A530-R-93-011

United States Environmental Protection Agency | Solid Waste and Emergency Response (OS-305) | EPA530-R-93-011 August 1993

EPA

RCRA Environmental Indicators

FY 1992 Progress Report

ENVIRONMENTAL PROTECTION AGENCY
DALLAS, TEXAS
LIBRARY

Printed on Recycled Paper

ENVIRONMENTAL
PROTECTION
AGENCY
DALLAS, TEXAS
LIBRARY

RCRA Environmental Indicators

FY 1992 Progress Report

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY ES-1

CHAPTER 1. INTRODUCTION TO ENVIRONMENTAL INDICATORS 1-1

What is an Environmental Indicator? 1-1
What is the Role of Environmental Indicators? 1-2
Indicators "Continuum" 1-2
Discussion of Environmental Goals 1-4

CHAPTER 2. ENVIRONMENTAL INDICATORS AND THE RCRA PROGRAM 2-1

RCRA Program Goals Supported by RCRA Indicators 2-1
Strategic Planning, Accountability, and Environmental Indicators 2-2
Challenges of Developing RCRA Environmental Indicators 2-2
The RCRA Environmental Indicators Workgroup Process 2-3
Summary of Past Efforts 2-4

CHAPTER 3. DISCUSSION OF DATA SOURCES 3-1

Resource Conservation and Recovery Information System (RCRIS) 3-1
Biennial Reporting System (BRS) 3-2
Characterization of Municipal Solid Waste in the United States 3-3

CHAPTER 4. WASTE MINIMIZATION INDICATORS 4-1

Program Goals 4-1
Waste Minimization Indicator Reporting for FY 1992 4-1
Next Steps 4-12

CHAPTER 5. SAFE MANAGEMENT INDICATORS 5-1

Program Goals 5-1
Safe Management Indicator Reporting for FY 1992 5-1
Next Steps 5-11

CHAPTER 6. CORRECTIVE ACTION INDICATORS 6-1

Program Goals 6-1
Corrective Action Indicator Reporting for FY 1992 6-1
Next Steps 6-8

TABLE OF CONTENTS (continued)

Page

CHAPTER 7. NEXT STEPS: IMPLEMENTATION PLAN FOR FY 1993 7-1

Introduction 7-1
Subtitle C Environmental Indicator Development 7-1
Subtitle D Environmental Indicator Development 7-2
Other FY 1993 Activities Related to Environmental Indicators 7-3

APPENDIX A. RCRA ENVIRONMENTAL INDICATORS WORKGROUP MEMBERSHIP

EXECUTIVE SUMMARY

In 1989, EPA's Office of Solid Waste (OSW) initiated an effort to identify environmental indicators to measure progress in the Resource Conservation and Recovery Act (RCRA) program. By the end of FY 1991, OSW established a framework for developing and reporting indicators and created a broad list of candidate indicators, some for immediate reporting and others for further evaluation. In FY 1992, reporting for 12 environmental indicators began and substantial progress was made in further defining and evaluating others.

OSW IS NOW REPORTING 12 RCRA ENVIRONMENTAL INDICATORS

OSW is now reporting 12 environmental indicators for the RCRA program. They span each of three major RCRA program goals -- waste minimization, safe management, and corrective action -- and pertain to hazardous and municipal solid wastes. These indicators are listed in Exhibits ES-1 through ES-3.

Subtitle C (Hazardous Waste) Indicators are Based on RCRIS and BRS Data

The FY 1992 indicators for Subtitle C are based on data from the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS). RCRIS, the national program management and inventory system for RCRA, provides identification and location data for all hazardous waste generators and treatment, storage, and disposal facilities (TSDFs). For TSDFs, RCRIS also provides information on permit/closure status, compliance with regulations, and clean-up activities. Indicators in this report that are based on RCRIS data reflect program activity through the end of the 1992 fiscal year.

BRS data originate from a census of large quantity hazardous waste generators that is conducted every two years, as authorized in Sections 3002 and 3004 of RCRA. BRS provides data on the quantity and disposition of hazardous waste, and on new efforts taken during the reporting year to reduce the volume and toxicity of wastes. Indicators in this report that are based on BRS data are derived from the 1989 hazardous waste census and therefore reflect waste management practices for that year. The 1991 BRS data should be available during the coming year and will be used in future RCRA environmental indicator reports.

Most Subtitle D Indicators are Based on *Characterization of MSW in the U.S.*

Most of the Subtitle D indicators presented in this report are based on data derived from EPA's *Characterization of Municipal Solid Waste in the United States,* July 1992 update. This study estimates municipal solid waste (MSW) generation and composition based on production data for the materials in the waste, with adjustments for imports, exports, and product lifetimes.

RCRA INDICATORS WILL COMMUNICATE PROGRESS TOWARDS PROGRAM OBJECTIVES

RCRA environmental indicators help measure and communicate the progress that the RCRA program has achieved towards the overarching Agency mission of protecting human health and the environment. The RCRA program includes three major approaches to reducing potential threats from solid and hazardous waste:

1. Waste Minimization: Reduce the quantity and toxicity of wastes generated and disposed through activities such as source reduction and recycling;

2. Safe Management: Ensure that wastes are managed in an environmentally safe manner; and

3. Corrective Action: Identify, prioritize, and take action to clean up contaminant releases.

The indicators presented in this report begin to articulate RCRA program accomplishments in these three areas, either by reporting initial data for future trend reporting, or by reporting actual trend data. As additional data become available in the future, these "early" indicators will be further developed and added to, in order to better measure and communicate the environmental results of RCRA activities. For example, with regard to corrective action, we currently report the number of actions taken to control contaminant releases at high, medium, and low priority facilities. In the future, we may be able to complete the story on how these actions have resulted in increased protection of human health and the environment.

WASTE MINIMIZATION INDICATOR REPORTING FOR FY 1992 (Exhibit ES-1)

Environmental Indicators Report Hazardous Waste Generation and Waste Minimization

The waste minimization indicators for Subtitle C in this document use 1989 BRS data to report quantities of hazardous waste generated by various industries and the waste minimization activities newly implemented by hazardous waste generators. As data for additional years become available, trends will be measured relative to the 1989 data. The data show the following:

1. Most of the nation's hazardous waste is generated by the chemicals manufacturing industry. Manufacturers of Chemicals and Allied Products (Standard Industrial Classification code [SIC] 28) generated about 88 percent of the nation's primary hazardous waste in 1989, mostly from the manufacture of industrial organic chemicals as well as plastics and synthetic resins and rubber. Other industries generating one percent or more of the hazardous waste were Petroleum Refining (SIC 29), Primary Metals (SIC 33), Electronics (SIC 36), Fabricated Metals (SIC 34), and Transportation Equipment (SIC 37). *See page 4-4.*

EXHIBIT ES-1.

WASTE MINIMIZATION INDICATOR REPORTING FOR FY 1992

Subtitle C Indicators:

Hazardous Waste Quantity Generated

1. Quantities of Primary Hazardous Waste Generated in 1989, By SIC Code
2. Quantities of Hazardous Wastewater and Non-wastewater Generated in 1989, By SIC Code

Number of Entities Implementing New Waste Minimization Programs

3. Percent of Hazardous Waste Generators that Initiated or Expanded Source Reduction or Recycling Activities in 1989

Subtitle D Indicators:

Trends in Waste Quantity Generated

1. Trends in Total Municipal Solid Waste Generation, 1960 to 1990
2. Trends in Per Capita Municipal Solid Waste Generation, 1960 to 1990

Trends in Municipal Solid Waste Recycling

3. Trends in the Recovery of Municipal Solid Waste for Recycling, 1960 to 1990

2. The vast majority of hazardous wastes are wastewaters. About 95 percent of the above-mentioned hazardous wastes generated in 1989 were wastewaters. The remaining five percent were sludges and solids. *See page 4-6.*

3. One-fifth of hazardous waste generators initiated or expanded waste minimization activities in 1989. Of the nation's 20,713 large quantity hazardous waste generators, 14 percent had new or expanded source reduction activities, 4 percent had new or expanded recycling activities, and 5 percent had both. Respondents generating more waste were more likely to have new or expanded waste minimization activities than firms generating less waste. *See page 4-7.*

MSW Generation Continues to Increase, But So Has The Proportion Recycled

Waste minimization indicators for Subtitle D monitor total and per capita MSW generation and recovery from 1960 to 1990. The major findings are:

1. Total MSW generation has been increasing over time, from 88 million tons in 1960 to 196 million tons in 1990. *See page 4-9.*

2. Per capita MSW generation has also been increasing, but more slowly than total MSW generation. This indicates the trend toward higher total MSW generation is attributable to population growth as well as increases in per capita waste generation. *See page 4-10.*

3. The proportion of MSW recovered through recycling has increased steadily over time, from under seven percent in 1960 to 17 percent in 1990. EPA has set a national goal of reducing the quantity of MSW destined for landfills and combustion by 25 percent. *See page 4-11.*

SAFE MANAGEMENT INDICATOR REPORTING FOR FY 1992 (Exhibit ES-2)

Environmental Indicators are Characterizing Hazardous Waste Management Practices

The safe management indicators discussed here for Subtitle C use 1989 BRS data to report the quantities of hazardous waste managed by various methods. Future trends will be measured relative to the 1989 data.

1. Most hazardous waste is sent to treatment. In 1989, approximately 82 percent of hazardous wastes were treated, predominantly through various wastewater treatment processes. About 15 percent of wastes were land disposed, mostly in underground injection wells. Materials recovery and reuse captured about two percent of the waste, while incineration accounted for less than one percent. *See page 5-3.*

EXHIBIT ES-2.

SAFE MANAGEMENT INDICATOR REPORTING FOR FY 1992

Subtitle C Indicators:

Quantity and Percent of Waste Managed, By Method

1. Quantities of Hazardous Waste Managed at Subtitle C Facilities in 1989, By Management Practice

Amount of Waste Handled at Facilities With Zero Class I Violations Outstanding, As of the Last Inspection

2. Number of Class I Violations Found at the Last Inspection During 1988-1989, by Number of Facilities and Volume of Waste

Subtitle D Indicators:

Quantity and Percent of Waste Managed, By Method

1. Municipal Solid Waste Management Trends, 1960 to 1990

Number of Communities Implementing Household Hazardous Waste Collection Programs

2. Trends in the Number of Household Hazardous Waste Collection Programs, 1980 to 1991

2. Most waste is handled at facilities with zero Class I violations[1]. Of the 2,182 facilities that both submitted a Biennial Report form and were inspected from 1988-1989, approximately 68 percent had zero Class I violations. These TSDFs managed about 67 percent of the hazardous waste in 1989. *See page 5-6.*

The Proportion of MSW Landfilled is Decreasing, and Efforts are Underway to Keep Household Hazardous Wastes Out of Landfills

Data from EPA's July 1992 update of *Characterization of Municipal Solid Waste in the United States* were used to examine trends in MSW management practices from 1960 to 1990.

1. Landfilling is the most common MSW management practice, but the proportion of MSW that is landfilled has decreased over the past few years. Larger proportions of MSW are being recovered for recycling (17 percent in 1990) or combusted in modern incinerators (16 percent in 1990). *See page 5-8.*

Data on the number of household hazardous waste collection programs in place from 1980 to 1991, using data supplied by the Waste Watch Center[2], are also presented.

2. Household hazardous waste collection programs have increased dramatically. The total number of programs (including one-day events) has grown from one in 1980 to 800 in 1991 and the number of permanent programs has increased to 96. *See pages 5-9 and 5-10.*

CORRECTIVE ACTION INDICATOR REPORTING FOR FY 1992 (Exhibit ES-3)

EPA and the States Have Evaluated a Majority of Sites and Are Taking Action to Address the Worst Sites First

The FY 1992 corrective action indicators focus only on Subtitle C since there are no Federal corrective action requirements for Subtitle D facilities currently in effect. RCRIS data are used to depict the past and current status of Subtitle C treatment, storage, and disposal facilities in the corrective action program.

1. EPA has steadily initiated the corrective action program to address environmental problems posed by past releases. As of the end of fiscal year 1992, EPA had assessed problems at 3,519 of the 4,218 TSDFs subject to corrective action

---

[1]The definition of a Class I violation has evolved over time, but in 1989 (the first year for reporting this indicator) a Class I violation was defined as: *"A violation that results in a failure to: assure that hazardous waste is destined for and delivered to authorized TSDFs; prevent releases of hazardous waste or constituents, both during the active and any applicable post-closure periods of the facility operation where appropriate; assure early detection of such a release; or perform emergency clean-up operation or other corrective action for release."*

[2] EPA provided funding to the Waste Watch Center for the collection of the information that is presented in this report.

regulations, and detailed site investigations had begun or were completed at 614 facilities. An estimated 247 TSDFs had taken action to control contaminant releases in response to environmental problems. These actions represent steady progress since FY 1990, when only 283 facilities had begun or completed detailed site investigations and 136 facilities had taken action to control contaminant releases. *See pages 6-3 and 6-4.*

2. EPA is addressing the sites posing the greatest threats first. EPA has assigned priority rankings to 63 percent of TSDFs subject to corrective action regulations based on health risks, and expects to rank all sites by the end of FY 1993. Detailed investigations and actions to control releases are underway or completed at substantially more high priority sites than medium priority sites, and at substantially more medium priority sites than low priority sites. *See pages 6-6 and 6-7.*

EXHIBIT ES-3.

CORRECTIVE ACTION INDICATOR REPORTING FOR FY 1992

Subtitle C Indicators:

Number and Status of Assessments, Investigations, and Actions to Reduce Risk and Control or Contain Releases Imposed or Underway

1. Status of Subtitle C Facilities in the Corrective Action Program
2. Number of Subtitle C Facilities Conducting Investigations and Controlling Releases, By Priority Ranking

INDICATORS REPORTING WILL BE EXPANDED IN FY 1993

All 12 indicators presented in this report will continue to be reported in FY 1993. For more meaningful trend analysis, some of these 12 will be refined. During FY 1993, OSW will also develop and begin to report indicators for which data exist, but for which additional time is needed for data compilation, review, and analysis. The possibility of new data collection efforts may also be investigated.

The planned next steps for environmental indicators in FY 1993 -- in addition to continuing to report the 12 indicators presented in this document -- are discussed below.

Waste Minimization Indicator Development in FY 1993

In FY 1993, 1991 hazardous waste generation rates will be available from the Biennial Report, allowing examination of the extent to which waste generation has changed since 1989. Because waste generation rates vary in response to factors other than waste minimization activities (e.g., economic conditions, wastes newly entering or exiting the Subtitle C system), methods to "normalize" waste generation to account for the impact of these other factors will be developed. OSW will also conduct a more in-depth analysis of 1989 and 1991 BRS data on newly implemented waste minimization activities. OSW's Waste Minimization Measurement Project is already investigating methods of normalizing waste generation and reporting waste minimization activities. The RCRA Environmental Indicators Workgroup will coordinate with these efforts in developing future environmental indicators. OSW will also use work currently underway to develop methods to measure the effects of waste minimization on demand for capacity.

Safe Management Indicator Development in FY 1993

The 1991 BRS data will be used to examine changes in hazardous waste management practices relative to 1989. This effort will also begin to distinguish between land-based and non-land-based management practices, and to report the extent to which waste is treated before being placed on the land. In addition, RCRIS data on facility closures may be used as an indicator of safe management.

Corrective Action Indicator Development in FY 1993

Starting in FY 1993, reports on the two indicators presented here will be updated with FY 1993 data, and will include information on the number of facilities at which no further action is needed. In addition, proposed changes to RCRIS will be analyzed to determine if they could be used to refine the existing indicators.

THE RCRA ENVIRONMENTAL INDICATORS WORKGROUP WILL CONTINUE TO SUPPORT INDICATORS DEVELOPMENT AND REPORTING

The RCRA Environmental Indicators Workgroup has continued to be pivotal to the success in developing and reporting indicators. Chaired by the Regulatory Analysis Branch (RAB) of the Communications, Analysis, and Budget Division (CABD) and composed of representatives of Headquarters, the Regions, and some States, the workgroup met several times in FY 1992 to exchange ideas, assess data quality, and discuss strategies for obtaining new data. OSW will continue to rely on input from the workgroup throughout the process of developing and reporting indicators for the RCRA program.

