Chapter 8

Government Planning and Programs

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OVERVIEW

"Garbage costs to soar, '' "Bury and Bum forces collide with recyclers, ' "State urged to define, collect home toxins, " "Town finds recycling works, worth the effort. ' These types of headlines, appearing with increased frequency in local newspapers all across the Nation, highlight the difficult challenges municipal solid waste (MSW) management poses for local and State governments. Many communities around the country are attempting to decrease reliance on landfilling by reducing the generation of the waste, increasing its reusability, expanding materials recovery and recycling, and/or building more incineration facilities. Determining the appropriate mix and feasibility of these prevention and management methods, however, can be a difficult task for State and local governments.

The management of MSW has traditionally been in the bailiwick of municipal and State governments. Although limited involvement by the Federal Government began in 1965 with the passage of the Solid Waste Disposal Act (see app. 8-A), the Federal role may be expanded as the national implications of increased MS W generation become more evident. In any case, the relationship among Federal, State, and local governments in the management of MSW continues to evolve and the most appropriate roles for each remain open issues.

The Resource Conservation and Recovery Act (RCRA), the major Federal statute regulating MSW, includes specific findings and objectives about MSW management (see app. 8-A).[1] Yet, RCRA does not include explicit findings, objectives, or goals which distinguish MSW prevention from management; the law also does not embody the materials management approach presented in this report (ch. 1). Although the Federal Government has had limited involvement in MSW activities to date, most observers now agree that a more clearly defined Federal role for MSW policy is needed. This task is a major focus of Congress' current RCRA reauthorization discussions.

Some Federal activity to pursue the materials and energy conservation objectives already stated in RCRA was undertaken in the 1970s. For example, the Bureau of Mines sponsored research on the technological and economic feasibility of recovering materials from MSW (94,121), the Department of Treasury investigated the effects of virgin materials tax subsidies on recycling (152), the Interstate Commerce Commission examined freight rates to determine their effects on the use of secondary materials (55), and the Environmental Protection Agency (EPA) established a program to transfer information about MSW to interested States, communities, and businesses (140). Energy recovery was encouraged by the Public Utility Regulatory Policies Act (PURPA) of 1978, which required utilities to purchase energy from waste-to-energy facilities at their "avoided cost" of its production, and the Department of Energy sponsored research on refuse-derived fuel and methane gas recovery techniques (127,138).

Most of this activity waned in the 1980s as concern over the energy crisis diminished and the Nation faced growing economic difficulties. At EPA, hazardous waste issues became the focal point. EPA's efforts to regulate existing MSW landfills and incinerators, as well as recycling facilities, remain limited to date. In 1979, EPA developed criteria to help improve landfill performance, but these are not enforceable regulations and are outdated. Although EPA proposed new regulations in 1988, their adequacy is debated (ch. 7). MSW incinerators also have received little regulatory attention; for example, ash has been left unregulated at the Federal level (ch. 6). Both Congress and EPA recently proposed applying more stringent regulations to MSW landfills and incinerators (chs. 6, 7).

[1] Statutes relevant to materials and energy recovery also include similar findings, for example, the National Materials and Minerals Policy, Research and Development Act of 1980 (Public Law 96-479), and the Public Utility Regulatory policies Act of 1980 (Public Law 95-617).

Little information has been systematically collected on the status of State programs and activities, and information on local programs tends to be anecdotal. It is apparent, however, that State, county, and municipal governments use a wide range of approaches to address MSW issues. In particular, many State and local governments are developing programs to stimulate recycling and some are attempting to encourage waste reduction (chs. 4 and 5). States are also adopting stricter regulations for landfill disposal and incineration facilities to improve their environmental safety. Public involvement is critical to the success of any MSW management strategy, and a number of States and localities have developed noteworthy programs in public education and participation.

This chapter, rather than evaluating the limited efforts of the past, reviews the current status of governmental activities for MSW, highlights particularly noteworthy and innovative policy programs, and assesses a number of cross-cutting issues effecting the prospects for further development of MSW management programs. The information presented here is meant to be illustrative, but given the rapidly developing nature of government MSW activities it cannot be entirely complete or up-to-date.[2]

The focus is on State and local government activities, because this is where most MSW activity has taken place, and the relationship of Federal efforts to these programs. Details on specific Federal programs, some State and local efforts, and important private sector activities are also included throughout the report and are noted where appropriate.

The chapter is divided into four sections: 1) a brief overview of trends in MSW policymaking; 2) a discussion of MSW planning efforts by different levels of government; 3) an examination of other recent program developments for various MSW alternatives, with an emphasis on highlighting innovative approaches; and 4) an assessment of cross-cutting issues, such as siting and the need for public involvement.

THE MOVEMENT TOWARD COMPREHENSIVE MSW MANAGEMENT

The Evolving Nature of MSW Policymaking

The challenges facing State and local governments today in formulating effective MSW management policies have their roots in the evolution of MSW management over the past two decades. In the late 1960s, as the country became increasingly aware of the environmental impacts of past disposal practices and concern over air pollution sources grew, many communities began to phase out open dumps and open burning of MSW, as well as the burning of MSW in relatively uncontrolled incinerators. In the 1970s, attempts were made to improve land disposal through "sanitary landfill" practices and to experiment with new technologies to reclaim materials from waste and/or bum the remainder for energy recovery purposes (e.g., refuse-derived fuel technology).

In the 1980s, the limitations of these efforts became apparent as environmental concerns (e.g., groundwater contamination from existing landfill sites) became more apparent (ch. 7). A dilemma grew clear: just as permitted landfill space became increasingly scarce and expensive, especially in more densely populated areas, the lack of readily available alternatives became evident. Some alternatives, such as incineration, generate intense public opposition primarily because of concerns about potential environmental impacts and high costs. Other MSW alternatives, such as recycling, suffer from difficulties associated with market uncertainties.

In many areas, public pressure exists to investigate and support recycling at least as aggressively as landfilling and incineration when devising solid waste management systems, and also to address the

[2] A number of publications are available which surveyed State activities and innovative programs (see e.g., 54,86,150).

need for waste reduction activities.[3] Increasingly, communities and States are devising comprehensive or 'integrated' MSW plans that consider a range of MSW options and then coordinate their use based on some presumed hierarchy. EPA, and many State and local governments, have explicitly adopted waste hierarchy and integrated waste management approaches for MSW, but the implications of such approaches do not appear to be generally well thought out.[4]

OTA finds a waste hierarchy can only be meaningfully applied to MS W when waste is managed on a materials management basis, that is, on a material by material basis, not generically as mixed MSW (ch. 1). A waste prevention and materials management approach is a more comprehensive approach to MSW than an integrated waste management approach. In any case, whatever approach a State or local government adopts, careful planning is key. Adequate resources, however, as well as sufficient authority or control over certain aspects of the MSW system, are not always available to local officials as they grapple to establish viable and publicly acceptable policies.

Yurtown and the Rest of the Nation

After nearly two decades of experimentation with MSW management alternatives, the Nation continues to landfill most of its waste—and approximately 40 percent of this waste goes to nonpermitted facilities (145). States and localities continue to search for new strategies to improve the management of the ever-growing amounts of MSW. As illustrated in the description of the experiences of the hypothetical town, Yurtown (box 8-A), localities across the Nation have continually adjusted their MSW management practices as Federal and State governmental programs have changed and MSW management options have developed.[5]

The management options available to localities, however, have always been affected by State and Federal activities. For example, in the 1970s as Federal and State air pollution regulations became more stringent, many localities were prompted to move away from municipal incinerators and develop recycling programs and a greater reliance on landfilling for MSW. In the mid-1970s, when the energy crisis spurred the establishment of a Federal waste-to-energy program, communities were encouraged to apply for planning grants for MSW incinerators. The passage of PURPA in 1978 further supported the development of municipal incineration. Today, as more stringent State regulations are implemented for landfill operations, municipalities making MSW policy decisions are again faced with a climate of change (1 14).

Many factors combine to determine the most suitable variation of MSW management practices at any given location. These factors include: the degree and type of governmental regulations; the particular geological and environmental conditions of the area; and the level of public concern and the public's general disposition and attitudes toward MSW management. For instance, some communities are more receptive to voluntary versus mandatory recycling programs; some communities are opposed to the use of waste-to-energy facilities because of health and environmental concerns.

The tremendous variation in the demographics and topography of our Nation is clearly reflected in the types of waste management methods practiced. Even a brief review of available national data on State MSW programs indicates striking variation across the country (18).

[3]Numerous polls indicate that consumers strongly support the use of recyclable. For example, a Gallup poll found that over 50 percent of the respondents would change their purchasing habits to buy recycable containers; a National Solid Waste Management Association survey found that over 40 percent of the respondents supported taxes on packaging and nonrecyclable materials to fund recycling programs; and a Schoen Associates poll found 91 percent of the respondents willing to pay a few cents more for recyclable or biodegradable products (87,98).

[4]Nearly all discussions about solid waste accept the premise that there is a hierarchy of management options that starts with "waste reduction," proceeds to recycling (and comporting), incineration (and other treatment methods), and finally considers land disposal. In general, the hierarchy refers to an ordered set of preferences, based on supposed levels of human health and environmental risk. A hierarchy for management of hazardous waste is in fact widely employed today. Its application to MSW may be more problematic (ch. 1). Combining the hierarchy with an "integrated waste management approach" may have some utility, since both reduction and management can be used together, but in most applications an integrated waste management "hierarchy" for MSW is nonlinear. For example. EPA's discussion about integrated management states that "source reduction and recycling are the preferred options' (151). EPA approach also considers incineration and landfilling as equally preferred options.

[5]Even though a typical town in our diverse nation is impossible to describe, a snapshot of a hypothetical town, Yurtown, illuminates the problems that are common to many real communities. Every event in the Yurtown snapshot occurred somewhere in the country during the past two decades.

Box 8-A—Yurtown: A Hypothetical Town

Yurtown is a middle to upper-middle class suburb of a medium-sized city (population *250,000)* and has a population of about 50,000. The county, Mye County, has a population of nearly 1 million and generates about 2,000 tons a day of MSW. Like many areas in the country, Yurtown, its county, and State are grappling with a number of MSW management issues. Prior to 1968, open burning and dumps were the primary disposal method in Yurtown. Several open dumps operated in the rural parts of the township, usually sited in gravel pits or swamps. Some of the residents in the more rural areas of the township dumped their wastes in gullies and/or burned their garbage in 'bum cans" (i.e., 50-gallon drums) on their property. Like most towns, Yurtown imposed few controls on these dumps. Consequently, hazardous wastes and other materials could be disposed of easily and smoke, odor, rodents, flies, blowing paper, and contaminated run-off were common.

In 1969, as Yurtown and the entire Nation became more conscious of environmental impacts from our society's activities, the State passed a law and established an air quality rule banning open burning. The State also directed the newly created State environmental protection agency to adopt standards, regulations, and variances regarding MSW. Under this authority, in *1970,* the State agency adopted rules that required the closure of open dumps and placed operational controls on permitted facilities. In 1972, Federal guidelines for land disposal facilities were adopted and State requirements were revised accordingly. Most of the open burning at dumps ceased in Yurtown at this time, although many of the dumps continued to operate until newer sites could be located and permitted. As environmental consciousness became more prevalent, some community groups and neighborhoods in Yurtown organized recycling efforts. These were largely private citizen-sponsored activities, not town-supported efforts, although some funds from the State government were available.

By the mid- 1970s, the energy crisis heightened concern over the use of resources. The Resource Conservation and Recovery Act passed by Congress in 1976 required the closing of all remaining open dumps and encouraged resource recovery of materials (through recycling) and energy (through incineration). Yurtown now had one of three permitted sanitary landfills in Mye County. The recycling programs were diminishing in size and impact, caused primarily by lower market values for the materials as a result of normal market fluctuations. At roughly this same time, the State and county expanded their involvement in MSW management. The State defined MS W goals (similar to those of RCRA), coordinated MSW management among local jurisdictions, and facilitated the development of waste facilities.

In the case of Yurtown, the county began to work with a major company to secure the construction of a resource recovery facility. The refuse-derived fuel plant (designed at 2,000 tons per day) was designed to handle all of the county's MSW and would require importing some MSW from surrounding areas. It cost over $50 million to build and its official start up was in 1978. The facility was designed to recover magnetic and non-magnetic metals and mixed glass for recycling and refuse-derived fuel (RDF) to be used by the local utility company. Some State and Federal funds supported the facility's construction and operation. The Public Utility Regulatory Policies Act (PURPA) of 1978 guaranteed the sale of any energy recovered by the facility to the local utility.

By the early 1980s, recycling efforts were almost nonexistent in Yurtown, the RDF facility was experiencing operating difficulties, and newly adopted State landfill regulations, combined with near-full capacity conditions, would ultimately lead to the closure of all but the Yurtown landfill in the county. The town and county were having difficulty finding suitable sites for new landfills, and a request for a permit to expand the Yurtown landfill was made to the State. The State now required county MSW plans to address certain goals for MSW management contained in the State's MSW plan. The State had authorized flow control for waste-to-energy facilities and had continued some support programs for low technology waste management options. Many of these efforts and programs were discontinued, however, during the recession of 1982-83.

In 1984, the RDF facility closed. No new landfills had been sited in the county and by 1987, the Yurtown landfill was expected to reach capacity. A park had been built over one of the landfills and the waste management company that now owned and operated the Yurtown landfill was exploring the possibility of methane recovery at that site. Approximately 87 percent of the county's MSW was now being sent 90 miles away to another private landfill and disposal costs were increasing dramatically. At about this time, the county executive proposed to build a new mass bum incinerator, next door to the RDF facility, which would be a MOO-ton-per-day facility and cost approximately $125 million to build. Again, a facility of this size would necessitate the importation of MSW from other jurisdictions.

The proposed plan for the incinerator and RDF facilities became a campaign issue and ultimately, given the concerns over the poor past performance of the RDF facility and concerns over the potential environmental effects of air emissions and ash from the proposed incinerator, the county executive was voted out of office and the proposal was shelved. The public was also concerned over possible groundwater contamination near old landfill sites and continued to oppose the siting of new landfills.

The State did grant the landfill in Yurtown an expansion permit. Nonetheless, about 90 percent of the county's waste is being transported to other areas for landfilling. Landfill costs have risen four-fold for Yurtown in the last decade and concerns over current MSW management practices have risen commensurately. A county survey found that about 80 percent of the citizens were willing to separate their waste as part of a recycling effort. A county recycling coordinator was hired in 1988 to develop a county recycling program. Meanwhile, Mye County continues to pursue siting anew landfill. One of the proposed sites is in Yurtown. The county is also reevaluating the necessity or desirability of an incineration facility for the area and how this management alternative could be coordinated with recycling and landfilling options.

For example, while some States report they have 5 years or less of permitted landfill capacity currently available, other States report no capacity problems at all (ch. 7) (16,17,145). Variation can also exist within a State, particularly between urban and rural areas. Among the States, four report recycling more than 15 percent of their MSW, while over half estimate that 5 percent or less of MSW is recycled (16, 17).[6] Waste-to-energy facilities also are not an evenly distributed MSW management option. As of 1986, approximately 35 percent of the existing facilities were located in the Northeast, while only 7 percent were found in the Plains/Inter-Mountain and Pacific coast regions.

This variation in the types of MSW management options used in different regions of the United States reflects the difference in the nature and degree of problems associated with MSW. Naturally, this variation is also reflected in the types of policy programs articulated in these areas and has implications for any further policy development by the Federal Government. These diverse national MSW experiences underscore the importance of coordinating government efforts and carefully articulating a Federal involvement that recognizes regional variation.

MSW PLANNING

Local Planning

As noted, the primary responsibility for administering MSW management programs lies with local governments. Indeed, until recently MSW has been managed almost exclusively by local governments. **As State** governments have begun to take a more active role in MSW management, and the Federal Government is reconsidering its role, localities face ever more complicated conditions for MSW planning and management. Given that most implementation still continues at the local level, however, local MSW plans are a key part of MSW management efforts. Indeed, in some States their role maybe most determinative of MSW policy actions.[7]

[6] The national recycling data from Franklin Associates are based on a materials flow calculation, while State data are likely 10 be calculated on different bases (such as within-State surveys of some sort). Thus the two types of estimates are not directly comparable.

[7] In this assessment, the term "local" includes both county and municipal levels of government. The split of responsibilities between these levels varies throughout the country. In some cases, counties are responsible for the operation of MSW facilities and municipalities are responsible for the collection and transportation of MSW; in other cases each level of government may have these responsibilities.

Considerable variation exists in local MSW plans. Although the details of local plans will not be discussed here, it is worth noting the major components of most plans before focusing on the important relationship between local and State governments in MSW planning. Local MSW planning is an ongoing, action-oriented process. Components of municipal plans may be required by county (or State) governments, and in turn county plans may have to meet State requirements. State plans to receive EPA approval must also meet requirements as defined by RCRA, but most States' planning processes are more comprehensive than that prescribed by the Federal requirements.

The local MSW planning process is likely to involve a number of studies: an engineering estimate of remaining solid waste capacity; a waste composition study; a recycling plan; an incineration feasibility study; analysis of ownership alternatives for MSW facilities; analysis of alternative pollution control equipment, facility size and stack height of incinerators; assessments of potential sites; possibly preliminary environmental and health assessments; and some assessment of public concerns over MSW alternatives. This information is then used by the local planning body (e.g., the county board, town council, or a designated planning board) to outline the best long-term and interim solutions to address the locality's MSW problems.

Typically, a local MSW plan will include some combination of management alternatives and goals for local reduction and recycling efforts. Interim solutions might include extending the permit of an existing landfill, which will be upgraded or closed when new management capacity is available. Long-term plans might include the development of transfer stations, a new landfill, an incineration facility, and/or a collection program for recyclable materials. Local plans involve some regional cooperation in the construction of new MSW facilities and/or arrangements for the use of facilities in other jurisdictions.

According to the U.S. Conference of Mayors, at least four concerns are uppermost in local officials' minds as more regulatory, management, and planning requirements are imposed on localities. These are: 1) any liabilities these additional requirements might entail for the municipalities; 2) the adequacy of the local government infrastructures to meet or adapt to mandated requirements; 3) the impact on the localities' ability to site and finance needed MSW facilities; and 4) the effect on the continuity of existing MSW programs (71).

The critical equation for local officials to balance is achieving effective planning for MSW programs with limited resources while State and Federal requirements for MSW management increase. Given the continually evolving nature of MSW policies, incorporating flexibility into a waste prevention and materials management approach is critical to effective implementation.

Key factors in devising effective local MSW programs, according to participants at an OTA workshop,[8] include: 1) identifying resources (e.g., information exchanges, technical assistance on available options and other resources); 2) collecting site-specific data on waste quantities and composition to analyze appropriate MSW management options; 3) developing public outreach (e.g., public education and participation) to develop a common perspective and share responsibility for MSW problems in the community; 4) clarifying the regulatory regime (e.g., link planning to permitting; clarify definitions/policy directions); 5) devising funding strategies or sources for new programs; and 6) identifying implementation options (e.g., assess siting prospects, flow control issues, and market development).

How States and localities share in these activities for devising MSW programs varies. In some States, such as Rhode Island and Delaware, the State government assumes a primary and central role in MSW management and local levels of government are not highly involved. In other States, such as New Jersey and Missouri, the State's role is less pervasive and counties and/or municipalities have a more primary role in MSW management.[9] Sometimes planning appears to be uncoordinated. In most cases,

[8] This list is a composite developed by the State and local officials who participated in the OTA Workshop on State and Local MSW Programs, March 17-18, 1988. Examination of State and local programs confirms at least the importance of these factors.

[9] Other States that report primary authority for MSW management at a local level are Arkansas, Connecticut, Kentucky, New York, North Carolina, Utah, and Washington (16, 17).

however, there is some cooperation between the levels of government within States, which can greatly improve MSW efforts. In some States, particularly those in New England where municipal governments are traditionally strong and active, the State and municipal governments may work together closely. Other State governments work more closely with the county level of government, as is the case for Michigan, South Carolina, Idaho, and several other States (16,17).

New Jersey and New York State exemplify situations in which the State government articulates goals, provides information, and establishes baseline regulations and directives to guide local MSW actions. In New Jersey, for example, a detailed planning process is outlined in the New Jersey Solid Waste Management Act Amendments of 1975 (Chapter 326), which sets rigid timetables and clear delegations of responsibility. The law is an attempt to move the State away from the past's uncoordinated and largely piecemeal approach to MSW management and build "a cooperative checks and balances strategy toward comprehensive long-term management' (1 17). The responsibilities are shared between the 21 counties, one special district, and the State. The counties and district assume primary responsibilities, including:

- 10-year Solid Waste Master Plan development;
- technology selection;
- site selection;
- permit application submission;
- project financing; and
- implementation.

The State's role is one of overseer and regulator. The New Jersey Department of Environmental Protection's functions include:

- State-level review coordination (including review and approval of county and district plans);
- c plan amendment certification;
- permit application review;
- construction and operation permitting;
- compliance and enforcement monitoring; and
- State funding.

The State, after more than a decade of effort, believes that the long-term planning process ***has*** been successful and that it will reach its goal of self-sufficiency in MSW management (i.e., waste will not be shipped out of the State for disposal) by 1992. Long-term project development has been hindered, however, by problems siting facilities and the changing nature of landfill and resource recovery facility design. These have delayed specific technology selection and submission and review of permit applications (1 17).

In Missouri, local governments have full authority for MSW management. The State reviews and approves local MSW management plans. regulates permitted facilities, takes enforcement action against illegal dumps, and provides technical assistance. The Missouri Department of Natural Resources, based on studies and its assessment of MSW activities throughout the State, has identified the key social, environmental, technological, financial and market-related, and institutional factors which determine the success of a locality's materials recovery, comporting and waste-to-energy projects (77). These types of factors are likely to be important to local planning in any State.

State Planning

In most States, primary responsibility for **overall** MSW planning lies with the State (16,17). A major focus of Subtitle D of RCRA was to encourage (not require) the development of State solid waste management plans covering MS W and other nonhazardous solid wastes to foster intergovernmental and public/private cooperation (App. 8-A). Federal technical and financial assistance was offered to States and localities as an incentive to develop the plans (Sections 4002-4003; Sections 4006-4008). Federal funding dwindled to zero in the early 1980s, however, and as a result some of the current State plans may not be formally EPA-approved. Most States continued the planning process for their own purposes and variation among State plans exists.

Given the voluntary nature of the State planning process and concern over the general effectiveness of past MSW management programs, some observers are critical of the State planning process (133). Congress could address this issue as part of the RCRA reauthorization by requiring that States submit plans and that the plans address certain MSW issues *with* national implications (ch. 1). Although RCRA lists some requirements that must be met if submitted plans are to be approved, some of these

may no longer be relevant and new issues may warrant inclusion (ch. 1). For example, some topics for State plans to address include provisions for capacity assurance, a siting process, and reporting composition and generation data. Incentives, for example in the form of technical assistance, could be granted to a State if its plan was submitted and approved by EPA and/or funding decreases or other penalties could be imposed if a State did not submit a plan.[10] State solid waste plans thus could be important to national MSW prevention and materials management efforts (e.g., through their impact on increased interstate transportation of MSW, or their contribution to a national database for MSW and recovered materials).

In any case, most State MSW plans are just that, *plans.* That is, they are general statements of the direction the State anticipates focusing MSW management efforts within a time period, usually between 5 and 10 years. The level of specificity of the plans is usually not high, although they do represent an attempt at a comprehensive assessment of MSW management for the State. The plans usually contain an overview of the State's current MSW situation, including the amounts and composition of MSW, the use of various management methods, variation within the State, and any problem areas. In addition, the plans explain new objectives and programs and outline how existing efforts will be modified. How State efforts will be coordinated with municipal and possibly regional efforts may also be included.

