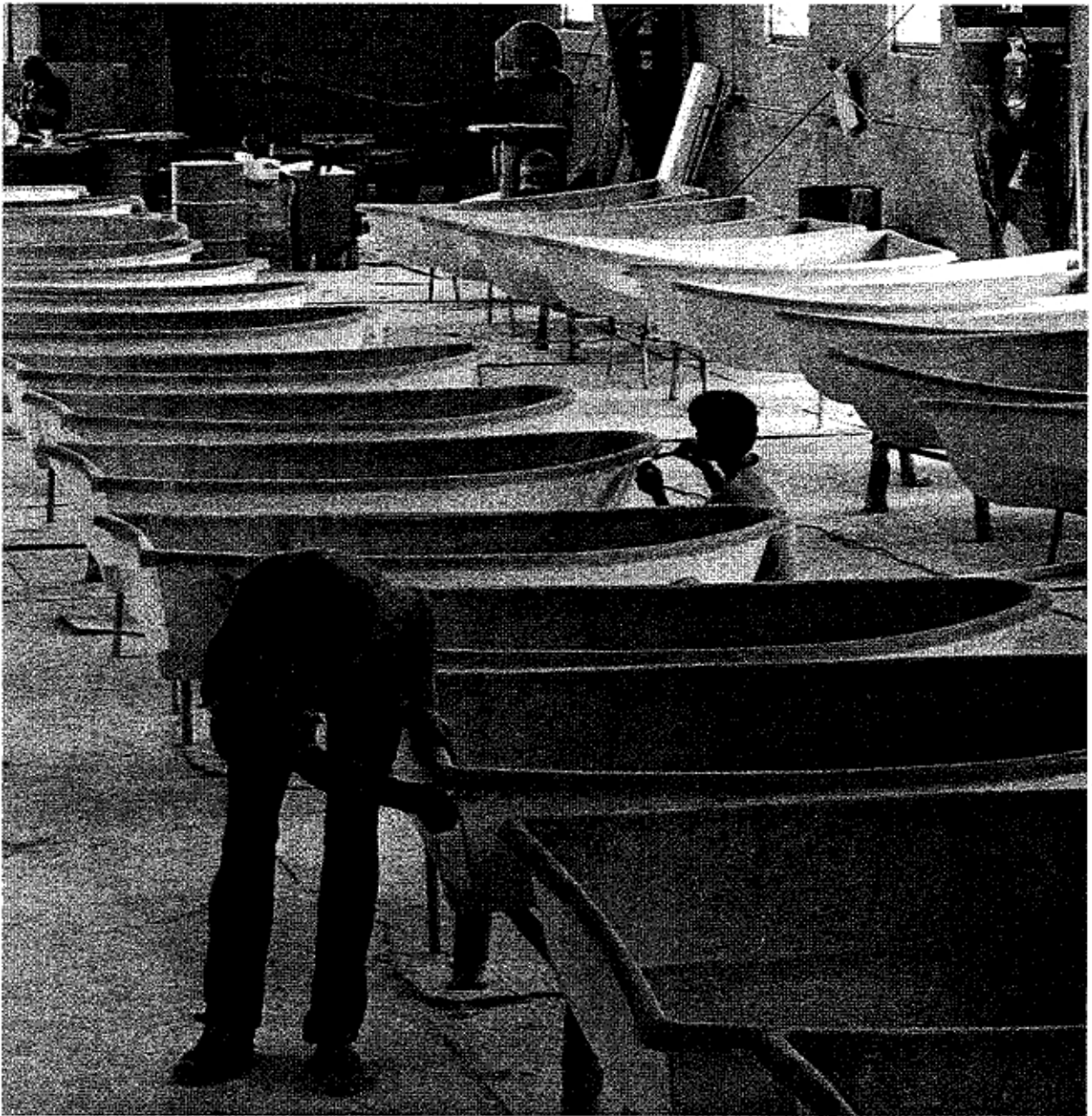




Prototype Study Of Industry Motivation For Pollution Prevention



PROTOTYPE STUDY OF INDUSTRY MOTIVATION FOR POLLUTION PREVENTION

by

Ohad Jehassi
Deborah Milecofsky
Susan Peck
Manik Roy

Final Production by

Laura J. McWhirter, Capt, USAF

**U.S. Environmental Protection Agency
Pollution Prevention Policy Staff
Office of the Administrator**

ACKNOWLEDGEMENTS

The authors wish to thank several people and organizations for their contributions, without which this study would not have been possible.

First are the pollution prevention staff of the eight states, two EPA regional offices, one research institute and the professional association that participated in this project. They were:

Connecticut:	Rita Lomasney (ConnTAP) Bob Brown (ConnTAP) Mary Sherwin (DEP)
Massachusetts:	Doug Fine (DEP) Kim Kreiton (DEP) Cynthia Barakatt (OTA) Ruth Polk (DEP) Rich Bizzozero (OTA) Den Soltis (OTA) Bill Griffin (OTA) Ariadne Kucz waj (OTA) Scott Fortier (OTA)
Maine:	Ann Pistel (DEP)
New Hampshire:	Vincent Perelli (DES)
New Jersey:	Jeanne Herb (DEP)
New York:	Bill Eberle (DEC)
Rhode Island:	James McCaughey (Narragansett Bay Commission)
Vermont:	Gary Gulka (DEC)
EPA Region I:	Mark Mahoney Abby Swaine
EPA Region II:	Janet Sapadin
Massachusetts Toxics Use Reduction Institute:	Monica Becker
Northeast Waste Management Officials Association:	Terri Goldberg

Also essential to the study were the organizations which graciously sent three of the four authors on detail to the Pollution Prevention Policy Staff to perform the study. In particular, thanks are due to:

Mary Ellen Weber, Director, Economics, Exposure, and Technology Division,
Office of Pollution Prevention and Toxics, EPA, for the efforts of Ohad Jehassi;

Jeanne Herb, Director, Office of Pollution Prevention, New Jersey Department of
Environmental Protection, for the efforts of Deborah Milecofsky;

Steven DeGabriele, Director, Hazardous Waste Management, Massachusetts Department
of Environmental Protection, for the efforts of Susan Peck; and

United States Air Force, for the efforts of Captain Laura McWhirter.

Thanks also to Donna Perla and James Lounsbury of the Waste Minimization Branch of the EPA Office of Solid Waste for making contract resources available to the project. The contractor team was Kerr and Associates working as a subcontractor to SAIC, Inc. The contractor team performed the literature review that formed the basis of the "Prior Work" section of Chapter Two.

Thanks to the 22 reviewers (see Appendix D) who provided written comments and the seventy-five who discussed this study at a session of the December 1995 meeting of the National Pollution Prevention Roundtable.

Finally, and most importantly, thanks to the forty-two businesses whose employees took time from their busy days to give the rest of us some insight into why they and their colleagues prevent pollution.

Cover photograph by Meira Jehassi of Eli Laminates Company, New York.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	v
CHAPTER 1: INTRODUCTION.....	1
CHAPTER 2: METHODOLOGY OF THE PROTOTYPE STUDY.....	4
CHAPTER 3: FINDINGS: IMPLICATION FOR THE DESIGN OF THE NATIONAL INDUSTRY MOTIVATION FOR POLLUTION PREVENTION STUDY.....	15
APPENDIX A: INDUSTRIAL FACILITY - TELEPHONE SURVEY.....	A1
APPENDIX B: INDUSTRIAL FACILITY - ONSITE SURVEY.....	B1
APPENDIX C: STATE CONTACT SURVEY.....	C1
APPENDIX D: LIST OF REVIEWERS.....	D1
APPENDICES PUBLISHED IN THE "INTERVIEW RESULTS" VOLUME OF THIS REPORT	
APPENDIX E: FACILITIES.....	E1
APPENDIX F: FACTORS THAT LED RESPONDENTS TO BEGIN INVESTIGATING POLLUTION PREVENTION.....	F1
APPENDIX G: FACTORS THAT INFLUENCED THE MEANS BY WHICH RESPONDENTS LEARNED OF POLLUTION PREVENTION OPTIONS...G1	G1
APPENDIX H: FACTORS THAT INFLUENCED RESPONDENTS' CHOICES OF POLLUTION PREVENTION PROJECTS.....	H1
APPENDIX I: POLLUTION PREVENTION MOTIVATORS MATRIX - INDUSTRIAL FACILITIES.....	I1

EXECUTIVE SUMMARY

This document, "A Prototype Study of Industry Motivation for Pollution Prevention," reports on a study undertaken by the Pollution Prevention Policy Staff of the U.S. Environmental Protection Agency (EPA). Through this study EPA sought to better understand whether and how environmental issues influence core business decisions -- such as those involving product design and production process design and operation -- in order to better understand how various factors, including public policy, motivate pollution prevention in industry.

