

Rethinking U.S. Environmental Protection Policy: Management Challenges For A New Administration



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The PricewaterhouseCoopers Endowment for
The Business of Government

About The Endowment

Through grants for Research and Thought Leadership Forums, The PricewaterhouseCoopers Endowment for The Business of Government stimulates research and facilitates discussion on new approaches to improving the effectiveness of government at the federal, state, local, and international levels.

Founded in 1998 by PricewaterhouseCoopers, The Endowment is one of the ways that PricewaterhouseCoopers seeks to advance knowledge on how to improve public sector effectiveness. The PricewaterhouseCoopers Endowment focuses on the future of the operation and management of the public sector.

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TABLE OF CONTENTS

Foreword	4
Executive Summary	5
Introduction	8
The Limitations of Command-and-Control Management	8
The Need for Pollution Prevention.....	9
An Opportunity for Change	12
Study Findings	13
The Limitations of Regulatory Approaches to Environmental Management	13
Corporate Environmental Management: Moving Toward P2/E2	15
Why Corporations Adopt P2/E2 Practices	22
Recommendations and Conclusions	24
Creating a Policy Framework for More Effective Environmental Management	24
Summary Conclusions	33
About the Author	34
Key Contact Information	35

Foreword

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On behalf of The PricewaterhouseCoopers Endowment for The Business of Government, we are pleased to present this report by Dennis Rondinelli, "Rethinking U.S. Environmental Protection Policy: Management Challenges for a New Administration."

This report sets forth a series of ideas on how the new Administration can use a variety of different techniques, centered on pollution prevention and eco-efficiency, to improve the nation's environmental quality. This is the Endowment's second report in the area of environmental protection. In an earlier Endowment report entitled "New Tools for Improving Government Regulation," Gary Bryner examined emissions trading as an innovative regulatory tool for environmental protection.

While the environment has become a highly charged political issue, Endowment-supported studies have attempted to examine environmental protection from a management perspective: are there additional management tools or approaches that can be deployed to improve the quality of the environment? This report describes environmental protection activities that corporations are now undertaking.

We trust that this study will be useful to the new Administration as it examines the portfolio of tools and approaches that can be used to protect the environment.

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Executive Summary

A new presidential administration and Congress have the unprecedented opportunity to revise, improve, and strengthen environmental policy and management in the United States for the 21st century. Environmental regulations have attained impressive results in improving air and water quality and in mitigating environmental degradation over the past 30 years. Regulation is an essential instrument through which government protects the public health and welfare by assuring a clean environment. But like all regulations, environmental laws are limited in their ability to achieve continuing improvements. Many large corporations are adopting pollution prevention and eco-efficiency (P2/E2) practices that offer the potential for the private sector to move beyond regulatory requirements to reduce or eliminate pollution at the source rather than merely controlling emissions. The federal and state governments can play a crucial role in identifying P2/E2 practices that work well in the private sector, reinforcing through incentives and regulatory relief those companies that adopt beyond-compliance environmental management systems, and helping to disseminate best practices within industries and to small and medium-sized businesses.

Corporations are adopting P2/E2 practices for a variety of reasons. More stringent regulations, stronger enforcement of existing regulations, and increasing legal and civil liabilities for violations of regulations initially lead some corporations to prevent pollution rather than coping with complex and ever changing mandates for emissions control. For most compa-

nies the financial benefits of good environmental management are the most convincing reasons for moving beyond compliance. The increasing costs of emissions control, greater savings from waste reduction, and the availability of lower-cost technologies for clean manufacturing convince firms to explore, develop, and adopt new processes that reduce or eliminate pollutants at the source. Stronger public demand for environmental protection, shareholder rejection of environmental risks, and customer demand for cleaner production processes and products motivate other companies to adopt P2/E2 practices. Finally, international competition requires corporations to adopt quality management principles in order to retain and expand their market shares. Proactive environmental management often leads to new business opportunities for cleaner products and processes. The requirements of trade agreements and the adoption of voluntary environmental management standards, such as ISO 14000, in major international markets can easily exclude companies that do not meet or exceed home and host country environmental expectations.

The current regulatory system in the United States requires the private sector to use the “best available” technology to control environmentally harmful air, water, and solid waste emissions from industrial and business facilities. Although regulations are necessary to ensure current levels of achievement, they provide little or no incentives for industry to move beyond compliance to find new and innovative ways of preventing pollution at the source and conserving resources through eco-

efficiency practices. They have been useful in reducing pollution from stationary points of emission, but not always as effective in controlling non-point pollution. Since the 1970s, environmental regulation has become more complex. Separate laws for each type of environmental medium (air, water, and land) do not easily address complex environmental problems that involve more than one source. Nor are regulations always cost-effective or based on sound scientific foundations. State and local government officials and business leaders often point out that national regulations result in a “one-size-fits-all” approach that may not be responsive to local conditions and needs or to industry differences.

In 1990, Congress authorized the U.S. Environmental Protection Agency (EPA) to focus on pollution prevention. Yet federal and state environmental agencies have never been given the flexibility and resources to pursue source reduction as an alternative to emissions control. As a result, federal industry assistance programs are limited in scope, and often focus more on compliance than innovation. At the same time, many large corporations are adopting P2/E2 practices that can be the basis for a new system of environmental policy and management that allows the private sector to move beyond compliance to eliminate pollution in manufacturing processes, products, and operations.

Large corporations are adopting voluntary environmental management systems, auditing and monitoring their environmental performance, using environmental cost accounting, and applying life cycle analysis and product stewardship. An increasing number of firms are using “design for environment” concepts to make their production systems and products and services more environmentally friendly, reducing or eliminating waste, recycling and reusing materials, substituting cleaner materials for environmentally hazardous ones, conserving water and energy, and extending good environmental practices throughout their supply chains.

Although many large corporations are, for sound business reasons, applying P2/E2 practices that go beyond regulatory compliance, their spread to smaller enterprises has been slow and sporadic. Many small and medium-sized businesses still see environmental protection as a cost rather than an asset and struggle to keep abreast of constantly

changing regulations. P2/E2 practices have not spread faster, because many enterprises do not yet see clearly the benefits of moving beyond regulatory compliance under command-and-control policies. Federal and state governments can play a catalytic role in identifying, testing, disseminating, and assisting companies to adopt P2/E2 practices that ensure continuous improvement in environmental quality.

Maintaining a clean environment is a high policy priority in the United States because environmental protection is essential to improving public health, conserving natural resources, and enhancing overall quality of life. An increasing number of studies now conclude that regulation is a necessary but not sufficient means of improving environmental conditions in the United States. As problems of environmental pollution become more complicated and as attempts are made to tighten regulations, command-and-control approaches to environmental management are likely to be less effective, more frequently challenged, and more costly to implement. The current complex, media-specific, constantly changing, and costly regulatory system can weaken or undermine attempts by industry to adopt beyond-compliance environmental management practices. To convince the private sector to adopt P2/E2 practices, environmental protection agencies must sell them primarily on their cost-saving, quality-enhancing, efficiency-promoting business advantages rather than on their environmental benefits alone. Industry leaders must see adoption of P2/E2 practices first as a good business decision.

In order to promote P2/E2, the new administration and Congress should review federal environmental laws and administrative procedures and revise them to make pollution prevention and eco-efficiency practices a stronger focus of environmental management. The following recommendations offer a platform on which a new generation of environmental policies can be built. In the 21st century, the federal government should:

- Increase the focus of environmental policy on pollution prevention and eco-efficiency (P2/E2) as the primary means of managing environmental impacts in the private sector, while maintaining a sound regulatory system as the foundation for ensuring current levels of environmental achievement.

- Revise environmental policy and management to give stronger attention to achieving performance improvements through multimedia, integrated approaches to environmental management in both the public and private sectors.
- Increase the use of market-based mechanisms — including emissions trading, technology development and commercialization, pricing and tax policies, and financial incentives — for encouraging the private sector to comply with environmental regulations and to move beyond compliance toward P2/E2 practices.
- Give more responsibility, authority, and resources to state and local environmental agencies to encourage and reward organizations that adopt P2/E2 practices.
- Improve federal and state environmental regulatory agencies' information and data collection systems.
- Strengthen the scientific foundation for regulatory changes and rule making in federal and state environmental programs through support for science and technology research on environmental issues and through strong scientific peer review of new rules and standards.
- Extend the use of cost-benefit analysis, cost criteria, and risk analysis in environmental rule making.
- Expand programs to test, verify, and commercialize the results of new pollution prevention technologies and processes in the private sector.
- Strengthen and extend public-private partnerships between federal, state and local environmental agencies and the business community to explore, test, and apply P2/E2 practices.
- Increase governments' roles in assisting private enterprises to adapt and integrate P2/E2 practices in their overall management systems by providing regulatory relief, compliance flexibility, and other rewards to companies that do so.

Introduction

A large and diverse group of organizations in the United States is calling for a review and revision of federal and state governments' environmental policy. A remarkable convergence of opinion in both the public and the private sectors is evolving about the need to supplement regulatory policies with environmental management systems that focus more strongly on pollution prevention and eco-efficiency.

Environmental policy now predominantly relies on a regulatory approach that requires the private sector to use the "best available" technology to control environmentally harmful air, water, and solid waste emissions from industrial and business facilities. Observers both inside and outside of government generally agree that environmental regulations have greatly reduced air, water, and soil pollution in the United States since the early 1970s. Many note, however, that the regulatory system is not always effective in controlling non-point sources of pollution. Moreover, single media environmental regulations (separate laws for each type of pollution) do not address complex environmental problems that involve more than one source. Nor are regulations always cost effective or based on scientific findings. Both business leaders and state and local government officials often point out that national regulations result in a "one-size-fits-all" approach that can be relatively inflexible and sometimes unresponsive to conditions and needs in different areas of the country, in different communities, and in different industries.

The Limitations of Command-and-Control Management

Although regulations are usually effective in reducing emissions from large and obvious point sources, they do not allow the U.S. Environmental Protection Agency (EPA) and state regulators the flexibility to reduce pollution among numerous small sources that account for a significant portion of all environmental degradation. National environmental regulations are numerous, complex, fragmented, and ever-changing, making it difficult for both the regulators and the regulated to keep pace with new requirements and to achieve and maintain compliance. The number of federal, state, and local environmental rules and regulations in the United States grew from about 2,000 in the 1970s to more than 100,000 at the end of the 1990s. Environmental regulations are now listed in over 789 parts of the Code of Federal Regulations. At the same time that environmental regulations were becoming more complex, they became more costly for governments to enforce and businesses to comply.

The total cost of compliance with environmental laws since 1970 now exceeds \$1.5 trillion. Studies indicate that by 1990, the cost of pollution abatement had "emerged as a major claimant on the resources of the U.S. economy," reaching more than 10 percent of the total cost of government purchases of goods and services.¹ Individuals,

¹ Dale W. Jorgenson and Peter J. Wilcoxon, "Environmental Regulation and U.S. Economic Growth," *RAND Journal of Economics*, Vol. 21 (Summer 1990): 314-340.

businesses, and governments now spend more than \$120 billion annually on pollution abatement and control alone. Clearly, the reduction of environmental pollution has significant social and economic benefits, but alternatives to command-and-control regulation may be more effective and less costly.