One goal of most State solid waste management plans is 'integrated waste management. " Integrated waste management is basically the recognition that some combination of waste management methods (e.g., recycling, incineration, and landfilling) is necessary to ensure more efficient and environmentally sound MSW disposal. The waste prevention and materials management approach presented in chapter 1, although not explicitly embodied in any current State plan, is not inconsistent with an integrated approach. Indeed, the prevention and materials management strategy described by OTA may clarify some of the distinctions and interrelationships now blurred in many of the existing plans' articulation of "integrated waste management. " A prevention and materials management strategy could be required in State plans (ch. 1).

At least 12 States have legislation requiring recycling (or the opportunity for it). A larger number of States and localities have set goals for recycling a certain percentage of MSW. The range is from 15 to 50 percent, but usually the recycling goal is about 25 percent. Of course, how recycling is defined and which portions of the MSW stream are included in calculating the percentage affects the recycling rate figure. States may also project the amount of MSW to be managed by source reduction, incineration, and landfilling.[11] The State of Michigan, for example, has set an overall goal to reduce the use of MSW landfills by 70 percent and projects that it can reduce its waste by 5 percent, recycle 25 percent, reuse 5 percent, compost 6 percent, incinerate 40 percent to recover energy, and landfill 19 percent. Other States only set a goal for recycling; for instance, New Jersey has a recycling goal of 25 percent.

In 1986, EPA issued a report as part of its mandate from the Hazardous and Solid Waste Amendments (HSWA) of 1984 to survey and assess the adequacy of national Subtitle D activities (145). EPA reported that in 39 States and territories, 2 to 8 different agencies administer parts of the State's MSW program (usually solid waste and water-related agencies were listed). In the other 15 States and territories, only one State agency administered Subtitle D activities.[12] The number of agencies involved in State MSW management presents a challenge to efforts to achieve a more integrated waste management approach (145).

In most cases, State MSW plans have been revised recently or are in the process of changing. Indeed, State activities in general are in a state of flux. Almost every State in the country has several pieces of legislation related to MSW pending or recently passed. In some States the flurry of activity

[10] Federal involvement in encouraging the development of State solid waste planning began with the Solid Waste Disposal Act of 1965, which provided grants to States to develop statewide solid waste management plans and designate a single implementing agency. By 1975, all States had adopted some form of solid waste regulations, although tremendous variation existed among them (68).

[11] Source reduction, however, is defined differently by different States and often includes recycling. The definition may differ than that used by OTA.

[12] It should be noted that Subtitle D wastes are a larger universe than MSW as defined in this assessment. EPA believes that other State agencies may be administering parts of Subtitle D activities that were not reported since they are not generally recognized by these agencies as Subtitle D activities.

is almost too fast to follow; for example, in California close to 50 bills were pending in the legislature in early 1988 and others continue to be introduced. Administering agencies are also reorganizing and changing in response to the increased emphasis to MSW issues.

Despite the recent attention directed to recycling, most current State MSW activities are focused on landfill management. According to EPA, 41 percent of the estimated total number of hours spent on Subtitle D activities (which would include management of landfill operations) by States were spent on surveillance and enforcement activities. Permitting and licensing accounted for almost 28 percent, and technical assistance accounted for 9 percent. Planning, regulation, development, training, and research accounted for the remaining hours (145).[13] Respondents to EPA's survey indicated that surveillance and enforcement, followed by technical assistance, and permitting, and licensing, are the most important activities for improving overall Subtitle D program effectiveness (145). This assessment could change, however, as new programs are established to address recycling, source reduction, and other MSW issues.

There is tremendous variation in the staffing of MSW activities by States, with a reported range from zero to over 200 (16,17). [14] Utah reports the smallest staff—no professionals working on solid waste activities-while Pennsylvania reports the most, 212 professionals employed (16). EPA's census indicated that 10 or fewer persons were allocated to Subtitle D activities in 22 States and territories, 10 to 25 persons were allocated by 15 States and territories, and 25 or more persons were allocated by 10 States and territories (145). In many States, the staff allocations for MSW activities are increasing as MSW programs are dramatically expanded. Yet, as in many areas of public policy, staffing and funding resources rarely are commensurate with what is necessary to fully develop quality programs.

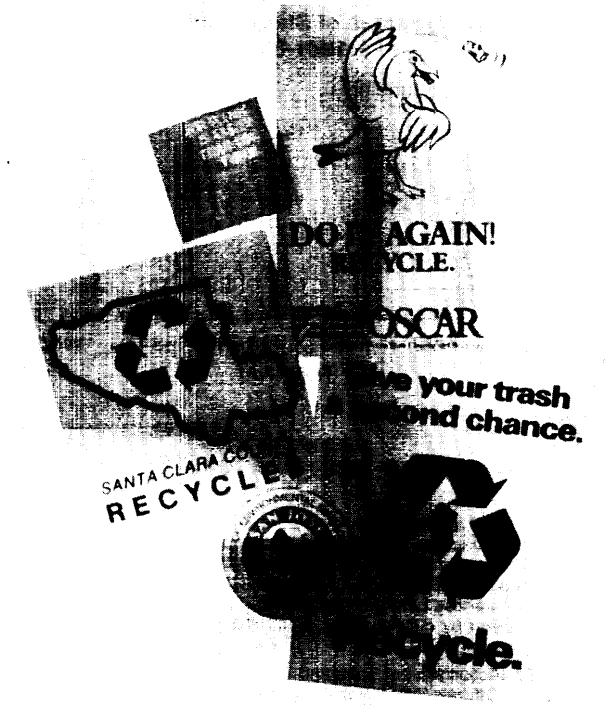


Photo credit: Office of Technology Assessment

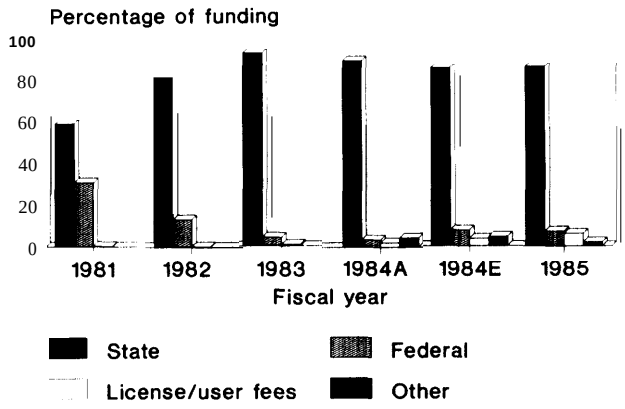
Many States and communities have adopted slogans and logos to symbolize and promote their recycling efforts.

EPA provided Federal funds to help States fund Subtitle D programs from 1971 to 1981. Under this program, the Federal Government provided 25 percent if the States provided 75 percent. Federal grant money peaked in 1979, but dropped to zero in 1982 after the Reagan Administration's budget reductions (18). Since 1982, States have had to support Subtitle D activities essentially on their own. In 1981, the State provided 79 percent of the budget, while the Federal Government provided 21 percent; in 1984, the State provided 95 percent of the budget, and the Federal Government provided only 2 percent (some Federal funding did continue in water programs) (figure 8-1). EPA's survey indi-

[13] Data from the Association of State and Territorial Solid Waste Management Officials' survey generally SUpport these findings (5,18).

[14] Discrepancies exist among the available estimates of the total number of people working full-time on Subtitle D issues. The most recent estimate is 1,098 full-time professionals (16). Based on information from 1984, EPA Previously reported 858 full-time professionals and ASTSWMO reported 787 full-time equivalents (including clerical). The reliability of any of these estimates is questionable and the discrepancies maybe due to the different number of States reporting, the definitions assumed by the respondents, the different yews* surveys were taken, etc. Further, they may overestimate the number of persons working only on MSW, because they include all Subtitle D and all solid waste activities (18).

Figure 8-1—Sources of State Subtitle D Budgets, 1981-85



NOTES: "Other' includes district funding sources in Idaho and environmental license plate funds in California Data for years 1981 to first 1984 column (labeled 1984A) are from ASTSWMO; data for second 1984 column (labeled 1984E) and 1985 are from EPA. Differences between ASTSWMO and EPA data in 1984 maybe caused by differences in methodologies and number of States reporting.

SOURCES: Association of State and Territorial Solid Waste Management Officials (ASTSWMO), *National Solid Waste* Survey (Washington, DC: October 1984); U.S. Environmental Protection Agency, *Census of State and Territorial Subtitle D Non-Hazardous Waste Programs,* prepared by Westat, EPA/530-SW-86-039 (Washington, DC: October 1986).

cated that these trends continued for FY 1984 and FY 1985 (145).

License and user fees are increasingly important sources of funding for State MSW management (figure 8-1) (5,145). It remains to be seen, however, whether State funding will keep pace with the expanding scope of MSW activities. In the past, most States (28) have allocated less than $500,00 per year for Subtitle D activities; 13 States have budgeted between $500,000 and $1 million, while 7 have spent over $1 million (145,149).

Regional Planning and Cooperation Efforts

Some regional cooperation within or between States is planned or exists. Such cooperation is increasingly desirable given the siting difficulties, high costs, and capacity issues associated with planning and developing integrated MSW facilities. Regional efforts are particularly advantageous for local MSW management in some rural areas. For example, the Land-of-Sky Regional Council, a Council of Governments organization in North Carolina, represents a four county region in western North Carolina. It includes the Regional Solid Waste Alternatives Committee, which is charged to spearhead solid waste projects in the region (including MSW management plans, feasibility studies for waste-to-energy plants, and waste composition studies) (80).

The Land-of-Sky Regional Council recently completed a nationwide survey of MSW activities of Regional Councils of Government and Development Districts. Thirty-seven States responded. In all regions of the country, "lack of landfill capacity" was identified as a significant concern (18,80). Differences in the nature of MSW concerns in different regions also were evident. In the Midwest, tipping fees and ''intercounty and interstate transfer of waste" received more attention than in any other region. In the Southeast and Central regions, 'problems with solid waste collection" and "illegal and open dumps" were identified as two issues of importance for MSW management (18,80). The critical MSW issues identified by regional governmental entities are the same as those identified by States and municipalities (133).

States also have begun to coordinate some efforts, in particular to support recycling efforts through an exchange of information and some coordination and facilitation of marketing secondary materials. The most formal regional recycling organization is in the Northeast: the Northeast Recycling Coalition (NERC) of the Eastern Regional Conference of the Council of State Governments. NERC, formed in 1988, consists of the recycling directors and representatives of the State legislatures of Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode island, and Vermont. The group meets quarterly, and publishes a newsletter to exchange information about State innovations and research (22).

One NERC project, "Developing a Regional Approach to Buying Recycled Paper Products," addresses matters such as definitions and percentages for the various types of recycled paper products, cooperative purchasing agreements among and within States, and standard vendor certification format and procedures. In addition, discussions at NERC meetings have addressed New York State's proposed packaging tax and similar legislation, research being

conducted in each State, and areas in need of research (22). Independently, the Coalition of Northeastern Governors (CONEG) issued a policy statement about the reduction of packaging(11) (also see "Waste Prevention" below).

In the Midwest, a more informally organized regional effort exists. Every 3 to 6 months, recycling officials from the following States and one Canadian Province have been meeting: Arkansas, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Wisconsin, and Ontario, Canada. This regional effort has discussed plastic packaging and paper markets. The meetings help States exchange information and update the status of their activities. The group is seeking to expand their meetings into a national effort and are cooperating with the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) to establish a Waste Reduction/Recycling Committee (lo).

In the West, some effort to form an informal "compact" for recycling is being discussed. The States interested in such an activity are Alaska, California, Idaho, Oregon, and Washington (4). No government-level regional efforts in the Southwest and Southeast were identified. However, regional efforts between States are sometimes part of Council of Governments efforts. For example, county and municipal public works officials in Virginia, Maryland, and the District of Columbia meet to discuss how to attract recycling industries to their region. Their efforts have thus far focused on markets, cooperative purchasing of recycled products, and coordination to sell secondary materials (22,33).

SPECIFIC MSW PROGRAMS AND POLICY DEVELOPMENTS

Many State and local MSW programs are so recent in their development that there is little implementation history to evaluate. This chapter, however, presents examples of past as well as present MSW management experiences in an attempt to evaluate how the range of waste management and programs being adopted by particular States and localities are being implemented. For example, it is possible to *examine* some existing management alternatives and the plans for other programs, such as waste reduction. This section looks at current policy and programs related to waste reduction efforts, recycling, resource recovery and landfill disposal use, and possible future trends. Special programs for particular problem wastes, such as household hazardous wastes, tires, and comporting are noted.

Although this section focuses on State and local programs, it also reviews some Federal activities related to MSW management. EPA has the broadest Federal authority for regulating MSW activities (see "Environmental Protection Agency" below). Other Federal agencies also have key roles in particular aspects of MSW management (see discussions under "Waste Prevention," "Recycling,' and ' 'Incineration"). Even a cursory review of Federal activities shows the uneven and uncoordinated nature of past Federal MSW efforts. The need for a more comprehensive approach to MSW issues, by all levels of government, is clear.

Environmental Protection Agency

In 1988, EPA completed a major assessment of the adequacy of the current Subtitle D program for Congress (ch. 7), proposed new landfill guidelines, and established a special task force to examine broader MSW issues and outline an agenda for agency actions regarding MSW (147,149,1 51). Many of the specific actions recommended are described in chapter 1 and thus are mentioned only briefly in this chapter.

EPA's implementation of RCRA's solid waste provisions has been described as "tardy, fragmented, at times nonexistent, and consistently inconsistent" (66). This view is borne out by even a cursory examination of EPA's actions. According to Subtitle D of RCRA, Federal criteria for landfills form the basis of State regulations. However, the current Federal criteria are general and incomplete. For example, the Federal criteria do prohibit contamination of groundwater used for drinking water, but do not require any monitoring or specify corrective action requirements. Also, no Federal provisions related to closure, post-closure, or financial responsibility exist (40 CFR Part 257; ref. 149). The 1984 amendments to RCRA, the Hazardous and Solid Waste Amendments, required EPA to revise Federal criteria for solid waste landfills to ensure the protection of human health and the environment.

Chapter 7 discusses in greater detail the new proposed landfill criteria and the effect of the Federal criteria issued in 1979 (53 *Federal Register 33314).*

EPA has initiated some regulatory activity on air emissions from MSW incinerators, but generally it has been criticized for its slow pace. Based on emissions from new and existing MSW incinerators, EPA has documented risks to human health and the environment which warrant regulatory action (ch. 6). EPA and congressional approaches to regulating MSW incinerators differ, however, in significant ways (e.g., in emission limits) and contentious debate continues over how to regulate MSW incinerator ash (see ch. 6).

In 1976, RCRA required agencies to begin procurement of recycled products within 2 years. EPA was to establish procurement guidelines. Until recently, however, all three agencies with some Federal responsibilities for recycling—EPA, the Department of Commerce, and the Office of Policy Procurement (General Services Administration)-largely failed to encourage the Federal Government to use items containing the maximum amount of recovered materials as intended by RCRA (see "Procurement" below). The Department of Commerce, through the Office of Recycled Materials of the National Bureau of Standards, however, engaged in some activity (see "Recycling' below).

In 1980, in light of EPA's inactivity, Congress added specific deadlines requiring that procurement guidelines for certain materials be set by May 1, 1981, while guidelines for two other areas were due by September 30, 1982. The deadlines were missed again and the 1984 Amendments established a 1985 deadline for EPA to establish guidelines for paper products, tires, and two other materials. Four environmental groups (Environmental Defense Fund (EDF), Environmental Task Force, Coalition for Recyclable Waste, and the National Recycling Congress) sued EPA in 1987 to issue procurement guidelines and requested the Federal court to place EPA on an expedient schedule. 's A consent decree in the case required that these guidelines be finalized and also that EPA continue to explore additional product categories appropriate for guidelines.[16]

EPA, meanwhile, had issued only one final guideline addressing cement containing fly ash. In 1984, EPA proposed guidelines for recycled paper; in 1986, it presented a proposal for asphalt materials containing used tires; and in 1987, it proposed a guideline for re-refined lubricating oil. However, none of these proposals had been issued in final form. After the lawsuit was filed, however, EPA did issue the paper guideline in final form (52 *Federal Register 37293).*[17] In addition, EPA proposed an amendment to the paper guideline that would create minimum content standards (52 *Federal Register 37335).* Soon after, EPA also issued a proposed guideline for re-refined lubricating oil (52 *Federal Register 48388).* EPA issued final guidelines for purchase of paper on June 22, 1988; oil on June 30, 1988; tires on November 17, 1988; and insulation materials on February 17, 1989.

In 1989, EPA's MSW Task Force proposed a number of activities to increase waste reduction and recycling (chs. 1 and 4; ref. 151). In addition, the task force report suggests schedules for EPA's MSW activities.

MSW Prevention

Several Federal agencies have programs or statutory authorities that could be applied to help reduce the quantity or toxicity of MSW. These agencies include, for example, EPA, the Food and Drug Administration (FDA), and the Consumer Products Safety Commission (CPSC).

EPA had an active program investigating MSW reduction in the 1970s under the authorities of the Resource Recovery Act of 1970, which called for studying production and packaging practices to reduce waste generation (93). EPA created a waste reduction branch that studied, for example, beverage container deposits, milk packaging, and tires. Waste reduction options and activities were the subject of four EPA reports sent to Congress in the mid-1970s

[15] *Environmental Defense Fund, et al. v. EPA, No. 87-3212 (D. D.C.).*

[16] *Environmental Defense Fund v. Thomas, No. 88-1003 (D.C. Cir.).*

[17] In January 1988, EDF and the National Recycling Coalition filed a petition for review of the EPA's final paper guideline in Federal court in an attempt to address the substance of the guidelines *(Environmental Defense Fund and National Recycling Coalition v. Thomas).* For EDF's critique of the guidelines, see ref. 52.

(e.g., 141). Recently, EPA signaled its intent to reconsider MSW reduction (151). It took an initial step in this process by sponsoring a dialog on MSW reduction in 1988 (12).

The Food and Drug Administration also has authorities that could affect the composition of MSW. For example, FDA regulates food additives; some packaging materials; color additives in foods, drugs, and cosmetics; and various food constituents (132). FDA regulations require that food packaging either not be likely to become a component of food at all (i.e., no migration into the product) or be safe in a given application. Although FDA clears some materials, much of the responsibility for evaluating the health and environmental implications of new food packaging is given to the manufacturers of the packaging. These evaluations generally are based on extraction tests that indicate whether potentially toxic substances can be extracted from food packaging materials. Recently, the FDA announced that it would prepare an Environmental Impact Statement on the effects of its proposed action on the use of polyvinyl chloride in food containers *(53 Federal Register 47264, Nov. 22, 1988).*

The Consumer Products Safety Commission has authority for all consumer products except foods and drugs, pesticides, tobacco and tobacco products, motor vehicles, aircraft and aircraft equipment, and boats and boat accessories.[18] CPSC can require labeling or packaging as control measures against accidental or improper use of hazardous substances. The CPSC also can ban products. In 1978, for instance, the commission banned consumer use of any paint that contains lead or lead compounds in concentrations exceeding 0.06 percent. The commission's approach since 1981, however, has been toward voluntary standards developed in cooperation with industry (19a).

Several ongoing CPSC projects within the Chemical Hazards program are relevant to MSW prevention, even though their focus is harm from usage rather than from disposal. For example, one project is evaluating products containing methylene chloride, perchloroethylene (dry-cleaning fluid), paradichlorobenzene (room air fresheners and deodorizers), and 1,1,1 trichloroethane (a solvent).

Although few other countries have directly addressed waste prevention, West Germany has made strides to reduce **MSW** toxicity and quantity (box 8-B). For instance, the Federal Environmental Agency has studied ways for individual consumers to reduce waste generation rates (48), as has the City of Hamburg (43). The greatest value of these studies may lie in drawing attention to the possibility of MSW reduction (48). West Germany also awards an "Environmental Angel" logo (figure 8-2) to products considered beneficial on the basis of environmentally related criteria; over 2,200 products in 50 categories have received the award in the last 10 years (box 8-B). Canada is instituting a similar program, using a maple leaf and dove logo, and Japan and Norway are considering such programs (28,160).

State governments generally recognize the value of MSW prevention, but it has been difficult to translate this into clearly focused programs. Few States provide the types of positive incentives to manufacturers or consumers that OTA discusses in chapter 1 (e.g., information clearinghouses, grants, procurement, and awards). Most waste reduction programs proposed in State plans are broad and they often focus on recycling. OTA, however, considers recycling as a separate alternative from waste reduction (see chs. 1 and 4).[19]

Some States consider recycling together with reduction because recycling decreases the amount of MSW that needs landfilling. The Rhode Island Source Reduction Task Force, a leader among State groups involved in reduction efforts, devotes some attention in the State's reduction program to increased recyclability and use of recycled material (106). New York's solid waste plan sets a goal of 8 to 10 percent weight reduction by 1997 and lists six initiatives for potential legislation; three of these,

[18] CPSC acts under the authority the Consumer Product Safety Act of 1970 (Public Law 92-573). Action under the Act requires a finding of unreasonable risk of injury or illness. Under the Federal Hazardous Substances Act, CPSC can find that a substance will cause substantial personal injury or illness as a result of any customary use or foreseeable handling or use.

[19] Although OTA treats recycling and reduction separately, there may be some merit in a logistical sense for States to link the two. For example, one State official argues that reduction efforts are unlikely to receive financial commitments from State legislators unless they are linked with recycling programs that yield measurable results in a relatively quick period (49).

Box 8-B—Federal Republic of Germany: Section 14 and the Environmental Angel

West Germany has one of the most advanced approaches to MSW management of the industrialized nations. For instance, Section 14 of the 1986 Waste Avoidance, Utilization, and Disposal Act gives the government statutory authority to ban problem products. The act covers all products, not just packaging and containers, and focuses on materials that increase the amount or toxicity of MSW. When the government determines that a product contributes unnecessarily to MSW generation or contains toxic substances that hinder MS W management, the act requires one of three responses:

1) *Labeling-the* specified products can only be marketed if they have labels showing how to deal with the product after use (e.g., return to manufacturer or separate for municipal collection). This is intended to provide an incentive to industries to change product designs.
2) *Mandatory return—the* specified products can only be marketed if distributors offer the possibility of return or if they include a deposit on the products to encourage return. This gives manufacturers and distributors responsibility for waste management of products they market.
3) *Restrictions on circulation—if* restricted use or appropriate management of resulting waste cannot be guaranteed, then a product can be banned. These regulations can only be implemented after the government has first sought voluntary agreements with the industries involved. The ultimate effect of the regulations may be to act as a signal to industry.

Implementation of Section 14

Actions taken under Section 14 include: 1) proposals by the Environment Agency that list substances and products of concern; *2)* a voluntary agreement regarding household batteries; and 3) regulations for plastic beverage containers. Negotiations are proceeding on other plastic products and tinfoil caps for bottles. Discussions with the plastics industry about the effects of plastics on automobile recycling efforts are also ongoing.

The Environment Agency's Proposals

Thus far, proposals have been developed for various products or substances for which regulations might be issued if voluntary agreements cannot be reached with manufacturers. As of April 1989, the list included lead-acid batteries, tires, waste paper, drugs, ferrous scrap from households, scrap from electronic equipment, used tapes from typewriters and printers, toner cartridges from copiers, plastics containing fluorinated and chlorinated hydrocarbons, refrigeration liquid from household refrigerators, tinfoil bottle caps, plastic and metal foil from food packaging, fluorescent lamps, PCBs in household appliances, small PCB-containing capacitors (e.g., from fluorescent lamp starters), motor oil and oil filters and containers, and pesticide residues and containers (48). In 1988, the Agency proposed **mandatory return** for starters for electrical equipment and cars, fluorescent tubes, household batteries, and thermometers, and it drafted a regulation on halogen-containing solvents (48).