To carry out this study, pollution prevention staff from EPA and eight Northeastern states (CT, MA, ME, NH, NJ, NY, RI, VT) compiled and analyzed information from the employees of forty-two industrial facilities on their pollution prevention decisions and on the factors that influenced their decisions. The results of a national study, based on this prototype, are intended to be published later this year. Both the prototype and national studies are part of EPA's continuing efforts to improve its effectiveness at promoting pollution prevention. EPA is making available to the public the primary materials on which the prototype was based (and will do so for the national study as well), to allow stakeholders to draw their own conclusions and thereby contribute as equal partners to the national debate on this issue.

Distinguishing features of the prototype study

While several important studies assessing pollution prevention programs have been performed previously, EPA is not familiar with any prior efforts to perform a study of the scope of either the present prototype study or the full national study discussed below. The most important features of the prototype study are that:

- Information was gathered on a large number of industrial firms from both the firms themselves and from state employees familiar with the firms;
- Several different potential motivators of industrial pollution prevention were investigated, including several government and private programs; and
- Stakeholders from several points of view were asked to comment on the initial findings, and where their comments differed from those of the authors, they were included and cited.

The prototype study was intended to identify factors motivating industrial pollution prevention, rather than to assess their prevalence or effectiveness. For this reason, respondents were not chosen at random.

The Prototype Study

Following are some of the lessons learned from the Prototype Study.

- ✓ Everything seems to work for somebody. Among the forty-two business respondents, the prototype study found supporters (as well as detractors) of nearly every major type of pollution prevention policy -- including technical assistance, facility planning requirements, and voluntary programs.

- ✓ Different factors affect the various stages of pollution prevention differently. Respondents described the process through which a business prevents pollution as occurring in three stages. Different factors reportedly affected each of these stages differently.
 - The business decides to investigate pollution prevention. Respondents mentioned both top management support and internal champions as important for initially drawing their facilities' attention to pollution prevention. Some respondents suggested that end-of-pipe standards, planning requirements, reporting requirements, enforcement actions, voluntary programs, and awards programs gave latent pollution prevention champions and their managers the excuse they needed either to carry out long-standing plans or to call in assistance or training. Some respondents, as well, suggested that certain regulatory requirements could distract facility staff from pollution prevention projects that had greater potential for environmental protection than did simple compliance with the requirements.

 - The business identifies and investigates its options. Technical assistance, one means by which government helps businesses identify and investigate their options, was discussed by some respondents. Onsite technical assistance visits were reported as more important to respondents at facilities with less environmental sophistication in-house than to respondents at facilities that were growing and had environmental professionals on staff. Respondents from companies with strong environmental staffs reported having developed their major projects in-house, using vendors and internal engineering staff as needed.

 - The business chooses and implements a particular option or group of options. Respondents reported that management commitment eased implementation of pollution prevention projects, partly by influencing the relative importance of cost and payback in the decision to implement projects. Some respondents reported the implementation of projects chosen primarily to speed up and improve production which resulted in pollution prevention, and vice versa. In addition, some respondents reported that regulatory requirements provided the impetus for implementation.

-
-
- ✓ Nothing occurs in a vacuum. Respondents mentioned several pollution prevention motivations together so often, they appeared different facets of the same motivator. In particular:
 - The perceived cost incentive for investigating pollution prevention seemed partly a function of the anticipated cost of compliance using standard pollution control approaches, the cost of input materials, and potential cost of enforcement.
 - The assessment of the technical feasibility of a pollution prevention option seemed partly a function of the availability of alternative technologies, the availability of information about alternative technologies, the willingness of employees to modify procedures to accommodate new technologies, and the willingness of customers to accept changes in products and services.
 - "The right thing to do" (often cited as a reason for a certain action) seemed partly a function of environmental compliance requirements, public and private voluntary environmental excellence programs, the local environmental ethic, and the corporate environment, health and safety ethic.

For example, a business reporting that "cost" is an important factor in pollution prevention decisions may actually be referring to any number of factors.

- ✓ Where you stand is based on where you sit. Researchers found that different respondents within a business (for example, environmental staff, production manager, production equipment operator, etc.) reported a different understanding of the process by which the business arrived at its pollution prevention decisions.

Design of the National Study of Industry Motivation for Pollution Prevention

The above lessons have several implications for the design of the National Study of Industry Motivation for Pollution Prevention. The following section describes the general design of the study, which will be carried out from May - August 1996 and is intended to be published in September 1996.

- Sample Selection. 500 printers and 500 facilities reporting under the Toxics Release Inventory (TRI) will be selected at random from business directories. Researchers will survey the presidents of the small printing companies and production process managers in the larger printing companies and the TRI facilities.
- The Dependent Variable: Identifying the Practice of Pollution Prevention. Having selected the study facilities, the researchers will seek to ascertain which of the facilities

are practicing pollution prevention, by gathering the following three types of information:

- Quantitative data on the business's pollution prevention progress, where available;
 - The influence respondents report that environmental issues have on production decisions; and
 - Respondents' reports of specific pollution prevention practices in use.
- The Independent Variables: Assessing the Factors that Might Promote or Inhibit Prevention. Researchers will identify possible influences on each business's pollution prevention decisions by identifying the extent to which each business is affected by environmental requirements and by asking respondents to report their:
 - initial reasons for investigating pollution prevention;
 - sources of information about pollution prevention options;
 - approaches to analyzing options; and
 - factors considered in making the final choice.
- Analysis: Statistical Analysis and Public Comment. The analysis of the information will take place in two stages.
 - Statistical Analysis. First, EPA will statistically analyze the above information to identify the factors, including policy tools, associated with the industrial practice of pollution prevention.
 - Public Comment. The raw data and the results of the statistical analysis will be shared with reviewers representing a wide range of perspectives, and their comments will be incorporated into the report.
- The Report. The national study is intended to be published in September 1996, and will discuss:
 - Study objectives;
 - Methodology;
 - Raw data gathered (which will be published as an appendix);
 - Results of the statistical analysis;
 - Comments received from peer reviewers;
 - EPA's findings; and
 - Plans for further study.

EPA believes the national study to be an essential next step for understanding and promoting pollution prevention.

CHAPTER ONE

INTRODUCTION

This document, "A Prototype Study of Industry Motivation for Pollution Prevention," reports on a study undertaken by the Pollution Prevention Policy Staff of the U.S. Environmental Protection Agency (EPA). Through this study EPA sought to better understand whether and how environmental issues influence core business decisions -- such as those involving product design and production process design and operation -- in order to better understand how various factors, including public policy, motivate pollution prevention in industry.

To carry out this study, pollution prevention staff from EPA and eight Northeastern states (CT, MA, ME, NH, NJ, NY, RI, VT) compiled and analyzed information from the employees of forty-two industrial facilities on their pollution prevention decisions and on the factors that influenced their decisions. The results of a national study, based on this prototype, are intended to be published later this year. Both the prototype and national studies are part of EPA's continuing efforts to improve its effectiveness at promoting pollution prevention.

"Pollution prevention" as a characteristic of business behavior

EPA's official definition¹ of "pollution prevention" describes the technologies and work practices that constitute pollution prevention (e.g. "input substitution" or "production process improvement"), and the technologies and work practices not defined as pollution prevention (hence the phrase "prior to recycling, treatment, or disposal"). This definition was used in carrying out this study (e.g. survey respondents were read the definition before being surveyed) and is the sense in which "pollution prevention" is used throughout this report.

It has additionally been useful in this study to approach "pollution prevention" in terms of business behavior, rather than in terms of the technological results of that behavior. The basic premise of this behavioral approach is that:

- many businesses isolate fundamental business decisions, such as those regarding the financing, design, production, costing, pricing, and marketing of products and services, from environmental considerations,
- to the extent that a business tries to meet its environmental protection obligations

¹ See F. Henry Habicht II, Deputy Administrator, Memorandum on "EPA Definition of Pollution Prevention", May 28, 1992, EPA.

without accounting for them in core business decisions -- strictly at the "end of the pipe" -- the business may be passing over more cost effective, more protective strategies, and

- pollution prevention involves addressing environmental considerations in core business decisions, such as those involving product design and production process design and operation.

It is complicated to understand how and why any group of people take a certain set of actions. Understanding the specific cause of how and why businesses prevent pollution is no less complex. Nevertheless, improving EPA's effectiveness at promoting pollution prevention requires both the agency and its stakeholders to come to a better understanding of what inspires and inhibits businesses to undertake pollution prevention actions. This study explored in particular the influence of public policy tools -- such as technical assistance, facility planning, Right-to-Know reporting, recognition programs, and traditional end-of-pipe regulatory programs -- on product design, production process design and operation decisions.

The structure of this report

The first chapter of this report is the introduction. The second reviews prior efforts to evaluate the effectiveness of pollution prevention programs and discusses the methodology used in this prototype study. The third chapter describes the lessons learned from the prototype study and the implications for design of the national study. The appendices provide the reader with the survey instruments used and a list of reviewers.