The Need for Pollution Prevention

Many of those who have assessed the performance of environmental management in the United States conclude that, in a post-industrial nation in which legal controls are already quite stringent, federal and state environmental protection agencies must use a wide array of policy, technical, and management instruments to achieve continuous improvements in environmental quality in the future.² Many of those calling for a review of environmental policy note that greater returns on public and private investment can be obtained from management practices that, while maintaining a sound regulatory system, place much more emphasis on promoting pollution prevention and eco-efficiency. Environmental conditions can best be improved by encouraging business and industry to eliminate the sources of environmental degradation rather than continuing to try to clean up pollution at the “end of the pipeline.”

Pollution prevention is not, of course, a new idea. Many corporations are pursuing pollution prevention, clean manufacturing, and the responsible use of resources through voluntary environmental management systems that make use of eco-efficiency practices. (See “The P2/E2 Concept” on page 10.)

Corporations in some industries have been practicing pollution prevention for more than 25 years. But environmental protection policy based on P2/E2 has never been widely adopted in the United States because it requires flexibility and a multi-media approach that the current regulatory system does not easily accommodate.

² *Enterprise for the Environment*, The Environmental Protection System in Transition: Toward a More Desirable Future, (Washington, D.C.: Center for Strategic and International Studies, 1997); and Gary C. Bryner, “New Tools for Improving Government Regulation: An Assessment of Emissions Trading and Other Market-Based Regulatory Tools,” Arlington, VA: The PricewaterhouseCoopers Endowment for The Business of Government, 1999.

A “Win-Win Strategy” for Environmental Management

The arguments for increasing the emphasis on promoting P2/E2 in environmental management policy are compelling for both government and the private sector. P2/E2 can be a “win-win” solution for both government and the private sector. Eliminating pollution from production systems and from goods and services and conserving natural resources and energy would reduce substantially the volume of pollutants that would have to be controlled at the end of the pipeline. In government, billions of dollars could be saved that now go to administration and enforcement of regulations at federal, state, and local levels, and to monitoring compliance, prosecuting violators, and defending legal challenges to new rules and to civil and criminal penalties. P2/E2 would reduce workers’ exposure to toxic materials and health-threatening emissions, degradation of the environment in communities where companies’ facilities are located, and pressures on local landfills and on water, air, and land resources.

To the extent that harmful emissions and wastes can be removed from products and manufacturing processes, companies would save money, increase their efficiency, improve the quality of the products they make, and enhance customer satisfaction. Cleaner production would result in cost savings through energy and water conservation, materials substitution, and recycling and reuse of “waste materials.” By eliminating or significantly reducing pollution at the source, companies could more easily comply with environmental laws, saving them money in fines, penalties, and compliance costs. By lowering their risks, firms could save on legal and insurance costs. Lower legal liabilities would help to satisfy stakeholder concerns about corporations’ environmental impacts and to improve their images as socially responsible organizations. Eco-efficiency practices would help companies improve the quality of their products and give them competitive advantages in global markets.

A P2/E2 Policy in Government

These arguments are, of course, well known in Congress, EPA, and state regulatory agencies. Indeed, in 1990, Congress mandated the EPA to focus its efforts on pollution prevention. (See “The Pollution Prevention Act of 1990” on page 11.)

The P2/E2 Concept

Pollution prevention (P2) is a set of technologies and processes that help organizations to reduce or eliminate waste at the source rather than controlling emissions at the “end of the pipeline.”

The World Business Council for Sustainable Development (WBCSD), the Organization for Economic Cooperation and Development (OECD), and the United Nations Environment Program (UNEP) all recommend that manufacturing industries adopt “eco-efficiency” (E2) practices that seek not only to reduce waste in manufacturing, but also to reduce environmental impacts and conserve resources throughout a business’s entire operations, from the acquisition of inputs and raw materials to the final disposal of products by consumers.

The WBCSD defines eco-efficiency as the “delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the earth’s estimated carrying capacity.”*

Eco-efficiency encourages businesses to become more competitive, innovative, and environmentally responsible by pursuing both environmental

protection and productive commercial activities. Organizations attain eco-efficiency by:

- reducing the material requirements of goods and services;
- reducing the energy intensity of goods and services;
- reducing toxic dispersion;
- enhancing material recyclability;
- maximizing sustainable use of renewable resources;
- extending product durability;
- increasing the service intensity of goods and services.

The terms “pollution prevention” and “eco-efficiency” are complementary and are sometimes used interchangeably, but E2 is generally broader in scope than just waste reduction or elimination of waste at the source. The combination of management and technical tools inherent in pollution prevention and eco-efficiency provide a strong thrust for multimedia environmental performance improvement in the private sector.

* Source: C. Keffer, R. Shimp, and M. Lehni, “Eco-Efficiency Indicators and Reporting,” (Geneva: WBCSD, 2000), quote at p. 1.

Yet, Congress never really followed up with significant reform of environmental laws to allow EPA the flexibility, or gave it the budgetary resources, to make pollution prevention the focus of its activities. EPA officials recognize the limitations of the conventional regulatory approaches to management, and emphasize in the agency’s *Strategic Plan 2000* that end-of-pipe pollution control must be supplemented in the future with new and different alternatives.³ “EPA increasingly finds diminishing

returns in its traditional approaches to regulating large and obvious sources of pollution,” its strategic plan points out. EPA claims that its “strategy of first choice is to prevent pollution before it occurs. Pollution prevention precludes environmental damage and necessity for costly cleanups.”

EPA officials recognize the need to “promote the use of pollution prevention (P2) for meeting environmental goals by ... increasing adoption of environmentally protective business practices such as environmental accounting practices and P2 opportunity assessments ... [and] increasing integration

³ U.S. Environmental Protection Agency, Draft 2000 Strategic Plan, Washington, D.C.: USEPA, 2000.

The Pollution Prevention Act of 1990

The Congress finds that:

- (1) The United States of America annually produces millions of tons of pollution and spends tens of billions of dollars per year controlling this pollution.
- (2) There are significant opportunities for industry to reduce or prevent pollution at the source through cost-effective changes in production, operation, and raw materials use. Such changes offer industry substantial savings in reduced raw material, pollution control, and liability costs as well as help protect the environment and reduce risks to worker health and safety.
- (3) The opportunities for source reduction are often not realized because existing regulations, and the industrial resources they require for compliance, focus upon treatment and disposal, rather than source reduction; existing regulations do not emphasize multimedia management of pollution; and businesses need information and technical assistance to overcome institutional barriers to the adoption of source reduction practices.
- (4) Source reduction is fundamentally different and more desirable than waste management and pollution control. The Environmental Protection Agency needs to address the historical lack of attention to source reduction.
- (5) As a first step in preventing pollution through source reduction, the Environmental Protection Agency must establish a source reduction program which collects and disseminates information, provides financial assistance to States, and implements the other activities provided for in this chapter.

Policy

The Congress hereby declares it to be the national policy of the United States that pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

Source: United States Code, Title 42, "The Public Health and Welfare," Chapter 133: Pollution Prevention, 1990.

of P2 into EPA's regulatory, enforcement, and compliance programs..."⁴ EPA attempts to promote innovations in pollution prevention by testing market-based solutions, providing compliance assistance, developing partnerships with industry to address environmental problems, encouraging breakthroughs in science and technology, and promoting "pollution prevention and reduction by developing more environmentally compatible technologies and facilitating their introduction into the marketplace."⁵

⁴ *Ibid.*, p. 26.

⁵ *Ibid.*, p. 48.

EPA initiated several programs during the 1990s to work with the private sector on voluntary pollution prevention. Through the Common Sense Initiative (CSI), EPA elicited the participation of stakeholders from industry, environmental justice organizations, labor organizations, environmental organizations, as well as federal, state, and local governments to address environmental issues facing companies in the automobile manufacturing, computer and electronics, iron and steel, metal finishing, petroleum refining, and printing industries. EPA's Climate Wise and Energy Star programs help industry to practice energy efficiency and conservation. Its "Design for Environment" program helps businesses take

environmental considerations into their design of products, processes, and management systems. Project XL is a pilot program that encourages corporations to test innovative ways of achieving more cost-effective environmental performance. In addition, the EPA has programs promoting environmental accounting and sustainable development practices in specific industries.

However, the agency is not organized or staffed effectively to work with the private sector nor is it supported adequately with legislative authority to do so. EPA has not been able to commit sufficient financial resources to increase its focus on P2/E2. EPA programs for pollution prevention and industrial partnership have been limited in scope and impact. Only a small percentage of EPA's budget goes to promoting pollution prevention in the private sector. In fiscal years 1998, 1999, and 2000, EPA's total expenditures for pollution prevention programs were less than 4 percent of its budget each year, and only a small part of those expenditures targeted industry. In FY 2000, programs for preventing pollution accounted for less than \$278 million (3.6 percent) of a \$7.5 billion budget.⁶

An Opportunity for Change

As a new presidential administration and Congress take office in Washington, new opportunities emerge to review and revise environmental protection policy in the United States for the 21st century. Regulation is a necessary part of environmental policy, but it may be reaching the limits of its capacity to improve environmental conditions effectively. A stronger emphasis on programs that encourage businesses and industries to prevent pollution, reduce or eliminate waste, and adopt principles of eco-efficiency can supplement the regulatory system in creative ways to achieve continuous improvements. The National Research Council (NRC) points out that "the environmental problems of today are often difficult to diagnose and treat; they cross state and national boundaries, entail difficult tradeoffs, and sporadically present unpleasant surprises."⁷ Relying simply on regulatory

solutions will not address the complexities of environmental protection in the 21st century. "Past illusions about simple and easy solutions to environmental problems," the NRC report emphasizes, "have been replaced by the realization that environmental protection is often complicated and challenging."

Implementing a policy of environmental management more strongly focused on P2/E2 will require a better understanding by environmental protection agencies of trends in the private sector to adopt beyond-compliance environmental management systems and P2/E2, and of their motivations for doing so. At the same time, if P2/E2 is to play a stronger role in U.S. environmental management, beyond-compliance practices will have to be disseminated more widely in the private sector. Although many large corporations are innovating with new technologies and processes for achieving eco-efficiency, commitment to beyond-compliance management varies from industry to industry, and among companies within industries. Often these innovative processes and technologies do not filter down from large companies to medium- and small-sized enterprises. Some companies, both large and small, still see environmental management as a cost and regulations as burdens to be avoided or complied with minimally. Supplementing "end of pipeline" emissions-control regulations with a system of environmental management based on pollution prevention and eco-efficiency will require both public agencies and private businesses to experiment with and develop innovative processes and technologies for improving environmental quality and find new ways of disseminating them more widely.⁸

The findings of this study show what companies can do in pollution prevention and eco-efficiency, what motivates them to do it, and the types of interventions governments can make to spread these practices from large corporations to small and medium-sized enterprises.

⁶ U.S. Environmental Protection Agency, *Summary of 2001 Budget*, Washington, D.C.: USEPA, 2000.

⁷ National Research Council, *Strengthening Science at EPA: Research Management and Peer Review Practices*, (Washington, D.C.: National Academy Press, 2000): quote at p. 1.

⁸ Dennis A. Rondinelli and Michael A. Berry, "Corporate Environmental Management and Public Policy: Bridging the Gap," *The American Behavioral Scientist*, Vol. 44, No. 2 (2000): 168-187.