A Voluntary Agreement on Household Batteries

In 1987, a voluntary agreement on household batteries was reached between the government, the Association of Electronic and Electrotechnical Industries, and involved trade organizations (48). Manufacturers and importers agreed to reduce the level of mercury in alkali-manganese batteries from 0.5 to 0.15 percent by weight by 1988, with an option to reduce the level to 0.10 percent by 1990 and to less than 0.10 percent by 1993. Manufacturers also agreed to accept used alkaline/manganese batteries with mercury concentrations above agreed limits, nickel/cadmium batteries, mercury oxide batteries, and button-shaped batteries (e.g., from watch-makers and camera shops). If the percentage of returned batteries is deemed insufficient, the government could impose a mandatory deposit on the sale of new household batteries. One complicating factor is a guideline being prepared by the European Community on the mercury content of batteries. If the guideline is less stringent than Germany's voluntary agreement it is not clear how it would affect implementation of the voluntary agreement.

Mandatory Deposit of Plastic Beverage Containers

Before the 1970s, about 90 percent of Germany's beer, wine, and soft drinks were packaged in refillable bottles. This percentage declined in the 1970s as plastic and metal single-use containers became more popular. In 1977, the government and the beverage industries reached a voluntary agreement to stabilize the use of refillable and single-use containers, but the proportion of single-use containers continued to grow, reaching about 25 percent in 1986. The government is concerned that the refillable system might collapse economically if the percentage of refillable bottles drops much lower. and that this might increase MSW generation by about 20 percent.

Consequently, in November 1986 the government began to negotiate with the beverage industry to stabilize the use of refillable beverage containers. Government proposals involved specific percentages for different refillable bottles, increased recycling of throw-aways, and mandatory labeling. The beverage industry offered instead to reduce the types of bottle shapes and carriers (to make the existing deposit/return system work more easily), include some labeling information, and work on innovative packaging designs. In response, the government again proposed quantitative goals for different refillables and indicated that it would consider regulations on labeling, deposits, and obligations to accept returned containers if a voluntary agreement could not be achieved.

In late 1987, Coca-Cola announced the pending introduction of a new single-use container made of PET plastic. The beverage industry announced at the same time that it would build a recycling system to accept between 40 and 70 percent of these bottles. This added a new dimension to the negotiations. In spring of 1988, after no agreement had been reached, the government proposed regulations on plastic beverage bottles-the first time that Section 14's regulatory authority was to be used in this context. In December 1988, the government adopted the regulations, which required: 1) a deposit on plastic beverage containers with capacity between 0.2 and 3 liters; 2) all retailers, distributors, and bottlers to accept returned plastic beverage containers; and 3) labeling. The deposit is higher than the deposit on refillable glass bottles. The regulation became effective on March 1, 1989, although Coca-Cola had announced in January 1989 that it would not use the nonrefillable bottle. The regulation provides a one-year phase-in period for plastic beverage containers that had already been introduced.

The Environmental Angel

Prior to the 1986 act, the Environmental Agency had developed a special product label, the Environmental Angel, to highlight environmentally sound products. The logo, a blue angel in the middle of a blue circle (figure 8-2), is awarded to products that contain fewer toxic substances or are more recyclable than similar products. Over 2,200 products have received awards during the last 10 years, including water-soluble paints and floor coverings without asbestos. The label's main purpose is to give consumers information about environmentally improved products and provide a publicity incentive to manufacturers. A list of the products that can use the Environmental Angel logo and their manufacturers is published by the Environment Agency (20).

however, are more related to recycling than reduction (89).[20]

States and local communities have taken several approaches to developing MSW reduction efforts: packaging review boards, packaging taxes, bans on products, education of consumers, and toxics reduction legislation. Most have focused on implementing taxes or bans on particular components of MSW, usually packaging or plastic products, but potentially toxic substances are beginning to receive greater legislative attention. In addition, the governors of States in the Northeast have initiated a region-wide reduction task force to address these issues, and several States have initiated education programs.

Washington State was the first to establish an office of waste reduction, which also includes recycling activities. The Unit of Waste Reduction and Recycling of the State Department of Ecology, at least to date, focuses most of its activities on increasing public awareness, although some localities such-& Seattle are adopting b&s or taxes on nonrecyclable products. As with most State and local waste reduction efforts, however, waste reduction is not clearly distinguished from recycling, and recycling programs have received most of the attention thus far. Rhode Island has an innovative reduction program, primarily focused on education. It established a source reduction task force in 1986 to develop a research program, educational efforts, information-gathering forums, technical assistance to commercial establishments, and legislative initiatives (107).

Thus far, most State and local efforts to encourage post-consumer MSW reduction have consisted mainly of proposed bans of plastics or certain types of packaging and proposed packaging or product taxes. Some of these measures have passed; most are pending. Their main message and impact may ultimately be to encourage industry and society as a whole to consider the disposal implications of

[20]Fee on non-recyclable packaging, deposits on tires, price preference for recycled paper products,

Figure 8-2-West Germany's "Environmental Angel" Logo

SOURCE: Deutsches Institut fur Gutesicherung und Kennzeichnung, "Verzelchnis der Produkte und Zeichenanwender sowie der jeweiligen Produktanforderungen" (Bonn: June 1968)

products as they are made. The best way to encourage waste prevention may not be direct regulation by any level of government, but rather indirectly through education programs and incentives for industry and the public that focus on the importance of changing the nature of the Nation's waste stream (ch. 1).

Packaging Review Boards

The first packaging review board was established in Minnesota in 1973, when a law passed giving the Minnesota Pollution Control Agency authority to review new and modified packages sold at retail outlets (12,93). Although challenged, the courts eventually ruled that the law did not violate the interstate commerce clause, but also that the agency could only issue guidelines, not regulations. Minnesota also passed the Excess Packaging Act in 1977, which established a State board to review all new packaging in the State. Guidelines on packaging were not issued until 1980, and they apparently have had little effect, apparently because of perceived industry resistance and some administrative difficulties (12). Iowa passed a law modeled after the Minnesota statute, and it may soon have its first test case. Several other States also have proposed legislation to establish packaging review boards or study packaging issues.

Packaging Tax Proposals

Packaging taxes are also being proposed with increased frequency. In New York State, a Waste Reduction Packaging Tax of $0.03 was to be levied on non-food or fast-food packaging (i.e., deposit bottles and other food packaging are not included). According to the proposal, however, a packaging review board could apply a tax credit of $0.01 if the package is made of recyclable material, or if the product itself is recyclable. Also, the package could be exempted from the tax if it qualifies for both credits. The money collected from the tax would form the "Solid Waste Management Fund," to be used for activities such as remedial action at municipal landfill closure projects, grants for recycling, and technical assistance grants.

At least four other States have proposed packaging taxes similar to the proposed New York State legislation or tax incentives to encourage the use of degradable packaging. These include Iowa, Maine, Massachusetts, and Minnesota. The proposed taxes range from $0.01 to $0.05 per package and would be applied to either manufacturers or distributors.

The packaging tax concept has not been fully analyzed, particularly the relationship between the disposal costs of a package, the suggested tax rates, and MSW generation rates. Another problem is that the tax rate may be too low to induce change across the multitude of packaged products that industries sell. If manufacturers rather than retailers or consumers are charged the tax (to increase the likelihood of influencing packaging design), they can maintain their profit margins by passing the tax along in the price of products or they can decide that paying the tax is preferable to changing product design. Moreover, unless some special labeling is required on the packages that are subject to such a tax, most consumers will never know they are paying the tax. For high-priced items, the tax may be such a small portion of the cost that, even if known, it will be of

no consequence to the consumer. Thus, the tangible outcome of these taxing bills is likely to be revenue generation rather than changes in MSW generation.

Alternatives to packaging taxes and product bans are appearing. Recently, for example, a project to foster recycling of HDPE and PET plastics involving public-private sector cooperation was announced between the State of Illinois and the DuPont Co. The initial project, entirely funded by DuPont, will evaluate the viability of using reprocessed scrap plastics in highway construction and maintenance (99) (ch. 5).

Product Bans

Bans on the use of plastics in food packaging have begun appearing across the country.[21] This legislation is attempting to address concerns about: 1) the Earth's ozone layer and the potential for types of polystyrene made with certain chlorofluorocarbons (CFCs) to harm it (box 4-E in ch. 4); 2) solid waste, including the tendency for polystyrene/styrofoam to be nondegradable and nonrecyclable, as well as resistant to compacting (thereby requiring more scarce landfill capacity) (ch. 5); and 3) litter.

At least 16 States have legislation pending that would ban or prohibit the use of some plastic materials or polystyrene, or require the use of biodegradable materials. It is not clear how many of these proposals will actually pass into law. Examples, including examples of local efforts, include:

- Suffolk County, New York, passed a law on March 29, 1988, scheduled to take effect July 1, 1989, requiring that all retail food establishments within the county only sell food packed in biodegradable packaging. The law also bans the use of polyethylene grocery sacks and polystyrene or polyvinyl chloride in eating utensils and food containers sold or provided within the county by retail food establishments. The law was stayed by the New York Supreme Court in 1989 until its potential environmental impact is studied.[22]
- Rockland County, New York, and the City of New York have similar legislation pending that would ban the use of polystyrene foam food packaging.
- Minneapolis and St. Paul, Minnesota, passed legislation in 1989 that could ban the use of nonrecyclable plastic food packaging.
- Berkeley, California, in 1988 had one vote on a proposed ordinance to ban polystyrene foam food packaging. Another vote was pending and required for the ordinance to take effect. The City's Solid Waste Management Commission did ask fast-food restaurants to reduce nonbiodegradable packaging by 50 percent.
- Maine was the first State to pass a law prohibiting the use of polystyrene foam food packaging made with ozone-depleting CFCs, specifically CFC-11 or CFC-12. Minnesota and Rhode Island recently passed similar laws.
- Minnesota had a law that prohibited the use of plastic milk bottles but it was repealed. In 1987, however, the State enacted a law banning plastic beverage containers.
- One proposed law to control packaging in Missouri would ban the sale of multi-resin plastic containers. Connecticut has banned the plastic-aluminum beverage container.
- Disposal of yard wastes in landfills has been banned in Minnesota, effective in the 1990s.
- At least three States have had legislation introduced attempting to ban the use of disposable diapers. New Jersey and Rhode Island considered legislation to ban plastic tampon applicator.

Many of the proposed bans on polystyrene or other nondegradable plastic products require the substitution of degradable products. In particular, some proposed laws require State agencies to procure "ozone safe' and/or degradable food packaging. Legislation has been introduced in New Jersey that would prohibit the sale or distribution of any packaging made of "thermoplastic synthetic polymeric material or any other petroleum-based, non-biodegradable material. " In Florida, as of January 1, 1990, plastic shopping bags used by retailers will have to degrade within in 120 days.[23]

[21] Other types of bans are also appearing in some legislative proposals. For example, a law proposed in Connecticut would ban the use of lead and cadmium as stabilizers, pigments, inks, or glazes in packaging.

[22] *Society of the Plastics Industry, Inc., et al.* v. *The County of Suffolk, et al.*, No. 88/1 1262, New York State Supreme Court.

[23] Technical information on degradable plastics is presented in ch. 5.

Two problems associated with these bans are that they do not consider whether the replacements will be improvements, and they rarely consider the economic implications to retail stores. For example, polystyrene is used in many single-use products. The costs of banning polystyrene foam cups include not only the costs of replacements, but also the labor and energy needed to wash or reuse cups, and the costs of washing equipment; on the other hand, new service jobs might be created, disposal costs might be lowered, and other packaging manufacturers would benefit by having their products purchased. However, polystyrene foam cups probably constitute less than 0.1 percent of all MSW by weight; their replacements could be heavier, single-use, plastic-coated paper cups, as opposed to reusable washable cups. Also, plastic-coated paper cups cost more, and increasing their production would require additional investments in manufacturing equipment (l).

Another example of the trade-offs to be considered is seen in switching from plastic to paper bags. Switching from plastic to paper bags could increase waste generation because paper bags actually take up more landfill space than plastic bags, and paper often does not degrade rapidly in landfills (ch. 7). The relatively low use of energy for plastics production, although nonrenewable fossil fuels are used, is another issue (ch. 5).

Product bans in general might be more effective if they focused on toxicity reduction—removing toxic products or chemicals from use to lower the toxic content of MSW.

Toxics Reduction Legislation and Propositions

States have responded to concerns about household hazardous wastes by providing information and funds to develop local household hazardous waste collection programs. On a broader scale, States also have developed various activities oriented toward the issue of toxicity in general. In 1986, for example, voters in California approved Proposition 65, which shifts the burden of proof in toxicity determination by saying, essentially, that a manufacturer must prove that a substance released into the environment or included in a product is **not** toxic.

Other action includes lobbying by local grassroots and statewide environmental organizations to pass versions of a model toxic use reduction bill authored by the National Toxics Campaign and the Massachusetts Public Interest Research Group (2). The intent of this type of legislation is to help industry reassess and reduce the use and production of toxic substances, by requiring toxics-use reduction plans and by offering grants, education, and information. Revenue would be raised through a tax provision. The bill has been introduced and debated in Massachusetts and other States, and sponsors planned to re-introduce it in a number of States in 1989 (2).

Education

Rhode Island has adopted a strong educational approach at all levels, from grade to graduate school, which is focused on both consumers and industry (107). The State's Department of Environmental Management has published books on waste management, including waste reduction, and has held workshops on the topic. A task force is charged with providing technicaI assistance to commercial establishments, including guidance documents, training and certification of waste auditors, and design and specification of equipment and services. The New York State Department of Economic Development established a secondary materials program in 1989 that will serve as a clearinghouse for information about waste reduction techniques available to commercial and industrial firms.

Regional Efforts

In 1988, the Coalition of Northeastern Governors (CONEG), which includes nine States, issued a policy statement on the reduction of packaging (11). The statement called for working with the packaging industry to reduce the volume of disposable packaging, increase the recyclability of packaging products that cannot be reduced, increase the use of more environmentally benign packaging material, and increase the recycled material content of packaging. CONEG also established a task force on source reduction to identify voluntary and other measures that could be carried out by and within the region. The task force includes four working groups that focus on different product categories (i.e., convenience food, consumer electronics, hardware, and automotive goods). Recommendations, expected by September 1989 (ha), are likely to address guidelines (i.e., definitions, goals, standards, timetables) for "preferred" product packaging; voluntary efforts by industry; education; and criteria to evaluate

legislation that incorporates the use of incentives and disincentives.

Recycling

Although some Federal authority exists to encourage recycling, it has not been exercised in a concerted, consistent, or coherent manner. In general, States and communities have been left to devise their own programs. Indeed, recycling is an increasingly popular management option for communities and States across the country. Many of these programs focus on the collection of recyclable materials. Comparable efforts to increase the demand for recycled materials have not been coordinated with efforts encouraging separation and collection, however.

Government efforts to increase recycling must take into account the market conditions of materials, their dynamic nature, and the effects of programs on existing recycling activities and markets (ch. 5) (66). For example, a glut of used newsprint paper in the Northeast in 1989 was in part attributed to the increased supply of used newsprint collected by new recycling programs in Northeast States. To expand the market for recycled newsprint, Connecticut passed legislation in 1989 that requires newspaper publishers to phase in increased use of recycled newsprint, and several other States (e.g., California and Wisconsin) have introduced similar legislation. In Florida, effective January 1, 1989, newsprint users began paying a waste disposal fee of $0.10 per ton of all nonrecycled newsprint. If by October 1, 1992, newsprint is recycled at a rate of 50 percent or more, the fee will be rescinded; if the rate is not achieved the fee will be increased, but credits to publishers using recycled newsprint will also be available. Some experts suggest that a sufficiently high consumption tax might be more effective in altering a publisher's newsprint purchasing decisions (155).

Beverage Deposit Laws and Recycling Laws

Nine States have mandatory deposit laws for beverage containers: Connecticut, Delaware (applies to glass only), Iowa, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont. California and Florida have different types of mandatory programs (discussed below) and Florida's law applies to additional types of containers and products. Mandatory recycling programs, other programs to encourage recycling, and deposit laws vary considerably from State to State. At least a dozen States have passed legislation encouraging or requiring localities to implement community recycling programs.[24] Rhode Island, New Jersey, and Connecticut were the first States to adopt mandatory source separation programs. Laws enacted more recently by such States as Florida, Maryland, and Pennsylvania more explicitly recognize a need for a comprehensive approach to recycling. Although some European countries have adopted beverage container deposit systems, they are geographically much smaller than the United States and factors affecting the feasibility of such systems differ (box 6-C).

These State laws attempt to encourage cooperation between the existing recycling industry and counties and municipalities and allow the flexibility needed to design programs to meet specific State goals. State programs to stimulate recycling can include financial incentives, technical assistance, information dissemination and research, procurement requirements, recycling goals, and mandatory local collection of materials for recycling.[25] In the past, most MSW recycling collection programs have been based and managed at the local level.

Some States, such as Oregon and New York, have both mandatory deposit programs and community recycling programs. The two systems are not necessarily incompatible, but the combination can be inefficient and less cost-effective than a mandatory local collection of materials for recycling (chs. 1 and 2). Mandatory recycling laws vary with respect to: requiring mandatory source separation or primarily using drop-off centers; local, regional or State implementation; and whether other mechanisms such as grants, funding, or educational programs are included. Variation also exists in the types of mandatory deposit legislation adopted; for example, the types of beverage containers included, the amount and nature of the deposit system can vary.

[24] Connecticut, Florida, Hawaii, Illinois, Maryland, Massachusetts, Minnesota, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Washington, and Wisconsin.

[25] "Mandatory" can mean the State mandates all details of local recycling programs, but usually means the collection of some materials is mandated and some flexibility remains with the locality to determine which materials are collected, by which methods, etc.

In some States with deposit legislation--e.g., Connecticut, Massachusetts, and New York—curbside collection programs also are being adopted. In areas where either recycling programs existed first and then mandatory deposit/redemption legislation came into effect (e.g., California), or deposit legislation existed first and then mandatory recycling laws were enacted (e.g., New York), neither program appears to have been hindered in the amount of material collected (15,40,42,63,78,92,1 33). However, when both approaches operate concurrently, recycling revenues to the public sector may decrease because aluminum is the highest value material collected and presumably a beverage container law would largely eliminate its collection with other recyclable (ch. 2; ref. 37). A recent report concluded, in part based on its analysis of the States "of Vermont and New York, that comprehensive materials recovery programs are more efficient and cost-effective if beverage containers are included in them (37).[26]

In the past, the intent of most State deposit laws was to deter littering rather than encourage recycling (ch. 1) (130).[27] Ohio and some other States enacted litter control legislation that does not involve a mandatory deposit system. Although some research indicates that aggressive litter control programs can be highly successful (56), other studies show that litter programs are not as effective as deposit legislation in controlling litter and that they do not address the nonlitter objectives of deposit legislation, such as increasing recycling of beverage containers (1 10,130). In general, beverage container deposit systems capture between 70 and 90 percent of the targeted containers and are particularly effective in reducing litter (7). Several States with deposit systems report that roadside litter decreased 15 to 50 percent, and beverage container litter decreased by as much as 80 percent (47,1 10).

The impact of deposit legislation on MSW, however, is less certain and difficult to calculate. Critics of mandatory deposit legislation point out that it has a relatively small impact on MSW disposal problems, given that beverage containers are a small, albeit highly visible, portion of the waste

Box 8-C—Beverage Container Deposit Systems in Europe

Deposit systems on beverage containers exist in several European countries **(8,95),** with the focus of activity being in Scandinavia and West Germany.

In Sweden, a deposit system exists for most glass bottles, including wine, beer, and carbonated soft drinks (74,122). About 98 to 99 percent of the beer and soft drink bottles and 75 percent of the wine bottles are returned. Sweden also has a deposit system on aluminum cans, and over 75 percent of such cans are recovered; the system is run and financed by the can companies, breweries, and retailers. A deposit system for PET bottles was tested on one island and may be introduced throughout the country. The Swedish National Environmental Protection Board has proposed a target return rate of 90 percent for both aluminum cans and PET bottles.

Norway also has a deposit system on glass bottles, although imported bottles are exempted (8). In contrast to Sweden, Norway places a high tax on aluminum beverage containers and they are not used at a high rate.

Denmark does not have a deposit system on glass or aluminum containers, but in 1984 it placed a tax on aluminum beverage containers and required all beverage containers to be refillable (8). As a result, most beverage containers are now made of glass and about 50 percent were recycled in 1985 (53). This action has been criticized by other European countries as restricting international trade, because many of Denmark's plastic and aluminum beverage containers are imported from other countries **(8).**

Switzerland has a deposit system on glass beverage containers, and the rate of return appears to be high. In contrast to Denmark and Norway, it has not placed a deposit or high tax on aluminum beverage containers, and the market share for these containers is increasing.

In September 1988, the West German government adopted regulations for a mandatory deposit system on plastic beverage bottles (see box 8-B).

[26] Whether directly or indirectly, the consumer will bear costs associated with either system or the combination of them. Which system is most cost-effective is a separate issue, but one that effects the ultimate cost to consumers.

[27] Proposals for a national manadatory deposit system of some type for beverage containers appear before Congress annually. They are designed to address a variety of issues, including litter control and energy conservation.

stream (ch.3).[28] New York State estimates that adoption of their Returnable Beverage Container Law has reduced MSW by 5 percent by weight or 8 percent by volume (47,89). Curbside programs to collect recyclable, on the other hand, cover a broader portion of MSW (e.g., newspapers and nonbeverage containers) and have the potential to achieve greater diversion of materials from landfills.

Where in the collection and processing systems costs are borne is critical to consider. In a comprehensive curbside collection program, collection costs are high, but necessary (and become part of a government infrastructure). In contrast, a deposit container system has a ''free" collection system, but the retail handling and wholesale processing operations do not generate net revenues (even with unredeemed deposits). Thus, one recurring concern about deposit systems is increased costs to consumers, retailers, the beverage industry, and the government. The extent of such increases is disputed (72,96,108), but it appears that the benefits and costs of deposit systems are relatively balanced (84,96,110). Studies show a net gain of jobs, plus some energy and resource savings, from deposit systems, but that the rate of price increases for beverages in nonrefillable containers is above normal inflation. Costs for converting to a system for returnable/refillable containers can be high for the beverage industry, but they are at least partially recovered within a few years (84,1 10).

Laws to Encourage or Mandate Recycling

Typical features of recent State recycling laws include:

- A numerical recycling target ranging between 15 to 50 percent, but usually about 25 percent. These recycling goals generally are not set based on knowledge of the waste stream or actual projections of the recycling potential for particular materials.
- Provisions on segregation of materials. There is a trend toward mandatory source separation of selected MSW components. Sometimes commercial and institutional sources of MSW, as well as residences, are covered by the law.
- Designation of the materials to be recycled or delegation of a local authority to designate them.
- Requirements for local government to develop a recycling plan.
- Funding mechanisms. These include such mechanisms as a surcharge on the tipping fee at landfills to fund grants for local planning and development of recycling programs, or financial incentives to encourage new recycling operations.

In addition, States can attempt to stimulate recycling markets through procurement programs and/or by providing tax incentives. In general, mandatory programs are preferred on the east coast, while the voluntary programs work best on the west coast. Among the States that have received attention for their recycling programs are Oregon, Rhode Island, New Jersey, California, and Florida.