EPA is publishing, as a companion document, the primary materials on which the prototype was based (and will do so for the national study as well), to allow stakeholders to draw their own conclusions and thereby contribute as equal partners to the national debate on this issue. The companion document, "Interview Results for the Prototype Study of Industry Motivation for Pollution Prevention," contains additional appendices and includes: a listing of the forty-two companies whose employees were interviewed (Appendix E); the factors the respondents reported as motivating them to begin investigating pollution prevention (Appendix F); the factors respondents reported as important in gathering information and otherwise investigating pollution prevention (Appendix G); the factors respondents reported as influencing their decision of which pollution prevention projects to implement and the implementation of them (Appendix H); and finally, a list of the motivations reported by each company in a matrix display (Appendix I). For copies of the companion document, please write :

Prototype Study of Industry Motivation for Pollution Prevention
Pollution Prevention Policy Staff (1102)
U.S. Environmental Protection Agency
401 M St. S.W.
Washington, DC 20460

Only with the input of EPA's stakeholders can EPA understand the effect of its current programs and improve them. EPA appreciates the time and energy stakeholders will invest in providing that input.

CHAPTER TWO

METHODOLOGY OF THE PROTOTYPE STUDY

This chapter discusses earlier attempts to evaluate the effectiveness of efforts to promote pollution prevention and the methodology used in this prototype study.

Prior Work

In the last few years, several state agencies, industry groups, environmental groups, and academics have studied the extent to which government and private programs motivate or inhibit pollution prevention activities.

The major finding from several of the studies was of the degree of difficulty of evaluating pollution prevention progress and programs. For example, the General Accounting Office (GAO), studying the Toxics Release Inventory (TRI) and EPA's voluntary 33/50 program in 1994, found it difficult to determine the source reduction impact of the 33/50 program, primarily because of the program's focus on the reduction of toxic chemical releases, rather than on source reduction². Another GAO study of programs supported by EPA grants for state pollution prevention activities, found that then-current (1994) data did not allow for such evaluation at either the state or national level³. The National Roundtable of State Pollution Prevention Programs studying technical assistance programs found at the time (1994) too few directly comparable situations between states to make a determination that one tool or combination of tools was more useful for measuring effectiveness than any other tool or combination of tools⁴.

Despite the daunting challenges, several organizations made their best efforts. Two

² General Accounting Office, Toxic Substances: EPA Needs More Reliable Source Reduction Data and Progress Measures, Report to the Chairman, Subcommittee on Health and the Environment, Committee on Energy and Commerce, GAO/RCED-94-93, September 1994.

³ General Accounting Office, Pollution Prevention: EPA Should Reexamine the Objectives and Sustainability of State Programs, Report to the Chairman, Subcommittee on Environment, Energy, and Natural Resources, Committee on Government Operations, House of Representatives, GAO/PEMD-94-8, January 25, 1994.

⁴ National Roundtable on State Pollution Prevention Programs (since renamed the National Pollution Prevention Roundtable), Measuring the Effectiveness of State Pollution Prevention Programs, Prepared under EPA Cooperative Agreement No. 817728, Washington D.C., February 1994.

especially important national studies were performed by the Business Roundtable⁵ and INFORM⁶.

The Business Roundtable Study

The Business Roundtable studied several "best in class" facilities of large corporations to determine what it was that made each of the facilities successful at promoting the environmental management hierarchy⁷. The following common elements were found by The Business Roundtable:

- Companies had clear pollution prevention definitions and goals.
- Facilities had both a champion or key person (not always located at the facility), and clear management support.
- Pollution prevention was a regular part of business planning, and was utilized in planning for future compliance requirements; ultimately, pollution prevention was integrated into pre-manufacturing decisions.
- Unlike compliance projects, pollution prevention projects had to compete with other facility projects for financing, and had to be at least as cost-effective as other potential uses of capital.
- Pollution prevention results were communicated on a regular basis.
- While accountability for pollution prevention varied (e.g., facility manager, environmental staff), there was a clear focal point.
- Flexibility to select pollution prevention goals and pursue pollution prevention approaches in ways appropriate to the facilities' culture and needs was critical; facilities were not told by regulators how to prevent pollution.

⁵ The Business Roundtable is an association of chief executive officers who examine public issues that affect the economy and develop positions which seek to reflect sound economic and social principles.

⁶ INFORM, Inc. is a nonprofit environmental research organization that examines business and municipal practices that impact environment and public health.

⁷ The Business Roundtable, Facility Level Pollution Prevention Benchmarking Study, prepared by AT&T Bell Laboratories QUEST Organization, 1993.

-
-
- Facilities did not use out-of-company consultants for pollution prevention efforts, although they sometimes did for end-of-pipe projects.
 - Recognition was a key to employee motivation.
 - New technologies were a key to effective pollution prevention.
 - Facilities spent more on compliance (in response to government regulations) than on pollution prevention.

INFORM Study

INFORM's analysis of EPA's 33/50 program was intended to answer questions as to the actual transfer and release reductions achieved, the extent to which they had been achieved through source reduction, how program participation impacted reductions, and features of the program that were of value and should be maintained in future voluntary programs based on 1991 and 1992 data.⁸ INFORM found that:

- Fifteen percent (1,242) of the 8,091 companies originally invited to participate in the 33/50 program ultimately agreed to do so. Of these, 61% (754) made numerical reduction pledges testable against the 1988 Federal Toxics Release Inventory (TRI) baseline. Of these, 31% (234) pledged reductions already made.
- The rate of reductions of the 17 chemicals subject to the 33/50 Program stayed constant at 33/50 Program facilities, but slowed at other facilities. In addition, 33/50 Program facilities appear to have reduced other chemicals as well. But reductions of the 17 chemicals "do not appear to be much greater than reductions that would have occurred had the Program not existed at all."
- 33/50 Program facilities used treatment, control and recycling more than source reduction to achieve their goals.
- Lack of source reduction volume reporting made TRI reports an inadequate measure of progress.

Several state programs have been studied as well, including those in California, Iowa,

⁸ INFORM, "Tackling Industrial Toxic Waste through Voluntary Action: EPA's 33/50 Program and Preliminary Findings of INFORM's Research," Toxics Watch 1995, New York, INFORM, 1995, pp. 491-522.

North Carolina, Rhode Island, and Washington. The Northeastern state programs that have conducted studies include Massachusetts, New Jersey, New York, Rhode Island and New Hampshire.

Central Massachusetts Pollution Prevention Project

The Central Massachusetts Pollution Prevention Project, carried out in coordination with the Blackstone Project⁹, was evaluated by an independent consulting firm.¹⁰ The consultant carried out telephone interviews of 110 companies (62 inside the project area and 48 similar firms outside). In addition, the firm carried out 28 in-depth personal interviews at companies to evaluate companies' assessments of the Massachusetts Office of Technical Assistance (OTA) effort. Among other things, the study found that:

- The cooperation of the regulatory and non-regulatory agencies involved in the project increased utilization of technical assistance services, leading in some way to 2/3 of the 40 site-visit requests received by OTA.
- 87% of the firms receiving on-site assistance from OTA or attending OTA workshops undertook toxics use reduction, as opposed to only 39% of similar firms in the same region.
- Over half the companies that attended OTA workshops or had on-site OTA assistance said that OTA influenced them to make reductions.
- Firms implementing toxics use reduction changes generally achieved positive economic results (although OTA had to analyze the results, since most firms do not track the financial results of toxics use reduction changes).
- OTA's clients were generally favorable about the usefulness of OTA assistance, with workshops and on-site assistance rated highest. Companies felt, however, that OTA needed more industry-specific technical expertise, and should do a better job of marketing its services.

⁹ The Blackstone Project was a Massachusetts pilot project testing different methods of coordinating multi-media inspections, enforcement, and technical assistance to promote pollution prevention.

¹⁰ Timothy J. Greiner, Massachusetts Office of Technical Assistance for Toxics Use Reduction, The Central Massachusetts Pollution Prevention Project: Summary Report.

Timothy J. Greiner Study

Timothy J. Greiner, a Massachusetts Institute of Technology graduate student, examined whether the facility planning required under the Massachusetts Toxics Use Reduction Act (TURA) provided a means to encourage companies to integrate toxics use reduction planning into companies' core business operations and planning processes.¹¹ Specifically, the study examined, through on-site interviews, the perspectives and actions of ten companies in the paint and coating industry. Greiner found that two months before the deadline for completing TURA plans, nine of the ten firms viewed TURA planning primarily or exclusively as a compliance exercise; of those, four felt that the process might nonetheless generate some useful information on environmental impacts, production processes, or environmental management costs. Only one firm felt the TURA process positively benefitted the firm environmentally or economically.

Gouchoe, James, Lynch, Rose, and Usher Study

Gouchoe, James, Lynch, Rose, and Usher, a group of Tufts University graduate students, studied the effectiveness of U.S. and Massachusetts pollution prevention planning and reporting requirements through interviews with company "environmental managers".¹² They found that TURA was rated higher than other regulatory factors in encouraging industrial facilities to undertake pollution prevention planning. Of the thirteen companies subject to TURA, nine rated it highly effective in getting companies to evaluate pollution prevention opportunities. These firms believed that the TURA planning requirement would be enforced, due to the coincidence that the interviews were conducted near the deadline for TURA report submissions.