Study Findings

If regulatory approaches to environmental protection are to be supplemented by a stronger focus on P2/E2, how should environmental policy be managed in the future? A large number of studies undertaken over the past decade generally conclude that the success of pollution prevention programs depends on developing a deeper understanding among political and legislative leaders and regulatory personnel at the federal and state levels of “best practices” in the private sector to achieve eco-efficiency, and the motivations of business leaders for adopting beyond-compliance environmental management systems.

To understand better what must be done to shift from a predominantly command-and-control approach to environmental management to one that focuses more strongly on P2/E2 requires first a brief summary of the limitations of the regulatory approach and then a review of the types of practices being adopted in the private sector.

The Limitations of Regulatory Approaches to Environmental Management

Public, private, and nonprofit organizations in the United States have been calling for changes in federal and state environmental policy for more than a decade. Many of the problems of the current system arise from the intrinsic nature of regulation.⁹

⁹ *David Osborne and Ted Gaebler, Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector, (New York: Penguin Books, 1993): see pages 300-301.*

Frequently observed weaknesses of the command-and-control approach to environmental management include the following:

- Environmental regulations are numerous, complex, and frequently amended, making it costly and difficult for regulated entities to stay abreast of requirements and compliance.
- Regulations are punitive rather than incentive-driven, creating tensions (and sometimes hostility) between government and regulated entities rather than positive incentives for change.
- The slowness of regulatory and bureaucratic processes makes it difficult for government to stay ahead of environmental threats and to make pollution prevention rather than emission control the focus of environmental policy.
- A command-and-control approach to environmental protection encourages regulated entities to comply with the minimum requirements set in regulatory standards rather than exploring managerial and technological innovations that go beyond compliance.
- Regulations result in a uniform set of standards that are not flexible enough to address variations in industry conditions and local needs for solving environmental problems.
- Media-specific environmental regulations are inadequate to deal with the increasingly significant “non-point” sources of environmental degradation.

- Changes in environmental regulations are often based on administrative or political criteria rather than sound scientific evidence, causing suspicion of or opposition to seemingly arbitrary changes in standards.
- Regulations for which benefits are not obvious, widespread, or clearly in excess of financial costs undermine compliance and encourage regulated entities to find ways of evading them or complying minimally.
- The command-and-control approach to environmental protection reinforces an adversarial relationship between government and the private sector that subjects regulatory changes to political backlash and legal challenges.

The U.S. General Accounting Office (GAO) concludes that although the current system of environmental regulation in the United States is the most advanced in the world, its volume and complexity “often results in conflict and gridlock.”¹⁰ Between 1970 and the mid-1990s the federal government promulgated more than 11,000 pages of environmental regulations resulting in more than \$1.5 trillion in compliance costs for industry.¹¹ The GAO points out that this regulatory structure impairs the EPA’s “ability to experiment with innovative and more cost-effective ways of reducing pollution (such as preventing pollution by eliminating or minimizing it at its source, instead of containing it at the end of the pipe) or using market-based incentives (such as pollution or trading emission rights).” In turn, federal regulatory restrictions make it more difficult for states and localities to solve creatively environmental problems in their jurisdictions.

Numerous problems arise from the fact that environmental regulations focus separately on individual media of pollution (air, land, and water) and categories of pollutants (toxic substances, hazardous wastes, pesticides), rather than on overall environmental quality.¹² New laws have been

enacted and amendments have been made to environmental regulations over a 30-year period, usually independently of each other and sometimes in conflict with already existing standards. Rarely are requirements for one medium coordinated with requirements for others either in legislation or in administrative rule making. Often the regulation of one medium (e.g., air) increases pollution in other media (e.g., water or soil).

Restrictions on one category of pollutants sometimes lead to increases in other types of emissions or degradation. Because Congress passes environmental legislation piecemeal, consolidates diverse environmental regulations under EPA’s control, and adds new environmental rules and regulations without reviewing the scope and impacts of previous laws, the federal government lacks a coherent environmental mission and a clear direction. More than 40 committees and subcommittees of Congress have some type of oversight responsibility for or jurisdiction over EPA. More than a dozen statutes govern EPA’s mandate to control pollution and require the agency to organize into numerous offices with different environmental management philosophies, control strategies, and “legal cultures.” Frequent changes in federal and state environmental regulations make it difficult for companies, especially smaller ones, to keep abreast of requirements and to comply.¹³ Environmental protection agencies sometimes do not use accepted scientific findings as the basis for regulations, explain their decisions realistically in terms of risk, or take into account the compliance costs to government or the private sector.¹⁴ The Enterprise for the Environment Committee, led by former EPA Administrator William Ruckelshaus, emphasizes that “the environmental protection system of the next century must become as efficient and low cost as possible without compromising environmental progress.”¹⁵

¹⁰ *United States General Accounting Office, “Regulatory Reinvention: EPA’s Common Sense Initiative Needs an Improved Operating Framework and Progress Measures,” GAO/RCED-97-164, (Washington, D.C.: USGAO, 1997): quote at p.12.*

¹¹ *Kathi Futornick, “Total Quality Environmental Management: Managing Corporate Change,” in Thomas E. Higgins (ed.) Pollution Prevention Handbook, (Boca Raton, FL: Lewis Publishers 1995): 57-76.*

¹² *National Academy of Public Administration, Setting Priorities, Getting Results: A New Direction for the Environmental Protection Agency, Washington, D.C.: NAPA, 1995.*

¹³ *National Research Council, Review of Research Progress of the Partnership for a New Generation of Vehicles — Sixth Report, Washington, D.C.: National Academy Press, 2000.*

¹⁴ *Mark R. Powell, Science at EPA: Information in the Regulatory Process, (Washington, D.C.: Resources for the Future, 1999): quote at p. 112.*

¹⁵ *Enterprise for the Environment, The Environmental Protection System in Transition, (Washington, D.C.: Center for Strategic and International Studies, 1997); quote at p. 3.*

Since the early 1990s, many corporations have taken new initiatives in managing their environmental impacts. They seek new ways to reduce their costs, increase their efficiency, lower their liabilities, and enhance their competitiveness while reducing pollution, conserving resources, and eliminating waste. These P2/E2 practices in the private sector can be the foundation for government programs that identify, test, disseminate, and encourage pollution prevention in an environmental protection policy for the 21st century.

Corporate Environmental Management: Moving Toward P2/E2

Increasing the focus on P2/E2 in environmental policy requires policymakers and regulators to understand better how progressive companies are seeking to apply beyond-compliance practices and what motivates them to do so. Most large corporations in the United States are implementing voluntary environmental management systems (EMS) that go well beyond legal requirements, and many are adopting international standards of environmental management, such as ISO 14000, that transcend or exceed national environmental regulations. The challenge for federal and state government regulators is to understand better what companies are

doing, why they are doing it, how to reinforce those that are moving toward pollution prevention and eco-efficiency, and how to encourage other companies to do the same.

Figure 1 summarizes the P2/E2 management practices that many companies are embracing:

Environmental Management Systems (EMS)

Large corporations in North America and Europe are adopting environmental management systems that integrate eco-efficiency practices into their overall business operations. By early 1999 more than 330 organizations in 37 states had officially joined more than 8,000 other organizations worldwide in certifying their EMS under ISO 14001, an international standard that was developed by the International Organization of Standardization in Geneva and implemented in the United States by the American National Standards Institute (ANSI). Many companies are using ISO 14001 guidelines to design or improve their environmental management systems without seeking official certification.

ISO 14001 provides a framework for environmental management that focuses on five major components. First, the facility or firm seeking certification

Figure 1: Components of Corporate P2/E2 Management



must develop and adopt an environmental policy to which senior management is committed. Second, it must establish a planning process that identifies all of the environmental aspects of a facility's operations, legal and other requirements, a set of clearly defined objectives and targets for environmental improvement, and a set of environmental management programs. Third, it must create a clear structure of responsibility for environmental management; programs for training, awareness and competence among all employees of the facility; and internal and external communication of the EMS; a system of environmental management documentation; a documentation control system; and procedures for operational controls of environmental impacts and emergency preparedness and response. Fourth, the facility or organization must monitor and measure environmental impacts, report non-conformance and take corrective and preventive action; keep environmental management records; and carry out environmental audits. Fifth, it must establish a review process through which senior management reassesses the suitability, effectiveness, and adequacy of the EMS at appropriate intervals to assure continuous improvement.

Some companies have been implementing environmental management systems that go beyond regulatory requirements for more than two decades. The 3M Corporation long ago committed itself to solving its own environmental problems, preventing pollution at the source wherever possible, developing products that have minimal effect on the environment, conserving natural resources, meeting and sustaining government regulations, and, where possible, assisting government agencies in environmental activities.¹⁶

Other corporations such as Texaco, Kodak, SmithKlein Beecham, Goodyear, Bristol-Myers Squibb, and Alcoa developed their EMS based on their own corporate environmental, health, and safety standards that exceed U.S. standards and international guidelines. These corporate standards are often more stringent than the requirements adopted by governments. Texaco's EMS addresses product stewardship, air emissions, spill prevention and control, and waste management, as well as

health and industrial hygiene and personnel and contractor safety. Texaco applies its environment, health, and safety policies not only in its facilities in the United States but in all of its global business operations.¹⁷

Some companies have their EMS certified for the entire corporation; others for strategic facilities, products, or processes. IBM certified an EMS for the entire corporation to the ISO 14001 standard, with all of its manufacturing and hardware development sites having completed the audit process by 1999.¹⁸ Lucent Technologies implemented its EMS for 98 percent of its products, services, operations, and facilities in 1999 and certified 63 percent of its facilities.¹⁹ Motorola plants in the United States and around the world use a common environmental, health, and safety management system framework that satisfies ISO 14001 requirements; the corporation seeks to have all of its manufacturing plants certified by 2001.²⁰ General Motors, Ford, Toyota North America, and other automobile manufacturers not only require all of their plants to certify their EMS but also to encourage or require their suppliers to certify as well. Indeed, General Motors' EMS includes all of the ISO 14001 requirements plus several others that require plants to provide higher levels of support for environmental performance, cost reduction, and system auditing.

Xerox has completely integrated its EMS with health, safety, and operational processes and is continuously improving its environmental performance through beyond-compliance practices. Figure 2 shows how Xerox's Environment, Health, and Safety (EH&S) system focuses on achieving sustainable growth by internally managing environmental impacts, reducing the corporation's external environmental "footprint," and partnering with customers and suppliers to improve environmental performance. Since the 1980s when the corporation focused on ensuring regulatory compliance, Xerox has moved steadily from voluntary assessment and remediation of contaminated sites to

¹⁶ 3M Corporation, "3M Environmental, Health and Safety Progress Report, 1998-1999," St. Paul, MN: 3M, 1999.

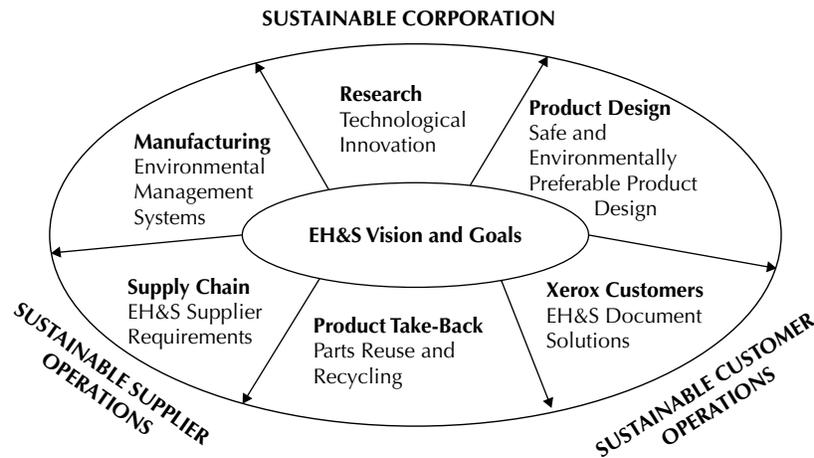
¹⁷ Texaco, Inc., "Environment, Health and Safety Review 1996," White Plains, NY: Texaco, 1997.