In 1972, Oregon passed a beverage container deposit law that reportedly recovers over 90 percent of all soda and beer containers sold and brings a 7-percent reduction of the total waste stream to be landfilled (84). In 1983, Oregon passed the Opportunity to Recycle law, which requires municipalities of over 4,000 to provide convenient drop-off centers and at least monthly curbside collection of recyclable. Household participation is voluntary; localities are required to fund, administer, and report their recycling plans to the State. Public education is an important part of the program. In 1982, only 14 multi-material curbside recycling programs existed. Since the law's passage the number of programs has grown to over 110 programs, even though the requirement applied to only 70 cities. Oregon now estimates that it recycles 18 to 22 percent of its waste stream.

Rhode Island's Solid Waste Management Act Amendments of 1986-87 is the Nation's first mandatory State source separation program. The State has a target goal of recycling 15 percent of its MSW by 1992. A new materials recovery facility is being built as part of the program. The recycling efforts are part of a comprehensive waste management program that also includes the establishment of three waste-to-energy facilities and possibly a landfill,

[28] Beverage containers constitute 6 to 11 percent of all MSW on a national basis; beverage containers covered by most deposit legislation are a smaller portion, approximately 5 percent, of MSW because some types of containers are not included (e.g., wine, liquor, and milk containers).

Another State recycling program receiving attention is New Jersey's Mandatory Recycling Act of 1987. This law requires localities to reach a recycling rate of 25 percent by 1989. Each county designs its own program by designating three materials (from a list of materials provided by the State) that households will be required to separate, in addition to leaves. The programs are supported by a landfill tax of $1.50/ton that should provide counties with $8 million to begin their programs.

In 1987, California enacted a redemption law for beverage containers that requires the establishment of "convenience" buy-back centers for recycling. However, the financial stability of the convenience centers, administrative burdens associated with implementing the program, and other difficulties are creating concern over the viability of this approach.

A processing fee is the mechanism driving the California program and is its most unique feature. If recycling is not high enough, distributors must pay a processing fee; this keeps market prices high so recyclers can stay in business. It also gives the State some control over the markets. Unlike Florida and most States with beverage deposit laws, California does not require a deposit by consumers. Instead. consumers are paid a redemption of $0.01 for returning containers.[29] Convenience is seen as key to the law's success, and the establishment of 2,400 redemption collection centers was required.

Recycling rates have increased only slightly since the California law took effect. This may be caused by the slow start-up of the program or its cumbersome administrative nature. Many local officials express skepticism over the law, in particular that it is inefficient to team the processing fee with an emphasis on convenience—although all acknowledge they benefit from the inflated scrap values. Some officials also maintain that if the same State resources spent on administering the beverage container law were spent on curbside collection, more recycling would occur. Some officials actually predict that the law will "collapse under its own weight' within a few years. Still, the processing fee continues to attract attention from other State and Federal officials (15,40,42,63,92).

In 1988, Florida adopted a deposit-fee system that affects all types of containers, not just beverage containers. The law attempts to distribute the rising cost of solid waste disposal and emphasize the virtues of recycling in a State where a high water table prohibits landfilling in many areas and where siting incineration facilities has been difficult. As of October 1, 1992, a disposal fee of one cent will be levied on any container (i.e., glass, plastic, plastic-coated paper, aluminum, and other metals) sold at retail which is not recycled at a 50 percent rate in Florida. The fee will increase to two cents if the 50 percent target is not met by October 1, 1995. The goals of the law are to discourage single-use disposable items and build a statewide infrastructure for recycling.

The inclusive scope of materials covered by the Florida law is generally viewed as an asset, but it is too soon to judge how effectively this program will be implemented. Florida's new law is one of the most recent and ambitious efforts to manage MSW. Localities are required to reduce landfilling by 30 percent by 1993, mostly by recycling. If a locality does not meet the goal, funding can be suspended by the State; most municipalities are expected to establish mandatory residential recycling programs. Taxes and fees on a variety of products and materials will be used to encourage recycling.

Variety of Local Programs

In a survey, the Council of State Governments found that 25 States responding to a question on recycling identified 6,461 local recycling programs (16,18). The western States reported the most, with 3,378 recycling programs in Oregon and California alone. Alaska reported approximately 100 programs. In the Midwest, 1,710 programs were identified; the Northeast reported 1,148, the Plains States identified 118, and only 7 programs were reported in the South. Some of these programs may be private (e.g., sponsored by the Boy Scouts, civic groups, or others groups), although most are assumed to be local government programs. Because it is not clear how the respondents were defining "recycling program,' it is not known for sure how many of these efforts are public versus private in nature.

[29] Curbside collection program operators can also receive the $0.01 redemption.

Local recycling programs can vary. What mix of characteristics is ''best" will depend on the locality (see ch. 2 for cost comparisons between methods). In many States, recycling associations provide guides, hold conferences, and distribute information to local communities to promote recycling. In addition, organizations such as the National Association of Towns and Townships issue guides to help communities establish recycling programs (85). Two basic characteristics of recycling programs are whether they are mandatory or voluntary and how recyclable are collected (separated or commingled). Other factors such as the frequency and efficiency of collection, or location of collection centers (if drop-off centers are used), and public education programs also affect the effectiveness of recycling programs. In general, mandatory recycling programs generate higher participation rates than voluntary programs with the same frequency of collection (18,150).

Variation in participation also occurs when more than one material is collected. For example, in Minneapolis, Minnesota, only about 50 percent of all participants recycle all the collected materials, 25 percent recycle paper and one other item, and the other 25 percent recycle only paper. In Austin, Texas, less than 50 percent of the participants recycle bottles and cans in addition to paper. Even in Montclair, New Jersey, where recycling is mandatory, only 75 percent of the participants recycle all the materials required. Not surprisingly, newspaper makes up about 75 percent of the material collected; glass contributes 15 to 25 percent and metal 5 to 10 percent (46). It is important to note that participation rates, however, are different than materials recovery rates.

Collection of recyclable can happen in at least three different ways: household source separation of individual materials or commingled materials and curbside collection; household collection of mixed wastes with processing at a centralized facility; and drop-off centers. Some systems combine two or all three of these options. In general, weekly curbside collection of source-separated material is most effective, generates the most (and least contaminated) material, and achieves higher participation rates. Curbside collection is often impractical in rural areas and drop-off centers (and the buy-back variation of this) are more common.

Photo ***credit: M.*** *Wagner*

Some community programs for collecting recyclable materials distribute special recycling bins to citizens. Filled with separated materials, the bins are put out at the curbside for pickup on specified days.

A study completed by The Minnesota Project, a nonprofit rural community development organization, found that in seven innovative programs in rural communities, drop-boxes and drop-off recycling centers have been successful (83). In rural Wayne County, New York, however, private haulers are cooperating with local officials to initiate curbside collection of some recyclable (thus far, newspaper, corrugated cardboard, and tin cans) to supplement the drop-off collection program.

The striking contrast between the coasts illustrates the Nation's great variation in MSW management programs. For example, most communities in the San Francisco Bay area of California favor voluntary, curbside recycling programs and strongly support source separation. Many are expanding their programs to include community comporting and commercial recycling. Indeed, the desirability of the "three C's of recycling" are repeatedly referred to by these local officials: 1) a curbside program; 2) a compost program; and 3) a commercial/industrial

program. These programs are not yet common in the Northeast.

Even within California, however, there is variation among recycling programs. For example, the City of San Francisco sees its primary purpose as coordinating and encouraging the numerous (over 20) private recycling efforts in the city and county. It estimates that approximately 25 percent of its waste stream is recycled. The City of San Jose, in contrast, is more directly involved in recycling. It operates the largest curbside program in the country, servicing 180,000 residents, recycling 100 tons/day, and reportedly diverting about 35 percent of its waste stream.

The incentive for recycling in California is not, for the most part, lack of landfill space or high landfill cost. In fact, some waste officials there look to the higher disposal costs of Seattle, Washington, the Northeast, and elsewhere with a bit of envy, believing it would allow them to justify further expansion of their recycling operations (15,40,40a,42,63,78,92,133). Strong markets are a key advantage for California, which relies primarily on overseas markets. Profit is not a driving force for these programs and an important factor contributing to support for them is that new waste-to-energy or other combustion facilities are not being sited in California. This is primarily because of concerns over air pollution potential and strong public opposition. Using intensive recycling to prolong the life of landfills is the main MSW management rationale.

In the United States, most communities with curbside collection designate no more than three materials to be separated. Typically, localities separate newspapers, other waste paper, glass and cans, and sometimes plastics. Sometimes grass clippings and leaves are collected separately for comporting. Materials for recycling are collected in various types of bins and containers, usually provided by the community, and collected on specially designated days (weekly, biweekly, or monthly). In Japan, a few communities have households separate their MSW into seven or more categories. Most **community** programs, however, have households separate MSW into only two categories, combustible and noncombustible, for municipal collection; recyclable materials are separated for collection by the private sector.

Some communities, regions, and States have developed materials recovery facilities (MRFs) for commingled recyclable (ch. 5). The State of Delaware manages all waste disposal through the Delaware Solid Waste Authority (DSWA) and does soon a mixed waste basis. Mixed waste is brought to the State's largest facility in northern Delaware, a centralized processing facility. A landfill and waste-to-energy facility are also located at this site. The facility has had some difficulty marketing recovered materials because of contamination, a problem that is not uncommon with this type of centralized processing (ch. 5). The compost material produced is also too contaminated to be marketed for many uses, but it can be used for landfill cover (156).

The costs of collecting different materials from MSW for recycling vary depending on their weight, volume, and other factors (chs. 2 and 5). The collection of newspapers (given their weight and volume) and plastics (given their volume) are the most expensive materials to collect for recycling. Materials collected directly from households are usually less contaminated and of higher market value than those recovered through centralized processing facilities.

Financial Incentives

Federal and State financial incentives to stimulate recycling activities, as well as increase the markets for recycled materials, have been limited. The following sections describe past efforts and note some recent initiatives. Although this discussion is primarily descriptive, some effort is made to determine the potential for programs, especially at the Federal level, to increase the use of secondary materials .30

Federal financial incentives for recycling are essentially nonexistent. An investment tax credit for recycling equipment to promote energy conservation was available from 1978 to 1983 under the Energy Act of 1978. Although many businesses took advantage of this credit, with total value reaching $143 million (27), it is difficult to prove that the investments would not have occurred absent the credit.

To date, this was the only direct Federal initiative to provide incentives for market development,

[30]The majority of this discussion is based on ref. 36.

despite the fact that RCRA directed the Department of Commerce to undertake market development efforts.[31] However, the Tax Reform Act of 1986 did remove some disincentives to recycling in an attempt to equalize the tax system. The act repealed some preferential tax treatment for the timber industry and modified oil depletion allowances.

Approximately 16 States use financial incentives to encourage recycling (16). These incentives include subsidies, grants, low interest loans, and/or preferential tax treatments. Most States with such programs are located east of the Mississippi River. The next section focuses on tax incentives, one of the most prevalent (such provisions exist in at least 11 States), but also problematic, types of financial incentive programs.

Tax Incentives-Three main types of tax incentives are available for recycling activities: investment tax credits, sales tax exemptions, and property tax exemptions. Examples of these incentives are noted in tables 8-1 and 8-2. As shown in table 8-3, there is considerable variation in the types of programs adopted by States, both in the types of incentives offered and their areas of application.

Investment tax credits (ITCs) allow businesses to subtract a portion of the cost of qualifying capital purchases from their Federal or State tax liability, thus reducing the net after-tax cost of capital. The most recent Federal experience with ITCs was in the early 1980s, after Congress passed the Economic Recovery Tax Act (ERTA) in 1981.32 The purpose of this ITC was to stimulate economic activity through increased investment. Thus, the real target of the ITC was not the investment alone, but the general economic growth that the increased investment would generate through the ''multiplier effeet. '' One of ERTA's effects was to cut the cost of borrowing for capital equipment roughly in half (36).

The impact of ERTA's ITC provisions was uneven across the economy, because the Deficit Reduction Act of 1982 eliminated ERTA's tax subsidies for certain investments and retained them for others. In any case, the correlation between the reduction in the net cost of capital and business investment was not strong, leading to the conclusion that tax consequences are not the only consideration in business decisions. The House Committee on Ways and Means surveyed evidence on business response to ERTA and concluded (36):

> Proponents of the massive tax benefits for depreciable property have theorized that these benefits would stimulate investment in such property, which in turn would pull the entire economy into more rapid growth. The committee perceives that nothing of this kind has happened.

Among the States, pioneering tax incentive programs of Oregon and Wisconsin are examples of investment tax mechanisms and sales and property tax mechanisms, respectively. Oregon has three tax investment programs, two with purposes broader than recycling (the business energy tax credit and the pollution control facility tax credit), and one dedicated exclusively to the reclaiming of plastics (the plastics recycling tax credit).

The Oregon Department of Energy administers the Business Energy Tax Credit, which allows companies to write off, over a 5-year period, 35 percent of the cost of any equipment used solely for recycling. Garbage haulers and supermarkets have been the primary recipients of the tax credits to date. In 1985, the legislature renewed the law until December 31, 1990. The program is popular with legislators and businesses. The effect on the State treasury, however, is not known (although it clearly amounts to a revenue expenditure for the State) (36).

Oregon's Pollution Control Facility Tax credit was made available to recycling facilities or materials recovery facilities in 1973. The Oregon Department of Environmental Quality, which administers the program, has no limit on the individual projector total annual project costs. The credit is 50 percent of the certified costs, which may be taken over 10 years or the life of the facility if it is shorter than 10 years, and it can be applied against corporate, individual income, property taxes for nonprofit organizations. Pollution control facility tax credits have been used by firms that process a variety of materials, such as tires, asphalt, yard debris and wood wastes, gravel,

[31] The Department of Commerce, through the National Bureau of Standards, undertook numerous studies of recycling markets, costs, and technologies (138). However, no direct action to stimulate markets was taken as a consequence,

[32] Public Law 97-34.

Table 8-I-State Tax Incentives (Active and Proposed)

State	Investment tax credit	Property tax exemption	Sales tax exemption	Other
California				**Consumption tax credit**
Illinois			X	
Indiana		X		
Kentucky		X		
Massachusetts[a]	X			
New Jersey	x		X	
New York[a]	x			
North Carolina		X		Income tax deductions
Oklahoma	x			
Oregon	**X(3 programs)**			
Pennsylvania	X			
Wisconsin		X	X	

[a]Proposed incentives.

SOURCE: Franklin Associates, Ltd., *Economic Incentives and Disincentives for Recycling Municipal Solid Waste,* contract report prepared for U.S. Congress, Office of Technology Assessment (Prairie Village, KS: December 1988).

waste paper, plastics, batteries, and glass. Examples of certified projects include a $23.8 million battery recycling plant and a $13.3 million for a facility for old newsprint deinking.

The Department of Environmental Quality also administers Oregon's Plastic Recycling Tax Credit, which began in 1986. This income tax credit applies to machinery and equipment that uses at least 50 percent recycled post-consumer or industrial plastic from Oregon and is manufactured into a product there. The credit of 50 percent of allocatable costs taken over 5 years can apply to 100 percent of costs (or less, if the facility is not only dedicated to recycling plastics) (36).

Wisconsin uses both a sales tax exemption and a property tax exemption as financial incentives to ecourage recycling.[33] Nonprofit organizations, including some recycling facilities, can avoid sales taxes in some States but few States offer sales tax exemptions specifically for recycling, such as Wisconsin does. In Wisconsin, collectors, processors, and manufacturers using secondary materials are exempt from paying the *5* percent sales tax on equipment or on the recyclable themselves. Recyclers can also benefit from the property tax exemption in Wisconsin.

Wisconsin's Department of Revenue determines whether a piece of equipment qualifies, and some litigation has resulted over the Department's interpretation of the tax code. This type of problem can occur where tax incentive programs are administered by the Department of Revenue because the first concern of tax officials is revenue losses, not promoting the program's intent. Another difficulty with property tax exemptions is that reduced property taxes through statewide legislation often hurts local governments. The overall effect of both the sales exemption and property tax exemption on recycling in Wisconsin is reported as minimal (36).

The purpose of recycling tax incentives is different than that of ERTA; recycling tax incentives are not intended to promote the general economy but to increase capital in firms using recycled materials, boost productivity, and thus increase greater demand for recycled material inputs, and divert solid waste from landfills. The reduction in the cost of capital would also theoretically reduce the cost of production, which could then be passed on as a reduction in **the** price of the final product. Tax incentives cost a State a certain amount of money in foregone revenues and administrative costs, but this should be offset by increased economic activity and increased recovery of materials from solid waste. **The extent of these benefits, however, has not been documented in operational programs. Most States do not know the impact the incentives have had on**

[33]This is because recyclers are classified as manufacturers in Wisconsin for purposes of property taxes, and are thereby eligible for these benefits available to all manufacturers. Statutes expressly grant these two tax exemptions to both encourage waste reduction and recovery and to provide tax equity with other manufacturing (103).

Table 8-2-State Investment Tax Credits

State	Eligibility	Amount	Comment
Massachusetts	Research and development on recycled and recyclable materials in manufacturing.	50% of R&D costs (100% if performed by institution of higher learning).	Available to corporations manufacturing plastic and paper consumer products.
	Tangible property used in manufacturing.	1 O% of cost in year of acquisition.	
New Jersey	Recyding equipment used in transportation, processing, or manufacturing.	SO% spread over 5 years; maybe carried over.	Available to corporations only.
New York (proposed)	Recycling equipment used solely for processing secondary materials.	500/'; may be carried over for 4 years.	Includes deduction for construction or improvement of recycling facilities.
Oklahoma	Installation, purchase, and construction of facilities.	20%	Hazardous wastes only.
Oregon (3 programs):			
Business Energy Tax Credit	Equipment used solely for recycling.	35% (10°/0 in each of first 2 years; 5% each of next 3 years). Maybe carried over for 3 years.	Certification simple, quick. Major state program used by MSW recycling activities. Due to sunset after 1990.
Pollution Control Facility Tax Credit	Equipment, land, and buildings used for recycling.	50% spread over 10 years (5% a year). May be carried over for 3 years.	Credit will be reduced to 25% in 1989. Due to sunset after 1990.
Plastics Recycling Tax Credit	Machinery and equipment used solely for reclaiming plastic and making it into a product.	50% spread over 5 years (10% a year). May be carried over for 5 years.	Applies to capital investment made from January 1, 1988, to January 1, 1989.
Pennsylvania (proposed)	Machinery and equipment used to process and manufacture products from post-consumer waste materials.	50% of equipment cost credit shall not exceed 20% in any year or 50% of total tax liability.	Does not apply to secondary waste material or demolition waste.

SOURCE: Franklin Associates, Ltd., Economic Incentives and Disincentives for *Recycling Municipal Solid Waste,* contract report prepared for U.S. Congress, Office of Technology Assessment (Prairie Village, KS: December 1988).

Table 8-3-State Tax Incentives and Areas of Application

State	Supply-side incentives: For recycling operations			Demand-side incentives: To manufacturers/users of recycled materials
	Equipment	Buildings	Land	
California[a]				**CTC**
Illinois				**STE**
Indiana	**PTE**	**PTE**	**PTE**	**PTE**
Kentucky	**PTE**			
Massachusetts[a]				**ITC**
New Jersey	**ITC**			**ITC**
New York[a]	**ITC**	ITD		
North Carolina	**PTE, ITD**	ITD	ITD	—[c]
Oregon:				
Business Energy Tax Credit	ITC			
Pollution Control Facility Tax Credit	ITC	ITC	ITC	
Plastics Recycling Tax Credit				ITC
Pennsylvania	ITC			
Wisconsin	STE, PTE[d]			STE, PTE

[a]Proposed incentives.
[b]Includes collection and/or processing operations.
[c]Some users of recycled materials may qualify as recycling operations.
[d]Some procssors qualify as a result of court ruling.

Abbreviations: ITC=investment tax credit; PTE=property tax exemption; STE=sales tax exemption; CTC=consumption tax credit; ITD=income tax deduction.

SOURCE: Franklin Associates, Ltd., Economic Incentives *and Disincentives for Recycling Municpal Solid* Waste, contract report prepared for U.S. Congress, Office of Technology Assessment (Prairie Village, KS: December 1988).

their treasuries or if they have significantly increased the amount of material recycled (35,36).

In most cases, tax incentives do not appear to be major influences on business investment decisions and they do not necessarily lead to increased recovery of materials from wastes (35,36). Historical trends in manufacturing industries using secondary materials indicate that recent capital investments have been relatively limited. For example, most glass container manufacturers, steel mills, and paper mills are operating with facilities older than 10 years. No new glass container plants have been built in the last 10 or 15 years in the United States, and the actual number of operating glass plants has declined over the last several years as competition from plastics has increased.

These long-term trends suggest that the lack of investment in recycling industries is unlikely to be reversed by the small change in the cost of investment that could be brought about by an ITC. Of course, definitive estimates of investment behavior would require a case by case evaluation of individual plants. If an ITC were available, it would obviously become a factor in investment decisions. However, industry representatives indicate that such tax incentives would not be a deciding factor (36). Other factors, such as labor costs and proximity to markets, are more critical determinants of investment decisions.

Even if recycling ITCs were successful in expanding capacity to manufacture products from secondary materials, however, the capacity will not be used unless there is a demand for the final product. In sum, without increases in the demand for products made from recycled inputs, there is little reason to believe that supply-side tax incentives for the purchase of capital equipment will result in the increased use of recycled materials.

In addition, no evidence suggests that sales or property tax exemptions are a determining factor in a company's decisions for expansion or startup (36). In Illinois, and probably elsewhere, a general limit on the amount of influence any tax incentive will have is the fact that tax liabilities for most companies are quite low, generally less than 1 percent of gross sales. Every business manager interviewed by Franklin Associates reported that this amount is not significant enough to effect their business decisions. Further, nonprofit organizations, which many recovery operations are, have no State tax obligations.

Consumption Tax Credits-Consumption credits act as an incentive by reducing the cost of the

targeted material to the manufacturer. In particular, they reduce tax liability by an amount proportional to the quantity of targeted material used. For such a tax-based 'throughput subsidy" to be effective, two assumptions must hold:

1. taxes paid by the target industry must be high enough that credits for purchasing a favored material can actually affect the material's net after-credit price; and
2. the primary factor in buyers' choice between competing materials must be price, so that a difference no larger than possible through the tax code will cause them to change their buying habits.

Subsidies can be granted to manufacturers who reprocess newsprint, glass bottles, and other wastes, as a way of reducing the cost of the wastes they buy. They can also be granted to firms that purchase recycled finished goods such as newsprint, bottles, and other goods as inputs into their own productive process. The goal of these subsidies is to reduce the cost of recycled inputs relative to virgin inputs.

Consumption tax credits have not yet been applied anywhere, but they are considered by some analysts to be a potentially effective stimulant for secondary materials markets (35,36). Also called ''secondary materials use credits,' this mechanism allows companies using secondary materials in manufacturing to apply a portion of the price paid for those materials as a credit against owed income tax. Even if effective, however, the use of consumptive tax credits could require a long-term, State-financed subsidy to users of secondary materials to maintain the desired market conditions (36).

A bill proposed in California during the 1985-86 session (Assembly Bill No. 1109), would have given consumption tax credits to users of recovered glass, paper, oil, and plastics from the State and used in the State. The bill would have allowed a tax credit against a company's State income tax, based on an amount calculated as a percent of the amount paid for qualifying secondary materials.[34] The bill was not enacted, reportedly because of an inability to develop a suitable funding mechanism, and subsequent versions have also failed.[35]

The potential effect of consumption tax credits can be difficult to estimate. For example, newsprint can be produced from old newspaper (ONP) or virgin wood pulp, or both. A consumption credit applied to ONP would theoretically lower its price as a raw material in newsprint production relative to the price of virgin wood pulp. This would theoretically increase the use of ONP to make newsprint. Because the raw material is less expensive, the price of the finished newsprint could be reduced, and thus more could be sold. However, historical data for the newsprint industry indicate that movements in the price of waste paper are not reflected in price movements for finished newsprint. In fact, the price of ONP has declined dramatically over the long run relative to the price of the newsprint made from it (table 8-4). These data call into question any program based on the assumption that a reduction in the price of an input would lead directly to a reduction in the price of output.