In addition, Gouchoe, et. al. found that other planning requirements (e.g., the HSWA requirement for a "waste minimization program in place", and the Stormwater Pollution Prevention Plan required under the Clean Water Act) received lower ratings either because of perceived lack of enforcement or lack of relevance or specificity. The study did not find any of these planning requirements effective in bringing about real planning initiatives at companies. Several companies indicated that the TRI reports motivated them to undertake some degree of pollution prevention planning (even though planning is not required under TRI).

¹¹ Timothy J. Greiner, The Environmental Manager's Perspective on Toxics Use Reduction Planning, thesis for M.S. in Management and Master of City Planning degrees, Massachusetts Institute of Technology, June 1994.

¹² Susan Gouchoe, Michael James, Kevin Lynch, Marcia Rose, and Shawn Usher, Evaluation of the Effectiveness of Industry Pollution Prevention Planning Requirements & Guidance for Integrating Pollution Prevention Plans, thesis for M.S. degree, Tufts University, November 1994.

In response to Gouchoe, et. al.'s questions about the most beneficial elements of the planning requirement, the highest number of companies selected financial accounting, materials accounting and chemical tracking. Because of the requirement to relate production, profitability, and environmental factors, these were felt to improve the working relationship between production and environmental management personnel, and to increase awareness of pollution prevention approaches among all personnel. Among the most commonly mentioned barriers to pollution prevention were the necessary investment of time, money and staffing.

The Massachusetts - New Hampshire Merrimack Project

The Massachusetts - New Hampshire Merrimack Project was the focus of a study in which several facilities were contacted by phone. Sixty-two on-site assessments of pollution prevention opportunities were conducted at facilities in the Merrimack River Watershed. Thirty of 46 companies which both received pollution prevention technical assistance and were still in business "accomplished significant pollution prevention in that they changed their processes or materials, came into compliance, saved significant money, eliminated a sizeable amount of pollution, or established a strong on-going program." An additional four had "minor" pollution prevention accomplishments. Eleven of the 46 companies had undertaken pollution prevention efforts prior to the site visits. Of the 35 companies, 23 took pollution prevention measures, of which 4 took only minor measures.

The study reported environmental benefits to the Merrimack River Watershed and cost savings for industry: 1.7 million pounds of toxic wastes eliminated and over \$1.9 billion saved by industry.

New Jersey Study

A study of the New Jersey Pollution Prevention Program summarized the early findings of the effects of facility planning on fifty industrial facilities.¹³ The study includes an analysis of facilities' on-site pollution prevention plans and the execution of a personal questionnaire to gauge facilities' perspectives on the results of their planning efforts. New Jersey found that:

- 69% of facilities predicted net cost savings as a result of pollution prevention techniques identified through the planning process.
- Using the facilities' own cost estimates for preparing plans and projected net savings, industry realized net savings between five to eight dollars for every dollar spent on plan preparation.

¹³ New Jersey Department of Environmental Protection, Early Findings of the New Jersey Pollution Prevention Program, August 1995.

-
-
- For many facilities, pollution prevention planning was the first time materials use efficiency was measured. 45% of facilities reported having no measure of process efficiency prior to planning.
 - 74% of facilities found the pollution prevention planning process to be "worthwhile". Reasons cited included: learning about their processes, cost savings, reduced regulation, more accurate environmental reporting, and better business decisions.

New York Study

A New York study summarized the accomplishments in a variety of areas of the Department of Environmental Conservation's Pollution Prevention Unit and of the state's Multi-Media Pollution Prevention (M2P2) program.¹⁴ It reported the number of M2P2 inspections conducted, workshops and training programs, internal departmental organizational efforts to promote pollution prevention, and other measures. The principal evaluative element of the report related to the Hazardous Waste Reduction Plans (HWRPs) mandated by state legislation for the largest hazardous waste generators. The New York study reported a general reduction since 1989 in both the number of waste streams and the pounds of toxics released to the environment, though this trend may also be related to an economic slowdown. In addition, the study reported that, although the TRI database shows reductions, "there is ambiguity as to what factors cause the reductions that have occurred."

Rhode Island Study

A Rhode Island report discussed many project tasks, but focused on the state pollution prevention program's four-year on-site assessment efforts which involved the initiation of 104 engineering studies (of which 3/4 were complete at the time of this report) at Rhode Island companies, using a methodology not detailed.¹⁵ The study reported that the four-year on-site technical assistance program identified at least one cost-effective opportunity for waste minimization at each facility studied. Many of these changes involved recycling and fifty percent of the companies implemented source reduction measures.

¹⁴ New York Department of Environmental Conservation, 1993-94 Annual Report: Multi-Media Pollution Prevention in New York, January 1995.

¹⁵ Rhode Island Office of Environmental Coordination, Rhode Island Technical Assistance Project Report, Report Period 11/1/92 - 4/30/93, U.S. EPA Source Reduction and Recycling Technical Assistance Grant # X-815629-01-0.

Distinguishing Features of the Prototype Study

While several important studies assessing pollution prevention programs have been performed previously, EPA is not familiar with any prior efforts to perform a study of the scope of either the present prototype study or the full national study discussed in the next chapter. The most important features of the present study are that:

- ✓ Information was gathered on a large number of industrial firms from both the firms themselves and from state employees familiar with the firms;¹⁶
- ✓ Several different potential motivators of pollution prevention were investigated, including several government and private programs; and
- ✓ Stakeholders from several points of view were asked to comment on the initial findings, and where their comments differed from those of the authors, they were included and cited.

EPA hopes that such features will make both the prototype study and the national study uniquely valuable in improving the effectiveness of efforts to promote pollution prevention. A discussion of the prototype study's methodology follows.

Prototype Study Workplan

A study team led by EPA's Pollution Prevention Policy Staff (PPPS), which included representatives of pollution prevention programs in all eight Northeastern states and EPA Regions I and II, performed the study through the following workplan.

- May 1995** PPPS met with representatives of the pollution prevention programs of eight Northeastern states (CT, MA, ME, NH, NJ, NY, RI, and VT) and EPA Regions I and II to propose the study and enlist support for it.
- June** PPPS, the state programs and the Regional Offices created a list of data to be gathered for each subject facility, mostly from existing data sources.
- August** PPPS developed the survey instruments (See Appendices A, B, &C), gained approval from Office of Management and Budget (OMB) to use them, and, working with state programs and Regional Offices, gathered the data and

¹⁶ Reviewers from the Environmental Defense Fund, Natural Resources Defense Council and Greiner Environmental cited the need to include information from environmental, labor and public interest groups.

developed a set of strawman findings.

September PPS discussed the data and strawman findings with the state programs and Regional Offices.

October PPS drafted the report and distributed it to reviewers (See Appendix D) for comment.

June 1996 Upon receiving a budget for printing, PPS published the report.

Case Selection

The study was intended to identify factors motivating industrial pollution prevention, rather than to assess their prevalence or effectiveness. For this reason, respondents were not chosen at random. Most of the facilities selected for the telephone survey, and all those selected for onsite interviews, were known to have received technical assistance or a pollution prevention award or both, or been subject to mandatory materials accounting reporting, pollution prevention planning, or a multimedia inspection. A few telephone interview sites were chosen at random or because available data indicated that the firm had done little or nothing to implement pollution prevention.

The study team developed a comprehensive list of factors that various members of the pollution prevention community thought could influence pollution prevention decision making. These included: facility size, ownership structure, participation in voluntary programs, and receipt of technical assistance. Facilities were chosen so that a varying range of these factors were exhibited by the selected sites.

The study focused on chemical manufacturing, metal product manufacturing, and woodworking. These industries were chosen because businesses in at least two of the industries could be found in each state. The state pollution prevention contacts worked with the selection criteria to nominate candidate facilities. Except in Massachusetts and New Jersey and for the facilities selected at random, the state pollution prevention contact ascertained each facility's willingness to participate in the study prior to forwarding the facility name and contact person to the study team.

The survey questions were designed to elicit the answers to three different questions:

- 1) What led companies to begin investigating pollution prevention?
- 2) What sources of information did companies use to identify and evaluate particular pollution prevention options?

-
-
- 3) What were the considerations that made a company decide whether or not to implement particular pollution prevention projects?

Data Collection and Reporting

Several approaches were used to collect data. Interviews with state program personnel were held to obtain background information on the facilities that received on-site surveys and interviews. Through interviews with state program personnel, researchers sought opinions about what led firms in general to implement pollution prevention.¹⁷

Researchers had also hoped to obtain reporting data from state personnel on changes in waste generation from the waste streams that had been affected by the pollution prevention projects implemented at the facilities. Depending on the waste stream and facility size, the potentially useful data bases included TRI, materials accounting (for New Jersey, Massachusetts and Maine), hazardous waste biennial reports, hazardous waste manifest data, annual air pollution registrations, and water discharge reports. However, time constraints prevented the study team from collecting the information from all the facilities.