EPA's Office of Solid Waste (OSW) is developing environmental indicators to measure progress in the Resource Conservation and Recovery Act (RCRA) program. The process of developing RCRA environmental indicators has been, and continues to be, an excellent team effort, with active participation from the various programs at OSW Headquarters, the Office of Waste Programs Enforcement (OWPE), the Office of Pollution Prevention and Toxics (OPPT), EPA Regions, and the States.

Last year, the first in a series of annual reports was published summarizing progress made in developing RCRA indicators and presenting plans for the future. This report, the second in the series, summarizes environmental indicator achievements during FY 1992 and implementation plans for FY 1993 and beyond.

This chapter provides a brief introduction to environmental indicators and their role in EPA programs. Chapter 2 presents the basic framework for RCRA indicators and describes the process by which these indicators are developed.[1] Chapter 3 briefly discusses the data sources currently being used to report RCRA environmental indicators on a national basis.

Chapters 4 through 6 discuss indicators for three major components of the RCRA program: waste minimization, safe management, and corrective action. Included in each chapter are indicator reports in the form of graphics and accompanying text, and a discussion of next steps. Chapter 7 presents the overall strategy for further development and reporting of RCRA indicators.

WHAT IS AN ENVIRONMENTAL INDICATOR?

An environmental indicator is a measure of the quality of the environment and its ability to support human and ecological health. Any biological, chemical, and/or physical measurement that describes environmental or public health conditions can be considered an environmental indicator. Environmental indicators also include measurements that do not describe environmental conditions explicitly but do measure factors known to affect environmental quality. Examples include measures of pollutant loadings to air and quantities of solid waste disposed on land.

[1] This material is discussed in more detail in: EPA. 1992. *RCRA Environmental Indicators: FY 1991 Progress Report and Implementation Plan for the Future.* Office of Solid Waste. Communications, Analysis, and Budget Division. January 1992.

WHAT IS THE ROLE OF ENVIRONMENTAL INDICATORS?

Environmental indicators can be used to provide information on (1) environmental status and trends and (2) the effectiveness of EPA programs in addressing environmental problems. Indicators can be used to assist in program planning and management, and to communicate with Congress and the public about the quality of the environment and how it has been affected by EPA's programs.

Information on environmental status and trends is necessary to identify emerging problems, assess their significance, and set priorities. One of the most important potential uses of environmental indicators is to assess the success of EPA programs. Data on environmental trends can be used to determine whether a program's activities are bringing about intended improvements in environmental quality. When environmental indicators are used to assess program performance, it is crucial to establish a cause-and-effect relationship between program activities and changes in environmental conditions, and to isolate program impacts from the influence of extraneous factors.

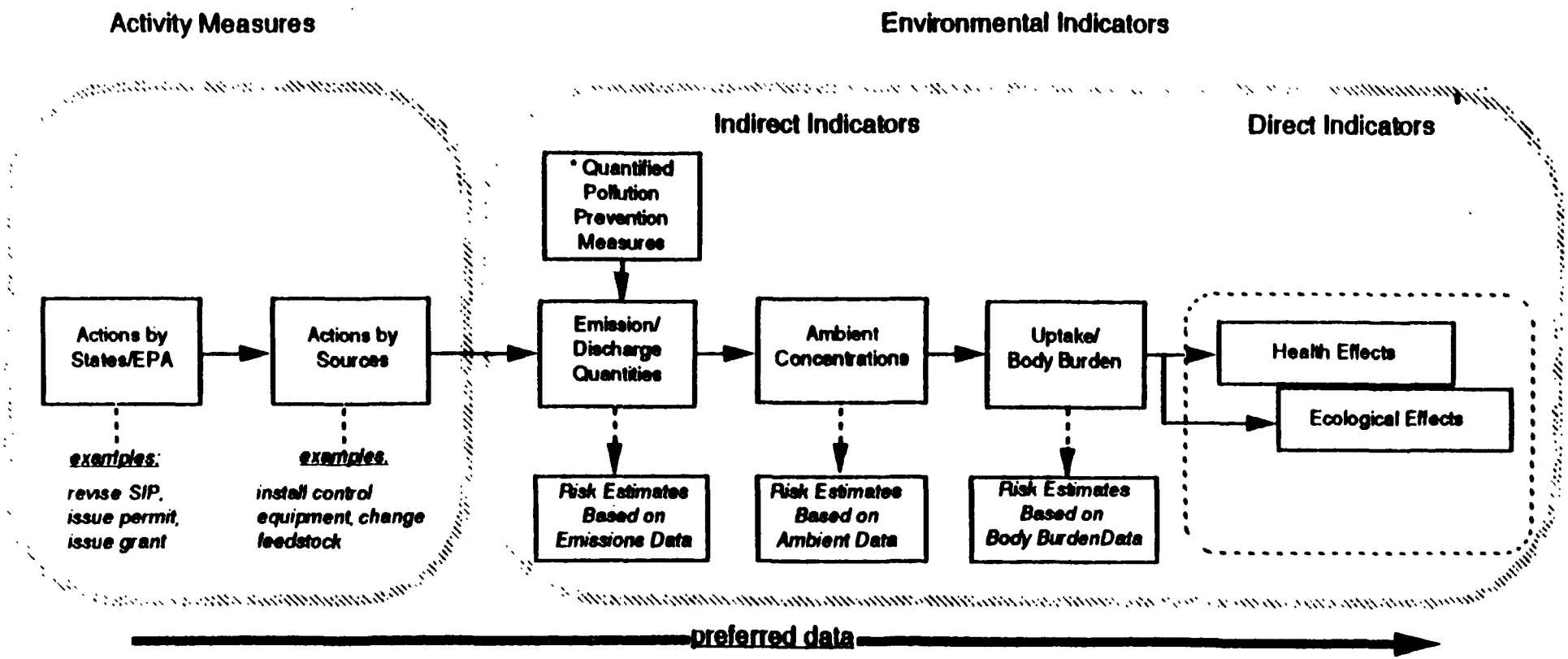
Some EPA programs already use environmental indicators to evaluate program effectiveness; others have met with difficulties in linking program success to changes in environmental quality. As will be discussed in Chapter 2, the RCRA program is faced with a complex challenge in measuring program progress based on environmental results, since RCRA-regulated sites have localized impacts on several media, and the cause-and-effect relationship between program activities and environmental changes is difficult to establish for some major RCRA program components.

INDICATORS "CONTINUUM"

As discussed above, environmental indicators may be used to assess the effectiveness of EPA programs. Program progress also can be -- and historically has been -- assessed by monitoring the activities of the Agency or the entities it regulates. EPA has identified a continuum of measures of environmental program effectiveness, shown in Exhibit 1-1. At the left-hand side of the exhibit are activity measures, which measure actions taken by EPA or the States, or by the entities regulated by EPA or State programs. Examples of activity measures include the number of permits issued to hazardous waste management facilities; the number of inspections conducted or enforcement actions taken; and the number of sites at which groundwater monitoring systems have been installed.

To the right are environmental indicators, which are more direct measures of environmental quality. Those furthest to the right are direct measures of human health or environmental endpoints, such as the incidence of disease or the abundance of a species of wildlife in an area. In the middle are measures of factors that contribute to human health or environmental endpoints which are also considered "environmental indicators", but are not themselves measures of those endpoints. Listed in decreasing order of their "directness" to actual endpoints are measures which include: uptake or body burden (such as lead levels in human blood), ambient conditions (such as concentrations of pollutants in groundwater near sites), and loadings or emissions (such as pounds of pollutants released to surface water). In developing RCRA environmental indicators, EPA will be working towards the right side of this continuum as data on actual environmental trends become available.

EXHIBIT 1-1.
CONTINUUM OF MEASURES OF ENVIRONMENTAL PROGRAM EFFECTIVENESS



Theme 1: Managing for Environmental Results. Data to the right are closer to the "adverse ultimate impacts of pollution" that the States and EPA are charged with preventing or mitigating. All else being equal, data further to the right are better indicators of environmental result than data further to the left.

Theme 2: Emphasizing Pollution Prevention. Pollution prevention should result in the same kinds of environmental improvements as all Agency programs, so all these indicator types may be used to reflect pollution prevention successes. However, to prove the results are due to pollution prevention, data would be needed on the box marked with a *.

In the short term, the Agency will report more activity measures. Activity measures and environmental indicators both play an important role in program management and evaluation, and both are necessary. Activity measures provide a means for documenting Agency responses to legislative mandates and public pressure, both for internal purposes and for communications with Congress and the public. They are used to support short-term program management activities such as determining the amount of work completed and additional work needed to be done. Because environmental results are sometimes not manifested for years or decades, activity measures also provide a valuable record of actions taken to address environmental problems. The major shortcoming of activity measures is that they do not tell us whether the actions taken have had, or will have, the desired effect on environmental quality.

DISCUSSION OF ENVIRONMENTAL GOALS

In addition to reporting changes in environmental status, environmental indicators can also be used to measure progress toward specific environmental goals. The Agency has recently begun an initiative to develop a short list of cross-program environmental goals. These goals will represent the environmental problem areas of most concern and will present the potential for progress in these areas. These overarching goals will differ from EPA program-specific goals because they are not confined to the scope of a specific mandate or statute, but reflect more broad-based, cross-media concerns. For cross-program goals that pertain to RCRA, OSW will work to develop appropriate indicators to measure RCRA's contribution towards achieving those goals.

This chapter discusses the basic approach to developing indicators for the RCRA program. The first section discusses the three program goals that define the current framework for RCRA indicators. The second section relates RCRA environmental indicators to strategic planning and accountability. The third section discusses aspects of the RCRA program that have shaped the approach for developing indicators. This chapter also discusses the process by which RCRA indicators are being developed, and summarizes past efforts.

RCRA PROGRAM GOALS SUPPORTED BY RCRA INDICATORS

OSW has defined three major goals for the RCRA program, consistent with the objectives and themes of the RCRA statute: waste minimization, safe management, and corrective action. Environmental indicators are being developed for each of these three goals.

Waste minimization indicators are being developed to help determine the effect of RCRA program activities to reduce the quantity, toxicity, and hazardous properties of wastes; conserve natural resources by reducing the use of raw materials; and reduce the use of toxic materials in production. OSW is just beginning efforts in some of these areas.

Safe management indicators are being developed to measure the effectiveness of program activities to prevent harm to human health and the environment from the mismanagement of wastes after they are generated. This category of indicators encompasses the safe management of wastes from "cradle to grave," i.e., from the point of generation through transportation, storage, treatment, and final disposal. A wide variety of program activities are covered in this category, including waste manifesting; treatment of wastes prior to land disposal (e.g., best demonstrated available technology [BDAT]); location standards for waste management units; standards for the design, operation, and closure of waste management units; and monitoring to identify releases from waste management units to ensure that the units' design and operating practices are effective in preventing releases.

Corrective action indicators are being developed to measure the effectiveness of activities to control and clean up contamination from waste at RCRA facilities. Activities covered include assessing sites to determine the need for corrective action, stabilizing and cleaning up releases, and prioritizing site assessment and cleanup based on human health and environmental risks.

Although these goals apply to both the Subtitle C (hazardous waste) program and Subtitle D (non-hazardous waste) program of RCRA, the two programs are administrated separately,

cover different wastes, and have different data sources for environmental indicators.[1] Therefore, environmental indicators for each goal listed above are reported separately for Subtitle C and Subtitle D.

STRATEGIC PLANNING, ACCOUNTABILITY, AND ENVIRONMENTAL INDICATORS

RCRA environmental indicators are closely tied with RCRA's Strategic Plan[2] and are focused on the objectives identified in that plan. They are also included in the RCRA Implementation Plan (RIP)[3] as a possible tool for better measuring RCRA program success. In the past, RCRA program success has been measured by numbers of activities such as permits, inspections, and enforcement actions. As OSW develops better measurements and systems for reporting actual environmental trends, these indicators will be incorporated into future Strategic Plans.

CHALLENGES OF DEVELOPING RCRA ENVIRONMENTAL INDICATORS

Designing and reporting environmental indicators for the RCRA program is difficult in many respects. First and foremost, success in two of the three major program goals -- waste minimization and safe waste management -- is not linked directly or easily to improvements in environmental quality. The focus of the waste minimization and safe management programs is that, if one hundred percent effective, contamination is prevented and no environmental change occurs. Measuring progress of preventive measures such as safe management in environmental terms would require a prediction of the environmental damages that might occur in the absence of the controls -- a complex and difficult task.

Second, RCRA is a multi-media program. The RCRA program focuses on controlling the contamination of air, soil, surface water, and groundwater by wastes. Solid wastes may affect any of the environmental media, and these effects are difficult to separate from effects of sources not regulated by RCRA (including natural sources). For example, EPA has authority under several statutes to protect groundwater quality (e.g., RCRA, CERCLA, the Safe Drinking Water Act), and a myriad of State programs also protect groundwater. It is difficult, particularly on a national scale, to decipher the impacts of each program individually on groundwater quality. It is therefore difficult to measure the effectiveness of the RCRA program by monitoring human health effects, the well-being of other species, or the physical and chemical characteristics of groundwater, surface water, soil, or air.

---

[1] Subtitle C of RCRA establishes a program to manage hazardous wastes from "cradle to grave" and therefore regulates generation, transportation, treatment, storage, and disposal of hazardous wastes. Subtitle D promotes environmentally sound management of solid (non-hazardous) wastes and includes minimum technical standards for solid waste disposal facilities and guidelines for State solid waste management plans.

[2] From *Office of Solid Waste and Emergency Response Strategic Plan, FY 1994-1997.*

[3] *FY '93 RCRA Implementation Plan*, Office of Solid Waste and Emergency Response, April 1992.

Third, RCRA regulates wastes that are generated and managed at specific sites. To measure the impact of RCRA programs on the environment, surface water, groundwater, and air monitoring data would have to be collected at each site. This information is not now collected and compiled nationally.

Finally, the RCRA program is not fully in place. Many regulations governing the management of hazardous waste are in effect and appear to have prompted significant improvements in waste management practices. In contrast, the Subtitle D program is still immature. Therefore, indicators that would show substantial progress when applied to the Subtitle C universe might show little progress when applied to the entire universe of solid wastes (i.e., Subtitles C and D combined). Also, these two universes are "moving targets" -- facilities and wastes frequently switch from one universe to the other due to the promulgation of new hazardous waste listings or characteristics, delistings, and regulatory determinations for special wastes. This makes it difficult to establish a baseline from which to measure progress.

These aspects of the RCRA program have helped to shape the overall approach to developing RCRA indicators.

- OSW has elected to develop indicators in stages. In FY 1992, indicators were developed that can be reported using readily available data. These indicators reside toward the middle and left-hand side of the "continuum" shown in Exhibit 1-1. OSW has recently begun developing strategies for obtaining and managing data needed to support expanded reporting on environmental results. For program goals that are not measurably linked to environmental quality, indirect measures will continue to be used.[4]

- RCRA environmental indicator near-term efforts will focus on Subtitle C wastes because national information systems are in place that either provide the needed data or provide a framework for collecting it. A limited set of indicators will be reported for municipal solid wastes using data compiled by sources outside the Agency. Indicators for other Subtitle D wastes (industrial, special wastes) will be deferred until mechanisms are developed to collect and report data. However, indicators developed for Subtitle C could be applied to all facilities and wastes regulated under RCRA. The distinction between a Subtitle C industrial facility and a Subtitle D industrial facility is not a meaningful one to the public or the environment.

THE RCRA ENVIRONMENTAL INDICATORS WORKGROUP PROCESS

OSW formed the RCRA Environmental Indicators Workgroup in August 1991 to assist in the development, evaluation, and reporting of RCRA indicators. The workgroup is chaired by the Regulatory Analysis Branch (RAB) of the Communications, Analysis, and Budget Division

---

[4] For example, to measure progress toward a goal of "reducing by 25 percent the amount of municipal solid waste generated," the indirect indicator "changes in tons of municipal solid waste generated over time" is a better measure than an indicator relating directly to environmental quality.

(CABD), and its members include representatives of OSW, other EPA offices such as Superfund, OGWP, OPPE, all ten Regions, and some States.