¹⁸ IBM, "Environment and Well-Being," Somers, NY: IBM, 1999.

¹⁹ Lucent Technologies, 1999 Annual Report — Environment, Health and Safety, Murray Hill, NJ: Lucent Technologies, 2000.

²⁰ Motorola Inc., "The Journey to a Sustainable World: Progress for 1999," Schaumburg, IL: Motorola, 2000.

Figure 2: Environmental Management at Xerox



Source: Xerox, 1999 Environment, Health and Safety Progress Report

developing and implementing waste reduction programs for its factories, products, and offices, and initiating product take-back and recycling programs.²¹ (See Figure 3.)

During the mid-1990s, Xerox began to pursue an eco-efficiency strategy that focuses on sustainable product design, development of an EMS, and the extension of environmental management programs and projects throughout its supply chain. From 2000 to 2005, Xerox aims to achieve sustainable growth objectives by integrating environmental, health, and safety practices into all of its businesses and services, achieving a zero injury target, minimizing use of natural resources, and adopting knowledge management solutions. Xerox has registered all of its major manufacturing and logistics facilities to ISO 40001 environmental management standards.

Environmental Monitoring and Auditing

An essential element of P2/E2 is monitoring, auditing, and measuring environmental performance. An increasing number of corporations are now voluntarily monitoring and auditing their environmental impacts regularly in order to prevent problems or correct them quickly. General Motors assesses air emissions, wastewater discharges, solid and hazardous materials handling and waste disposal, and emergency response capabilities for all facilities,

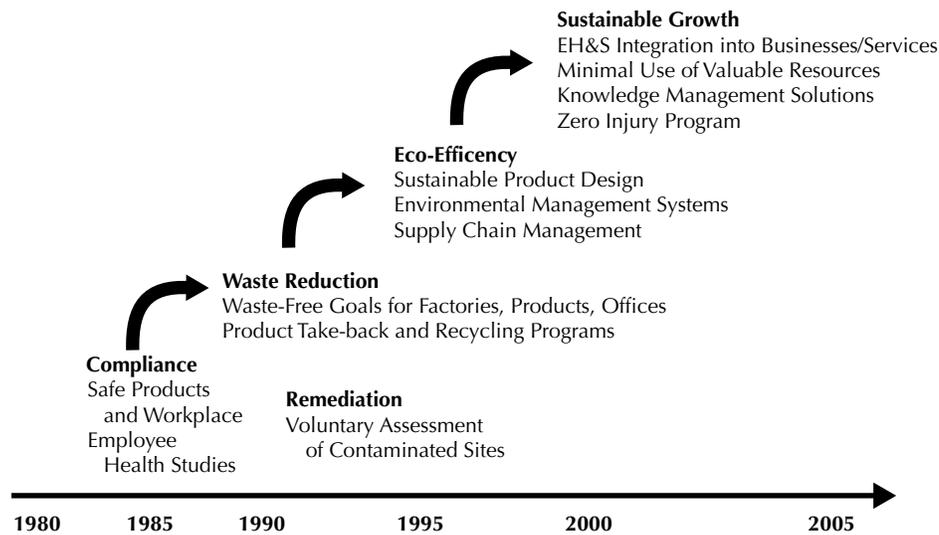
plus other impacts that are regulated in specific jurisdictions.²² Kodak uses a "Business Unit Evaluation Guide" to measure semi-annually how well unit managers integrate environmental responsibility into business plans and track progress in environmental performance.²³ SmithKlein Beecham and Kodak assess each of their facilities' environmental performance against legislation and corporate standards at least once every three years. Kodak evaluates all of its sites worldwide on a regular basis by 28 performance criteria and for compliance with local laws and regulations. In addition, Kodak has integrated environmental performance progress criteria into pay raise evaluations for senior corporate and business unit managers. Bristol-Myers Squibb developed a self-assessment process for measuring its performance against 16 principles of the International Code Council Business Charter for Sustainable Development and its own EH&S codes of practice that encompass ISO 14001 standards. Baxter International, for example, requires all of its operating units to perform environmental self-audits annually and outside auditors to evaluate 25 percent of its divisions each year using the company's rigorous environmental audit protocol. Baxter's headquarters holds operating unit managers responsible for closing audit action items quickly.

²¹ Xerox Corporation, "1999 Environment, Health and Safety Progress Report," Webster, NY: Xerox Corporation, 1999.

²² General Motors Corporation, "1998 GM Environmental, Health and Safety Report," Detroit, MI: General Motors, 1999.

²³ Eastman Kodak Corporation, "Health, Safety and Environment 1996 Report," Rochester, NY: Eastman Kodak Corporation, 1998.

Figure 3: Environmental Progress at Xerox



Source: Xerox, 1999 Environment, Health and Safety Progress Report

All of Alcoa's business units formulate annual action plans for environmental management and set specific targets. All of its facilities are audited at least once every three years. The audits — conducted by multi-functional teams of central-resource experts, business-unit managers, and external representatives — identify environmental problems or deficiencies and make recommendations for improvements. Audit teams diagnose each site's environmental conditions and report unsatisfactory performance. Facility managers must provide an analysis of the deficiencies, outline corrective action that will be taken, and submit quarterly progress reports. Sites with unsatisfactory ratings are audited again within a year.²⁴

Environmental Accounting

Increasingly, American corporations are attempting to identify the costs of their environmental impacts and expenditures, and the savings from reducing the use of materials, energy, and water, as well as the costs of regulatory compliance and penalties. Environmental accounting is a management tool that firms use to identify, quantify, and allocate the direct and indirect costs of operations and to determine the real costs of producing a product. Environmental cost accounting identifies and

quantifies not only the direct costs of environmental management (labor, capital, and raw materials), but also the hidden costs (monitoring and reporting), contingent liability costs such as fines and remedial action, and intangible costs such as public relations and goodwill.

Baxter International was a pioneer in the development of a corporate environmental financial statement that accounts for the costs of basic environmental programs, remediation, waste, and other environmental responses, and for income, savings, and cost avoidance related to environmental activities. Baxter keeps detailed accounts of its environmental costs and savings.²⁵ Its accounting system allows it to capture information about the administrative costs of basic environmental programs within the corporation and the costs of remediation, waste disposal, and other responses. It also calculates savings and costs each year for ozone-depleting substances, hazardous and non-hazardous waste disposal and material reductions, recycling, energy conservation, packaging, and water conservation.

General Motors, Amoco, 3M, DuPont, Allied Signal, Monsanto, and others have discovered ways of offsetting environmental costs with revenues by

²⁴Dennis A. Rondinelli and Gyula Vastag, "Private Investment and Environmental Protection: Alcoa-Kofem's Strategy in Hungary," *The European Management Journal*, 16, 4 (1998): 422-430.

²⁵Baxter International Corporation, "Environmental, Health and Safety Sustainability Report," Deerfield, IL: Baxter International, 1999.

selling waste by-products, adopting clean technologies, and selling unused pollution allowances. Improving environmental performance in any area of business operations contributes to the overall effectiveness of a firm's environmental management system. General Motors, for example, uses environmental cost accounting information in internal decisions concerning the risks and impacts of its manufacturing processes and tracks cost information to assist in prioritizing its environmental management activities.

Environmental Life Cycle Analysis

An increasing number of firms are adopting principles of "extended product responsibility" that commit them to assessing the environmental, health, and safety impacts associated with their products and services throughout their life cycles. Life cycle analysis is a systematic means of measuring resource use and environmental releases to air, water, and soil from products, processes, and services. It helps companies to improve their understanding of how much resources their products consume in raw materials extraction, manufacturing, transportation, distribution, and final disposal, and the environmental impacts of production at each stage in the life cycle. Using life cycle analysis, corporations such as Dow Chemical, Intel, Hewlett-Packard, General Motors, International Paper, Xerox, and Nortel determine the environmental implications of producing, distributing, using, and disposing of a product and ways of improving the eco-efficiency of their operations, products, technologies, and practices. Life cycle analysis helps these firms reduce material intensity and create a smaller environmental "footprint" from their operations.

Many firms use life cycle analysis to study the environmental effects of products both within the factory during production and externally. Bristol-Myers Squibb is minimizing its environmental impacts by conducting product life cycle reviews of the company's major product lines.²⁶ During these life cycle reviews, cross-functional teams identify and reduce negative environmental, health, and safety impacts

at all production and distribution stages. Baxter International uses checklists to forecast the environmental, health, and safety consequences for people who will handle all proposed new products and their packaging. 3M's life cycle management process helps executives to understand, manage, and systematically evaluate opportunities to improve the environmental impacts of its products. Using the life cycle process, product development teams designed recycling-compatible label materials for plastic electronic equipment, reduced the solvents used in manufacturing one of its electronically cut film products, and developed high-performance cloth for commercial use as a replacement for throwaway paper towels.

Environmental Design and Product Stewardship

Companies concerned about quality management are designing or redesigning their products to decrease or eliminate adverse effects on the environment. Many large firms are adopting "Design for Environment" (DfE) programs that allow them to redesign old products or to create new ones in ways that minimize their environmental impacts by using less raw materials or substituting inputs that are more environmentally benign. DfE guides designers to produce, package, and distribute products so that they conserve energy, water, and other resources. Companies use DfE to make components and finished products that can be recycled when customers no longer use them.

IBM created an "Environmentally Conscious Products" program in 1991 to help its engineers upgrade or extend product life by taking into consideration new ways of reusing or recycling them rather than disposing of them in landfills. The program guides IBM designers in finding ways to use recycled materials and to improve energy efficiency or reduce energy consumption in new or redesigned products. Other computer firms also adopted environmentally friendly design principles. Dell Computer Corporation developed a new personal computer chassis in 1996 that was not only 100 percent recyclable but also allowed the computer to be serviced and upgraded more easily.²⁷

²⁶ Michael A. Berry and Dennis A. Rondinelli, "Environmental Management in the Pharmaceutical Industry: Integrating Corporate Responsibility and Business Strategy," *Environmental Quality Management*, 9, 3 (2000): 21-34.

²⁷ Dell Computer Company, "Dell Observes Earth Day by Adding a Fully Recyclable Chassis to its Line of Business PCs," *News Release, Austin, TX: Dell Corporation, 1996.*

By designing the machine to be easily upgraded rather than replacing the entire computer, Dell can extend its life and reduce disposal problems.