Comprehensive onsite interviews were held at nine facilities with plant personnel to elicit information about each plant, its pollution prevention projects, and the factors that influenced the decisions about pollution prevention. The interviews generally lasted from two to three hours, and were conducted with the individual responsible for environmental matters at the facility. In some instances, plant management or production staff were also present during the interviews. In other instances, the environmental lead at the facility was also the plant manager or production manager. The researchers had hoped to talk with individuals representing all three perspectives at each facility, but this was not possible given the time constraints of the project.

A relatively unstructured, open-ended style was used with the onsite interviews. The interview guide for these facilities is provided in Appendix B. Broad questions were asked in order to get unbiased answers about the factors that contributed to decisions about pollution prevention. The researchers did not want interviewees to simply affirm ideas suggested by the questions. However, the researchers wanted to make sure that respondents remembered every factor that had influenced them and wanted to get opinions about the effectiveness of the various

¹⁷ Reviewers from both the Northeast Waste Management Officials' Association and a Chemical Manufacturers Association member company questioned the value of asking state agency contacts for opinions on firms' motivating factors. EPA believes that perspectives from both inside and outside a business are important in understanding the business's behavior, and for that reason sought the perspectives of state program personnel. EPA acknowledges that state perspectives were most illuminating when state personnel were familiar with the particular business studied. See Section F in Chapter Three.

strategies that have been or could be used by EPA and the states to promote pollution prevention. Accordingly, the open ended questions were followed with a comprehensive set of prompts designed to address each of the factors that have been thought to influence pollution prevention implementation.

On-site interviews were conducted by the PPPS members of the study team. Follow up questions were asked over the telephone as necessary, and the draft report of the results was sent to each of the facilities for their review prior to releasing this document.

Shorter telephone surveys focused solely on the factors that influenced facilities' pollution prevention decisions. The interview guide for these facilities is provided in Appendix A. As required by the Federal Paperwork Reduction Act, EPA was granted approval by the Federal Office of Management and Budget (OMB), to conduct the telephone interviews. (OMB approval is required for all surveys of more than nine entities.) Conditions imposed pursuant to OMB's approval of the study limited the telephone surveys to collecting opinions on the factors that led to the implementation of pollution prevention. Under the terms of the approval, researchers could only ask respondents' opinions, and were not allowed to ask for factual information, such as the amount of pollution prevented at the facility. The interviews were designed to take 15 minutes, although they sometimes ran longer if the respondents volunteered additional information. The telephone interviews were conducted by PPPS study team members as well as volunteers from the Northeastern states. Volunteers were trained through a conference call.

With the exception of the state volunteer telephone surveyors, each interviewer was responsible for writing up his or her interview notes, completing a facility motivator matrix, and reporting respondent opinions on motivating factors.

In summary, the most important features of the this study were that it gathered information on a large number of firms from both the firms themselves and from state employees, that several different sources of potential pollution prevention motivators were investigated, and that stakeholders representing several viewpoints were included, regardless of whether they differed from EPA.

CHAPTER THREE

FINDINGS: IMPLICATIONS FOR THE DESIGN OF THE NATIONAL INDUSTRY MOTIVATION FOR POLLUTION PREVENTION STUDY

The primary purpose of this study was to serve as a prototype in the design of a national study of industrial motivation for pollution prevention intended to be published in 1996. This chapter is comprised of two parts: the lessons learned from the prototype study and based on those lessons learned, the design of the national study.

The principle challenge in designing such studies is to find a methodology that is statistically sound, so that findings are sufficiently unbiased to be relevant to a wide range of stakeholders, yet flexible enough to describe the very human stories behind every business's experience with pollution prevention. The prototype caught much of the human aspect, as is reflected in the interview results, but lacked statistical validity. The national study will gather much the same type of information as the prototype, but will adhere to statistically valid methods. EPA hopes this will be done without losing too much of the human side of the story.

The Prototype Study

Following are some of the lessons learned from the Prototype Study.

A. Everything seems to work for somebody

Among the forty-two business respondents, the prototype study found supporters (as well as detractors) of nearly every major type of pollution prevention policy. This is not surprising given that every business is unique in some way, by design or by fortune. Each business differs from its neighbor in its products, production methods, service, marketing strategy, access to input materials and information, and methods of managing internally. Because of this, each business has its own strengths and weaknesses. One may excel technologically, but lack information about the least expensive input materials; another may produce a top-notch product, but provide its customers only fair service. Such strengths and weaknesses will also be found in the businesses' environmental management programs. One business may consider environmental excellence a civic responsibility, another may feel obliged only to comply with the minimum requirements of the law, and another may feel driven by competition to pollute even in possible violation of the law.

The prototype study found different businesses reacting differently to the same policy approach. Some industry respondents found technical assistance invaluable, and some found it of little value. Some respondents felt planning requirements helped identify pollution prevention

options, and others found them hollow paperwork exercises. Stories could be found in the prototype study (as in the many prior studies) to support any hypothesis. More importantly, though, nearly every policy tool studied seemed to motivate pollution prevention successfully in some business.

Given this finding, two reviewers questioned the value of this or the subsequent study, but EPA believes there may be patterns to the variations between firms and will seek to identify these patterns with the national study. In particular, EPA will assess the prevalence of different responses to different motivating factors. (See the discussion of "Seeking 'association' between public policy and industrial pollution prevention" and Step #4 below) Doing so will require a larger sample of businesses chosen in a way that eliminates sample bias. (See Step #1a below) The study will especially seek patterns as they pertain to the different stages of pollution prevention, as discussed next.

B. Policy approaches affect different stages of pollution prevention differently

Respondents described the process through which a business prevents pollution as occurring in three stages. Different factors reportedly affected each of these stages differently.

1. The business decides to investigate pollution prevention. Respondents mentioned both top management support and internal champions as important for initially drawing their facility's attention to pollution prevention. Some respondents suggested that end-of-pipe standards, required pollution prevention planning and reporting requirements, enforcement actions, voluntary programs, and awards programs gave latent pollution prevention champions and their managers the excuse they needed either to carry out long standing plans or to call in assistance or training. Some respondents as well suggested that certain regulatory requirements could distract facility staff from pollution prevention projects that had greater potential for environmental protection than did simple compliance with the requirements. (See Steps #3a, #3b, #3c, and #3f below and Appendix F.)

2. The business identifies and investigates its options. Technical assistance, one means by which government helps businesses identify and investigate their options, was discussed by some respondents. Onsite technical assistance visits appeared more important to respondents at facilities with less environmental sophistication in-house than to respondents at facilities that were growing and had environmental professionals on staff. Respondents from companies with strong environmental staffs reported having developed their major projects in-house, using vendors and internal engineering staff as needed. (See Steps #3a and #3d below and Appendix G.)

3. The business chooses and implements a particular option or group of options. Respondents reported that management commitment eased implementation of pollution prevention projects, partly by influencing the relative importance of cost and payback in the

decision to implement projects. Some respondents reported the implementation of projects chosen primarily to speed up and improve production which resulted in pollution prevention, and vice versa. In addition, some respondents reported that regulatory requirements provided the impetus for implementation. (See Steps #3a, #3e, and #3f below and Appendix H.)

The national study will seek to better understand the importance of such factors in each of these stages as explained below.

C. *Nothing occurs in a vacuum*

Respondents mentioned several pollution prevention motivations together so often, they appeared different facets of the same motivator. No business decision is made on the basis of only one factor. One factor, such as the discovery of a new technology, the current availability of capital, a customer's feedback, or the threat of an impending enforcement action, may provide the impetus for a decision-maker choosing from a set of options. However, that choice is always made against a background that includes several other factors, some of which themselves may be in flux.

In particular, no business chooses to prevent pollution in response to one public policy approach. Survey respondents always referred to several factors explicitly or implicitly involved in their choices. (See Step #3 below.) The national study will investigate the interrelationship between factors so often mentioned together they appear inseparable. These include:

- the relationship between the perceived cost incentive for investigating and implementing pollution prevention and:
 - anticipated cost of compliance using standard pollution control approaches,
 - cost of input materials, and
 - perceived cost of enforcement.

(See the sections on regulatory compliance, staying ahead of compliance, costs/savings, competitiveness issues, environment/health/safety considerations, and resource constraints in Appendices F, G, and H. Also, see Step #3b, questions 7,8,9, and 10 and Step #3e, questions 10, 11, 12, 13, and 14.

-
-
- the relationship between an assessment of technical feasibility and:¹⁸
 - the availability of alternative technologies,
 - the availability of information about alternative technologies,
 - the willingness of employees to modify procedures to accommodate new technologies, and
 - the willingness of customers to accept changes in products and services.