The workgroup has met regularly since its inception. The early meetings focused on discussing lists of indicator "categories"[5] for each of the three RCRA program goals. Through these meetings, the workgroup reached consensus on indicators to report in the short term, and identified medium- and long-term indicator categories to analyze in more detail. The outcome of the workgroup's early efforts is presented in the environmental indicator FY 1991 progress report.

In FY 1992, the workgroup has continued to exchange ideas about the advantages and disadvantages of candidate indicators and has helped to assess the quality of data retrieved from different sources. The workgroup has also begun discussing possible strategies for obtaining information that is currently unavailable at EPA Headquarters. The results of these efforts are reflected in the remaining chapters of this report.

SUMMARY OF PAST EFFORTS

The process of developing environmental indicators for the RCRA program began by reporting three indicators in 1990.[6] This was only a first step, and for the past two years OSW has been working toward developing and reporting a fuller set of RCRA indicators. RCRA environmental indicator accomplishments during fiscal years 1991 and 1992 include:

- Establishing a framework for an ongoing effort to develop RCRA environmental indicators by using RCRIS and BRS as information systems, using the expertise of the workgroup, and reporting progress annually;
- Completing the *RCRA Environmental Indicators FY 1991 Progress Report and Implementation Plan*, which outlines a multi-year strategy to develop RCRA environmental indicators and the messages that they support;
- Providing data summaries, analysis, and graphics on some short-term RCRA indicators for OPPE's May 1992 Agency-wide draft report *EPA's Environmental Progress Report: Strategies, Goals, and Environmental Results*; and
- Conducting analysis of short-term indicators, assessing data quality for some medium-term indicators, and conducting preliminary investigations of strategies for obtaining data needed for long-term indicators.

---

[5] Indicator "categories" reflect general approaches to looking at program areas and activities. Specific indicators that fall within a category express similar themes, have similar strengths and weaknesses, and require similar types of data.

[6] The three indicators that OSW reported in 1990 were: quantity of hazardous waste generated; ratio of hazardous waste quantity to production activity; and number of generators with waste minimization programs in place. These indicators were based largely on data collected in EPA's 1986 Generator Survey.

Recognizing that the success of this project hinges on close coordination with the Regions, States, and other Headquarters offices, OSW sponsored or participated in several meetings and events to involve these parties throughout this process. OSW will continue to rely on input from the RCRA Environmental Indicators Workgroup throughout the process of developing and reporting indicators for th. RCRA program.

This chapter briefly discusses the major sources of data for the indicators reported in this document. Subtitle C indicators were based on data from the RCRA program's two major national information systems: the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).[1] Subtitle D indicators were based mainly on EPA's *Characterization of Municipal Solid Waste in the United States.*[2]

RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM (RCRIS)

Background

The Resource Conservation and Recovery Information System (RCRIS) directly supports the management of the RCRA Subtitle C program by Regions and States. It is a national program management and tracking system containing information on facilities that treat, store, or dispose of Subtitle C hazardous wastes, facilities that generate such wastes (both large quantity generators [LQGs] and small quantity generators [SQGs]), and those engaged in transporting such wastes. RCRIS contains information on facility identification and location, permit/closure status, compliance with Federal and State regulations, and clean-up activities.

State and Regional users update RCRIS on an on-going basis with current information as program activities occur. On a monthly basis, the RCRIS national database is updated to reflect State/Regional activity. Updates may occur as a result of several different types of activities; examples include receipt of notification information from a generator; inspection of a treatment, storage, or disposal facility (TSDF); and completion of corrective action stabilization measures at a site.

Data Quality

Indicators that are based on RCRIS data were developed with the assistance of State, Regional, and Headquarters personnel who use and/or manage the data. These parties reached consensus on three criteria for selecting RCRIS data for indicators reporting: (1) the data must be available in Headquarters' national oversight reporting database; (2) the data must be of high

---

[1] Additional general information on RCRIS and BRS can be found in the *RCRA Hazardous Waste Information Management Executive Summary*, which also provides references for more detailed information.

[2] Additional information can be found in the report *Characterization of Municipal Solid Waste in the United States, 1992 Update, Final Report*, July 1992, U.S. EPA Office of Solid Waste.

quality overall on a national basis; and (3) there must be a programmatically sound correspondence between the data and the indicator.

Indicators included in this report draw on the RCRIS Corrective Action module to identify program progress in that area, and the Compliance Monitoring and Enforcement module in support of safe management. The elements used for both indicators have high visibility from the standpoint of actual program implementation at the State/Regional level, and at Headquarters from a national program administration perspective. Projections for the quality of these data as a function of their timeliness, national completeness, and basic accuracy are strong. As with any national system, local variation in data quality may occur. However, by emphasizing data elements with high national priority, the impact of such potential variance is minimized. Efforts are underway to identify additions to RCRIS that can expand RCRA environmental indicator reporting capabilities. Subsequent reports will reflect those efforts.

BIENNIAL REPORTING SYSTEM (BRS)

Background

Every two years, LQGs and TSDFs are required to report to EPA on the quantity, composition, and disposition of hazardous waste, and on efforts undertaken to reduce the volume and toxicity of waste compared to previous years. EPA collects this information under the authority of Sections 3002 and 3004 of RCRA. Handlers provide this information to their State or EPA Region by submitting a Hazardous Waste Report Form.

Beginning with the 1989 reporting cycle, OSW developed the Biennial Reporting System (BRS), an automated data processing system that assists EPA and the States in compiling and maintaining the data from the Hazardous Waste Report Forms. States are responsible for collecting the information from facilities, reviewing it for consistency and completeness, and entering it into the automated system. EPA Regions conduct additional quality control and then transfer the files to EPA Headquarters, who loads the data into the national system. EPA is currently receiving State submissions of 1991 hazardous waste data. These data will be included in the FY 1993 environmental indicator progress report.

Data Quality

OSW currently is using BRS data to report certain waste minimization and safe management indicators. In particular, information on industry classification, the quantity and type of waste generated, the management practices used for the waste, and the existence of a new or expanded waste minimization program are reported in this document. OSW is using 1989 data as a basis for future trend analysis because (1) data from earlier reporting cycles were not incorporated into the automated data system and (2) problems resulting from inconsistent reporting by some States were generally resolved in the 1989 reporting cycle.

EPA emphasized assuring the quality of submissions from the largest generators and management facilities and has verified the 1989 waste generation and management data for over 90 percent of the waste. However, the data on waste minimization activities from the generators have not been verified.

CHARACTERIZATION OF MUNICIPAL SOLID WASTE IN THE UNITED STATES

Background

Characterization of Municipal Solid Waste in the United States: 1992 Update is the most recent in a 20-year series of reports sponsored by EPA to characterize municipal solid waste (MSW) in the United States. It provides information on MSW generation and management from 1960 to 1990; MSW composition by volume and weight; and projections for MSW generation, combustion, and recovery through the year 2000.

The report characterizes the MSW stream of the nation as a whole and does not reflect local variations in waste generation rates, composition, or management practices. The information was derived using a materials flow approach. This methodology is based on production data for the materials and products in the waste. Adjustments are made for imports and exports, product lifetimes, and diversions of products from the waste stream.

Data Quality

The information presented in this report is based on estimates rather than measurements of MSW generation and composition. Although the estimates are based on the best data available, they are subject to uncertainties associated with the methodology itself and the quality of the input data. In this ongoing series of reports, EPA has updated previous estimates if better information has become available, and will continue to do so.

Certain wastes that are frequently disposed in municipal landfills are not covered by the materials flow methodology. MSW as defined in this report does not include construction and demolition wastes, industrial process wastes, and a number of other wastes that may go to a municipal landfill. Certain other materials are also not included, such as product residues in containers (e.g., detergent left in a box). Therefore, the estimates of MSW generation presented in this report are typically lower than those found in other sources.

PROGRAM GOALS

RCRA's waste minimization goals focus on risk reduction and resource conservation, and apply to all types of waste -- hazardous, non-hazardous industrial, municipal, and special wastes. The goals can be represented as follows:

- Reducing risk to human health and the environment associated with waste management by reducing the quantity, toxicity, and hazardous properties of wastes;
- Conserving natural resources by reducing the use of raw materials; and
- Reducing the use of toxic materials in production.

RCRA requires hazardous waste generators and owners and operators of hazardous waste treatment, storage and disposal facilities to certify that they have hazardous waste reduction programs in place. OSW has also undertaken a variety of non-regulatory actions to promote waste minimization. For the municipal solid waste[1] program, EPA fosters an Integrated Waste Management (IWM) approach that encourages first source reduction, then recycling as preferred waste management approaches. Other non-regulatory actions include developing guidelines for Federal procurement of recycled materials to encourage recycling, providing grants to States, and making guidance materials and technical assistance available to States and industry. Other powerful incentives for hazardous waste generators to minimize wastes include the increasingly stringent waste treatment and disposal requirements, and the need to address capacity shortfalls that have been documented in the 1989 State Capacity Assurance Plan.

WASTE MINIMIZATION INDICATOR REPORTING FOR FY 1992

Six waste minimization indicators are being reported in this chapter, three for hazardous wastes and three for municipal solid wastes.

Subtitle C Indicators:

- Subtitle C Indicator No. 1. Quantities of Primary Hazardous Waste Generated in 1989, By SIC Code

[1] In this report, "municipal solid waste" refers primarily to residential solid waste, with some contribution from commercial, institutional, and industrial sources.

- Subtitle C Indicator No. 2. Quantities of Hazardous Wastewater and Non-wastewater Generated in 1989, By SIC Code

- Subtitle C Indicator No. 3. Percent of Hazardous Waste Generators that Initiated or Expanded Source Reduction or Recycling Activities in 1989

Subtitle D Indicators:

- Subtitle D Indicator No. 1. Trends in Total Municipal Solid Waste Generation, 1960 to 1990

- Subtitle D Indicator No. 2. Trends in Per Capita Municipal Solid Waste Generation, 1960 to 1990

- Subtitle D Indicator No. 3. Trends in the Recovery of Municipal Solid Waste for Recycling, 1960 to 1990

Subtitle C Indicators

1. Quantities of Primary Hazardous Waste Generated in 1989, By SIC Code

In order to report hazardous waste minimization activities, OSW examined hazardous waste generation rates over time. Looking at summary numbers from the 1987 and 1989 Biennial Reports, national generation of RCRA hazardous waste in 1989 was approximately 200 million tons, down from a reported 240 million tons in 1987. Much of this reduction, however, is believed to be a result of waste management being shifted from surface impoundments, which are subject to RCRA regulation, to tanks, which are often exempt from RCRA.

To rigorously analyze trends in hazardous waste generation over time, OSW has decided to use 1989 BRS data to report the initial waste quantities for this indicator[2]. The quantities include only waste specified by the 1989 Biennial Reporting System as "primary waste" -- waste generated on site from production processes, service activities, or the management of non-hazardous waste. Excluded from these quantities are "secondary wastes" -- hazardous waste residuals resulting from the treatment or recycling of previously existing hazardous waste.[3] Secondary wastes are excluded because they are not the target for waste minimization. Indeed,

---

[2] OSW is using 1989 data as a basis for future trend analysis because: (1) data from earlier reporting cycles were not incorporated into the automated data system, and (2) problems resulting from inconsistent reporting by some States were generally resolved in the 1989 reporting cycle.

[3] Examples of secondary wastes are solids resulting from stabilization processes and sludges resulting from the treatment of hazardous wastewater.

one might prefer that secondary wastes increase because this could indicate that more hazardous waste is being treated or recycled.[4]

Of the 200 million tons of total RCRA waste generation in 1989, 156 million tons were primary waste. Exhibit 4-1 shows the 156 million tons of primary hazardous waste generated broken out by various industries. The breakout by industry will allow monitoring of waste generation changes within industries that might otherwise be masked. This exhibit excludes (to the extent permitted by the Biennial Report data submissions) hazardous wastes managed exclusively in units exempt from RCRA permitting requirements.[5] Such wastes are mostly wastewaters treated in tanks and discharged to a Publicly-Owned Treatment Works (POTW) or to surface water under a National Pollutant Discharge Elimination System (NPDES) permit. In the future, these quantities will be captured in an examination of trends in cross-media transfers.

Exhibit 4-1 suggests that manufacturers of Chemicals and Allied Products (SIC 28) are responsible for 87.8 percent of all primary waste generation. Within this industry, Industrial Organic Chemicals (SIC 286) is the largest waste generator category; it accounts for almost three-fifths of the waste generated by SIC 28, and about half of all primary hazardous waste generated in the United States. Another large generator category in the chemical manufacturing industry is Plastic Materials, Synthetic Resins, and Synthetic Rubber (SIC 282), which is responsible for about 29 percent of all hazardous wastes. About five percent of all hazardous wastes are generated by manufacturers of Industrial Inorganic Chemicals (SIC 281), and almost two percent are generated by drug manufacturers (SIC 283).

Industrial sectors other than Chemicals and Allied Products that generate one percent or more of the nation's hazardous waste are:

- Petroleum Refining and Related Industries (SIC 29) - 2.5 percent (predominantly petroleum refining);
- Primary Metals Industries (SIC 33) - 2.3 percent (predominantly blast furnaces, steel works, and rolling mills);
- Electrical and Electronic Machinery, Equipment, and Supplies (SIC 36) - 2.3 percent (predominantly manufacturers of semiconductors or cathode ray television picture tubes);

---

[4] Although "primary waste" excludes residuals from hazardous waste treatment practices, it does not exclude residuals resulting from treatment mandated by other statutes, such as the Clean Air Act. Thus, RCRA primary hazardous wastes may increase as a result of the implementation of other statutes.

[5] In cases where it is difficult to determine from the submission to the Biennial Report System whether the waste was managed in a RCRA-regulated or RCRA-exempt process, the waste was assumed to be RCRA-regulated.

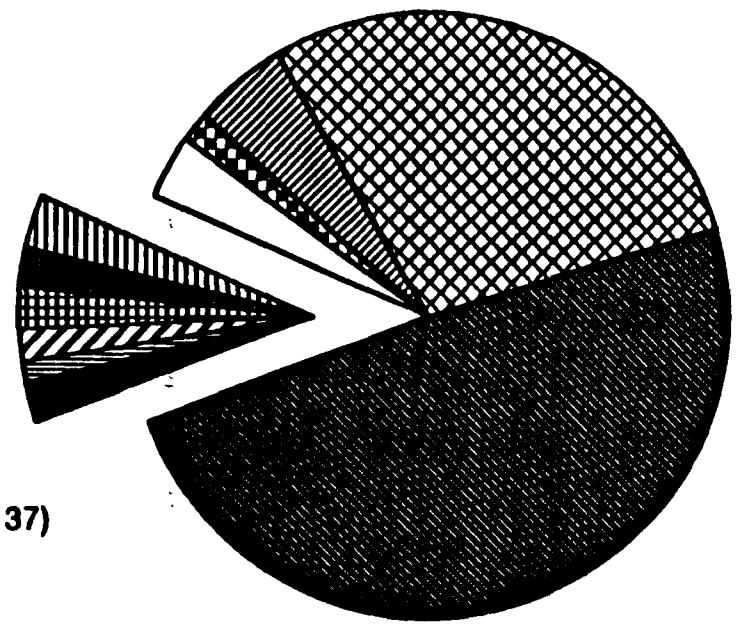
Exhibit 4-1.

Subtitle C Indicator No. 1. Quantities of Primary Hazardous Waste Generated in 1989, by SIC Code.

Waste Generation Quantities Include Primary Waste Only

All Other Industries
19.0 Million Tons, 12.2%

- Petroleum Refining (SIC 29)
  3.9 Million Tons, 2.5%
- Primary Metals (SIC 33)
  3.6 Million Tons, 2.3%
- Electronics (SIC 36)
  3.6 Million Tons, 2.3%
- Fabricated Metals (SIC 34)
  2.8 Million Tons, 1.8%
- Transportation Equipment (SIC 37)
  1.6 Million Tons, 1.0%
- Other Industry
  3.6 Million Tons, 2.3%



Chemicals and Allied Products (SIC 28)
137.2 Million Tons, 87.8%

- Industrial Organic Chemicals
  (SIC 286)
  77.0 Million Tons, 49.3%
- Plastics, Resins, and Rubber
  (SIC 282)
  44.8 Million Tons, 28.7%
- Industrial Inorganic Chemicals
  (SIC 281)
  7.7 Million Tons, 4.9%
- Drugs
  (SIC 283)
  2.6 Million Tons, 1.7%
- Other Chemicals
  5.0 Million Tons, 3.3%

1989 Primary Hazardous Waste Quantity = 156 Million Tons

- Fabricated Metal Products, Except Machinery and Transportation Equipment (SIC 34) - 1.8 percent (electroplaters, hardware manufacturers, ammunition manufacturers, and others); and

- Transportation Equipment (SIC 37) - 1.0 percent (predominantly aircraft engines).