Compaq also created a Design for Environment Resource Center, which is located on the company's intranet, giving all employees access to the best mechanical, electrical, and packaging design practices.²⁸ Compaq redesigned its manufacturing processes in order to increase reusable packaging and minimize waste, extend the life of computer products by making upgrading easier, and reduce their energy consumption. Other firms are innovating with new information technologies to guide DfE applications. Motorola adopted the software "Green Design Advisor," which allows product designers to compare materials and processes used to create a product and calculate the environmental impact of the product design for the materials selected. Motorola completely redesigned its Horizon Office products to be completely disassembled and divided into plastic housing, aluminum chassis, and electronic assembly for easy recycling. Lucent Technologies uses a formal DfE process to review and evaluate criteria for each of its products in order to minimize environmental impacts throughout their life. Lucent seeks to "dematerialize" products to use fewer components and raw materials, reduce energy in manufacturing and product use, "detoxify" products, and make them with more recyclable and reusable materials.

Supply Chain Environmental Management

Other companies are extending their environmental management practices and life cycle analyses throughout their supply chains and attempting to encourage suppliers, distributors, and customers to manage their environmental impacts more effectively. IBM requires all of its suppliers to comply with all applicable environmental laws and regulations in performing work for any of its units, and does environmental evaluations of those with environmental risks that are inherent in the work they do for IBM. IBM encourages its suppliers to pursue ISO 14001 certification and shares environmental management expertise and technology with them. Motorola asks its suppliers to provide environmen-

tally preferred products — that is, those that are energy efficient, recyclable, and with significant amounts of recycled materials. Motorola plants also partner with suppliers to minimize product-packaging materials.²⁹

Ford, General Motors, and Daimler-Chrysler are adopting pollution-prevention measures in production and distribution, and requiring their suppliers around the world to certify their environmental management systems by ISO 14001 standards. General Motors created a "GM Suppliers Environmental Advisory Team" to improve mutual understanding of environmental programs and efficiency and evaluate new ideas to promote eco-efficiency throughout its supply chain.³⁰ The Ford Motor Company works with suppliers to redesign parts and equipment to reduce adverse environmental impacts. Ford and its suppliers, for example, redesigned the alloy used in the production of heat exchangers to eliminate chromium coating and painting requirements and to replace a vapor degreasing process.³¹

Waste Reduction, and Materials Recycling and Reuse

Literally hundreds of examples can be found of how corporations are reducing inputs and recycling materials. The automobile industry has been especially attentive to reducing waste. General Motors' application of life cycle analysis helped it to find ways of recycling up to 200,000 pounds of fender scrap from its Saturn car line into wheel cap assemblies and to use 56,000 recycled tires per model year for making radiator side air baffles. GM uses more than 2,700 tons of recycled textile fabric each model year for floor insulation.

The carpet industry is also making significant progress in reducing waste. Shaw Industries, for example, reduced the amount of waste generated in manufacturing by adopting high-precision technology that cuts by 25 percent the amount of selvage or residual edge trimming that had to be sent to local landfills. It reuses selvage and carpet

²⁸ Compaq Corporation, "1999-2000 Environmental Health and Safety Leadership Report," Houston, TX: Compaq Corporation, 2000.

²⁹ Motorola Inc., "The Journey to a Sustainable World: Progress for 1999," Schaumburg, IL: Motorola, 2000.

³⁰ General Motors, "1997 GM Environmental, Health and Safety Report," Detroit, MI: General Motors, 1998.

³¹ Ford Motor Company, "1996 Environmental Report," Detroit, MI: Ford Motor Company, 1997.

seams for making 100 percent recycled carpet pads that pass its industry trade association's "green label" requirements. Shaw engineers also recycled carpet fiber waste that would have had to be sent to landfills into reinforced concrete to make a product that is tougher, stronger, and more resistant to drying. Millikan Company is aggressively cutting waste from its carpet manufacturing plants. By 1999, 43 of its 55 locations in the United States achieved the company's "zero-waste-to-landfills" target. Millikan has reduced its waste output to landfills by 98 percent since 1988 and recycled 100 percent of its office paper since 1992. Interface, Inc. has a product take-back program for carpet that reclaims any brand, whether or not its owner is purchasing Interface products. The company recycles carpet tile and broadloom and reuses the material for carpet or other products so that waste will not end up in landfills.

Corporations in the retail and wholesale industries are also adopting waste reduction practices. J.C. Penney Company, for example, cut by more than 80 percent its paper, cardboard, wood, plastics, polystyrene and scrap metal at catalog customer service centers and catalog outlet stores. It refurbishes old cardboard cartons for reuse.³² Home Depot uses recycled materials in its shopping bags, signage and office supplies, and it recycles all of its corrugated cardboard and wood pallets. It keeps drywall separators out of landfills by making them into other products.

Air Emissions Reduction/Elimination

Corporations are also finding new ways of reducing their harmful air emissions. Xerox cut its Toxic Release Inventory (TRI)-reportable air emissions by more than 92 percent and all TRI air emissions by nearly 86 percent by installing abatement technologies and improving production processes. DuPont's environmental management practices resulted in reductions of 65 percent in air toxic releases and 87 percent in air carcinogens since 1987. The company is stretching from a 39 percent cut in greenhouse gas emissions in 1999 to a 45 percent reduction target. The Olin corporation, a specialty producer of chemicals, metals, and aerospace equipment, substantially reduced air emissions of

carbon tetrachloride by applying technologies that reclaim the material for reuse in several of its production processes. Kodak's aggregate emissions declined by 40 percent, and its emissions from power plants by 20 percent from 1997 to 1999 alone.³³

The 3M Corporation prevents pollution within its own plants and designs products that help customers reduce emissions. For example, it introduced hydrofluoroether (HFE) fluids to replace chlorofluorocarbons (CFCs) and other ozone-depleting materials for commercial applications such as parts cleaning in the aerospace, computers, electronics, and medical products industries. 3M cut volatile organic air emissions by 80 percent since 1990 through a combination of pollution prevention practices and pollution control equipment. It reduced by one-third its greenhouse gases from fluorochemicals in manufacturing operations between 1995 and 1998 alone.

Energy and Water Conservation

Many corporations are decreasing their energy and water use in order to achieve significant cost savings and improve the efficiency of their operations. By using water-saving devices and selling some of its high water-consumption facilities, Nortel decreased its overall water consumption by 70 percent between 1993 and 1998.³⁴ Two Motorola plants in Arizona saved 138 million gallons of water in 1999 by reusing water sample streams, part of the reverse osmosis reject water, and modifying tools and software in their processing systems. United Parcel Service uses a variety of alternative fuels and engines, including compressed and liquid natural gas and propane- and electric-powered engines in its delivery trucks to lower their use of fossil fuels and vehicle fuel emissions. It has purchased thousands of electronic fuel injected engines to reduce gasoline consumption. PepsiCo initiated energy conservation programs that have saved more than 4.6 million kilowatts of electricity since their inception, preventing the emission of 1.5 pounds of carbon dioxide, 5.8 grams of sulfur dioxide, and 2.5 grams of nitrogen oxide for every kilowatt-hour saved.

³² *Business for Social Responsibility Education Fund, "Retailers and the Environment," San Francisco: BSREF, 1999.*

³³ *Eastman Kodak Company, "Environment, Health and Safety 1999 Annual Report," Rochester, NY: Eastman Kodak, 2000.*

³⁴ *Nortel Networks, "1998 Progress Report on Environment, Health and Safety," Mississauga, Canada: Nortel, 1999.*

Through effective environmental management practices, IBM has conserved more than 8 billion kilowatt-hours of electricity during the 1990s, and avoided more than 5.6 million tons of carbon dioxide emissions. Hughes Electronics is reducing water usage and using recycled wastewater in its manufacturing processes wherever practical. One of its businesses, Hughes Network Services, recycles nearly 27 percent of its water in manufacturing wave solder board wash machines, and another business, Hughes Electron Dynamics, recycles more than 18 percent of the water used as a cooling medium in cooling towers.³⁵ By using a turbine-powered co-generation plant at its Los Angeles refinery, the ARCO Corporation was able to double the productivity of its natural gas fuel. In addition, it achieved energy savings equal to 4,000 barrels of crude oil a day and reduced daily nitrogen oxide emissions by an equivalent of the emissions of 162,000 vehicles.

Why Corporations Adopt P2/E2 Practices

Corporations are adopting P2/E2 practices for a variety of reasons.³⁶ Four sets of forces are driving companies to pursue pollution prevention:

- **Increasing regulatory demands** — including more-stringent regulations, stronger enforcement of existing regulations, and increasing legal and civil liabilities for regulatory violations;
- **Stronger stakeholder pressures** — including stronger public demand for environmental protection, shareholder rejection of environmental risks, and customer demand for cleaner production processes and products;
- **Increasing costs and savings potential** — including increasing costs of emissions control, greater savings from pollution prevention, and the availability at lower costs of new technologies for waste reduction; and

- **Stronger competitive requirements** — including the need to adopt quality management principles in order to compete in global markets, new business opportunities for cleaner products and processes, the requirements of international trade agreements and standards to do business overseas, and the adoption of voluntary environmental management standards in major international markets.

Most firms try pollution prevention initially to get ahead of regulatory requirements or to obtain relief from regulatory burdens or because they find significant cost savings from waste reduction or elimination. IBM, for example, saved nearly \$36 million in 1998 alone from energy conservation and cost avoidance efforts, and since 1990 has saved \$518 million in energy costs from its reduced use of electricity. Xerox was able to achieve 88 percent solid waste recycling rates in 1998 and generated savings of more than \$45 million that year alone from reducing, reusing, and recycling materials. DuPont cut waste in its polyester films throughout its value chain by reducing the components used in packaging, reusing as many components as possible, and recycling materials. In doing so, it kept 30 million pounds of materials out of landfills between 1997 and 2000 and saved \$7.6 million in packaging costs.

Since 1980, 3M Corporation has carried out more than 4,600 pollution prevention projects that eliminated 1.6 million pounds of releases to air, water, and soil and produced savings of more than \$810 million. Baxter International's pursuit of pollution prevention initiatives cut its costs by more than \$100 million. By applying product life cycle analysis at all of its operating sites, Bristol-Myers Squibb identified potential savings in excess of \$6.5 million. By re-engineering its carpet manufacturing process, Interface reduced waste from its production process, resulting in savings of more than \$90 million since 1990.

Many companies are learning that pollution prevention not only helps them avoid the costs of regulation by eliminating harmful air and water emissions and by reducing wastes in their operations, but also that eco-efficiency has other business benefits. The adoption of a beyond-compliance EMS can help a company protect or enhance its ethical image,

³⁵ Hughes Electronics Corporation, "Environment, Health and Safety Annual Report," El Segundo, CA: Hughes Electronics, 1999.

³⁶ Dennis A. Rondinelli and Michael A. Berry, "Proactive Environmental Management: A New Industrial Revolution," *The Academy of Management Executive*, 12, 2(1998): 38-50.

avoid serious legal liabilities, and satisfy the safety concerns of employees. For many firms, the challenge is to balance concerns with cash flow, profitability, and environmental protection in order to respond to the demands of stakeholders.

Companies such as 3M, Kodak, Xerox, Alcoa, and Procter & Gamble that adopted quality management programs during the 1980s to improve their competitive positions are also recognized by their shareholders and external stakeholders for exemplary environmental performance and social responsibility. Pharmacia's environmental policy, for example, declares that protecting the environment and the health and safety of its employees and the communities in which it operates "is central to our responsibility of a good corporate citizen. It is also good business, and ultimately benefits all of our stakeholders and shareholders."³⁷ The application of the corporation's environmental management standards worldwide is intended "to create a competitive advantage by maximizing operational effectiveness and minimizing environmental and safety impacts and their accompanying liabilities." Johnson & Johnson's reputation as a socially responsible company, developed over several decades, is reinforced by its environmental management policy.³⁸ "We are responsible to the communities in which we live and work and to the world community as well," its environmental performance report declares. "We must maintain in good order the property we are privileged to use, protecting the environment and natural resources."