(See the sections on government and private technical assistance, employee commitment, worker acceptance, customer acceptance, and technical feasibility in Appendices F, G, and H. Also, see Step #3d, and Step #3e, questions 4, 5, 6, 7, and 8.)

- the relationship between that which was perceived as “the right thing to do” (often cited as a reason for a certain action) and:
 - environmental compliance requirements,
 - public and private voluntary environmental excellence programs,
 - the local environmental ethic, and
 - the corporate environment, health and safety ethic.

(See the sections on regulatory compliance, staying ahead of compliance, mandatory reporting, voluntary programs, environment/health/safety considerations, public image, and employee commitment in Appendices F, G, and H. Also, see Steps #3b, questions 1, 2, 3, 4, 10, 11, and 12 and #3e, questions 1, 2 and 3 below.)

The interrelationships between these factors should give pause to anyone who might argue that “cost”, “technical feasibility”, or the perception that something was the “right thing to do” are important motivating factors. For example, a business respondent reporting that “cost” is an important factor in pollution prevention decisions may actually be referring to any number of interrelated factors.

D. Where you stand is based on where you sit

In any business over a certain size, employees have different specialized roles and responsibilities. Many employees are recruited specifically to perform a specialized role, have

¹⁸ A reviewer with the Natural Resources Defense Council suggested assessing whether unionized facilities operated any better or worse in modifying procedures for pollution prevention.

work and educational backgrounds related to that role, see career advancement related to that role, and currently belong to networks of people outside the company in similar roles in their own companies. Consequently, a business may be composed of employees with very different perspectives, interests, and approaches to their work.

The specialization of employee roles is an important factor for understanding pollution prevention. The employees responsible for a business's environmental management may be quite removed from those responsible for designing, producing and marketing the business's products. This separation is problematic for pollution prevention, since pollution prevention involves addressing environmental considerations in core business decisions such as those involving product design, production process design, operation, and maintenance.

The specialization of a business's employees also presents a challenge for understanding the business's pollution prevention decisions. In the prototype study and in other studies, researchers found that different respondents within a business reported a different understanding of the process by which the business arrived at its pollution prevention decisions.

The national report will focus on people managing production processes, who are a key to pollution prevention. (See Step #2b below)

Besides taking steps to examine the above propositions, the national study will have to address other issues, as well.

E. No researcher is bias-free

No researcher is free of opinions that can act as a lens or filter in the course of research. Whether an employee of a public, private, non-profit, academic, or consulting organization, researchers performing sophisticated data-gathering and analysis can introduce some bias, despite their best efforts not to do so.

One way to address this sort of bias is to diversify the group of researchers gathering and analyzing the data. In the prototype study, EPA used eight researchers to perform the interviews to address some of this bias and to test the challenges involved in using several interviewers for the national study. All of the interviewers, however, were employees of government pollution prevention programs, which leaves open the possibility of an interviewing bias peculiar to such employees. Industry representatives were also invited to participate in the interviewing, but were unable to do so.¹⁹

¹⁹ A reviewer with the Environmental Defense Fund suggested that EPA consider using interviewers from public interest groups.

To reduce bias in analyzing the data gathered through the surveys, the draft of this report was sent to fifty reviewers in industry, government, and environmental advocacy groups. Comments were received from twenty-two of those reviewers and have been either incorporated into the text or incorporated throughout this document as footnotes attributed to the sources.

To reduce bias in the national study, a much more highly structured survey instrument will be used, and the survey will be performed by a professional survey group. Also, once again, a wide range of reviewers will be called upon to comment. (See Step #4b below)

F. Types of Information Successfully Collected

Experience with the prototype study indicates that a national study could successfully identify most tools available to EPA for promoting pollution prevention and the circumstances in which they prove most effective. For the most part, respondents were willing to participate, forthcoming with information, and were able to provide thoughtful, apparently reliable responses.

Respondents could recall the process by which they and others in their companies learned about pollution prevention and how they came to implement particular projects. Most of the companies which were surveyed through on-site surveys had a sense of the amount of money spent and the volume of waste that had been reduced the first year after the project was completed. They were also able to recall the extent to which production levels at the facility had changed. In general, they were also able to identify specific waste streams that had been affected. Some of the telephone survey respondents also volunteered this type of information, though due to the limits of the OMB clearance, researchers were not allowed to ask these questions.

Researchers heard relatively few comments about ways EPA could improve its pollution prevention promotional efforts. Nevertheless, respondents freely expressed opinions about the potential impacts of programs that they had not experienced.

State agency staff had differing amounts of information about the case study sites, depending upon how closely staff had worked with the facility. In some cases, state staff had a different interpretation of the causality than the company. In one instance, a state agency employee said a facility called for technical assistance following a referral or an enforcement order from the regulatory agency. The facility respondent had not mentioned this fact. Another facility respondent said that the role of mandatory planning was minimal in their pollution prevention efforts. However, the state had seen great progress by the facility after the plans were completed.

The state staff did not always have information about facility ownership, history, the various regulations a facility was subject to, whether or not the facility had participated in some

of the voluntary programs, or specifics about the pounds of waste or dollars saved through pollution prevention. In addition, the technical assistance agencies were generally not free to give out information without the company's permission.

Finally, as would be expected, most state agency employees were most familiar with the effects of the activities, such as technical assistance or facility planning, run by their own offices.

The national study will seek much the same information as that gathered for the prototype study, though in a more highly structured form.

G. Some information was difficult to collect

Some problems were encountered during the surveys. In particular the researchers noticed the relative lack of opinions and statements about government-imposed obstacles to pollution prevention, such as examples of a regulatory bias pushing companies toward treatment.

Three of the six companies that were "cold calls" -- contacted without being referred to the researcher by a state agency employee -- would not participate in the survey. Their reasons included uncertainty that the interviewer really was from EPA, a dislike of government, and a fear of talking to EPA about anything unless required to do so. Two firms suggested by state agency contacts refused to participate without giving a reason.

In addition, several reviewers challenged statements made by respondents. Some industry reviewers challenged some industry respondents' reports on the benefits of certain regulatory requirements. Some state agency and environmental group reviewers challenged reports that certain regulatory requirements were confusing or distracted from more important work. Some reviewers challenged reports of costs or benefits. Some reviewers specifically suggested corroborating such reports by interviewing vendors, and environmental, labor, and community leaders familiar with a given business.

Given the limits of this study due to the implementation of the Federal Paperwork Reduction Act and the time and resource constraints, the researchers were unable to challenge or otherwise fully investigate such reports in the prototype study. The national study will seek to better check such reports by seeking more information inside the business and on the policies facing the business. (See Step #3 below).

Nevertheless, there will always be limits on the extent to which respondents' reports can be challenged or investigated in a broad study of so many businesses. In particular, EPA lacks confidence that informed outside stakeholders, such as the public or vendors, can be identified for each business studied and interviewed without greatly adding to the expense of the research, and without jeopardizing the anonymity of the business respondents. As a result of these limits, a more in-depth investigative study may be necessary as policy makers act to address the issues

raised by such reports. The value of broader studies such as this is in raising and giving perspective to such issues.

H. Survey logistics

The prototype study used both telephone and on-site surveys. The on-site survey instrument seemed effective at gathering the information sought by the researchers. However, the survey was difficult to use as designed. Often the most productive approach was to simply ask to hear the facility's pollution prevention story. The researchers felt the telephone survey was a more effective survey tool, although it did not capture the full human aspect of each company's pollution prevention story. The national study, discussed next, will rely primarily on highly-structured telephone surveys, largely because of the expense associated with gathering information from a large enough sample of businesses to be statistically valid.

Design of the National Industry Motivation for Pollution Prevention Study

The above lessons have several implications for the design of the National Study of Industry Motivation for Pollution Prevention. The following section describes the general design of the study, which will be carried out from May - August 1996 and is intended to be published in September 1996. (Note that aspects of this design will likely be modified before and during implementation. Also this section was not included in the draft reviewed by the fifty reviewers mentioned in Section E above. This section was written in response to reviewers' comments.)

Objectives

As with the Prototype Study, the objective of the National Study is to better understand whether and how environmental issues influence core business decisions -- such as those involving product design and production process design and operation -- in order to better understand how various factors, including public policy, motivate pollution prevention in industry. Several issues embodied in this objective statement bear further discussion.

Seeking "association" between public policy tools and industrial pollution prevention. EPA primarily intends to assess the extent to which a given policy tool (e.g. technical assistance or Superfund liability) is associated with an increased tendency to prevent pollution. Subsequent studies should improve understanding of both the causal links and the relative impacts of policy tools. (See A above.)

Studying the importance of environmental issues in the operation of production processes. There are many functions essential to running a business; nearly all of them have environmental implications, therefore nearly all of them could be legitimately included in this study. EPA's limited resources for this study required that a limited set of business functions be

studied. Production process operation was chosen because it is among the business functions mentioned as being most important to a business's environmental profile, while not always being addressed in the business's environmental protection strategy.