The remaining industries generate 2.3 percent of the primary hazardous waste and have been collapsed into the "others" category.

2. Quantities of Hazardous Wastewater and Non-wastewater Generated in 1989, By SIC Code

Data from the 1989 BRS, displayed in Exhibit 4-2, show that 95.4 percent of the primary hazardous wastes shown in Exhibit 4-1 are wastewaters[6]. The remaining wastes are sludges and solids, and comprise 4.6 percent of all wastes generated. Waste generation is broken out into wastewater and non-wastewater in order to better monitor the types of waste generation changes that might occur. As above, this indicator reports only primary waste and (to the extent permitted by the data submissions) excludes hazardous wastes managed exclusively in units exempt from RCRA permitting requirements.

Exhibit 4-2 also shows the distribution of non-wastewater generation among industries. The Chemicals and Allied Products industry (SIC 28) dominates non-wastewater generation (34.2 percent), but not as dramatically as it does total wastes. The second largest generator of non-wastewaters is Primary Metals (SIC 33), which is responsible for 22.8 percent of all non-wastewater generation (predominantly blast furnaces, steel works, and rolling and finishing mills). Other industries that generate relatively high quantities of non-wastewaters are similar to those listed above.

Note that both the first Subtitle C waste minimization indicator and this indicator will eventually monitor changes in waste quantity over time. (Because of a lack of hazardous waste constituent concentration data, the indicator does not measure changes in hazardous waste toxicity over time.)

3. Percent of Hazardous Waste Generators that Initiated or Expanded Source Reduction or Recycling Activities in 1989

The 1989 Biennial Report asked respondents to provide information on waste minimization activities that were initiated or expanded in 1989, including the quantity recycled and the quantity not generated due to source reduction activities. To aggregate these data, OSW reported the number of facilities which not only reported that they have undertaken new or expanded activities, but also listed a quantity of waste reduced due to these activities. The results, shown in Exhibit 4-3, show that across the 20,713 large quantity generators, 14 percent reported a

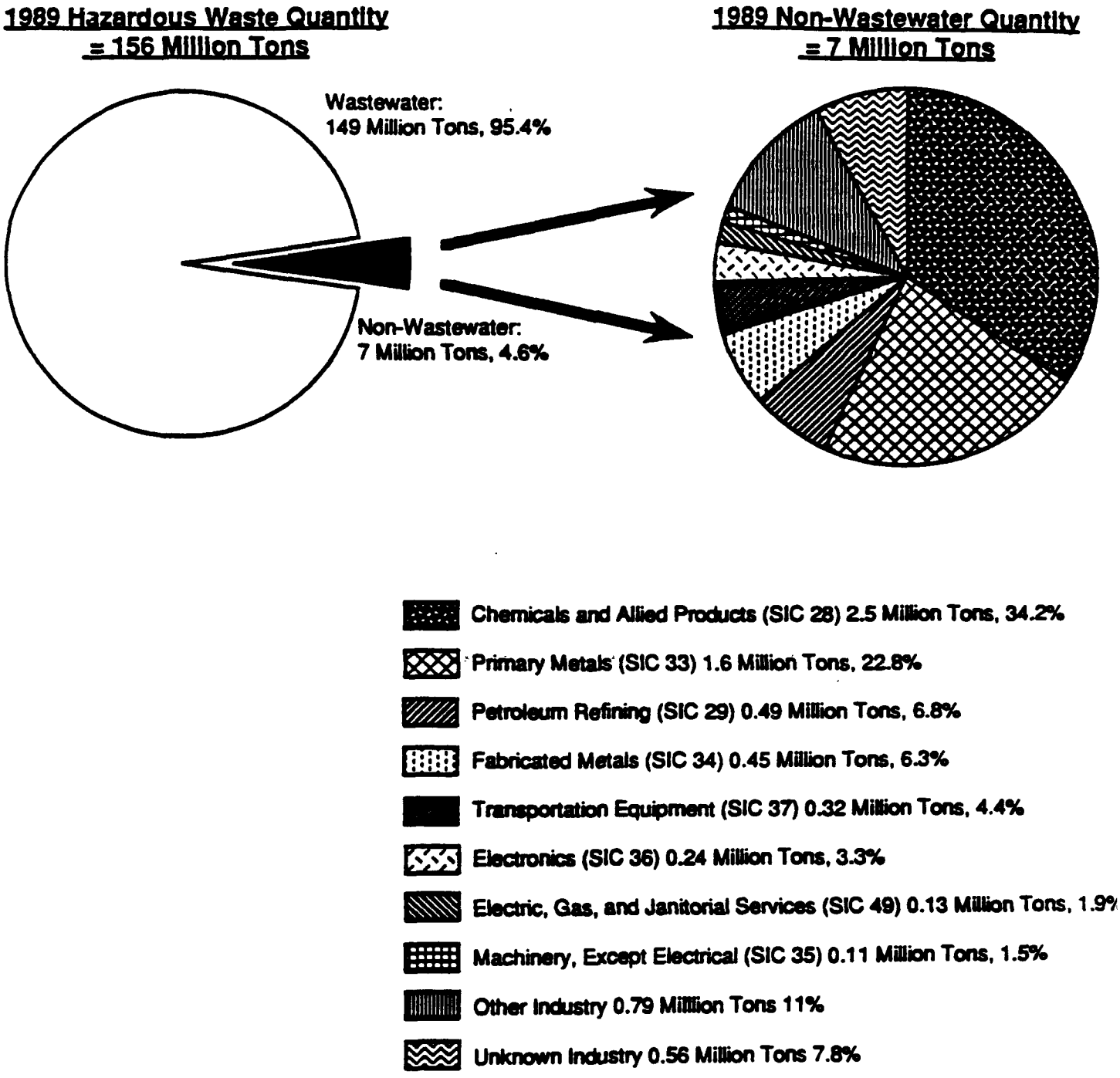
---

[6] Wastewaters are defined in the October 1992 *BRS Core Exception and Verification Report Technical Instructions* as hazardous waste whose form codes indicate aqueous waste, scrubber water or leachate, or whose system type codes indicate aqueous treatment, underground injection, direct discharge to sewer, or direct discharge to surface water.

Exhibit 4-2.

Subtitle C Indicator No. 2. Quantities of Hazardous Wastewater and Non-Wastewater Generated in 1989, By SIC Code

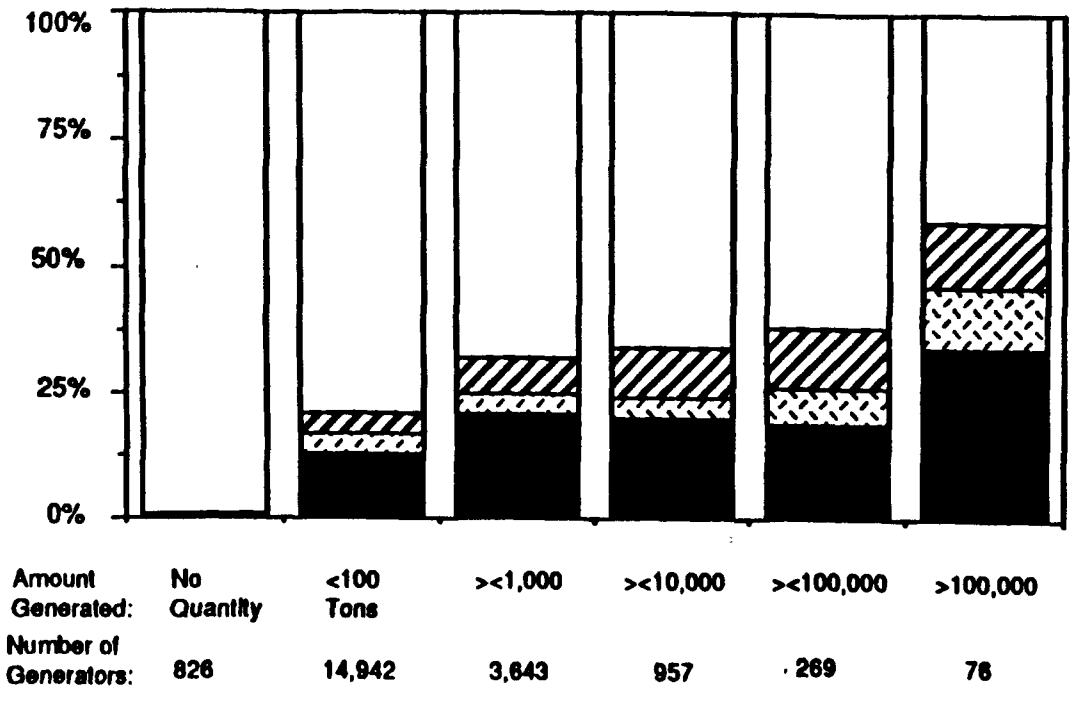
Waste Generation Quantities Include Primary Waste Only



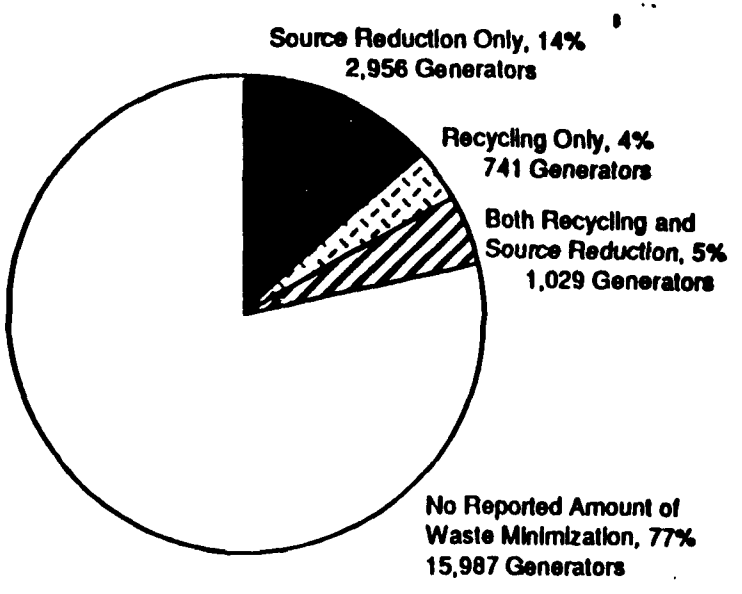
Source: 1989 Biennial Reporting System

Exhibit 4-3.

Subtitle C Indicator No. 3. Percent of Hazardous Waste Generators that Initiated or Expanded Source Reduction or Recycling Activities in 1989



RCRA Hazardous Waste Generators, Grouped by Amount of Waste Generated in 1989 (Tons)



All RCRA Hazardous Waste Generators (20,713)

Waste Minimization Activity Reported
Source Reduction Only | Recycling Only | Both

Source: 1989 Biennial Reporting System

waste quantity avoided due to new or expanded source reduction activities in 1989, 4 percent reported a quantity of waste recycled due to new or expanded recycling activities, and 5 percent reported a reduction of waste quantities for both types of activities.

Disaggregating these results according to the amount of waste generated by facilities shows that facilities generating larger quantities of waste are more likely to report new or expanded waste minimization activities. If these reported activities are in fact a reflection of what is happening in larger facilities, it is important because the 76 firms that generated over 100,000 tons of waste in 1989 (59 percent of which had new or expanded waste minimization programs) are responsible for more than 90 percent of all hazardous waste generated in 1989[7].

This indicator captures those waste minimization activities that are reported as producing a measurable reduction in the quantity of waste. The indicator does not capture, however, those activities that reduce the toxicity of the waste, such as substituting chemicals with less toxic alternatives. Future waste minimization indicators, developed in coordination with the Waste Minimization Measurement Workgroup, will report efforts to minimize waste toxicity as well as waste quantity.

Subtitle D Indicators

1. Trends in Total Municipal Solid Waste Generation, 1960 to 1990

Exhibit 4-4 shows trends in the total quantity of municipal solid waste (MSW) generated in this country from 1960 to 1990. The data were derived from EPA's *Characterization of Municipal Solid Waste in the United States*, July 1992 update. In 1990, the nation generated 196 million tons of waste, up from 88 million tons in 1960. MSW generation has been increasing steadily over time.

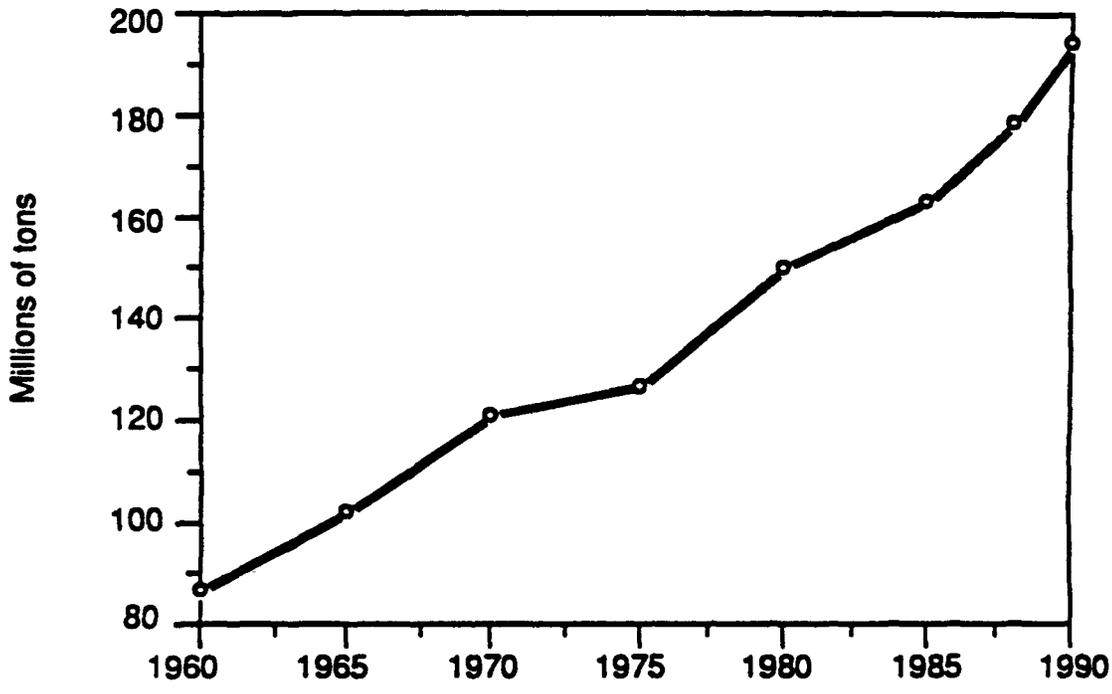
2. Trends in Per Capita Municipal Solid Waste Generation, 1960 to 1990

Exhibit 4-5 shows trends in average per capita MSW generation rates from 1960 to 1990. Again, these data were derived from EPA's *Characterization of Municipal Solid Waste in the United States*, July 1992 update. Per capita waste generation has been increasing since 1960, but more slowly than total MSW generation. This indicates that past trends toward higher total MSW generation rates are attributable to population growth as well as increases in per capita waste generation.

[7]Although the increasingly stringent hazardous waste treatment and disposal requirements of the RCRA program provide a strong incentive to minimize hazardous waste generation, it is difficult to determine to what extent waste minimization activities are directly attributable to the RCRA program.

Exhibit 4-4.