Some firms have also found that applications of life cycle and supply chain analyses lead to the discovery of new business opportunities and new products, more efficient and effective production processes, and new sources of revenue. By adopting international standards of environmental management, such as ISO 14001, American corporations can more easily remain or become competitive in world markets. Through beyond-compliance environmental management practices, corporations are also finding ways of developing new products or improving existing products that make them more environmentally friendly, and marketing them on

their "green" characteristics. According to the Marketing Intelligence Service, in 1998 and 1999 alone, the food industry introduced 641 new "green products," the beverage industry launched 266 new products with environmental features, the health and beauty aids industry came out with 560 green products, and the household products industry developed 193 environmentally improved products. Texaco has designed or reformulated products to reduce potential hazards, including biodegradable hydraulic fluids, non-chlorinated gear compounds, cleaner burning gasoline, ash-less lubricants, and long-life antifreezes.³⁹ Cooper Industries produces airtight recessed lighting fixtures for homes and offices to prevent energy leaks and reduce heating costs. Its industrial fluorescent lamps provide double the wattage output of incandescent lamps and last 13 times longer, thereby cutting energy use in factories.⁴⁰

³⁷ Pharmacia & Upjohn, "Taking Care of Tomorrow: Environment and Safety," Bridgewater, NJ: Pharmacia & Upjohn, 1999.

³⁸ Johnson & Johnson, "Environmental Report," New Brunswick, NJ: Johnson & Johnson, 1998.

³⁹ Texaco Inc., "Environment, Health and Safety Review" 1996, White Plains, NY: Texaco, 1997.

⁴⁰ Cooper Industries, "1996 Environmental Report," Houston, TX: Cooper Industries, 1998.

Recommendations and Conclusions

Calls for increasing the emphasis on pollution prevention and eco-efficiency in U.S. environmental policies are becoming more frequent and are emanating from a wider array of public and private organizations. Because regulations alone cannot achieve continuing improvements in environmental conditions during the 21st century, they must be supplemented with programs that promote P2/E2. Clearly, changes will be needed in the ways in which governments attempt to intervene to protect the environment and in the ways in which business executives perceive P2/E2 practices. Although federal and state governments alone cannot bring about a revolution in business practices, they can help to create conditions that encourage and promote beyond-compliance environmental management in the private sector. New federal environmental policies must combine cost-efficient, scientifically sound regulations with stronger programs to promote, reward, and disseminate new technologies and practices of eco-efficiency in the private sector to ensure continued improvement of environmental conditions in the United States during the 21st century.

Creating a Policy Framework for More Effective Environmental Management

Most public and business leaders accept the fact that a scientifically sound and cost-efficient regula-

tory system is the foundation for achieving environmental quality. But many observers argue that the regulatory system in the United States must be rethought and redesigned to leverage the resources of the private sector in achieving higher levels of environmental performance.⁴¹ A new generation of environmental policy for the 21st century should include the components shown in Figure 4.

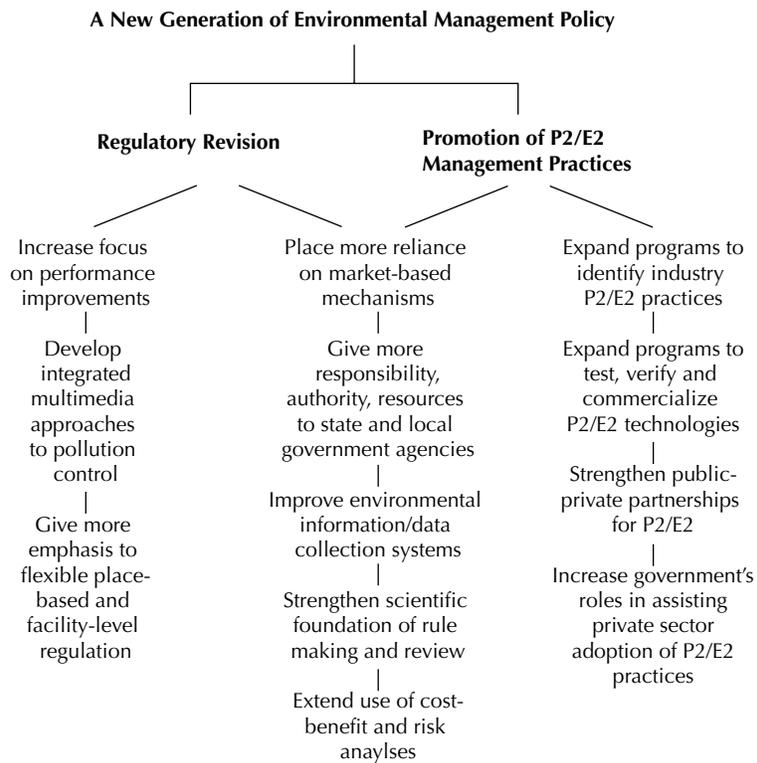
Among the most important management challenges for a new presidential administration and Congress will be to find ways to:

Increase the focus on pollution prevention and eco-efficiency for achieving environmental performance improvements in the private sector, while maintaining a sound regulatory system as the foundation for ensuring current levels of achievement.

For all of the reasons outlined earlier in this report, the promotion of pollution prevention and eco-efficiency practices should become a stronger focus of environmental policy in the United States during the 21st century. The Tellus Institute's assessment of environmental protection programs, however, points out that by the late 1990s pollution prevention had "by and large stalled in its evolution

⁴¹ See Dennis A. Rondinelli and Michael A. Berry, "Corporate Environmental Management and Public Policy: Bridging the Gap," *American Behavioral Scientist*, 44, 2 (2000): 168-187.

Figure 4: P2/E2 Environmental Management Policy



toward becoming the dominant regulatory ethic and framework," largely because the concept had not permeated the operations of regulatory agencies.⁴²

The examples offered earlier show that many large corporations can and do apply pollution prevention and eco-efficiency practices. The spread of P2/E2 practices to other corporations and to small and medium-sized enterprises, however, requires policy revisions and new government programs that allow more businesses to develop flexible and innovative responses to reducing or eliminating harmful pollutants at the source. Government can play a crucial role in encouraging pollution prevention, recognizing innovative and effective practices, rewarding companies that adopt them, testing and verifying pollution prevention and eco-efficiency technologies and processes, supporting clearinghouses of information about best practices, and helping to commercialize those technologies that are proven effective.

Give greater attention to achieving performance improvements through multimedia, integrated, approaches to environmental management in both the public and private sectors.

A growing number of public and private organizations agree on the need to revise U.S. environmental policies in order to promote P2/E2 practices more widely. The U.S. General Accounting Office points out that "many state and industry officials have cited the need for statutory revisions, both in the near term to encourage experiments in alternative methods of achieving environmental compliance and in the longer term to achieve a more fundamental change in the conduct of environmental regulation."⁴³ A report of the Center for Strategic and International Studies concludes that the United States will find it more difficult to protect and restore the natural environment during the 21st century unless Congress and the Administration shift the current command-and-control approach "toward a more performance-based, information-

⁴² Jeanne Herb, Allen White, and Susan Helms, "Pathways to State Pollution Prevention Regulatory Integration: The SPRINT Compendium," (Boston, MA: Tellus Institute, 1999): quote at p. 3.

⁴³ United States General Accounting Office, "Environmental Protection: Challenges Facing EPA's Efforts to Reinvent Environmental Regulation," GAO/RCED-97-155, (Washington, D.C.: USGAO, 1997): quote at p. 10

rich, technology-spurring, flexible, accountable regulatory system.” The report notes the need for “a broader array of policy tools that promote continuous environmental improvement, including environmental taxes, subsidy reform, emissions trading, and information disclosure; and toward stronger private-sector management systems that internalize the same stewardship ethics embodied in environmental statutes.”⁴⁴

In an internal report, a task force assessing EPA’s source reduction efforts found “the importance of taking a multimedia approach was striking, yet a multimedia perspective is often not emphasized in the development and implementation of regulations at the agency.”⁴⁵ The most frequently offered recommendation is that federal and state environmental laws be revised into a cross-cutting, three-dimensional (air, water, and land) policy framework that allows businesses and government to conceive of the environment as a whole rather than as separate environmental media.

Emphasize flexible place-based and facility-level regulation

Because the natural environment is composed of three inextricably interrelated media — air, water, and soil — what happens to one always affects the others. Segmented approaches to managing the environment are costly, inefficient, and ineffective, and invite continuing pollution displacement. One means of giving policies a multimedia focus is to adopt what the Ruckelshaus report calls “place-based” environmental protection that allows federal, state, and local governments to work together with the private sector and other stakeholders to find the most effective solutions within local communities and regions. (See “Place-Based Environmental Protection.”) Another approach is to set facility performance targets and let business executives decide on the best methods for reaching the targets.

⁴⁴ Karl Hausker, “Reinventing Environmental Regulation: The Only Path to a Sustainable Future,” (Washington, D.C.: Center for Strategic and International Studies, 1999); quote at p. 2.

⁴⁵ Lynn R. Goldman, “Transmittal of Our Assessment of the Source Reduction Review Project,” (Washington: USEPA, 1996): quote at p. 1.

Place-Based Environmental Protection

The Enterprise for the Environment committee headed by former EPA Administrator William D. Ruckelshaus recommends that environmental policy give greater attention to place-based environmental protection.

Place-based environmental policy involves identifying a geographic area, usually communities or distinct places defined by natural boundaries or ecological features; assessing the area for ecological, human health, economic, and socio-cultural aspects that relate to the environment; and involving diverse stakeholders in developing a vision, goals, priorities, and strategies.

Place-based environmental policy focuses on creating a collaborative process aimed at improving environmental, economic, and social conditions in a sustainable manner, building partnerships, and leveraging resources. It seeks to catalyze prescriptive, voluntary, and educational actions to achieve the goals. It requires monitoring environmental conditions, evaluating results, and redirecting efforts through adaptive management and developing processes that inform, assist, and involve the public.

Source: Enterprise for the Environment, The Environmental Protection System in Transition: Toward a More Desirable Future, (Washington, D.C.: Center for Strategic and International Studies, 1997): pp. 44-45.

In order to promote P2/E2 more effectively, environmental protection agencies must place more emphasis on environmental performance than on regulatory compliance. EPA and the states must have the authority and ability to plan and budget their activities across media. Media-specific enforcement offices must be able to coordinate with each other and with regulated organizations to achieve facility-level improvements. They will have to retrain regulatory-oriented staff to understand and promote beyond-compliance technologies and processes in the private sector and find ways of setting compatible deadlines for rule making to allow for cross-media analysis and selection of appropriate technologies.

Increase the use of market-based mechanisms for encouraging the private sector to comply with environmental regulations and to move beyond compliance toward pollution prevention and eco-efficiency practices.