Building expertise in program evaluation. EPA intends to build its expertise and that of other stakeholders in evaluating the extent to which various environmental programs promote pollution prevention. The national study will be by no means the final word on such evaluation, but will instead be used as an important stepping stone, as was the prototype study.

These objectives will be achieved through the following steps.

Step #1: Sample Selection: 500 printers and 500 facilities reporting under the Toxics Release Inventory (TRI)

#1a. Selection of businesses to be studied. EPA researchers will select at random 500 printers and 500 facilities reporting under the TRI, drawing from business directories.

#1b. Background information. EPA will gather from business directories and other sources, information on each of the chosen business's:

- estimated number of employees
- estimated sales

Step #2: The Dependent Variable: The Practice of Pollution Prevention

Having selected the study facilities, the researchers will seek to ascertain which of the facilities are practicing pollution prevention by gathering the following three types of information.

#2a. Quantitative data. The researchers will gather, where available, the following information for each business:

- TRI chemical waste reported for the most recent two years,
- TRI chemical release reported for the most recent two years,
- TRI "production index", a ratio that compares last years level of production to this years level of production, and
- hazardous waste generation reported for the most recent two years.

These data are important, but for various reasons are not suitable as the sole basis for assessing whether a business is preventing pollution. For that reason, the following qualitative data must be used as well.

#2b. Attitudes of core business people. For each small printing company, researchers will attempt to speak to the company owner or president. For each large printer or TRI facility, researchers will attempt to speak to a person responsible for managing a production process. The researchers will first ask the respondents:

In making decisions related to your job responsibilities, how important are the following factors (scale: very important, somewhat important, not very important, not at all important):

- cost and quality of competitors' products,
- employee morale and productivity,
- the sources, quality, and cost of raw materials and inputs,
- the sources and cost of capital,
- technological advances in manufacturing your product,
- trends in customer preferences for your product,
- attitude of your company's neighbors and community towards your business,
- insurance, liability or risk management,
- possible environmental impact of your products during use or disposal,
- possible environmental impacts related to production process or environmental regulatory requirements

Respondents who report that environmental issues are very important or somewhat important to their work will be asked the following questions. The rest will go directly to question #3f.

#2c. Reports of pollution prevention in use. Researchers will gather reports of specific examples of environmental considerations being addressed in production process operation.

To identify businesses practicing pollution prevention, the study will consider responses to all of the above three sets of questions.

Step #3: The Independent Variables: Public Policy Tools that Might Promote or Inhibit Prevention

To identify the factors, particularly the public policy tools, that may have promoted or inhibited the practice of pollution prevention, researchers will gather data on the factors, including policy tools, that business respondents report having influenced them, and on some of the policy tools confronting each business.

The following questions are intended to illuminate the three "stages" of the process by which a business seems to prevent pollution, as discussed in B above. Steps #3a, #3b, #3c, and

#3f are intended to identify the factors influential in initially leading a business to investigate pollution prevention; Steps #3a and #3d, the factors influential when a business identifies and investigates its pollution prevention options; and Steps #3a and #3e the factors influential when a business chooses and implements a particular pollution prevention option. The use of questions more highly-structured than those used in the prototype study is intended to reduce the effect of researcher bias. (See E above)

#3a. Public policy tools confronting the business. Researchers will gather information where available on whether each business is the subject of:

- environmental regulatory requirements, and which ones;
- enforcement actions, and whether pollution prevention was a component of them;
- appeals to join voluntary programs, and whether it has joined;
- pollution prevention planning requirements;
- Superfund or Corrective Action; and
- any special regulatory programs, such as multi-media inspection or permitting, Project XL, or the Environmental Leadership Project.

Of the business respondents reporting that environmental issues are very or somewhat influential to their work (see Step #2b above), the researcher will ask the questions shown in Steps #3b, #3c, #3d, and #3e below.

#3b. Reported initial influences. To identify the factors that first drew business decision makers to consider environmental issues in their work, researchers will ask the following.

How important were each of the following factors in initially getting you to think about environmental issues at this job?

1. Your personal concern for the environment,
2. Your interest in keeping in compliance with environmental regulations,
3. The interest your family, friends, and community have in your company's environmental impact and compliance,
4. A directive from your boss or top management to consider environmental issues in your daily work,
5. Customer demand or requirements,
6. Internal company audit or training,
7. Your company's cost of input materials,
8. Your company's environmental protection costs,
9. Cost of waste disposal,
10. Environmental enforcement actions against your company,
11. Government environmental programs that provide awards or recognition,
12. A requirement that your company develop a pollution prevention plan.

#3c. Reported initial information sources. If the respondent replied that #7 through #12 were very or somewhat influential the researcher will ask:

Did you learn of this factor through:

1. Your company's environmental staff,
2. Other company employees,
3. Government employees, or
4. Your own sources of information (please identify)?

#3d. Reported sources of information on and analysis of alternatives. To identify sources of information on alternatives and methods of analysis, the researcher will ask the following:

How important were each of the following as a source of information about alternative practices or technologies to address environmental issues?

1. government employees,
2. consultants,
3. vendors,
4. government publications,
5. other publications,
6. the environmental staff of your company,
7. the production equipment operators of your company,
8. other employees of your company,
9. other (please identify).

How influential were the following in gathering and analyzing information on alternatives?

1. Pollution prevention planning,
2. A company "quality" program (e.g. TQM),
3. A company ISO²⁰ 9000 or ISO 1400,
4. Total cost accounting,
5. Material accounting, or
6. Any other formal or informal system established by your company.

²⁰ISO is the International Organization for Standardization, and their stated goal is to develop standards on a world-wide basis to "even the playing field" and allow commerce to transcend national boundaries without creating trade barriers. ISO 9000 is a benchmark for corporate management of quality management/quality assurance practices, and ISO 14000 is similar in addressing environmental standards.

#3e. Reported influences on the final choice. To identify the influences in choosing a particular pollution preventing technology or practice, the researcher will ask the following question:

How influential were the following factors in your final choice of equipment or operations?

1. government requirements,
2. advice or directives from government employees,
3. directives from your supervisor,
4. availability of information on the particular practices and technologies,
5. availability of the technologies themselves,
6. willingness and ability of employees to make changes,
7. willingness of customers to accept changes in products,
8. demand from customers to make specific changes,
9. prospect of new business development,
10. internal rate of return,
11. availability of capital,
12. cost of input materials,
13. cost of training employees,
14. cost of pollution control devices and other compliance-related costs.

#3f. Reported influence of the environment on other business issues. Of core business respondents who do not report finding environmental issues influential in their work, the researcher will ask the following question:

How influential are the following sources of information on environmental issues?

1. Environmental compliance staff at your company,
2. Your management,
3. Others at your company,
4. Customers,
5. Company newsletters and training,
6. Government inspectors and regulatory officials,
7. Government technical assistance providers,
8. Trade press, trade associations, and conferences,
9. Vendors and suppliers,
10. General press,
11. Your family, friends, or neighbors.

Step #4: Analysis: Statistical Analysis and Public Comment

The analysis of the information will take place in two stages.

#4a. Statistical Analysis. First, EPA will statistically analyze the above information to identify the factors, including policy tools, correlated with the industrial practice of pollution prevention, resulting in statements such as:

“There was a strong [or weak] association between sampled facilities that were required to develop pollution prevention plans and the implementation of pollution prevention practices. Of those required to develop plans, X% implemented pollution prevention practices. Of those facilities not required to develop pollution prevention plans, Y% had implemented prevention practices.”

EPA believes that an unbiased statistical approach is an important foundation for the national study, given the wide range of opinions on the motivations for and process of preventing pollution. At the same time, such a statistical approach is a crude method of analyzing the human aspect behind each business's experience with pollution prevention. Both the statistics and the public comments on these findings, discussed next, will be essential for understanding and interpretation.

#4b. Public Comment. The raw data and the results of the statistical analysis will be shared with reviewers representing a wide range of perspectives, and their comments will be incorporated into the report. Reviewers will be asked to comment, among other things, on:

- methodology;
- interaction between variables (for example, one might argue that states with awards programs tend to also have stronger enforcement of end-of-pipe regulations which are more responsible for pollution prevention progress than the awards programs);
- causality (for example, some may attribute pollution prevention directly to technical assistance); and
- areas for further study.

As in the case of the present report, comments will be either incorporated into the text, or will be attached and attributed to particular reviewers. This is intended to reduce the effect of researcher bias. (See E above)

The Report

The national study is intended to be published in September 1996, and will discuss:

- Study objectives;
- Methodology;
- Raw data gathered (which will be published as an appendix);
- Results of the statistical analysis;
- Comments received from peer reviewers;
- EPA's findings; and
- Plans for further study.

EPA believes the national study to be an essential next step for understanding and promoting pollution prevention.