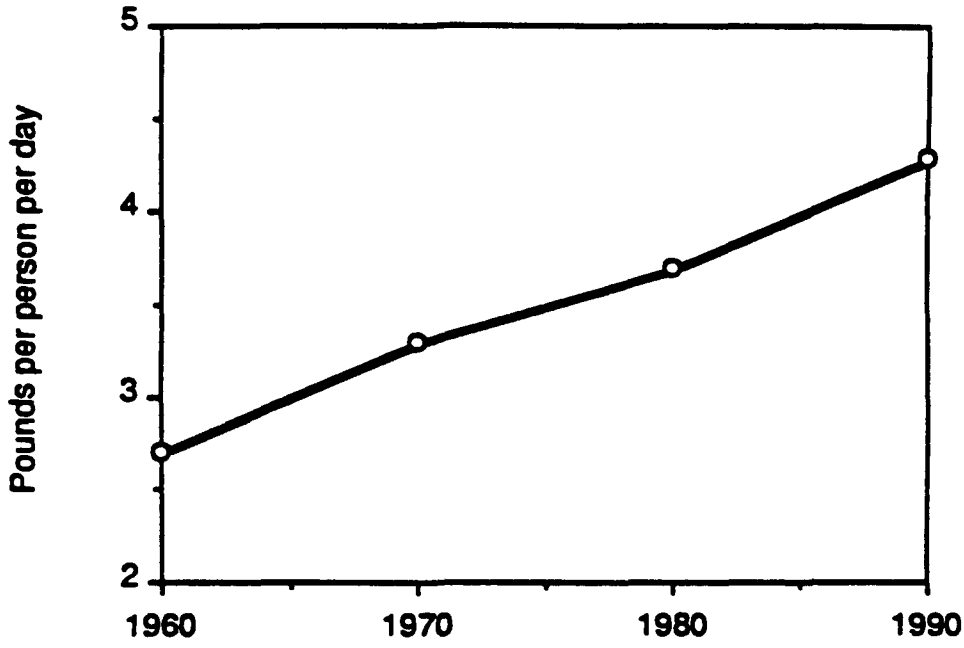
Subtitle D Indicator No. 1. Trends in Total Municipal Solid Waste Generation, 1960 - 1990



Source: EPA, *Characteriztion of Municipal Solid Waste in the United States, 1960 to 1990* (July 1992 Update).

Exhibit 4-5.

Subtitle D Indicator No. 2. Trends in Per Capita Municipal Solid Waste Generation, 1960 - 1990



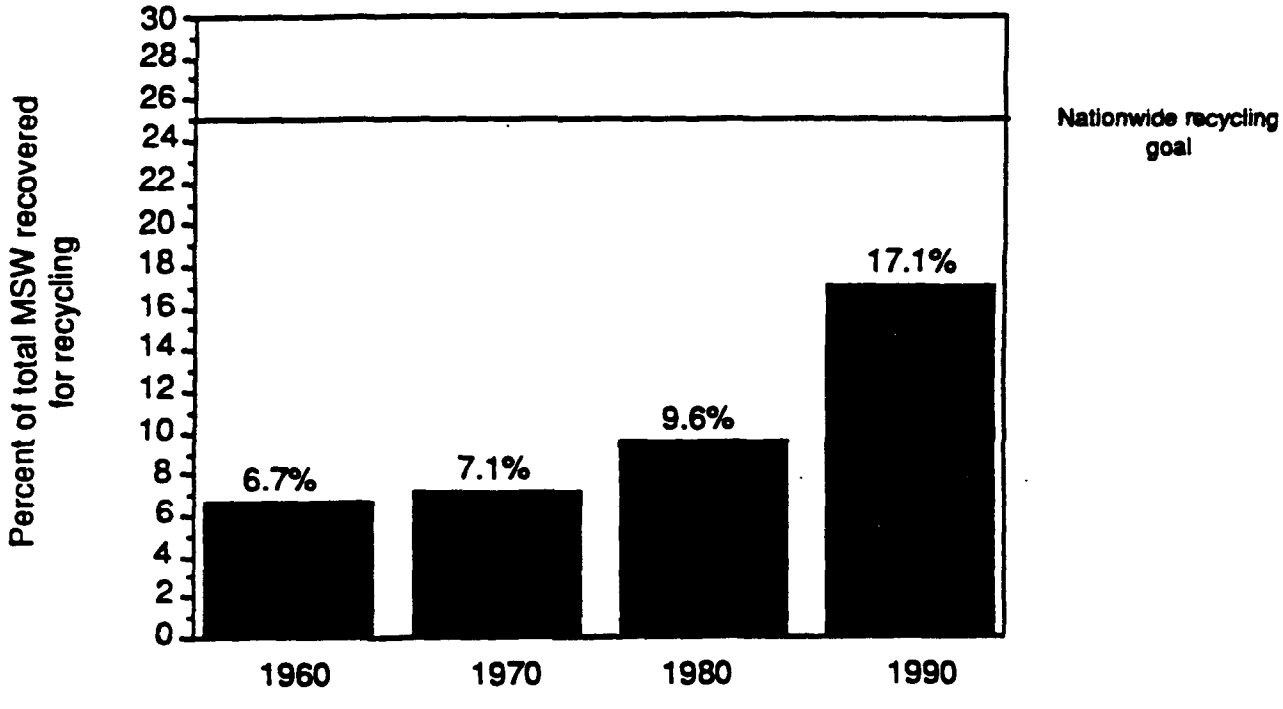
Source: EPA, *Characteriztion of Municipal Solid Waste in the United States, 1960 to 1990* (July 1992 Update).

3. Trends in the Recovery of Municipal Solid Waste for Recycling, 1960 to 1990

EPA studies show that the amount of waste recovered (through recycling, including yard waste composting) has increased steadily over time (see Exhibit 4-6). EPA's *Characterization of Municipal Solid Waste in the United States*, July 1992 update, shows that less than seven percent of our nation's waste was recovered in 1960, compared to 17 percent in 1990. This success is due largely to the States' and local governments' strong efforts in implementing recycling programs as well as business' increased use of secondary materials. EPA's current goal for the nation is 25 percent.[8]

Exhibit 4-6.

Subtitle D Indicator No. 3. Trends in the Recovery of Municipal Solid Waste for Recycling, 1960 - 1990



Source: EPA, *Characteriztion of Municipal Solid Waste in the United States, 1960 to 1990* (July 1992 Update).

[8] From EPA. *The Solid Waste Dilemma: An Agenda for Action*. February 1989. The 25 percent goal is for both source reduction and recycling.

NEXT STEPS

In FY 1993, hazardous waste generation rates will continue to be reported, using the 1989 and 1991 Biennial Reporting System data. The time series data will allow OSW to evaluate changes in hazardous waste generation rates. It is important to understand, however, that the nation's waste generation rates vary in response to numerous factors that are unrelated to waste minimization activities. For example, an increase in the reported quantities of waste could result from the coverage of newly regulated wastes in the Biennial Report. Conversely, a change in reported waste quantities could be attributable to a downturn in the nation's economy, which is typically accompanied by lower industrial production and decreases in waste generation. Complicating factors such as these need to be understood and accounted for when using waste generation rates as an indicator of the success of waste minimization activities.

In FY 1993, the RCRA Environmental Indicators Workgroup will coordinate with OSW's Waste Minimization Measurement Project to develop methods to "normalize" waste generation rates to account for the impact of the factors other than waste minimization activities. OSW will also continue to report the existence of new source reduction or recycling programs as reported in the 1991 BRS, looking at trends by SIC code and State.

PROGRAM GOALS

When waste reduction is not possible, the second objective of RCRA is to ensure that wastes are managed in ways that are protective of human health and the environment. The goal of EPA's waste management program is to ensure the safe management of wastes by properly identifying and monitoring waste movements, siting waste management facilities in safe locations, using waste management practices that reduce the potential for harmful releases, implementing design and operating practices that prevent or minimize releases, and environmental monitoring to ensure that technologies are performing as designed and that releases are detected.

EPA and the States have promulgated a number of rules pursuant to Subtitles C and D of RCRA that have brought about improvements in waste management practices. Since RCRA was promulgated, EPA has brought millions of tons of waste and thousands of waste management facilities into the Subtitle C regulatory system. Wastes regulated under Subtitle C must be monitored from "cradle-to-grave" and must be treated before being placed on the land. Facilities managing Subtitle C wastes must comply with a myriad of requirements including reporting, design and operating standards, standards for closure and post-closure care, and groundwater monitoring.

Municipal waste management is governed primarily by State/tribal programs. EPA's role is to promote nationally an Integrated Waste Management (IWM) approach to safely and effectively handle municipal solid waste. EPA reviews and approves State/tribe municipal solid waste programs and provides education and technical assistance. The recently-signed RCRA municipal landfill rule, and the municipal combustor rules proposed under the Clean Air Act, are major steps toward improving the management of municipal wastes nationwide. EPA is just beginning to gather data on other types of Subtitle D waste. These data, when available, will provide a basis for measuring environmental improvements as the wastes are subject to Federal regulatory requirements in the future.

SAFE MANAGEMENT INDICATOR REPORTING FOR FY 1992

Four safe management indicators are being reported in this chapter, two for hazardous wastes and two for municipal solid wastes.

Subtitle C Indicators:

- Subtitle C Indicator No. 1. Quantities of Hazardous Waste Managed at Subtitle C Facilities in 1989, By Management Practice

- Subtitle C Indicator No. 2. Number of Class I Violations Found at the Last Inspection During 1988-1989, by Number of Facilities and Volume of Waste

Subtitle D Indicators:

- Subtitle D Indicator No. 1. Municipal Solid Waste Management Trends, 1960-1990.

- Subtitle D Indicator No. 2. Trends in Number of Household Hazardous Waste Collection Programs, 1980 to 1991

Subtitle C Indicators

1. Quantities of Hazardous Waste Managed At Subtitle C Facilities in 1989, By Management Practice

Exhibit 5-1 shows the management practices used for 197 million tons of hazardous waste managed at TSD facilities in 1989. The data were derived from the 1989 Biennial Reporting System. The quantity of waste reported as "managed" in this exhibit is greater than the amount reported as "generated" in Chapter 4 because the quantity managed includes both primary and secondary wastes. As in Chapter 4, this exhibit excludes (to the extent permitted by the data submissions) hazardous wastes managed exclusively in units exempt from RCRA permitting requirements.[1] Such wastes are mostly wastewaters treated in tanks and discharged to a Publicly-Owned Treatment Works (POTW) or to surface water under a National Pollutant Discharge Elimination System (NPDES) permit.

Exhibit 5-1 shows that in 1989, approximately 82 percent of hazardous wastes were treated in some way:

- 77 percent of wastes were treated using wastewater treatment processes such as biological treatment and chemical precipitation;

- 5 percent of wastes were treated using processes such as neutralization, sludge dewatering, and stabilization.

Slightly more than one million tons of waste (less than one percent) were managed through incineration in 1989. This is an increase in the amount of waste incinerated in 1987[2].

About 15 percent of hazardous wastes were land disposed in 1989, 14 percent (28 million tons) in underground injection wells and one percent (3 million tons) in landfills, land application

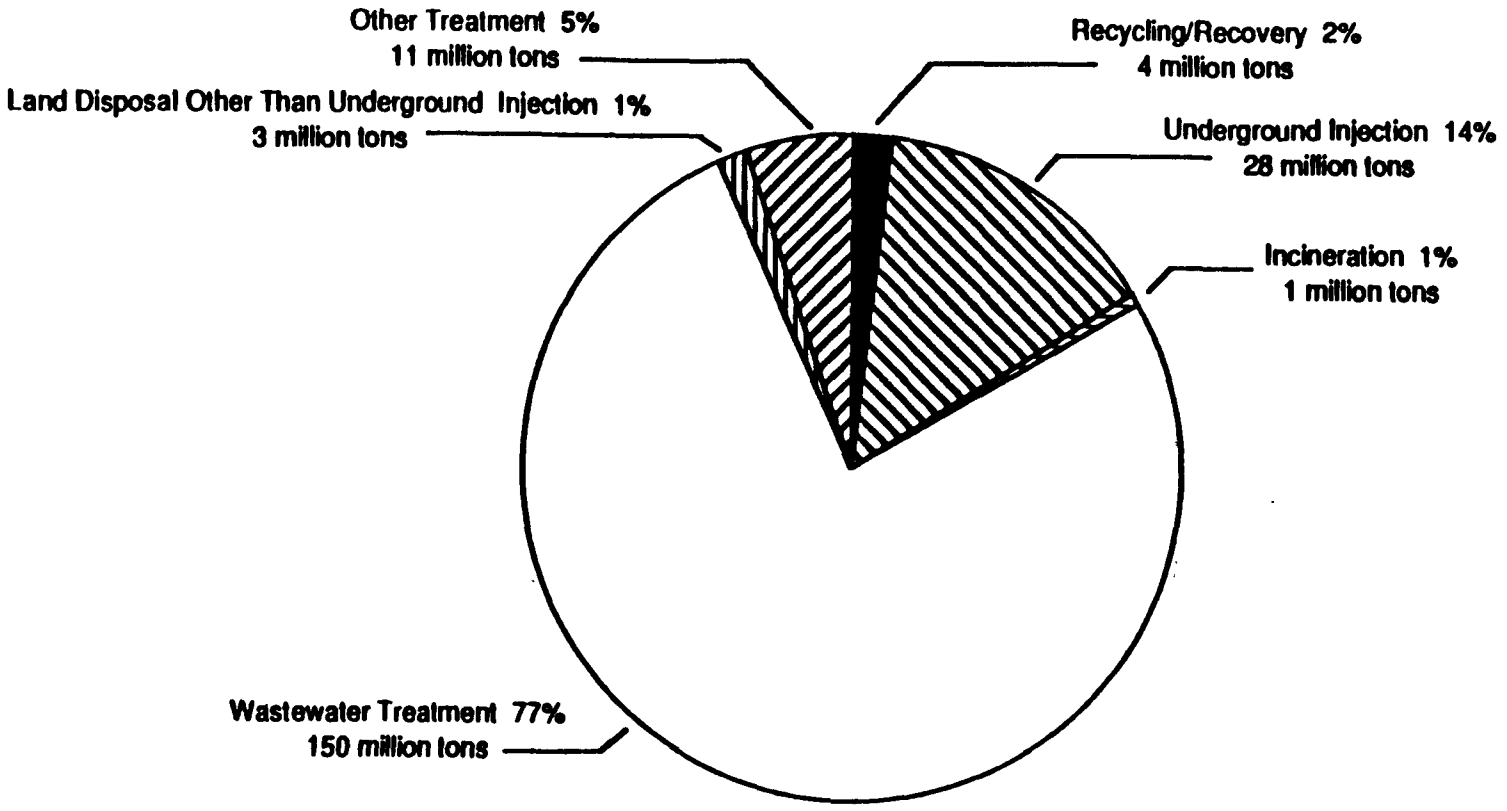
---

[1] In cases where it is difficult to determine from the information submitted whether the waste was managed in a RCRA-regulated or RCRA-exempt process, the waste was assumed to be RCRA-regulated.

[2] Waste management estimates from 1987 are from EPA's *1987 National Biennial RCRA Hazardous Waste Report*, July 1991. Because the 1987 Biennial Report had some problems with inconsistent reporting by some States, the 1987 data were not used as the baseline for this report.

Exhibit 5-1.

Subtitle C Indicator No. 1, Quantities of Hazardous Waste Managed at Subtitle C Facilities in 1989, By Management Practice



Total Hazardous Waste Managed - 197 Million Tons

Quantities include both primary and secondary waste.
Recycling/Recovery includes "reuse as fuel" and "fuel blending" as well.
"Other Treatment" includes sludge treatment, stabilization, neutralization, and treatment type unknown.
Quantities and percentages are rounded to the nearest whole number.

Source: 1989 Biennial Reporting System.

units, and surface impoundments[3]. Of the 3 million tons of waste managed in land disposal units in 1989, 2 million were disposed in landfills, a drop from an estimated 3 million tons in 1987

Recovery and recycling accounted for about two percent (4 million tons) of the hazardous waste managed in 1989. Over one million tons of this waste were managed through metals recovery. Reuse as fuel and fuel blending accounted for about 1.5 million tons, with the remainder managed using other types of recovery processes.

2. Number of Class I Violations Found at the Last Inspection During 1988-1989, by Number of Facilities and Volume of Waste

The RCRA program conducts inspections of hazardous waste generators, transporters, and treatment, storage, and disposal facilities (TSDFs) to determine whether they are in compliance with applicable regulations. EPA tracks the occurrence and severity of violations discovered during these inspections and uses this information for various enforcement purposes.