Because it appears that consumption credits are not likely to offset prices in all instances, a great deal of attention need not be given to the second condition for success—that buyers will choose recycled products if prices are reduced. Nevertheless, evidence suggests that this condition is not likely to hold in all cases either. For example, consumer perceptions that recycled inputs produce inferior quality products, whether true or not, can subvert the goal of such credits. Furthermore, industries such as newspaper publishing are vertically integrated and have substantial investment in, or longstanding ties to, virgin sources of inputs.

The experience with newsprint suggests that resistance to production with a particular input may be caused by factors other than price. Table 8-5 supports this conclusion for the paper industry as a whole. Over a 16-year period, the utilization ratio of recycled paper in total paper production has fluctuated over a range of only about 1 percentage point, despite a long-term trend toward lower recycled input prices. The recent change, shown in the table, **cannot be** attributed to the relative price relationship.

[34]The percents for the four qualifying secondary materials are: 15 percent for glass; 10 percent for paper; 22 percent for used oil; and 22 percent for plastics (36).

[35]It was re-introduced in 1988 as the Recycling Tax Fairness Act (Senate Bill No. 188).

Table 8-4--Relative Prices of Old Newspaper (Old News No. 1) and Newsprint from 1970 to 1966, Compared With 1967 Prices[a]

Year	Old news No. 1[b]	Newsprint[c]	U.S. consumer prices-urban (CPIU)	Ratio of old news to newsprint	Ratio of newsprint to CPILU[d]
1970 . ..0....., ...	10801	107.6	116.3	1.005	**0.925**
1971	103.1	112.2	121.3	0.919	**0.925**
1972 . . . . . ,	119.2	116.7	125.3	1.021	**0.931**
1973 ....., ...	137.2	122.2	133.1	1.123	**0.918**
1974	201.6	151.2	147.7	1.333	**1.024**
1975	111.8	184.0	161.2	0.608	**1.141**
1976	199.5	198.2	170.5	1.007	**1.162**
1977	209.6	215.5	181.5	0.973	**1,187**
1978	200.5	226.3	195.4	0.886	**1.158**
1979	151.8	250.2	217.4	0.607	**1.151**
1980	167.4	279.3	246.8	0.599	**1.132**
1981	95.7	308.0	272.4	0.311	**1.138**
1982	72.1	315.8	289.1	0.228	**1.092**
1983	N/A	303.0	298.4	—	**1,015**
1984	193.1	323.1	311.1	0.598	**1.039**
1985	150.0	332.5	322.2	0.451	**1.032**
1986	137.1	326.1	328.5	0.420	**0.993**

aThe price in 1967 is set equal to **100,and then the prices in other years are compared with this value (i.e., Price Index= 100).**
bPrice index for postconsumer newspapers purchased by paper mills.
cPrice index for rolls of newsprint paper purchased from paper mills.
dColumn 4 = (column 1/column 2); column 5 = (column 2/column 3); — means that calculation could not be made.
N/A = Not available.

SOURCE: Compiled by Franklin Associates, Ltd., *Economic Incentives and Disincentives for Recycling Municipal Solid Waste,* **contract report prepared for U.S. Congress, Office of Technology Assessment (Prairie Village, KS: December 1988).**

Table 6-5-Price indices of Wood Pulp and Waste Paper Compared With 1967 Prices, and Recyclable Paper Utilization Ratio, From 1970 to 1986

Year	Waste paper	Ratio of **waste paper** wood pulp	**Recycled** paper to wood pulp	Utilization ratio
1970	**125.0**	109.6	**1.141**	0.228
1971	**112.1**	112.1	**1.000**	0.228
1972	**133.6**	111.5	**1.198**	0.225
1973	**197.4**	128.3	**1.539**	0.235
1974	**265.5**	217.8	**1.219**	0.236
1975 ...., ...	**110,2**	283.3	**0.389**	0.230
1976 ., ...	**184.9**	286.0	**0.647**	0.233
1977 ., ...	**187.2**	281.1	**0.666**	0.234
1978	**191.2**	266.5	**0.717**	0.237
1979	**206.6**	314.6	**0.657**	0.238
1980	**208.7**	380.3	**0.549**	0.234
1981	**175.7**	397.1	**0.442**	0.233
1982	**122.8**[b]	397.0	**0.309**	0.237
1983	**201.2**[b]	346.9	**0.580**	0.234
1984	**240.1**	397.6	**0.604**	0.241
1985	**148.8**	346.6	**0.429**	0.238
1986 ....., ...	**172.8**	358.8	**0.482**	0.247
1987 ....., ...	**219.8**	422.5	**0.520**	0.250

aThe price in 1967 is set **equal to 100, and then the prices in other years are compared with this value (i.e., Price Index = 100).**
bJuly to December average.

SOURCE: Compiled by Franklin Associates, Ltd , *Economic Incentives and Disincentives* **for** *Recycling Municipal Solid Waste,* **contract report prepared for U.S. Congress, Office of Technology Assessment (Prairie Village, KS: December 1988).**

This implies that programs that seek to increase the use of recycled inputs by further reducing the relative price of such inputs (whether through the tax system or in any other way) are not likely to meet much success, at least not in the short term.

Although data from other industries are not as easy to analyze, no indication is found that low recovered material prices will increase recycling. For example, since 1970 the prices of glass cullet have doubled, or tripled in some instances, while the consumption has actually risen. The same is true for aluminum. For steel scrap, prices were deeply depressed for many years with no widespread switches in the industry from virgin to recycled inputs occurring. What does seem to occur is that the basic demand for these materials determines the price, not the converse. The demand is created by complex economic and noneconomic factors, of which the price of the recycled input is a small part.

Research and Development Tax Credits-For a tax credit for research and development (R&D) expenditures to be successful, it must meet the same criteria as any other investment tax credit. That is, it must actually increase R&D expenditures above their previous level or it must reduce the cost of previously planned R&D. The cost saving must be passed on to consumers, and sales must increase as a result.

At the Federal level, ERTA provided a 25 percent tax credit for R&D expenditures that exceeded average R&D expenditures in a base period, usually the three previous tax years. One study concluded that "there was no evidence . . . which supported a strong conclusion about the impact of R&D specific tax incentives on R&D spending" (Piekarz, 1983, cited in ref. 36).

One reason for this apparent lack of effectiveness of R&D tax incentives is that R&D costs are only a small proportion of the total costs involved in bringing a new product to market. Also, many firms cannot benefit from tax incentives because of low or nonexistent tax liability. Overall, firms that took advantage of the 1981 ERTA credit could only use 59 percent of it in the first year, with the rest being carried forward (36).

In short, it is unlikely that a tax credit for R&D for recycling will be a cost-effective method to increase the amount of solid waste recycled. Taxpayer dollars might be spent more effectively on direct subsidies to R&D organizations, such as universities, with a requirement that discoveries enter the public domain if not actually put into production within a specified time. This would foster increased recycling by discouraging licensing or other arrangements that permit the licensee to hold a discovery for a lengthy period of time before deciding whether to use it.

Subsidies, Grants, and Loans-Direct appropriated subsidies are an alternative to tax subsidies. Such subsidies have advantages over tax credits *in* several important respects. First, the appropriation of a direct subsidy is for a fixed dollar amount, so that the cost of the subsidy program is known and can be controlled. Furthermore, the subsidy appropriation must be reconsidered annually, allowing restructuring and adjustment to reflect changing conditions.

Second, direct subsidies are not administered by the Internal Revenue Service, but by other government agencies that are more likely to have experience with the recycling industries targeted for assistance. Also, the granting agencies are subject to oversight by congressional committees with responsibilities and expertise relevant to the original goals of the subsidy. Under these conditions, a direct subsidy can be carefully targeted to achieve the desired effects.

Third, direct subsidies can provide benefits more quickly to firms in need than can tax credits, which may take many months or years to be realized. These benefits are available even to firms with no tax liability; such firms would not be able to take advantage of tax credits. Finally, the effects of direct subsidies can be more easily determined than those associated with a more diffuse tax subsidy program.

Of course, direct subsidies also have some associated problems. Direct subsidies will increase the Federal budget deficit if new revenue sources are not specified. Large direct subsidies, although more likely to be effective than small ones, tend to make the recipients dependent on them-if the subsidy is suddenly terminated, these firms may face serious threats to their continued operation.

Finally, as with the tax incentives, the question of equity among competitors will arise when deciding

among subsidy recipients.[36] There can be no doubt that the historical use of subsidies at the local level has played a key role in keeping many recycling operations in business, especially during difficult times. However, no direct subsidies to the demand-side of the recycling system are known, nor are any broad subsidies at the Federal level to recycling industries known. To date, the debate about whether direct subsidies are preferable to tax incentives has not been resolved (36).

Direct subsidies, sometimes funded through user fees collected as part of tipping fees at landfills, may be of a substantial enough size to more strongly influence business decisions than tax incentives. For example, in Illinois, the Solid Waste Management Act designates the Department of Energy and Natural Resources to implement State programs to provide alternatives to traditional landfill disposal. The programs are to be funded by a surcharge placed on landfill tipping fees, which is expected to raise $10 million annually for solid waste planning, recycling, and resource recovery programs.

Although the constitutionality of the fees was successfully challenged on the grounds that exemption of certain wastes and a' 'pass through" exemption (for landfill owners with nonnegotiable contracts but not for haulers with similar agreements) were not defensible, the fees schedule was upheld. The case is being appealed by the Illinois Environmental Protection Agency.[37] In August 1988, the State of Illinois enacted legislation to correct the defects in how the fee was imposed. Other States (e.g., Massachusetts, New Jersey) and localities also charge such fees to generate revenue to fund solid waste management activities.

Grants, direct loans, and loan guarantees are non-tax types of financial incentives that can be funded by revenues generated by user fees. These programs are not revenue expenditures for the State and/or local government and can be of sufficient size to directly influence business decisions with respect to recycling. In New York State, for example, the Department of Economic Development (in part as a response to the State Solid Waste Management Plan) established a Secondary Materials Program that not only provides technical assistance, but also financial assistance in the form of grants and loans to qualifying companies. The purpose of the program is to stimulate private sector investment in recycling capacity, and projects funded by either the grant or loan program must document increased recycling and energy savings resulting from the project (88). Grants up to $50,000 or 80 percent of the total study cost (whichever is less) can be awarded to firms to evaluate the feasibility of recycling projects. In addition, loans up to $250,000 per applicant will be available to eligible companies to finance the acquisition, alteration, repair, or improvement of buildings or equipment used for recycling (88).

Several States award direct grants or loans to eligible recycling businesses. The Minnesota Waste Management Board can award grants for the establishment of eligible recycling operations. In Illinois, the Development Finance Authority Direct Loan fund provides subordinated, fixed asset loans based on a fixed rate of interest for 7- to 25-year periods, depending on the depreciable assets purchased.[38] The loans average about $150,000 for creditworthy businesses that could not acquire conventional financing (51). The New Jersey Office of Recycling provides low-interest, 10 year direct loans to recycling businesses, which range from $50,000 to $500,000 for the acquisition of fixed assets.

Loan guarantees for various percentages of loans may cover fixed assets or working capital and be offered by the State. New Jersey offers loan guarantees from 30 to 90 percent for up to 10 years for working capital ($600,000 maximum) and fixed asset ($1 million maximum) loans to creditworthy firms. Other types of non-tax financial incentives offered in some States, which could be used to encourage recycling businesses, are venture capital financing (e.g., Massachusetts) and industrial revenue bonds (e.g., Pennsylvania).

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[36] Any subsidy, whether in the form of a direct cash payment or a tax incentive, entails the prOViSiOn Of benefits to some groups and not to others. Because tax- based subsidies cannot be targeted as specifically as direct subsidies, they are much more likely to create inequities among competing groups of taxpayers and among taxpayers within the same industry.

[37] See for example, E & *E Hauling, Inc. Browning* Ferris *Industries of Illinois, Inc., Land and Lakes Co., and Haulaway, Inc v. Illinois Environmental Protection Agency (No. 87* CH 1262, Circuit Court of Cook County, Illinois County Department, Chancery Division, State of Illinois).

[38] Fixed assets might include equipment, land, or building purchases. Direct loans could also be used for working capita], for example fOr inventory purchases. Direct loans are also usually low interest (i.e., below prime rate) and may have an extended repayment term. See ref. 51.

Other types of non-financial assistance for recycling businesses offered by States include technical assistance (e.g., management training, site selection assistance, export assistance, regulatory compliance assistance, direct business consulting); business incubators (i.e., providing space, office services, consulting services and financial services at reduced fees or included in the rent in a multi-tenant facility); and categorical assistance (based on categories of business) (see ref. 51).

Procurement

To function, all governments and businesses must purchase materials and services; these are usually procured by awarding contracts. The most common method of awarding government contracts is by low bid. It is not uncommon, however, for noneconomic factors to be considered, such as special arrangements to Buy American or encourage affirmative action. Similarly, at least 23 States and the Federal Government have enacted legislation encouraging the purchase of secondary materials and items containing recycled materials.[39]

More than half of the States with procurement programs include more than paper in the materials to be preferentially procured (58). Items eligible for recycled materials procurement programs, in addition to paper, include tires, re-refined lubricating oil, construction materials such as glassphalt, and potentially items such as asphalt, HDPE drainage pipes, plastic floor mats, and polyester carpeting.

The potential of this market is large-Federal, State, and local government purchases of goods and services account for about 20 percent of the gross national product (GNP), amounting to expenditures of $865 billion in 1986 (135a).[@] However, the amount of a product procured by the government will not necessarily have a significant effect on the overall market for the product or on MSW management. For example, one reason for the minimal impact of government procurement programs on paper recycling is that the government consumes only 1 to 2 percent of the Nation's total paper (36).

Marty State and Federal procurement provisions have not yet been implemented, or have not achieved their intent to provide viable markets for secondary materials. EPA's failure to issue procurement guidelines was discussed above (see "Environmental Protection Agency"). The Department of Commerce, specifically the Office of Recycled Materials of the National Bureau of Standards (ORM/NBS), was at least initially the most active agency in attempting to fulfill the procurement requirements set under RCRA. ORM/NBS produced reports on State procurement efforts and on test method development and specification guidelines for numerous materials (136,1 37). The methods and standards developed by the ORM/NBS have been adopted by the recycling industry. Yet most of this activity occurred nearly a decade ago. Further, demonstration projects and other activities were not vigorously pursued.

A variety of reasons have been suggested for this lack of success, including unclear or no guidelines, inexact specifications, uncompetitive costs, and a generally negative societal attitude toward recycled materials (134). Two particularly critical barriers to implementing procurement guidelines are 1) conflicting definitions and percentages of recycled content, which hinder mass production; and 2) the lack of knowledge of where to buy recycled products (155).

Nonetheless, despite problems achieving specific quantitative results, procurement policies can act as stimulants and demonstrate government leadership in materials and energy conservation. One major advantage of procurement programs is their visibility and educational value. They can be used to demonstrate the successful use of recycled products. Widespread use of consistent guidelines by both government and business could provide economic stimulus for market development and expansion.

One noteworthy development is the initiation of "buy-recycled" programs by State and local governments (155). For example, Massachusetts, Oregon, Pennsylvania and Washington. and Suffolk

[39]These include Alaska, Connecticut, California, Florida, Iowa, Illinois, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Texas, Vermont, Washington, and Wisconsin. For a comparison of State procurement laws see refs. 3 and 105.

[40]It should be emphasized, however, that 20 percent of the GNP does not directly translate into that percentage of product consumption. In fact, no national statistics document percentages that high (155),

County, New York have such programs. NERC also has supported the development of "buy-recycled" plans.

Paper Procurement-Most targeted procurement programs focus on paper, primarily recycled printing and writing paper. Despite these programs, however, the supply of such paper made from ''waste paper" has not increased significantly .41 Although total U.S. shipments of printing and writing papers increased from 15.5 million tons in 1980 to 19.6 million tons in 1986 (a 26 percent increase), the amount of high-grade deinking recycled paper consumed in the manufacture of printing and writing paper increased from only 303,000 tons in 1980 to 342,000 tons in 1986, about a 13 percent increase.

This actually represents a slight reduction in the utilization rate (i.e., waste paper consumed/paper production) of high-grade deinking recycled paper from 1.95 to 1.74 percent. The amount of pulp substitutes consumed in the manufacture of printing and writing papers increased from 502,000 tons in 1980 to 910,000 tons in 1986, for an increase in the utilization rate of ***3.2*** to 4.6 percent. Therefore, constrained supply may present a barrier to increased consumption of recycled printing and writing paper.

Many factors might be contributing to the relatively small increase in recycled printing and writing paper production:

- capital investment required to build a recycled paper mill is high;
- government procurement programs do not provide adequate incentive because they are small and do not assure a long-term market;
- costs at smaller, non-integrated recycled paper mills are higher than at big, integrated virgin paper mills because economies of scale have not been realized, making it difficult to compete in the highly competitive non-specialty paper product market;
- consolidation in the paper industry has resulted in purchases of recycled paper mills by larger companies that subsequently resorted to the use of virgin raw materials and closed the deinking facilities required to use post-consumer waste paper;
- increased exports of waste paper have reduced the domestic supply and increased the price significantly;
- use of waste paper in producing printing paper requires more energy, labor, and materials than use of virgin pulp;
- a great deal of competition exists for the supply of clean waste paper from domestic mills producing tissue, paperboard, and other paper products; and
- the use of waste paper in paper products other than printing papers-may be more efficient from a raw materials viewpoint—the yield (weight of finished product/weight of raw material) in paperboard is 85 percent, compared with 65 percent in printing paper.

On the demand side, barriers to increase paper recycling via government procurement programs exist in the procurement process itself. Purchasing officials are often reluctant to use price preferences because of a desire to restrict ''unnecessary' expenses and maximize the purchasing value of public funds (161). Other arguments include:

- scientific tests to verify the recycled content of particular lots of paper are not economically available, providing no legal means of supporting a bid choice if contested;
- government orders are sometimes too small to qualify for direct mill runs, which often can supply paper at lower cost and allow for easier verification of recycled content;
- fewer responses to purchasing requests for recycled paper might be likely, reducing both competition and purchasing options considerably;
- the amount of paper procured by the government is too small to have an effect on MSW; and
- purchasing officials receive complaints about the quality of recycled paper (although it appears that high-quality recycled papers are more readily available and at more competitive prices than previously, an image of the inferior quality of recycled paper still persists).

These problems are not insurmountable. In some States, notably California, New York, and Maryland, procurement programs for secondary materials have

[41] The General Accounting Office is scheduled to release a report in 1989 on implementation of the paper guideline.

provided a market for recycled paper. The mechanisms most commonly used for recycled paper procurement are minimum content standards, price preferences, and set asides. Minimum content standards define the procuring agency's idea of "recycled" paper. Separate standards are often set for each type, or grade, of paper purchased to allow for technological constraints. A minimum content standard may include requirements for post-consumer waste as well as any type of waste paper in general. Price preferences allow the procuring agency to subvert the usual legal requirement to award contracts to the lowest qualified bidder. Most commonly, preferences range from 5 to 10 percent for paper, thus allowing the purchase of recycled paper at a price up to 10 percent above that of competing paper without the specified waste paper content. Set-aside programs allocate a specified amount of paper purchases to recycled paper, without consideration of price.

New York's procurement program has a 10 percent price preference for paper with a recycled content of at least 40 percent. During the period 1981 to 1987, paper certified by the State as recycled accounted for 40 percent of the paper purchased by the State government. This percentage fluctuated, with no discernible trend, reaching a high of 59 percent in 1985 and a low of 24 percent in 1987. A preference of $77,403 was paid in 1987 for the recycled paper, amounting to 0.9 percent of the total value of paper purchases. The types of recycled paper products purchased under the preference program in 1987 included offset sheet and rolls (43 percent), paper towels (38 percent), scratch pads (18 percent), and text and cover paper (1 percent) .42 In addition to certified recycled paper obtained under the recycled paper procurement program, the State purchased tissue, corrugated and chipboard boxes, napkins, fiber drums, and refuse sacks, all commonly made of recycled fiber, that amounted to about 30 percent of total paper purchases (45).

California has a 5 percent price preference for paper with a recycled content of 50 percent, including 10 percent post-consumer waste. During the period 1977 to 1987, 14.4 percent of California's paper expenditures was for recycled paper (57). The preference paid to procure this paper amounted to $505,000, or only 0.2 percent of the total value of paper purchases. In fiscal year 1986-87, California's recycled paper purchases amounted to 25 percent of total State paper purchases, the highest proportion of recycled paper attained thus far. Even so, the preferences granted amounted to only 0.35 percent. The types of recycled paper bought in that year included bond paper (52 percent), copier paper (22 percent), envelopes (22 percent), lunch boxes (3 percent), and chipboard (1 percent) .43

Maryland has a set-aside program for recycled paper that specified graduated increases in recycled paper purchases up to 40 percent of total paper purchases by 1985, the eighth year of the program. By 1986, Maryland had spent more than $19 million to purchase recycled paper products, defined as containing 80 percent recycled paper, including 80 percent post-consumer waste (57,58,153,154). Maryland's program focuses on bond paper.

Clearly, this review of various Federal and State financial incentives indicates that careful evaluation of the potential effect of incentives to encourage recycling is necessary before program commitments are made. Indeed, the dynamic nature of secondary materials markets makes it imperative that recycling be a carefully planned and implemented MSW management option.

Incineration

OTA estimates that about 10 to 15 percent of the Nation's MSW is managed through incineration. The status of regulation of air emissions and management of ash residues from MSW incineration is discussed in chapters 1 and 6. The discussion in this chapter is limited to the general context in which this policy debate is taking place.

Local officials were first encouraged to develop waste-to-energy incineration facilities by the Department of Energy and EPA, which in the mid-1970s promoted incineration as part of the Nation's strategy to be energy self-sufficient. The Department of Energy (DOE) was given authority to provide Federal funds to encourage the developing

[42]Offset papers, bond paper, copier paper, envelopes, and text and cover paper are considered printing and writing paper, while toilet paper, paper towels, and facial tissues are considered tissue papers.

[43]Previous years' purchases included tissue, paper towels, correlated, and other non-printing and ~@ papers.

waste-to-energy industry (i.e., incineration facilities that recover energy). A comprehensive waste-to-energy program, however, never developed. DOE issued several internal drafts of a Comprehensive Waste-To-Energy Plan, but the document was not published or submitted to Congress (66). Nonetheless, DOE continues to sponsor some related research efforts (139).

Price support regulations, in accordance with the Energy Security Act, were issued in 1980 but withdrawn in 1982. The funding for loan guarantees and price supports for waste-to-energy facilities was virtually eliminated at this same time (66). However, Federal support for waste-to-energy facilities continues through the Public Utility Regulatory Policies Act. PURPA guarantees a market for the electricity generated by waste-to-energy facilities (chs. 5 and 6). Utilities are not generally enthusiastic about the requirement to make "avoided cost" purchases of energy from MSW facilities, and although the program is under review it to date has seined to create an artificial market for these sources.

Many early combustion facilities suffered mechanical and technical difficulties, thus creating a climate of skepticism about the reliability of this management option. Today, the industry believes it has acquired the technical expertise necessary to run successful facilities (116). The public, however, remains concerned about the high capital costs associated with incineration, site selection, air emissions, and ash management.