Economic incentives and rewards for innovation and creativity can entice more businesses to adopt new technologies that improve environmental performance than continued reliance on regulatory enforcement alone. A wide array of market-based tools is available that can supplement command-and-control instruments and create economic and financial incentives for companies to adopt P2/E2 practices. These instruments include polluters-pay fees and charges, tax incentives, subsidies, emissions trading mechanisms, fees for emissions monitoring and treatment, reporting requirements, and government procurement of products that have desirable environmental characteristics.⁴⁶

Command-and-control policies do not adequately reward organizations adopting practices that lead to real, long-term solutions to environmental problems — such as the shift away from carbon-based economies — nor do they create business opportunities and make use of market forces to achieve improvements in environmental performance. States such as California, Massachusetts, Illinois, Colorado, New York, Michigan, Pennsylvania, and Maine have been experimenting with emissions trading and banking, pricing programs, and other incentives that reallocate costs of pollution to the sources and give regulated entities more flexibility in achieving emissions reduction goals.

Give more responsibility, authority, and resources to state and local environmental agencies to encourage and reward organizations that adopt P2/E2 practices.

Giving states more authority and responsibility in environmental policymaking can help overcome the conflict and gridlock that sometimes characterize the current command-and-control system. The states now implement much of the federal government's enforcement of air, water, and waste regulations, but responsibilities are not always clearly and effectively defined. The relationship between the

federal government and the states is often tense and characterized, as the GAO points out, by continuing disagreements over issues such as "state environmental agencies respective roles, appropriate priorities among state environmental programs, and the appropriate degree of federal oversight."⁴⁷

The need for decentralizing and delegating more responsibility and discretion to state and local governments arises from the growing complexity of environmental pollution and the need for more-flexible responses to local conditions and needs. State and local governments are often better able than federal agencies to develop programs that appeal directly to corporate motivations for adopting P2/E2 practices. They may also be better able to restructure environmental policies to provide support for new combinations of regulatory and voluntary management systems that are more effective and less costly than current command-and-control approaches.

Regulations should focus on performance criteria that allow businesses and industries to develop the most appropriate means of achieving desired objectives. New Jersey's experiments with flexible, facility-level permitting has saved time and money for the state and for businesses. North Carolina's pollution prevention programs provide technical assistance to small and medium-sized businesses in adopting eco-efficiency practices that save them money and improve environmental performance. Wisconsin's award recognition program for innovative technologies and practices in source reduction provides models for other companies to follow in preventing pollution.

Several state environmental agencies have developed agreements with the U.S. Environmental Protection Agency that more clearly define their respective roles and responsibilities. Wisconsin's Department of Natural Resources (DNR), for example, established an environmental performance partnership with EPA for fiscal years 2000 and 2001 that facilitates joint planning and priority setting with EPA's regional office. The agreement includes provisions for the use of a new integrated

⁴⁶ For a more detailed discussion see Gary C. Bryner, "New Tools for Improving Government Regulation: An Assessment of Emissions Trading and Other Market-Based Regulatory Tools," Arlington, VA: The PricewaterhouseCoopers Endowment for The Business of Government, 1999.

⁴⁷ United States General Accounting Office, "Major Management Challenges and Program Risks: Environmental Protection Agency," GAO/OCG-99-17 (Washington, D.C.: GAO, 1999): quote at p. 28.

work planning system, the development and use of a new environmental measurement system that is more relevant to Wisconsin's needs, the delegation of specific responsibilities to Wisconsin's DNR, and more consistent implementation of programs and regulations.

Although national regulations are needed to address "spillover effects" and regional impacts of pollution, many environmental problems can be solved more effectively at local and state levels through dialogue and interaction than by federal mandates. Local stakeholders generally understand local possibilities and constraints better than federal or state regulators. Business owners and managers often know the operational and economic realities of dealing with environmental problems at their facilities better than government officials. Federal regulations should be revised to allow EPA to set performance targets and allow businesses and state and local governments to determine the most effective ways of reaching them.

Improve federal and state environmental regulatory agencies' information and data collection systems.

The plausibility and acceptance of environmental rules and regulations depend in part on a sound information collection and analysis system that determines the types of harm caused to the environment and to public health by pollutants, the magnitude and scope of environmental threats, the risks inherent in continued or potential degradation, and technical requirements and economic costs involved in alternative solutions. Both public and private organizations insist that federal and state regulatory agencies need more comprehensive and sophisticated environmental information systems, more effective modeling capabilities, and more extensive environmental information dissemination programs.

Several states, including Ohio, Alabama, Illinois, Oregon, New York, Massachusetts, and New Jersey, are developing or expanding information collection systems that measure the integration of P2 practices in their compliance and technical assistance activities.⁴⁸ The information is aimed at determining how seriously environmental agencies are integrating P2 indicators in their regulatory, permitting, inspec-

tion, measurement, enforcement order, outcome tracking, and other activities.

The GAO points out that the federal government's existing environmental data management system "is outmoded in many ways. It continues to rely heavily on paper-based reporting, and its many separately designed databases are generally not technically compatible with one another."⁴⁹ The current environmental data management system, the GAO notes, makes it difficult to aggregate data from different databases to develop comprehensive information on environmental conditions, localities, industrial sectors, or even specific chemicals. The gaps in data make it difficult for regulatory agencies and the public to understand important human health and ecological effects.

Strengthen the scientific foundation for regulatory changes and rule making in federal and state environmental programs through support for science and technology research on environmental issues and through stronger external scientific peer review.

The willingness of the private sector and of the public to accept regulations or to adopt P2/E2 solutions depends on their faith in the scientific validity of decisions made by federal and state regulatory agencies. Federal and state environmental agencies must base rule making and standards on sound scientific evidence and on the results of scientific peer review. Confidence in P2/E2 practices also depends on government regulatory agencies' research and development, scientific review, and technology evaluation processes.

The National Research Council (NRC) points out that a stronger system of scientific review is needed in EPA to help determine which environmental problems threaten public health, quality of life, ecosystems, and the economy. EPA needs better scientific review procedures to avoid placing too much emphasis on problems that may be inconsequential and ignoring problems that may have significant impacts on public health and ecology. Better scientific information can help to reduce uncertainties in environmental decision making,

⁴⁸ Tellus Institute, "Measuring Pollution Prevention (P2) Regulatory Integration," Boston, MA: Tellus Institute, 2000.

⁴⁹ United States General Accounting Office, "Major Management Challenges and Program Risks: Environmental Protection Agency," GAO/OCG-99-17 (Washington, D.C.: GAO, 1999): quote at pp. 15-16.

identify emerging problems, deal with unanticipated threats, and develop cost-effective strategies to reduce risks.

The NRC calls on Congress to create a new position of deputy administrator for science and technology in EPA to strengthen overall responsibility for scientific and technical policy, coordinate scientific activity throughout the agency, and review potential rules and standards from a scientific perspective. EPA needs stronger capacity to identify and define important scientific issues facing the agency and in “developing and overseeing an integrated agency-wide strategy for acquiring, disseminating, and applying scientific information; and coordinating and overseeing scientific quality-assurance and peer review practices throughout the agency.” EPA must create and strengthen processes to ensure that “appropriate scientific information is used in decision making through the agency, and ensuring that the scientific and technical information underlying each EPA regulatory decision is valid, appropriately characterized in terms of scientific uncertainty and cross-media issues, and appropriately applied.”⁵⁰

Extend the use of cost-benefit analysis, cost criteria, and risk assessment in environmental rule making.

Congress requires all regulatory agencies to take the costs of implementing new and more stringent rules into consideration. Current policies, however, do not require environmental agencies to use cost as a major criterion in promulgating and implementing regulations. Environmental regulations that are economically unrealistic can and do impose enormous costs on both businesses and state and local governments. In making decisions, businesses consider alternatives and balance value, quality, costs, and payback. In order to motivate the private sector to comply with regulations and adopt P2/E2 practices, environmental regulations must reflect similar criteria.

Environmental regulations based on unrealistic assumptions of risk in the face of scientific uncertainty do little more than encourage the practice of prudent avoidance. Risks are an integral

part of human existence, and policies that seek to eliminate risks or minimize them at any cost quickly become unaffordable and lose their credibility. Environmental policies must make clear distinctions between real and perceived risks, and environmental protection agencies must make transparent the assumptions on which they base their estimates of environmental hazard. In order to improve risk assessment, New York’s Department of Environmental Conservation (DEC), for example, is experimenting with a “Comparative Risk Project” that provides assessments that will help state government officials better understand which environmental problems create the highest potential risks to public health and safety, create strategies for reducing those risks, and select pollution prevention options.⁵¹

Expand programs to test, verify, and commercialize the results of new pollution prevention technology and eco-efficiency processes in the private sector.

Public confidence in P2/E2 practices will increase only if demonstrations show that new technologies and processes aimed at source reduction or elimination work effectively. In order to promote P2/E2, EPA and the states should explore more effective programs to test and verify the results of pollution prevention technologies and processes. The current federal environmental technology verification (ETV) program is slow, burdensome, and costly. The National Pollution Prevention Roundtable and other organizations recommend that the federal government create a simpler, lower-cost program for evaluating pollution prevention technologies. “A simpler protocol review process of existing data on critical performance and cost from multiple sites may be sufficient” for many pollution prevention technologies and more cost-efficient than the pilot programs EPA now uses. Massachusetts, for example, has a standard reporting and evaluation format for all technology development and verification activities that streamlines the process and helps disseminate results more quickly. Firms competing on quick manufacturing turnaround or short design and production cycles cannot afford to wait for time-consuming technology verification. EPA’s program should also focus more strongly on identifying and disseminating information about the

⁵⁰ National Research Council, “Strengthening Science at the U.S. Environmental Protection Agency,” (Washington, D.C.: National Academy Press, 2000): quote at p. 6.

⁵¹ New York Department of Environmental Conservation, “New York State Comparative Risk Project,” Albany, NY: NYDEC, 2000.

benefits of technology verification to developers and users.

If P2/E2 practices are to be disseminated more widely, companies must have easy access to affordable and effective technologies. Although many large corporations, research organizations, and engineering and consulting firms do develop technologies for pollution prevention, it is often difficult to commercialize them for general use. The U.S. Department of Commerce's Office of Technology Policy points out that there is often sufficient capital available for organizations to develop environmental technologies, but not for the stages between introduction and regulatory approval of use, when many technologies face a financial "valley of death" from which they never again emerge.⁵²

Strengthen and extend public-private partnerships between federal, state, and local environmental agencies and the business community to explore, test, and apply P2/E2 practices.

More rapid dissemination of P2/E2 practices in the private sector requires government and private sector organizations to work together to identify, test, and apply effective technologies and processes for reducing or eliminating pollution at the source and the negative environmental impacts of products and services. Federal and state environmental agencies alone lack the expertise and information needed to promote P2/E2 practices, and the private sector is unlikely to take the initiative to disseminate successful practices on its own. Working together, state environmental agencies and private businesses can more effectively identify, test, verify, and disseminate P2/E2 technologies and processes.

Several states have been experimenting with public-private partnerships for pollution prevention since the early 1990s. Wisconsin's Department of Natural Resources, for example, develops joint agreements with industry-wide partners to work together voluntarily to reduce environmental emissions beyond levels required by regulations. Partnerships have been successfully developed with the pulp and paper, printing, and dry-cleaning industries. California's Environmental Technology Partnership is a joint program of the California EPA and the

state's Trade and Commerce Agency that works with industry, academia, financial, and legal organizations and public interest groups to explore technological innovations and advances in knowledge for pollution prevention and to help commercialize promising approaches. The partnership seeks ways to encourage regulatory and user acceptance of new technology, and works with California companies to promote the export of environmental technology. The Pennsylvania Department of Environmental Protection (DEP) establishes partnerships with trade and professional associations to provide training and technical assistance to their members on pollution prevention and environmental management systems. It also works with environmental and management consulting firms and with banks, accounting, and insurance companies to introduce them to new business opportunities related to strategic environmental management.