The most serious violations are called Class I. The definition of a Class I violation has evolved over time, but in 1989 (the first year for reporting this indicator) a Class I violation was defined as:

> *"A violation that results in a failure to: assure that hazardous waste is destined for and delivered to authorized TSDFs; prevent releases of hazardous waste or constituents, both during the active and any applicable post-closure periods of the facility operation where appropriate; assure early detection of such a release; or perform emergency clean-up operation or other corrective action for release."*[4]

Class I violations include certain types of physical violations (such as environmental pollution controls that are not properly installed or maintained) as well as some types of administrative violations (such as failure to maintain adequate groundwater monitoring records). While all Class I violations could result in a situation that has the potential of being environmentally

[3] In the Biennial Reporting System, the "surface impoundment" system code applies only to surface impoundments that will eventually be closed as landfills, i.e., with accumulated sludges in place. Wastes that are placed in surface impoundments that are dredged periodically and that remove wastes before closing are not included among the quantities reported as land disposed. These wastes are typically reported under the wastewater treatment system codes.

[4] U.S. EPA. *Enforcement Response Policy*. December 1987.

threatening[5], the occurrence of a Class I violation does not necessarily mean that a release has occurred (i.e., that a facility is not managing hazardous waste safely).[6]

For this indicator, the absence of Class I violations at inspected TSDFs is acting as a surrogate measure of safe management of wastes. This indicator does not specifically include large quantity generators because (1) such facilities are not inspected as frequently as TSDFs, and (2) those TSDFs that are also large quantity generators would be double counted.

Wastes managed at TSDFs that do not have Class I violations are considered to be managed "safely" for the purpose of this indicator. There are several important caveats associated with using compliance information in this way; these caveats are listed at the end of this section.

Exhibit 5-2 presents information on the occurrence of Class I violations at RCRA hazardous waste TSDFs. Data on waste quantity were derived from the 1989 BRS and include all hazardous waste managed in units subject to RCRA permitting, both wastewaters and non-wastewaters. Data on the number of Class I violations were drawn from the results of facility inspections recorded in RCRIS for fiscal years 1988-1989. Thus, the universe of facilities shown in Exhibit 5-2 is limited to TSDFs that submitted a 1989 Biennial Report form[7]. The classification of facilities as TSDFs is based on 1989 BRS data.

Exhibit 5-2 shows the number and percent of TSDFs that were found to have zero, one, two, or more than two Class I violations during the last inspection. It is based on 3,062 TSDFs that submitted a Biennial Report form in 1989 (an additional 16 TSDFs submitted forms but are *not included because they contain confidential business information* [CBI]).

Exhibit 5-2 also shows the proportion of waste managed by these facilities. Of the 2,182 inspected TSDFs (that submitted a 1989 Biennial Report Form), 1,492 TSDFs had no Class I violations and managed 131 million tons (67 percent) of the hazardous waste. Class I violations were found at 690 facilities that managed 61 million tons (31 percent) of the waste. Most (about 54 million tons) of this waste was managed by 456 TSDFs that had only 1 Class I violation[8].

---

[5] Even an administrative violation can be environmentally threatening, for example, if it precludes an inspector from determining whether a facility is in compliance with permit conditions.

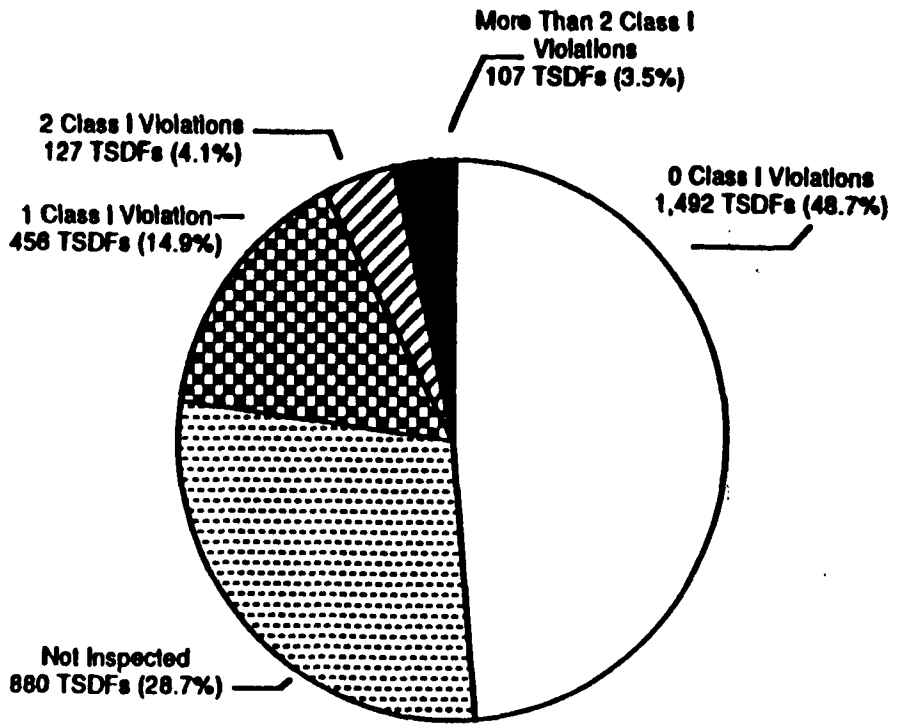
[6] The RCRA program applies a rigorous definition of facility compliance. It is not sufficient that a violator be on a compliance schedule. To be considered in compliance, all outstanding RCRA violations must actually have been returned to full compliance.

[7] According to BRS, there were 3,078 TSDFs in 1989. RCRIS, however, reports the figure to be more than 4,000. There are several possible reasons for the difference between these two numbers. First, BRS does not include facilities that only store waste. Second, BRS does not include closed and closing facilities that do not report any waste being managed.

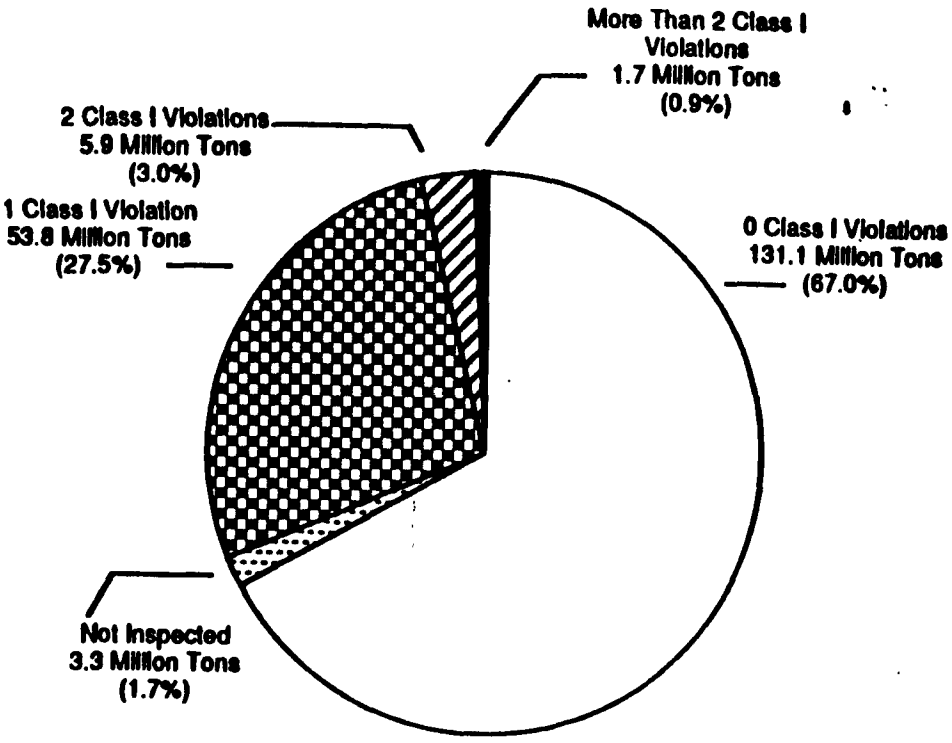
[8] The number of facilities with no class I violations is probably slightly overestimated here because not all States entered information on outstanding violations from before 1988 into RCRIS.

Exhibit 5-2.

Subtitle C Indicator No. 2. Number of Class I Violations Found at the Last Inspection During 1988 - 1989, By Number of Facilities and Volume of Waste



Number of TSDFs
(3,062 Total)



Tons of Waste Managed at TSDFs
(196 Million Tons Total)

Universe is limited to TSDFs that submitted a 1989 Biennial Report Form.
An additional 16 TSDFs are not included because of Confidential Business Information (CBI).

Sources: 1989 Biennial Reporting System
Resource Conservation and Recovery Information System (RCRIS), 1990

Note that while only 71 percent of the TSDFs that submitted a 1989 Biennial Report Form were inspected, the inspected facilities managed over 98 percent of the hazardous waste in 1989.

The data presented in Exhibit 5-2 suggest that as of 1989, most TSDFs were in compliance with RCRA regulations and most RCRA hazardous waste was being managed safely. It is important, however, to understand three limitations associated with this indicator:

- Only inspected facilities have information on the number of violations. There is no way to determine which uninspected facilities were managing wastes safely in 1989.

- The occurrence of a Class I violation does not necessarily mean that a facility is posing actual threats to the environment; the lack of compliance only suggests the potential to do so.

- Facilities not having Class I violations entered in the RCRIS database for fiscal year 1988-1989 may pose a threat to the environment through unidentified releases, or from outstanding violations from previous years.

OSW recognizes that this indicator is only a surrogate for safe management, and is working to develop the capability to more realistically assess the number of facilities that manage hazardous waste safely (i.e., in a manner that limits risk to human health and the environment).

Subtitle D Indicators

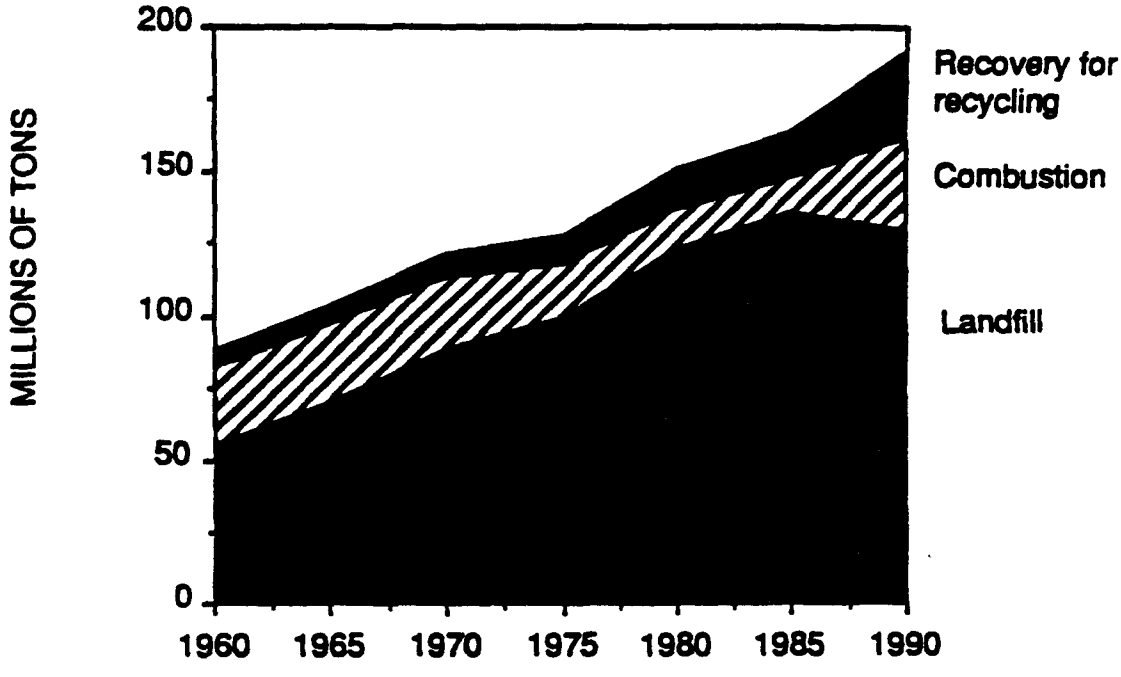
1. Municipal Solid Waste Management Trends, 1960 - 1990

Exhibit 5-3 shows national trends in municipal solid waste (MSW) management methods from 1960 to 1990. The source of this information is EPA's *Characterization of Municipal Solid Waste in the United States*, July 1992 update. The exhibit shows that while generation rates of MSW have been increasing over time, trends in the proportion managed by different methods have varied over the past 30 years. An estimated 31 percent of MSW was combusted in 1960, mostly in incinerators with no air pollution controls and no energy recovery. As old incinerators were closed, combustion dropped steadily over the next 20 years, reaching a low of 9 percent of generation in 1980. Over the past decade, MSW combustion has been increasing again. All major new facilities have energy recovery and are designed to meet air pollution standards.

The amount and percentage of MSW placed in landfills increased in the 1960's and 1970's, reflecting the declining use of incineration and the low rates of recycling and composting. By 1980, the percentage of MSW landfilled had increased to 81 percent of generation, from 72 percent in 1970 and 63 percent in 1960. In the 1980's, increased recycling and combustion caused the percentage of waste remaining to be landfilled to decline. By 1990, 67 percent of MSW was landfilled.

Exhibit 5-3.

Subtitle D Indicator No. 1. Municipal Solid Waste Management Trends, 1960 - 1990



Source: EPA, *Characteriztion of Municipal Solid Waste in the United States, 1960 to 1990* (July 1992 Update).

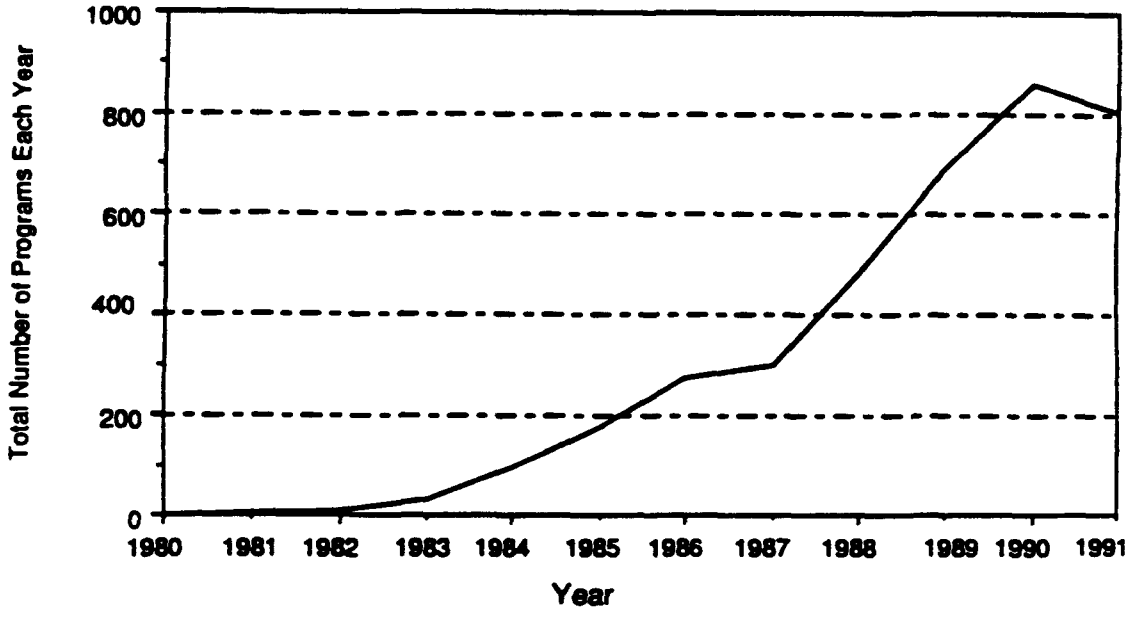
2. Trends in the Number of Household Hazardous Waste Collection Programs, 1980 to 1991

Exhibits 5-4a and 5-4b report the increased interest by local communities in reducing the toxicity of their municipal solid waste by collecting household hazardous waste (HHW) separately. Since 1981, the number of HHW collection programs, as reported by the Waste Watch Center[9], has grown dramatically. Exhibit 5-4a shows the total number of programs (including one-day events and permanent facilities) from 1980 to 1991. The drop in the number of programs from 1990 to 1991 is a result of communities switching from a few one-day collection programs a year to permanent facilities. This switch is shown in Exhibit 5-4b, with 56 permanent HHW collection programs in 1990 and 96 permanent programs in 1991 -- an increase of 71 percent.