Siting incineration facilities is a slow process that can take 5 years or more. In addition, several more years may pass before a facility is operational. For example, in New Jersey the Department of Environmental Protection estimates that it may take a year or more to complete its comprehensive permit process; construction is estimated to require an additional 2 to 3 years (117). The financing and management costs associated with incineration can also be formidable (ch. 2). Some localities have canceled or postponed proposed waste-to-energy facilities (including Austin, Texas; Seattle, Washington; Philadelphia, Pennsylvania; and Alachua County, Florida). In March 1989, Tulsa, Oklahoma adopted an ordinance that increases trash collection rates for households and businesses to help finance the city's waste-to-energy facility. The facility has experienced annual shortfalls of $6.3 million since 1986, largely caused by lower than projected natural gas prices and because the facility is operating at only 65 percent capacity (31).

In the current highly uncertain regulatory climate for MSW incineration, municipalities need reliable information on incineration technologies, cost estimate scenarios, and realistic assessments of their potential liabilities if they are to plan and evaluate proposals for incineration projects. The National League of Cities published a guide to answer questions many municipalities face when contemplating an incineration project, and some other information resources are available (86a). Guidance from the Federal Government to clarify the regulation of incineration is strongly needed, however, to facilitate local planning.

Compatibility With Recycling

As incineration and landfilling become more costly, recycling may become more cost competitive with these options. Some observers are concerned, however, that "flow control ordinances," designed to ensure sufficient refuse for efficient incinerator operation, and related factors make these two options basically incompatible.[44] Flow control ordinances, in which a municipality grants an exclusive contract for the collection and/or disposal of waste to an incinerator (or other waste facility), have been upheld as "a reasonable and foreseeable exercise of [State] powers."[45] That is, flow control ordinances under certain circumstances have been upheld by the Supreme Court, and are not a violation of antitrust laws even though they can displace competition.

[44] Most localities do guarantee a certain flow of MSW to facilities, the so-called "put or pay" or "flow control" contracts. If a facility is not sized to adjust for the amount of MSW a community will recycle, and an ambitious recycling program reduces the volume of waste available to the facility, the locality may have to contract with other communities for that amount of MSW. Flow control ordinances of some sort exist in every region of the country (80).

[45] *Hybud Equipment Corp. v. City of Akron, Ohio* 742 F.2d 949 (1984), 471 U.S. 1004; see also *Town of Hallie, et al. (Wisconsin) v. City of Eau Claire (Wisconsin)* 700 F.2d 376 (1983), 467 U.S. 1240 *Central Iowa Refuse Systems, Inc. v. Des Moines Metropolitan Solid Waste Agency, et al.* 715 F.2d 419 (1983), 471 U.S. 1003; and J. *Filiberto Sanitation, Inc. v. State of New Jersey Department of Environmental Protection and Board of Public Utilities;* Hunterdon County Municipal Utilities Authority 857 F.2d 913 (3rd Cir. 1988).

Although some experts argue that incineration deters recycling, others disagree, saying that recycling and incineration are compatible management options (ch. 6). Section 4003(d) of RCRA states that the sizing of waste-to-energy facilities should take recycling and resource recovery activities into account. In some cases, States are taking an active role to help ensure that recycling and incineration are compatible. This is essential if States are to successfully implement a waste prevention and materials management approach to MSW.

In New Jersey, the State's mandatory recycling law targets 25 percent of MSW for recycling. In Essex County, New Jersey, the State funded a study to examine how comprehensive recycling might effect the design and operation of the county's proposed waste-to-energy project. The study estimated that removing significant quantities of recyclable could increase the heat content of the remaining waste and reduce the quantity of ash produced. In addition, capital costs could be reduced by approximately $22 million by reducing the size of the facility 15 percent. Ground was recently broken for the 2,250-ton-per-day facility. According to the New Jersey Department of Environmental Conservation, most of the State's planned waste-to-energy projects have been scaled down to be consistent with the State's 25 percent recycling goal. Scaling facilities to meet recycling goals underscores the critical role of recycling in integrated MSW management systems.

Failure to consider the reduction in waste caused by recycling can bring unexpected problems. In Warren County, New Jersey, for instance, a 400-ton-per-day facility is under construction. It will be the first large-scale waste-to-energy facility to open in New Jersey; a new landfill was also permitted nearby. But Warren County, in meeting its 25 percent recycling goal and given the anticipated growth of its communities, may have a shortfall of refuse for its facility by 1990. It has, therefore, contracted with Hunderdon County for 100 tons per day. It also decided not to require newspaper recycling, and has instead targeted glass and aluminum containers, and plastic beverage bottles for recycling. The newspaper will then flow to the waste-to-energy facility. This compromise brought mixed reactions from citizens and public officials.

This situation and similar ones around the country illustrate the difficulty of achieving a delicate balance between incineration and recycling management options. Recently in Spokane, Washington, the County Board of Health issued a permit that requires 35 percent of Spokane's MSW to be recycled by 1998, but supporters of the incineration project believe that the new county recycling requirement may make the incinerator economically unfeasible because there would not be enough MSW to burn.[46]

In contrast, the County Commissioner of Marion County maintains that Oregon's ambitious recycling goals are not having a negative impact on operation of the county's waste-to-energy facility (133). New York State has a regulatory requirement that a community applying for a permit to build an MSW management facility include a comprehensive recycling analysis in the preliminary application.

The ultimate effect of provisions to ensure the compatibility of recycling and incineration is not yet clear. State and local planning and development of incineration facilities requires as careful consideration as the development of any other MSW alternative.

Landfill Disposal

Many areas around the country are facing shortages in permitted landfill capacity (ch. 7). Continued reliance on landfilling is a source of concern as a number of potential problems become increasingly apparent: capacity issues (as landfills unable to meet permit requirements close); costs (as tipping fees increase to cover costs or control use); siting difficulties for new landfills; and concerns over ground and surface water and air emissions. In addition to efforts to upgrade existing landfills and site new landfills with better environmental designs (ch. 7), many States are also attempting to clean up existing landfills. This can be expensive. For example, in Wisconsin it is estimated that a six-fold increase in the State's tipping fee could be needed to cover expected pollution problems at licensed landfills during the next 30 years.

[46] In 1989, EPA Region 10 (which includes Washington Stile) included the front-end source separation of recyclables in the permit ss a Best Available Control Technology (BACT) requirement. Although EPA Headquarters denied the permit, the attempt has potentially far-reaching implications (chs. 1 and 6).

The current Federal criteria regulating landfills became effective in late 1979 and apply to both new and existing MSW landfills. In August 1988, EPA proposed regulations for the design and operation of new and existing MSW landfill facilities (ch. 7). Currently, 38 States require groundwater monitoring, but only 14 States require corrective action for groundwater contamination. Final cover at closure is required in 49 States and 42 States have requirements for post-closure care (this varies, however, from 1 to 5 years to 20 years), and 20 States require some financial assurance.

EPA has concluded that while a few States have comprehensive regulations, the majority have inadequacies in one or more provisions (149,149a). For example, few States include location standards for landfill sites in their regulations.[47] Almost 60 percent of all MSW landfills have permits or approved plans (yet 50 percent of all Subtitle D facilities are operating without a State permit). Enforcement efforts in general also need improvement, even though most of the States' activities (as noted above) are spent on surveillance/enforcement and permitting.[48] Inadequacies with State regulations indicate that Federal criteria may need to be more complete, and the proposed regulations include provisions for corrective actions, performance standards, closure and post-closure requirements, and financial assurance. As Federal requirements are developed, the relationship to State permitting and enforcement programs needs to be clarified. State variation in standards also means that the degree to which landfills are located, designed, and operated in an environmentally sound manner is highly dependent on wherein the country they are located.

Although landfill ownership varies among States, on a national level most MSW landfills tend to be owned and operated by public entities (ch. 7) (16,18,145).[49] Overall, 86 percent of all the landfills are publicly owned, 57 percent of these by local governments (149a). In some States (e.g., Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, and West Virginia), however, the distribution of ownership among public and private entities is relatively even.

Details of landfill technologies and related issues of performance are discussed in chapter 7. As in many areas of MSW management, contrasts between different regions of the country, particularly between the west and east coasts, are apparent. For example, methane gas recovery at landfills began in California at the Los Angeles Sanitation District in the early 1970s. Most sites recovering methane gas remain in the West, but recovery operations are opening with increased frequency east of the Mississippi *(78).*[50] Some of the recovery operations in California are associated with sites that are now closing as new regulations take effect or adapting to changing circumstances.

One example is the landfill in Mountainview, California, which has a successful methane gas recovery project. The landfill project started in 1970 and today is nearly completed. Mountainview wanted a park in a swampy, wrecking area which is the landfill site, but to bring in fill would have been too costly. Nearby San Francisco wanted a transfer station and additional disposal capacity; Mountainview built the landfill to secure the money for a park and eventually a park was developed over closed areas of the landfill. In addition, an amphitheater, a golf course, park, and saltwater lake have been created. The methane gas recovery project was established largely as a response to flares of *methane* gas escaping from the landfill caused by cigarette smoking on the amphitheater grounds.

In some areas of the country, particularly rural areas of the Midwest and in the generally arid Southwest, municipalities and States are generally concerned over their ability (and in some cases need) to meet any new Federal requirements for landfills. Even in these areas where the goal is to upgrade landfills to better protect groundwater or for other purposes, lack of financial resources seriously con-

[47] That is, only 12 States include location standards for wetlands, 3 States have such standards for seismic impact zones, and 6 States have them for subsidence-prone areas.

[48] EPA estimates that approximately $200 and 8 labor hours per facility per year are spent on average by States agencies for Subtitle D Activities. It is not surprising, then, that about 75 percent of all MSW landfills are inspected only once a year.

[49] The actual volume of waste disposed of in these facilities may be a much smaller percentage of the waste. For example, in Wisconsin 95 percent of the landfills are owned by public entities, but they manage only 28 percent of the waste (103).

[50] Details about the recovery of methane gas are discussed in ch. 7.

strains these activities and the development of any management alternatives. These concerns need to be addressed at the Federal level. Clearly, programs cannot be implemented at the State and local level without resources, and the funding of any new MS W regulations and provisions needs to be considered at the time of their adoption.

Special Programs

The potential for certain elements of MSW to pose greater risks than the rest of the waste stream or require special handling has caused some States and localities to establish special programs for these MSW components. Such programs are being adopted for household hazardous wastes (including waste oil and batteries), tires, and yard wastes. Concerns over the possible harmful effects from improper disposal of these wastes are associated with both landfilling (i.e., releases of harmful substances to groundwater or the air) and combustion technologies (i.e., contributing to hazardous air emissions or ash toxicity).[51] Again, this discussion only highlights the general nature of some of these special programs.

Household Hazardous Waste

Household hazardous waste (HHW) is now exempt from Federal regulations for disposal that are applicable to other types of hazardous wastes (RCRA, Section 3001).[52] About 1 percent or less of MSW is believed to be hazardous, but the potential impact of these wastes on leachate and emissions from waste management facilities continues to fuel interest in household hazardous waste programs (ch. 3) (see e.g., 146,39).

EPA completed the only comprehensive study of HHW in 1986, which is already dated given how rapidly the number and nature of these programs is changing (144). The EPA survey found that participation in HHW programs has been low, often less than 1 percent. The quantities collected, however, typically range from 20 to 40 pounds per household (apparently representing several years accumulation of wastes). Unit costs for these collection programs can be very high, up to $18,000 per ton. A program with high participation may cost $2/pound of HHW collected, while a program with low participation may cost over $9/pound (144).

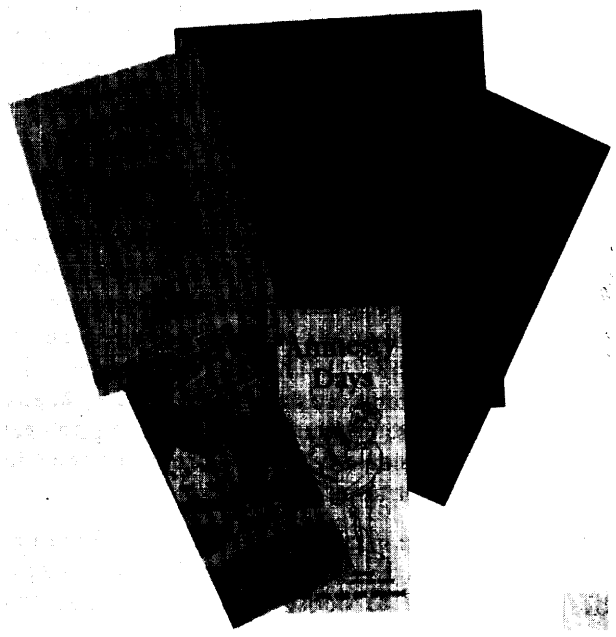


Photo credit Office of Technology Assessment

Special management programs for household hazardous wastes are increasing throughout the country. The information distributed as part of the programs can be a very effective way of educating people about alternatives to toxic products.

The relatively high economic cost of collecting HHW raises some questions, given that other sources of toxic pollution such as small quantity industrial generators may dwarf the HHW contribution to potential environmental and health risks (60,79) (ch. 3). Small quantity generators (SQGs) may be included in HHW programs and at least one study, for Seattle/King County, Washington, found that about the same amount of HHW and SQG waste was sent to the area landfill as was sent off-site from larger industrial sources (39). In addition, the separate collection of HHW is not always necessarily consistent with a materials management ap-

[51] The effects of household hazardous wastes on municipal wastewater and its treatment also are a concern if they are disposed of into a sewer system.

[52] This means that it is not necessary to obtain a permit to store HHW. Liability under CERCLA ("'Superfund'"), however, may be incurred by a municipality transporting or disposing of HHW at a site (21).

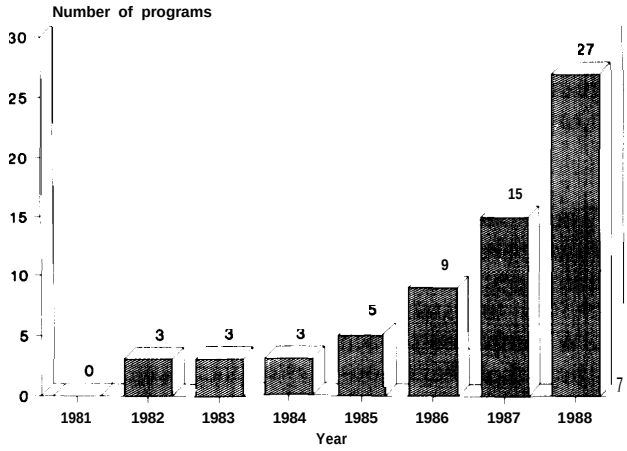
preach to MSW (ch. 1).[53] In any case, support for HHW programs continues because of the educational value of these efforts, especially in terms of promoting the use of alternative, less toxic products (24,144).

At least one HHW collection program has been held in each of 42 States between 1981 and 1987; in total, there are at least 849 ongoing HHW programs (23,24).[54] Half of the States have laws and/or regulations addressing HHW. Often, however, localities hold these programs with or without State or Federal funding (18,24). This, in part, may be why many HHW programs are short-lived or sporadically held. Nonetheless, particularly in areas highly dependent on groundwater, HHW programs tend to persist and appear to be expanding.

Some areas are establishing regional and permanent facilities for HHW management. These facilities are intended to boost participation rates and distribute the cost of HHW collection among communities. Public education is also key to the success of HHW programs. As of 1988, there were 27 permanent HHW collection programs in the country, sometimes at transfer stations (figure 8-3). For example, San Bernardino County, California, has two permanent HHW centers that are open on a daily basis. Each facility has a specially designed storage unit for the wastes. Wastes are accepted, categorized (open and unidentified wastes are not accepted), properly packaged, and entered on a log sheet. Wastes are then shipped off site for disposal (usually in drums to hazardous waste landfills). The program is funded by the State with some matching funds from the county's surcharge at landfills (38,81,82,91,1 11).

One of the oldest and largest State HHW programs is in Florida (62,73,146). Florida, with its high water table and porous soil, is dependent on groundwater and vulnerable to groundwater contamination. The county-breed "Amnesty Days" program is funded by the State through the Water Quality Assurance Trust Fund and is supervised by the Department of Environmental Regulation. A variety of approaches have been used in the 3 l/2-year-old program, but educational efforts are generally combined with collection. Usually a''transfer station on wheels," tractor rigs equipped for the collection process, are used. Unlike some HHW programs, the "Amnesty Days" collections will accept hazardous waste (and pesticides) from small businesses, farmers, and State agencies as well as households. Rhode Island has a similar State-managed regional collection program (50). Other States, such as California and Washington State provide guidelines but no direct funding.

Figure 8-3-Permanent Household Hazardous Waste Collection Programs By Year



SOURCE: Dana Duxbury & Associates, personal communication, February 1989.

Perhaps the most effective framework for HHW programs is a statewide, State-managed collection program with adequate funding (73). If no funds are available, at a minimum State guidelines or regulations are considered desirable (73). A State excise tax (essentially a user fee) is one funding option for HHW programs. Connecticut, Massachusetts, New Hampshire, and Vermont, among other States, have matching grant programs to help fund local HHW efforts. For example, in Connecticut matching grants of 50 percent are available for HHW collection days. Other types of funding available are EPA grants, State Superfund monies, and State bonding (73,100), Local governments may use a variety of approaches to fund or subsidize HHW programs, such as establishing surcharges (e.g., refuse collection surcharge, water bill surcharge, or tipping fee sur-

[53]For example. some toxic residues in glass containers might be destroyed during recycling processes, in which case the collection of this type of HHW in a separate program may not be desirable from a materials use perspective.

[54]In contrast t. the proliferation of HHW programs today, in 1981 there were only two programs in one State.

charge), stipulating the establishment of an HHW program when granting a site permit to an appropriate firm, and/or using subsidies or general tax revenues (100,101).

States can also provide technical assistance to localities for HHW programs and evaluate the impacts of existing programs. Indeed, some State statutes require the evaluation of pilot HHW program efforts. Areas of concern for improving HHW programs that could be addressed by the Federal Government include clarifying the liability of collection program sponsors, improving technical assistance, funding public information efforts, and addressing labelling and disposal restriction issues (e.g., providing clearer guidelines for use and disposal; requiring consideration of HHW in MSW plans). Industry cooperation, by both manufacturers and waste management companies, will facilitate any of these efforts for proper disposal of HHW.

In some States and/or localities, more specialized programs to handle pesticides, paints, used oil, and batteries have been established.[55] "Pesticide Days" are held with increased frequency around the country, but pesticides are also often accepted at HHW collection programs (6,41). Some communities will collect used oil at their recycling centers (e.g., Davis, California); several communities also collect used oil through curbside collection programs (e.g., Palo Alto, California) (44,148). Liability concerns have limited efforts to establish permanent collection sites in some areas, but collection directly from households may avoid classification of the oil as hazardous.

Batteries are also collected by some targeted programs. For example, the New Hampshire/ Vermont Solid Waste Project, a consortium of 26 municipalities in the two States, began a program to collect household batteries in 1987. The batteries are collected through retail stores that sell dry cell batteries for flashlights, radios, cameras, and hearing aids.[56] Consumers are encouraged to return batteries through public education efforts, and batteries are collected by local civic groups and stored in 55 gallon drums in a secure location until the next local HHW collection is held.[57] In New York City, the Environmental Action Coalition (EAC) began in 1988 to collect button cell batteries from apartment buildings participating in its recycling programs. The EAC estimates that as many as 10,000 button cell batteries may be disposed of daily in the city.[58]

Tires

Tires are a prevalent MSW problem for States and localities because they create serious problems for landfills. They tend to float to the surface; sometimes they ignite underground and cause severe fires. Aboveground stockpiles are fire and health hazards (e.g., mosquitoes, which can transmit diseases, breed when water collects in the tires). Chipping tires and landfilling them or chipping and burning them have been expensive alternatives to landfilling whole tires.[59] The Department of Energy estimates that 168 million of the 200 to 250 million tires disposed of each year are landfilled or placed in junk yards. At least 34 stockpiles of 100,000 tires or more have been identified and are within 150 miles of major metropolitan areas.

Some States impose deposits on tires to help finance recycling and research on appropriate disposal methods (e.g., Wisconsin imposes a $2 deposit). Other States have adopted a fee (e.g., Florida and Oregon) or are proposing to adopt a fee (e.g., New York State) on new tires and to use the money to help municipalities remediate existing tire piles, provide grants and/or loans to businesses adopting new technologies for tire recycling, and/or support research on new methods for managing discarded tires. Fee systems typically require that tire retailers accept discarded tires from consumers purchasing new tires. At least three States have a used tire recycling program.

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[55] These items are also often collected in high volumes in HHW programs, and they do require special handling.

[56] Lead-acid batteries are also a concern, but no known program for their collection was identified. Private recycling of these batteries has been affected by liability concerns and, until recently, depressed prices for lead in secondary market (ch. 5).

[57] The Southwest Missouri State University Household Hazardous Waste Project is establishing a mechanism to facilitate battery collection in retail stores by providing self-mailer boxes (123) (ch. 5).

reliability concerns over the processing of the batteries for recovery and recycling are not resolved. See refs. 91 and 123.

[59] Ch. 5 discusses technologies and related concerns associated with tire disposal.

Yard Wastes

Several States (e.g., California, Massachusetts, Minnesota, New Jersey, Oregon, Washington, and Wisconsin) have programs and/or regulations to encourage or even mandate comporting (10a,107a). In 1988, New Jersey banned disposal of leaves in landfills (September through December) and mandated comporting (76).[60] Minnesota and Wisconsin banned landfill disposal of all yard wastes effective in 1993 (46). At least three States (i.e., California, Massachusetts, New Jersey) have preferential procurement policies regarding compost. The New Jersey State Department of Transportation, however, has said it cannot give preferential treatment to compost until specifications are developed (76). Minnesota has a policy of using compost, and Montana has exempted compost from the State sales tax (107a).

Some States offer technical or financial assistance to foster comporting (l0a). New Jersey, Wisconsin, and other States provide manuals on comporting for community-level operations. In New Jersey, leaf comporting operations are eligible for State recycling grants and, because siting in general is so difficult, the State will approve the siting of such operations on public lands (10a,120a). The 1987 Massachusetts Solid Waste Act provides $7 million for municipal yard waste comporting programs (109). Minnesota's Waste Management Board has provided funding for various studies and projects, and Florida has provided financial assistance for feasibility studies (107a). Delaware played a major role in developing the mixed MSW comporting facility in Wilmington.

Many localities operate yard and leaf waste comporting operations or contract with private operations (ch. 5). For example, Urban Ore, a nonprofit recycling business in Berkeley, California, produced commercial grade compost for 3 years. The program ended because of political reasons, not its effectiveness (63). However, the city may renew its comporting efforts because studies indicate that 35 percent of the MSW volume accepted by the landfill is brush and yard debris from small and independent haulers.

Two private firms in Portland, Oregon, cooperate with the Metropolitan Service District (Metro) to compost the area's yard waste. Metro provides technical assistance to the firms, marketing assistance to processors, and a public education program to promote comporting. At least 25 percent of the area's yard waste is now composted and officials expect this will double within 5 years (157). In Davis, California, leaves are collected in plastic bags by the municipality, which grinds them and makes non-commercial grade compost. Unlike some communities with similar programs, it has been able to give away compost the town does not use. These few examples indicate that compost programs, if carefully planned and executed, can preserve landfill space and produce usable compost (also see ch. 5).

