waste reduction program.**

Spending for other than the State grants could be limited to $5 million to $10 million annually (including funding of ORD efforts), equivalent to about 10 to 20 fulltime equivalent (FTE) employees. This FTE level is consistent with the tasks described above for an Office of Waste Reduction.

The $255 million total for a 5-year waste reduction program to prevent pollution and, ultimately, the creation of more Superfund sites amounts to about 3 percent of the $8.5 billion that Congress has recently appropriated for the second 5-year Superfund program. Cleaning up a few major Superfund sites can cost several hundred million dollars. The Governor of New Jersey has recently made the connection between the role of government in waste reduction and cleanup costs, saying:

> **Right now we are spending billions on hazardous waste cleanup and on regulating the storage and handling of hazardous substances. Yet we don't spend anything on programs to reduce the production of waste in the first place.**[71]

New Jersey's recent initiatives to promote waste reduction include a proposal for fees on waste generation, creation of an information transfer program, and a review and revision of regulations that limit waste reduction.

Finally, 5 years of Federal grants might be enough. Once waste generators get direct technical assistance, overcome major obstacles, and learn how to implement waste reduction, they will know how beneficial waste reduction is to them, economically. After 5 years, a smaller Federal effort (e.g., $10 million annually or less than 1 percent of EPA's operating budget for

[68] U.S. Environment] Protection Agency, *Report to Congress: Minimization of Hazardous Waste,* op. cit., p. 124.

[69] This estimate is based on the 2-year experience of the Ventura Country waste reduction program, which cost the county **$1.50,000** and reduced hazardous wastes by an estimated 40,000 tons. Given land disposal costs of $250 per ton, for every dollar spent by Ventura County, its industry is saving $67 annually. An unknown portion of the initial savings was spent on one-time capital investments in waste reduction technology and processes. The estimated savings is conservative, however, since it is based on only reducing RCRA hazardous wastes and only those shipped offsite and does not account for other economic benefits that accrue from waste reduction such as avoided liabilities and energy and raw materials savings. These factors offset the fact that some wastes probably became treated onsite instead of being reduced or eliminated and the fact that some of the tonnage decrease came from cuts in industry production. A $10 billion annual savings nationwide would result from only about 10 percent waste reduction for RCRA wastes (50 million tons annual reduction). See also footnote 30.

[70] The Department of Energy's Energy Analysis and Diagnostic Centers, which offer similar in-plant technical assistance, have resulted in a federal government internal rate of return of 56 to 101 percent per year because manufacturers' savings become taxable incremental earnings. For every Federal dollar spent industry has saved over $5 annually, Despite the high positive revenue return to the Federal government, in 10 years the program has only managed to assist 1,750 plants because of its limited budget, which for fiscal year 1987 totals $1.5 million. [See the University City Science Center's "Energy Analysis and Diagnostic Centers Fact Sheet," January 1987.]

[71] Thomas *H.* Kean, *Annual Message to the New Jersey State Legislature,* Jan, 13, 1987, p. **23.**

nongrant activities including R&D) might be enough to ensure that waste reduction is pursued to its limits, incorporated into new industrial operations, and perhaps extended to municipal waste and consumer products. In the initial years, States will also learn how to run effective waste reduction programs that assist economic growth. An effective 5-year grants program, therefore, might permanently alter how American industry functions. It can be explicitly established as a seed program to demonstrate that waste reduction is an effective complement to our current regulatory system. The experiences of companies like 3M and Dow Chemical indicate that **once the waste** reduc**tion lesson is learned first-hand by production people, government can play a smaller role. EPA has said:**

> **One** critical benefit of technical **assistance is that it can be started immediately and can show at least some benefits within months of enactment.**[72]

OTA agrees, because limited State programs have started **to show** this. If technical **assistance is good, then should it not be made available to American industry nationwide as part of a major Federal effort to encourage waste reduction?**

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[72] U.S. Environmental Protection Agency, *Report to Congress: Minimization of Hazardous Waste,* op. cit., p. 117.