Exhibit 5-4a.

Subtitle D Indicator No. 2. Trends in the Number of Household Hazardous Waste Collection Programs, 1980 to 1991

Includes one-day events and permanent facilities



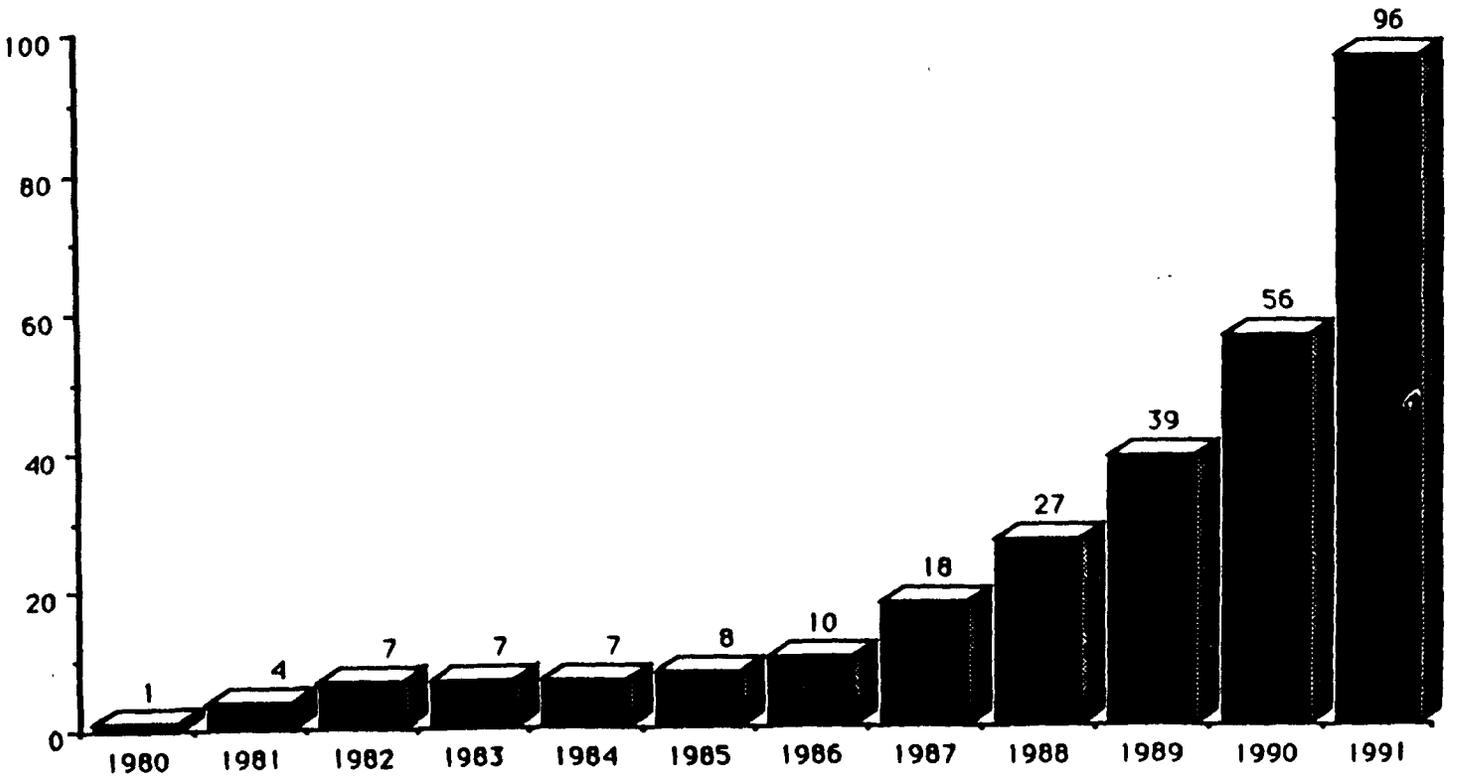
Source: Waste Watch Center, 1991.

[9] The Waste Watch Center is a non-profit organization devoted to educational projects in the areas of solid, hazardous, and household hazardous waste management; reduction, reuse, and recycling; and pollution prevention. EPA provided funding to the Waste Watch Center for the collection of the information that is presented in this report.

Exhibit 5-4b.

Subtitle D Indicator No. 2 (cont). Trends in the Number of Household Hazardous Waste Collection Programs, 1980 to 1991

Includes permanent facilities only



Programs are included only during year of operation.
Source: Waste Watch Center, 1991.

NEXT STEPS

During FY 1993, OSW will continue to evaluate trends in hazardous and MSW management methods over time.

In the future, the "quantities of hazardous waste managed" indicator will be refined to distinguish between land-based and non-land-based management practices. Because some wastewaters treated in surface impoundments are currently reported under "wastewater treatment" instead of "surface impoundment," the quantities of waste that are treated on the land versus in tanks is not captured. This distinction is important because one goal of the RCRA program is to reduce reliance on land-based management practices such as surface impoundments and landfills.

In addition, the quantity or proportion of waste treated prior to placement in land-based units will be reported. This information could be used to help report progress achieved by the land disposal restrictions program, which requires wastes destined for land management to be treated. OSW may also identify specific indicators and investigate data sources relating to closure of unsafe facilities.

For the municipal solid waste indicators, trends in municipal solid waste management methods and in household hazardous waste collection programs will continue to be reported.

PROGRAM GOALS

The overall goal of RCRA corrective action is to prevent or reduce harm to human health and the environment from releases at RCRA facilities. EPA currently requires corrective action only for Subtitle C (hazardous waste) facilities. The October 1991 rule promulgating revised criteria for Subtitle D municipal solid waste landfills (MSWLFs), which will become effective in October 1993, will require corrective action for MSWLFs as well. To date, EPA has not proposed any corrective action requirements that would apply to facilities that manage only Subtitle D industrial or special wastes. Because no corrective action requirements are currently in effect under Subtitle D of RCRA, the remainder of this chapter focuses on Subtitle C corrective action. Subtitle D corrective action indicators will be addressed in the future.

The overall strategy of the Subtitle C corrective action program is to identify environmentally threatening sites, prioritize the sites according to risk, and address the most threatening sites first by stabilizing releases and reducing the further movement of contaminants. While all sites with releases of concern will eventually be addressed, the process can take a long time, depending on the complexity of the action, the immediacy of the threat, the facility's priority for corrective action, and the financial viability of the owner/operator. Because the systematic assessment, identification, and cleanup of all sites will take many years, EPA has implemented a stabilization strategy whose basic goal is to take whatever actions are necessary to control releases and reduce the further spread of contamination. After stabilization is achieved, EPA's focus will shift to cleaning up releases to specified performance standards for long-term remediation.

CORRECTIVE ACTION INDICATOR REPORTING FOR FY 1992

Two indicators are being reported for corrective action:

- Subtitle C Indicator No. 1. Status of Subtitle C Facilities in the Corrective Action Program
- Subtitle C Indicator No. 2. Number of Subtitle C Facilities Conducting Investigations and Controlling Releases, by Priority Ranking

Both of these indicators reflect the current status of Subtitle C treatment, storage, and disposal facilities (TSDFs) in the corrective action program. They measure in a direct and straightforward way the progress EPA has made in taking actions to prioritize sites and to assess, investigate, and respond to past releases. Additional work is needed to develop the capability to quantify the direct environmental significance of these actions.

1. Status of Subtitle C Facilities in the Corrective Action Program

Exhibit 6-1a shows the current (1992) status of RCRA treatment, storage, and disposal facilities in the Subtitle C corrective action program. It is based on data from RCRIS (September 1992) for all 56 States and territories. Three general stages of the corrective action process are shown:

i. Assessments: The RCRA Facility Assessment (RFA) is a general assessment of the site and an important step in identifying potential problems. EPA (along with States and territories) has completed RFAs for all facilities reported in this category[1].

ii. Investigations: The RCRA Facility Investigation (RFI) is a more detailed study of sites that may be of concern, and the Corrective Measures Study (CMS) is a study of actions that may be taken to respond to environmental problems identified at the site. Facilities placed in this category have begun an RFI or CMS.

iii. Controlling Releases: Facilities placed in this category have initiated or completed actions to address environmental problems. These actions include stabilization (near-term risk reduction actions typically taken in the early phases of the corrective action process) and long-term cleanup activities.

The data presented in Exhibit 6-1a show that EPA, along with the States and territories, has systematically initiated the corrective action program and is working to address environmental problems posed by past releases. Of the 4,218 TSDFs subject to Subtitle C corrective action at the end of FY 1992, EPA has already completed RFAs (i.e., has assessed problems) at over 80 percent (3,519 facilities). OSW estimates that about 25 percent of these facilities will need no further action beyond an RFA, meaning that an estimated 75 percent may require further investigation. EPA has already begun or completed further investigation at 614 facilities, or 17 percent of those assessed. In addition, seven percent of TSDFs assessed have taken stabilization or cleanup actions in response to environmental problems. ..

Exhibit 6-1b shows cumulative trend information on the progress of RCRA investigations and cleanup or stabilization activities since 1990. FY 1993 marks the full implementation of the RCRA corrective action strategy as defined in the *RCRA Implementation Study (RIS)*[2]. This strategy, among other things, directs national resources towards achieving more near-term clean up actions to control the most serious environmental problems. Future reporting of this indicator will monitor the effects of this strategy.

---

[1] An estimated 1,217 RCRA facilities received assessments under the Superfund program, and are also included under "Assessments."

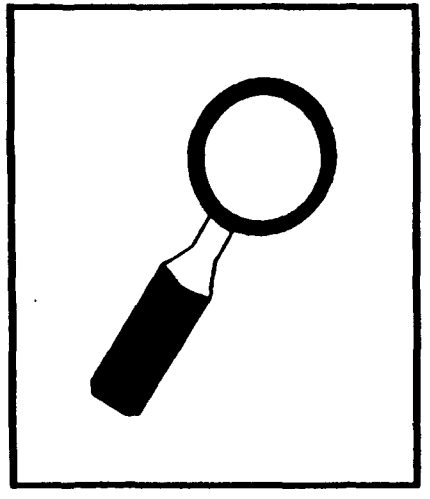
[2] EPA. 1990. *The Nation's Hazardous Waste Management Program at a Crossroads: The RCRA Implementation Study.* Office of Solid Waste and Emergency Response. July 1990.

Exhibit 6-1a.

Subtitle C Indicator No. 1. Status of Subtitle C Facilities in the Corrective Action Program

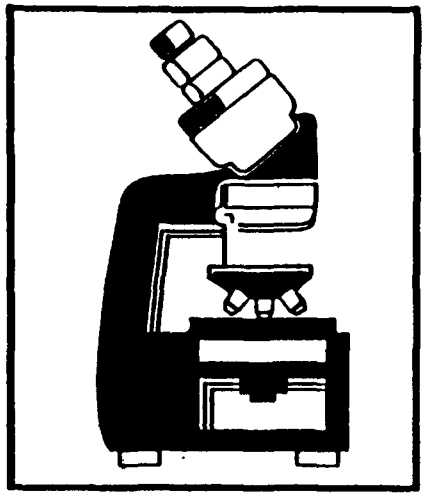
Program Inception Through FY 1992

Assessments



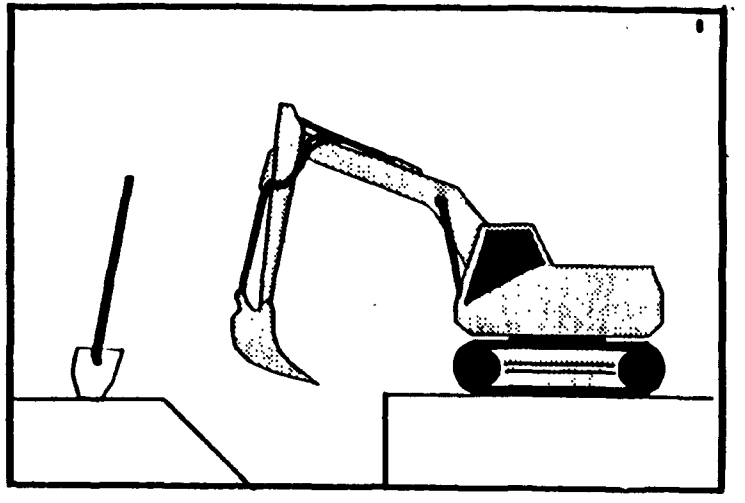
3,519 Facilities of a Total 4,218 Facilities Have Been Assessed (83%)

Investigations



17% of Facilities Assessed (15% of the Total) Have Begun or Completed Investigation (614 Facilities)

Controlling Contaminant Releases



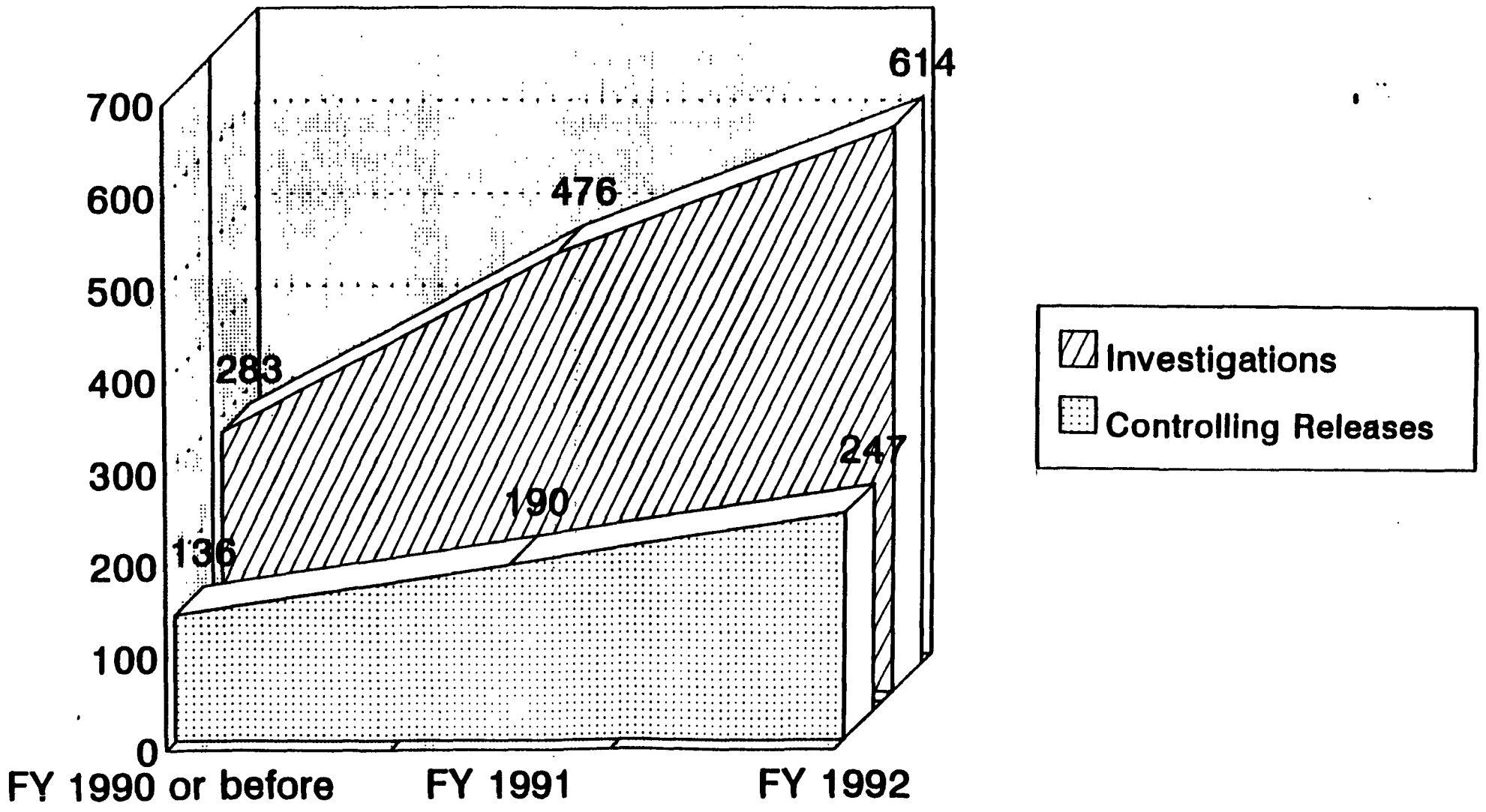
7% of Facilities Assessed (6% of the Total) Are Controlling Contaminant Releases (247 Facilities)

Facilities include only Subtitle C treatment, storage, and disposal facilities (TSDFs).