APPENDIX A

INDUSTRIAL FACILITY - TELEPHONE SURVEY

EFFECTIVENESS STUDY
Interview Cover Sheet

FACILITY NAME/ADDRESS:

INTERVIEWEE:

TITLE/DEPARTMENT:

PHONE:

DATE:

INTERVIEWER:

Interviewer Script

Hello, my name is (interviewer name) and I am working with the U.S. EPA on a customer service survey. We are trying to evaluate the effectiveness of EPA's pollution prevention programs. EPA defines pollution prevention as changes in the production process or product that reduce the quantity of waste generated prior to recycling, treatment or disposal. I expect the survey will take about fifteen minutes. Participation is completely voluntary. Would you like to participate?

If YES

Is this a good time, or is there a better time when I could call you back?

Call back date/time _____

CUSTOMER SERVICE SURVEY

PART ONE

- 1) What led you to begin investigating pollution prevention at your facility?

- 2) How did you learn about the pollution prevention options that were available to your facility?

- 3) What made you decide whether or not to implement pollution prevention at your facility?

PROMPTS

- costs and savings
 - availability of capital
 - worker acceptance
 - technical feasibility
 - customer acceptance
 - regulatory barriers
 - company policy
 - liability concerns
- 4) Is there anything EPA does that hinders the implementation of pollution prevention at your facility?

 - 5) Is there anything EPA could do to promote the implementation of pollution prevention at your facility?

PART TWO

After asking the above questions, use the prompts below to cover topics not mentioned by the interviewee. Please distinguish between initial answers to above questions and answers provided in response to the prompts.

Prompts

Voluntary Programs (e.g., 33/50, green lights)
EPA/EPA Supported Technical Assistance Programs
Private Sector Programs
Other Regulatory Programs
Supplemental Environmental Projects
Internal Management Structure

Prompt Questions

For each prompt, ask the following questions:

Did you participate in (insert prompt)?

If YES

Which one(s)?

How if at all did this help with pollution prevention at your facility?

Is there anything EPA could do to improve the effectiveness of this program?

If NO

Why not?

Do you think these programs help or hinder the implementation of pollution prevention at you facility?

How?

How do you think the effectiveness of these programs compare to the effectiveness of U.S. EPA programs?

Is there anything EPA could do to improve these programs?

APPENDIX B

INDUSTRIAL FACILITY - ONSITE SURVEY

SURVEY FOR NINE FACILITIES - SITE VISITS

Facility _____ Contact/Title _____

Address _____ Phone _____

Interviewer _____ Date _____

Does your state have a P2 planning or reporting law? ____ A technical assistance program?

(1) Background Information About Facility

- Describe what your facility does. What are your main products?
- Do any of these items describe your facility: a) part of a maturing industry; b) a job shop; c) a dedicated production facility; d) a batch or continuous operator; e) part of a highly cost-competitive industry
- How many people do you employ?
- What were your gross sales last year?
- Are you publicly or privately held?

(2) Data on Occurrence of Pollution Prevention

- What were your total releases/nonproduct output for 1992, 1993 and 1994? (calculated as sum total of questions 8.1 to 8.8)
- What was your total amount of RCRA waste generated in 1992, 1993 and 1994?
- Is your production index reported under question 8 of the Form R an accurate reflection of your business activity? If not, are you able to provide a more accurate measure? (i.e. using changes in total labor hours)
- What hazardous substances do you use? If the use of any chemical changed from 1992 to 1994, what factors accounted for these changes? (i.e. production shifts, process start-ups or shut downs, efficiency improvements, material substitutions, process changes, recycling, etc.)

- Describe the pollution prevention measures, if any, that your facility has undertaken in the last 10 years. How much did use and/or nonproduct output go down for any particular production process or product?
- What were the catalysts that started your pollution prevention program? (i.e. regulations, fines, corporate policy) Please describe.
- Are there difference between corporate pollution prevention efforts and facility efforts?
- How have your pollution prevention efforts impacted your bottom line?
- What percentage of environmental spending at your facility is on compliance vs. pollution prevention projects?
- Does corporate R & D, engineering or marketing participate in your pollution prevention activities?

Data on the Facility's Experience with Government Pollution Prevention Activities

- Is your facility subject to a state pollution prevention planning or reporting requirement? (including a pollution prevention or toxic use reduction statute, waste minimization requirements, storm water planning, etc.)
- Have you ever contacted a technical assistance program for environmental assistance? If yes, what type of information and service was provided?
- Has your facility taken part in any government initiated pollution prevention projects? (i.e. any type of permitting, enforcement or inspection activities with a pollution prevention emphasis)
- Has your facility voluntarily taken part in government initiated pollution prevention programs? (i.e. 33/50, Green Lights)
- Have you gotten any public acclaim for your pollution prevention successes? (i.e. awards, positive press)

Data on the Facility's Experience with Environmental Requirements Not Primarily Associated with Pollution Prevention Laws or Regulations

- Is your facility involved in cleaning up a waste site under federal Superfund, state clean up laws or corrective action requirements? If yes, has this had any impact on your facility's pollution prevention efforts?

- Has your facility been involved with any enforcement actions in the past five years? If yes, has this had any impact on your facility's pollution prevention efforts?
- Under what environmental laws are you regulated? How often are you inspected and to what extent?

Data on Events Important to the Facility's Environmental Performance Not Associated With Government Environmental Programs

- Does your facility participate in any private pollution prevention or environmental excellence programs? (i.e. Responsible Care)
- Is your facility ISO certified?
- Are your primary customers large businesses, small businesses, individuals, the government? How important are environmental issues to your customers?
- Have you ever approached a customer with changing the specs of a product in order to implement a pollution prevention initiative?
- Do you work with raw material and equipment suppliers to implement pollution prevention?
- Does your facility provide any type of pollution prevention training? Who is required to receive it?
- Would you describe your facility as being highly visible in the surrounding community?
- What position has your trade association taken on pollution prevention?

Data on the Inner Workings of the Facility

- Do you address most environmental matters through consultants or in-house staff?
- Does your facility have a Total Quality Management Program or a corporate policy promoting pollution prevention? How are staff involved in these programs?
- Are environmental compliance costs allocated to processes or are they charged to overhead?
- Has your facility ever used total cost accounting methods at the process level?
- What is the facility's internal rate of return or minimum payback period?

Causality

- Were any of the above factors important in the facility's decision about whether to implement pollution prevention measures? How?

APPENDIX C

STATE CONTACT SURVEY

APPENDIX D

LIST OF REVIEWERS

SURVEY FOR STATE AGENCY AND TAP CONTACTS

Contact _____ Organization _____

Phone _____ Interviewer _____ Date _____

Knowledge of and Contact with Industrial Facilities

- In which of the following sectors does your state have industrial facilities: a) chemical manufacturing; b) metal finishing; c) degreasing; d) wood products?
- Does your state have a P2 planning law? P2 reporting requirements?
- Do you have knowledge of any of these facilities doing pollution prevention?
- For facilities doing pollution prevention, how are you aware of the activities? (i.e. through P2 planning, data reporting, site visits, newspaper coverage, governor's awards applications, anecdotes, etc.) Are you able to make any written data or reports available to the research team?
- Are you able to describe any of these facilities' P2 efforts?
- What sort of written information (i.e. P2 plans, publicly available data, governor's award applications, case studies, etc.) regarding P2 efforts do you have about these facilities?
- Do you have personal contacts at any of these facilities? Provide names and phone numbers. Would any of them be willing to meet with the research team to discuss their P2 program? Would you be able or willing to assist the research team in setting up interviews with these facilities and would you be interested in attending?
- Are you able to speak with your agency's permitting and enforcement people to determine whether these facilities are doing pollution prevention through normal or pilot permitting projects or through supplemental enforcement programs?

Michael Aucott
New Jersey Department of Environmental
Protection

James Berry
Office of Air Quality Planning and
Standards
U.S. Environmental Protection Agency

William F. Eberle
New York Department of Environmental
Conservation

Facility 1
Vermont Wood Furniture Manufacturer

Facility 3
New York Pharmaceutical Company

Len Fleckenstein
Office of Policy Planning and Evaluation
U.S. Environmental Protection Agency

Joseph G. Gerard
American Furniture Manufacturers
Association

Terri Goldberg
Northeast Waste Management Officials'
Association

James R. Gomes
ELM Education Fund

Timothy J. Greiner
Greiner Environmental

Jeanne Herb
New Jersey Department of Environmental
Protection

Jessica Landman
Natural Resources Defense Council

Rita Lomasney
Connecticut Technical Assistance Program

Member Company 1
Chemical Manufacturers Association

Member Company 2
Chemical Manufacturers Association

Deborah Milecofsky
New Jersey Department of Environmental
Protection

Kevin Mills
Environmental Defense Fund

Edwin L. Mongan
DuPont Chemical

Marion Mudar
New York Environmental Facilities
Corporation

Peg Pierce
DuPont Chambers Works

Vincent Pirelli
New Hampshire Pollution Prevention
Program

Leslie Winik
Chemical Manufacturers Association