At the federal level, EPA should expand and reorient its industry partnership programs. Initiatives such as Project XL, Waste Wise, Design for Environment, Energy Star, and Green Lights encourage industries to develop alternative pollution reduction strategies, but too often use regulatory compliance rather than the inherent benefits to business of better environmental performance as the benchmark of progress.⁵³ Federal and state environmental agencies must overcome a relatively high level of mistrust that exists between companies and regulators, and between corporations and external stakeholders, who are required to provide inputs. Many firms fear that involving stakeholders might lead to public criticism or legal actions by regulators. Paperwork involved in many of the federal programs is voluminous and tedious, requiring companies to commit substantial resources to participate. Negotiations between companies and environmental protection agencies can be long and drawn out. Fear that participation in voluntary programs sponsored by government agencies might lead to compliance actions has also limited private sector responses. Reorienting these programs toward the benefits to business of adopting P2/E2 practices can contribute to disseminating them more widely and more quickly.

⁵² D.R. Berg, G. Ferrier, and J. Paugh, "The U.S. Environmental Industry," Washington, D.C.: USDOC, Office of Technology Policy, 1998.

⁵³ Nancy S. Bryson and Richard J. Mannix, "Reinventing Project XL," *Environmental Quality Management*, Vol. 7, No. 3 (1998): 111-117.

Increase governments' roles in assisting private enterprises to adopt and integrate pollution prevention and eco-efficiency practices in their overall management systems, and provide regulatory relief and flexibility to companies that do so.

Complying with regulations, no matter how inefficient and costly, is now safer for many companies than risking prosecution for violations when they attempt to apply new technologies or processes that could lead to better environmental performance. EPA and Congress should commit significant budgetary resources to developing new programs that help private companies adopt voluntary environmental management systems and P2/E2 practices. The success of such programs depends on a clear recognition of the factors that shape decisions in the private sector.

Environmental protection agencies can play important roles in accelerating the adoption of environmental management systems by providing technical assistance and stimulating technology transfer, developing metrics that measure performance in terms of both environmental protection and economic impacts, and testing new technologies and processes that achieve environmental goals in cost-effective ways. P2/E2 promotion programs should be based initially on reinforcing and disseminating practices that corporations are already testing or using.

As noted earlier in this report, corporations can and are adopting voluntary environmental management systems and P2/E2 practices. Federal and state environmental agencies should develop programs that identify, recognize, and assist in adapting and disseminating eco-efficient technologies and processes. Support for trade association or university-based clearinghouses of information on pollution prevention and eco-efficiency practices would provide greater access for small- and medium-sized companies to practices that work. More programs are needed like those in Ohio, Maryland, Pennsylvania, and North Carolina that provide technical assistance to companies in adapting P2/E2 practices. (See "Pollution Prevention Program in North Carolina.")

In order for businesses to adopt P2/E2 practices they need assistance in developing accounting systems that allow for accurate identification and

measurement of the value of natural resources and allocate responsibility for costs. Helping firms to adopt environmental accounting can have positive impacts on environmental performance because reducing or eliminating pollution will ultimately depend on changing the behavior of corporate executives and shareholders.

The success of P2/E2 programs depends in part on the capacity of environmental agencies to provide regulatory relief and flexibility to those companies

Pollution Prevention Program in North Carolina

The Division of Pollution Prevention and Environmental Assistance (DPPEA) of the North Carolina Department of Environment and Natural Resources (DENR) has been providing industry with free non-regulatory assistance since 1984. It provides a staff of engineers and chemists with manufacturing, regulatory, and consulting backgrounds to help companies find cost-effective ways to eliminate, reduce, recycle, and reuse waste and conserve natural resources.

DPPEA experts analyze a company's operations and make suggestions on possible material substitutions, process improvements, water and chemical conservation, inventory management, preventative maintenance, housekeeping, and reuse and recycling opportunities.

After a site visit, DPPEA experts research technologies and management practices that the facility may be able to implement and then draft a summary report that contains the following elements:

- 1) summary of costs for waste generation and management;
- 2) summary of the plant survey including identification of sources of wastes;
- 3) a listing of pollution prevention practices or technologies the facility may want to consider;
- and 4) when possible, an economic assessment for each option. DPPEA is a non-regulatory program.

DENR's confidentiality policy prevents regulatory divisions from seeking information from DPPEA about the compliance status of any individual or company in order to take enforcement action. If areas of non-compliance are identified during a site visit, they are pointed out to facility personnel.

that develop or adopt new technologies and processes. The National Academy of Public Administration recommends that EPA and state regulatory agencies encourage and reward companies that “draft multimedia, facility-wide plans to reduce their emissions to a point that might be significantly lower than national standards. EPA or a state environmental agency would formalize the plans by granting an integrated permit, which would stipulate the plant’s total allowable emissions.”⁵⁴ Under such a plan, the incentive for the firm is to find the least costly and most effective approach to improving environmental performance through appropriate combinations of emissions control and pollution prevention that meet its business needs and operational capabilities.

EPA and state regulatory agencies are now examining the possibility of integrating voluntary environmental management systems into their environmental policies. EPA and several states are pursuing pilot projects with both private and public organizations to test the EMS as an instrument for improving environmental performance.⁵⁵ EPA has developed a national tracking system based on successful experiments in New Jersey that can help determine the impacts of EMS implementation in private corporations and provide regulatory relief or compliance flexibility for companies that demonstrate better environmental performance.⁵⁶ These programs should be expanded and strengthened.

Expanding these programs at the federal level should be done carefully, however, because merely making what is now a voluntary management system part of the regulatory process can undermine the creative potential of businesses to protect the environment while reducing waste and gaining competitive advantage. A far more effective approach to promoting P2/E2 is for public agencies to pro-

vide incentives and rewards for companies that adopt beyond-compliance management systems. Those incentives should include facility-wide permitting, one-stop multimedia permitting, consistent industry-wide standards, permit streamlining, and concurrent compliance assistance, as is now done in New Jersey. Regulation should be used to change behavior, not to make it difficult for enterprises to comply or to punish executives that are trying new approaches to achieving beyond-compliance performance. More programs are needed like those in Oklahoma, Michigan, and Arizona that refund or reduce hazardous waste fees for pollution prevention activities. The State of Illinois gives preferred treatment in permitting and compliance problems to companies that develop toxic pollution prevention programs. Florida’s Metro-Dade County lowers fees or allows more lenient time schedules in enforcement settlement agreements for organizations that implement pollution prevention projects.⁵⁷ Minnesota’s Regulatory Innovation Act encourages assessment of pollution prevention strategies and authorizes flexibility to overcome unintended obstacles to P2 in existing statutes and rules.

Perhaps the most extensive P2/E2 experiments are being tried in Wisconsin, where the Department of Natural Resources has proposed a “Green Tier” program of performance contracts between the state and businesses that gives organizations a greater choice in how they meet statutorily set environmental standards.⁵⁸ The program evolved from ideas in regulatory reform studies and from experiments tried in Ireland, Germany, the Netherlands, and the European Union, and from programs tried in Oregon, California, New Jersey, Massachusetts, and Illinois. Recognizing that regulations, despite their volume and stringency, cover only about 20 percent of the environmental problems and opportunities in the United States, Wisconsin saw P2/E2 practices as a more effective way of addressing the 80 percent not covered by regulation. Although all businesses must meet regulatory requirements, those that sign agreements to

⁵⁴ *National Academy of Public Administration, Setting Priorities, Getting Results: A New Direction for the Environmental Protection Agency, (Washington, D.C.: NAPA, 1995): quote at p. 31.*

⁵⁵ *University of North Carolina at Chapel Hill and the Environmental Law Institute, “National Database on Environmental Management Systems,” Washington, D.C.: Environmental Law Institute, 2000.*

⁵⁶ *New Jersey Department of Environmental Protection, “Silver and Gold Track Program for Environmental Performance,” Trenton, NJ: Office of Pollution Prevention and Permit Coordination, 2000.*

⁵⁷ *National Pollution Prevention Roundtable, “White Paper on Government’s Role in Pollution Prevention Technology Verification,” Washington, D.C.: NPPR, 2000.*

⁵⁸ *George E. Meyer, “A Green Tier for Greater Environmental Protection,” Madison, WI: Wisconsin Department of Natural Resources, 1999.*

move into the “Green Tier” of environmental protection select appropriate tools for reaching specific environmental performance targets, develop performance mileposts, monitor and report requirements, and accept sanctions for failing to meet targets. The amount of regulatory relief and its timing are determined for each organization based on its negotiated agreement. (See “Wisconsin’s Green Tier Program for Environmental Management” for a summary of the program’s main components.)

Summary Conclusions

In brief, if the United States is to continue improving environmental conditions in the future, the current regulatory system must be augmented by a far stronger focus on pollution prevention and eco-efficiency practices in the private sector. In the future, significant gains in environmental quality are more likely to come from widespread adoption of P2/E2 practices than from more stringent control of “end-of-pipe” emissions.

New environmental management policies should focus on performance improvements rather than just regulatory compliance, use economic incentives to encourage clean manufacturing and the adoption of pollution prevention technologies and processes, and forge public-private partnerships for improving environmental quality. A new approach should reflect and reinforce the best practices that are being adopted by leading corporations in beyond-compliance environmental management. Governments have important roles to play in helping to reinforce innovation in the private sector, test and commercialize new pollution prevention technologies, and disseminate eco-efficiency practices from large companies to small and medium-sized firms and from the private sector to public organizations.

The recommendations described in this report provide a platform for a new generation of environmental policies in the United States that can protect the public health and natural resources through pollution prevention and eco-efficiency more effectively, less expensively, and more creatively than relying on a command-and-control regulatory system alone.

Wisconsin’s Green Tier Program for Environmental Management

Vision: Business achieves greater environmental and economic performance through a cost-saving, voluntary regulatory system.

What’s the problem? Government, business, and non-government parties may resist change, even knowing the regulatory system may have reached the limit of its effectiveness and all could benefit from more adaptive approaches.

What is the Green Tier System? It is a performance contract system to complement command-and-control regulations. The contract adapts to the needs of the firm, community, and environment.

How could it work? It’s voluntary. Firms and the government negotiate contracts that are flexible, innovative, efficient, and enforceable. An environmental management system in the contract provides assurance of compliance, predictable performance, and due diligence. Self auditing, policing, and reporting may be approved under “mixed liability” accountability.

What’s in it for business? Save time, reduce costs; encourage innovation; contain liability; adapt to market or supply chain demands; “trade” emissions within a “bubble”; incentives to prevent pollution first, and added credibility with citizens and customers.

What’s in it for taxpayers? Reduces bureaucracy. Allows regulators to set standards and focus on more pressing problems and sub-performing regulated organizations. Some duties are “deputized.”

What’s in it for the community? More communication, involvement, and a cleaner environment.

What’s in it for the environment? Produces greater environmental results by helping businesses and others do more than the minimum. Contracts may fit production lines, facilities, firms, areas, supply chains, sectors, products or pollutants and unregulated problems like land use, mobile air pollution sources, and runoff.

Source: Wisconsin Department of Natural Resources, 1999.

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