Sources: Resource Conservation and Recovery Information System (RCRIS), September 1992.
Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), December 1992.

Exhibit 6-1b.

Subtitle C Indicator No. 1. (Cont.) Status of Subtitle C Facilities in the Corrective Action Program



Source: Resource Conservation and Recovery Information System (RCRIS), September 1992

2. Number of Subtitle C Facilities Conducting Investigations and Controlling Releases, By Priority Ranking

Another fundamental strategy of the Subtitle C corrective action program is to address sites with the greatest environmental and health risks first. The National Corrective Action Prioritization System (NCAPS) was developed in 1991 to help the Agency prioritize corrective action at RCRA TSDFs. NCAPS is simpler than the Superfund Hazard Ranking System but considers many of the same factors, such as the history of hazardous waste releases, area hydrogeology, routes of continuing and sudden releases, waste types and quantities handled, and likelihood of human and environmental exposure.

Using NCAPS, EPA "scores" facilities based on environmental and health risks and ranks facilities as high, medium, or low priority based on these scores.[3] Typically, high priority facilities (the top one-third of the NCAPS list) are those with known releases to groundwater and/or soil, or suspected releases to groundwater (with other exacerbating factors such as high potential for direct human exposure). There are fewer high priority facilities with solely surface water or air problems.

Exhibit 6-2 shows the priority rankings of the 4,218 TSDFs subject to RCRA corrective action at the end of FY 1992. The exhibit is based on September 1992 RCRIS data and covers all 56 States and territories. About 24 percent of TSDFs (1,021 facilities) have been assigned high priority, 20 percent (831 facilities) medium priority, and 19 percent (785 facilities) low priority. Priority rankings are unavailable in RCRIS for 37 percent of TSDFs because they have not yet been ranked or have not yet entered their priority ranking into RCRIS.

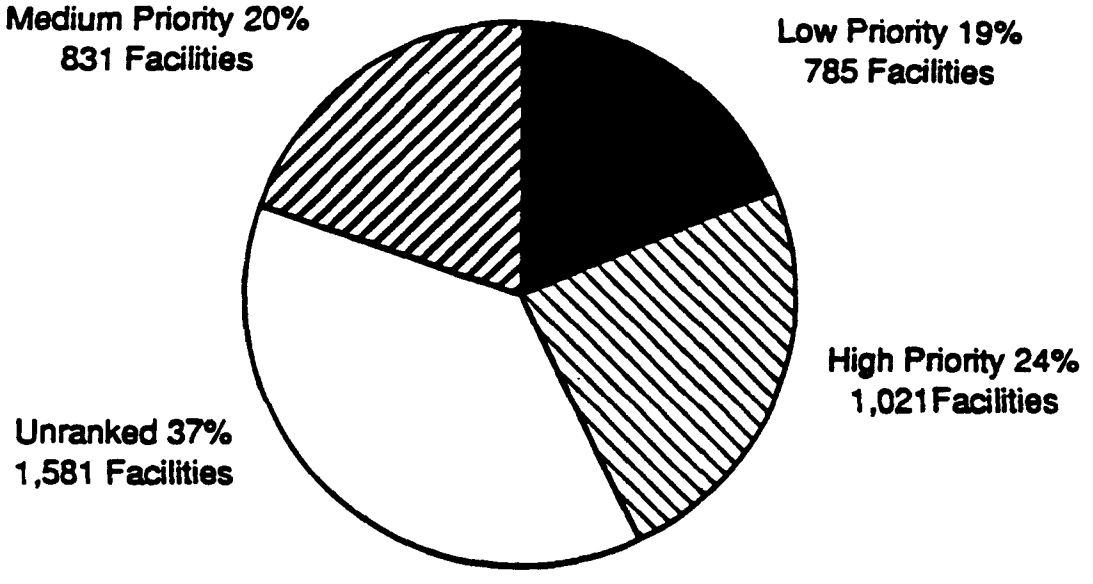
Exhibit 6-3 presents data for Subtitle C Indicator No. 2. It shows the number of facilities, by priority ranking, in each of two stages of the corrective action process: investigations and controlling contaminant releases (defined above). The data demonstrate that EPA is addressing the sites posing the greatest threats first. Detailed investigations are underway or have been completed at 345 high priority facilities, compared to 160 medium priority facilities and 56 low priority facilities. Actions have been taken to control contaminant releases at 159 high priority facilities, substantially higher than the 53 medium priority facilities and 13 low priority facilities. In fact, although only 24 percent of the universe of RCRA TSDFs have high priority rankings, they comprise 64 percent of all sites at which stabilization or cleanup actions have been conducted. Because facilities are prioritized based on the potential risk they pose to human health and the environment, actions taken to reduce risks at high priority facilities should lead to better protection of human health and the environment overall.

---

[3] NCAPS ranking is a separate process from the RCRA Facility Assessment process described in corrective action indicator no. 1.

Exhibit 6-2.
Priority Rankings of Subtitle C Facilities

4,218 Facilities Total

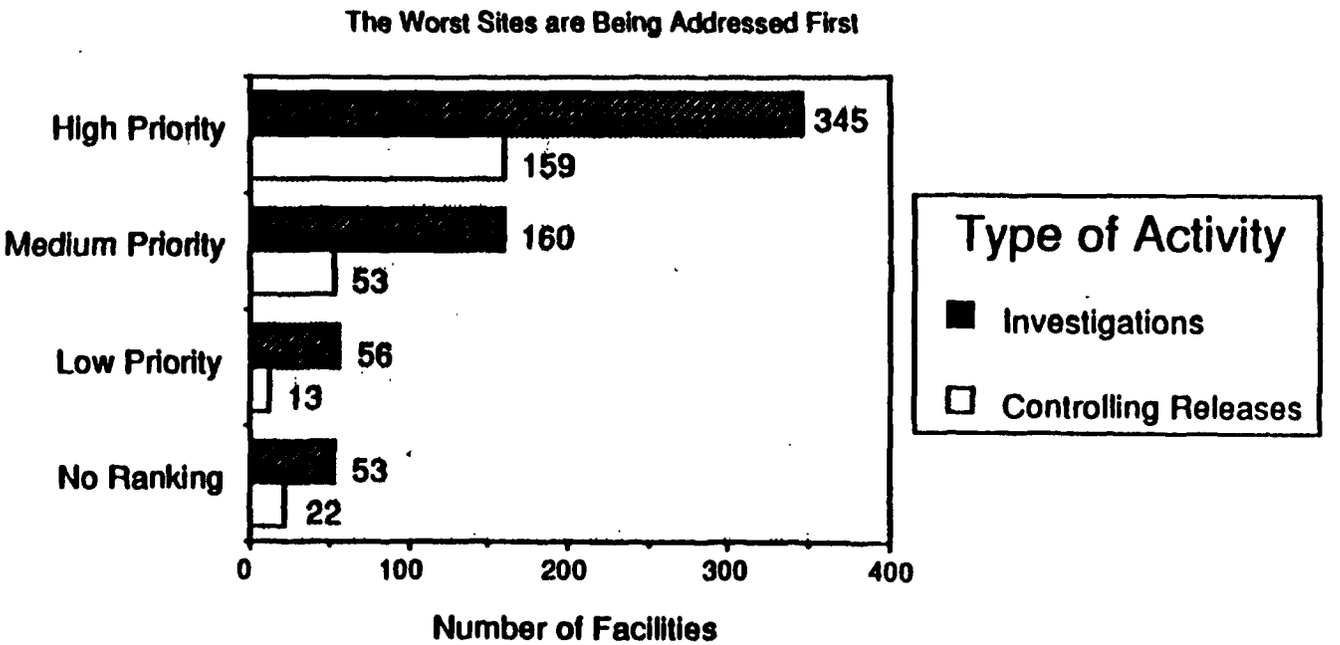


Facilities include only Subtitle C treatment, storage, and disposal facilities (TSDFs). "Unranked" also includes 2 facilities whose ranking is unknown.

Source: Resource Conservation and Recovery Information System (RCRIS), September 1992.

Exhibit 6-3.

Subtitle C Indicator No. 2, Number of Subtitle C Facilities Conducting Investigations and Controlling Releases, By Priority Ranking



High, Medium, and Low Priority refer to the corrective action (NCAPS) ranking of the facility.
Facilities include only Subtitle C treatment, storage, and disposal facilities (TSDFs).
Facilities may undergo more than one activity.
"No Ranking" includes two facilities whose ranking is unknown.

Source: Resource Conservation and Recovery Information System (RCRIS), September 1992.

NEXT STEPS

Starting in FY 1993, reports on the two indicators presented here will be updated with FY 1993 data, and will include information on the number of facilities at which no further action is needed. In addition, proposed changes to RCRIS will be analyzed to determine if they could be used to refine the existing indicators.

INTRODUCTION

The previous three chapters have reported environmental indicators for which data are readily available now. (These indicators were identified as "short-term" indicators in the *RCRA Environmental Indicators FY 1991 Progress Report and Implementation Plan for the Future.*) During FY 1993, OSW and the RCRA Environmental Indicators Workgroup will continue to update these indicators and analyze trends over time.

The major challenge for the environmental indicators project in FY 1993, however, will be to develop methods to report those indicators for which data exist but are not currently compiled in a usable form. Data compilation, review, and analysis for these "medium-term" indicators (as identified in the FY 1991 progress report) will be conducted during FY 1993. In addition, the workgroup will begin to examine and perhaps implement additional data collection efforts or case studies to allow reporting of more direct environmental indicators in FY 1994 and beyond ("long-term" indicators).

This chapter discusses proposed next steps for developing additional environmental indicators for FY 1993 and beyond.

SUBTITLE C ENVIRONMENTAL INDICATOR DEVELOPMENT

Proposed Waste Minimization Indicators

1. Quantity of Hazardous Waste Prevented Due to Waste Minimization Activities

The quantity of hazardous waste prevented due to waste minimization is a more direct measure of the waste minimization goal than the number of waste minimization programs. However, it is inherently difficult to estimate the amount of waste that would have been generated if source reduction measures had not been implemented. During FY 1993, OSW will coordinate its environmental indicator development effort with the on-going work of the Waste Minimization Measurement Project. This project is sponsoring State pilot programs designed to investigate different ways of estimating the effects of waste minimization activities on waste generation. Results from these pilots will help develop better waste minimization environmental indicators.

2. Effects of Waste Minimization on Demand for Hazardous Waste Disposal Capacity

One of the goals of the hazardous waste disposal capacity programs is to address capacity short-falls through waste minimization. The Capacity Programs Branch (CPB) of OSW is working with the Waste Minimization Branch (WMB) to develop a method for using BRS to estimate the projected effect of waste minimization on hazardous waste capacity and then measure the actual effect against projections. During FY 1993, OSW will coordinate with these efforts to develop indicators of the effects of waste minimization on demand for capacity.

Proposed Safe Management Indicators

1. Number of Land Disposal Facilities that Have Completed Adequate Closure

One of the initial goals of RCRA is to close facilities unable or unwilling to manage wastes safely. The Resource Conservation and Recovery Information System (RCRIS) provides information on the number of facilities closed and closing. This information may be a good surrogate for measuring progress towards the goal of closing unsafe facilities.

During FY 1993, OSW will examine the closure data included in RCRIS and analyze their applicability toward environmental indicator development.

Proposed Corrective Action Indicators

1. Quantities of Contaminated Media Treated or Removed

Quantities of contaminated media treated or removed is a useful indicator of interim progress at corrective action sites, although these quantities do not necessarily reflect actual risk reduction. This information is not collected in BRS, but the Capacity Programs Branch (CPB) is beginning an effort to measure quantities of remediation waste (which includes waste at Superfund and underground storage tank sites) generated for use in hazardous waste disposal capacity planning.

During FY 1993, OSW will work with CPB to develop methods of measuring quantities of remediation waste.

SUBTITLE D ENVIRONMENTAL INDICATOR DEVELOPMENT

During FY 1993, OSW will begin to develop indicators for the Subtitle D (non-hazardous) industrial waste program in the areas of waste generation, waste management, and waste minimization. OSW will also examine the possibility of developing indicators for special wastes, including cement kiln dust and wastes from mining, coal-fired electric power plants, and oil and gas production. In addition, municipal solid waste indicators will be developed further as more data become available.

OTHER FY 1993 ACTIVITIES RELATED TO ENVIRONMENTAL INDICATORS

EPA's National Environmental Goals

During FY 1993, EPA will develop and solicit comment on a set of national cross-program goals. Developing these goals will require cooperation between State and Federal governments, industry, environmental groups and the public. As this effort proceeds, RCRA environmental indicators will also be developed, as appropriate, to measure progress towards these goals.

Workgroup Process and Responsibilities

During FY 1993, the RCRA Environmental Indicators Workgroup (see Appendix A) will continue its role in reviewing and setting priorities for data collection, assessment, and reporting. In addition, development of specific indicators, case studies, etc., may be carried out by smaller subgroups of the workgroup.

OSW will continue preparing an annual RCRA environmental indicators progress report, summarizing results of the year's efforts and discussing future work. OSW's Communication, Analysis and Budget Division (CABD) has lead responsibility for developing RCRA indicators. The Regulatory Analysis Branch and the Information Management Branch of CABD share responsibility for this effort.

APPENDIX A

RCRA ENVIRONMENTAL INDICATORS WORKGROUP MEMBERSHIP

EPA HEADQUARTERS

Office of Solid Waste

Communications, Analysis and Budget Division
Loretta Marzetti
Sara Rasmussen
Kevin Phelps
John Sager
Barnes Johnson
Myra Galbreath
John Fogarty
Tracy Alfredson

Municipal and Industrial Solid Waste Division
Jim Lounsbury
Ellen Pratt
Daria Willis
Janice Johnson

Waste Management Division
Donna Perla
Mike Taimi
Laura Lopez
Clare Lindsey
Dan Derkics
Patricia Whiting
Robert Burchard

Permits and State Programs Division
Mary Felton
Vern Myers
Jim Brown

Characterization and Assessment Division
Ambika Bathija
Monica Barron

Office of Solid Waste and Emergency Response
Susan Absher

Office of Waste Programs Enforcement
Sandi Jones
Debbie Villari
Rose Lew
Karin Ashe

Office of Policy, Planning and Evaluation
Maurice LeFranc
Margaret Saxton

Office of Pollution Prevention and Toxics
Ed Weiler

Office of Water
Dick McDermott
Robin Heisler

EPA REGIONS

Region I	Ken Blumberg
Region II	Agathe Nadai Greg Zaccardi
Region III	Gmerice Wilson
Region IV	John Lank Bob Reimer
Region V	Rich Traub Jane Ratcliffe Dan Bakk
Region VI	Guy Tidmore
Region VII	William Pedicino Mary Clark Janet Hallier
Region VIII	Nick Robinson
Region IX	Chris Prokop
Region X	Susan Hutcherson Judy Stone

STATES

New Jersey:

Frank Coolick
Assist. Dir. Haz. Waste Reg.
Department of Environmental Protection
Division of Hazardous Waste Management
401 E. State Street - 5th Floor East
Trenton, NJ. 08625

Georgia:

Jennifer R. Kaduck
Program Manager
Environmental Protection Division
Georgia Department of Natural Resources
Floyde Tower East, Suite 1154
205 Butler Street, S.E.
Atlanta, GA 30334

Louisiana:

Peter Romanowsky
Deputy Assistant Secretary
Department of Environmental Quality
Office of Solid and Hazardous Waste
Post Office Box 82178
Baton Rouge, Louisiana 700884-2178

Oregon:

Stephanie Hallock
Oregon Department of Environmental Quality
811 Southwest 6th Avenue
Portland, OR 97204