CROSS-CUTTING CHALLENGES

As the responsibilities for MSW management are increasingly shared among local, State, and Federal Governments, a high level of coordination and clear designation of responsibilities becomes critical. Requirements and program initiatives cannot be enacted by higher levels of government without considering available resources and activities at lower levels of government. Further, planning efforts are severely handicapped if the regulation of various management alternatives, and indeed the entire Federal MSW program, is in a constant state of flux or is ambiguous.

Several problems exemplify contentious issues and illustrate the need for coordinated and cooperative intergovernmental efforts. Concerns over the potential for increased interstate shipment of MSW are often sparked by the problem of insufficient capacity within jurisdictions. Issues of siting and public participation are related to the problem of a lack of public confidence in newly proposed MSW policies.

Self-Sufficiency and Interstate Transportation Issues

To plan an effective MSW strategy, the responsible political jurisdiction needs to be able to predict the approximate amount of MSW to be handled and provide sufficient capacity. Currently, however,

[60] However, sufficient permitted capacity to compost all *the* leaves collected does not exist. As a result, New Jersey promulgated an emergency rule that simplified the permitting process for small operations and allowed larger facilities to obtain temporary operating certificates.

many communities and States are experiencing an MSW capacity shortfall, at least until new facilities are operational. This often leads to a greater shipment of waste between political jurisdictions. As a result, some States and communities are experiencing unexpected and dramatic increases in the amount of waste received from other areas at their facilities (ch. 7), which generates concern over the effect on their own future capacity and on other, revenue-raising activities (e.g., tourism).

In response to interstate imports, some States have attempted to ban the importation of MSW. However, given that siting MSW facilities may take 5 or more years, it is likely that at least in the short term, some communities will continue to need to ship some waste to areas with existing capacity. Therefore, the concerns of jurisdictions with existing capacity need to be addressed.

The Commerce Clause of the Constitution grants Congress the power to regulate all commerce; the "dormant commerce clause' is essentially a restatement of this power that makes explicit that State lines cannot be made barriers to the free flow of commerce (19).[61] The *City of Philadelphia v. New Jersey case* is the landmark decision regarding the question of whether a State may regulate the shipment of MSW into its jurisdiction.[62] in 1973, New Jersey enacted a waste control law clearly aimed at prohibiting the shipment of "unusable" MSW into the State for landfill disposal, but allowing shipment of MSW materials with some potential economic value (e.g., through reprocessing, heat recovery, recycling, or as animal feed).[63] Philadelphia sued New Jersey over the statute, claiming it was an encumbrance to interstate commerce, and the U.S. Supreme Court held that the New Jersey law was indeed in violation of the Commerce Clause. The New Jersey statute was not preempted by any existing Federal law; it was considered a ''protectionist" measure rather than a law "directed to legitimate local concerns, with effects on interstate commerce that are only incidental."[64] Some municipal bans on MSW importation also have been challenged as violations of the Commerce Clause, but the case law is not entirely consistent.[65]

Federal courts and at least one State appellate court have addressed the "market participation' exception to the Commerce Clause (as articulated by the Supreme Court) with respect to landfills.[66] If the State is acting as a "market participant,' that is, it owns, operates, or transacts business itself, then it may chose to conduct business with whom it wishes (e.g., refuse to accept out-of-State shipments of MSW) without violating the Commerce Clause.[67] The Commerce Clause is interpreted as prohibiting a governmental unit from "hoarding" all landfill facilities for its citizens, when the sites are viewed as natural resources. Restrictions are permissible under certain conditions if facilities are viewed as complex activities rather than natural resources (e.g., when private operators are allowed to compete with publicly operated landfills) (67).

Thus Delaware, which established the Delaware Solid Waste Authority to manage **all** of the State's MSW, can restrict the influx of any out-of-State waste.[68] Maine passed legislation that requires future solid waste facilities to be State-owned, the apparent intent being greater control over siting and interstate shipments of wastes. It appears that a **locality** would also be able to restrict the flow of

[61] U.S. Constitution, Article I, Section 8, Clause 3; Southern *Pacific Co. v.* Arizona, 325 U.S. 761 (1945).

[62] *City of Philadelphia v. New Jersey,* 437 U.S. 617 (1978); 98 S. Ct. 2531.

[63] Waste Control Act, N.J. Admin. Code 7:1-4.2 (Supp. 1977). See refs. 19,70, and 128.

[64] The Court rejected New Jersey's argument that MSW was "valueless.' See refs. 19, 70, 128.

65 S= *Monroe-Livingston Sanitary Landfill, Inc.* v. *Town of Caledonia,* 51 N.Y. 2d 679; *Dutchess Sanitation Serv., Inc.* v. *Town of Plattekill* 51 N.Y. 2d 670; 435 N. Y.S.2d 966 (1980). In addition, attempts by municipalities to control MSW disposal through their zoning power have also been challenged successfully if they discriminate on the basis of the source of the MSW (see refs. 70, 128),

[66] *See Hughes* v. *Alexandria Scrap Corp.* 426 U.S. 794 (1976); also Reeves, Inc. *v. Stake 477* U.S. 429 (1980) and *White* v. *Massachusetts Council of Construction Employees 460* U.S. 204 (1983).

[67] See, e.g., *LeFrancois* v. *Rhode* /s&~ 669 F. Supp. 1204 (D.R.I. 1987); *Shayne Brothers v, District of Columbia 592* F. Supp. 1128 (D.D.C. 1984); and County Commissioners *of Charles County v. Stevens* 299 Md. 203 (1984). These cases generally find that when States or municipalities operate landfill services as market participants they may under certain conditions be able to restrict their services to wastes from only their jurisdictions without violating the Commerce Clause of the Constitution.

[68] Delaware Solid Waste Authority, 7 Delaware Co,e, Chapter 64; also, *Hughes* v. *Alexandria Scrap Corporation,* 426 U.S. 794 (1976), See ref. 128.

waste if it was a "market participant, " that is it owned or operated a facility.[69]

The Federal Government could address the issue of self-sufficiency and interstate transportation by requiring or encouraging State solid waste plans to address capacity and how it will be provided (see ch. 1 for additional discussion). Some legislation has been proposed or discussed in Congress to establish Federal requirements regarding interstate transportation of MSW, as well as the exportation of MSW to foreign countries. One proposal, for example, would allow a State to ban imports from other States if it had an EPA-certified solid waste plan and a process for developing sufficient capacity to handle its own MSW. A reliable system to collect data on existing, planned, and future capacity also is needed and could be included in requirements for approval of State plans.

An alternative approach would be to provide mechanisms for cooperation in interstate MSW transportation (ch. 1). For example, interstate compacts have been used to deal with issues such as low-level radioactive waste disposal, navigation and flood control, water pollution control, community development, and crime prevention (66). In fact, provisions exist in RCRA (Sections 4002(a) and 4006(C))" to encourage interstate regional planning to facilitate MSW management. These provisions, which have not been implemented, could provide a basis for allowing States to enter into agreements on MSW issues such as transportation of wastes, disposal fees, or development of new management facilities. Instead of erecting a barrier, this would allow some wastes to move unimpeded across State lines, but in an orderly manner.[70]

Restoring Public Confidence

Siting

Siting new MSW management facilities—whether landfills, incinerators, or recycling facilities—has become increasingly difficult in some areas. Some State MSW plans, which in part address the development of adequate capacity, have failed to be implemented because new facilities to meet the goals of the plan could not be sited. Given that additional capacity shortages are expected as landfill closings increase when the new EPA landfill regulations take effect (ch. 7), the problem of siting facilities in a timely way is a growing concern.

Informal discussions by OTA with State and local officials and developers of various types of waste management facilities throughout the country revealed that **most facilities have taken at least 5 to 8 years to site.** Realistically, any locality needing additional disposal capacity within a shorter period of time will probably have to make interim arrangements for MSW disposal, such as expanding the capacity of existing facilities and/or entering into agreements with jurisdictions or facilities nearby that have sufficient capacity to accept additional wastes. Again, escalating costs will result.

Public opposition is the primary cause for the lengthiness of the siting process. The opposition is in part related to the "NIMBY" (not in my backyard) syndrome, which seems to affect a broad range of activities. The primary cause of the opposition, however, stems from a lack of confidence in the safety of a proposed facility and the uncertainties associated with its regulation and reliable operation. Residents also have concerns about potential negative effects on local property values.

Nonetheless, some new management facilities of all types have been sited in recent years (box 8-D). An extensive body of literature exists on the difficulties of siting facilities (particularly hazardous waste facilities) and evaluating various approaches to siting. In general, the key factors to foster public acceptance of a facility identified by such studies (69, 97, 131) are the:

. **credibility** of the siting process (i.e., the scientific assessments and political judgments of a site's suitability are trusted by the public);

[69] *Evergreen Waste Systems, Inc. v. Metropolitan Service District 820* F2d *951* (1987).

[70] One bill proposed in the 100th Congress (H.R. 3515) would not prohibit interstate transport of MSW, but would require that a written agreement exist between a party transporting MSW across a State line and the facility accepting the waste, and that other specified conditions be met as well. Bills restricting interstate transportation continue to be proposed in Congress (e.g., H.R. 2099, 101st Cong., 1st sess.), although it is not clear whether Congress will enact any such measures (75).

- **equity** issues (i.e., assurances to the host community that health and environmental risks will not be unfairly borne on its residents); and
- **public participation** (i.e., involving the public in selecting, evaluating, and locating facilities).

Successful siting is most likely if there is early, substantive, and continual public participation, positive local-State relations, and sincere efforts to mitigate risks (e.g., through additional controls, frequent monitoring and inspection, and rigorous enforcement).

Involving the public and building trust can add a significant amount of time and expense to the siting process. Yet, allowing the public only limited opportunities for participation (e.g., public hearings on an already government-selected site) can fuel opposition to waste management alternatives and also add delays and high costs to a project.

A comparison of the political processes in Japan and the United States provides some guidance on how to improve this critical component of policymaking. In Japan, public acceptance for new facilities is gained primarily by meeting public demands for advanced pollution controls. That is, political and social acceptability (rather than environmental, health, economic, or technical factors) are critical in determining which methods a community adopts. In addition, a community swimming pool or greenhouses, heated by steam recovered from the waste-to-energy facility, may be provided to the host community as part of the facility. This process, although generally successful, has resulted in escalating expectations by the public, longer negotiations, and substantial extra costs (in some cases up to 50 percent, some of which are borne by the national government). In the United States, similar approaches may prove necessary to gain public confidence in our entire approach to MSW management.

Effective siting is most likely when two basic premises are recognized—siting is a continual negotiations process and it must take place with public support (125,126).[71] One study, which reviewed 120 proposed MSW incineration projects and analyzed 20 as representative of the national situation, found that 35 percent completely abandoned plans for the facility, 15 percent are in "serious difficulty" proceeding, 25 percent are proceeding toward contract signing and are not at more than double the expected time at this stage, and 25 percent are under construction or operational (13).

Photo credit: M. Wagner

The famous "Not In My Backyard" or NIMBY situation applies not only to incinerators and landfills, but also to facilities for processing reclyclable materials. It stems from past experiences with poorly performing facilities, concerns over potential risks, and failure to involve the public adequately in decisionmaking.

In this study, the investigators found that it was not the technology, concerns over air degradation, or other concerns which caused a site or project to be abandoned, but rather "insufficient public appreciation of the need to find a waste disposal alternative. The researchers found that public education programs needed to begin before the site was announced and needed to include detailed explanations about the need for the facility.

Political and personal economic considerations can affect citizens living near a site. Sometimes indecision by local officials can fuel opposition to a proposed site; citizen advisory committees without sufficient public education efforts can also be associated with siting difficulties. In addition, if homeowner equity is the major personal asset of local citizens, opposition is likely to be high.

[71] See also refs. 64 and 124. For discussions of how procedural improvements in the siting process could increase the likelihood Of Siting, see ref. 9.

Box 8-D-Examples of Successful Local and State Siting Experiences

The Palm Beach County (Florida) Solid Waste Authority considers involvement of the Citizens Advisory Council (CAC) key to the successful siting of its resource recovery facility. The CAC assisted in defining the details of the $320 million bond issue, reviewing elements of the project before contract signing occurred, and continues to serve as a "watchdog" for the project. The authority, in an attempt to gain public confidence, went beyond regulatory requirements and attempted to address public concerns throughout the planning and implementation of the project. Although the siting process for the resource recovery facility did take 7 years and possibly entailed some additional expenditures, public support was established for the project and the county's MSW efforts (1 15).

Approximately 5 years were required to site the waste-to-energy facility in Marion County, Oregon. In total, however, 12 years were spent to develop a relatively long-term MSW solution for the county. The County Board of Commissioners, after meeting resistance to siting a new landfill, established a citizens group (the Solid Waste Advisory Council) in 1979 to study MSW options. The citizens advisory group recommended at the end of 2 years that a waste-to-energy facility be built. The board concurred and selected a prospective vendor. Soon, however, public pressure mounted again. A public relations firm was hired, and another citizens group was formed (the Citizens' Committee to Solve Marion County's Garbage Crisis). Eventually, a petition filed in opposition to the waste-to-energy facility was defeated and the plant opened in **1986 (34).**

In Wisconsin, the Department of Natural Resources (DNR) is responsible for the technical and environmental regulatory review of landfill sites, and the State Waste Facility Siting Board has the power to arbitrate an agreement between a municipality and a landfill developer as long as the agreement meets the regulatory requirements set by the DNR.[1] The DNR includes in its technical and environmental review criteria such as: an evaluation of the need for the facility; location criteria; environmental criteria **(e.g., soil type); design criteria (e.g., liner and cap design);** construction documentation; proof of financial responsibility for closure and long-term care; site licensing; and periodic inspections. The negotiated agreement can address landfill design, operation and closure issues, and alleviating economic impacts on the local area—but, again, State requirements must be met.

Of the 103 facilities that have been subject to the law, in 30 cases no negotiation process was sought; for the 73 which entered into the process, 26 reached a negotiated agreement, 41 are still in the process, 5 have withdrawn, and one is being brought to arbitration (102). The State of Wisconsin acknowledges that its siting process is "complex, comprehensive and time consuming' '-taking 3 to 5 years to complete, but it is also successful (102,1 12). One State official concludes that it is, ''The interplay of planning, state licensing and enforcement and the negotiation/arbitration of local approvals [which] makes the siting of new environmentally safe facilities possible" (1 12).

Another key to the siting program's success is the local approval process, which allows local units of government to establish reasonable controls on the facility and provides an opportunity for any adverse social and economic impacts to be mitigated through the negotiation process. Apparently, economic compensation to host communities and sometimes directly to property owners has been important to a number of agreements. In general, the negotiations proceed in good faith and result in resolution because of the specter of arbitration by the State, which could result in a less favorable outcome.

[1] For more discussion of the Wisconsin siting process, see ref. 112.

Although OTA did not attempt an exhaustive review of all siting experiences, it recognizes siting as a central problem for MSW managers. As discussed in box 8-D, several examples of successful State and local siting experiences can help identify what types of siting policies are likely to be most effective. In Palm Beach County, Florida, for example, local officials were able to implement a multi-faceted MSW program consisting of recycling, a refuse-derived fuel (RDF) resource recovery facility, and landfilling. A different approach, also successful, occurred in Marion County, Oregon, for a waste-to-energy facility. Wisconsin is often identified as having an innovative siting program for landfills that incorporates the use of a negotiation/arbitration process.

As this discussion indicates, public support is crucial to success. This means public involvement, through education and participation, must occur

early and throughout the planning, siting, and development of MSW management options. Sporadic involvement of the public, an unwillingness (or the appearance of inflexibility) to address public concerns, and a lack of consideration of all available management alternatives, can jeopardize successful siting. This may add time and additional expense to MSW projects, but it will encourage necessary public support.

Public Education and Participation

The importance of consumer education of the next generation of consumers--our children--can not be understated. As the public grows more aware of the environmental consequences of its lifestyles (e.g., purchasing decisions), its understanding of waste reduction, recycling, and other management alternatives broadens. In addition, concern for the interconnectedness of environmental problems increases. Public education, public participation, and public acceptance of MSW management alternatives are inextricably intertwined. One effort will not have meaningful results without the others.

A number of States and localities have created education programs as part of their MSW activities. For example, in California, particularly in the San Francisco Bay area, the importance of public education is widely recognized and is a key component in local recycling programs. This includes not only pamphlets and materials distributed to residents about the recycling program, but also a recycling curriculum guide for teachers. In Ohio, the Department of Education requires all Ohio schools to include environmental education in the curriculum, and the Department of Natural Resources' Division of Litter Prevention and Recycling developed a comprehensive solid waste, recycling, and litter prevention curriculum guide. It developed the guide because a review of current health, science, and social studies texts in the schools revealed that solid waste issues generally were not included. The solid waste curriculum guide is indexed to allow activities to be selected for lessons in mathematics, English, science, and social studies (158),

Most State and local education programs assume that the use of materials and the prevention and management of MSW should be included in the curriculum of all school-age children. The logic is that if the importance of sound waste management and the ethics of waste reduction and recycling are taught beginning in elementary school, by the time a child reaches adulthood practices such as materials separation will be part of one's lifestyle. In Japan, as well as in a number of other countries, lessons on recycling and other waste management issues are taught to all school-age children.

One example of a successful recycling information center is in Portland, Oregon. The Metropolitan Service District in Portland operates a Recycling Information Center that responded to nearly 30,000 calls in 1988. The Center began as a volunteer organization initially supported by a grant from the U.S. Office of Environmental Education (part of the Department of Health, Education, and Welfare) and donations. To date, however, the Federal Government has not been extensively involved in supporting any educational programs for MSW. Suggestions have been made that the Federal Government establish an organization similar to the Clean Japan Center to serve as an information source and clearinghouse for citizens and the private sector (66). Again, although some States and localities have established information centers, most have a more narrow focus than the Clean Japan Center.

Views of Appropriate Federal Roles

OTA released a study on materials in MSW 10 *years* ago, *Materials and Energy From Municipal Waste,* and many conclusions regarding key issues, findings, and the "current" Federal role appear strikingly similar to those in this report-at least at first glance (130). Little has changed in the Federal Government's role in MSW in the last 10 years. Concerns over appropriate methods of "resource recovery," the marketability of recovered materials, institutional barriers to recycling, inequities in the governmental incentives for resource recovery and recycling, and the desirability of source separation,

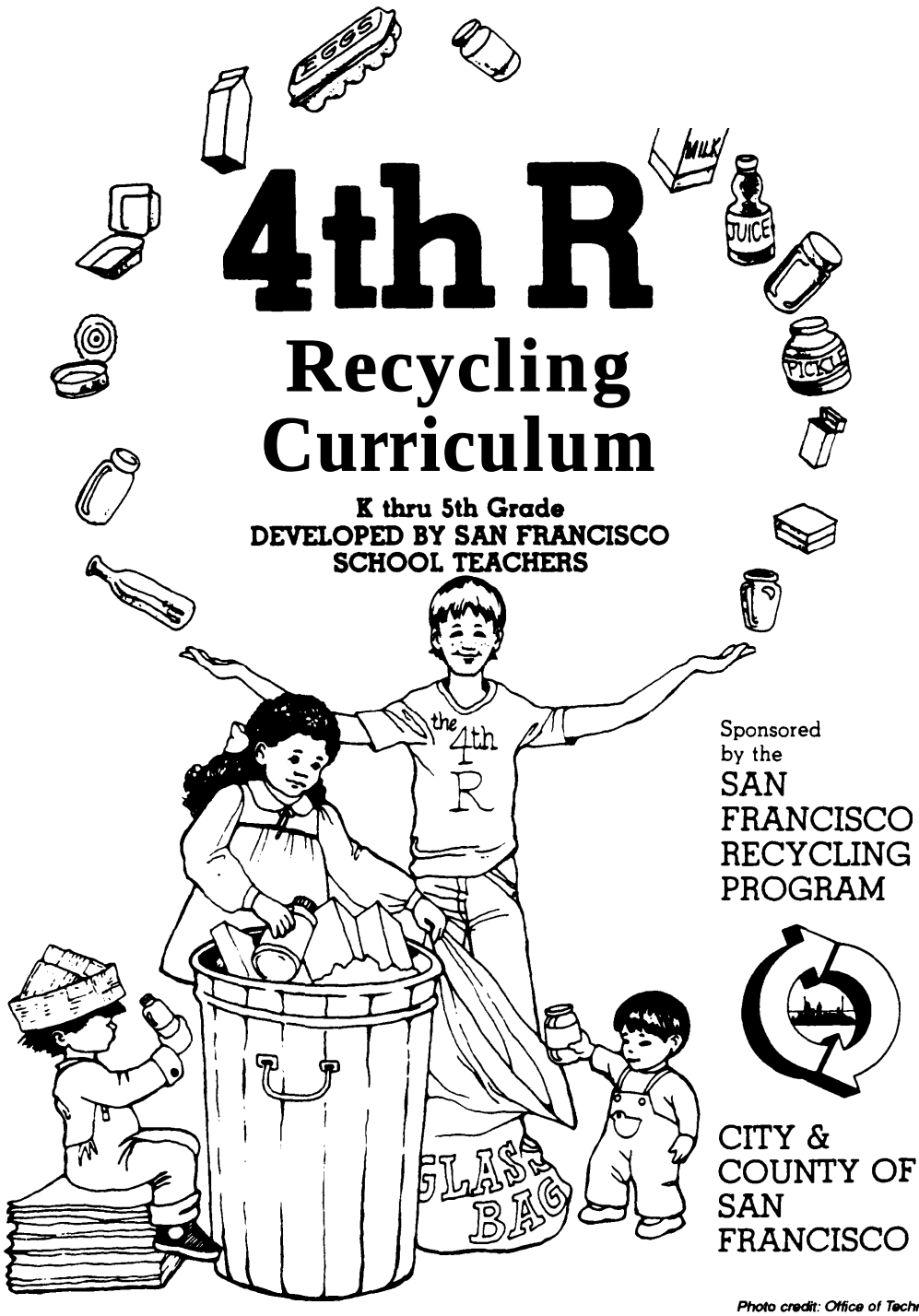

Photo credit: Office of Technology Assessment

The links between the extraction of virgin resources and the mounds of waste that we discard must be made more apparent to the next generation than they are to most Americans today. States and localities usually cite education-particularly at the grade school level—as a key factor in their recycling programs.

are all topics in the decade-old OTA assessment.[72] Yet new concerns have also arisen, such as the need for waste reduction efforts, and the technologies for resource (both energy and materials) recovery and recycling have changed. In the 1979 report, an entire chapter analyzed proposals for beverage container deposit legislation. In 1989, implications of newly adopted mandatory source separation recycling programs warrant detailed examination. Further, the rationale for source separation has been broadened beyond recycling (ch. 1).

Although the list of appropriate Federal activities suggested 10 years ago is not very different from that discussed in this assessment, the motivation for action may have changed. As more stringent landfill requirements have been adopted, available MSW capacity has declined dramatically. This was not a serious concern in 1979, although the potential environmental problems associated with improper landfilling methods were and prompted adoption of stricter regulations .73

Whether the pressure for new, more adequate MSW capacity and other conditions present today will motivate Federal action remains to be seen. As the 1979 OTA assessment concluded:

> Ultimately, the widespread adoption of resource recovery and recycling may depend not so much on the objective analysis of small actions taken together or separately, but on Federal action to create a climate in which the recovery, recycling, and reuse of discarded wastes becomes a valued way of life for all Americans.

Federal attention to MSW disposal and management problems lapsed during the last decade, primarily because of the Nation's preoccupation with hazardous waste problems. As municipalities struggle to devise appropriate mixes of MSW management options for their communities, and States become more directly involved in MSW management, the issue of the appropriate role for the Federal Government resurfaces. State by State, locality by locality, MSW policy development is hampered by limited resources. This results in inconsistent MS W programs and regulations. Consequently, the need for greater Federal involvement is once again being emphasized. As in other areas of environmental policy where a strong rationale for Federal involvement is clear, inconsistencies can lead to a confusing regulatory climate (hampering business decisionmaking) and even encourage the movement of waste from more regulated to less regulated jurisdictions (ch. 7).

State and local officials generally agree that there should be greater Federal involvement in MSW management. Specifically, the following tasks, compiled from a roundtable discussion at an OTA workshop (133), are frequently included in "wish lists" for an expanded Federal role in MSW management:

- establishing a national clearinghouse for information (e.g., developing a database, standardizing terms and definitions, compiling bibliographies);
- providing Federal incentives for recycling (e.g., stimulating markets, mandating product disposal charges, encouraging design for recyclability of products);
- undertaking research and development (e.g., ash disposal methods, determine health effects of management options, improve recycling processes, provide incentives for private research and development);
- providing technical assistance (e.g., provide training to State officials, develop performance-based standards for options, assist States in methods of waste reduction);
- establishing packaging and product regulations/ guidelines to reduce waste/toxicity (e.g., require labeling, ban toxic constituents);
- establishing workable Federal procurement standards; and
- finalizing regulations for landfilling and incineration facilities.

These tasks for further Federal involvement are not unlike those frequently voiced by other public and private interests as well.

[72] Usage of the term "resource recovery" has changed somewhat. In the 1979 OTA report, resource recovery activities referred mainly to the use of technologies for burning the combustible portion of MSW or converting it (through RDF processes) and recovering energy. At that time recovery of materials for recycling or composting was less available commercially. In this assessment, materials recovery is distinguished from energy recovery, and resource recovery can refer to either or both types of recovery activities.

[73] In addition to environmental concerns, wise and efficient use of materials, the preservation of virgin materials, energy conservation, and improving the balance of trade by reducing our dependence on imported natural resources were goals noted in the 1979 assessment.

As indicated in appendix 8-A, authority for many, but not all, of these activities already exists in RCRA. The current reauthorization of RCRA is an opportunity to address these issues and further define the Federal role in MSW. The establishment of a more effective system to reduce the generation of MSW and better manage what is produced is directly dependent on how well Congress meets the challenge of defining Federal involvement in MSW management.

The effective management of MSW will require not only intergovernmental changes in responsibilities and changes in Federal, State, and especially local budgets for MSW management, but also changes in people's lifestyles. If this is to happen, governments will have to proceed now with programs that will restore public confidence. Involving the public in meaningful ways-i. e., without allowing citizens only the power to object-in the MSW planning and facility siting processes will be key to ensuring the public trust necessary to re-direct past MSW management efforts and adopt lifestyle changes that generate less waste.

APPENDIX 8-A: FEDERAL STATUTORY AUTHORITY

Solid Waste Disposal Act and Resource Recovery Act

Congress first established a Federal role in solid waste issues bypassing the Solid Waste Disposal Act of 1 %5.[74] As was typical at this time for other environmental policy areas, the law merely authorized Federal research in the area and set up a program of grants to the States for similar research. The Resource Recovery Act of 1970 amended this law and strengthened the Federal role.[75] It was not until the Resource Conservation and Recovery Act (RCRA) of 1976 that Federal involvement was significantly expanded (see next section).

Prior to the mid- 1960s, fewer than half of the municipalities with populations greater than 2,500 had programs for solid waste disposal (68). Waste management regulations that did exist were primarily general health and safety ordinances applied to waste disposal sites. State activities were for the most part limited to formally delegating authority to municipalities for solid waste management, prohibitions against dumping of wastes on public property, and anti-litter programs. A few States, however, did have some solid waste activities, usually as part of their public health program (68).

The Solid Waste Disposal Act of 1965, in addition to initiating the Federal role in MSW policy, encouraged greater State involvement while affirming primary reliance on local management, The Department of Health, Education, and Welfare was authorized to provide technical and financial assistance to State and local governments, In addition, grants were available to States that developed statewide solid waste management plans and designated a single implementing agency (Section 206). By 1975, all States had adopted some form of solid waste regulations, although there was tremendous variation among them.

The Resource Recovery Act of 1970 amended the Solid Waste Disposal Act to authorize a Federal grant program for the "demonstration, construction, and application of solid waste management and resource recovery systems' (Section 101) and established Federal authority for the promulgation of guidelines for "solid waste collection, transport, separation, recovery, and disposal systems" (Section 104(b)). The funding of such solid waste activities increased after the creation of the Environmental Protection Agency (EPA) in 1970. EPA, for example, funded eight resource recovery projects under the program established by the 1970 Act. Shortly after this time, however, EPA activity decreased as other environmental issues received higher priority (68).

Resource Conservation and Recovery Act (RCRA) of 1976[76]

Passage of RCRA in 1976 was a clear movement toward more direct Federal involvement in solid waste management. The intent of RCRA was to improve waste management by discouraging landfill disposal. This was done by shifting the burden of costs more directly to users, and by encouraging development of resource recovery

[74] Public Law 89-272.

[75] Public Law 91-512.

[76] Public Law 94-580 (1976). RCRA's statutory definition of solid waste was quite broad, and included 'garbage, refuse, and other discarded solid materials, including solid-waste materials resulting from industrial, commercial, and agricultural operations, and from community activities. . ." (42 U.S.C. 53251-3259 (1970). Later, the definition was expanded to include sludges of various types and ". . . other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities" (42 U.S.C. Section 6903(27) (1977)). This assessment, however, does not examine all of these types of waste (ch. 1). Solid waste management was also broadly defined by the act to include "the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of solid waste" (42 U.S.C. Section 6903(28)).

technologies and use of the materials or energy recovered (66).

RCRA distinguishes between hazardous (Subtitle C) and nonhazardous (Subtitle D, including MSW) wastes. Since its passage, most activities by the Federal Government have focused on hazardous waste issues, RCRA did establish an office of solid waste within EPA, mandated *regulations* on solid waste disposal, and established procedures for State development of solid waste management plans. Yet most responsibility for overseeing the management of solid wastes remains with the States, as Congress expressly avoided preemption of State regulations in this area.

Subtitle D (Subchapter IV, RCRA) includes objectives that encourage methods of MSW management that are ''environmentally sound and [will] maximize the utilization of valuable resources including energy and materials which are recoverable from solid waste and to encourage resource conservation' (Section 4001). These objectives are consistent with the findings presented in RCRA's initial section (Section 1002) about solid waste, the environment and human health, and materials and energy. Similar findings relevant to MSW management are included in other statutes, such as the Mineral Lands and Mining Act (MLMA) and the Public Utility Regulatory Policies Act (PURPA).[77]

Despite these types of findings and objectives, what is **not** stated in the act is of great interest. **It is noteworthy that RCRA does not contain a statement of national policy for MSW.** Indeed, the lack of national goals for MSW possibly has contributed to the general lack of Federal leadership in this area. Such a policy may not have been stated because Congress has been careful to respect the traditional roles of local and State governments.

In addition, **although it is frequently assumed that a hierarchy of preferred MSW management options is stated in RCRA, no such hierarchy is explicitly outlined in the statute. The** section on findings (Section loo), for example, only notes a need for alternatives to landfills. With the statute's general emphasis on resource recovery, recycling and waste-to-energy incinerators seem to be viewed as equally desirable. **MSW prevention is not clearly stated as a policy or as the preferred option within a hierarchical approach.**[78] Finally, contrary to what often may be assumed, RCRA **does not explicitly state a policy of minimizing environmental and health risks associated with** MSW **management practices.** Again, however, the sections on findings (Section 1002(b)) and objectives (Section 4001) note the danger to human health and the environment from inadequate MSW management and state an objective of environmentally sound MSW management.

A major focus of Subtitle D was to encourage the development of State solid waste management plans (addressing both MSW and nonhazardous wastes) and foster intergovernmental (Federal, State, and local) and public/private cooperation. Federal technical and financial assistance were offered to States and localities as incentives for the development of plans (Sections 4002-4003, Sections 4006-4008). Another major focus of Subtitle D is the improvement of landfills. EPA was authorized to promulgate regulations containing criteria for classifying types of sanitary landfills (Section 4004), to facilitate in the closing or upgrading of existing open dumps (Section 4005), and to provide some assistance for these activities to rural communities (Section 4009).

RCRA also contains a substantial research, development, demonstration, and information subtitle (Subchapter VIII). This subtitle, in addition to establishing broad research authorities for EPA, ''alone or after consultation with the Secretary of Energy' (Section 8001), identifies a number of special studies to be supported, such as glass and plastic, tires, waste composition, ''small-scale and low technology," and "front-end source separation" (Section 8002). The act established the Resource Conservation Committee, composed of the EPA Administrator, the Secretary of Commerce, the Secretary of Labor, the Chairman of the Council on Environmental Quality, the Secretary of Treasury, the Secretary of Interior, the Secretary of Energy, the Chairman of the Counsel of Economic Advisors, and a representative of the Office of Management and Budget (Section 8002@). The committee was to investigate 'all aspects of the economic, social, and environmental consequences of resource conservation," including the "appropriateness and feasibility" of product charges or product bans, and the effect of existing policies (e.g., subsidies and other economic incentives) on resource conservation (104).

In addition, Section 8003 identifies a comprehensive list of topics for which the EPA is to "develop, collect, evaluate and coordinate information. ' This includes information on methods to reduce the amount of solid waste generated, the availability of markets for energy and materials recovered, methods and costs of solid waste collection and management, and research and development projects for solid waste management (section 8003(a)). A central reference library was to be established

[77] Public Law 96-479 and Public Law 95-617, respectively.

[78] RCRA's policy statement about reducing the generation of Wrote applies only to hazardous wastes (Section 1002(a)(6)), although MSW reduction is included in the findings as an area necessitating Federal action.

and maintained to house this information and other relevant data on performance and cost-effectiveness records for various solid waste management and resource conservation technologies and systems (Section 8003(b)). Full-scale demonstration facilities and grants for resource recovery systems and "improved solid waste disposal facilities" programs were also established (Sections 8004-8006).

Procurement guidelines are to be prepared by EPA, after consultation with the Administrator of General Services, the Secretary of Commerce (acting through the Bureau of Standards), and the Public Printer (RCRA, Subchapter IV). The guidelines should designate items produced with recovered materials that must be procured by Federal agencies (in accordance with the provisions of the Section), recommend practices for the procurement and certification of such items, and provide information on the availability, relative price, and performance of such items (Section 6002(e)). EPA was required to prepare final guidelines for paper and three other product categories, including tires, by 1985. In addition, each procuring Federal agency is required to establish an affirmative procurement program (Section 6002(i)).

In addition to EPA, the other Federal agency given major responsibilities under RCRA is the Department of Commerce. Four special areas of responsibilities under RCRA (Subchapter V, Sections 5001-5005) are delineated for the Secretary of Commerce: 1) to develop accurate specifications for recovered materials; 2) to stimulate and develop markets for recovered materials; 3) to evaluate and promote proven energy and materials recovery technologies; and 4) to establish a forum for the exchange of technical and economic data relating to resource recovery facilities.

Even this brief summary of RCRA indicates that it established broad authority for Federal involvement in the development of MSW policies. RCRA already includes provisions to address many of the areas frequently identified today in need of Federal attention (ch. 1). Yet Congress did not grant EPA any authority to **require** State implementation of any Federal standards relating to MS W management.[79] This, as noted above, preserved the primacy of State and local responsibilities for MSW management. Federal activity in MSW management has indeed remained limited, as clearly illustrated in the lack of funding of Subtitle D activities since 1981.

Hazardous and Solid Waste Amendments of 1984[80]

The Hazardous and Solid Waste Amendments (HSWA) of 1984 represent a broadening of the Federal involvement in MSW management, although their major focus is on refining hazardous waste management under RCRA. HSWA does add one additional method for EPA to encourage compliance of State solid waste plans with federal guidelines. EPA can use its enforcement powers under the hazardous waste provisions of RCRA if a State fails to implement permit programs for solid waste facilities receiving hazardous wastes from small quantity generators (SQGs) and/or household hazardous wastes (HHW) (Section 4005(c); see also Section 3001(d)).

HSWA also gives EPA the authority, if necessary, to directly manage portions of a State's solid waste management plan. Successful implementation, however, still depends on State and local planning and enforcement efforts. In addition, EPA is directed to survey solid waste management facilities across the Nation and evaluate whether current guidelines and standards are adequate to protect the environment and human health. It is also directed to promulgate revisions of the landfill guidelines and those for landfills receiving HHW and SQG hazardous wastes (Section 4009a) (143,144,145,147,149a). HSWA also clarified the open dumping ban and reemphasized the procurement program.

Current RCRA Reauthorization Efforts

Congress is focusing its attention during the current reauthorization process for RCRA on Subtitle D of the law and is revisiting the issue of the appropriate Federal role in MSW management. There is agreement that the Federal role in this policy area needs to be expanded, yet it is unlikely that a Federal role comparable to that established in other environmental areas (e.g., hazardous waste management) will be defined for MSW management.

The Chairman of the Senate Subcommittee on Hazardous and Toxic Substances of the Committee on Environment and Public Works introduced the Waste Minimization and Control Act of 1989 (S. 11 13; also see S. 1112) and held hearings throughout the year on MSW issues. The Chairman of the House of Representatives Subcommittee on Transportation, Tourism and Hazardous Materials of the Energy and Commerce Committee also held hearings and is expected to introduce a RCRA reauthorization bill in 1989. Separate legislation also has been

[79] Several methods exist, however, for EPA to encourage compliance. For example, if a State does not develop or implement a management plan, it will not receive financial or technical assistance (Section 4007). Also, EPA may seek injunctive relief if disposal practices present *'an imminent and substantial endangerment to health or the environment' (Section 7003). Citizen suits can also be used to encourage compliance (Section 7002).

[80] Public Law 98-616.

introduced to address specific aspects of MSW issues (e.g., the disposal of incinerator ash residues, interstate transportation restrictions, etc.).

Other Relevant Statutes and Authority

Public Utility Regulatory Polities Act and Other Energy Laws--The Public Utility Regulatory Policies Act (PURPA, Section 210)[81] of 1978 requires the Federal Energy Regulatory Commission (FERC) to guarantee a market for electricity generated by qualified small power producers, which includes most waste-to-energy incineration facilities (chs. 5 and 6). FERC is mandated to issue rules requiring electric utilities to purchase electricity from qualified cogenerators and small power producers. A qualified facility must: 1) produce electric energy "solely by the use, as a primary energy source, of biomass, waste, renewable resources, or any combination thereof"; 2) produce no more than 80 megawatts of power; 3) have the total annual input of oil, coal, and natural gas not exceed 25 percent in Btu value of the fuel; and 4) have equity ownership of a small power producer by a utility exceed 50 percent (Section 201; 16 U.S.C. Section 824a-3). PURPA also provides some exemptions from Federal and State requirements, such as those relating to financial arrangements for power sources and the Federal Power Act (Section 201(e)).

The intent of PURPA was to encourage cogeneration and small power energy production and thus decrease the Nation's dependence on fossil fuel and foreign sources of energy, and diversify energy production. Concern has been raised that FERC regulations issued in 1980 to implement PURPA essentially created a subsidy system for such sources of power. This is because the 1980 regulations allow States to set rates exceeding or falling below the avoided cost of purchasing the qualified *facility's* energy production.[82] These "incentive rates" can be used to encourage certain technologies, such as waste-to-energy incineration. In April 1988 FERC invalidated New York State's law which set the purchase rate above the utility's full avoided cost.[83] At least 20 other States have similar laws or regulations which could be preempted. The claim is that these laws could encourage the production of energy from "inefficient" sources, which was not the intent of PURPA; the counter-claim is that utilities are generally opposed to small power generators and this FERC decision reflects a "pro-utility" perspective (26). In any case, the New York Public Service Commission is contesting FERC's order in court and in Congress.

A number of other past energy and conservation statutes encouraged the use of resource recovery, either of energy or secondary materials. The Energy Security Act[84] of 1980 has a purpose of reducing the dependence of the Nation on imported oil. This in part entailed financial support of waste-to-energy facilities by providing the Secretary of Energy authority to grant construction loans and guarantee them, provide price support loans and guarantee them, and establish an accelerated research, development, and demonstration program (Section 237). The Non-Nuclear Research and Development Act[85] of 1974 was amended by the Department of Energy Act[86] of 1978 (Civilian Applications) to give the Department of Energy (DOE) general authority to award grants, contracts, price supports, and loan guarantees for municipal waste reprocessing demonstration projects (Section 20). In addition, the Department of Energy Act of 1978 amended the Energy Security Act to accelerate further the research, development, and demonstration program for waste-to-energy and to evaluate existing facilities for performance and costs.

The act which created DOE, the Department of Energy Organization Act[87] of 1977, includes as a goal the development and commercialization of recycling as part of a general emphasis on energy conservation. The National Energy Conservation Policy Act[88] went further to encourage the use of recovered or recycled materials in industrial operations by requiring DOE to set targets for the use of secondary materials for the metals, paper, textile, and rubber industries, and to create incentives for industries to work with the government to achieve these goals.

Other Relevant Statutes-Several other environmental statutes contain authority relevant to MSW

8] Public Law 95-617.

82The "avoided cost" is calculated based on what a utility would have paid to produce or purchase the energy itself rather than from a qualifying facility.

83*Orange and Rockland* v. *New York Public Service Commission*, Docket No. EL87-53.

84Public Law 96-294. *Biomass*, which the Act encourages the use of by all economically and environmentally sound ways, is defined in the Act to include MSW and industrial waste.

85Public Law 95-238.

86Public Law 95-238.

87Public Law 95-91.

88Public Law 95-619.

management or its reduction. These include the Clean Air Act, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, often refereed to as "Superfund"), and the Toxic Substances Control Act. In addition, the Internal Revenue Service (IRS) has some relevant authority effecting MSW activities. The Consumer Product Safety Commission and the Food and Drug Administration have authorities relevant to product or packaging changes that might result from waste reduction efforts (see "Waste Prevention' in text).

The only current standards promulgated under the Clean Air Act[89] that apply specifically to MSW incinerators are those for particulate emissions (ch. 6). In June 1987, EPA sent guidance to its regional offices that permits for new and modified facilities should be issued based on a dry scrubber and fabric filter, or electrostatic precipitator, as the best available control technology (BACT) for sulfur dioxide and particulate matter, and combustion controls as BACT for carbon monoxide (ch. 6).[90]

EPA is scheduled to propose new regulations for MSW incinerators by November 1989 (ch. 6). At that time, EPA also expects to issue guidelines for States to regulate the retrofitting of existing incinerators to bring them into compliance with new emission limits. Current congressional proposals for controlling air emissions are generally viewed as more stringent than EPA's proposals (29,30). Some environmental groups, such as the Environmental Defense Fund and the Natural Resources Defense Council, generally favor the more stringent congressional proposals. Some local and State officials, such as the U.S. Conference of Mayors and the Northeast States for Coordinated Air Use Management, and industry interests favor the EPA proposal (29,30).

CERCLA[91] directly affects localities whose MSW landfills are identified by EPA as Superfund sites (chs. 1,7). Under the liability provisions of CERCLA, all responsible parties (i.e., all parties disposing of waste at a site) cart be required to pay proportional shares of remediation costs. In the past, EPA usually only required private industrial parties to cover the costs of remedial actions and compensation from MSW landfills. Recently, EPA convened a Municipal Settlement Task Force to determine how local governments involved with Superfund sites will be handled. Local officials, for example the National League of Cities, argue that EPA should continue to consider the public and private sectors differently. In contrast, industry interests argue that local governments should be treated and prosecuted in the same way as corporate defendants (1 19,120). Indeed, it appears that there is no basis in Superfund to treat local governments differently from other responsible parties. However, the potential for creating a financial crisis for some municipalities by imposing this interpretation is a legitimate source of concern to local governments.

Some observers suggest that the Toxic Substances Control Act[92] (TSCA) is a potential tool for EPA to prevent or minimize toxic substances in products which ultimately become part of the MSW stream. Clearly, TSCA does contain appropriate legal authority, because it provides authority to regulate any part of a chemical's life cycle from production, distribution, use, and disposal (Section 4(a)(l)(A)(i); also Sections 5 and 6). To do so, however, requires determination of 'unreasonable risk of injury to health or the environment" (Section 4(a)(2). A major problem for regulating under TSCA is that 'unreasonable risk" is not defined. This requires a tremendous amount of data, and the resulting case-by-case approach leads to an extremely slow regulatory process. Thus TSCA is not likely to be an efficient way to prevent or minimize toxic substances in MSW. Rather, approaches that attempt more directly to affect the design of products (considering their waste implications) may be more effective for this purpose (chs. 1 and 4).

At least two sections of the Internal Revenue Code are directly related to MSW (chs. 5 and 6).[93] First, the Internal Revenue Service's (IRS) definition of solid waste is based on that of the Solid Waste Disposal Act of 1965, with the additional condition that the material have no market value.[94] Therefore, if anyone is willing to purchase the material at any price, it is not solid waste according to the IRS definition (66). Second, Section 103 of the Internal Revenue Code allows tax-exempt industrial development bonds to be issued by political subdivisions to private corporations to finance the construction of solid waste disposal facilities and arty waste disposal function of a facility. However, once the material is in saleable form it is no longer solid waste and bond revenues cart not be

[89] Public Law 95-95.

[90] EPA believes that a combination of an acid gas scrubber, controlled combustion conditions, and a particulate matter collection device can also reduce dioxins, furans, other organic chemicals, and metals to acceptable levels (ch. 6).

[91] Public Law 96.51().

[92] Public Law 94-469.

[93] In 1982, the Energy Tax Act (Public Law 95-618) provided a credit for "recycling equipment," but this has been repealed.

[94] Treas. Reg. Section 1.103 -108(2)(ii)(b); Rev. Rul. 72-190, 75-184, and 76-222.

applied to it. At least 65 percent of the materials processed are required by the IRS to be ''solid waste. ''

Exercising existing Federal regulatory authority could have the effect of internalizing production costs associated with environmental pollution in a way favorable to the use of secondary materials. Because the use of primary materials is sometimes more polluting in manufacturing processes than the use of secondary materials, further regulation and enforcement of pollution standards could indirectly increase the demand for secondary materials (ch. 5).

For example, under the Clean Water Act[95] EPA has set effluent guidelines and standards for industries in the pulp, paper, and paperboard point source category (including subcategories for primary and secondary material industries). Initially, the rulemaking focused on establishing effluent limitations based on "best practicable control technology currently available" (BPT), "best available technology economically achievable' (BAT), and "new source performance standards" (NSPS) for conventional pollutants such as biochemical oxygen demand (BOD), total suspended solids, and pH.[96] To address toxic and nonconventional pollutants as well, BPT and BAT control and treatment options have been adopted for some sources in the pulp, paper, and paperboard industry category directly discharging into navigable waters. Requirements for all toxic pollutants have not been established to date (142). If regulations for additional toxic and nonconventional pollutants were promulgated-and these regulations applied to more subcategories of the industry-it is likely that they would have a greater economic impact.

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[95] Public Law 95-217. Section 208 of the Clean Water Act provides for areawide waste treatment management and funding provided under such programs has been used for some solid waste management activities.

[96] 40 CFR Part 430, Subparts A-U. In 1977, performance standards for existing sources were proposed and efforts were directed toward establishing ''best conventional pollutant control technology" and BAT effluent limitations, along with pretreatment standards for existing and new sources, to result in reasonable progress toward the discharge elimination goat of the law (40 CFR Part 128; see Clean Water Act Sections 101, 304, and 306). In setting effluent limitation guidelines, the Act includes a provision requiring EPA to consider, among other factors, ''non-water quality environmental impact[s]'' when determining control measures. his would include effects on solid waste generation (e.g., sludge).

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